



Instructor's Manual

for Higher Education Mathematics

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ALEKS Corporation

ALEKS Instructor's Manual for Higher Education Mathematics, Version 3.6.
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Preface

Congratulations on your interest in ALEKS! This is an online educational system like none you have encountered before, a system that uses computer technology to promote math learning that is pedagogically sound and cutting edge.

The **features** of ALEKS make it a self-contained tool, opening new horizons for educators and learners alike in any educational context. The ALEKS Course Management System enables instructorscollege math instructors to oversee and monitor their students' progress, communicate with them, track usage levels, and focus instruction. By its unprecedented use of Artificial Intelligence, ALEKS determines quickly and precisely what your students know and what they need to learn, guiding them down individualized learning paths to mastery. Assessment and practice problems are algorithmically generated, so the students cannot predict them. The syllabi used in ALEKS are customizable, letting you conveniently add or subtract topics. Since ALEKS is accessed over the World Wide Web using standard browsers, no complicated technical preparation is needed—and your students can work at any time, from home, from work, or from the classroom! ALEKS is integrated with McGraw-Hill textbooks and a variety of other online learning resources. ALEKS is integrated with math textbooks and a variety of other online learning resources. And the price is low: no setup fees, no site licenses. It's a personal tutor for each of your students, at a fraction of what such services normally cost.

The **benefits** of using ALEKS are striking. Students work in a dynamic, interactive learning environment on precisely those materials that they are individually ready to learn, building momentum toward mastery. Students love ALEKS because **they** call the shots, working on their own schedule on what they need to learn right now. Students love ALEKS because **they** call the shots, working on their own schedule on what they need to learn right now. It is the personalized, “just-in-time” learning system.

ALEKS may be used in a variety of developmental math courses—whether in a traditional classroom or in a self-directed or distance-learning environment. ALEKS is sold to the student as a subscription. The student purchases a **User's Guide** with Access Code, usually through a bookstore. Using this Access Code along with the Course Code provided by the instructor, the student registers in the ALEKS system at the ALEKS website. Your sales representative will provide you with a Course Code once your order for **User's Guides** has been submitted to McGraw-Hill by your bookstore.

ALEKS can be adopted in one of three ways:

- ALEKS may be adopted as a supplement to a McGraw-Hill textbook. When you adopt ALEKS as a supplement, the student subscription cost is similar to the cost of a traditional print supplement, such as a student solutions manual. There is a special version of ALEKS to accompany most of McGraw-Hill's developmental math textbooks. This version allows the student to see references within ALEKS to the textbooks and provides links to the McGraw-Hill book-specific websites. These websites include additional tutorial material and interactive applications that supplement the explanations within ALEKS. If you adopt ALEKS as a supplement, students will need to purchase a McGraw-Hill textbook bundled with the **User's Guide** with Access Code.
- ALEKS may be adopted as a stand-alone item. In this case, the instructor adopts ALEKS alone, and the students purchase the **User's Guide** with Access Code for about the cost of a traditional textbook.
- ALEKS may be adopted with any of the course-specific ALEKS Worktexts. Each Worktext provides additional worked examples and practice problems for the student to use when a computer is not available. The Worktext websites provide additional tutorial material and interactive applications. Electronic files of the Worktexts are available by section online; this way students can hand in the printed Worktext pages as homework and still have access to the additional worked examples for reference.

ALEKS may be used in a variety of developmental statistics courses—whether in a traditional classroom or in a self-directed or distance-learning environment. ALEKS is sold to the student as a subscription. The student purchases a **User's Guide** with Access Code, usually through a bookstore. Using this Access Code along with the Course Code provided by the instructor, the student registers in the ALEKS system at the ALEKS website.

ALEKS can be adopted in one of two ways:

- ALEKS may be adopted as a supplement to a McGraw-Hill textbook. When you adopt ALEKS as a supplement, the student subscription cost is similar to the cost of a traditional print supplement, such as a study guide or student solutions manual. For McGraw-Hill textbooks, ALEKS allows the student to see references within ALEKS to the textbooks and provides links to the McGraw-Hill book-specific websites. These websites include additional tutorial material and interactive applications. If you adopt ALEKS as a supplement, students will need to purchase a McGraw-Hill textbook bundled with the **User's Guide** with Access Code.
- ALEKS may be adopted as a stand-alone item. In this case, the instructor adopts ALEKS alone, and the students purchase the **User's Guide** with Access Code for about the cost of a traditional textbook.

This **Instructor's Manual** is intended to provide complete information on the functioning of ALEKS. A description of its contents can be found in Chapter 1.

ALEKS: An Instructor's Video, packaged with this **Instructor's Manual**, prepares you to use ALEKS. In the video, you will meet the cognitive scientist, Jean-Claude Falmagne, who co-developed Knowledge Space theory and tapped its potential for developmental math instruction. To help you understand how ALEKS works—from both the student's and instructor's perspectives—you will see a thorough demonstration of its Assessment and Learning Modes and Instructor Module. Finally, you will hear math instructors discuss how ALEKS may be used in developmental math—whether in a traditional classroom or in a self-directed or distance-learning environment. The video is approximately 60 minutes in length. It is recommended that any instructor who will be assisting or instructing students using ALEKS take the time to watch the video.

Chapter 1

Introduction

1.1 What is ALEKS?

ALEKS is an online system for the assessment and individualized teaching of mathematics. It is accessed over the World Wide Web on any suitable computer and is designed to allow the monitoring and management of entire courses and colleges. The core of the system is an efficient, adaptive assessment engine that determines quickly and precisely what an individual student knows. Based on that assessment data, the system is able to offer material that the student is best able to learn at a given time. The ALEKS Learning Mode includes explanations and algorithmically generated practice problems, ongoing assessment of student knowledge, an online math dictionary, and facilities for review and collaborative help. It can be used on an independent basis or as a supplement to classroom instruction.

The ALEKS system is the product of years of cutting-edge research into the mathematical modeling of human knowledge (See Chapter 10). The creators of ALEKS are cognitive scientists, software engineers, and university professors in the mathematical disciplines. In designing ALEKS, their goal was to achieve the utmost simplicity of use without compromising the depth, rigor, or richness of mathematics instruction at its inspirational best. ALEKS is a tool to empower both instructors and learners of math: it opens doors and windows into the assessment and representation of knowledge, and it breaks down barriers to success by recognizing the vast diversity of paths that lead to mastery. The ALEKS system can make a radical difference in how math learning is experienced.

1.2 The ALEKS Instructor's Manual

The purpose of the **ALEKS Instructor's Manual** is to give instructors using ALEKS information on the operation of the system that is as complete as possible. The system

is not complex. ALEKS can be and often is used with no documentation whatsoever. At the same time, we wish to offer instructors a clear idea of everything ALEKS does, how it works, and where to find answers to their students' questions.

ALEKS is designed to be used without help from the Instructor's Manual. Feel free to use the system now. If questions arise, or if you want to learn more about ALEKS, this Instructor's Manual is intended as a convenient and comprehensive reference.

NOTE. For a brief, comprehensive overview of ALEKS, please turn directly to the "Frequently Asked Questions" in Chapter 11.

- The first chapters are those most likely to be turned to by instructors using ALEKS for the first time. Chapter 2, "Quick Start," contains a concise checklist for beginning to use ALEKS. Chapter 3, "Setup Guide for Instructors," provides all of the information necessary for preparing to use ALEKS with one or more courses. This ranges from technical requirements and installation through the students' first ALEKS session (which typically involves registration, tutorial, initial assessment, and entry into the Learning Mode). (Much of the information is the same as that in Appendix A.)
- Chapters 4 through 8 contain descriptions of the principal parts of the ALEKS system: Assessment Mode, Learning Mode, and Instructor Module. The Instructor Module is discussed in three chapters. Chapter B.13 presents the Instructor Module generally and is followed by treatments of the more specialized capacities of the Advanced Instructor Module. Chapter 7 covers Results & Progress, the facility for monitoring student use of ALEKS and managing accounts. Chapter 8 covers Standards & Course Syllabus, the facility for reviewing and modifying the curricular information used by ALEKS for a particular college or course. Chapters 4 through 8 contain descriptions of the principal parts of the ALEKS system: Assessment Mode, Learning Mode, and Instructor Module. The Instructor Module is discussed in three chapters. Chapter B.13 presents the Instructor Module generally and is followed by treatments of the more specialized capacities of the Advanced Instructor Module. Chapter 7 covers Results & Progress, the facility for monitoring student use of ALEKS and managing accounts. Chapter 8 covers Standards & Course Syllabus, the facility for reviewing and modifying the curricular information used by ALEKS for a particular college or course. Chapter 9 is a brief guide to teaching with ALEKS.
- Chapters 10 through 12 provide additional information that may be necessary or of interest to instructors using ALEKS. Chapter 10, "Knowledge Spaces and the Theory Behind ALEKS," explains the history of Knowledge Space theory and its fundamental concepts, along with the evolution of ALEKS itself. Also included is a Bibliography for those seeking to understand the theory behind ALEKS in greater depth. Chapter 11 provides answers to frequently asked questions about ALEKS. Chapter 12 gives the information necessary for obtaining technical and other support.

- The **ALEKS User's Guide** is distributed to all students using ALEKS. The **User's Guide** is reproduced here in Appendix A. Unlike the other chapters of the **ALEKS Instructor's Manual**, Appendix A is addressed to student users of the system. It covers technical requirements, installation, registration, the Tutorial, and ordinary use of the system, as well as guidelines for effective use and troubleshooting tips. Appendix A can be used by instructors to obtain a brief but complete picture of how the system is used. Appendix B contains content summaries for ALEKS

The **ALEKS User's Guide** is distributed to all students using ALEKS in college mathematics courses. The **User's Guide** is reproduced here in Appendix A. Unlike the other chapters of the **ALEKS Instructor's Manual**, Appendix A is addressed to student users of the system. It covers technical requirements, installation, registration, the Tutorial, and ordinary use of the system, as well as guidelines for effective use and troubleshooting tips. Appendix A can be used by instructors to obtain a brief but complete picture of how the system is used. Appendix B contains content summaries for ALEKS

Chapter 2

Quick Start

The purpose of this chapter is to provide a summary of the steps involved in starting a course with ALEKS.

2.1 Obtaining a Course Code

In order to use ALEKS with your course, you will need to have at least one Course Code. You give this code to the students in your course; they will use this Course Code, together with their Student Access Code, to register. The Student Access Code, together with the Course Code, is all your students need to register with ALEKS. When they register, they will receive a Login Name and Password; after this they will no longer need the Access Code or Course Code. Students should not use the Student Access Code and Course Code to register a second time, as they will not be able to create a new account this way.

You can have as many courses and sections as you need or want in ALEKS. For each course or section, there is one unique Course Code. Students who register using this code will be enrolled in the corresponding course. Students who accidentally enroll in the wrong course can easily be moved to the right one at any time, without any unwanted effect on their work or records (moving a student to a course using a new domain in ALEKS may trigger a new assessment). **To obtain the Course Code for any course, log on to your instructor account, click on “Course Admin,” and then on “View all your courses and course codes” (See Sec. 6.2.2).** Or, in the Advanced Instructor Module, simply select the name of the course and click “Edit.” The Code will appear in the upper right-hand part of the screen (See Sec. 7.18).

You will normally be provided with an instructor Login Name and Password by ALEKS Corporation; a colleague at your college with Administrator privileges in ALEKS can also create an instructor account for you. Once you are logged on to ALEKS as an instructor, you can create one or more courses through “Create a new course” (under “Course Admin”).

2.2 Registering Students

Students should use the following steps to register.

1. Go to the ALEKS website.

<http://www.aleks.com>

2. Click on the link for “SIGN UP NOW” to the upper left (This is the only time they will click on that button.)
3. On the page that follows, enter the Course Code in the spaces to the left of the window. Do not use the button on the right-hand side.
4. Enter other information as prompted.
5. In the course of registration, the student may be prompted for their individual Access Code.
6. Record their Login Name and Password, provided by the system. (Students can change their Password now or later if they wish.)
7. Begin using ALEKS by taking the Student Tutorial and an initial Assessment.

Students will subsequently use their Login Name and Password to enter their accounts.

Chapter 3

Setup Guide for Instructors

3.1 Instructor Preparation

As an instructor using ALEKS with your courses, it is important that you clearly understand the system's functioning and its underlying ideas. Take the time to study all materials provided to you, including this Instructor's Manual and the ALEKS video, and try out the system thoroughly. The supervisor for ALEKS can contact ALEKS Corporation for consultation at any time, preferably well in advance of the first session (See Chapter 12.).

3.2 System Requirements

The following table presents the system requirements for ALEKS in summary form.

	PC	Macintosh
Operating System	Windows	MacOS 10.2+
Processor	166+ MHz	Any
RAM Memory	32+ MB	32+ MB
Browser	Netscape 7.1+, Explorer 6.0+, Firefox 1.0+, Mozilla 1.6+	Safari (w/OS 10.3+), Firefox 1.0+, Netscape 7.2+
Modem Speed	28+ kbps	28+ kbps

Figure 3.1: System Requirements

Your browser should be configured with Java enabled. Both Netscape and Internet Explorer usually ship with Java. You can also install Sun Microsystems' Java® VM, version 1.4.1+, which can be obtained from Sun.



Figure 3.2: The ALEKS Website

Note that any of the kinds of direct connection (cable, ISDN, DSL) that are typical in computer labs are adequate for use with ALEKS. If your computer lab has security safeguards in place, you will need the cooperation of your LAN administrator, system administrator, or lab technician to install the ALEKS plugin.

3.3 Installation

Installation of the ALEKS plugin takes place from the ALEKS website (Fig. 3.2):

`http://www.aleks.com`

NOTE. You must use this URL to access ALEKS. Although there are other ALEKS websites that you may find using an Internet search engine, only this one contains your registration data as a licensed ALEKS instructor. It is advisable to mark this website in your browser with a “Bookmark” or “Favorite” or by creating a shortcut of some kind.

Close all applications other than your web browser before beginning installation.

Installation of the ALEKS plugin is automatic. If you attempt to use the system directly by clicking on “Be our Guest” or on “Register with ALEKS,” the system will automatically check to see whether your computer has the most recent plugin currently installed. If it does not, the system will download the plugin and ask for your permission to install. (This is not a high-risk operation for your computer. The ALEKS plugin is a small library of Java classes which are used by your browser when you are logged on to ALEKS. They are inactive at other times and do not do anything except provide functionality for ALEKS. They can easily be removed from the computer with no other effect except that ALEKS ceases to be available on that computer. ALEKS Corporation Customer Support will be happy to answer any questions about the plugin.) When you grant permission, it will install. Following installation you must close and reopen your browser application. Installation is automatic for registered users as well.

If you need to download and install the plugin and this does not occur automatically, click on “Download the ALEKS plugin.”

There is also a “streaming” plugin which can be used in situations where it is not possible to download to the local computer. Go to the following website:

<http://www.aleks.com/plugin>

Log on as usual. It will take one or more minutes for the plugin to load into memory. Once this is done, you will be able to use ALEKS in the usual way.

3.4 Instructor Module

The instructor enters the ALEKS Instructor Module by logging on to ALEKS with their Instructor Login Name and Password. The Instructor Module is an extremely important component of the ALEKS system, permitting instructors to monitor and manage their ALEKS courses. The Instructor Module is designed for the utmost ease of use; it guides users through the steps needed to accomplish tasks in such a way that no separate training is needed and mistakes or confusion are unlikely. See Chapter B.13 for a complete description of the Instructor Module.

After the instructor is familiar with the features of the Instructor Module, he or she may wish to try the Advanced Instructor Module, which is somewhat more complex than the standard interface but offers greater efficiency in some operations. Some instructors find the Advanced Instructor Module more convenient to use once they are used to it. There is a Tutorial in ALEKS explaining the use and features of the Advanced Instructor Module (See below).

3.5 Lab Check

To ensure the best possible experience of ALEKS for your students, we recommend that you check the computer lab in which ALEKS will be used in advance of the first session. This means installing and testing the plugin on some or (preferably) all of the computers in the lab. If security measures are in effect, you will need the cooperation of the lab administrator to install the plugin. To install and test, simply log on to ALEKS through "Be Our Guest" on each computer or use your instructor login to enter your account. Installation will occur automatically. Following installation, restart the browsers and attempt login again. This time you should access ALEKS.

If the ALEKS plugin is not preinstalled and tested in this way, it will be installed when your students first access the system. This will take away a certain amount of time from their use of the system. Also, if there is some problem in the lab that makes installation difficult, it is far better to catch and resolve it before the students arrive.

3.6 Student Orientation

It is strongly recommended that the first ALEKS session be conducted under supervision, perhaps with another instructor on hand to help your students get started. You may also choose to schedule supervised assessments at midterm and at the end of the course. It is not generally necessary to schedule a separate orientation meeting before the students actually begin using the system, although in some cases there may be reasons for doing so. Presumably, the students will all have copies of the **ALEKS User's Guide**. You should encourage students to familiarize themselves with this brief guide. You may wish to remind your students to bring it along to the first session as it contains their Access Code, which is required for registration. It is also advisable to emphasize the few requirements for assessments in ALEKS: paper and pencil are needed, as well as simple calculators. Calculators without graphic or symbolic functions are permitted for Algebra only. (A basic calculator is part of ALEKS.) Remind your students that help is not allowed during the assessment because if the student being assessed does not do their own work, the assessment results may not be accurate, and this will hinder that student's progress in the Learning Mode.

If at all possible, the students' first session with ALEKS should be long enough for them to complete their assessments and begin work in the Learning Mode. One hour may be considered a reasonable period of time. If the students cannot finish their assessments during this time, ALEKS will automatically keep their place, and they will resume next time where they had left off. No work will be lost.

3.7 Registration

Students register with ALEKS by going to the ALEKS website and clicking on “SIGN UP NOW.” This will be expedited if the browsers used by the students have ”Bookmarks” or ”Favorites” pointing to the website (See Sec. 3.3).

NOTE. In order to register, all students must have both their Access Code and the Course Code for the course that you are teaching. The students find the Access Code in their copy of the **ALEKS User’s Guide**, inside the back cover. The Course Code is sent to the instructor by ALEKS Corporation or obtained by the instructor when creating the course (See Sec. 6.2.1). You are responsible for giving this code to the students at the time of the first session.

To obtain the Course Code for any course, log on to your instructor account, click on “Course Admin,” and then on “View all your courses and course codes” (See Sec. 6.2.2). Or, in the Advanced Instructor Module, simply select the name of the course and click “Edit.” The Code will appear in the upper right-hand part of the screen (See Sec. 7.18).

The student registration process is described in detail in the User’s Guide (See Appendix A). There are complete online instructions for every step of this simple procedure. Among other information, some students may be able to supply their email address (so they can be helped more promptly in case of difficulties) and their Student ID number (if you wish to have this in the system). Special care should be taken in entering the latter, as the system cannot detect mistyping. Both email and Student ID are optional information.

Near the conclusion of Registration students receive a Login Name and Password. These should be noted carefully, as they will be essential for all further work with ALEKS. You may wish to advise the students to change their Passwords at the earliest opportunity. They should use a Password they will remember easily but that will be hard for others to guess. Login Name and Password can be typed with upper- or lower-case letters. Neither may contain spaces or punctuation.

3.8 Tutorial

Following Registration, the students enter a brief tutorial on the use of ALEKS input tools, also called the **Answer Editor Tutorial** (See Sec. 4.5). There are separate Tutorials for different subjects, since the specific tools for them differ somewhat. The ALEKS Tutorial provides ample feedback to ensure that students complete it successfully.

NOTE. The Tutorial is not intended to teach mathematical knowledge, but rather to train students in using the system tools. If students need a “refresher” on use of the system tools, it is always possible to click on the “Help” button, which gives access to the sections of the Tutorial (See Sec. 5.2.11).

3.9 First Assessment

Students proceed directly from the Tutorial to their first assessment (See Chapter 4). To reiterate, no help of any kind should be given to students being assessed, not even rephrasing a problem. Students need to have paper and pencil. Simple calculators without graphic or symbolic functions may be used for Algebra. A basic calculator is part of ALEKS. No calculators are used for Basic Math.

The ALEKS assessment is adaptive and variable in length. Some students will have very short assessments, whereas others will have assessments that are longer. Consistency of effort and concentration are the factors most likely to influence the length of an assessment.

NOTE. All students will be assessed upon their first use of the system. This will provide you with a baseline picture of your class and of each individual student.

3.10 Report Tutorial

At the conclusion of each assessment, the student is given a brief Tutorial on how to interpret the Assessment Report. This will be in the form of one or more color-coded pie charts, with accompanying textual information (See Sec. 4.13). It is important that the students know how to interpret these pie charts correctly. Some instructors have found it worth the effort to sit with each student individually as he or she concludes his or her assessment. They can then make sure the student understands the parts of the report and help him or her choose topics for entry into the Learning Mode. Keep clicking “Next” until you get to “MyPie,” where you can choose items for work in the Learning Mode.

Explain to students that subsequent assessments will produce only the pie charts. The pie charts also appear in the Learning Mode each time a new concept is mastered and “added to the pie.” If the student wishes to choose a new topic, the pie can always be accessed by means of the “MyPie” button.

3.11 Beginning the Learning Mode

Students enter the Learning Mode by clicking on one of the topics contained in their pie chart (topics they are completely “ready to learn”). If at all possible, the students should be given sufficient time in their first ALEKS session to use the Learning Mode and, ideally, to begin to “add concepts to their pie.” If they have this experience, their interest in using ALEKS is likely to be more favorable. You should also be present to answer questions regarding the Learning Mode and to assist your students in familiarizing themselves with its varied features. This is particularly important in cases in which their subsequent use of ALEKS will be unsupervised.

In some ALEKS course products, students may choose to continue their initial assessment for particular pie slices where no topics are yet available to them. In order to initiate these assessments, the students click a button marked “Assessment” which appears in the place of a list of available topics for the particular slice. Such assessments are called “Initial Assessment (continued),” and are generally shorter than other assessments. They focus on topics from the slice chosen, and their purpose is to “open” that slice for work by the student.

Chapter 4

Assessment Mode

The Assessment Mode is the heart of the ALEKS system. Its ability to quickly and accurately determine a student's knowledge enables ALEKS continuously to make available the material the student can most readily employ, and thus efficiently guide individual learning paths. The Assessment and Learning Modes work together closely. In ALEKS, learning is powered and optimized by assessment.

4.1 Assessments in ALEKS

The ALEKS assessment uses open-ended problems (no multiple-choice questions). It is an adaptive assessment; that is, problem types are selected based on all the previous answers the student has given. It is impossible to predict which types of problems will appear, or in what order. Moreover, the problems themselves are generated algorithmically, with randomly-selected numerical values (as is also the case in the Learning Mode). Thus, one cannot “learn the assessment” or “teach to the assessment,” and cheating is almost impossible. In the unlikely event that two students sitting next to one another were given the same problem-type at the same time, the problem parameters and numerical values would almost certainly be different, and so would the correct answer. Despite this, certain assessments must be supervised, such as the initial, midterm, and final assessments in a course. Without supervision, students could use a textbook, receive systematic help, or have someone else take the assessment in their place. This point is critical where assessment results are used for purposes other than those internal to the system. (There is no reason for a student who has begun using ALEKS to cheat on a “progress” assessment, as this will simply cause the system to suggest problems that are too difficult, and thus hinder the student's own work.)

As noted, the student takes an initial assessment immediately following completion of the Tutorial (See Sec. 3.9). When an assessment begins, the student is clearly informed it has begun. Next a series of mathematical problems is posed to the student. The student provides the solution to each problem using the Answer Editor (or clicks “I

don't know"). In the Assessment Mode, the system does not inform the student whether the answer just given was correct or not. The assessment continues until the system has determined the student's precise knowledge of the domain, at which time the assessment ends and a report is presented to the student. The number of questions asked cannot be known in advance, although consistency of effort and attention seem to contribute to shorter assessments.

4.2 Rules for Assessments

Because assessments in ALEKS are important, it is essential that they be conducted according to certain guidelines. Assessment in ALEKS is an important and serious event. It is essential that assessments be conducted according to certain guidelines and in the proper spirit. If there is an atmosphere permitting disturbances or distractions, students will not obtain the benefits the system is capable of providing. If assessment results are inaccurate, the system will give the student inappropriate problems and progress will initially be impaired. The system will recover and find the right level, but the student may still experience a degree of frustration. In order to avoid this, it is strongly recommended that the first assessment be taken under the instructor's supervision (See Sec. 3.9).

All students being assessed need paper and pencil. No calculators are permitted in assessments for Basic Math, but simple calculators without symbolic or graphing functions should be available for students being assessed in Algebra. A basic calculator is part of ALEKS. Most important, no assistance may be given—not even to the extent of explaining or rephrasing a problem. Students should be encouraged to use the “I don't know” button when they do not know what to do. It is not possible to return to previous assessment questions; students should not click their browser's “Back” or “Forward” buttons when using ALEKS.

4.3 Scheduling of Assessments

Initial Assessment. The initial assessment takes place at the outset of students' use of ALEKS, immediately after Registration and Tutorial (See Sec. 3.9). We strongly recommend that this initial assessment, which has the character of an orientation to the system for student users, take place in a supervised computer lab setting to ensure that students do not receive help or collaborate. In creating or editing a class account, the instructor can stipulate that the initial assessment be allowed only from school (See Sec. 7.17.).

In some ALEKS course products, students may choose to continue their initial assessment for particular pie slices where no topics are yet available to them. In order to initiate these assessments, the students click a button marked “Assessment” which appears in the place of a list of available topics for the particular slice. Such assessments

are called “Initial Assessment (continued),” and are generally shorter than other assessments. They focus on topics from the slice chosen, and their purpose is to “open” that slice for work by the student.

Automatic Assessments. Additional assessments are scheduled automatically by the system based on two factors: overall time spent in the Learning Mode (called “Login Time Assessment”) and progress made while there (called “Progress Assessment”). By default, a new assessment is triggered after 20 new items have been learned (but no sooner than 5 ALEKS hours after the last assessment) or after 10 hours have been spent in Learning Mode since the last assessment or after 60 days have passed since the last assessment. Some modification of these parameters is possible; please contact ALEKS Corporation Customer Support for assistance if you would like to do this. The Learning Mode itself updates students’ assessment results as it goes along, periodically displaying new pie charts and new choices of concepts they are completely “ready to learn.” The automatic assessments, however, provide a firmer basis for such guidance.

Completion Assessments. ALEKS also assesses students automatically when they complete the syllabus for a course. If the assessment does not confirm the student’s mastery of the syllabus materials, they will return to the Learning Mode. More than one Completion Assessment is thus possible, but as a rule ALEKS will not reassess the student if only a small number of topics need to be relearned.

Requested Assessments. Assessments can also be requested by the instructor for individual students or for entire courses. For example, the instructor, department, or college may wish to have “midterm” assessments under supervision to guarantee sound results. ALEKS allows the instructor to schedule the assessment for a particular date and time (See Sec. 6.5.1). Students logging on to ALEKS within the time period specified for the assessment will automatically enter Assessment Mode.

The instructor simply announces the assessment for a certain time and place. Just prior to this time the instructor prompts the course assessment in the Instructor Module (See Secs. 7.9–7.10). The next time students log on they will automatically enter the assessment. Note that a requested assessment “resets the clock” for automatic assessments, so that students will not be assessed with undue frequency. Also, among the options for a requested assessment is one to prevent automatic assessments within a certain number of days prior to the requested assessment (See Sec. 6.5.1).

NOTE. In some ALEKS products, there is an option to request the assessment on a particular slice or slices of the pie chart. When this is done, there will be a note regarding the estimated number of questions needed for the assessment. Often, assessing on more than one slice of the pie chart will result in an assessment that is longer than desired; therefore, this feature is usually most effective when only a single slice is selected. The instructor also has the option of letting ALEKS select an appropriate slice for each student, based on their individual progress.

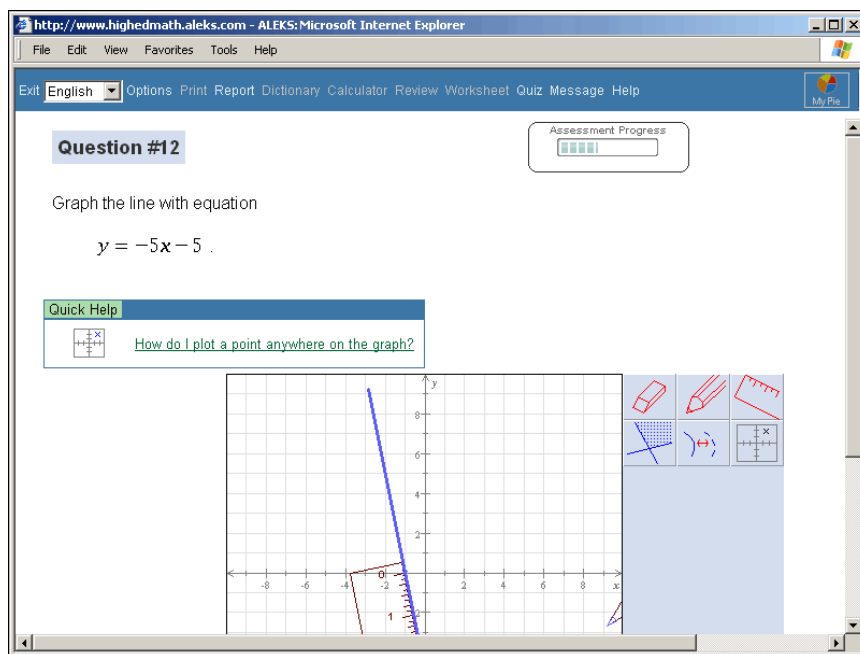


Figure 4.1: The Answer Editor for Mathematical Expressions (Assessment)

4.4 Buttons

The Assessment Mode (Fig. 4.1) has a reduced set of active menu buttons enabling the student being assessed to leave the system (“Exit”) or get help on use of the Answer Editor (“Help”). Other buttons appear, but they are disabled. All of the ALEKS menu buttons are enabled in the Learning Mode (See Sec. 5.2).

Note that students using ALEKS should **not** click their browser’s “Back” and “Forward” buttons. Only the navigation tools that are part of the ALEKS interface should be used.

The two aspects of the ALEKS interface relevant to work in the Assessment Mode are the Answer Editor and the Assessment Report.

4.5 Answer Editor

Input to the ALEKS system is always in the form of proper mathematical expressions and constructions, never multiple choice. A critical reason for this is to prevent substantial inaccuracies which arise from students’ guessing and trying out the different choices.

Another purpose of this approach is to train students in the same skills that are necessary for conventional, paper-and-pencil communication of solutions and results. At the same time, the sophistication of the ALEKS input tools provides certain advantages. The

presentation of results is always neat and clear. Manual dexterity plays a reduced role in drawing an accurate graph or geometrical construction. Immediate feedback is provided on the formal completeness of solutions.

The general term for the input tools used in ALEKS is the “Answer Editor.” This encompasses a variety of actual modes for user input: an Answer Editor for mathematical expressions, an Answer Editor for the numberline, an Answer Editor for graphing in the Cartesian plane (with x and y coordinate axes), and an Answer Editor for histograms (in Statistics). A student beginning to use ALEKS is thoroughly trained in all features of the Answer Editor that are relevant to the subject being studied during the Tutorial (See Sec. 3.8).

In much of what follows, emphasis is on the “Answer Editor for mathematical expressions,” as this is the section which involves the greatest degree of interplay between mouse, keyboard, and on-screen buttons and icons.

4.6 Manipulators for Mathematical Expressions

The Answer Editor for mathematical expressions consists of two parts: a rectangular field into which mathematical expressions are entered (the “entry field”) is to the left, and a “keypad” made of buttons with mathematical symbols is to the right (Fig. 4.1). These buttons have labels in the Tutorial, but not afterwards. Mathematical expressions are entered and edited using the buttons of the Answer Editor keypad, as well as the basic keyboard, the Left and Right arrow keys, the Tab, Enter, and Backspace keys, and the mouse.

NOTE. Buttons are displayed to correspond with the kind of problem being solved. The selection is made in such a way as to avoid giving away the correct answer. Keyboard shortcuts (Fig. 4.2) work only when the corresponding button is displayed.

Basic Input

When a new page is opened and contains a problem whose solution is a mathematical expression, the entry field initially contains at least one blue box. Each blue box represents a mathematical expression that forms part of the complete answer. To enter a mathematical expression one must first click on a blue box. When this is done, the cursor (or “caret”) appears inside the box. The cursor marks the point at which something is entered. Material can be entered using the basic keyboard or the buttons of the keypad. Individual digits can be entered only from the keyboard. Symbols can be entered using the buttons of the keypad and, sometimes, from the keyboard as well (Fig. 4.2).

Basic Editing Tools

The cursor, showing the point at which material is entered, can be moved using the Left and Right arrows and the Tab and Enter keys. It can also be positioned using the mouse. Input can be deleted using the Backspace key (Fig. 4.3).

Expression	Answer Editor keypad button	Keyboard equivalent
Square Root	$[]\sqrt{[]}$	(none)
Fraction	$\frac{[]}{[]}$	/
Mixed Number	$[]\frac{[]}{[]}$	(none)
Repeating Decimal	$[]\overline{[]}$	(none)
Absolute Value	$[] [] $	(none)
List of Expressions	$[], [], \dots$,
Exponent	$[]^{[]}$	^ (before exponent)
Multiplication Expression	$[] \times []$	*
Percentage	%	%
Greater-Than	$[] > []$	>
Less-Than	$[] < []$	<
Greater-Than-or-Equal-To	$[] \geq []$	(none)
Less-Than-or-Equal-To	$[] \leq []$	(none)
Equal-To	$[] = []$	=
Not-Equal-To	$[] \neq []$	(none)
AND	<i>AND</i>	(none)
OR	<i>OR</i>	(none)

Figure 4.2: Mathematical Expressions Produced by the Answer Editor

Selecting Input

It is possible to select a continuous portion of input by dragging the pointer with the mouse button held down. A segment that has been selected by dragging in this way can be deleted by pressing Backspace, replaced by typing, or replaced by clicking the buttons of the Answer Editor keypad. It can also be inserted into a mathematical expression such as a fraction or a square root (the selected portion is placed in the numerator position or under the square root sign, respectively).

Clear and Undo

After material has been entered, the field can be returned to its empty state by clicking on “Clear.” Clicking on “Undo” cancels the most recent action. Clicking on “Undo” a second time restores the effect of the canceled action (including a “Clear” command).

4.7 Mathematical Expressions

The purpose of the Answer Editor for mathematical expressions is to process user input in the form of correct mathematical expressions. One important way in which the Answer Editor guides the user in constructing such expressions is by means of the blue boxes. If a blue box remains on the screen, you know that the input typed so far is not valid.

Key	Effect
Right arrow - Tab - Enter	moves the cursor one place to the right (ahead)
Left arrow	moves the cursor one place to the left (back)
Backspace	deletes input immediately preceding (to the left of) the cursor and moves the cursor one place to the left (back) OR deletes selected input

Figure 4.3: Using Special Keys in the Answer Editor

Entering expressions from the keyboard

For expressions that do not require the use of the Answer Editor keypad, the user can place the cursor within a blue box and enter the mathematical expression from the keyboard. For many expressions, however, the Answer Editor keypad must be used. It may be used, as well, for some types of expressions that can also be entered from the regular keyboard (Fig. 4.2).

Using the Answer Editor keypad to structure simple expressions

To form a simple mathematical expression, the user places the cursor in an empty blue box and clicks on the appropriate button from the Answer Editor keypad. The initial blue box disappears and new blue boxes may appear (depending on the button), accompanied by all of the necessary signs. The user can now fill in the new boxes.

Entering complex expressions

Sometimes it is necessary to enter more complex mathematical expressions. What has been written about entering mathematical expressions into a single blue box holds equally true for entering expressions into any of the blue boxes produced by clicking a button of the Answer Editor keypad. One can place the cursor in one of these boxes and enter an expression from the keyboard, or, by clicking on a button of the Answer Editor keypad, replace it with the structure of a new mathematical expression. Expressions of any degree of complexity can be created in this way.

NOTE. The Answer Editor does not supply parentheses. The user must know when these are necessary. In particular, when there is an expression consisting of more than one symbol that must be raised to a power, one may need to enclose it in parentheses, just as in writing; otherwise, only the final symbol (just before the exponent) will be raised to the specified power.

Alternate ways of entering expressions

The buttons of the Answer Editor keypad can be used in other ways as well. In particular, one can select some portion of the input in the entry field which constitutes a complete mathematical expression, and then click on a keypad button. This will create a new mathematical expression within which the expression selected is one component. The same basic rule applies: the minimum unit of manipulation is a complete mathematical expression.

Other mathematical signs

The following mathematical signs can be entered only from the keyboard:

- the plus sign (+);
- the minus sign (-), both for connecting the two parts of a subtraction expression and for designating a negative number;
- the period (.) used in decimals;
- the comma (,) used to punctuate numbers of more than three places.

Please note as well the following special cases:

The asterisk for multiplication

The “x” character on the keyboard cannot be used to enter a multiplication sign. Only the asterisk (*) serves this purpose. (The multiplication sign on the Answer Editor keypad, however, is the traditional x-shaped symbol.)

Mixed numbers

Although fractions can be entered from the keyboard using the front slash character (/), mixed numbers **cannot** be entered this way. More precisely, the Answer Editor does not automatically regard a whole number followed by a fraction as a mixed number. The mixed number button on the Answer Editor keypad **must** be used to enter mixed numbers.

4.8 Types of Mathematical Expressions

The following set of tips is intended to illustrate the variety of ways in which mathematical expressions can be entered using the Answer Editor. It is in no way a thorough description of the Answer Editor, which includes many other kinds of mathematical expressions and constructions.

Here, “Button” will always refer to a button on the Answer Editor keypad. By “select” we mean drag the mouse over the expression to be selected with the mouse button depressed, so that a red box appears surrounding it.



Percentage

48%

The next example illustrates the possibility, in some cases, of using either the Answer Editor keypad or the regular keyboard to enter signs:

- Enter the expression you wish to express as a percentage and click on the percent button; **OR**
- Enter the expression you wish to express as a percentage and then enter the (keyboard) percent sign.



Fraction

$\frac{7}{10}$

Fractions can be entered conveniently at least three ways:

- Enter the numerator, enter a (keyboard) forward slash character, and enter the denominator; **OR**
- Enter the numerator, click on the fraction button, and enter the denominator; **OR**
- Click on the fraction button, enter the numerator, then click on the blue square in the position of the denominator and enter the denominator.

**Mixed Number**

$$5 \frac{7}{8}$$

Mixed numbers can be entered in more than one way, but they each require use of the mixed number button:

- Enter the whole number part, click on the mixed number button, enter the numerator, press Enter, and enter the denominator; **OR**
- Click on the mixed number button, click on the first blue box (for the whole part), enter the whole number part, press the right arrow, enter the numerator, move the cursor to the denominator position, and enter the denominator (i.e., fill in the boxes).

**Repeating Decimal**

$$1.\overline{27}$$

- Enter all digits that precede the repeating pattern, including the decimal point (a period on the keyboard) and any decimal places preceding the pattern, click on the bar button, and enter the repeating pattern; **OR**
- Enter all digits, including the decimal point (a period on the keyboard) and all decimal positions following it, select the repeating pattern only, and click on the bar button.

**Fraction in square root followed by multiplier**

$$\sqrt{\frac{5}{8}} \times 3$$

For this example only one input method is given, but others could be suggested:

- Click on the square root sign button, click on the fraction button, enter the numerator, tab, enter the denominator, then tab, enter an asterisk (from the keyboard), and enter the multiplier.

**List**

$$1, 2, 3$$

For the purposes of the following example, assume that there is a list consisting of three components to be entered:

- Enter the first expression, click on the list button (or press the keyboard comma), enter the second expression, click on the list button, enter the third expression, click on the list button, and enter the fourth expression; **OR**
- Click on the list button (or press the keyboard comma) twice, click on the first blue box, enter the first expression, move the cursor right, enter the second expression, move the cursor right, and enter the third expression.

Answers with Units

10 cups

There are also some cases where the Answer Editor does part of the formatting. For example, in problems where answers must be expressed in some kind of units, such as dollars or candies, the unit expression needed may appear in advance.

**Square Root**

$\sqrt{81}$

- Click on the square root button and enter the expression into the square root sign; **OR**
- Enter the expression you wish to appear under the square root sign, select it, and click on the square root button.

In the simple example just given the second method reverses the sequence of steps of the first method. Such complementary methods are typical.

**Absolute Value**

$|-6|$

- Click on the absolute value button and enter the expression whose absolute value you wish to express; **OR**
- Enter the expression whose absolute value you wish to express, select it, and click on the absolute value button.

**Exponent**

3^2

- Click on the Exponent button, enter the base, then move the cursor to the exponent box and enter the exponent; **OR**
- Enter the expression you wish to raise to a power, click on the exponent button, and enter the exponent.

NOTE. If the number you wish to raise to a power is an expression consisting of more than one symbol, it may need to be enclosed in parentheses. The Answer Editor will not do this for you. If no parentheses are used, only the last symbol will be raised to a power.

**Square Root Preceded by Multiplier**

$2\sqrt{6}$

With more complex expressions you can use the mouse to place the cursor in the needed position, as in the second method:

- Enter the multiplier, click on the square root button, and enter the expression you wish to be under the square root sign; **OR**
- Click on the square root button, click to the left of the square root sign, enter the multiplier, tab (or press the right arrow, or press Enter, or click on the blue box under the square root sign), and enter the expression you wish to be under the square root sign.

4.9 Advanced Mathematical Expressions

The following types of mathematical expressions occur in more advanced subjects.



To create a matrix, the user clicks on an icon corresponding to the dimensions desired (2×2 , 2×3 , *etc.*), then fills in the cells with appropriate values.



For topics involving set notation, there will appear icons for each of the special symbols required, such as curly braces, “belongs to,” “such that,” the real numbers, the integers, and so forth.

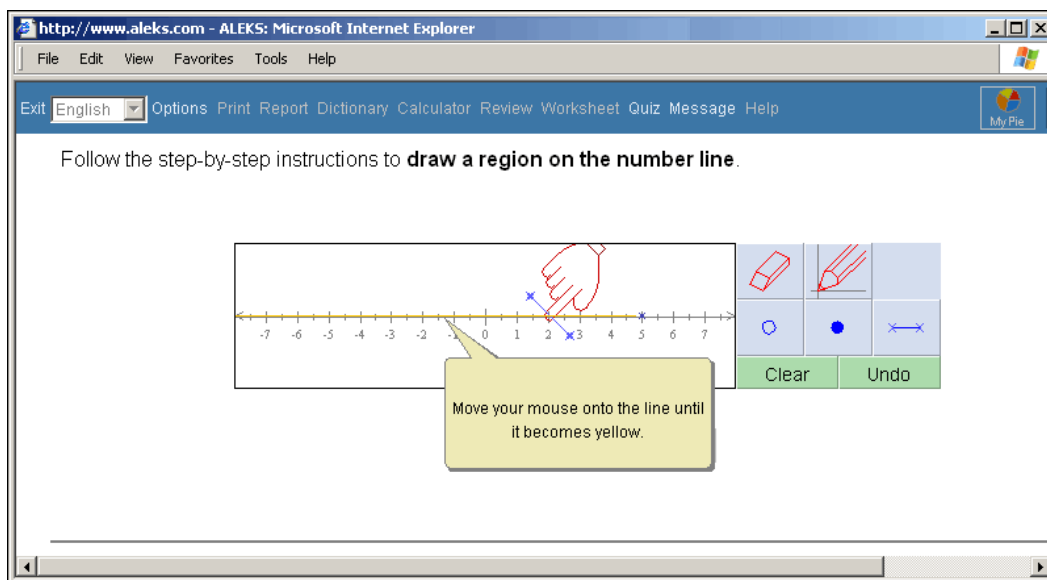


Figure 4.4: The Answer Editor for the Numberline

4.10 The Answer Editor for the Numberline

The Answer Editor for the numberline consists of a numberline and tools for placing full and empty endpoints and segments (Fig. 4.4). To place a segment, mark a point on the numberline with the pencil, then click on that point with either the full or the empty tool. To place a segment, use the Region tool to click on any point in the relevant part of the numberline. If the user clicks between two endpoints, the segment will extend to each of them. When the user clicks between an endpoint and an extremity of the numberline, the segment will appear with an arrow to indicate that it continues to infinity. Click with the eraser to remove any part of the construction.

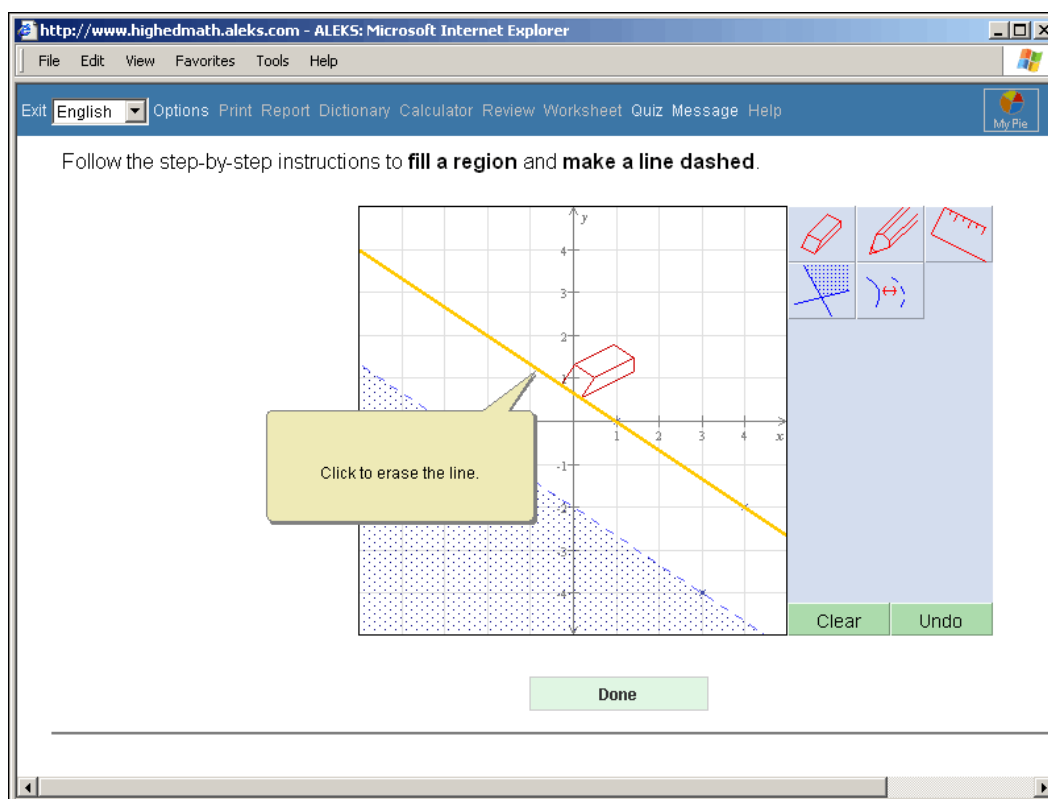


Figure 4.5: The Answer Editor for Graphing

4.11 The Answer Editor for Graphing

The Answer Editor for graphing consists of a Cartesian plane with x - and y - coordinate axes and a selection of other tools for graphing lines and regions of the plane (Fig. 4.5).



To graph a line, use the pencil tool to plot two points. Then, align the straightedge (ruler) on the two points (it is a “grabby” tool and will jump to a point when it is near it). Then use the pencil tool to draw the line. Note that the effect of the straightedge continues past its ends, so there is no need to move it to make a line going from edge to edge of the depicted plane. The line should be started within the graph area, however.



To fill in a region, use the region tool and click in the desired region of the plane. One must draw all lines defining the region before filling it in. In order for one or more of the lines defining a region to be dotted (as in the graph of a system containing one or more strict inequalities), click on the line with the dotted line tool. This may be done before or after the region is filled.



To place a point where coordinates are not both integers: use the input field to enter numerical values (fractions and mixed numbers can be placed using the icons beneath the field), then click on the icon with horizontal broken line (for the y -coordinate) or vertical broken line (for the x -coordinate). A broken line will appear on the plane for each given coordinate. Use the pencil to mark the desired point at their intersection. Another method is the click on the ordered pair icon (with a comma separating two boxes in parentheses), enter a pair of coordinates (in terminating decimal, fractional, or mixed-number form), then click on the icon with a small Cartesian plane and a point marked by “X.” This will place the point directly on the plane without using the pencil.



To draw a graph requiring an asymptote, use the asymptote tool (broken horizontal or vertical line) to place the asymptote as needed. A slanted asymptote may be placed by first drawing two points and then using the tool with a broken diagonal line. Plot the additional points needed for the graph, and then click on the graph button (curved line connecting “X”s).



For each type of conic section, there is a special tool allowing the construction of its graph. Normally, the user clicks once with the tool to establish the center or vertex of the graph, and then one or more additional times to determine its final form.



As with the numberline, select the eraser tool and click on any part of a line, arc, or other component to remove it.

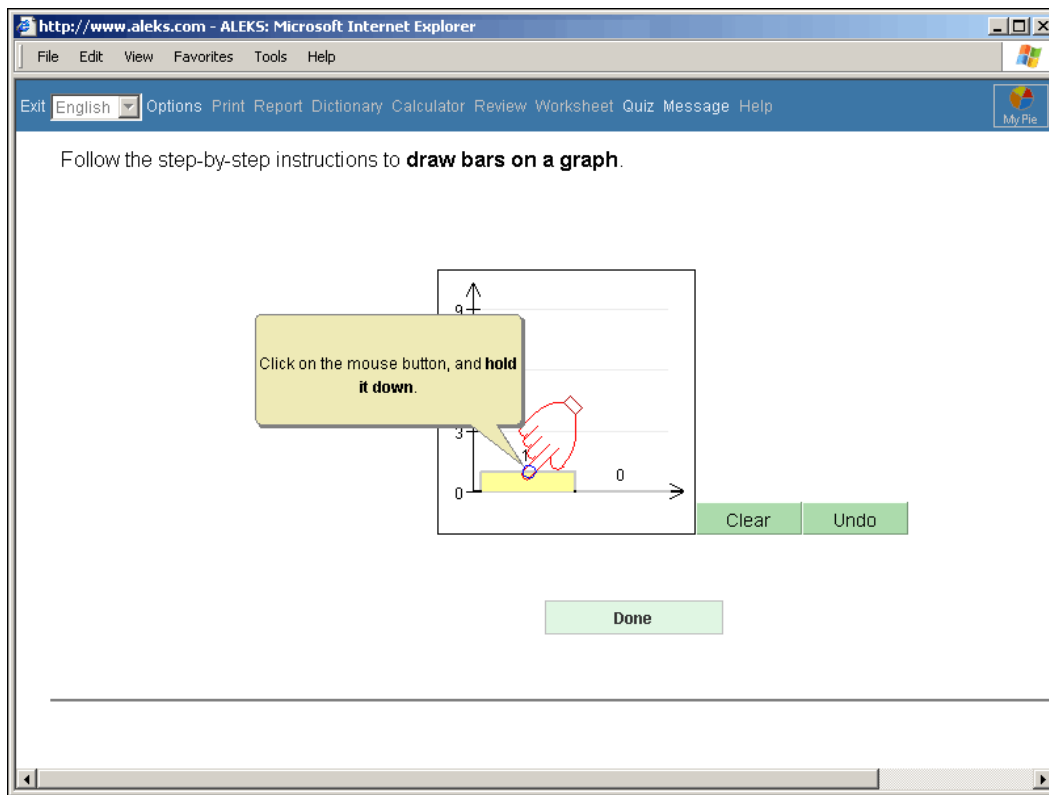


Figure 4.6: The Answer Editor for Histograms

4.12 The Answer Editor for Histograms

The Answer Editor for histograms consists of a space for drawing histograms and icons (buttons) permitting the creation and adjustment of bars (Fig. 4.6).



Initially, the histogram appears with a small number of bars (e.g., two). The height of the bars is adjusted by clicking on the top edge of each and holding the mouse button down while dragging to the desired height. To add bars, click on the icon with the plus sign; to subtract bars, click on the icon with the minus sign. Each bar has a space beneath it where an appropriate label can be typed in.



Any bar may be set to any integer height by dragging. To set the height of a bar at a non-integer value, enter the value in the white area to the upper right of the histogram, then click on the icon with the broken horizontal line. This will place a broken line on the histogram at that height. Any bar may then be dragged to the height of any broken line that has been placed.

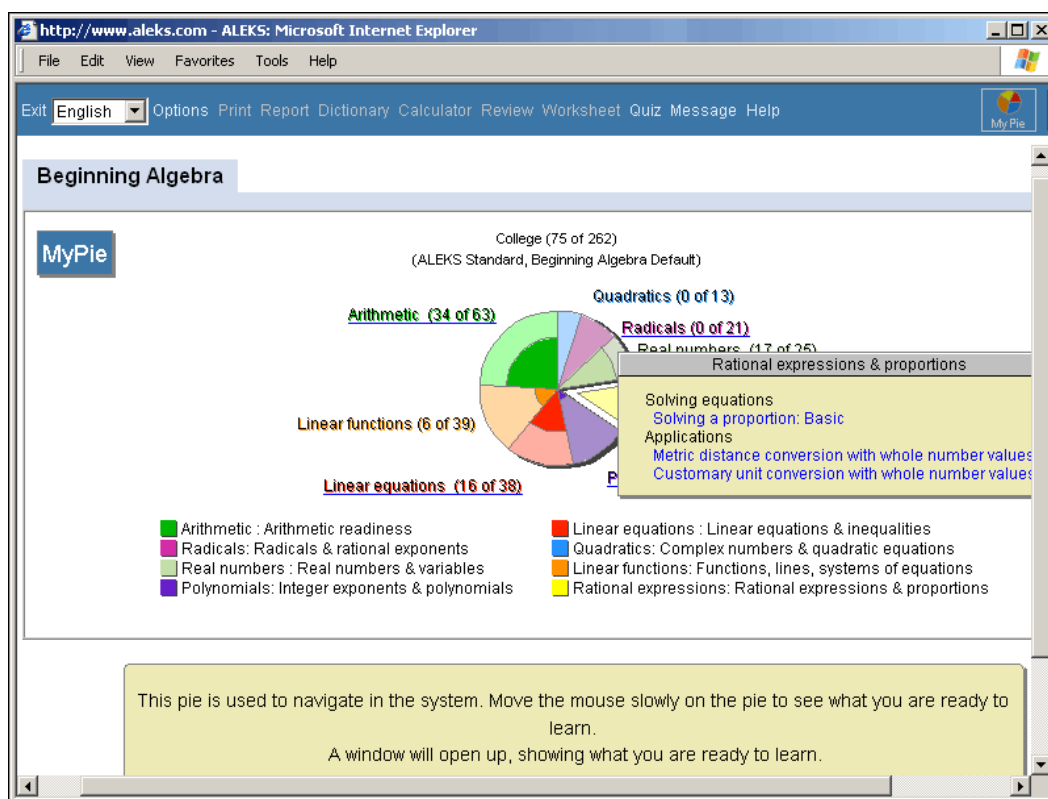


Figure 4.7: Assessment Report

4.13 Assessment Report

At the conclusion of an assessment, the Assessment Report is presented. The interpretation of this report is the same as for pie chart displays found in other places within ALEKS (such as in “MyPie”).

4.13.1 Standard Report Format

The standard report format is used for all assessment reports. This format consists of one or more pie charts (Fig. 4.7).

4.13.2 Interpreting the Pie charts

Pie charts express the results of a given assessment. They contain the following types of information:

- which mathematics topics are part of the syllabus;
- the relative importance of the parts of the mathematics syllabus; and

- to what extent the student has attained the knowledge for each part of the mathematics syllabus, according to the assessment.

Each color-coded slice of the pie chart refers to a particular part of the syllabus, such as “Whole Numbers” or “Proportions and Percents.” Each slice is marked with an abbreviation. The meanings of these abbreviations and of the chart’s color-coding are given in the legend immediately following the pie chart. If the abbreviation next to the slice is underlined, it means this topic contains concepts the student is most “ready to learn.”

A pie chart will show only those topics that are part of the math curriculum for the course indicated. The portion of the chart taken up by any one topic reflects the importance of that topic relative to others in the given syllabus.

The progress a student has made toward satisfying the syllabus for knowledge in a given topic is expressed by the degree to which the slice corresponding to that area is shaded (i.e., filled in with solid color). The measure of progress given by the pie charts is dependent on the standards for a particular course and is set by instructors and administrators (See Chapter 8).

When a user places the pointer over one of the slices of the pie charts, the slice pops out of the pie. A list of the items for that topic the student is currently best ready to learn will appear. Not every slice necessarily contains such a list, even if the topic has not yet been fully mastered. If the slice contains concepts, its label is underlined. This is because a student may not be ready to learn a concept in a given topic (slice) before concepts in another topic (slice) have been mastered. Clicking on any one of these concepts takes the user into the Learning Mode, beginning with that concept.

4.14 Multiple Pie charts

For some courses in ALEKS, there is a pie chart labeled “Readiness” and a pie chart labeled “Mastery.” The “Readiness” pie chart shows the student’s level of mastery in the subject-matter considered prerequisite for that of the student’s current course (as, for example, Basic Math is the prerequisite for Beginning Algebra). The “Mastery” pie chart shows the student’s level of mastery in the current course. For some courses in ALEKS, there is a pie chart labeled “Readiness” and a pie chart labeled “Mastery.” The “Readiness” pie chart shows the student’s level of mastery in the subject-matter considered prerequisite for that of the student’s current course (the prerequisite topics for Introductory Chemistry are a selection from Basic Math and Algebra). The “Mastery” pie chart shows the student’s level of mastery in the current course.

4.15 Ready to Learn

The concepts given as most “ready to learn” do not represent a casual selection of concepts that the student has not yet mastered. By resuming study with one of these concepts, the student is following the most efficient path to mastery of the complete domain (See Chapter 10).

4.16 Progress Bars

Another graphic expression of the student’s progress is given by the bar graphs at the bottom of the report (“History”). These represent the general extent of the student’s mastery: the blue portion of each bar represents material that was learned as of the given assessment, the green portion material mastered in the Learning Mode since that assessment, and the yellow portion material belonging to the curriculum for the given level that has yet to be learned. When the bar is entirely blue, the student has completed the curriculum for a level or levels.

Chapter 5

Learning Mode

5.1 The ALEKS Learning Mode

The purpose of the Learning Mode is to assist students in mastering mathematical concepts mathematical and statistical concepts. Students using ALEKS choose which concepts they wish to work on in the Learning Mode from the list of concepts the system has determined they are most prepared to learn. This happens either as the result of an assessment or through the continuous update of assessment results that is performed by the Learning Mode. Students in the Learning Mode work on those concepts they are best prepared to learn, so that the benefit of their work is maximized.

In the Learning Mode students always work on one concept at a time. The Learning Mode provides them with a rich array of resources to help in mastering the concept. This includes explanations, references to a McGraw-Hill textbook if one is being used in conjunction with ALEKS, links to supplemental tutorial material and interactive applications, practice problems, diagnostic feedback on problem solutions, and access to a student mathematical Dictionary. Moreover, the Learning Mode is designed to monitor the progress made by students toward mastery of a given concept and advise them on continuing or changing concepts. A student is required to solve an appropriate number of practice problems correctly before the system will conclude that the concept has been mastered. At this point the student is encouraged to choose a new concept from the (updated) pie chart, but the opportunity to continue to work on this concept is available if the student wishes. If the student makes mistakes, a greater number of correct solutions may be required.

If the student has difficulty, the system may suggest closer attention to the explanations or offer the name of a classmate who has recently mastered this concept. A new selection may also be encouraged.

The student continues to work in the Learning Mode until a new assessment is ordered, either by the instructor or automatically when a certain amount of time has been spent or a certain amount of progress has been made since the last assessment (See Sec. 4.3).

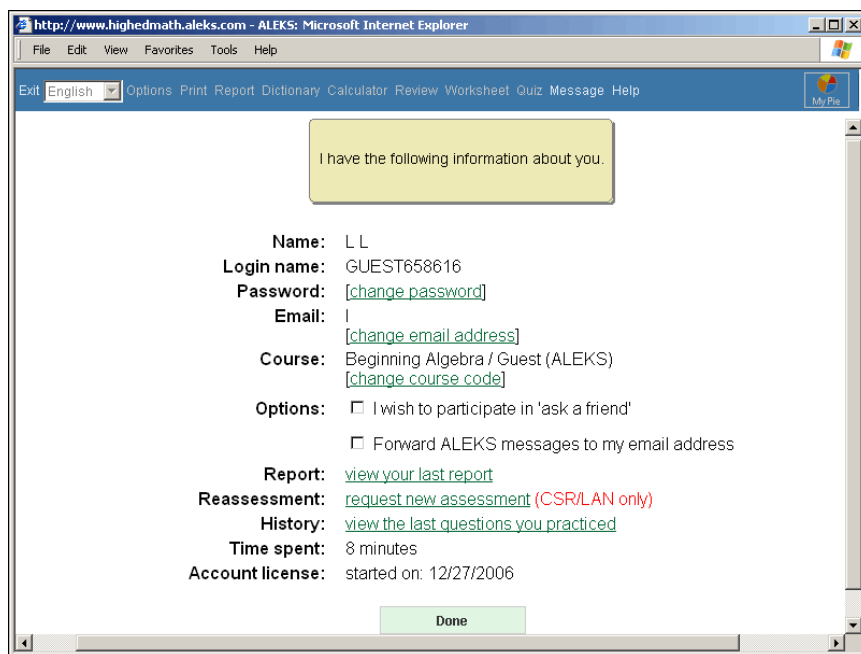


Figure 5.1: The Options Page

5.2 Buttons

5.2.1 Exit

Exit

One can end a session with ALEKS in either of two ways: click on the “Exit” button at the upper left-hand corner of the browser window or simply close the window in one of the ways provided by the browser. Also, if no input is supplied to the system for 15 minutes the session is terminated automatically. No matter which way you exit, ALEKS will return you to the same place when you next log on.

5.2.2 Options

Options

The “Options” button opens a page containing the user’s current registration information (with a link for changing the Password), course and instructor (with a link for changing the course), a checkbox for joining “Ask a Friend” (See Sec. 5.7), a link for suspending the account (See Sec. 5.10), and the beginning and expiration dates of the account (Fig. 5.1). “Report” connects to a menu of all assessment reports (See Sec. 5.2.4.). “History” displays a list of concepts the student has worked on recently, indicating the level of mastery achieved and providing the opportunity to return to that concept for further practice. Clicking on “Done” returns to the Learning Mode.

5.2.3 Print

Print To print the contents of the ALEKS display, click the “Print” button on the menu bar. This transforms the display into a form suitable for printing. Next, click on the browser’s “Print” button, or use whatever keyboard equivalent is provided. The procedure is the same as for printing any web page. To return to the Learning Mode, close or minimize the window that was printed.

5.2.4 Report

Report Clicking on the “Report” button displays a menu of all past assessments, with the most recent displayed by default. Any assessment can be selected (by date) from the menu. Then click “OK” to see the results of that assessment. This will include one or more pie charts, a list of concepts recently learned, a list of concepts most ready to be learned, and the progress bar graphs (See Sec. 4.16). To return to the Learning Mode, click “Done.”

NOTE. Click on the link “and many other more elementary concepts.” to see a complete list of topics mastered.

5.2.5 Dictionary

Dict Clicking on the “Dictionary” button produces a new browser window with an index of entries in the online student mathematics Dictionary. Click on any entry to view the definition. Remember that the Dictionary can also be accessed by clicking on underlined words (hypertext links) anywhere in the Learning Mode. Dictionary definitions are designed to present concepts in their simplest form first, moving into greater depth as the definition proceeds (See Sec. 5.3.5). Close or minimize the Dictionary window to return to the Learning Mode.

5.2.6 Calculator

Calc The Calculator button will light up (become enabled) on topics where ALEKS permits use of a calculator. Click on this button to use the online calculator.

5.2.7 Review

Review The “Review” button gives a list of concepts the student has recently worked on in the Learning Mode (See Sec. 5.5). One can click any of these concepts to get further practice on it. There is also an option for “more extensive review.” Click on “Done” to return to the Learning Mode.

5.2.8 Worksheet

Worksheet The student may obtain an individualized, printable homework sheet by clicking “Worksheet.” The questions on the worksheet are based on that student’s most recent work in ALEKS (See Sec. 5.6).

5.2.9 Quiz

Quiz The student can take a quiz assigned by the instructor or check the results of quizzes already taken by clicking “Quiz.” If a quiz has been “scheduled” by the instructor, however, the student does not need to use this button; when the student logs on during the time the quiz has been taken it will begin automatically (See Sec. 7.11).

5.2.10 Message

Msg The student can use the “Message” button to check for messages from the instructor or administrator, and send or respond to messages if this has been enabled (See Secs. 7.12, 7.13). It is also possible to send messages directly to ALEKS Corporation. Click on “Done” to return to the Learning Mode.

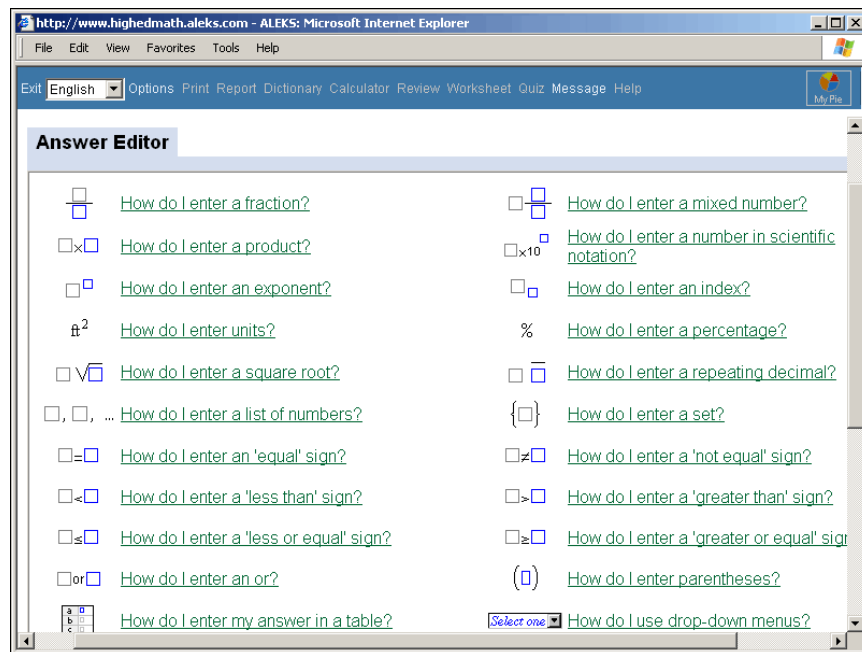



Figure 5.2: The Help Menu

5.2.11 Help

 The “Help” button in the Assessment and Learning Modes provides detailed assistance with use of the Answer Editor (Fig. 5.2). The Help Menu contains a list of questions on how to use the various icons of the Answer Editor; clicking any one of these leads to a brief refresher tutorial on the use of the icon.

5.2.12 MyPie



Clicking on “MyPie” produces a pie chart display reflecting the current state of the student’s mastery in the Learning Mode (See Sec. 4.13). The student can use this button to select a new concept to work on from among those currently most “ready to learn.”

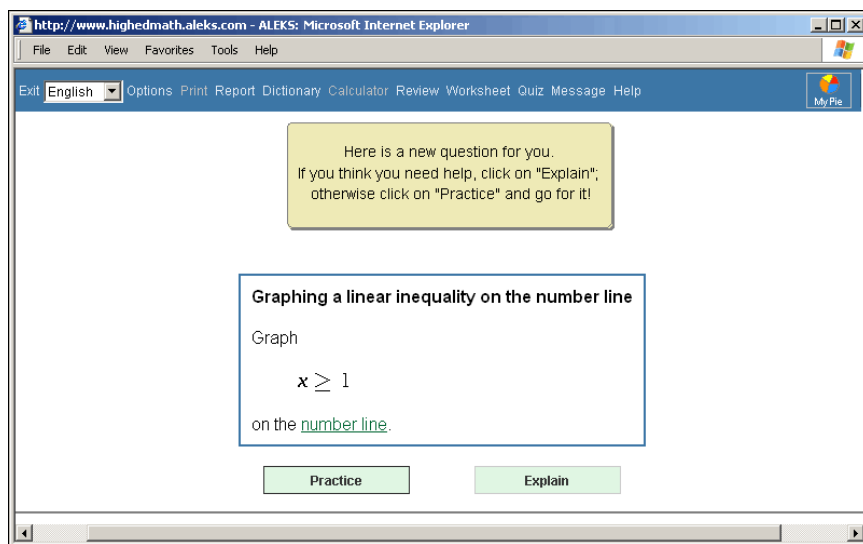


Figure 5.3: Item Page

5.3 The Learning Mode Interface

5.3.1 Item Page

After clicking on the name of an item from their pie chart, the student comes to an item page containing the title of the current item, such as “Absolute Value of a Negative Integer,” followed by a problem or **instance** of that item (Fig. 5.3). TermsMathematical terms are underlined and set off as hyperlinks (clicking on these will open the Dictionary). There is, however, no Answer Editor: the answer to the problem must be given on the Practice page.

Underneath the problem are two buttons, “Practice” and “Explain.” Clicking on “Explain” goes to a detailed explanation of the item with additional Dictionary links. Clicking on “Practice” goes to a page containing the Answer Editor and provides the opportunity to attempt solving the problem.

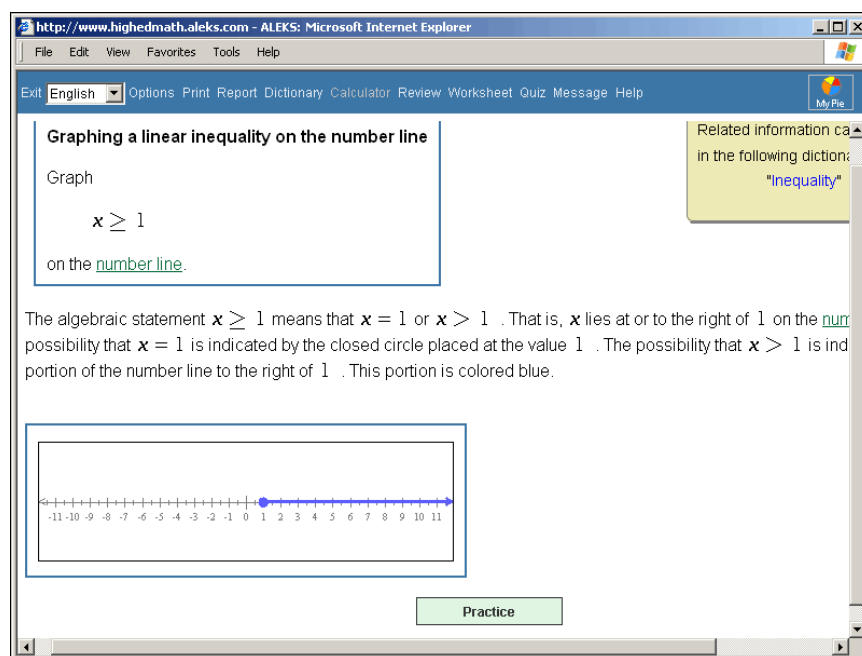


Figure 5.4: Explanation Page

5.3.2 Explanation Page

Like the item page, the explanation page (Fig. 5.4) begins with the title of the current item and an instance of that item. The answer to the problem is supplied at the end of the explanation.

When ALEKS is used with textbook integration, a reference will appear at the bottom of the explanation page giving the chapter and section of the textbook where additional explanation of the concept may be found (See Sec. 7.20). Additional tutorial material and interactive applications may also be found through links at the bottom of the explanation page.

Here again, mathematical terms are linked to Dictionary definitions. The system may suggest looking up certain key terms to help with the explanation (especially if the explanation has already been visited). At the bottom of the page is the “Practice” button. Clicking on this button produces a new instance of the same problem-type. Sometimes there may also be a button for “Additional Explanation” or “Detailed Explanation.”

You can always return to the pie chart to choose a different topic by clicking on the “MyPie” icon in the upper right-hand corner of the ALEKS window.

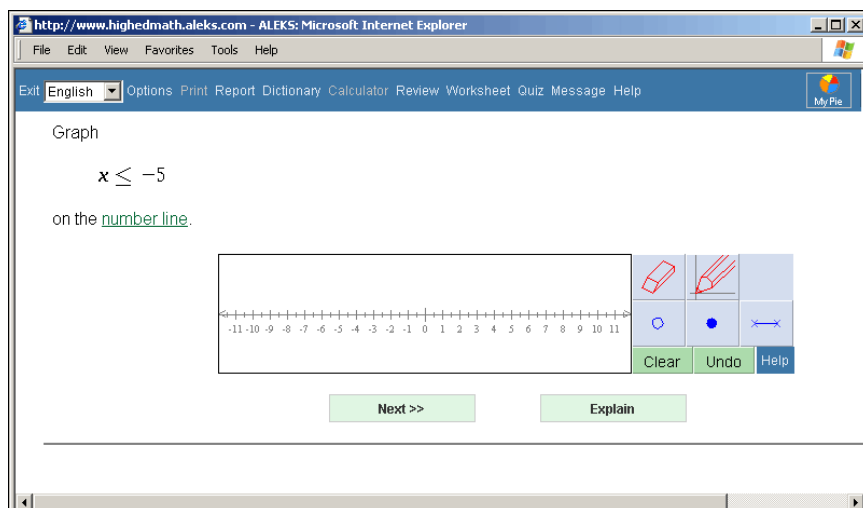


Figure 5.5: Practice Page

5.3.3 Practice Page

This page displays an instance of the problem, followed by the Answer Editor. This is where a solution to the problem can be attempted (Fig. 5.5). All practice problems are generated by algorithms with random selection of numerical values values so that the variety of problem instances for any item is very great.

Underneath the Answer Editor are buttons labeled “Next” and “Explain.” Clicking on “Next” has the same effect as described for the Assessment Mode: it submits the answer. Here, however, the user finds out immediately whether the answer is right or wrong. If it was correct, a new problem is presented or (if the system believes this topic has been mastered) a choice of new items is offered. Wrong answers will return the presentation of the original problem (on the Wrong Answer page) with feedback on the student’s error. Students can then click on “Explain.”

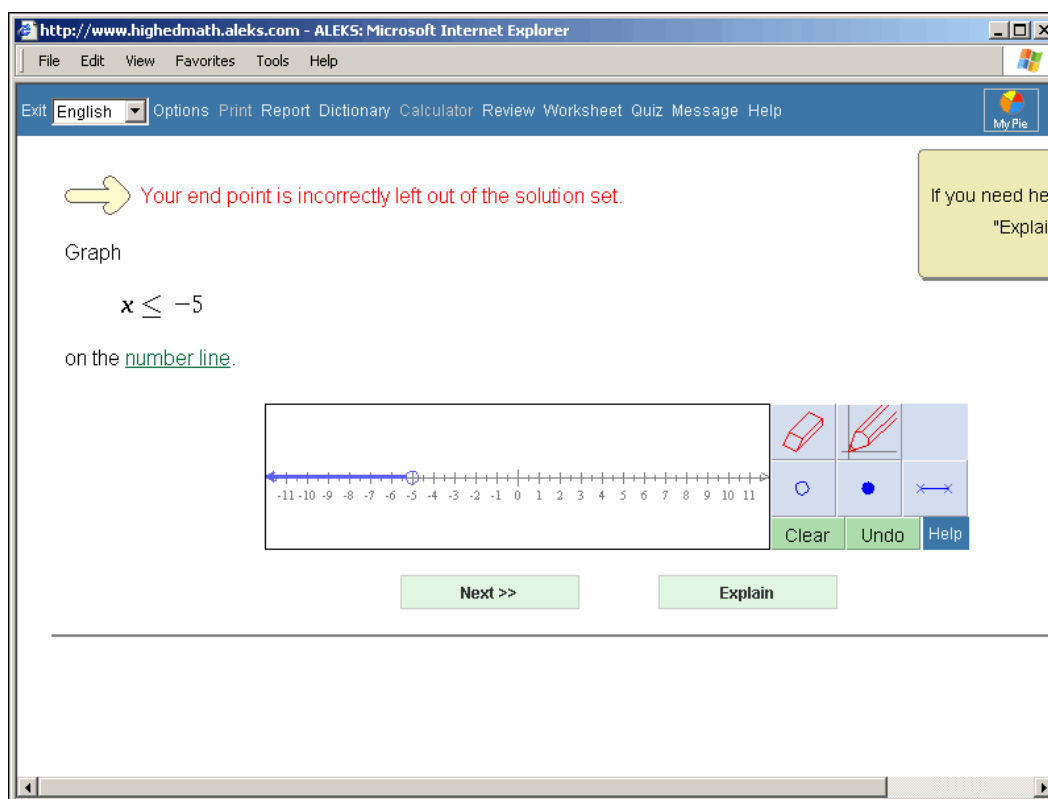


Figure 5.6: Wrong Answer Page

5.3.4 Wrong Answer Page

The wrong answer page appears only after an incorrect answer has been submitted on the practice page (Fig. 5.6). It is identical to the previous page except that the system explains the answer is wrong, and offers advice on what went wrong and which words might be looked up in the Dictionary.

The old, incorrect answer appears in the Answer Editor, where it can be corrected and resubmitted. Again, clicking on “Explain” is an option that leads to an explanation of the problem.

5.3.5 Dictionary

The online mathematics dictionary is always available in the Learning Mode. In addition to the Dictionary menu (button), links to the Dictionary appear in explanations, item descriptions, and in the feedback.

Clicking on a link to the Dictionary creates a new window on top of the ALEKS interface. At the top of the window is a bar with an Index button and text entry field

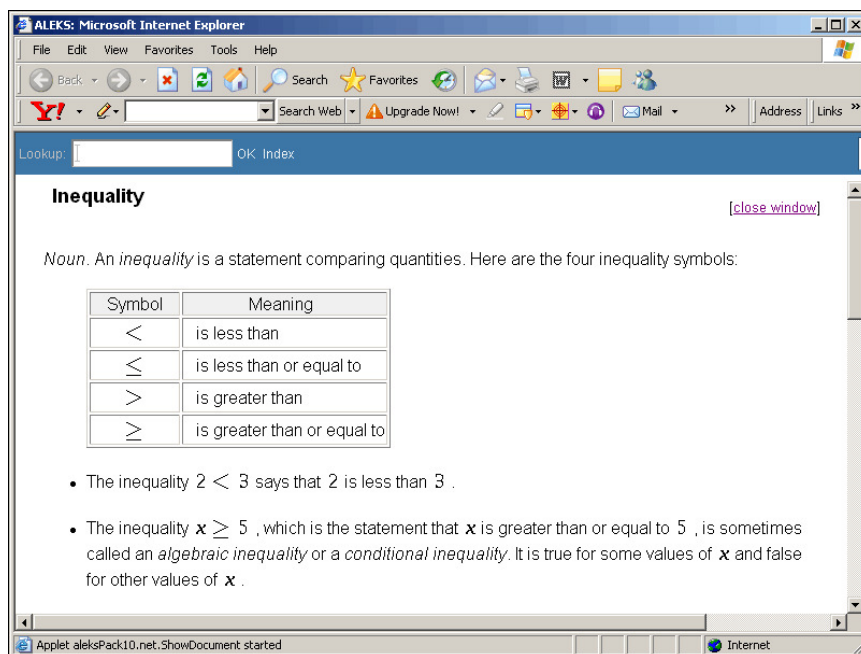


Figure 5.7: Dictionary

(Fig. 5.7). The “Index” button gives access to an index of all the Dictionary’s headings and subheadings. Beneath this bar is the Dictionary entry, with links to other entries and graphic illustrations as appropriate. The window can be closed after use or minimized for quicker access the next time needed.

5.4 Feedback in Learning Mode

In the Learning Mode feedback is integrated into a sophisticated system of guidance for the student. Some errors prompt ALEKS to give specific hints and suggestions (Fig. 5.6). For example, it may say that a fractional answer needs to be reduced or that a list of expressions is incomplete. After a right answer the system will ask a limited number of questions for the same concept before judging that it has been mastered. If an item is missed too many times, however, a new topic will be suggested. If a concept has been left without mastery being attained, however, the system may suggest returning to it after one or two other topics have been covered.

5.5 Review

A student using ALEKS can review topics recently worked on in the Learning Mode by using the “Review” button (Fig. 5.8). Clicking on any of these topics provides the

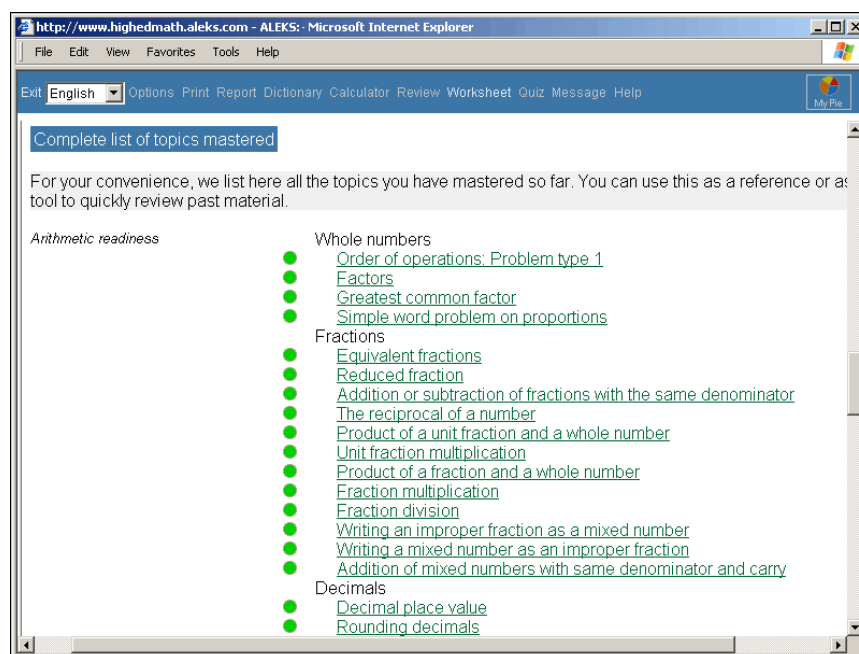


Figure 5.8: Review

chance for additional practice; this is particularly useful when the student knows that a new assessment is imminent. When the student has not yet worked in Learning Mode since a new assessment, this list may be empty. “More Extensive Review” gives a comprehensive list of all topics mastered by the student for brief, summary review.

The Review page also contains a link to the Worksheet (See Sec. 5.6).

The Review page also contains suggested study in the ALEKS Worktext for this subject, if applicable; sample explanations for each topic may be viewed and printed by clicking on the links (See Sec. 5.8).

NOTE. The system will sometimes automatically offer a student the option of reviewing past material at the time of login.

5.6 Worksheet

A student using ALEKS can obtain an individualized, printable homework sheet (in .pdf format) containing 16 practice questions based on the student’s most recent work in ALEKS by clicking the “Worksheet” button (or the “Review” button) (Fig. 5.9). When the student does this, a sheet containing answers for this individual worksheet (labeled with the student’s name and the date) is sent to the instructor via the ALEKS message system (See Sec. 7.13). The instructor may set the option for this feature so that there are 12 review questions and 4 “Extra Credit” questions (See Sec. 7.17).

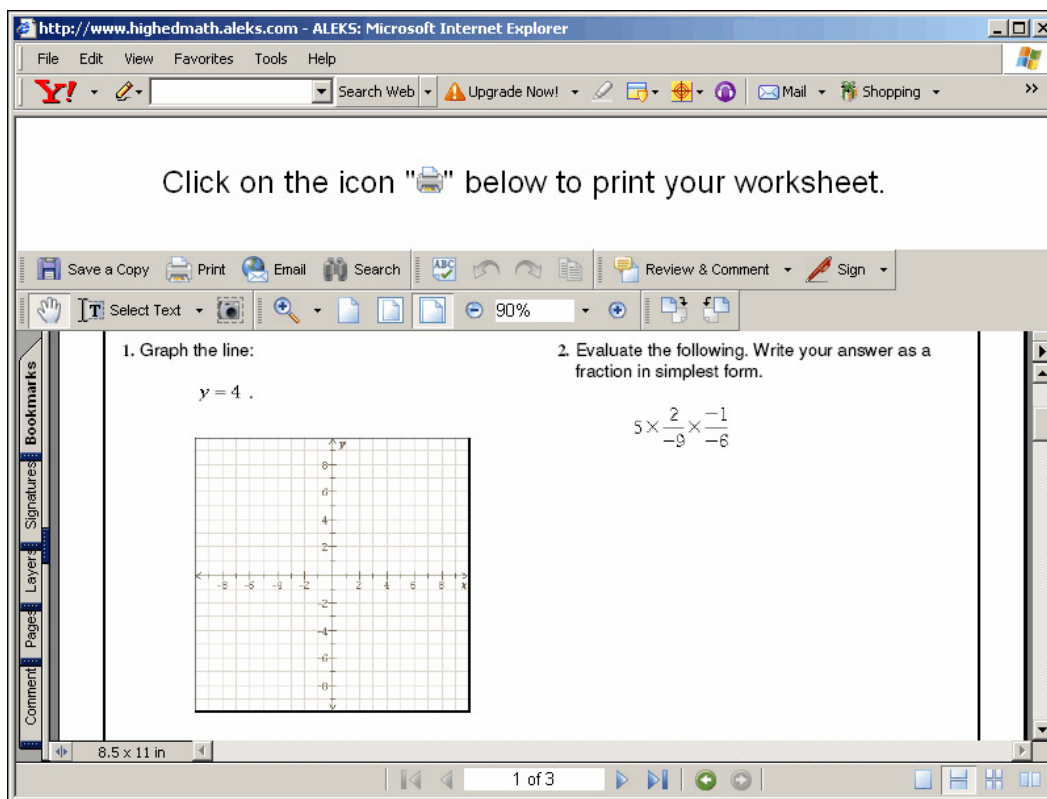


Figure 5.9: Worksheet

A record will be kept on the Worksheet page of all worksheets produced by the student. The student can click on the link for any past worksheet in order to obtain that worksheet again. If the instructor has permitted access to worksheet answers, there will also be links on this page to answer keys for each of the worksheets (See Sec. 7.17).

NOTE. In order to view or print documents in .pdf format, such as the ALEKS worksheet, Adobe Acrobat or Adobe Acrobat Reader must be installed on your computer. Most computers have this software. If for any reason your computer does not, there is a link on the ALEKS Worksheet page to download it. Also, because the worksheet is opened in a new browser window, it may be necessary to disable your popup blocker temporarily in order to produce the ALEKS worksheet.

5.7 Ask a Friend

Under some circumstances, a button marked “Ask a Friend” will appear at the bottom of the page in the Learning Mode, next to the “Explain” button. Clicking on this button enables the student to ask for help from another student using ALEKS in the same course.

The button appears only if (1) the instructor or supervisor has made this feature active, (2) the student was unsuccessful in answering this concept, and (3) there is another student who has successfully answered the concept and who has chosen to participate in the “Ask a Friend” component.

5.8 Worktext

The purpose of the Worktext button is to provide a convenient linkage between a student’s work in ALEKS and their use of the ALEKS Worktext. The student can click on this button at the end of an ALEKS session and receive a “homework” assignment to be done away from the computer, continuing and reinforcing what that student has most recently learned in ALEKS. This written assignment can then be turned in to the instructor.

The “Worktext” button is visible to students logged on to ALEKS, on the brown menu bar at the top of the ALEKS window. It is active when the student is in Learning Mode. Clicking on this button produces a page with a list of topics in the Worktext. These are the topics that ALEKS suggests that the student work on when they are away from the computer, based on the student’s most recent work in ALEKS. Clicking on the name of any topic shows the print preview of a sample explanation; the student can then print it out for later use.

5.9 Suspend Account and Leave of Absence

These two features are intended to provide additional flexibility in the student’s access to an already-purchased subscription with ALEKS. “Suspend Account” is used when a student has already purchased and registered in ALEKS, but then decides to drop the course with the intention of taking it again at the next opportunity. “Leave of Absence” is used when a student has subscribed to ALEKS for two semesters, but is skipping a semester in between. Both of these features are accessed through the “Options” button.

Within a limited time from the first use of the Student Access Code a student can “suspend” his or her ALEKS account and recover it later for the full period. If the account is 1-semester or 2-semester it can be suspended 1 semester, if the account is 1-quarter it can be suspended 1 quarter, and if it is 8-week or 6-week it can be suspended 8 or 6 weeks. The flexibility offered by this option is limited in the following ways:

1. it can be used only once and it has to be used within the first 30 days (1-semester, 2-semester), first 14 days (1-quarter), or first 7 days (8-week and 6-week accounts);
2. once an account has been suspended it can only be recovered after the semester (1-semester and 2-semester), quarter (1-quarter), 8 weeks (8-week) or 6 weeks (6-week accounts) have passed;

3. once the recovery date has arrived the account should be used (time will begin to run on the subscription period whether it is used or not).

To request that his or her account be suspended, a student goes to “Options” and chooses “suspend account” under the “Special” heading. Clicking on the link displays a warning that explains the rules given above. The student can then choose to go ahead or to cancel the request.

The Suspend Account feature should not be confused with the Leave of Absence feature, which is available only for 2-semester accounts. The Suspend Account feature has to be used within the first few days of the first use of the access code. The Leave of Absence feature can only be used for a 2-semester account after the first semester has ended. A student could conceivably use the Suspend feature at one point, then request a Leave of Absence later on, within the same two-semester course.

At any time between the end of the first semester and the first week of the second semester you can decide if you want to take the leave of absence. If you don’t plan on using ALEKS during the next semester you go into “Options” and click on “Take a leave of absence.” This link will only be available during the period when it can be selected, that is, close to the end of the current semester. There will be a reminder to students as they log in after the first week of the second semester that the new semester has started and that this is their last opportunity to opt for a leave of absence. If you don’t plan on taking a leave of absence you don’t need to do anything.

At any time during this period you are also allowed to switch to a new course by clicking on “Options” and choosing “Change course” to enter a new Course Code. As is the case with the Leave of Absence, this link is only visible at the outset of the semester, and students will be reminded that they can switch when they log in to ALEKS.

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1. it can be used only once and it has to be used within the first 30 days (1-semester, 2-semester), first 14 days (1-quarter), or first 7 days (8-week and 6-week accounts);

2. once an account has been suspended it can only be recovered after the semester (1-semester and 2-semester), quarter (1-quarter), 8 weeks (8-week) or 6 weeks (6-week accounts) have passed;
3. once the recovery date has arrived the account should be used (time will begin to run on the subscription period whether it is used or not).

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Chapter 6

Instructor Module: Basic Interface

The basic interface to the ALEKS Instructor Module was designed for the greatest possible ease of use. Although all parts of ALEKS can be used without training or documentation, the wealth of features in the Instructor Module is not easily grasped by a first-time user. The basic interface, to address this need, has been constructed to be a fully functional, menu-driven gateway to the ALEKS Instructor Module. Once common operations are familiar, the instructor may prefer to bypass the basic interface and work directly in the advanced interface, which is somewhat more powerful, especially in the fewer steps needed to accomplish tasks and in the possibilities for combining tasks and working with groups.

Wherever possible in this chapter, descriptions of operations in the basic Instructor Module are cross-referenced to descriptions of similar operations in the Advanced Instructor Module.

The essential method of the basic interface is what software designers call the “wizard.” This method breaks a task down into steps and leads the user through those steps, asking questions and confirming the accuracy of information and decisions as it goes. The wizard minimizes the likelihood that the user will become lost or confused or take an unintended action while using the system. The use of the wizard interface involves a tradeoff between the number of steps required for a given action and the degree of familiarity expected of the user.

Throughout the Instructor Module (as we will call the basic interface in this chapter) there is a left-hand sidebar with links to the major areas of the Instructor Module: “How do I,” “Course Admin,” “College Admin” (available to users with Administrator status), “Reporting,” “Taking Actions,” and “Advanced” (Fig. 6.1). These areas will be explained in the following sections. Also, each page of the Instructor Module contains a link to the Message Center, which can be used at any time to send queries or messages to ALEKS Corporation Customer Support.

Like the Advanced Instructor Module, the basic Instructor Module offers different capacities to users who are registered in ALEKS with Administrator status, as opposed

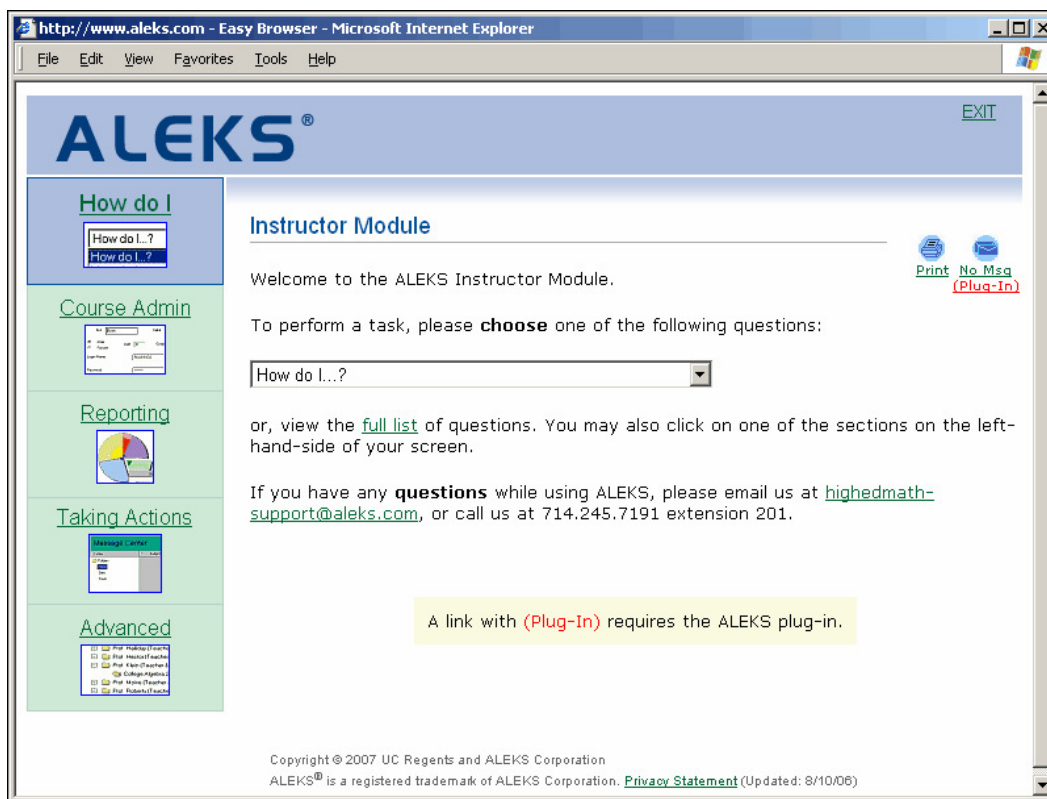


Figure 6.1: Instructor Module

to those with Instructor status. Essentially, an Instructor has control only over those courses for which she or he is the instructor; an Administrator has control over all courses for all instructors in the college, exactly as though he or she were the instructor for each of those courses.

In the following, the parenthetical notation “(*Administrator*)” indicates which areas, operations, and parts of operations are available only to users with Administrator status.

6.1 How do I

The first thing you will notice on the home page of the Instructor Module (called “How do I”) is a menu of questions. These questions correspond to the most frequently performed operations in the Instructor Module, such as “How do I change someone’s password?” or “How do I create a new instructor account?” By choosing the last item, “More,” in the menu, or clicking “full list,” you can see the entire list of questions, arranged by category (Fig. 6.2). These categories are also included in the links featured in the left-hand sidebar of the Instructor Module: “Course Admin,” “College Admin” (*Administrator*), “Reporting,” “Taking Actions,” and “Advanced.” Along with “How

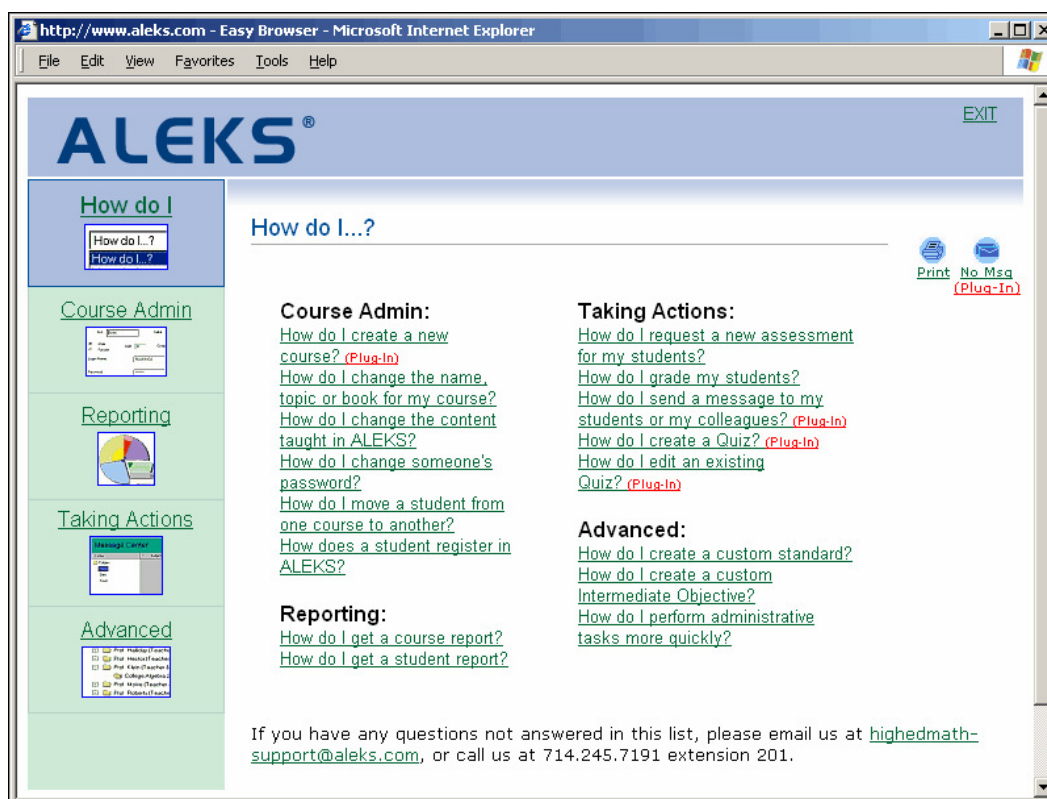


Figure 6.2: How do I Questions

do I" (for the home page) and "Logout," respectively the top and bottom elements of the sidebar, these are available from anywhere in the Instructor Module.

The questions on "How do I" are simply a way of getting quickly to the tutorial descriptions found in the Instructor Module. For example, clicking on "How do I move a student from one course to another?" brings you to the page for "Move a student from one course to another," which can also be found by clicking the sidebar link for "Course Admin."

The "How do I" page contains an email link and telephone number for contacting ALEKS Corporation Customer Support. Questions and messages can also be sent directly to ALEKS Corporation Customer support using the Message Center links found on each page of the Instructor Module.

6.2 Course Admin

Course Admin is concerned with the creation and management of courses in ALEKS, and is available to all instructors for ALEKS in a given college (Fig. 6.3). This area of the Instructor Module will be needed especially around the beginning of a new term or



Figure 6.3: Course Admin

course, and also as the term proceeds, when students complete domains in ALEKS and need to be moved up to new ones.

6.2.1 Create a new course

See also Section 7.17.

- (*Administrator*) click on a name from a list of existing instructors;
- enter name of course, choose topic, and click “Save”;
- receive Course Code for new course, with option for further customization (below).

6.2.2 View all your courses and course codes

This command is useful for obtaining an overview of the courses you are teaching.

- for each course (*Administrator*: for each instructor), view name, topic, instructor (*Administrator*), number of students, and Course Code.

6.2.3 Customize a course

See also Section 7.18.

- click on name from list of courses (*Administrator:* for each instructor);
- edit name and topic of course and click “Save”;
- choose textbook to be linked to course in ALEKS and click “Save.”

ALEKS has powerful features for organizing the content of courses according to the textbook being used. Please see Sec. 7.20 for a complete description.

6.2.4 Password issues

See also Section 7.22.

- click on name from list of courses (*Administrator:* for each instructor);
- click on name from list of students in course;
- enter new password twice and click “Save.”

6.2.5 Account preferences

See also Section 7.16.

- edit own title, name, status options, email, and email/message options and click “Save.”

6.2.6 Student Account preferences

See also Section 7.22.

- click on name from list of courses (*Administrator:* for each instructor);
- click on name from list of students in course;
- edit name, email, and active status of student and click “Save.”

6.2.7 Move a student from one course to another

See also Section 7.21.

- click on name from list of courses (*Administrator:* for each instructor);
- click on name from list of students in course;
- click on name from list of courses (*Administrator:* for each instructor) to move student to that course.

NOTE. This procedure is fine for moving one student at a time. If groups of students need to be moved, see Section 7.21.

6.2.8 Unenroll a student from a course

See also Section 7.21.

- click on name of course from list of courses containing students;
- click “Select All” if all students are to be unenrolled, or click “Select None” to cancel section, or click the names of students to select them individually, and then click “Next”;
- click “Confirm” to confirm unenrollment of student or students.

6.2.9 Delete a course

See also Section 7.18.

- click on name from list of empty courses (*Administrator:* for each instructor);
- click “Confirm” to confirm deletion of empty course.

Note that a course must be empty (contain no students) before it can be deleted. See above, “Unenroll a student from a course.”

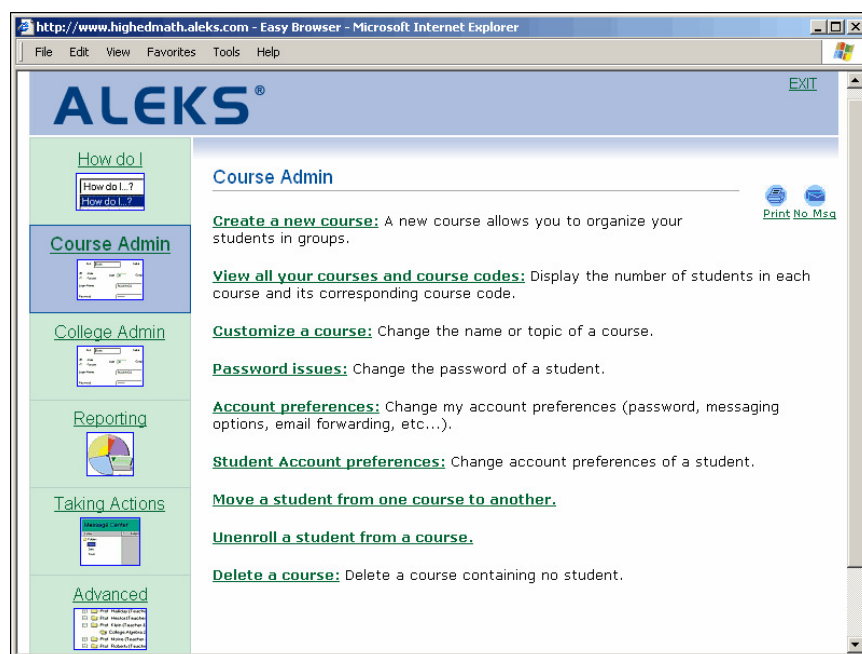


Figure 6.4: College Admin

6.3 College Admin (Administrator)

College Admin allows the ALEKS Administrator(s) for a given college to create and manage the accounts of instructors using ALEKS, and is accessible only to users with Administrator status (Fig. 6.4). In most cases, instructors, once they are enrolled in ALEKS, will be able to manage their own accounts, and will require little or no assistance from the Administrator.

6.3.1 Create a new instructor account

See also Section 7.15.

- fill in title, name, and administrator status (*Administrator*) and click “Next”;
- edit Login Name, set Password, and click “Save”;
- option to create courses for new instructor (below).

6.3.2 Password issues

See also Section 7.16.

- click on a name from a list of existing instructors (including self);
- enter new password twice and click “Save.”

6.3.3 Instructor account preferences

See also Section 7.16.

- click on a name from a list of existing instructors (including self);
- edit title, name, status options, email, and email/message options and click “Save.”

6.3.4 Move a course from one instructor to another

See also Section 7.18.

- click on name from list of courses for all instructors;
- click on a name from a list of existing instructors (including self) to transfer course to that instructor.

6.3.5 Delete an Instructor Account

See also Section 7.16.

- click on a name from a list of existing instructors (including self);
- click “Confirm” to confirm deletion of instructor account (possible only if the instructor does not currently have courses in ALEKS).

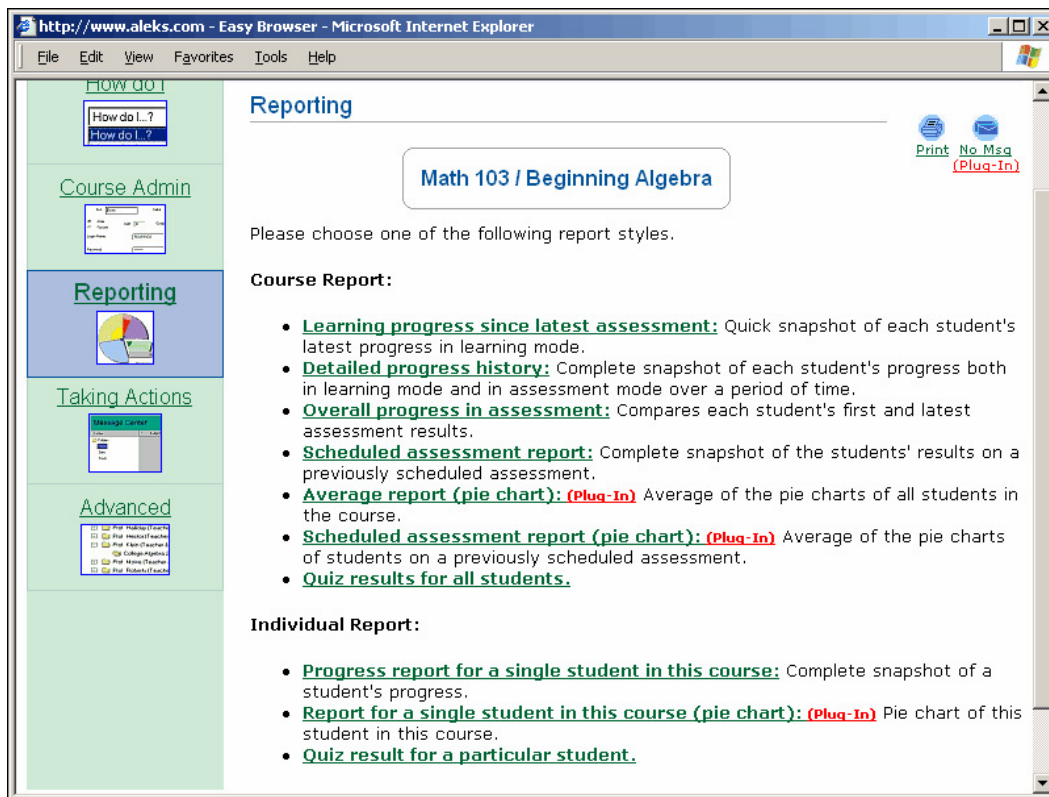


Figure 6.5: Reporting

6.4 Reporting

Reporting should be used frequently during a course taught with ALEKS to monitor the students' use of and progress in the system.

To begin, click on a name from the list of courses (*Administrator*: for each instructor). A series of options for reporting will be shown (Fig. 6.5).

6.4.1 Course Progress options

The rows in the "Progress" views contain bar graphs showing students' performance on and following dated assessments. You can use the students' Login Names or id's rather than their names as the identifier in the left-hand column; simply click on the corresponding link at the top of that column. This may be useful when the data from this page needs to be downloaded and stored in a particular format for administrative purposes.

Each student's name is linked to their individual Progress page (See Sec. 6.4.15).

6.4.2 Download Excel spreadsheet

A link at the top of the page allows you to download the data in Excel spreadsheet format.

6.4.3 Sorting

The information in the Course Progress page can be sorted on any of the columns. Simply click on the header or footer of a column to sort on that column; a second click switches between ascending and descending order.

6.4.4 Statistical information

Most display options provide additional types of statistical information on student progress in the right-hand part of the display. Their significance varies according to the display option, and is indicated in the column headings. One or more fields may be blank if the information gathered for that student is not sufficient at a particular time. It is also possible to choose “Time to Completion”; this indicates the estimated time necessary for individual students to complete the course goals based on average progress for the period chosen. Where the Intermediate Objectives are in use, this also shows “Time to Current Objective” (See Sec. 7.23).

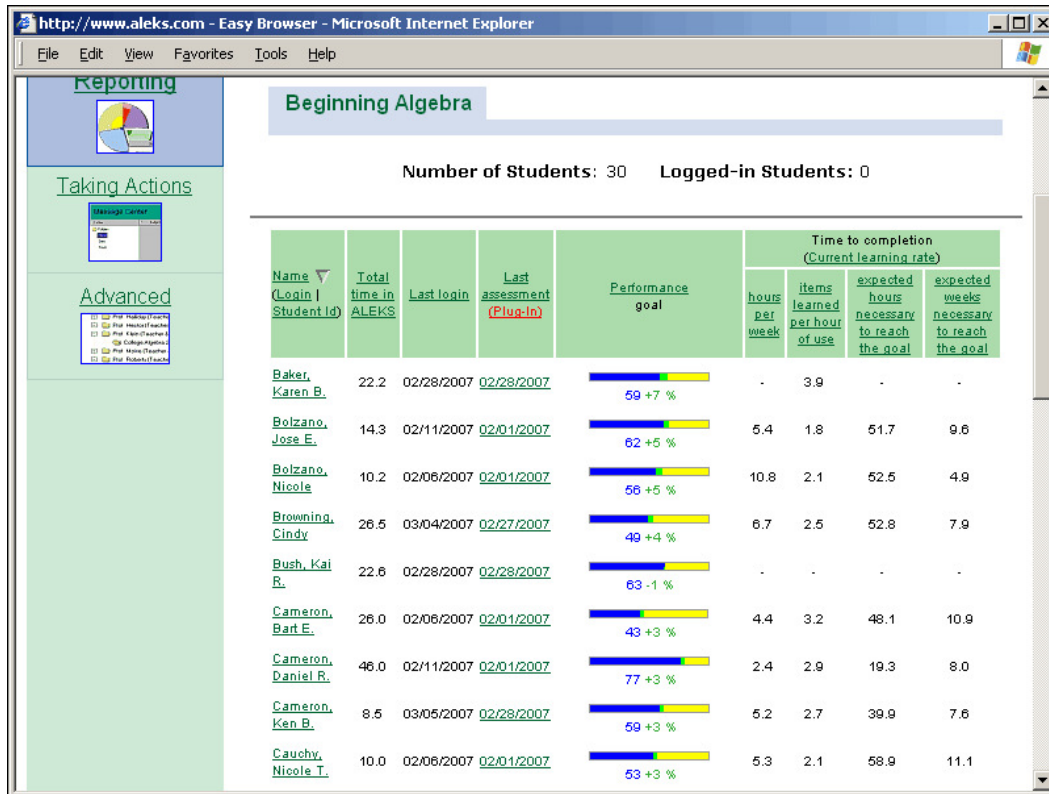


Figure 6.6: Individual learning progress since latest assessment

6.4.5 Individual learning progress since latest assessment

Individual learning progress since latest assessment displays a list of the students in the course, each with a single bar graph showing the most recent assessment and progress made since that assessment (Fig. 6.6). All students who have completed at least one assessment have bar graphs. The blue portion of the bar graph shows mastery as of the most recent assessment, and the green portion shows progress in the Learning Mode since that assessment.

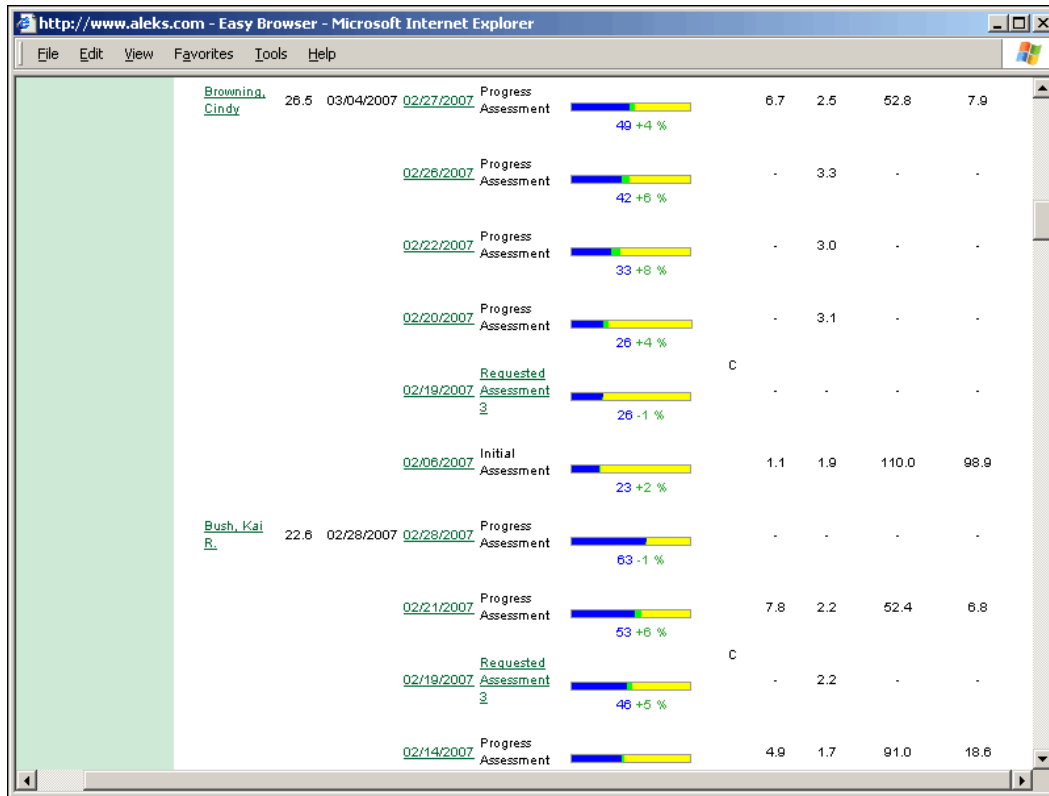


Figure 6.7: Individual detailed progress history

6.4.6 Individual detailed progress history

Individual detailed progress history displays a list of the students in the course, each with a series of bar graphs for each assessment taken to date (Fig. 6.7). For each student who has taken at least one assessment, there is a bar graph shown for each assessment taken in the last 6 months (other periods may also be chosen). The blue part of the bar shows mastery on the assessment, and the green part additional mastery achieved in Learning Mode following that assessment (but before any subsequent assessment).

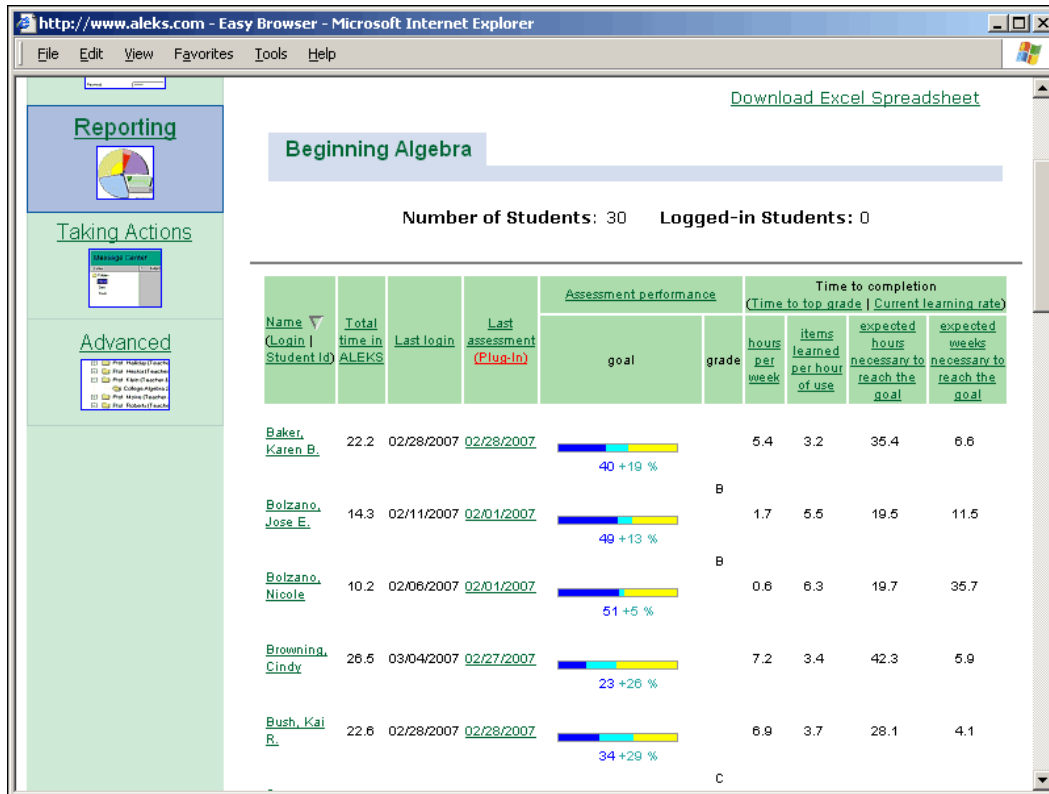


Figure 6.8: Individual overall progress in assessment

6.4.7 Individual overall progress in assessment

Individual overall progress in assessment displays a list of the students in the course, each with a single bar graph showing the progress made between that student's first and most recent assessments (Fig. 6.8). All students who have completed at least two assessments have bar graphs. The blue portion of the bar graph shows mastery as of the first assessment, and the light blue portion shows progress made between that assessment and the most recent assessment taken.

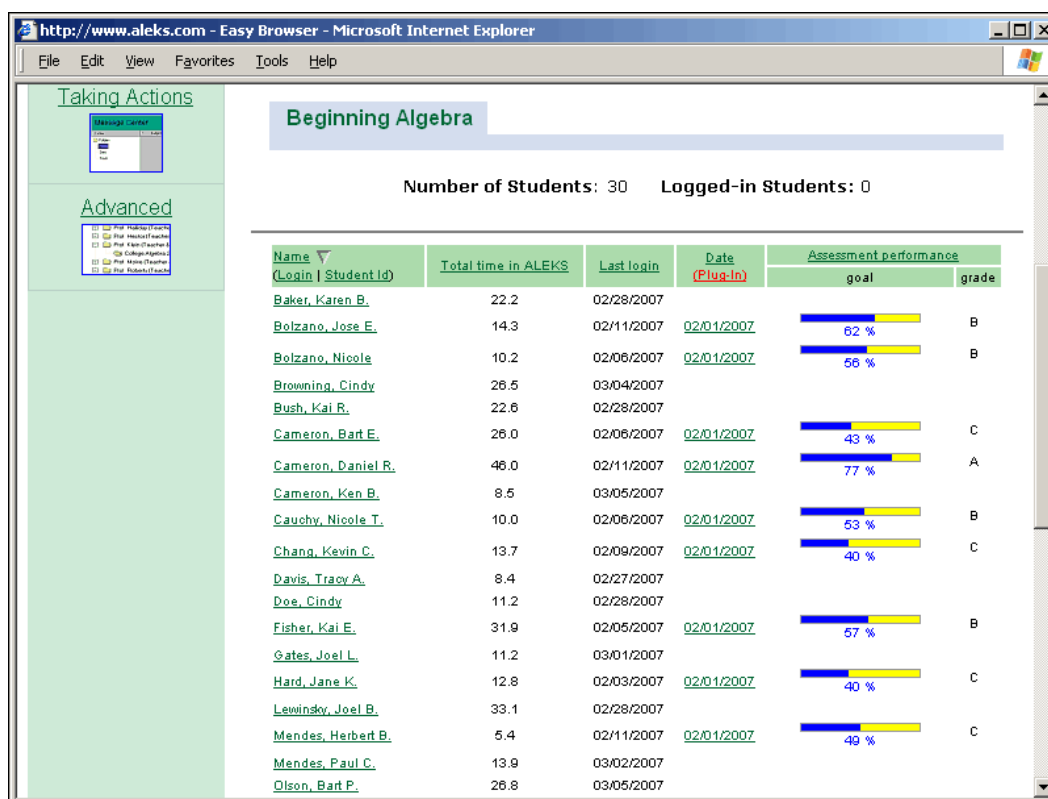


Figure 6.9: Scheduled Assessment Report

6.4.8 Scheduled assessment report

Scheduled assessment report shows the results of an assessment that has been scheduled for the course in the form of a series of bar graphs (Fig. 6.9). The blue portion of each bar graph shows the student's knowledge as measured by the assessment; subsequent progress in Learning Mode is not shown in this view. Grades for the assessment are shown if the instructor has chosen to grade the assessment (See Sec. 6.5.1). A menu at the top of the display can be used to choose earlier scheduled assessments.

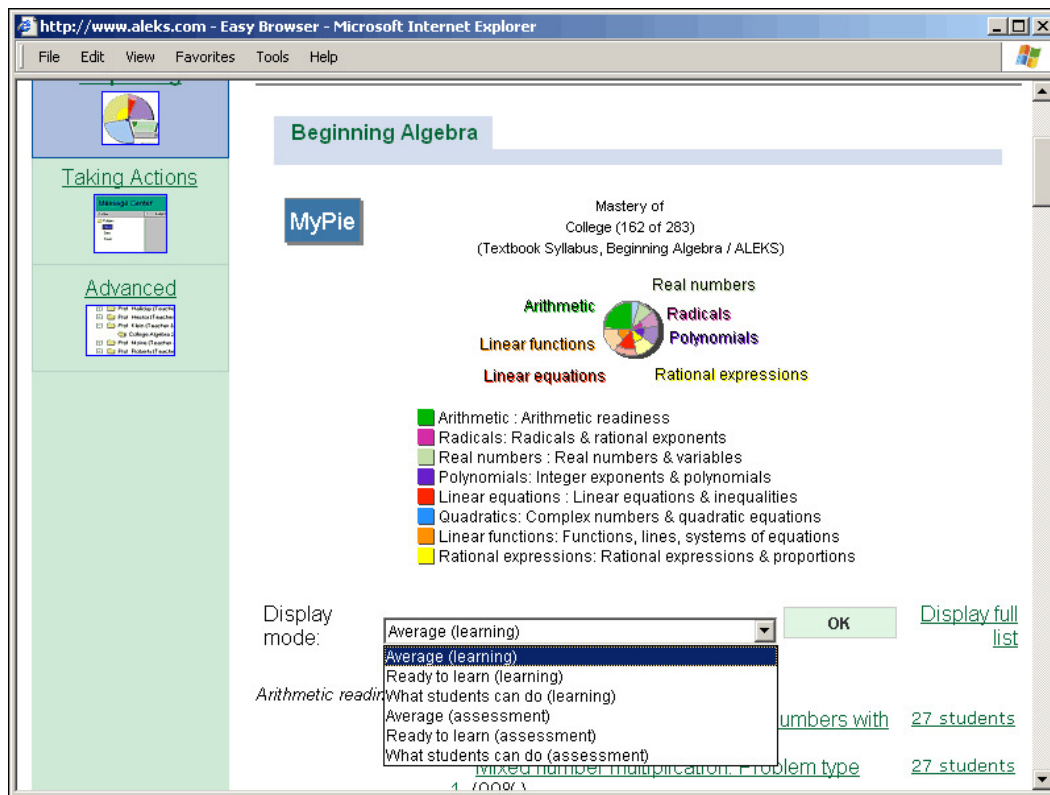


Figure 6.10: Average report (pie chart)

6.4.9 Average report (pie chart)

Average report (pie chart) displays one or more combined pie charts for the course, showing its average progress toward mastery of the curriculum (Fig. 6.10).

6.4.10 Display options for Average Report

Beneath the pie charts there are other kinds of analysis available for class assessment data. Choose “Average,” “Ready to learn (learning),” “Ready to learn (assessment),” “What students can do (learning),” or “What students can do (assessment)” from the “Display Mode” menu and click on “OK” to display results.

6.4.11 Average

This option produces a list of the specific concepts mastered by a percentage of the students, as of their most recent assessment. The list is organized by general categories (Fig. 7.6). For each concept, the percentage of students in the course who demonstrated mastery is given.

6.4.12 Ready to learn

This option also shows a list of specific concepts, organized by general categories. For each concept, it shows the number of students in the course who are ready to learn that concept in the Learning Mode (learning) or as of their most recent assessment (assessment). Clicking on the number of students will display a list of their names; there also appears a link for sending a message to all the students in the group so defined (See Secs. 7.12, 7.13). The button “Open All” displays all students’ names in each group (with links).

6.4.13 What students can do

This option also shows a list of specific concepts, organized by general categories. For each concept, it shows the number of students in the course who have recently mastered that concept in the Learning Mode (learning) or as of their last assessment (assessment). Clicking on the number of students will display a list of their names; there also appears a link for sending a message to all the students in the group so defined (See Secs. 7.12, 7.13). The button “Open All” displays all students’ names in each group (with links).

The screenshot shows the ALEKS reporting interface for 'Quiz Homework 1'. The browser window title is 'http://www.aleks.com - Easy Browser - Microsoft Internet Explorer'. The interface includes a sidebar with 'Reporting', 'Taking Actions', and 'Advanced' sections. The main content area displays a table of student scores and a summary box for the average score.

Reporting

Quiz Homework 1
View: [Student Scores](#) | [Per Question Results](#) | [Detailed Student Results](#)

[Download Excel Spreadsheet](#)
Download the results of all student quizzes

Average Score:
74%
(30 out of 30 Students)

Student (Name Login Student id)	Date Submitted	Score
Baker, Karen B.	09/01/2006	83%
Bolzano, Jose E.	09/01/2006	72%
Bolzano, Nicole	09/02/2006	50%
Browning, Cindy	08/30/2006	61%
Bush, Kai R.	09/04/2006	83%
Cameron, Bart E.	09/02/2006	78%
Cameron, Daniel R.	09/03/2006	72%
Cameron, Ken B.	08/29/2006	67%
Cauchy, Nicole T.	09/01/2006	67%
Chang, Kevin C.	09/02/2006	72%
Davis, Tracy A.	09/03/2006	78%
Doe, Cindy	09/04/2006	83%
Fisher, Kai E.	09/02/2006	78%
Gates, Joel L.	08/29/2006	78%
Hard, Jane K.	09/04/2006	83%
Lewinsky, Joel B.	09/03/2006	56%
Mendes, Herbert B.	09/02/2006	72%
Mendes, Paul C.	08/30/2006	78%
Olson, Bart P.	09/01/2006	67%

Figure 6.11: Quiz results for all the students

6.4.14 Quiz results for all the students

Quiz results for all the students shows the results on any given quiz for all students in the course who took the quiz (Fig. 6.11). Clicking on the Date Submitted for any particular quiz will give the individual results of that quiz by question. It will also be possible to see the individual questions and the answers that the student submitted for them. Please also note the option to view quiz results on a per-question basis, which can be useful in identifying the specific course strengths and weakness shown by the quiz results.

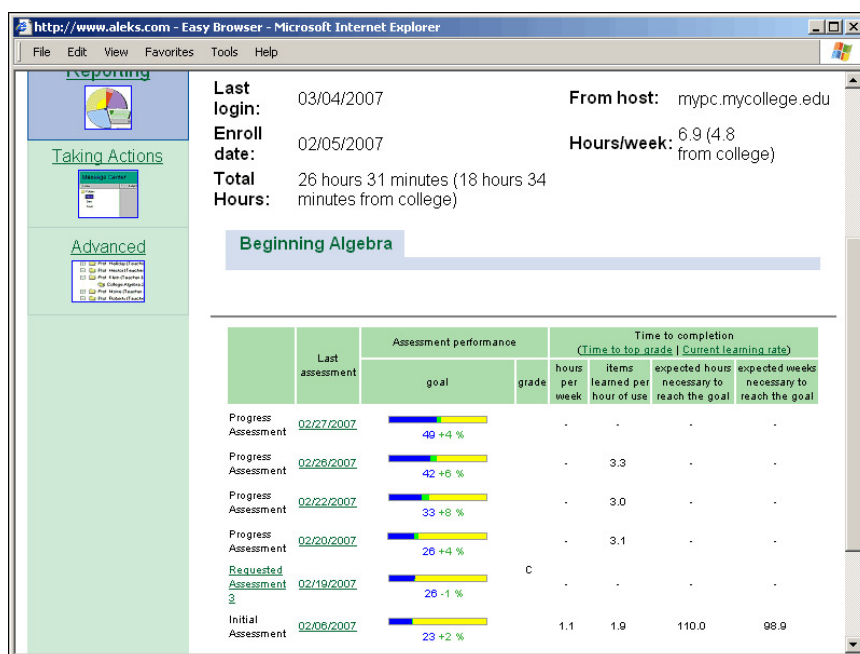


Figure 6.12: Progress report for a single student in this course

6.4.15 Progress report for a single student in this course

Progress report for a single student in this course displays a list of bar graphs for the single student chosen. There is one row for each assessment that the student has taken, with dates (linked to the Report page for that assessment) (Fig. 6.12). Each row contains one to three bar graphs, depending on the student's level. Each bar graph measures the student's mastery as of the given assessment as seen by the blue portion of the bar. Progress made in the Learning Mode subsequently to that assessment (but before the next assessment, if there is one) is measured by the green portion of the bar. There are also percentage values given beneath the bar for the blue and green portions of the bars; for example, 57+9% means that the last assessment showed 57% mastery, and that subsequent work in the Learning Mode added another 9% mastery. If there is more than one bar per row, they will correspond to the syllabi for the previous level, the current level, and the subsequent level.

Information on each assessment, total hours and weeks spent subsequently in the Learning Mode (up to the time of the next assessment) with average numbers of items gained per hour and per week is also provided (optionally, this shows the time left to completion of course goals).

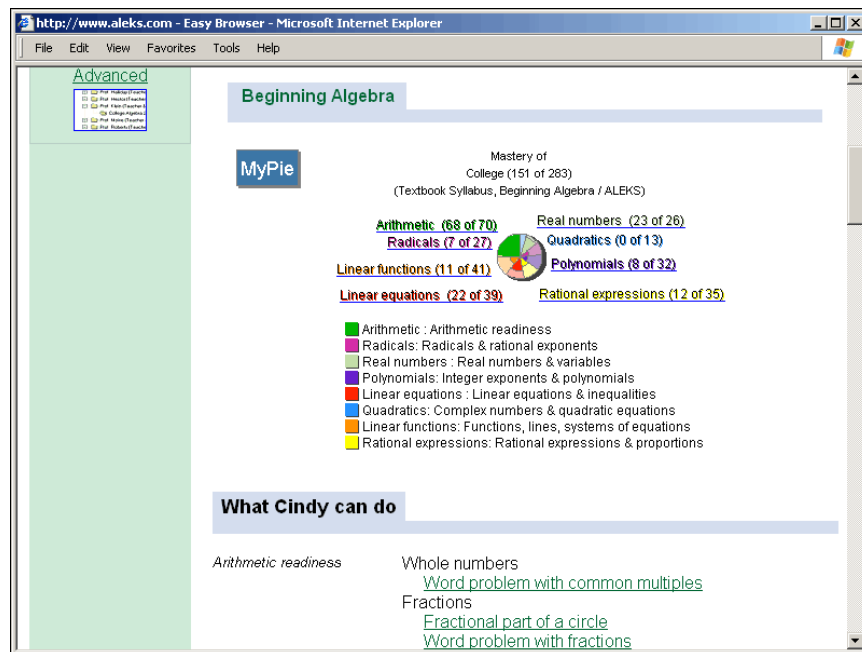


Figure 6.13: Report for a single student in this course

6.4.16 Report for a single student in this course (pie chart)

Report for a single student in this course (pie chart) displays one or more pie charts for the single student chosen, showing the student's current progress toward mastery of the curriculum (Fig. 6.13). There is also a menu giving access to earlier points in the student's progress.

Beneath the pie charts is a list of concepts that the student has mastered recently ("What *Name* Can Do") and another list of concepts that the student is currently (as of the given assessment) most ready to begin learning ("Ready to Learn"). There may also be a summary of the student's history in ALEKS ("History") and a log of work in the Learning Mode following that assessment ("Learning Log"). There are also buttons allowing the instructor to request or cancel an assessment for that student and to edit Intermediate Objectives (See Sec. 7.23).

6.4.17 Complete list of topics mastered

Click on the link "and many other more elementary concepts." to see a complete list of topics mastered by the student.

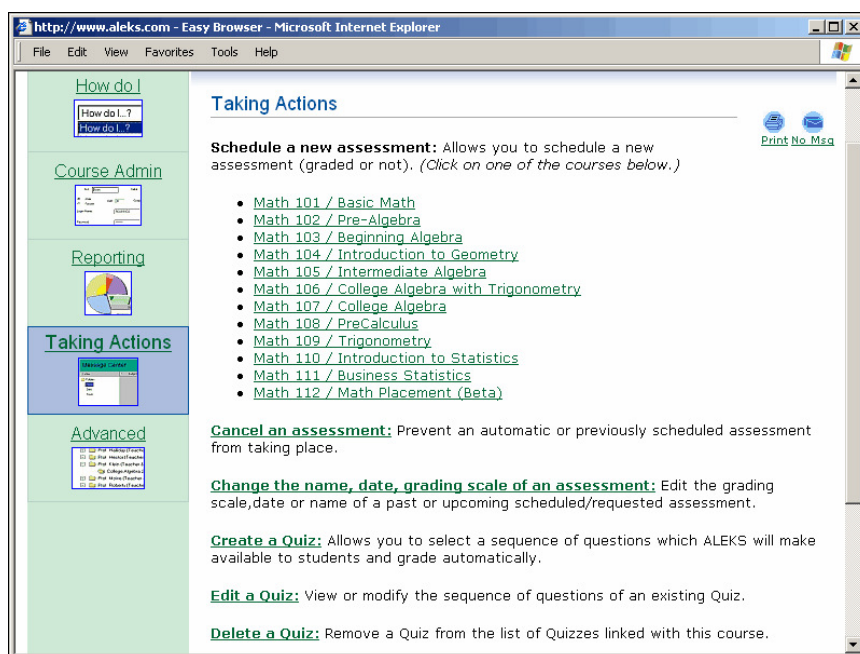


Figure 6.14: Taking Actions

6.4.18 Quiz results for a particular student

Quiz results for a particular student shows the results for any given student on any quizzes taken by that student.

6.5 Taking Actions

Additional course management features are available under “Taking Actions” (Fig. 6.14). Many of these are ways of providing assignments to the students in the course.

6.5.1 Schedule a new assessment

See also Section 7.10.

- click on a name from a list of courses (*Administrator:* for each instructor);
- provide name and date for assessment and click “Next” (Fig. 6.15);
- provide start time for assessment with option for more detailed scheduling (prevent automatic assessment up to 7 days in advance, trigger assessment on specified day only, restrict assessment to college; assign grading scale to assessment) and click “Save.”

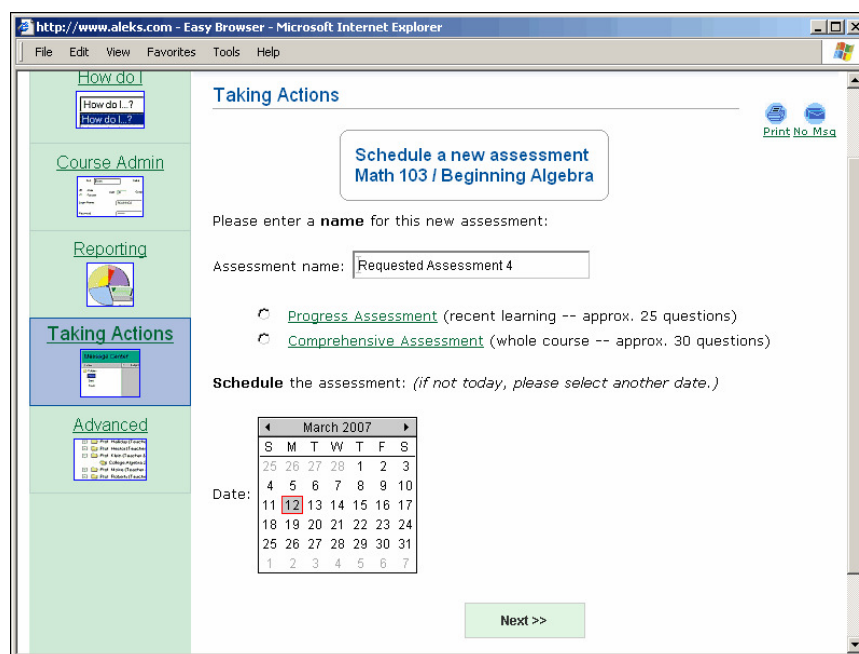


Figure 6.15: Schedule a new assessment

In order to schedule a course assessment, the instructor is asked to specify the name of the assessment (by default, a scheduled assessment is called “Requested Assessment” plus its number), a date (by default the current date), and a time (by default the current time) (Fig. 7.8). “Detailed scheduling options” permit the instructor to restrict the assessment to campus and to limit the time when it can be begun. When this information has been given, the instructor schedules the assessment by clicking “Save.” If all the defaults are left, the students will immediately enter Assessment Mode at their next login. If a later date and/or time are chosen, the students will enter Assessment Mode the next time they log in **after** that date and time. The calendar graphic provides a quick and easy way to choose the date of an assessment (click on the calendar thumbnail to use this feature).

NOTE. A Progress Assessment will tend to focus its questions on the material most recently learned by the student, and will be shorter than a Comprehensive Assessment. A Comprehensive Assessment is a bit longer, but will question the student more comprehensively on material covered in the course product. If an assessment is being given to determine students’ overall mastery at the end of a course, the Comprehensive Assessment should be used.

NOTE. In some ALEKS products, there is an option to request the assessment on a particular slice or slices of the pie chart. When this is done, there will be a note regarding the estimated number of questions needed for the assessment. Often, assessing on more than one slice of the pie chart will result in an assessment that is longer than desired; therefore, this feature is usually most effective when only a single slice is selected. The

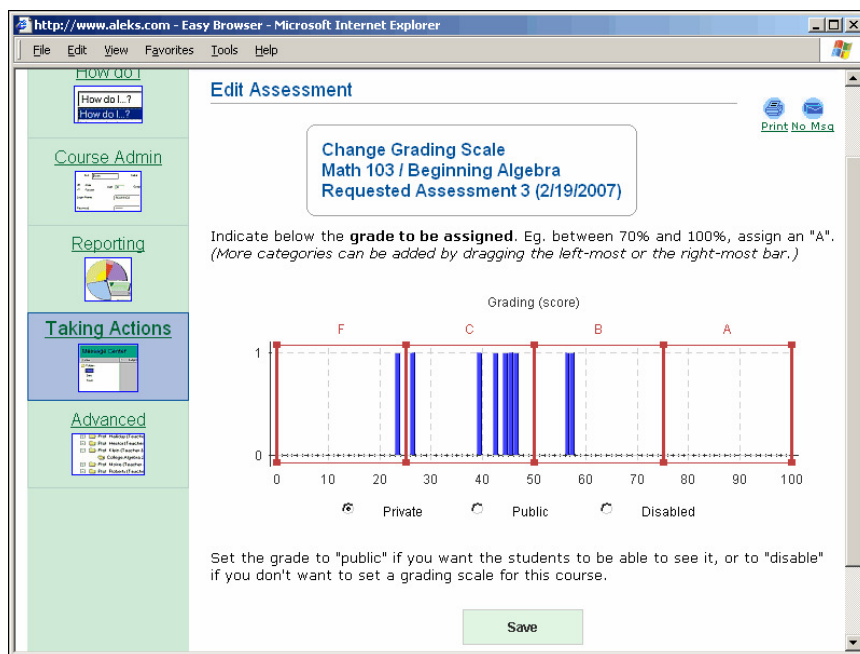


Figure 6.16: Grading with Scheduled Assessment

instructor also has the option of letting ALEKS select an appropriate slice for each student, based on their individual progress.

6.5.2 Detailed scheduling options

You can block automatic assessments for up to 7 days prior to a scheduled assessment (useful to avoid having some students assessed twice in a row); limit the effect of a scheduled assessment to the day it is assigned to or leave it in effect until the next scheduled assessment. If an assessment is limited to the assigned day, a student logging on to ALEKS on that day (after the start time) will be assessed, but if the student does not log on that day that student will not be assessed until the next automatic or scheduled assessment.

6.5.3 Grading with Scheduled Assessments

You can assign a grading scheme to this assessment only. The Grades feature uses a chart with sliders (Fig. 6.16). The grades received by students on scheduled assessments can be seen under “Scheduled Assessment Report” (See Sec. 6.4.8).

The three buttons under the graph determine the use of the evaluation: if “Disabled,” no one sees it; if “Private,” the instructor sees it but the students do not; if “Public,” the instructor sees it and each student sees it for their own work.

The graph has sliders, with labels referring to the intervals they define. Additional sliders may be placed by dragging the right-hand or left-hand sliders, or sliders may be removed by dragging them off to the right or left. The sliders may be set and the labels edited as the instructor desires. To change the label on a new or existing slider, select the text of the current label, retype as desired, and then press “Return.”

6.5.4 Cancel an assessment

See also Section 7.10.

- click on name from a list of courses (*Administrator:* for each instructor);
- click on name from list of scheduled assessments;
- click “Save” to confirm cancellation of assessment.

6.5.5 Change the name, date, grading scale of an assessment

See also Section 7.10.

- click on name from a list of courses (*Administrator:* for each instructor);
- click on name from list of scheduled assessments, with option to schedule new assessment;
- click link to modify grading scale, name, date, or other property of assessment;
- modify settings and click “Save” (possible option for more detailed settings).

6.5.6 Create a quiz

See also Section 7.11.

- click on name from a list of courses (*Administrator:* for each instructor);
- enter a name for the quiz, or leave the name provided (“Quiz **N**”), and click “Next” (you can also use the link provided to copy an existing quiz, if there is a quiz in existence for this kind of course);
- select from the list of topics in the left-hand window either by dragging topics into the right-hand window, or by highlighting topics and clicking “Add”, then click “Save”;
- use the links provided to continue editing the topics on the quiz, assign a grading scale, change how the quiz is made available to your students, or assign the quiz to some group of students within the course.

NOTE. Often it is necessary to provide a “makeup” quiz to some students. This can easily be done by copying the original quiz, then editing it so that it is assigned only to the students needing the makeup.

6.5.7 Tips

Double-click on the name of any topic to see a sample problem. Topics can be selected in continuous groups using the Shift key or discontinuous groups using Ctrl; the entire folder is selected by using Ctrl-a.

The Quiz feature in ALEKS allows instructors to create quizzes for their students using any topics in the ALEKS domain. These quizzes are administered through ALEKS and scored automatically, with optional use of a grading scale set by the instructor. Quizzes may be scheduled for particular days and times, or they may be made available for the students in a course to take when they are ready (“Homework Quiz”). The results of quizzes can be seen through the reporting features of ALEKS, but do not influence the students’ knowledge states or their guided learning in ALEKS.

6.5.8 Grading with quizzes

The grading scale used with quizzes is like the one used for assessments (See Sec. 6.5.3). As with assessments, grading is not obligatory; if no grading scale is set, the students and the instructor will only see the percentage of questions answered correctly.

6.5.9 Availability of quizzes to students.

By default, quizzes are made available to students as “Homework Quizzes.” This means that the student is not forced into the quiz by ALEKS; rather, the student clicks the “Quiz” button when they are ready to take the quiz (See Sec. 5.2.9). If this option is chosen, the instructor must indicate a due date for the quiz, after which the quiz will no longer be available to students. A message can also be sent to students informing them that the quiz has been assigned.

Quizzes may also be “hidden” for later availability to students (“Don’t make this quiz available yet”), or they may be scheduled. A graphic calendar is provided for easy scheduling of quizzes. If the quiz is scheduled, the instructor will have options for specifying the time of day it is to begin, the time limit on the quiz, whether students are notified, how many days the quiz should be in effect (“Window of time to take the quiz”), whether the quiz is restricted to the college, and prevention of automatic assessments up to five days before the quiz is scheduled.

The quiz may be assigned to all the students in the course or, optionally, to some group within the course.

6.5.10 Edit a quiz

See also Section 7.11.

- click on name from a list of courses (*Administrator*: for each instructor);

- click on name from a list of existing quizzes;
- modify the quiz using the features described above.

6.5.11 Delete a quiz

See also Section 7.11.

- click on name from a list of courses (*Administrator:* for each instructor);
- click on name from a list of existing quizzes;
- click on “Confirm” to delete the quiz, or “Cancel” to leave it.

6.5.12 Send a message

See also Section 7.12.

Using this link connects you to the ALEKS Message Center, an extremely powerful and useful component of the ALEKS system. Please see Section 7.12 for a detailed description of the Message Center. The Message Center can also be reached via the envelope icon in the upper right corner of every Instructor Module page.

6.6 Advanced

On clicking this link, the user is shown a brief explanation of how the Advanced Instructor Module differs from the standard one (Fig. 6.17).

Instructors using ALEKS should not be intimidated about trying the advanced interface. It is a visual or graphic (“point and click”) interface based on a model of directories, files, and actions applied to files and directories, which is essentially shared by all modern computer systems. With even slight familiarity, most users will have no difficulty using it (See Chapters 7-8).

6.6.1 Show me a tutorial for the “Advanced” Instructor Module.

The Tutorial for the Advanced Instructor Module is a complete guide to the most commonly-used features of this area (See Sec. 7.2). From within the Advanced Instructor Module, it is possible to retake the Tutorial at any time or to review parts of it by using the “Help” button.

- click “Next” to enter the Tutorial for the Advanced Instructor Module.

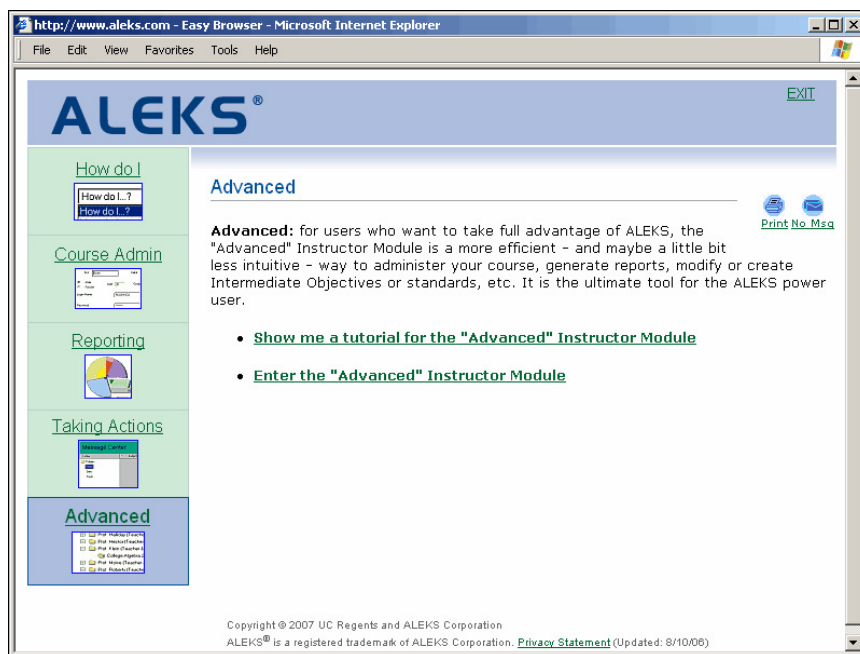


Figure 6.17: Advanced

6.6.2 Enter the “Advanced” Instructor Module now.

When an instructor has achieved a certain level of familiarity with the Instructor Module, she or he may wish to try using the advanced interface, or even to use the advanced interface exclusively. As noted, the Advanced Instructor Module has certain advantages of efficiency and flexibility, especially in operations affecting groups of students.

- click “Next” to enter the Advanced Instructor Module (optionally, set your preferences to log directly into the Advanced Instructor Module when using this account).

Chapter 7

Advanced Instructor Module: Results & Progress

7.1 The ALEKS Advanced Instructor Module

The Advanced Instructor Module interface provides an array of features enabling instructors having some familiarity with ALEKS to carry out management and monitoring of their courses with more efficiency and power. The Advanced Instructor module is entered from the basic Instructor Module by clicking “Advanced”; instructors may also choose to make the advanced interface their default interface for the ALEKS Instructor Module. Instructors using the Advanced Instructor Module can return to the basic Instructor Module at any time by using the link, “Go to the Basic Instructor Module,” located at the top of the Advanced Instructor Module window.

7.2 Instructor Tutorial (Advanced Instructor Module)

The Tutorial for the Advanced Instructor Module is designed to parallel the function of the Tutorial taken by all student users of ALEKS when they first register with the system. It introduces the instructor to the features of the ALEKS Advanced Instructor Module in a brief, but thorough, interactive way, and will give instructors who choose this interface confidence in carrying out the operations needed to effectively monitor and manage their ALEKS courses.

The Tutorial for the Advanced Instructor Module reproduces the advanced ALEKS interface and poses the instructor a series of tasks involving the interface tools (Fig. 7.1). The instructor proceeds to the next page by carrying out the current task; feedback is provided to guide the instructor through all needed actions.

Instructors will normally take the Tutorial at the time that they begin to explore or use the Advanced Instructor Module interface. Instructors will normally take the Tutorial

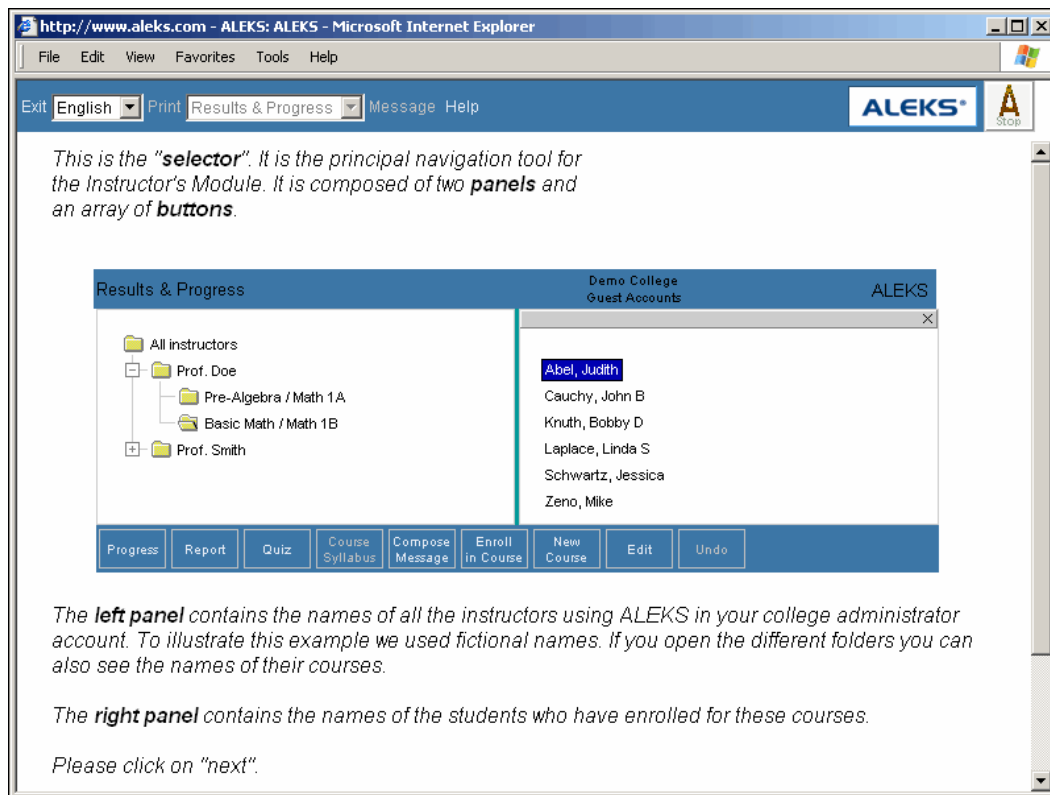


Figure 7.1: Tutorial for the Advanced Instructor Module

at the time that they begin to explore or use the advanced Instructor Module interface. The Tutorial can be skipped; an instructor who has skipped part of the Tutorial can return to where they left off or restart from scratch. Also, the Help page contains an index, which links to every section of the Tutorial. Current instructors may take the Tutorial at any time by clicking the link marked "Show me a Tutorial" at the top of the Advanced Instructor Module window. (An instructor who has chosen to skip all or part of the Tutorial sees "Return to the Tutorial.")

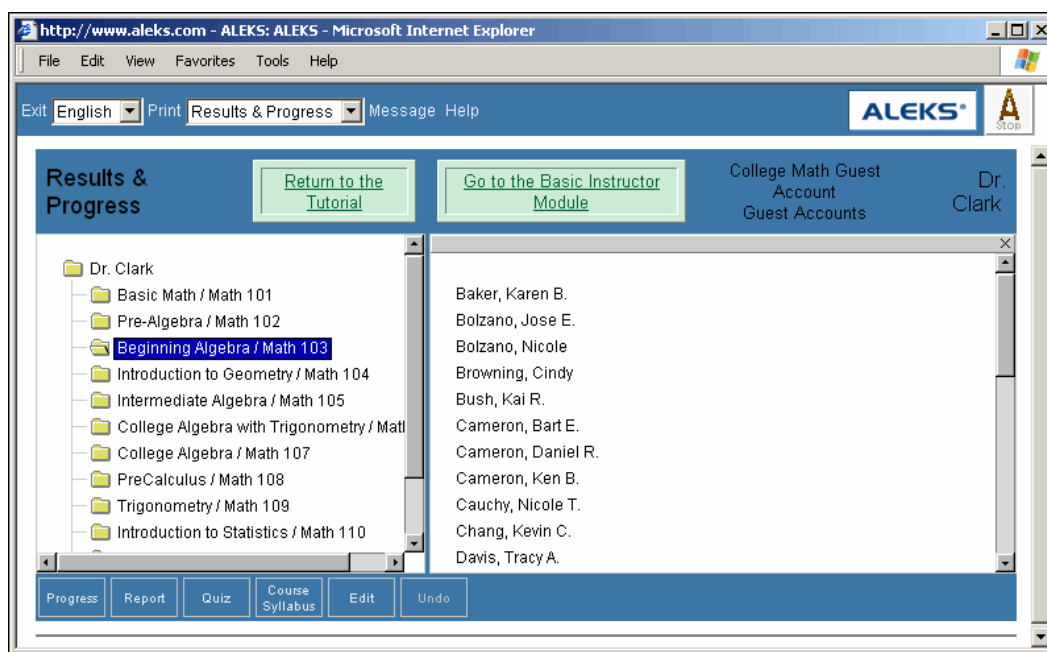


Figure 7.2: The Results and Progress Directory (Advanced Instructor Module)

7.3 Access to the Advanced Instructor Module

When you enter the Advanced Instructor Module with instructor status, you will see a directory containing only your own courses. If you have an administrator account you will see all of the instructor directories for your college. If you have a root administrator account you will see directories for all colleges under your administration (Fig. 7.2).

NOTE. The directory window is called the “Selector.” It is the chief graphic navigation tool of the Advanced Instructor Module. You can always return to the Selector by scrolling your browser window up. Similar Selector windows are used in other areas of the Advanced Instructor Module for special purposes.

If you have an instructor account, the system features at your disposal can affect only your classes and the students under your supervision. If your account is that of a supervisor, your privileges are similar, but extend to all the classes and all of the students in the college. If your account is that of a root administrator (e.g., over an entire multi-campus community college system), your privileges extend to all colleges under your administration. In the following, we assume that your account is that of a supervisor.

The Advanced Instructor Module has two parts: “Results & Progress” and “Standards & Syllabi.” When you enter the Advanced Instructor Module, you are automatically placed in “Results & Progress.” Use the ALEKS menu bar to change the part of the Advanced Instructor Module in which you are working (See Chapter 8).

“Results & Progress” is used for most administrative tasks, such as monitoring indi-

vidual and group progress. Instructors using ALEKS with one or more courses will probably wish to check into this part of the Instructor Module on a daily basis. This allows the instructors to verify the rate of progress achieved by the students. The features also enable instructors to set up additional classes if they need to.

The following sections describe the various actions that can be carried out by instructors with appropriate levels of privilege in the Advanced Instructor Module.

7.4 Online Help in the Advanced Instructor Module

Context-sensitive online help in the Advanced Instructor Module can be obtained by clicking on “Help” in the bar at the top of the window (next to the “Message” button).

Bulletin Board and Mailing List. The “Help” button also gives access to the ALEKS bulletin board and mailing list for instructors. The purpose of these features is to allow instructors using ALEKS to exchange information and viewpoints on teaching methods, strategies, and the like. They can also be accessed from the ALEKS website by registered instructors (click on “Help”).

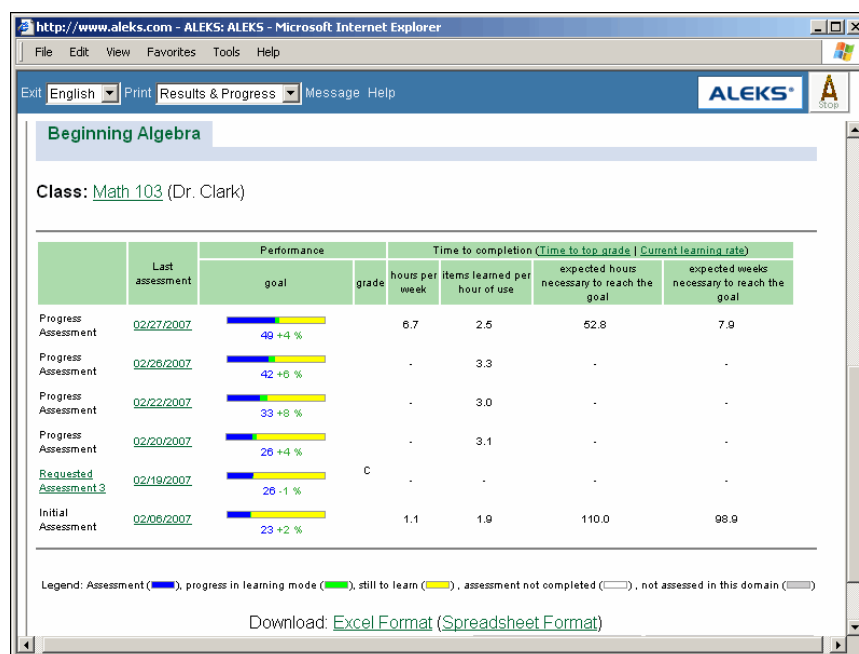


Figure 7.3: Student Progress (Advanced Instructor Module)

7.5 View Student Progress

Progress

To view student progress, select the name of the student and click on the “Progress” button. A chart will appear below the directories window with one or more rows of information (Fig. 7.3). There is one row for each assessment that the student has taken, with dates (linked to the Report page for that assessment). Each row contains one to three bar graphs, depending on the student’s level. Each bar graph measures the student’s mastery as of the given assessment as seen by the blue portion of the bar. Progress made in the Learning Mode subsequently to that assessment (but before the next assessment, if there is one) is measured by the green portion of the bar. There are also percentage values given beneath the bar for the blue and green portions of the bars; for example, 57+9% means that the last assessment showed 57% mastery, and that subsequent work in the Learning Mode added another 9% mastery. If there is more than one bar per row, they will correspond to the syllabi for the previous level, the current level, and the subsequent level.

A variety of other information, clearly labeled, is provided on the Progress page: date of last login, enrollment date, total hours spent on the system. Information on each assessment, total hours and weeks spent subsequently in the Learning Mode (up to the time of the next assessment) with average numbers of items gained per hour and per week is also provided (optionally, this shows the time left to completion of course goals). There are also buttons allowing the instructor to schedule or cancel an assessment for

that student and to edit Intermediate Objectives (See Secs. 7.9, 7.23), and a link for downloading this information to the instructor's computer.

Downloading. Information from the Student Progress page can be downloaded in two formats. "Spreadsheet Format" is comma-separated values (CSV), which can be imported into a variety of applications but is raw in appearance. "Excel Format" is in Microsoft Excel format, and has a legible, professional appearance, suitable for printing.

Monitoring progress. When a student has spent enough time on ALEKS to have had two or more assessments, the sequence of bar graphs appearing on the Student Progress page begins to tell a clear story of the student's success in moving toward mastery. There may be considerable difference among individual students in the speed and smoothness of their progress. When one bar graph appears above another bar graph, the uppermost one represents a later assessment, in which the student seeks to confirm knowledge of material tentatively mastered in Learning Mode. For some students, progress in assessments is slower than that in Learning Mode. This can be seen when the green portion of one bar graph extends further to the right than the blue portion of the bar graph above it (not everything covered in Learning Mode was confirmed subsequently in the assessment). For other students the opposite is true: progress in assessments is faster than that in the Learning Mode. This can be seen when the green portion of one bar graph does not extend so far to the right as the blue portion of the bar graph above it (more knowledge was confirmed in the assessment than had been covered previously in Learning Mode). When a student is frustrated, this will be obvious from the bar graphs; in such cases the instructor may need to provide extra help or encouragement. It is well worth the instructor's time to check daily on individual and course progress in ALEKS.

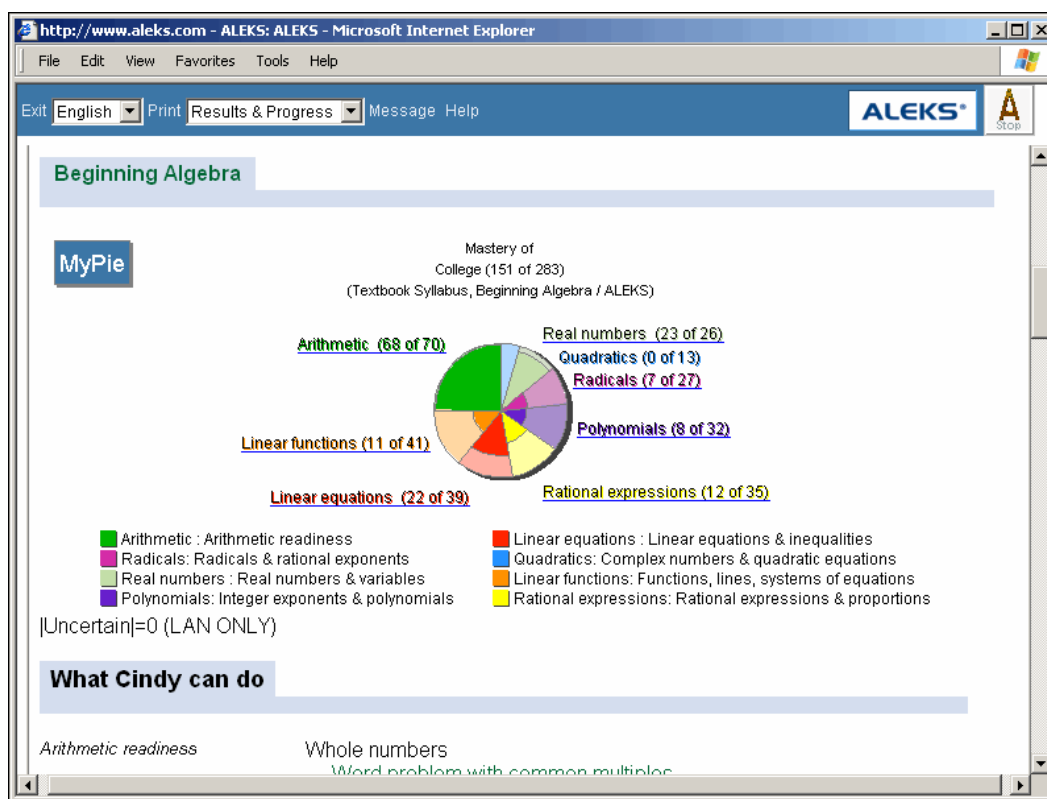


Figure 7.4: Student Report (Advanced Instructor Module)

7.6 View Student Assessment Report

Report

Select the name of the student for whom you wish to observe a report and click on the “Report” button. A display containing one or more pie charts will appear beneath the directories window (Fig. 7.4). Its interpretation is the same as for the reports received by students following all formal assessments (See Sec. 4.13.1). By default, the Report page shows the most recent assessment or the most recent knowledge attained in the Learning Mode. Other assessments or other Learning Mode reports may be chosen by selecting dates from the menu at the top of the chart and clicking on “OK.”

Dates. Each report in the menu at the top of the Student Report page is dated. If an assessment is begun on one date and finished on another, the begin and end dates are shown on the Student Report page, along with the amount of time spent in the assessment (the menu shows only the begin date). The date for a Learning report is the last date on which the student worked in the Learning Mode before any subsequent assessment.

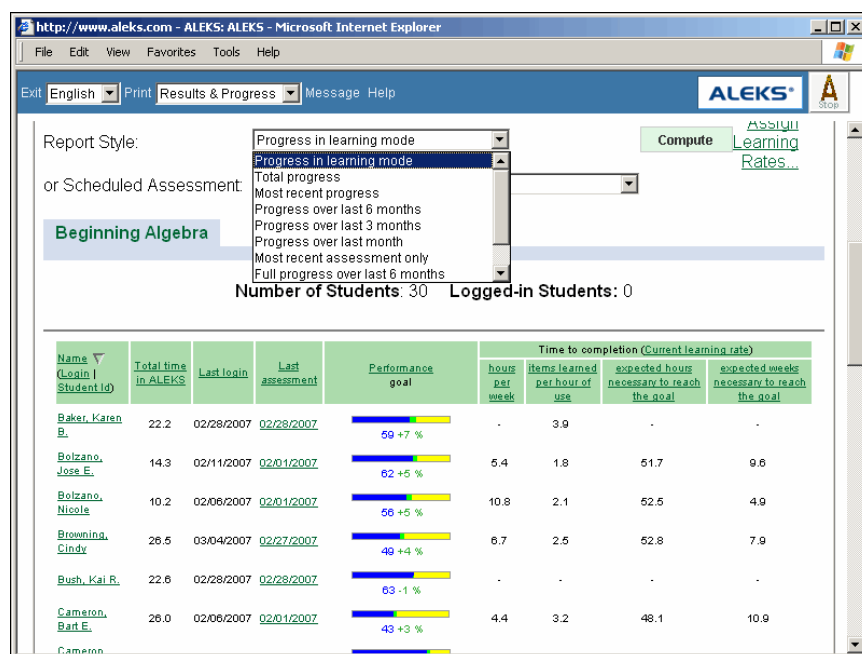


Figure 7.5: Course Progress (Advanced Instructor Module)

Beneath the pie charts is a list of concepts that the student has mastered recently (“What *Name* Can Do”) and another list of concepts that the student is currently (as of the given assessment) most ready to begin learning (“Ready to Learn”). There may also be a summary of the student’s history in ALEKS (“History”) and a log of work in the Learning Mode following that assessment (“Learning Log”). There are also buttons allowing the instructor to request or cancel an assessment for that student and to edit Intermediate Objectives (See Secs. 7.9, 7.23).

Complete list of topics mastered. Click on the link “and many other more elementary concepts” to see a complete list of topics mastered by the student.

7.7 View Course Progress



Select the course for which you wish to observe progress and click on the “Progress” button. A chart will appear below the directories window with a series of rows, one for each student enrolled in the course (Fig. 7.5). The rows contain bar graphs (See interpretation in “View Student Progress,” Sec. 7.5). By default, only the bar graph for the most recent assessment is shown (the students’ names are linked to their individual Progress pages, while the assessment dates are linked to their individual Report pages). You can use the students’ Login Names or ids rather than their names as the identifier in the left-hand column; simply click on the corresponding link at

the top of that column. This may be useful when the data from this page needs to be downloaded and stored in a particular format for administrative purposes.

Report Style. A range of options providing variations on this format are accessible through a menu at the top of the chart. Choose the desired format from the menu and click on “Compute” to view results.

Of these options, the following have been found particularly useful by a wide range of users: “Progress in learning mode” (for frequent checks on progress and time spent in ALEKS), “Total progress” (for viewing the overall effectiveness of students’ use of ALEKS over a longer period of time, such as a term or semester), and “Full progress over last 6 months” (for convenient examination of the learning patterns followed by students in a course).

Progress in learning mode

All students who have completed at least one assessment have bar graphs. The blue portion of the bar graph shows mastery as of the most recent assessment, and the green portion shows progress in the Learning Mode since that assessment.

Total progress

All students who have completed at least two assessments have bar graphs. The blue portion of the bar graph shows mastery as of the first assessment, and the light blue portion shows progress made between that assessment and the most recent assessment taken.

Most recent progress

All students who have completed at least two assessments have bar graphs. The blue portion of the bar graph shows mastery as of the assessment immediately preceding the most recent one, and the light blue portion shows progress made between that assessment and the most recent assessment taken.

Progress over last 6 months

All students who have completed at least two assessments within the last six months have bar graphs. The blue portion of the bar graph shows mastery as of the first assessment taken within the last six months, and the light blue portion shows progress made between that assessment and the most recent one taken.

Progress over last 3 months

All students who have completed at least two assessments within the last three months have bar graphs. The blue portion of the bar graph shows mastery as of the first assessment taken within the last three months, and the light blue portion shows progress made between that assessment and the most recent one taken.

Progress over last month

All students who have completed at least two assessments within the last month have bar graphs. The blue portion of the bar graph shows mastery as of the first assessment taken within the last month, and the light blue portion shows progress made between that assessment and the most recent one taken.

Most recent assessment only

All students who have completed at least one assessment have bar graphs. The blue portion shows mastery as of the most recent assessment.

Full progress over last 6 months

For each student who has taken at least one assessment, there is a bar graph shown for each assessment taken in the last 6 months. The interpretation is the same as for “Progress in learning mode”; that is, the blue part of the bar shows mastery on the assessment, and the green part additional mastery achieved in Learning Mode following that assessment (but before any subsequent assessment).

Full progress over last 3 months

For each student who has taken at least one assessment, there is a bar graph shown for each assessment taken in the last 3 months. The interpretation is the same as for “Progress in learning mode”; that is, the blue part of the bar shows mastery on the assessment, and the green part additional mastery achieved in Learning Mode following that assessment (but before any subsequent assessment).

Full progress over last month

For each student who has taken at least one assessment, there is a bar graph shown for each assessment taken in the last month. The interpretation is the same as for “Progress in learning mode”; that is, the blue part of the bar shows mastery on the assessment, and the green part additional mastery achieved in Learning Mode following that assessment (but before any subsequent assessment).

Scheduled Assessment

Underneath the “Report Style” menu is a second menu listing assessments that have been scheduled for this course. To view the results of that assessment, select the name (with date) of the assessment and click “Compute” (See Sec. 7.10).

Buttons at the bottom of the page allow the instructor to schedule an assessment for all the students taking the course and to download information from the page in a format suitable for spreadsheet display (See Sec. 7.10).

Statistical Information. Most display options provide additional types of statistical information on student progress in the right-hand part of the display. Their significance varies according to the display option, and is indicated in the column headings. One or more fields may be blank if the information gathered for that student is not sufficient at a particular time. It is also possible to choose “Time to Completion”; this indicates the estimated time necessary for individual students to complete the course goals based on average progress for the period chosen. Where the Intermediate Objectives are in use, this also shows “Time to Current Objective” (See Sec. 7.23).

Assign Learning Rates. A link at the top of the Course Progress page provides access to the learning rates feature (See Sec. 7.25).

Sorting. The information in the Course Progress page can be sorted on any of the columns. Simply click on the header or footer of a column to sort on that column; a second click switches between ascending and descending order.

Grouping. It is possible to create arbitrary groups within the course and generate Progress pages for these groups. Simply select the names of the students in the Selector: hold Shift to select a continuous range, or Ctrl to select a discontinuous group. Then click the “Progress” button.

Downloading. Information from the Course Progress page can be downloaded in two formats. “Spreadsheet Format” is comma-separated values (CSV), which can be imported into a variety of applications but is raw in appearance. “Excel Format” is in Microsoft Excel format, and has a legible, professional appearance, suitable for printing.

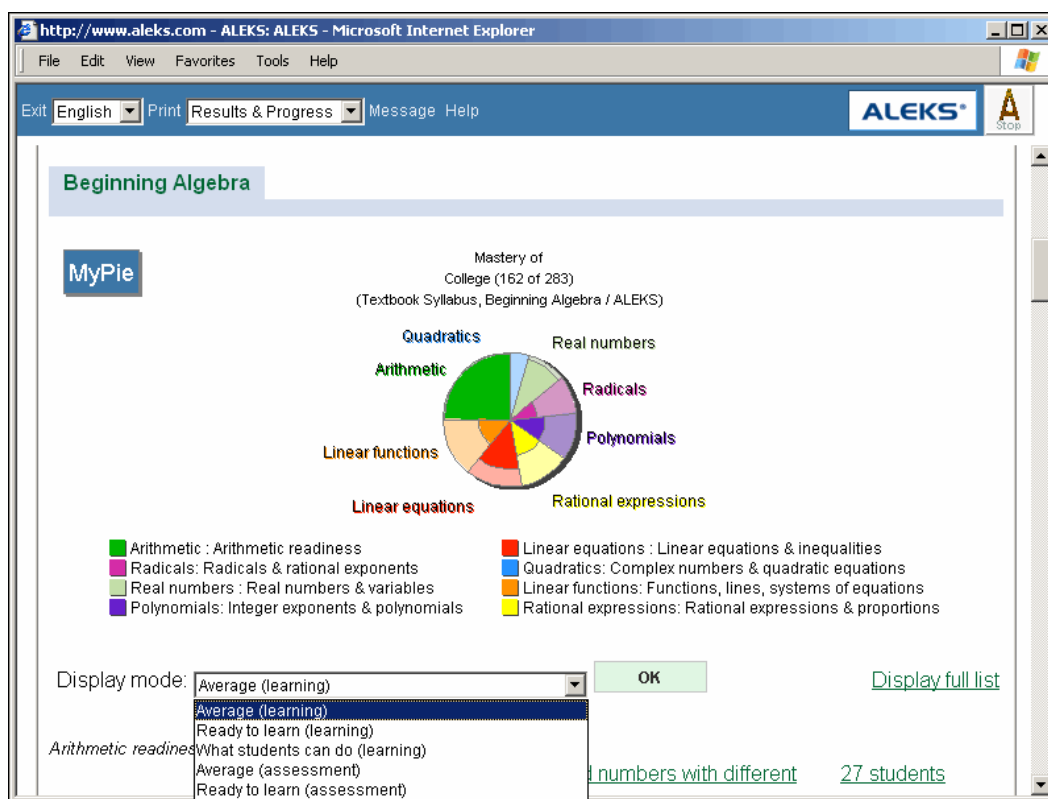


Figure 7.6: Course Report (Advanced Instructor Module)

7.8 View Course Report

Report

Select the course for which you wish to view a report and click on the “Report” button. A display containing one or more pie charts will appear beneath the directories window (Fig. 7.6). Its interpretation is the same as for the reports received by students following all formal assessments, except that it represents an analytic summary of reports received by all students in the course. The period summarized may be changed using the menu at the top of the chart (click on “OK” to display results).

Display options. Beneath the pie charts there are other kinds of analysis available for class assessment data. Choose “Average,” “Ready to learn (learning),” “Ready to learn (assessment),” “What students can do (learning),” or “What students can do (assessment)” from the “Display Mode” menu and click on “OK” to display results.

Average

This option produces a list of the specific concepts mastered by a percentage of the students, as of their most recent assessment. The list is organized by general

categories (Fig. 7.6). For each concept, the percentage of students in the course who demonstrated mastery is given.

By default, items are not listed if they have been learned by fewer than 5% or by more than 95% of the students in the course. For a comprehensive list (0%-100%), click the link “Display full list.”

Ready to learn

This option also shows a list of specific concepts, organized by general categories. For each concept, it shows the number of students in the course who are ready to learn that concept in the Learning Mode (learning) or as of their most recent assessment (assessment). Clicking on the number of students will display a list of their names; there also appears a link for sending a message to all the students in the group so defined (See Secs. 7.12, 7.13). The button “Open All” displays all students’ names in each group (with links).

What students can do

This option also shows a list of specific concepts, organized by general categories. For each concept, it shows the number of students in the course who have recently mastered that concept in the Learning Mode (learning) or as of their last assessment (assessment). Clicking on the number of students will display a list of their names; there also appears a link for sending a message to all the students in the group so defined (See Secs. 7.12, 7.13). The button “Open All” displays all students’ names in each group (with links).

Focusing instruction. These tools can be used to focus instruction for courses and groups of students. The “Average” display shows very clearly which specific concepts and general areas within the syllabus need the most work for the greatest number of students. Consequently, it can be used to prioritize topics for lectures and lesson plans. The “Ready to learn” display, on the other hand, makes it possible to break a large course up into small groups, each focused on the concept or concepts that it is working on currently in Learning Mode. The “What students can do” display mode can be used to form groups of students for special discussions and exercises designed to expand and deepen their understanding of a concept they have all recently mastered. Where there is not sufficient teaching staff to coach several groups simultaneously, the instructor may call out small groups during their use of ALEKS for brief, pointed “chalk talks.”

At the bottom of the Course Report page there are buttons allowing the instructor to schedule an assessment for all the students in the course or to edit Intermediate Objectives (See Secs. 7.10, 7.23).

Grouping. It is possible to create arbitrary groups within the course and generate Report pages for these groups. Simply select the names of the students in the Selector: hold Shift to select a continuous range, or Ctrl to select a discontinuous group. Then click the “Report” button.

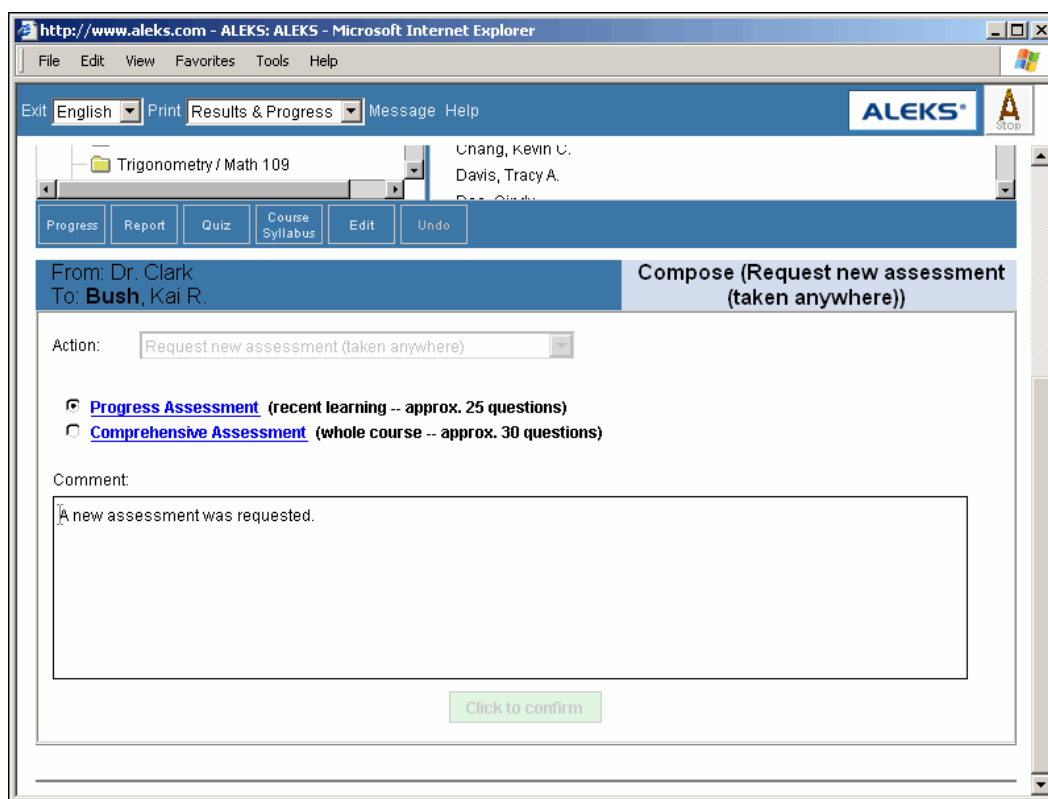


Figure 7.7: Student Assessment (Advanced Instructor Module)

7.9 Schedule Student Assessment

Assessments for individual students may be requested or canceled using buttons on the Progress or Report pages for those students (Fig. 7.7). If more than one student name is selected before clicking “Progress” or “Report,” the assessment will be requested for that group of students. When the instructor has requested an assessment, the student or students will immediately enter the Assessment Mode at the next login. The instructor can specify whether the assessment is to be taken from any location or only from the college.

NOTE. In some ALEKS products, there is an option to request the assessment on a particular slice or slices of the pie chart. When this is done, there will be a note regarding the estimated number of questions needed for the assessment. Often, assessing on more than one slice of the pie chart will result in an assessment that is longer than desired; therefore, this feature is usually most effective when only a single slice is selected. The instructor also has the option of letting ALEKS select an appropriate slice for the student, based on that student’s individual progress.

NOTE. If an assessment is scheduled, whether by the instructor or automatically by the system, and the student is required to take the assessments at the college, the student

Requested Assessment 1 (03/12/2007) **Assessment Scheduling**

General Message Grades Assign To Advanced

Name: Requested Assessment 1

Date: Mar / 12 / 2007

Start at: 4 : 30 pm PDT

Location: Anywhere

Progress Assessment (recent learning -- approx. 25 questions)
 Comprehensive Assessment (whole course -- approx. 30 questions)

Scheduled assessment
 No automatic assessments

Save Back

Figure 7.8: Course Assessment (Advanced Instructor Module)

will be unable to use the system from locations other than college until the assessment is completed (See Sec. 7.17). Instructors wishing to constrain assessments in this way should contact ALEKS Corporation for assistance in determining the domain addresses used by their college.

7.10 Schedule Course Assessment

Assessments for entire courses may be scheduled using buttons on the Progress or Report pages for those courses, or on the Edit page under the tab “Advanced.”

In order to schedule a course assessment, the instructor is asked to specify the name of the assessment (by default, a scheduled assessment is called “Requested Assessment” plus a number), a date (by default the current date), and a time (by default the current time) (Fig. 7.8). The instructor can also specify whether the assessment can be taken anywhere (the default) or is restricted to campus. When this information has been given, the instructor schedules the assessment by clicking “Save.” If all the defaults are left, the students will immediately enter Assessment Mode at their next login. If a later date and/or time are chosen, the students will enter Assessment Mode the next

time they log in **after** that date and time. The calendar appearing to the right of the input fields provides a quick and easy way to choose the date of an assessment. The calendar also shows the dates of all currently scheduled assessments and days on which automatic assessments have been blocked.

At the bottom of the Course Assessment page all currently scheduled assessments are listed. Clicking any of these links brings up the scheduled assessment for modification or deletion. Use the “Delete Assessment” button to delete a scheduled assessment, or the “Create New Assessment” button to add a new assessment from this page.

The tabs “Slices” (for some products), “Message,” “Grades,” and “Advanced” provide access to additional features affecting scheduled assessments.

Slices

In some ALEKS products, there is an option to request the assessment on a particular slice or slices of the pie chart. When this is done, there will be a note regarding the estimated number of questions needed for the assessment. Often, assessing on more than one slice of the pie chart will result in an assessment that is longer than desired; therefore, this feature is usually most effective when only a single slice is selected. The instructor also has the option of letting ALEKS select an appropriate slice for each student, based on their individual progress.

Message

Add a special message to accompany the automatic message which students receive informing them that they are entering a scheduled assessment. If you prefer that the students not receive a message, cancel the automatic message.

Grades

Assign a grading scheme to this assessment only. The Grades feature uses a chart with sliders (Fig. 7.9). The grades received by students on scheduled assessments can be seen under Course Progress using the “Scheduled Assessment” menu (See Sec. 7.7).

The three buttons under the graph determine the use of the evaluation: if “Disabled,” no one sees it; if “Private,” the instructor sees it but the students do not; if “Public,” the instructor sees it and each student sees it for their own work.

The graph has sliders, with labels referring to the intervals they define. Additional sliders may be placed by dragging the right-hand or left-hand sliders, or sliders may be removed by dragging them off to the right or left. The sliders may be set and the labels edited as the instructor desires. To change the label on a new or existing slider, select the text of the current label, retype as desired, and then press “Return.”

Advanced

Block automatic assessments for up to 7 days prior to a scheduled assessment (useful to avoid having some students assessed twice in a row); limit the effect of a scheduled assessment to the day it is assigned to or leave it in effect until the next scheduled assessment. If an assessment is limited to the assigned day, a student

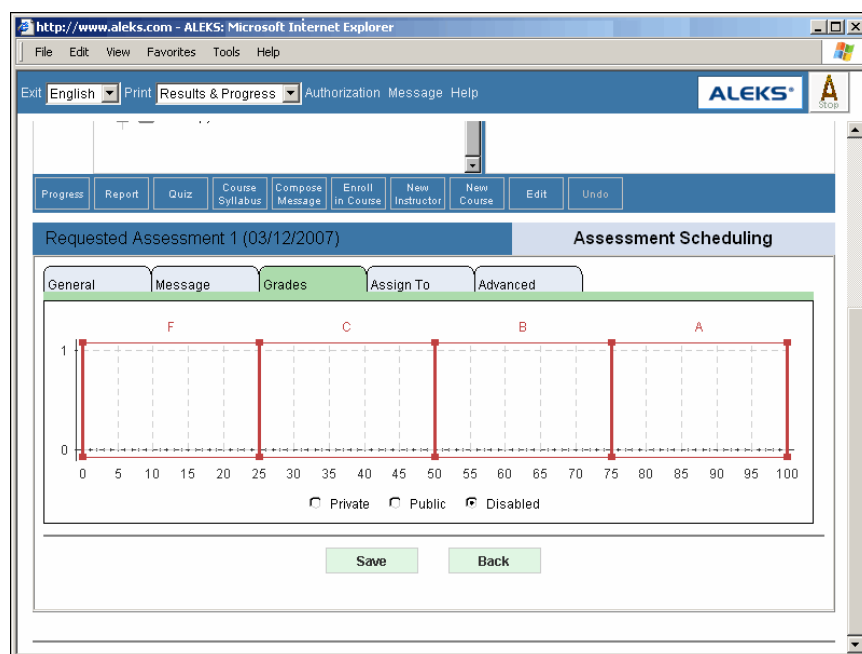


Figure 7.9: Grading with Scheduled Assessment (Advanced Instructor Module)

logging on to ALEKS on that day (after the start time) will be assessed, but if the student does not log on that day that student will not be assessed until the next automatic or scheduled assessment.

NOTE. If an assessment is scheduled, whether by the instructor or automatically by the system, and the student is required to take assessments at the college, the student will be unable to use the system from locations other than college until the assessment is completed (See Sec. 7.17). Instructors wishing to constrain assessments in this way should contact ALEKS Corporation for assistance in determining the domain addresses used by their college.

Grouping. It is possible to create arbitrary groups within the course and request assessments for these groups. Simply select the names of the students in the Selector: hold Shift to select a continuous range, or Ctrl to select a discontinuous group. Then click the “Progress” or “Report” button, and request the assessment as you normally would for an entire course.

7.11 Create, Edit, View Quizzes

Quiz

To create, edit, or view quizzes, select the name of the course for which you wish to do this and click “Quiz.” You will see a list of students in the course with results for the most recent quiz. A menu above the list allows you to select a previous

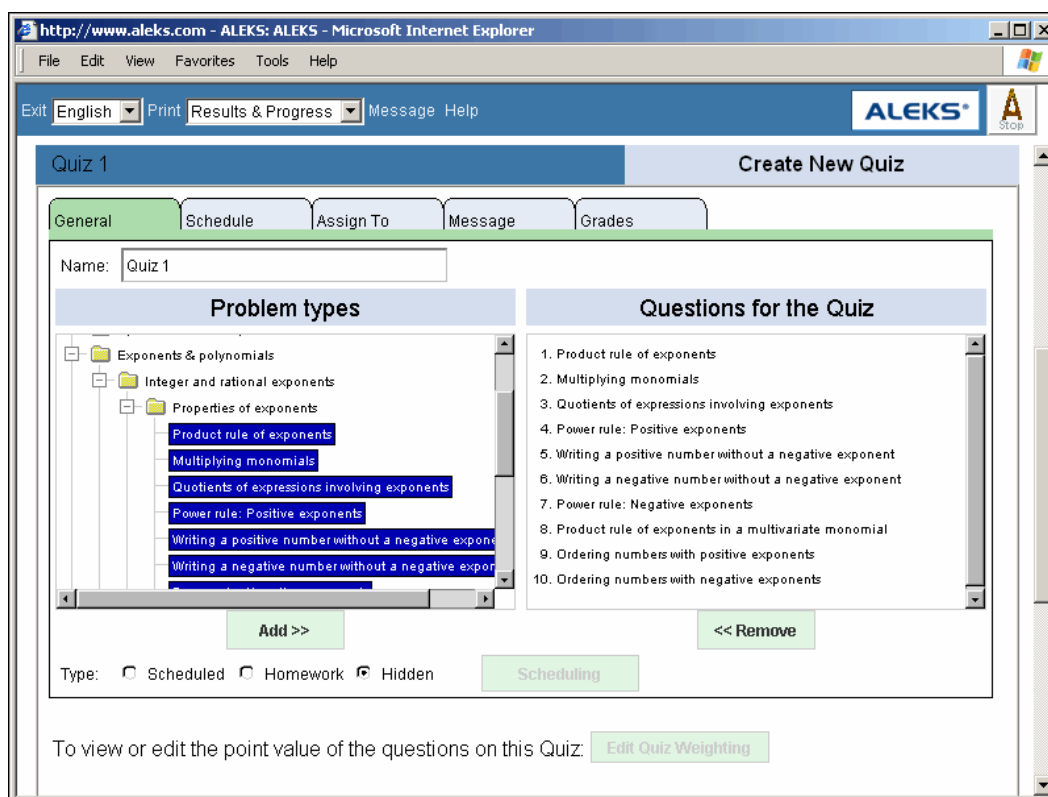


Figure 7.10: Creating a Quiz (Advanced Instructor Module)

quiz (then click “OK” to view the quiz results). To see detailed results for any particular student on that quiz, click on the date of the quiz opposite the student’s name. It will also be possible to see the individual questions and the answers that the student submitted for them. To see all quiz results for a particular student, click that student’s name in the main display. This list can be resorted on any of the headings by clicking on that heading. Links at the top of the page enable you to see a breakdown of quiz results by question and to assign a grading scale for the quiz.

The Quiz feature in ALEKS allows instructors to create quizzes for their students using any topics in the ALEKS domain. These quizzes are administered through ALEKS and scored automatically, with optional use of a grading scale set by the instructor. Quizzes may be scheduled for particular days and times (“Scheduled”), or they may be made available for the students in a course to take when they are ready (“Homework”). The results of quizzes can be seen through the reporting features of ALEKS, but do not influence the students’ knowledge states or their guided learning in ALEKS.

Create New Quiz. To create a new quiz, click on the button to lower right, “Create New Quiz.” If you have not chosen a textbook for integration with your course, you have the opportunity to do this before creating the quiz. Textbook integration makes it easy to base quizzes on textbook chapters. On the page that follows, you will see various options for the quiz. Enter a name for the quiz in the box to upper left, or leave the name provided (“Quiz 1”, etc.). Next, select from the list of topics in the left-hand window either by dragging topics into the right-hand window, or by highlighting topics and clicking “Add.” Click “Save” to create the quiz. To set the availability of the quiz, use the radio buttons at the bottom of the page and the “Scheduling” button. When the quiz is properly configured, click “Save.”

Other buttons enable you to create a different quiz (“Create New Quiz”) or delete this one (“Delete Quiz”). There are links at the bottom to edit any existing quiz. Also, a new quiz can be created by duplicating an existing quiz (“Copy Quiz”).

The tabs at the top can be used to schedule, send a message to announce the quiz, or set a grading scale.

- The **Schedule** tab generally features an interactive calendar for scheduling quizzes. For “Scheduled” quizzes, this is the date (and time) when students are put into the quiz by ALEKS; for “Homework” quizzes, it is the date on which the quiz is due (at midnight of the date indicated).
- The **Assign To** tab allows the instructor to assign any quiz to particular students in the course (including a single student, or no students). By default, any quiz is assigned to all students in the course.
- The **Message** tab allows the instructor to customize the simple message normally sent to students announcing a quiz, or to cancel the message. By default, a message is sent to all students indicating that a quiz has been scheduled (for “Scheduled” quizzes) or posted (for “Homework” quizzes).
- The **Grades** tab allows the instructor to set a grading scale for the quiz. By default, the grading scale is “Disabled,” meaning that neither instructor nor students see any grades. If it is set to “Private,” only the instructor sees the grades for all students. If it is set to “Public,” the instructor sees the grades for all students, and each student sees their own grade.

NOTE. Often it is necessary to provide a “makeup” quiz to some students. This can easily be done by copying the original quiz, then editing it so that it is assigned only to the students needing the makeup.

Tips. Double-click on the name of any topic to see a sample problem. Topics can be selected in continuous groups using the Shift key or discontinuous groups using Ctrl; the entire folder is selected by using Ctrl-a.

Grading with quizzes. The grading scale used with quizzes is like the one used for assessments (See Sec. 7.10). As with assessments, grading is not obligatory; if no grading

scale is set, the students and the instructor will only see the percentage of questions answered correctly.

Availability of quizzes to students. By default, quizzes are made available to students as “Homework Quizzes.” This means that the student is not forced into the quiz by ALEKS; rather, the student clicks the “Quiz” button when they are ready to take the quiz (See Sec. 5.2.9). If this option is chosen, the instructor must indicate a due date for the quiz, after which the quiz will no longer be available to students (Homework Quizzes are always due on midnight of the due date specified). A message can also be sent to students informing them that the quiz has been assigned.

Quizzes may also be “hidden,” meaning that the students do not have any access to them (pending the instructor’s decision to “release” the quiz), or they may be scheduled (“Scheduled Quiz”). A graphic calendar is provided for easy scheduling of quizzes. If the quiz is scheduled, the instructor will have options for specifying the time of day it is to begin, the time limit on the quiz, whether students are notified, how many days the quiz should be in effect (“Window of time to take the quiz”), whether the quiz is restricted to the college, and prevention of automatic assessments up to five days before the quiz is scheduled.

Edit Quiz. To edit an existing quiz, click on the button to the lower right, “Edit Quiz.” The quiz may be modified using the features described above for the creation of quizzes, or it may be deleted.

Downloading. Information from the Quiz page can be downloaded in two formats. “Spreadsheet Format” is comma-separated values (CSV), which can be imported into a variety of applications but is raw in appearance. “Excel Format” is in Microsoft Excel format, and has a legible, professional appearance, suitable for printing.

Makeup Quizzes. The easiest way to create makeup quizzes is to duplicate the quiz needing to be made up, then give it a new due date and “assign” the quiz to only those students needing to make it up. When doing this, either turn off the Message notification or make sure that the quiz has been assigned to the necessary students **before** clicking the “Save” button. Attention to this detail will spare your other students from an unintended notification of the new quiz!

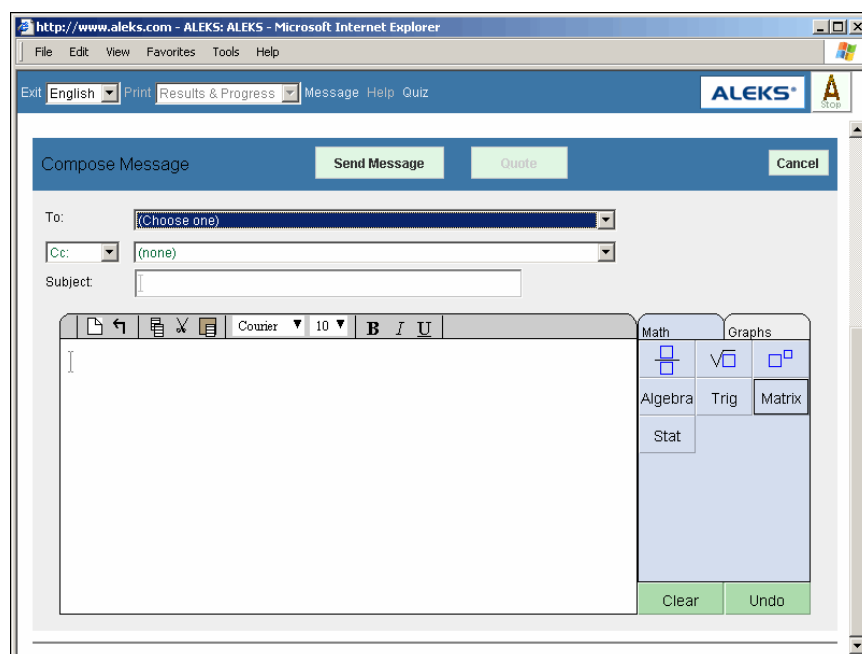


Figure 7.11: Send Message (Advanced Instructor Module)

7.12 Send Message



Select the student or course to whom you wish to send a message, and click on the “Compose Message” button. A full-featured editor will appear beneath the directories window with fields for a subject and a message and a “Send Message” button (Fig. 7.11). The student or students to whom the message is being sent will see it at their next login (See Sec. 5.2.10). It is also possible to send messages directly to ALEKS Corporation.

ALEKS Message Center. The ALEKS Message Center resembles an email program in most of its features, although the exchange of messages takes place within the ALEKS system. Also, the Message Center is equipped with special symbols and tools appropriate to communication about the subject-matter used in ALEKS. Optionally, you can have copies of your students’ messages sent to your email account as well (See Sec. 7.15).

Mathematical Expressions. The ALEKS Message Center contains a full range of tools for using mathematical symbolism, constructions, and expressions in your messages. The tools are like those used by ALEKS itself in the Answer Editor (See Sec. 4.5). Moreover, students sending you messages in the Message Center can attach a graphic representation of the problem they are currently working on, to facilitate posing and answering mathematical questions.

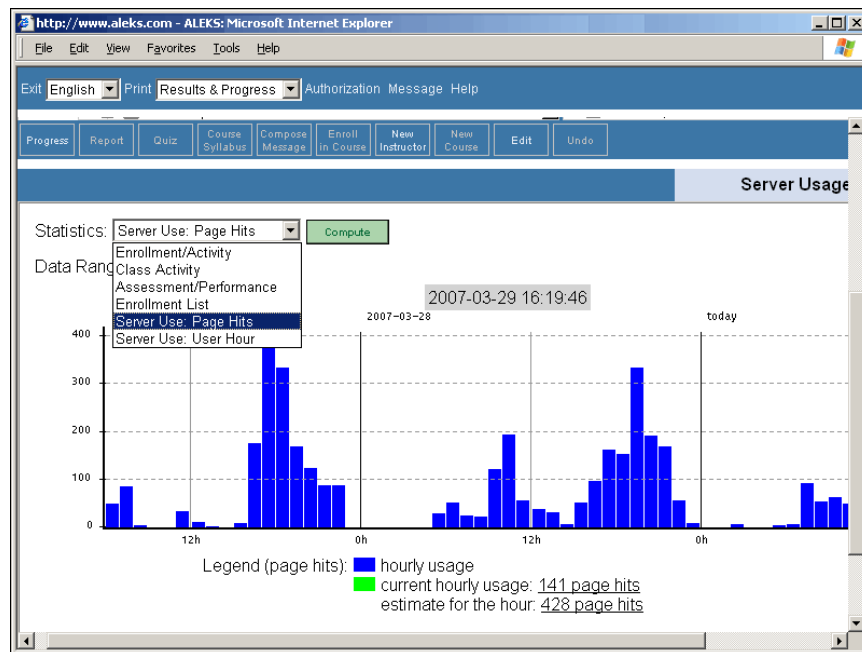


Figure 7.12: Server Statistics (Advanced Instructor Module)

Grouping. It is possible to create arbitrary groups within the course and send messages to these groups. Simply select the names of the students in the Selector: hold Shift to select a continuous range, or Ctrl to select a discontinuous group. Then click the “Compose Message” button.

7.13 Check Messages

Msg Click on the “Message” button at the top of the Instructor Module window. You can receive messages from students in a course only if this has been enabled in the instructor account (See Sec. 7.15.).

7.14 Check Server Usage

Server Stats Click on the “Server Stats” button. A table will appear beneath the directories window (Fig. 7.12). The type of information shown in the table can be changed by selecting a heading from the menu at the top of the table and clicking the “Compute” button. The options for display are: Enrollment/Activity, Assessment/Performance, Enrollment List, Server Use: Page Hits, Server Use: User Hours.

Figure 7.13: Instructor Account (Advanced Instructor Module)

NOTE. The information provided by this feature is of interest to system administrators, instructors, and educational administrators seeking general statistical information on the use of ALEKS.

7.15 Create Instructor Account



Select the directory for the college where you wish to create an instructor account (or the directory “All instructors”) and click on the “New Instructor” button. A form for the new account will appear beneath the directories window (Fig. 7.13). Supply the instructor’s first and last names, a title (“Mr.,” “Mrs.,” “Ms.,” etc.), a Login Name, and a Password. By default, the new account is set for an instructor. If you are an administrator, you can make another administrator account by checking “Instructor and Administrator.” The “id” field is optional and may be left blank. “Message from student” should be enabled if you wish the account holder to receive messages from students (See Sec. 7.13). “Status” must be enabled if the instructor is to have courses assigned (if “Status” is enabled, you will see here how many courses are assigned to the instructor).

When you are finished filling in the form click on “Save.” This creates the account. To start over, click “Reset.” To cancel the account, click “Delete File.”

Other settings may be changed for the instructor by using the additional tabs “Mail” and “Advanced.”

Mail

This tab contains options for entering an email address, forwarding ALEKS messages to this address, and permitting students to send the instructor messages through ALEKS (See Sec. 7.13).

Advanced

This tab contains a button for “Cleanup Tools.” These tools permit the instructor to unenroll and delete students and to modify database records in other ways.

NOTE. Deleting a student removes that student’s records permanently from the ALEKS system.

NOTE. Under the “Cleanup Tools,” “Records” refers to information in the database concerning student knowledge as shown on assessments and in the Learning Mode. Clear Records will remove all such information. “Stats” refers to information in the database concerning the hours students have spent in ALEKS. Clear Stats will remove all such information.

7.16 Edit Instructor Account



Select the instructor whose account you wish to edit and click the “Edit” button. The same form will appear as described in “Create Instructor Account” (Fig. 7.13). The account may be deleted (“Delete File”) only if there are no courses and no students enrolled for this instructor (“Advanced”).

The screenshot shows a web browser window at <http://www.aleks.com>. The page title is "ALEKS: ALEKS - Microsoft Internet Explorer". The browser's menu bar includes File, Edit, View, Favorites, Tools, and Help. The page has a navigation bar with "Exit", "English", "Print", "Results & Progress", "Message", "Help", and "Quiz". The main content area is titled "Beginning Algebra / Math 103 (Dr. Clark)" and "Course File Course Code: N/A". Below this are tabs for "General", "Status", "Assessment", "Learning", "Content", and "Advanced". The "General" tab is active, showing a form with the following fields: "Name:" with the value "Math 103", "Instructor:" with a dropdown menu showing "Dr. Clark", "Category:" with a dropdown menu showing "Beginning Algebra", and "ID (optional):" with an empty text box. Below the form is a note: "To login to ALEKS, your students will need the ALEKS plug-in 3.4.7 or later (the ALEKS plug-in 3.4.7 was released on 06/23/2006)." At the bottom of the form are four buttons: "Save", "Reset", "Duplicate File", and "Delete File".

Figure 7.14: Course Account (Advanced Instructor Module)

7.17 Create Course Account



Select the instructor for whom you wish to create a course and click on the “New Course” button. A form for the new account will appear beneath the directories window (Fig. 7.14). Provide a name (e.g., “Aleks”) and choose a category. At this point, you have the option of choosing an instructor other than the one initially selected (if others are available). This will transfer the course to that instructor. The “id” field is optional and ordinarily left blank.

The Course Code for the newly-created Course appears in the upper right-hand corner of the screen.

When you are finished filling in the form click on “Save.” This creates the account. To start over, click “Reset.” To cancel the account, click “Delete File.”

Other settings may be changed for the course by using the additional tabs “Status,” “Assessment,” “Learning,” “Content,”

Status

Under “Status” you can close the course for enrollment (by default it is open) and restrict students’ access to their account (“assessment only” or “denied”—no access). Also, you can request to be notified by ALEKS (through the Message Center) when any student in the course assesses at 100% of your syllabus.

Assessment

The students' assessments can be restricted so that either the initial assessment, or subsequent assessments, or both, can be taken only from the college. For this setting to be effective, a valid domain name must be entered in the college account. Instructors wishing to constrain assessments in this way should contact ALEKS Corporation for assistance in determining the domain addresses used by their college.

Learning

If the "Ask a friend" option is checked, students in the course will be able to request the name of a classmate for help with a topic that is causing difficulty. "Novice" means the system will choose a classmate who has mastered the concept very recently. "Expert" means that the system will choose a classmate who mastered the concept earlier than others in the group. The instructor may pick any point on the continuum between "novice" and "expert."

This tab also contains options for the use of the ALEKS Worksheet (See Sec. 5.6). The instructor may enable or disable the worksheet, choose between 16 review questions or 12 review plus 4 extra credit, remind students to print a worksheet when exiting ALEKS, and have answer sheets sent through the Message Center each time a student downloads a new worksheet. The instructor can also choose to make the answers to the worksheets directly available to students on their Worksheet page.

Other options here concern the availability of the calculator and of the "Time to Completion" data to students on their Report page (See Secs. 5.2.4, 7.5, 7.7).

Content

Clicking the "Content" tab gives access to the ALEKS Content Editor (See Sec. 7.24). This feature lets the instructor quickly and easily modify the content for a course. If the instructor clicks in the checkbox for any content area, that content area is removed from the curriculum of the course; it will also not appear in assessments. To see exactly which items are contained in this content area, click on the title of the content area.

Content

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Advanced

Under "Advanced" it is possible to find a range of course management features. "Cleanup Tools" permit the instructor to unenroll and delete students and to modify database records in other ways. The "Course Syllabus" button is equivalent to the "Select Course Syllabus" button (See Sec. 7.20). "Assign Learning Rates"

opens the Learning Rates feature (See Sec. 7.25). “Edit Int. Objectives” gives access to the Intermediate Objectives feature (See Sec. 7.23). “Schedule Assessment” permits the instructor to schedule an assessment for the course (See Sec. 7.10.).

NOTE. Under the “Cleanup Tools,” “Records” refers to information in the database concerning student knowledge as shown on assessments and in the Learning Mode. Clear Records will remove all such information. “Stats” refers to information in the database concerning the hours students have spent in ALEKS. Clear Stats will remove all such information.

7.18 Edit Course Account



Select the course you wish to edit and click on the “Edit” button. The same form will appear as described in “Create Course Account” (Fig. 7.14). The account may be deleted (“Delete File”) only if there are no students currently enrolled in the course (“Unenroll Students”).

The Course Code for the Course being edited appears in the upper right-hand corner of the screen.

7.19 Select Course Syllabus



Select the course for which you wish to choose the course syllabus and click on the “Select Course Syllabus” button. A form will appear beneath the directories window containing menus for all syllabi needed for the given course (Fig. 7.16). When you are finished filling in the form click on “Save.” To start over or restore defaults, click on “Reset.”

NOTE. The “course syllabus” is a set of topics or items used as a goal for mastery by the students in a given course (See Chapter 8.). In college courses one syllabus is usually set for the course. “Standards” are collections of syllabi covering a range of levels. ALEKS always contains ready-made standards set to appropriate defaults. Thus, in most cases the college instructor need not select the course syllabus.

7.20 Textbook Integration



Select the course for which you wish to choose the course syllabus and click on the “Select Course Syllabus” button. (This feature can also be used in the Basic Instructor Module; see Sec. 6.2.3 You will be shown a menu of textbooks available

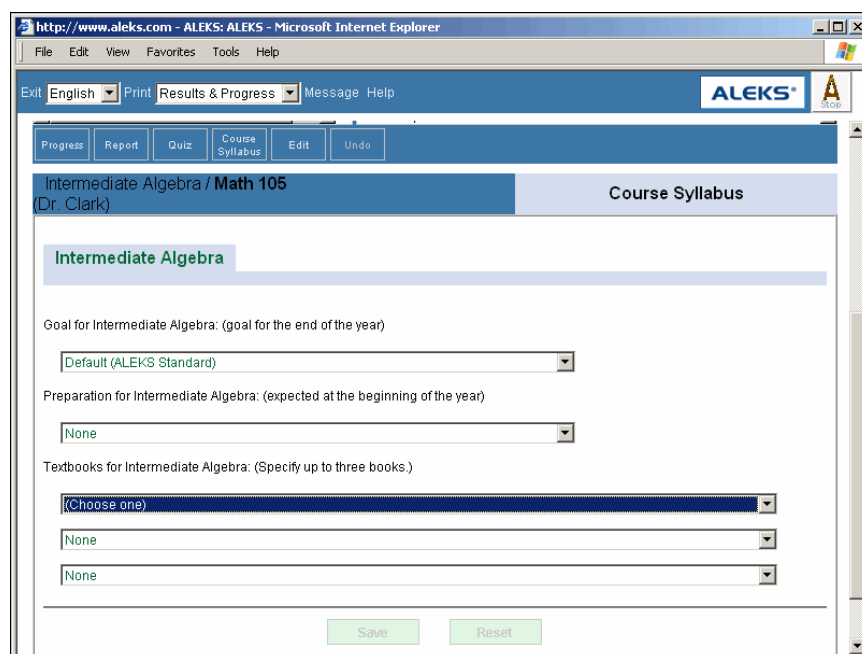


Figure 7.15: Course Syllabus (Advanced Instructor Module)

for integration with this course. If you wish to organize the content of your course on the basis of an available textbook, select the name of the textbook and click “Next.” (There is also a checkbox which you can uncheck if you wish to have the precise textbook coverage and textbook references, but not full integration.)

The page that follows contains a list of chapters in the textbook with menus for assigning dates to each of them. For each chapter, assign the date on which you require your students to complete that material. If the date is left blank, no date will be assigned for that material; this does not mean it will be skipped, but rather that it will be included in the material for the next chapter to which a completion date is assigned. When you are done assigning dates, click “Save,” and the dates chosen will go into effect. They can be modified at any time.

The textbook integration feature in ALEKS presets both syllabus and intermediate objectives for the course. During the time that the students are supposed to be completing a particular chapter, they will see dotted lines on their pie charts showing how far they need to fill in, and the date by which they need to do it; if they complete the chapter there will be a congratulatory message and they will be moved to the next chapter. The instructor will also see which students in the course have completed the current chapter (See Sec. 7.23).

If a student does not complete the chapter by the completion date, there will be no congratulatory message, and the dotted lines on that student’s pie chart will move out to their new positions. The student will still have to complete any prerequisite material

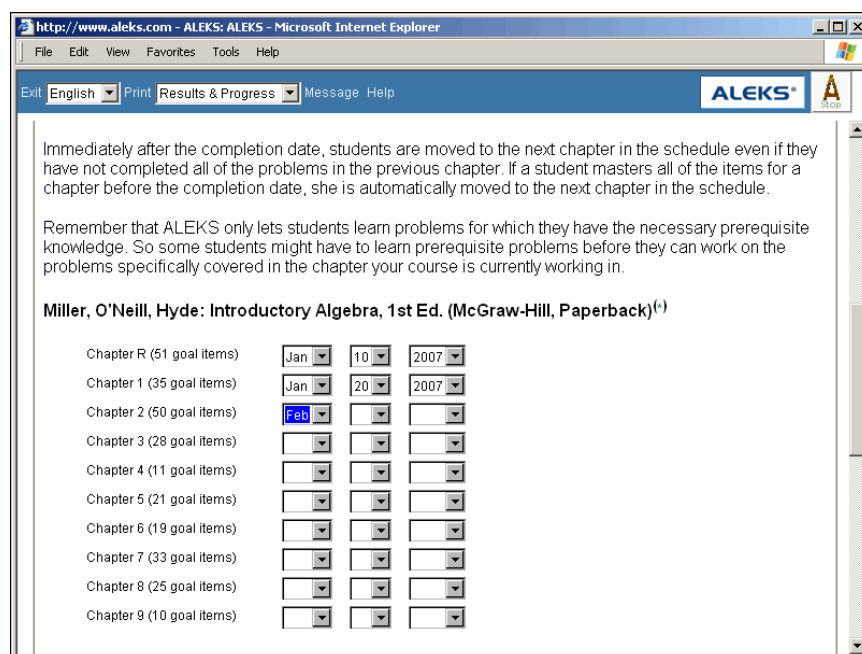


Figure 7.16: Textbook Integration (Advanced Instructor Module)

from unfinished chapters while working on the current one.

Another effect of textbook integration is that references will appear on the ALEKS Explain pages, indicating the specific place in the textbook where the current concept is covered (See Sec. 5.3.2).

When textbook integration is in effect, the quiz feature in ALEKS is also customized so that quizzes can easily be created on the basis of textbook chapters (See Sec. 7.11).

If you do not wish to use full integration of an available textbook with this course, click the button “No Integration.” You will then have a choice of syllabi for the course. You may also have the option of choosing a textbook to be used with ALEKS (this will generate textbook references on the Explain page, but will not provide full textbook integration). When you are finished filling in the form click on “Save.” To start over or restore defaults, click on “Reset.”

NOTE. The “course syllabus” is a set of topics or items used as a goal for mastery by the students in a given course (See Chapter 8.). In college courses one syllabus is usually set for the course. “Standards” are collections of syllabi covering a range of levels. ALEKS always contains ready-made standards set to appropriate defaults. Thus, in most cases the college instructor need not select the course syllabus.

7.21 Enroll and Unenroll Students



Select the course for which you wish to enroll or unenroll students and click on “Enroll in Course.” A display will appear beneath the directories window showing the names of all students who may be enrolled. The students currently enrolled in this course appear with their names highlighted in gray; those enrolled in some other course are highlighted in yellow. The names of students can be highlighted (enrolled) or dehighlighted (unenrolled) by clicking on them. When all desired changes have been made, click on the “Save” button.

Drag and drop. Students may be moved between courses more easily by dragging and dropping their names. Simply select the names of students to be moved in the right-hand side of the directories window and drag them to the target folder on the left. The entire course can be selected by using Ctrl-A; a continuous range by holding Shift and clicking; or a discontinuous group by holding Ctrl and clicking. You will see the target folder become highlighted when the student or students are ready to “drop.”

The screenshot shows a web browser window with the URL <http://www.aleks.com>. The page title is "ALEKS: ALEKS - Microsoft Internet Explorer". The browser's menu bar includes File, Edit, View, Favorites, Tools, and Help. The page content includes a navigation bar with "Exit: English", "Print", "Results & Progress", and "Message Help". The main content area is titled "Student File" and displays information for a student named "Bolzano, Nicole".

Key information displayed includes:

- Last login: 02/06/2007
- From host: mypc.mycollege.edu
- General tab selected
- First: Nicole, Initial: [empty], Last: Bolzano
- Login Name: NBOLZANO2
- Password: [masked with asterisks] (use this to change a forgotten password)
- ID (optional): [empty], Email: [empty]
- Status: Enabled Disabled
- Enrollment: Beginning Algebra / Math 103 (Dr. Clark)
- Account: started on: 01/06/2007

Figure 7.17: Student Account (Advanced Instructor Module)

7.22 Edit Student Account



To edit a student account, select the name of the student and click on the “Edit” button. A form will appear beneath the directories window containing the student’s account information: name, login name, id, email, and current enrollment status (Fig. 7.17). The student’s Password is not shown in a readable form, but it can be changed to provide a student with a new Password when one has been forgotten. Corrections or changes may also be made to the student’s name, login name, id, and email. The student’s id and email are optional, though it may be useful to have these on record.

Advanced. Under “Advanced,” “Cleanup Tools” permit the instructor to unenroll and delete the student and to modify database records in other ways. “Records” refers to information in the database concerning student knowledge as shown on assessments and in the Learning Mode. Clear Records will remove all such information. “Stats” refers to information in the database concerning the hours the student has spent in ALEKS. Clear Stats will remove all such information.

Account Information. The begin and expiration dates of the student’s current account are also shown on this page. Similar information is available to the student on the Options page (See Sec. 5.2.2).

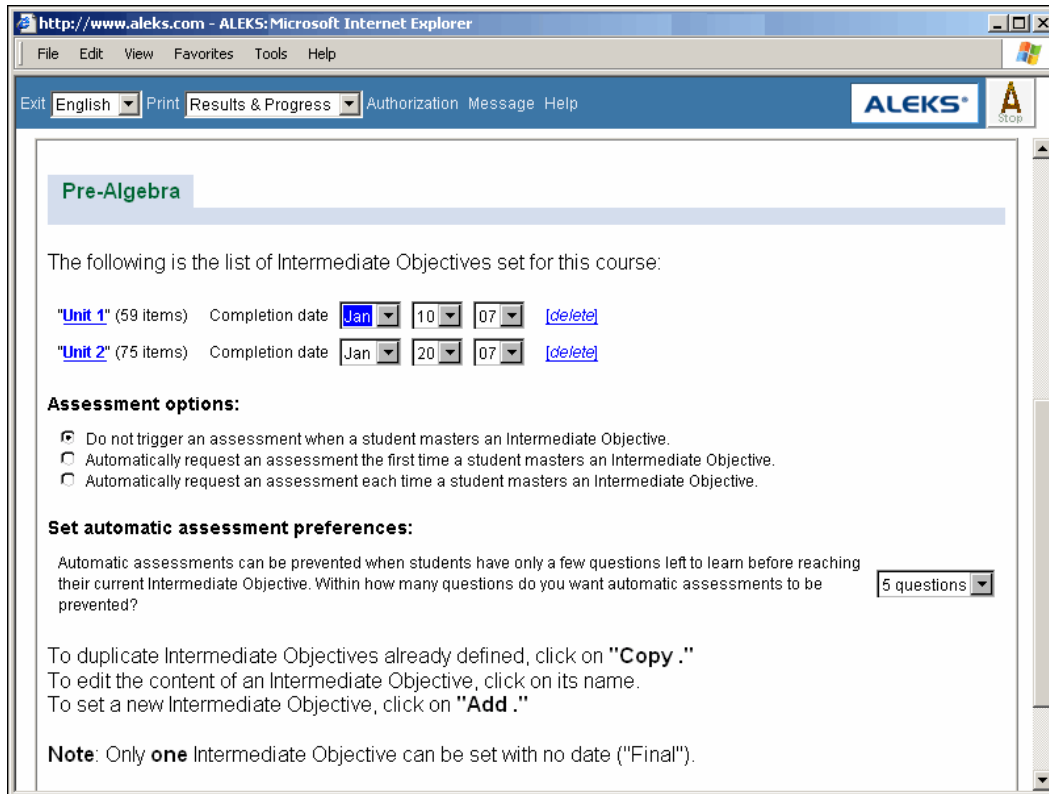


Figure 7.18: Intermediate Objectives List (Advanced Instructor Module)

7.23 Intermediate Objectives

The Intermediate Objectives feature was created to address the needs of instructors using ALEKS in conjunction with a planned sequence of topics for classroom instruction (Fig. 7.19). It enables instructors to prioritize certain groups of topics for specified segments of time, when these topics will be at the focus of class discussion. When intermediate objectives have been set, students will be directed to work on these objectives as soon as they are available in the domain and guided through their prerequisites in the most direct way possible. Both students and instructor will receive clear information on current progress toward completion of scheduled objectives.

To create or edit intermediate objectives, select the name of the course for which you would like to set or modify objectives and click "Edit." On the Edit page, click the tab marked "Advanced." On the page that follows, click "Edit Int. Objectives."

The page that follows shows you a list of any intermediate objectives currently set for your course (or a note that none is currently set) and buttons for adding and copying intermediate objectives (Fig. 7.18). The dates for existing intermediate objectives can be changed by using menus in the list and clicking "Update." If you wish to copy one or more intermediate objectives that have been set for another course or section,

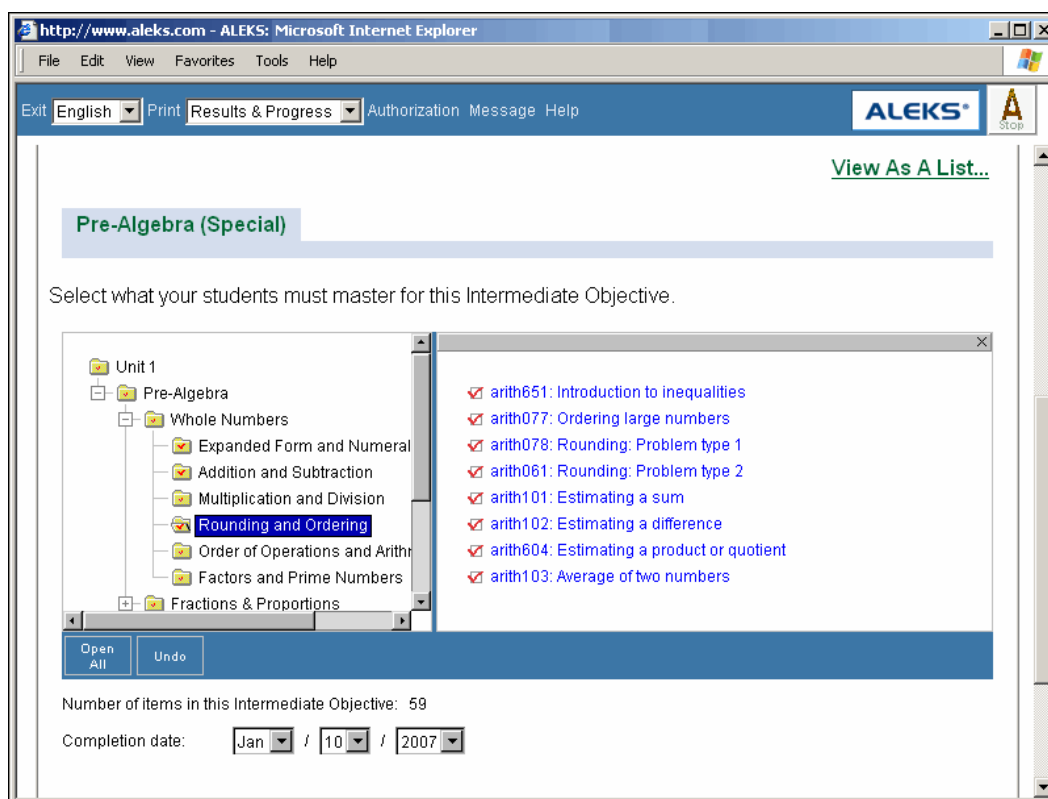


Figure 7.19: Intermediate Objectives (Advanced Instructor Module)

click “Copy Int. Objectives.” Also, you can choose to prevent automatic assessments for students in this course for up to five items before fulfillment of your intermediate objectives. To create a new set of intermediate objectives, click “Add Int. Objectives.” To edit an existing set of intermediate objectives, click on their link in the list.

Here you will see a vertically divided selector window (Fig. 7.19). This window displays the topics available to be selected for the set of intermediate objectives. To view a single, scrolling list of topics, click on “Open All,” then on the tiny “X” in the upper right-hand corner of the window. Select and unselect items for inclusion by clicking on and off the little checkmarks in the boxes that precede them.

NOTE. ALEKS always maintains the coherence of its intermediate objectives; any set of intermediate objectives must contain all of the items within the domain needed to learn the items it contains. If an item being added to the objectives has prerequisite items not currently also belonging to the objectives, these will be automatically added as well; conversely, if an item being removed from the objectives is a prerequisite item for some items presently in the objectives, these will also be removed. The editor warns when this is occurring (See Sec. 8.4.3).

Every set of intermediate objectives is assigned to a particular date, which is the date by which the students are to have completed this set of objectives. The date is set in

a pair of menus directly below the selector window, one for month, one for day. The set of objectives will be in effect through the date to which it is assigned, after which the next set of objectives will take effect. If no date is assigned, the objectives will take effect following the last set of objectives to which a date has been assigned, and remain in effect to the end of the course (“final” objectives).

The name of a set of objectives appears at the top of the list of topics. Click on this name to edit it. When you have picked a name, selected topics, and set a date, click “Save” to enter the objectives into the system for this course.

When a set of objectives is in effect, both instructor and student will receive information about progress toward their fulfillment. The instructor will see notations on the Course Progress page indicating which students have fulfilled the current objectives, and which are close to doing so. The student will see dotted lines on their pie chart showing how far each slice will need to be filled in to achieve the current objectives. The instructor will see the same dotted lines when they view the pie charts for the class and for individual students.

When a student uses MyPie to choose a topic for work in the Learning Mode, the items shown as available are those which the student is “Ready to Learn,” excluding any items which do not lead directly to fulfillment of the current objective. Once the student has completed the intermediate objective, she or he will move immediately into the next objective, whether or not the completion date has passed. If the completion date passes without the student’s completion of that objective, the new intermediate objective will take effect in terms of the student’s guidance, but unfinished prerequisite material from the earlier objective will still have to be completed before moving on.

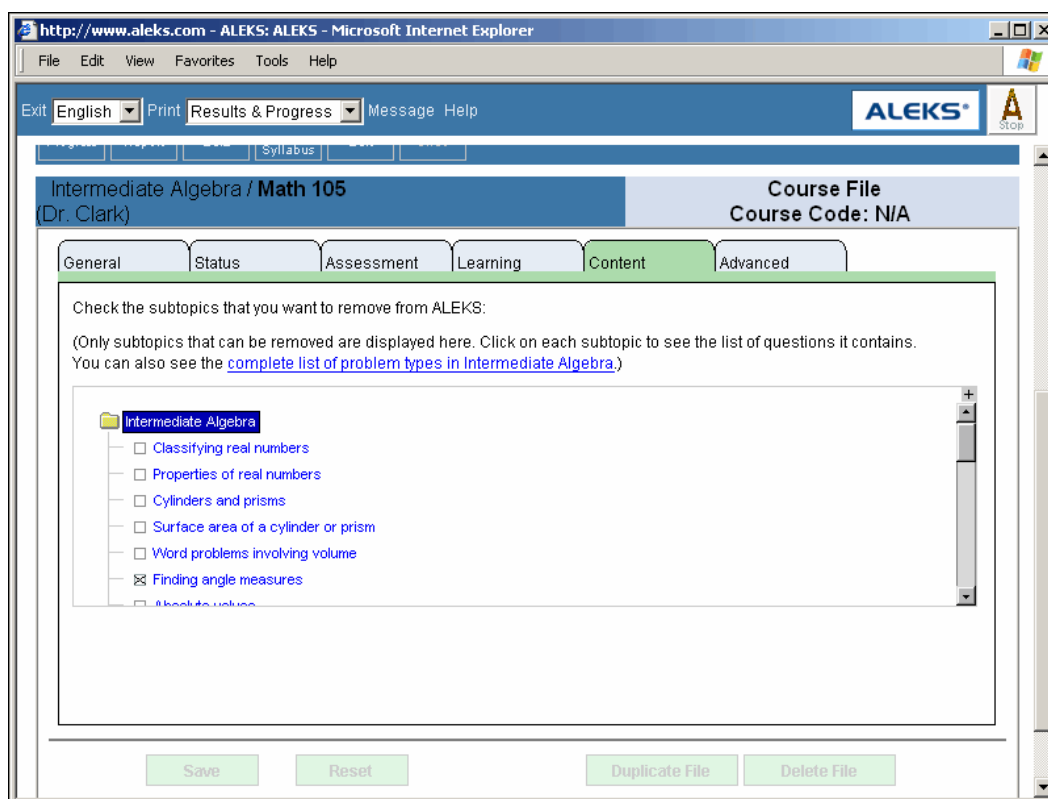


Figure 7.20: Content Editor (Advanced Instructor Module)

7.24 Content Editor

The ALEKS Content Editor is a quick and easy way to modify the content of a course (Fig. 7.20). Select the name of the course and click “Edit,” then click on the tab for “Content.” You will see a list of content areas, each preceded by a checkbox. To see what is contained in any of these areas, click on its title. To **remove** the area from the course, click on the checkbox to place an “x” in the box. This indicates that the area has been **removed** from the course content; it will also not appear in assessments. Then click “Save” to put your changes into effect, or “Reset” to undo them.

NOTE. The Content Editor is far more convenient, though somewhat less powerful, than the Syllabus Editor (See Sec. 8.4). Keep in mind that while a syllabus created or modified by the Syllabus Editor can be used by any number of courses within the college, the Content Editor acts on only one course at a time.

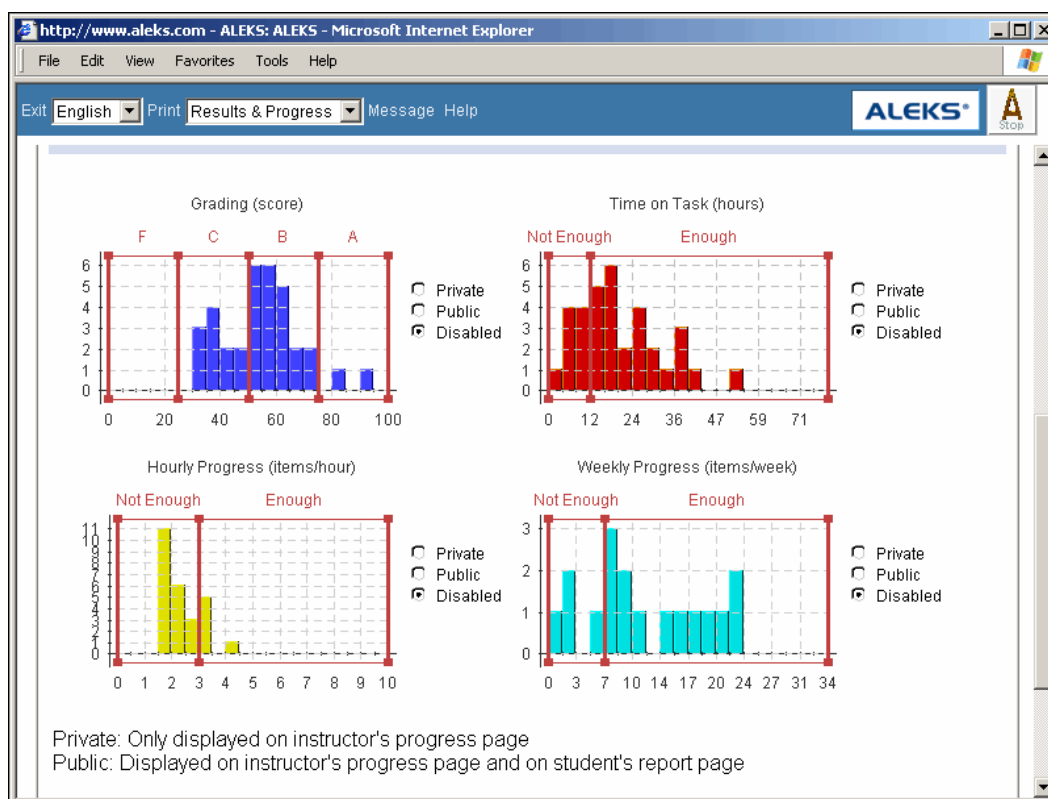


Figure 7.21: Assign Learning Rates (Advanced Instructor Module)

7.25 Assign Learning Rates

The purpose of the Assign Learning Rates feature in ALEKS is to provide instructors with a highly flexible tool for interpreting and evaluating the work of students in ALEKS. One possible use of the information provided by this feature is as a component in the grading system used for a course, or in some other method of motivation or reinforcement for student success.

In the Advanced Instructor Module, select the name of the course for which you wish to assign learning rates and click the “Progress” button. At the top of the Course Progress page you will see a link marked “Assign Learning Rates.” Clicking on this link produces a page with four rectangular graphs (Fig. 7.21). Each of the graphs refers to a particular way of evaluating a student’s work: by the percentage of course objectives that they have mastered (Grading), by the total number of hours spent on ALEKS (Time on Task), by the average number of items gained per hour (Hourly Progress), and by the average number of items gained per week (Weekly Progress). The vertical bars appearing in the graphs indicate the distribution of students relative to the given scales. Any combination of these scales may be used. The three buttons to the right of each graph determine the use of the evaluation: if “Disabled,” no one sees it; if

“Private,” the instructor sees it but the students do not; if “Public,” the instructor sees it and each student sees it for their own work.

Each graph has sliders, with labels referring to the intervals they define. Additional sliders may be placed by dragging the right-hand or left-hand sliders, or sliders may be removed by dragging them off to the right or left. The sliders may be set and the labels edited as the instructor desires. To change the label on a new or existing slider, select the text of the current label, retype as desired, and then press “Return.”

The function of the sliders is as follows: a student’s evaluation on a given scale is the label of the interval within which that student is currently located. For example, if one slider is set to 80 on the “Grading” graph and another slider to 90, with the interval between them labeled “B,” a student who has mastered 82% of the course goals will have the evaluation “B.” To take another example, if a slider under “Time on Task” has been set to 10 hours and another to 20 hours, with the label for their interval set to “Enough,” a student who has spent 11 hours on ALEKS will receive the evaluation “Enough.” When the desired settings have been made, click “Save.” Now the labels set to “Private” will appear in the Progress page.

If any of these charts are set to “Public” the students will see their ratings according to those charts when they log on to ALEKS. Explain carefully to the students what the meaning is of the notations that they will see, and how they relate to the overall goals for the course. Some charts, such as Weekly Progress, may be more useful to the instructor than to the students, as an aid to monitoring students’ work and learning. These should be set to “Private.”

Variable Scale. By default, the segments into which values are divided in the “score” graph are at 5-unit intervals. This can be reset to 2 units for greater precision, using a link in the lower right-hand part of the page.

Chapter 8

Advanced Instructor Module: Standards & Syllabi

By default, the Advanced Instructor Module displays “Results & Progress,” as described in the preceding sections (See Chapter 7). A second mode, “Standards & Syllabi,” can be chosen from the menu at the top of the Advanced Instructor Module window (Fig. 8.1). This mode enables the instructor to explore the system of standards and syllabi currently available in their ALEKS database. Administrators with a sufficiently high level of user privilege may also copy syllabi and standards, and modify them to suit the needs of a college.

At the college level, the goals of courses in mathematics usually correspond to the entire subject matter, so that editing syllabi is seldom necessary.

The “syllabus” is a set of concepts taken from the sum total of concepts defining mastery of a domain (e.g., Basic Math or Algebra) that has been set as the curricular goal for a particular level of study. That is to say, mastery of this set of concepts is equivalent to completion of the curriculum for that level, and all reports generated by the system for students and courses using the syllabus are framed in terms of this syllabus. A “standard” is a collection of syllabi covering a range of levels.

To view a particular standard or syllabus, use the directories window of “Standards & Syllabi.” This will open the folder for a particular level within a particular standard. Normally the syllabus will be organized by topics and subtopics using standard mathematical terminology. There is a list of individual concepts within each of these topics, each of which is either marked with a checkmark, indicating that it belongs to the syllabus, or not so marked. Editing a new standard means adding and removing checkmarks from individual “items” according to some scheme of curricular progress.

NOTE. In some ALEKS products, the syllabus is maintained internally and is not accessible for editing. In such products, modification to the scope of the course can be achieved using the Content Editor (See Sec. 7.24).

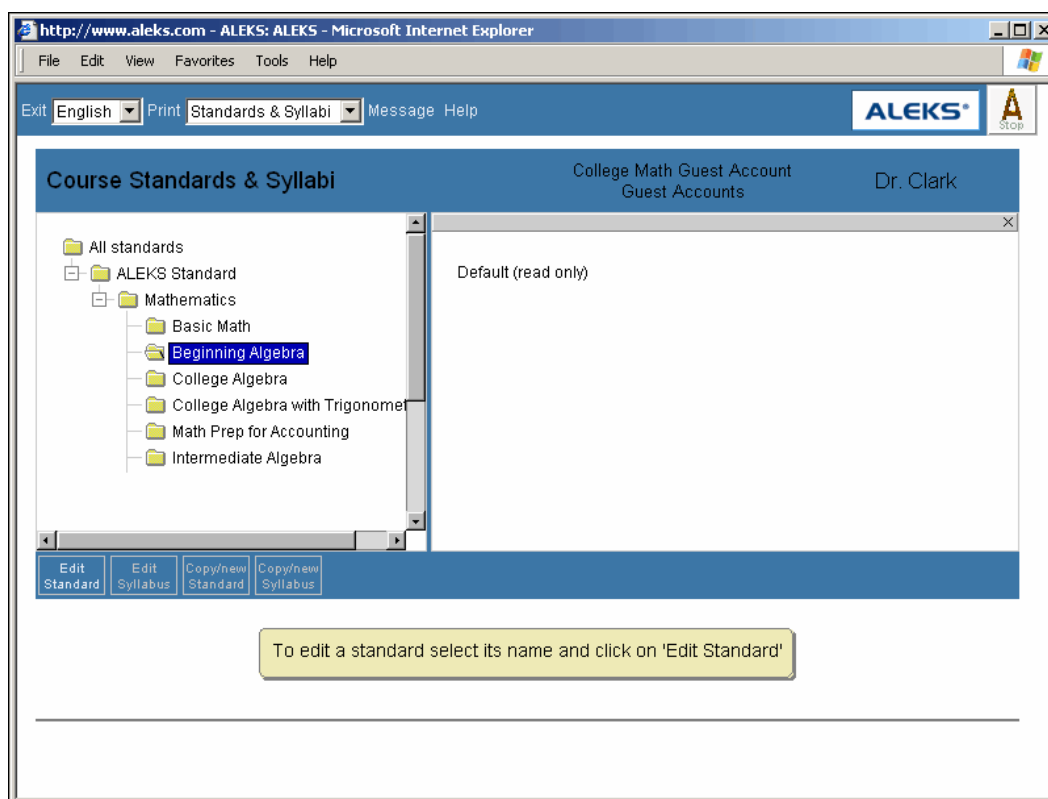


Figure 8.1: The Standards & Syllabi Directory (Advanced Instructor Module)

8.1 Items, Syllabi, and Standards

In order to understand and use this part of the Advanced Instructor Module effectively, it is necessary to grasp three key concepts. Additional information can be found in the discussion of Knowledge Space theory (See Chapter 10).

Item

An item is a fundamental unit of knowledge or ability recognized by the system. An example of an item in Basic Math is “Subtraction of Negative Integers.” An example of an item in Introductory Chemistry is “Distinguishing Chemical and Physical Change.” Every mathematical subject covered by ALEKS (such as Basic Math) corresponds to a set of items, each of which can be tested and taught by the system. Mastery of the subject means mastery of each of the items making up the subject.

Syllabus

A syllabus is a subset of the set of items belonging to a mathematical subject that has been defined as the goal for a particular course. For example, a syllabus for Basic Math is a set of items that students completing the course are expected to

master. All assessment reports by the ALEKS system are based on some syllabus selected by instructors or administrators for use by those students. The ALEKS Syllabus Editor is provided to permit instructors and administrators to customize existing syllabi (See Sec. 8.4).

Standard

A standard is a set of syllabi, usually covering the entire range of levels over which a particular subject is taught. A standard should organize the teaching of a subject in a coherent and methodical way. That is, items belonging to the syllabus for one level should belong to the syllabi for higher levels, and items should be distributed among the syllabi according to some well-founded pedagogical rationale.

Under “Standards & Syllabi,” users of the Advanced Instructor Module can navigate through a hierarchical listing of the standards currently available and the syllabi contained by them. Standards and syllabi can be copied. Users with appropriate levels of privilege can enter the Syllabus Editor to create new syllabi based on existing ones, possibly leading to the creation of new standards.

8.2 Navigation and Use

Access to directories under “Standards & Syllabi” is the same for all levels of user privilege, instructor and above. Any user of the Advanced Instructor Module may navigate through all directories and make copies of all available standards and syllabi. Users, however, may change only those standards and directories which they have themselves created (by copying existing ones), or those created by users within their authority. This means, for a root administrator, any administrator or instructor under their administration; for a college administrator, it means any instructor in the college. A user not within the authority of another given user has independent authority. Standards and syllabi created by a user with independent authority may not be changed. The privilege level of a particular user also determines where the new standards and syllabi created by that user will be placed.

- On choosing “Standards & Syllabi,” the user begins with a master directory entitled “All Standards,” containing a list of all the standards available for that system (Fig. 8.1).
- On opening any of the listed standards, the user is presented with a list of the levels covered by that standard.
- On opening any of the levels listed for the given standard, the user will see a list of the (mathematical) subjects covered for that level. At a minimum, there will be an element entitled “Basic.” Each element in this list corresponds to a syllabus available within the system.

8.3 Buttons

The following buttons appear next to and beneath the navigation display in “Standards & Syllabi” (Fig. 8.1). The buttons are always visible; which buttons are active at any given moment depends on what is selected in the navigation display.



Edit Standard

The selected standard must have been created (copied from another standard) by the current user or by one within the authority of the current user. The basic standards included with ALEKS and syllabi created by users with independent authority cannot be changed, but they can be copied and the copies changed.

A standard is defined by designating its name, source (authority), and an optional id number. The “Enabled” button must be selected if the standard is intended for use.



Edit Syllabus

This will open the selected syllabus for modification in the Syllabus Editor (See Sec. 8.4). The selected syllabus must have been created (copied from another syllabus) by the current user or by one within the authority of the current user. Syllabi belonging to the basic standards included with ALEKS and syllabi created by users with independent authority cannot be changed, but they can be copied and the copies changed.



Copy/New Standard

If a standard is selected, this will make a copy of that standard, usually for the purpose of establishing a new one based on it. If no standard is selected, it creates a new, empty one.



Copy/New Syllabus

If a syllabus is selected, this will make a copy of that syllabus, usually for the purpose of establishing a new one. If no syllabus is selected, it creates a new, empty one. If a new standard has been created, the new syllabus will be placed here.

Drag and drop. The syllabi may be copied between folders by dragging and dropping them. Simply select the names of syllabi to be copied in the right-hand side of the directories window and drag them to the target folder on the left. You will see the target folder become highlighted when the syllabus is ready to “drop.”

8.4 Syllabus Editor

In order to make changes to syllabi that have been copied, users must select the new syllabus and click on the “Edit Syllabus” button (or double-click on the icon for that syllabus). This gives access to the ALEKS Syllabus Editor for that syllabus. Although

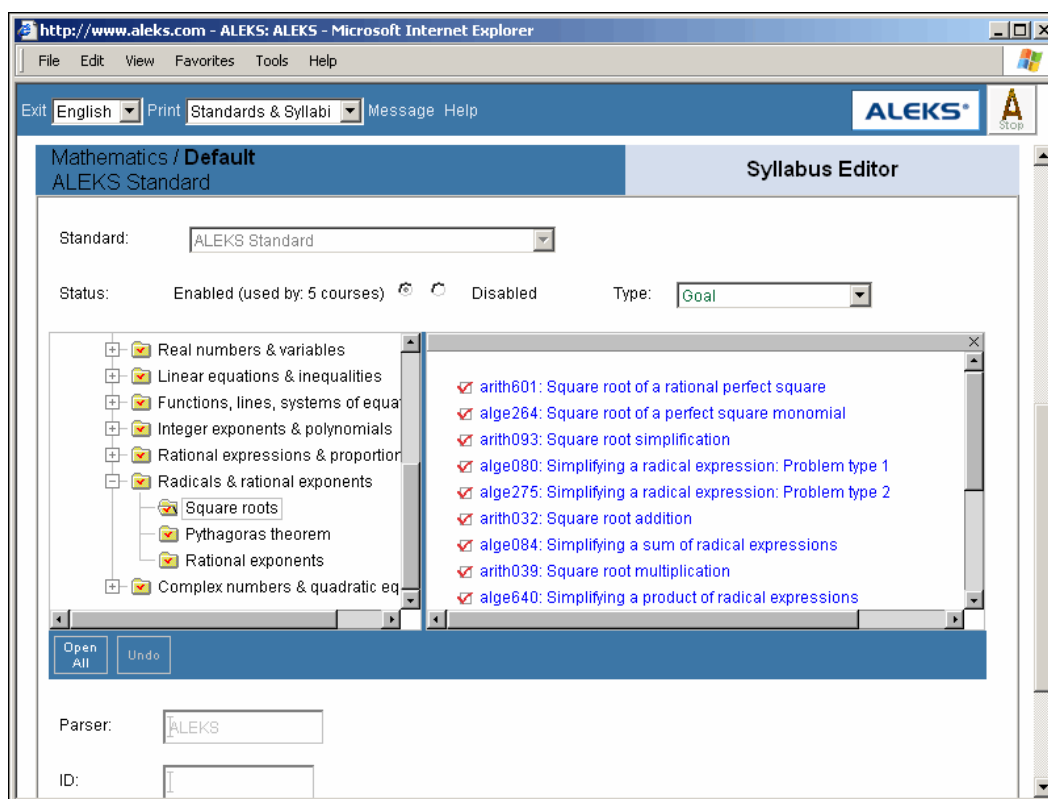


Figure 8.2: The Syllabus Editor (Advanced Instructor Module)

the Syllabus Editor is always entered under the heading “Standards & Syllabi,” it has its own, distinctive interface appearing beneath the “Standards & Syllabi” directory.

The Syllabus Editor displays items for the given subject, organized in folders by general topic. To see items you must open all folders in which they are contained. Items are labeled by name and topic, and indicate whether or not they belong to the current syllabus by a checkmark (Fig. 8.2). If a new syllabus is created by copying another syllabus, precisely the same items are selected in it as in the original. If the syllabus is created from scratch, no items in it are selected.

NOTE. If a folder is marked with a large checkmark, this means that all items in that folder currently belong to the syllabus. A small checkmark means that some of the items in that folder belong to the syllabus. No checkmark means no items in that folder belong to the syllabus.

Clicking on the tiny “x” in the upper right-hand corner of the directory window creates a single window and makes it possible to view all the items at once (click on “Open All”).

8.4.1 Fields

The following fields appear above and below the editor display, and should be filled in as needed in creating or editing a syllabus.

Standard

The standard to which this syllabus belongs.

Status

Should be set to “enabled” if the syllabus is to be available for use.

Parser

The name of the person creating or modifying the syllabus (and so responsible for selection of items). To parse in this sense means to establish functional relationships between all elements of a sequence; the parser is making all items for the subject either members or nonmembers of the syllabus.

id

Optional identification number.

8.4.2 Buttons

The following buttons also appear adjacent to the editor display.

**Open All**

Shows all folders in the editor display. This gives a complete picture of the topical structure of the subject matter.

**Undo**

Undoes the most recent editing action (the addition or removal of an item).

8.4.3 Using the Syllabus Editor

To define a syllabus, the instructor must first ascertain which of the items in the complete list of items making up the subject matter are to belong to this syllabus. This should be a thoughtful decision, usually made within an appropriate institutional framework.

At the college level, the goals of courses in mathematics usually correspond to the entire subject matter, so that editing syllabi is seldom necessary. If a particular source is used for defining a syllabus, the source should be recorded in the standard containing the new syllabus, and should be documented externally as justification for the decision to adopt the given syllabus. If the course is part of a sequence, the syllabi for the other courses in this sequence will normally be defined together with it as part of a single progression.

Once the list of items to be included has been established, the instructor responsible for editing the syllabus examines each of the displayed items. There should be a checkmark before each item to be included, and no checkmark before items that are not to be included. A checkmark is added or removed by clicking once on the checkbox. Following this, click on the “Save” button to record the syllabus.

NOTE. ALEKS always maintains the coherence of its syllabi; any ALEKS syllabus must contain all of the items within the domain needed to learn the items it contains. If an item being added to the syllabus has prerequisite items not belonging to the syllabus, these will be automatically added as well; conversely, if an item being removed from the syllabus is a prerequisite item for some items presently in the syllabus, these will also be removed. The Syllabus Editor warns when this is occurring.

Chapter 9

Teaching with ALEKS

9.1 The ALEKS Educational Paradigm

ALEKS is based on the realization that students learn math in different ways, at differing speeds. Starting from an accurate assessment of their current knowledge, students in ALEKS are only offered what they have shown themselves ready to learn. They therefore experience less frustration (from material that is too hard for them) and boredom (from material that is too easy for them). Learning is more efficient and more rapid. Students have “ownership” of their learning process, and grow in confidence and independence. If a student forgets what was once learned, ALEKS smoothly and efficiently guides the student through all necessary review and reinforcement. The student will not be “lost.” With time and persistence, every ALEKS student will progress toward mastery; this progress will be clearly visible to both student and instructor.

It is normal for students to be in disparate knowledge states; this would be the case in any event, but ALEKS puts this information clearly at the instructor’s disposal. The relative mastery attained by students appears clearly from the “Learning Progress Since Latest Assessment” Report in the Instructor Module. ALEKS does not require the students to progress as a unified group. ALEKS will permit a student to work on any topic in the category “ready to learn,” a well-chosen list of topics which the student has not yet learned, but has demonstrated (within ALEKS) the readiness to begin learning.

Students using ALEKS will experience new independence in learning, to which some may be unaccustomed. Many will find this difference exhilarating. Instructors also may find different opportunities for optimizing their role in the learning process, with a greatly expanded ability to accurately monitor and effectively promote their students’ learning. The role of the instructor is critical in providing structure, support, and reward for the students’ effective use of ALEKS. If ALEKS is used properly, the instructor’s scope for individual coaching and small-group instruction will be greatly expanded, as will the freedom to teach a broader and richer math culture (to some or all students,

time permitting).

In other words, ALEKS turns the instructor from a footsoldier in the trenches into a field commander, possessed of powerful resources, surveying a broad landscape of information, able to make effective strategic decisions. The point is that ALEKS puts the instructor in command; among other things, the instructor can take more or less of ALEKS, give it a greater or lesser position among other course requirements and activities. Various styles of use are possible. The following should be understood as mere suggestions, designed to give instructors a sense of the possibilities offered by ALEKS's substantial library of tools.

9.2 The Instructor and ALEKS

Not every way of using ALEKS involves supervised classroom sessions. When this is sensible, however, it provides a new dimension to the students' learning.

The instructor in an ALEKS course need not be collecting, correcting, or distributing papers, struggling with discipline issues, organizing groups, managing materials, giving instructions, or supervising activities. The instructor in an ALEKS course may be just as busy teaching mathematics/statistics to individual learners: getting one student started on a new topic, checking another student's work, responding to questions, suggesting alternate methods and explanations, making or reinforcing connections among concepts, congratulating those who "add an item to their pie." ALEKS provides comprehensive support to the student in every phase of its use; yet the instructor will find that the additional direct support given this way is unexpectedly welcome and productive. Suddenly the relation of teacher and student is based on knowledge and discovery, not management and sanction. No one is "behind" in ALEKS; setbacks are readily addressed and overcome; every student can expect to make progress and be recognized.

It is important, especially in the early stages of an ALEKS course, that the instructor be generous in recognizing student progress. Students need to understand that when they add an item to their pie, or show progress in a new assessment, it is an achievement, and the proper use of ALEKS. Soon this will become second nature and learning will be its own motivation. At the same time, formal rewards for the effective use of ALEKS need to be built into the course structure and made clear from the outset (See Sec. 9.3.).

Students will be assessed at the beginning of their use of ALEKS (following Registration and the Tutorial), and at regular intervals thereafter. The instructor does not need to supervise all ALEKS assessments; normally, students will be using ALEKS outside as well as in the lab or classroom, and taking assessments at various times and locations. Once the students realize that the purpose of the ALEKS assessment is to provide appropriate material in the Learning Mode, there will be little reason to get help, use the textbook or calculator inappropriately, or in any other way achieve incorrect assessment results.

We recommend that the initial assessment be supervised. The students may need

assistance in their first use of the system, they will need to be reassured that the assessment is not for a grade, and it is important that the results of this initial assessment be valid, so that the students' work in the Learning Mode be productive from the start. For the instructor's own information, other supervised assessments may also be held at regular intervals to provide accurate "snapshots" of overall progress by the course (See Sec. 9.11). We suggest that such supervised assessments be scheduled at the midpoint and end of the course. Also, any assessment results which may be used as a component in the students' grades should, of course, be obtained from assessments performed with the level of supervision required by the educational institution for final exams (See Sec. 9.16).

NOTE. In cases where students do not seem to be making adequate progress in ALEKS, the cause may be found in help that the student received on an unsupervised assessment from a person or inappropriately used calculator, skewing the assessment results and leading to inappropriate material in the Learning Mode.

9.3 Planning the ALEKS Course

In some ways, planning a course in which ALEKS is to be used is simpler than planning other kinds of courses. The instructor may assume complete freedom in planning lectures, lessons, and assignments, while ALEKS ensures that students can progress toward mastery regardless of their level of preparation. It is neither necessary nor helpful for the instructor to attempt to constrain the interactions of the ALEKS system with individual students. To the extent that students will be working independently in ALEKS, the content of lab classes is provided by their work in ALEKS, and need not be planned separately. Instructors wishing to give their students the greatest possible benefit from using ALEKS, however, can use its features to plan focused small-group instruction from week to week (See Sec. 9.5).

At the same time, it is extremely important to make ALEKS an integral part of the course requirements and grading scheme. There is no other single factor which influences the success of students using ALEKS so much as the time that they spend on the system, along with the regularity of their use. This means that the students must be required to spend a suitable amount of time in ALEKS on a weekly basis, say 2-4 hours, that they must be informed of this at the very beginning of the course, and that the instructor must monitor their fulfillment of this obligation. Moreover, the amount of time required must be carefully determined to be reasonable, and in balance with other requirements for the course. The instructor should not simply include an ALEKS requirement without reducing in corresponding measure the other requirements that the students would have had to fulfill without ALEKS. For example, the quantity of homework problems may be reduced, as the students will be solving problems in their ALEKS sessions. In a sense, the ALEKS requirement is stricter than others, since the instructor knows exactly what time the students have spent, and the students will naturally be sensitive to this. With time, students will realize the benefit that they receive from ALEKS, and its effect on

their overall grades. At first, however, it will be simply another requirement, one whose communication requires particular thoughtfulness on the instructor's part.

Obviously these are only suggestions, and experienced instructors may well choose approaches that will be more effective with their own students. The underlying idea is that there must be clear, formal support for the use of ALEKS, however that support is best implemented in a particular setting.

Many instructors have found that in order for the ALEKS requirement to be meaningful, it may beneficially be made part of the grading system or system of rewards for the course. The simplest approach is to provide a certain number of points toward the final grade for each week that the student fulfills their required hours. It is advisable to reward each week, so that the student does not fall into the expectation that all of the required hours can be done at the end; consistency should be rewarded, along with total hours. If a student falls short of the specified hours during a particular week, that week is not rewarded, but neither is the "deficit" carried forward; the next week begins with a clean slate (the primary concern is regular use of the system; for this reason a surplus is also not carried forward). Proportional rewards are also possible; each hour spent has a point value, up to the required minimum.

In order to effectively monitor the students' use, the instructor should check the hours on the "Learning progress since latest assessment" page (under "Reporting"). This page can be printed out every week for record-keeping. In very rare cases, students will try to fool ALEKS by logging on to their accounts and doing something else; this can be detected by noticing that the number of items gained per hour is far too low (or null). ALEKS will log the student off if there is no activity after a certain amount of time. Instructors can obtain a precise record of a student's actual work in ALEKS by viewing the student's Report ("Reporting"/"Report for a single student in this course (pie chart)"), under "Learning Log."

The students' achievement in ALEKS (as opposed to their use of the system) may also be used as a component in their final grade. For information on how to do this please see Sec. 9.16.

9.4 Preparing Your Students

The following considerations may be useful in preparing your students to begin to use ALEKS.

Computer Skills

Some students who have had little experience with computers may need assistance with the use of the mouse and, in particular, with "scrolling" the window of a web browser. We recommend that you demonstrate these skills to the students before beginning their use of ALEKS. If possible, additional staff should be on hand for the first session to assist the students as necessary.

Difficulty of Assessment Questions

The ALEKS assessment is always comprehensive in order to achieve the highest degree of accuracy and reliability. In the course of the assessment, some questions may be too easy or too difficult for some students. The students should be told to click the “I don’t know” button if a question is completely unfamiliar to them, but otherwise that they should do their best to answer. As the assessment proceeds, the questions will focus more and more closely on the outer limits of the student’s actual knowledge. In Learning Mode (following assessment), students will be provided only material that they are ideally prepared to learn.

Length of Assessments

The number of questions asked in an ALEKS assessment varies. Normally an assessment in Basic Math requires between 15 and 2520 and 30 questions. Occasionally, the number of questions asked may be greater than this.

No Help in Assessments

Explain to the students that they will need to use paper and pencil for answering assessment questions, but that no help or collaboration whatsoever is permitted during assessment. If the teacher or anyone else helps the student during assessment, even to the extent of explaining or rephrasing a question, assessment results may be inaccurate and the student’s learning in ALEKS may initially be hindered. Be sure they understand that the purpose of the initial assessment is to give ALEKS a precise, detailed understanding of what a student knows, so as to render learning very efficient by focusing on what the student is ready to learn. It is not a “test” that one can pass or fail. They will not receive a grade on an ALEKS assessment unless the instructor deliberately chooses to use grades.

9.5 Focused Instruction with ALEKS

The features of the Instructor Module make it possible to prepare students for specific topics that they are going to work on, and to reinforce and expand on knowledge that students have recently acquired. This involves either guiding lectures or focused instruction to small groups of students based on data obtained from ALEKS. From the instructor’s viewpoint, these are powerful features of ALEKS, and their use constitutes a proactive integration of ALEKS with the course structure.

The two kinds of “teaching opportunities” cued by ALEKS come from two types of information maintained by the system for students over the entire time that they use it: the set of items a student is “ready to learn” (or “outer fringe” of the student’s knowledge state), and the set of items most recently learned (“what students can do,” the “highest” topics in the student’s knowledge state, called the “inner fringe”) (See Sec. 10.2.4) (See the **Instructor’s Manual** under “Inner and Outer Fringes of a Knowledge State,” in the chapter “Knowledge Spaces and the Theory Behind ALEKS”). The items “ready to learn” are the topics a student may normally choose to work on in ALEKS; the items recently learned (“what a student can do”) are considered the least secure and

most likely to need review or reinforcement. (These items may be made available for review by clicking “Review”; if a student has difficulty in the Learning Mode, this “inner fringe” will be substituted for the “outer fringe” or topics “ready to learn.”) When the students are logged on to ALEKS these two kinds of information are used automatically to guide and manage their learning. The instructor, however, can also view the inner and outer fringes in a convenient format to plan focused instruction that will parallel, supplement, and enhance the individual work that their students are doing in ALEKS.

To find this information for a course, the instructor should enter the Instructor Module and click “Reporting,” the name of the course, then “Average report (pie chart).” The piechart in Average report represents the average student in the given course, and displays the weaknesses and strengths of the course as a whole. To see the outer and inner fringes of the group we need to use options from the “Display mode” menu: “Ready to learn,” and “What students can do.”

Suppose we choose the option “Ready to learn (learning)” from the menu “Display Mode.” This will summarize the topics that all of the students in the course are currently ready to learn; the parenthesis “(learning)” indicates that the information is based on their most recent work in the Learning Mode, and so completely current. For each topic the number of students ready to learn that topic appears to the right (e.g., “12 students”); clicking on that phrase displays the students’ names, whereas clicking on “Open All” displays all the students’ names for all of the topics. For each topic-list, there is a link to send a message to precisely those students. The purpose of this analysis is that the instructor may pick one or more topics from the list and schedule small-group sessions preparing the named students to learn them more effectively.

Now suppose we choose “What students can do (learning)” from the menu “Display Mode.” Another list of topics will be produced; the students listed for these topics, however, are those who have recently worked on and, at least tentatively, learned the topics. Thus, the instructor can schedule focused sessions with these groups of students to reinforce or expand on material that is fresh in the students’ minds, on which they are likely to have the most questions and ideas.

This gives the instructor the possibility of always teaching to students who are ideally prepared. It suggests a mode of teaching to the moment of opportunity, and generalizes individual learning to small groups of learners at specific times; obviously, the data obtained for this purpose from ALEKS on one day will be of considerably less value if used a week later.

It may be useful to look at some examples illustrating how these features may be used. If you have not used the ALEKS Instructor Module extensively, it will make more sense as you have more experience using ALEKS as a teaching tool.

Example 1: Basic

On a Friday evening, the instructor sits down to plan lessons for the following week. He or she logs onto ALEKS, selects the reporting feature and the name of a course in Basic Math, and clicks “Average Report.” A pie chart appears showing the average profile of mastery in the course.

The “slice” of the pie chart for Whole Numbers is full to about 90 percent; the slices for Fractions, Decimals, and Proportions and Percents are filled much less, ranging between 20 and 40 percent. This indicates that lessons for the week may focus profitably on the most advanced Whole Numbers topics as well as on topics of moderate difficulty in Fractions, Decimals, and Proportions and Percents. The “slice” of the pie chart for Random Variables is full to about 90 percent; the slices for Inferential Statistics, Distributions, and Descriptive Statistics are filled much less, ranging between 20 and 40 percent. This indicates that lessons for the week may focus profitably on Inferential Statistics, Distributions, and Descriptive Statistics.

Example 2: Intermediate

On a weekend afternoon, the instructor logs on to ALEKS, clicks “Reporting,” then the name of a course in Basic Math, and then “Average report (pie chart).” After a look at the pie chart, the instructor selects “Ready to learn (learning)” from the “Display Mode” menu, and clicks “OK.” When the list of topics appears, the instructor scans this list for items of particular difficulty. There it is! “Ordering Numbers with Exponents” “Confidence Interval for the Population Mean” has 16 students currently able to choose this topic from their pie charts. The instructor notes this topic down for class discussion early in the week. With the benefit of some timely preparation, the students can be expected to master this troublesome topic with little or no difficulty.

Example 3: Advanced

On a Monday morning, the instructor logs on to his or her ALEKS account, clicks “Reporting,” then the name of a course in Beginning Algebra, and then “Average report (pie chart).” Following this the instructor switches, first, to the option for “Ready to learn (learning)” and clicks the ALEKS Print button. Even if “Open All” was not clicked the page will be displayed with all lists of students’ names displayed. Then, the instructor switches to the option for “What students can do (learning),” and, again, clicks the Print button. With these two printouts in hand, the instructor is ready to begin planning. At this point, the experience and expertise of the instructor are needed to use this information to best advantage. Suppose that there is only time in the week’s schedule for two small-group sessions. (The ALEKS class has only one hour in the lab, and ten minutes are set aside to speak with each small group; the remaining 40 minutes are for helping students in the lab.) The instructor will look over the topics with two questions in mind: which topics have the greatest numbers of students, and which are pedagogically most worth discussing.

For example, looking at the list of topics “Ready to learn,” the instructor sees “Solving a Linear Equation with Absolute Value: Problem Type 1.” “Ordering Scatter Diagrams by Increasing Correlation.” The instructor knows from experience that students have difficulty with the concept, and that they are more successful with it if they have had a chance to review. This topic has 12 students out of 30 in the class, so it has critical mass. The instructor uses the message feature

to send a note to these students, asking them to meet in the front of the room at the beginning of the lab; the students will receive this note the next time they log on to ALEKS, no later than the beginning of that lab.

Looking over the list of topics “What students can do,” the instructor sees “Marking a point in the coordinate plane,” with 10 students. Although the number of students is less than for other topics, this one seems to the instructor richer in its content of mathematical culture than the others. Students who have just worked on this topic are using the coordinate plane for the first time, and they are ripe for an introduction to the vast areas of mathematical thought for which it opens the door. Thus this is chosen as the second topic, and a second message is sent to these students, to meet at the front of the room, ten minutes into the lab.

9.6 Models of Classroom Integration

There are numerous ways in which ALEKS can be and is used in concrete educational situations.

1. **Supervised Math Lab.** Expert supervision can be provided for the students’ use of ALEKS in regularly scheduled math lab periods, whether or not these are part of a conventional class structure. Students benefit from the direct coaching and assistance of qualified instructors in the course of their work with ALEKS.
2. **Math Lab in Structured Course.** The supervised math lab may be part of a structure of class meetings, combined with conventional and lecture-style classes. The instructor in such a setting need not gear the sequence of topics covered in classes in any way with what the students are doing in ALEKS; the students’ independent work in ALEKS will increasingly benefit their performance on quizzes and tests, as well as their understanding of lectures, as the course progresses. ALEKS is not designed to “teach to the test,” although experience has shown that students’ performance on comprehensive tests improves dramatically when they have worked with ALEKS over time.
3. **Small-Group Instruction.** The recommended use of ALEKS in a classroom setting makes use of the detailed analysis of individual student knowledge provided through the Course Report page to tailor the lectures to the skills of students.
4. **Self-Paced Learning.** In this scenario students may use the college computer lab on their own, with only informal supervision. ALEKS is used in this case much as it is for distance learning, except that students have the opportunity for closer consultation with the instructor.
5. **Distance Learning.** ALEKS is used with great independence by students who may never enter the physical classroom, or may enter only on a few occasions for orientation and supervised assessments. ALEKS provides a range of features for communication between instructor and student, as well as powerful facilities for the monitoring and evaluation of student work.

Regardless of which approach is used, you can derive more benefit from ALEKS through monitoring the students' use of ALEKS and communicating with them, whether in direct contact, by email, or by messages through the ALEKS system. As discussed above, we recommend that a certain number of hours in ALEKS each week be required (See Sec. 9.2); this should be made clear from the start as part of the published course syllabus and rewarded appropriately through the grading scheme. Students' progress in ALEKS should be recognized and reinforced early on by informal, personal praise; conversely, students who do not seem to make adequate progress should be contacted promptly, the cause of their difficulty determined and remedied.

The following sections of this chapter provide more information on these issues affecting the classroom use and integration of ALEKS.

9.7 Monitoring Student Use

In the day-to-day use of ALEKS by a class, a principal concern of the instructor is to monitor that students are using the system with the required regularity and for at least the minimum required amount of time. The most convenient place to find this information is the "Learning progress since latest assessment page" (under "Reporting"). Each student's name is displayed on this page with the total number of hours that student has spent logged on to the system. Students can see this same total in their own accounts by using the button "Report."

It is also important that critical assessments throughout the course be supervised by the instructor, to ensure that valid results are received (See Sec. 9.2).

9.8 Monitoring the Progress of a Course

The instructor can also use the bar graphs to see how close each student is to mastery of the subject matter on the Learning Progress Since Latest Assessment page. It should be kept in mind that the bar graphs displayed on this page show only the students' achievement as of their last assessment (in blue) and any progress made in the Learning Mode since that assessment (in green). For a more panoramic view of the progress made by a group, select the "Overall progress in assessment" report. This displays the difference between the students' knowledge as of their first assessment and that demonstrated on their most recent assessment.

To see each of the assessments for a given student, with that student's progress subsequent to each assessment in the Learning Mode, the instructor should view the page "Progress report for a single student in this course" for the student.

9.9 Monitoring Individual Progress

On the page “Progress report for a single student in this course” there is a line for each assessment taken by a particular student, with bar graphs showing mastery as of that assessment and subsequent progress made in the Learning Mode. The initial assessment is shown in the bottom line, with later assessments “stacked” upward. By following progression from earlier to later assessments, the instructor can see very clearly how a student is progressing toward mastery of the subject matter.

Caution should be exercised in interpreting this information. Students vary widely both in the smoothness and in the speed with which they master material. Progress made in the Learning Mode (green bar) is not always immediately reflected in the student’s level of mastery on a subsequent assessment. Some students progress more quickly in assessment than in the Learning Mode. In such cases the “new” blue line is further ahead than the green line just below it. On the other hand, many students make faster progress in the Learning Mode than in assessment. In such cases the “new” blue line lags behind the green line below it. It is very common for a student to master the entire subject matter two or more times in the Learning Mode before that mastery is finally confirmed in an assessment. None of these situations is unusual. Part of the power of the ALEKS system is that it does not expect students to behave like machines, but makes allowance for a robust and unpredictable “human factor.”

NOTE. In cases where a student moves backward in his or her mastery, the instructor should make individual contact with the student. This student may be experiencing a personal problem, there may have been third-party help on an initial assessment, or there may be other external factors affecting the situation.

9.10 Moving a Student to a New Course

A student subscription to ALEKS entitles the student to work through as many subjects in the sequence as the student masters during the subscription period. When a student completes the objectives of a course, ALEKS will allow the student to continue until the subject-matter is exhausted. At this point the student should be moved to a more advanced course.

For example, when a student completes the subject matter for a course whose syllabus corresponds to Basic Math, the instructor should unenroll that student from Basic Math in ALEKS and reenroll the student in a new course whose topic is set to Algebra. If no such course exists, it should be created so that the student is not prevented from making further progress.

9.11 Ordering Assessments

Following the initial assessment (which should be taken under the instructor's supervision), the ALEKS system will automatically schedule any other assessments needed for correctly informing and guiding a student's progress. The instructor, however, can order an individual or group assessment at any time. It is a good practice for the instructor to schedule supervised assessments at regular intervals (midterm and end of the course), as "snapshots" of overall course achievement. Assessments may be ordered more frequently if the instructor feels that there has been third-party help on some automatic assessments, producing invalid results.

9.12 Independent Study and Distance Learning

The ALEKS system is well suited to use in an independent study or distance learning context. ALEKS is self-contained and adaptable to any syllabus or course materials. Students using ALEKS under these circumstances know exactly what the course goals are, where they stand in relation to those goals, and where to find the instructional and practice tools to achieve them.

For the instructor administering an independent study or distance learning program, ALEKS solves nearly every problem of management, oversight, evaluation, and communication. All of the information needed to keep track of far-flung independent learners is at the instructor's fingertips, through the features of the Instructor Module. The internal message system of ALEKS puts the instructor in constant touch with students without dependence on telephone or email communication.

9.13 The ALEKS Knowledge Structure

Each ALEKS subject, such as Beginning Algebra, has a knowledge structure associated with it. The knowledge structure for Beginning Algebra, for example, is covered by about 300 ALEKS items (or problem types). The knowledge structure for Introductory Chemistry, for example, is covered by about 170 ALEKS items (or problem types). A knowledge state is a subset of items which may correspond to the knowledge of an actual student (i.e., there may be a student who has mastered exactly those items, and no others). A knowledge structure is the family of all the knowledge states that we may encounter for a given subject.

An ALEKS structure impacts virtually every aspect of ALEKS's functioning. In the ALEKS assessment mode it enables ALEKS to make inferences from student answers, keeping the ALEKS assessments brief, but uncannily accurate.

The structure is also crucial in the ALEKS Learning Mode. Using the structure of Beginning Algebra, for example, the system knows precisely which items are in the

inner fringe and outer fringe of each of the knowledge states in ALEKS for Beginning Algebra. Using the structure of Introductory Chemistry, for example, the system knows precisely which items are in the inner fringe and outer fringe of each of the knowledge states in ALEKS for Introductory Chemistry. The items in the outer fringe of a student's knowledge state are those items that the student is the most ready to learn next. (From a technical standpoint an item is in the outer fringe of a state if adding that item to the state results in a feasible knowledge state.) These items are presented to the student in MyPie when the student moves the mouse pointer over the ALEKS pie chart. Similarly, an item in the inner fringe of a student's state is an item either recently learned or one whose mastery by the student might be shaky. (Technically, an item is in the inner fringe of a state if removing that item from the state results in another feasible knowledge state.) They are presented to the student when the student is having difficulty in the ALEKS Learning Mode and during ALEKS review.

An additional benefit of the proliferation of connections among items in ALEKS is its extreme flexibility from the students' viewpoint: for any particular topic, there is a vast number of possible approaches, or learning paths, which may lead students to mastery of that topic. This flexibility does not imply, however, that *any* order is possible. Each learning path leading to a particular topic must contain, at a minimum, the items which are "below" such topic in the ALEKS structure. That is, we may say that the more "advanced," or "highest," topics in an ALEKS structure are those for which the ALEKS system will require the student to learn the largest number of other items before those items will be presented to the student.

9.14 Modification of Syllabi

Instructors do not need to create or modify the syllabus in order to use ALEKS. Every subject has a comprehensive default, which will be in effect without any actions on the instructor's part.

In some cases it may be desirable to modify the syllabus used for a particular group of students. Extensive creation and modification of Standards and Syllabi is possible in the ALEKS Advanced Instructor Module (See Chapter 8). Please keep in mind the following points regarding the use of syllabi in ALEKS:

- A syllabus in ALEKS implies the existence of a knowledge state, that is, a possible configuration of a student's knowledge, defined as the goal of the course. As such, all items in this "final" knowledge state of the syllabus must be learnable **within** the syllabus. This is determined in ALEKS by reference to the ALEKS structure (See above, Sec. 9.13). If an item is added to the syllabus in ALEKS, all other items which are "below" that item will also be added. If an item is removed, all other items in the syllabus which are "above" that item in the ALEKS structure will also be removed. The Content Editor warns when this is occurring.
- Thus it is possible to modify a syllabus in ALEKS only by "trimming" the tree

from its branches, not from its roots.

ALEKS also provides a facility for creating multiple sets of syllabi within a single course (See Sec. 7.23). The Intermediate Objectives feature makes it possible to prioritize particular sets of items for particular periods of time, by constraining the choices available to the students. When Intermediate Objectives have been set, students will be guided to these items by the shortest possible path. Items that they are ready to learn, but are not on the shortest path to the Intermediate Objectives, will be “grayed out”; they will appear in the students’ pie charts, but the students will not be able to choose them.

Textbook Integration in ALEKS provides functionality very similar to that of the Intermediate Objectives, except that the objectives themselves are pre-defined according to the chapters of a chosen textbook (See Sec. 7.20).

9.15 Modification of Syllabi

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ALEKS also provides a facility for creating multiple sets of syllabi within a single course (See the **Instructor’s Manual** under “Intermediate Objectives,” in the chapter “Advanced Instructor Module: Results & Progress”). The Intermediate Objectives feature makes it possible to prioritize particular sets of items for particular periods of time, by constraining the choices available to the students. When Intermediate Objectives have been set, students will be guided to these items by the shortest possible path. Items that they are ready to learn, but are not on the shortest path to the

Intermediate Objectives, with be “grayed out”; they will appear in the students’ pie charts, but the students will not be able to choose them.

9.16 Learning Rates in ALEKS

ALEKS allows instructors to flexibly evaluate and interpret student learning. There are four criteria, which can be used in any combination: percentage of course goals mastered, total hours spent in ALEKS, average items gained per hour of use, and average number of items gained per week of use. Each can be set to “Private,” so that only the instructor sees the evaluations, to “Public,” so that the instructor sees the evaluations for all students, and each student sees their own, or to “Disabled,” so that no one sees them.

For detailed instructions on the use of the learning rates feature, see Section 7.25.

Detailed instructions on the use of the learning rates feature may be found in the **Instructor’s Manual** under “Assign Learning Rates,” in the chapter “Advanced Instructor Module: Results & Progress.”

Caution must be exercised in determining which, if any, of these criteria should be set to “Public,” so that they are seen by the students. For example, if the evaluation for percentage of course goals mastered is set to A for 90 percent, B for 80 percent, C for 70 percent, D for 60 percent, and Failure below that, the students will see these letters in their accounts as long as their percentage mastery is in the ranges given (i.e., D when it is between 60 and 69 percent). Under normal circumstances, even good students will spend much time in percentage ranges that do not correspond to their expected grades, and they may easily be discouraged by seeing poor evaluations in their accounts. The point is that they are being evaluated not for the point in the course where they are currently working, but for the end of the course. For this reason, the instructor should explain very carefully to the students what the evaluations signify, if the decision is made that they should be “Public.”

The same proviso applies to the other kinds of evaluations available through ALEKS. The value of using these evaluations in the “Public” mode may be greatly enhanced if the instructor decides to set a new scale every week, or at other appropriate intervals. This might mean, for example, that A is set to 20 percent for the first week, to 25 percent for the second week, and so forth, with the other evaluations set accordingly. Such a procedure requires more work by the instructor, but it certainly gives the students a more meaningful frame of reference for their progress.

Some of the kinds of evaluations in ALEKS may be more useful for the instructor alone than for the students. Such evaluations should be set to “Private.” The evaluation based on average items gained per week, for example, might be set to some minimum value like 3 (in an Algebraa Chemistry class requiring 3 hours of work in ALEKS per week). Now, the instructor would not want to send the message to the students that 3 items gained per week is “Enough,” since many students in the course may be capable

of much more. Conversely, a student whose progress falls below this rate might not be helped by the stern notation in their account that their progress is “Not enough”; the reasons for slow progress may be varied. At the same time, a student making slower progress than this should be brought to the instructor’s attention for intervention of some kind. If the evaluation is set to “Private,” the instructor will see the flag “Not enough” appearing next to the names of students whose progress is slower than this, on the Course Progress page, alerting them to the need for special attention.

Chapter 10

Knowledge Spaces and the Theory Behind ALEKS

10.1 History

Knowledge Space Theory has been under development since 1983 by Professor Jean-Claude Falmagne, who is the Chairman and founder of ALEKS Corporation, and other scientists (especially, Jean-Paul Doignon from Belgium) in the United States and Europe.

ALEKS is the first computer system to embody Knowledge Space Theory for assessment and teaching.

10.2 Theory

An exposition of Knowledge Space Theory is not intended here, nor is one necessary for the purposes of this manual. Knowledge Space Theory is expressed in a mathematical discipline often referred to as “Combinatorics.” The Bibliography contains a number of references for those interested in further details (See Sec. 10.3). What follows here is a brief, intuitive summary introducing certain fundamental terms employed in discussions of ALEKS.

10.2.1 Domain, Items, and Instances

An academic discipline such as Basic Math or Algebra is represented as a particular set of problems or questions that comprehensively embody the knowledge of the discipline. That set is called the **domain**, and the problems are called **items**. A symbolic representation of the domain of Basic Math uses dots standing for items (Fig. 10.1). One of

Set of problems in Basic Math.

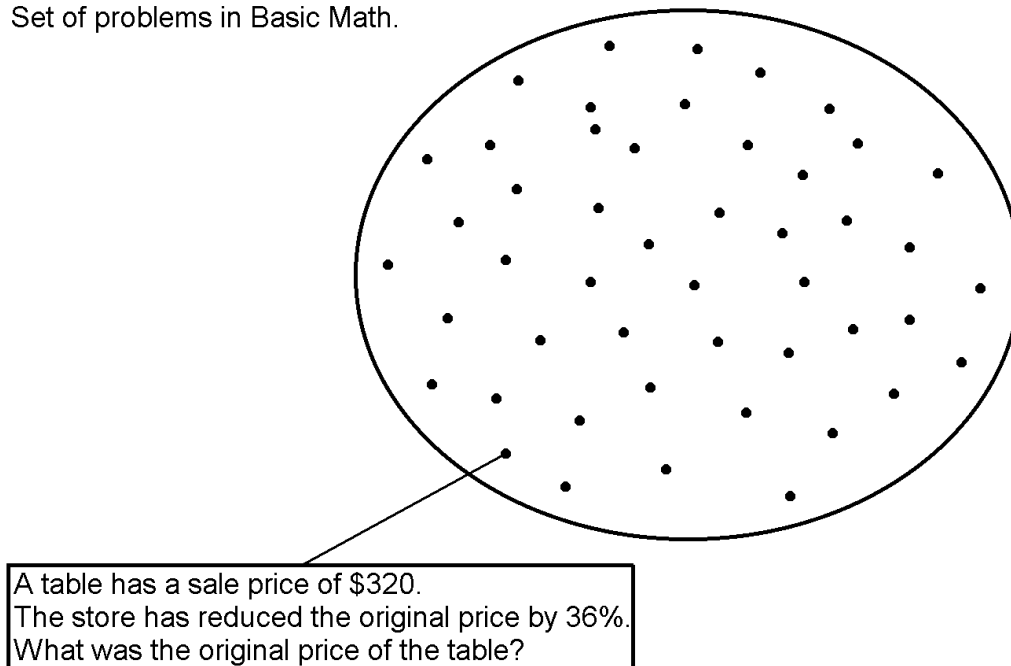


Figure 10.1: Domain of Basic Math

the items, which might be entitled “Word Problem with Percentages,” is indicated by a line. The problem in the rectangle is an **instance** of that item.

Each item, or problem type, has dozens, sometimes hundreds or thousands, of instances. In ALEKS, the domain of Basic Math is made up of about one hundred items, ranging from two-digit addition (without carry), to negative exponents. Algebra has a domain containing around two hundred items. In ALEKS for Introductory Chemistry, for instance, the domain contains about one hundred and seventy items, ranging from unit conversion to redox reactions. Full mastery of the domain implies the ability to solve problems corresponding to all the items making up the domain.

Determining the set of items that make up the domain is the first step in constructing a “knowledge structure” for that domain. This is done by research in instructional materials and standards and very systematic, painstaking consultation with instructors. Substantial agreement is achieved among expert pedagogues on the choice and definition of items. The set of items finally arrived at and forming the domain must be comprehensive, that is, it must cover all the concepts that are essential in the particular academic discipline.

A possible knowledge state.
In Basic Math, we use a knowledge structure
with roughly 40,000 states.

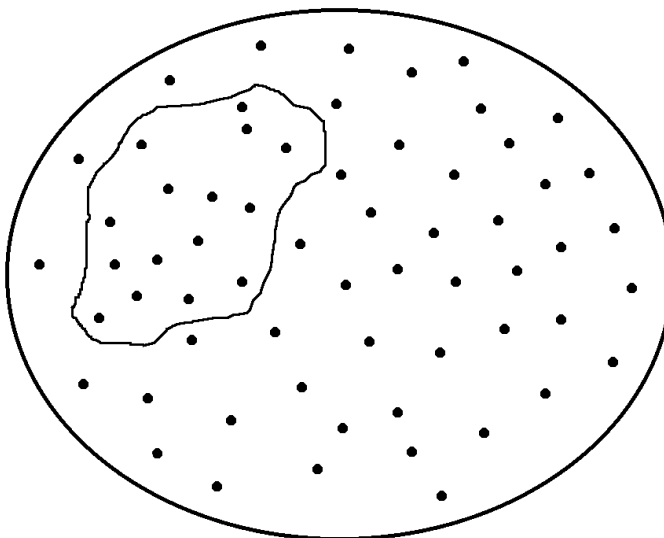


Figure 10.2: Knowledge State

10.2.2 Knowledge States

The **knowledge state** of a student is represented by the set of items in the domain that he or she is capable of solving under ideal conditions (Fig. 10.2). This means that the student is not working under time pressure, is not impaired by emotional turmoil of any kind, etc. In reality, careless errors may arise. Also, the correct response to a question may occasionally be guessed by a subject lacking any real understanding of the question asked. (This will occur very rarely when using the ALEKS system, because multiple choice answers are not used.) In general, an individual's knowledge state is thus not directly observable, and has to be inferred from the responses to the questions.

10.2.3 Knowledge Structures and Knowledge Spaces

It should be intuitively obvious that not all possible subsets of the domain are feasible knowledge states. For instance, every student having mastered “long division” would also have mastered “addition of decimal numbers.” Thus, there is no knowledge state containing the “long division” item that does not also contain the “addition of decimal numbers” item. The collection of all feasible knowledge states is referred to as the **knowledge structure**. In the current implementation of ALEKS for Basic Math, the number of feasible knowledge states is approximately 50,000. Thus, the

The beginning of a possible learning path.
Our structure in Basic Math allows for
billions of them.

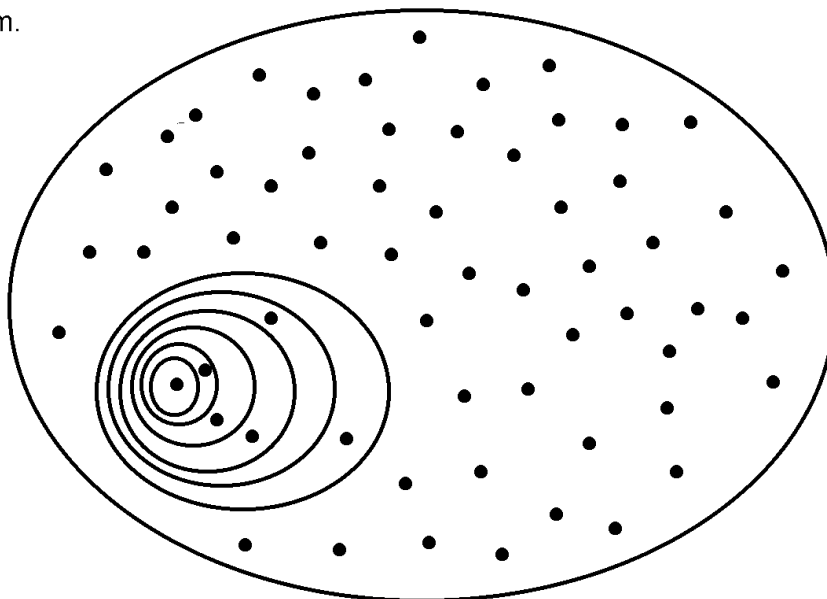


Figure 10.3: Learning Path

knowledge structure for Basic Math contains approximately 50,000 knowledge states. In order to assess a student in Basic Math, ALEKS must find out by efficient questioning which of these 50,000 states the student is in. In the current implementation of ALEKS for Introductory Chemistry, the number of feasible knowledge states is approximately 75,000. Thus, the knowledge structure for Introductory Chemistry contains approximately 75,000 knowledge states. In order to assess a student in Introductory Chemistry, ALEKS must find out by efficient questioning which of these 75,000 states the student is in. This large number of states means that there are many possible ways of acquiring knowledge, i.e., many learning paths (Fig. 10.3). In the ALEKS knowledge structure there are literally billions of such learning paths. A “knowledge space” is a particular kind of knowledge structure.

As in many real-life applications, “noise” and errors of various sorts often creep in, which require the elaboration of a probabilistic theory. The ALEKS System is based on such a probabilistic theory, which makes it capable of recovering elegantly from any misconceptions. For instance, ALEKS is capable of deciding that a student has mastered an item, even though the student has actually made an error when presented with a problem instantiating this item. This is not mysterious: a sensible examiner in an oral exam, observing an error to a question about addition would nevertheless conclude that the student has mastered addition, for example, if that student had given evidence of skillful manipulation of fractions.

A knowledge state and its outer fringe.

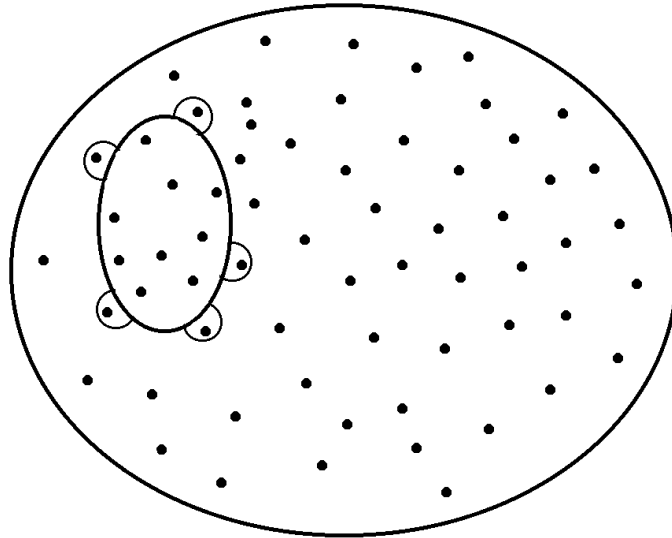


Figure 10.4: Outer Fringe of a Knowledge State

10.2.4 Inner and Outer Fringes of a Knowledge State

An item that has not yet been mastered by a student may not be immediately learnable by that student. Learning one or more prerequisite items may be necessary. Consider a student in a particular knowledge state K . The set of all items that may be learned immediately by a student in that state K is called the **outer fringe** of the state K . More precisely, an item is in the outer fringe of the state K if the addition of that item to the state K forms a new, feasible knowledge state (Fig. 10.4). Typically, the outer fringe of a knowledge state will contain between one and several items.

Similarly, an item is in the inner fringe of a state K if there is some other knowledge state to which that item may be added to form state K (Fig. 10.5). The **inner fringe** of a state K is thus defined as the set of all items which **may** have been the last one learned.

These two concepts of inner and outer fringes are used in powerful ways in the Learning Mode of the ALEKS system. For example, the system always offers a student problems to solve that are based on items in the outer fringe of his or her state. If ALEKS judges that a student is experiencing difficulties in learning some new item, ALEKS typically reviews the mastery of items in the inner fringe of the student's state that are also related to the new item to be learned.

A knowledge state and its inner fringe.

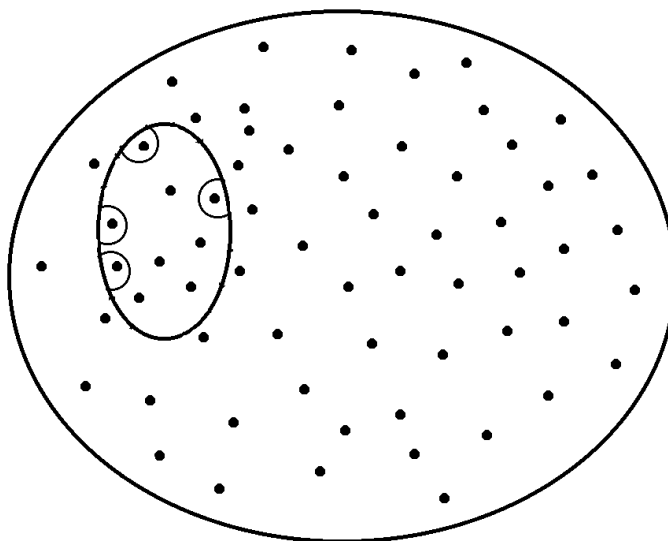


Figure 10.5: Inner Fringe of a Knowledge State

10.2.5 Assessment

How can ALEKS uncover, by efficient questioning, the particular knowledge state of a student? While the details of ALEKS’s method for achieving such a goal are technical, the guiding intuition is straightforward. At every moment of an assessment, ALEKS chooses a question to be “as informative as possible.” In our context, this means a question which the student has, in the system’s estimate, about a 50 percent chance of getting right. The student’s response (correct or false) determines a change in all the likelihood values: for instance, if the question involved a manipulation of fractions, and the student’s response was correct, then all the knowledge states containing this item would have their likelihood values increased. The specific way the questions are chosen and the likelihood values altered makes it possible for ALEKS to pinpoint the student’s state quite accurately in a relatively short time. In Basic Math, for example, approximately 15–25 questions often suffice.

Finally, it should be noted that the assessment report given to students, instructors, and administrators is a very precise **summary** of the student’s knowledge state. If the structure is known, the outer fringe and inner fringe together completely define the student’s knowledge state. Internally, the system registers the student’s knowledge or non-knowledge of each item in the domain.

A comprehensive treatment of Knowledge Space Theory can be found in Doignon and Falzagne, **Knowledge Spaces** (Springer-Verlag, 1999).

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Chapter 11

Frequently Asked Questions

11.1 General

General questions on ALEKS concern what it is, its purpose, and what it contains.

What is ALEKS?

ALEKS is the new way to learn a variety of subjects, from Math to Statistics to Accounting math on the World Wide Web. By knowing exactly which math concepts the student has mastered, which are shaky, and which are new but within reach, ALEKS enables the student to work on those concepts the student is most ready to learn. ALEKS is a full-time automated tutor, including explanations, practice and feedback. ALEKS closely interacts with the student, continuously updating its precise map of the student's knowledge state. ALEKS combines the advantages of one-on-one instruction and evaluation with the convenience of being on-call, on your computer, 24 hours a day, seven days a week. The cost of ALEKS is a small fraction of the cost of a human tutor.

What makes ALEKS different?

A great many important differences exist between ALEKS and other kinds of "educational software," including its finely individualized instructional features, easy access over the World Wide Web, its rigorous and comprehensive educational content, and its course-management module for instructors and administrators.

A critical difference is the capacity of ALEKS for efficient, precise, comprehensive, and qualitative assessment. This not only makes it a valuable tool for monitoring educational progress, but also enables it to provide students with the material they are most able to learn at a particular time. This means that the students are given neither material that they have already mastered nor material that they are not well suited to work on yet because some prerequisites have yet to be learned.

ALEKS is a self-contained learning environment, with complete sets of practice and explanatory units needed for the subjects that it covers. The units may also be referenced or linked

to textbooks for extended treatment of mathematical concepts. There is an online student mathematics dictionary for any subject accessed by clicking on underlined mathematical terms (hypertext links), and a diagnostic feedback facility that, in many cases, is able to explain the nature of misunderstandings and errors made by students.

For instructors, ALEKS offers a complete administrative and monitoring facility through which individual and group progress can be checked, standards established, enrollment managed, and messages exchanged. ALEKS can be configured for use with diverse educational standards.

ALEKS is not a game or “edutainment.” It is an automated educational tool with robust, carefully-designed features for both learners and educators.

What are the parts or “modules” of ALEKS?

The principal “modules” of ALEKS are the **Assessment Mode**, in which student knowledge is rigorously assessed, the **Learning Mode**, where students work on mastering specific concepts, the **Instructor Module**, in which instructors and administrators are able to monitor student progress and carry out administrative functions, and the **Administrator Module**, which permits management and monitoring of an arbitrary number of separate institutions, such as those making up a multi-campus community college system. There is also a Tutorial (which students take once when first registering with the system), online help, a subject mathematics Dictionary, graphic display of assessment results and learning progress, and many other features.

Why is ALEKS on the Internet?

ALEKS is available on the Internet so that a student who has registered with the system can use it from any suitable computer, in a college, at home, or anywhere else. Very little technical preparation is required. All you need is a self-installing, self-maintaining “plugin” obtained directly from the ALEKS website. No disks, CD’s, peripherals, or backup facilities are required. All data is kept on the ALEKS Corporation servers.

11.2 Technical

The technical information needed to use ALEKS is minimal. These few questions are all that are likely to come up, even in a large number of users.

What are the system requirements for using ALEKS?

[**Sec. 3.2**] The following table presents the technical requirements for ALEKS in summary form:

Your browser should be configured with Java enabled. Both Netscape and Internet Explorer usually ship with Java. You can also install Sun Microsystems’ Java® VM, version 1.4.1+, which can be obtained from Sun.

Note that any of the kinds of direct connection (cable, ISDN, DSL) that are typical in computer labs are adequate for use with ALEKS. If your computer lab has secu-

	PC	Macintosh
Operating System	Windows	MacOS 10.2+
Processor	166+ MHz	Any
RAM Memory	32+ MB	32+ MB
Browser	Netscape 7.1+, Explorer 6.0+, Firefox 1.0+, Mozilla 1.6+	Safari (w/OS 10.3+), Firefox 1.0+, Netscape 7.2+
Modem Speed	28+ kbps	28+ kbps

Figure 11.1: System Requirements

rity safeguards in place, you will need the cooperation of your LAN administrator, system administrator, or lab technician to install the ALEKS plugin.

Where can I get more information on ALEKS? How can I try out the system?

The ALEKS website provides complete information on the ALEKS system, including a Quick Tour, Guest registration, licensing, history and theory, and technical support.

11.3 Theory

For those interested in looking beneath the surface, these questions concern the principles on the basis of which ALEKS is designed and constructed.

What is the theory behind ALEKS?

[Chapter 10] [Sec. 10.3] ALEKS is based on a field of Cognitive Science (Mathematical Psychology) called “Knowledge Spaces.” The purpose of research in Knowledge Spaces is to model human knowledge in any subject, using mathematical tools such as Set Theory, Combinatorics, and Markovian Processes, so as to make possible fast and accurate assessment through interactive computer applications. There are numerous scientific publications in the field of Knowledge Spaces dating back to the early 1980’s. A recent, authoritative treatment (with Bibliography) is Doignon & Falmagne, **Knowledge Spaces** (Springer-Verlag, 1999).

What is an “item”?

[Sec. 10.2.1] In Knowledge Space theory, an “item” is a concept or skill to be learned, the mastery of which is captured by a “problem type” serving as the basis for specific assessment and practice problems. Thus the item “addition of two-digit numbers without carry” might produce the problem (instance) “What is 25 plus 11?”

What is a “domain”?

[Sec. 10.2.1] In Knowledge Space theory, a “domain” is the set of all items making up a particular subject matter, such as Basic Math. A learner is considered to have mastered the domain when that learner can solve problems corresponding to all the items in the domain.

What is a “knowledge state”?

[Sec. 10.2.2] In Knowledge Space theory, a “knowledge state” is the set of items belonging to a domain that a learner has mastered at some point in time. We speak of knowledge states in relation to a particular learner and a particular domain. Obviously, a learner’s knowledge state changes in time, and the goal of learning is that it should eventually include (correspond to) the entire domain.

What is the “outer fringe” of a knowledge state?

[Sec. 10.2.4] In Knowledge Space theory, a learner’s “outer fringe” is the set of items, any one of which can be added to the current knowledge state, to make a new, feasible knowledge state. These are the items that the student is considered most “ready to learn.” Progress is made from one state to another through one of the items in the first state’s “outer fringe.”

What is the “inner fringe” of a knowledge state?

[Sec. 10.2.4] In Knowledge Space theory, a learner’s “inner fringe” is the set of items, any one of which can be taken away from the current knowledge state, to make a new, feasible knowledge state. These are the items that the student may have learned recently, and thus whose knowledge might be shaky.

What is a “knowledge structure”? What is a “knowledge space”?

[Sec. 10.2.3] In Knowledge Space theory, “knowledge structure” or “knowledge space” (the two concepts differ in a technical way) refers to the collection of feasible knowledge states for a particular domain. It is a key point that not all sets of items from the domain (subsets of the domain) are feasible knowledge states. For instance, in mathematics there can be no knowledge state containing the item “finding the square root of an integer” that does not contain the item “addition of two-digit numbers without carry,” since no one will master the first without having mastered the second.

How was the structure created?

The knowledge structures (or, briefly, “structures”) used by ALEKS are created by analysis of the subject matter and extensive, computer-aided querying of expert instructors. When ALEKS assesses a student, it is actually searching the structure for knowledge states that match the student’s present competence.

What is the educational philosophy behind ALEKS?

The educational use of ALEKS is not tied to any particular theory of education or knowledge acquisition. A key insight underlying ALEKS is the existence of a vast multiplicity of diverse “learning paths” or sequences of topics by which a field can be mastered. Based on an inventory of knowledge states that numbers in the tens of thousands (for the subjects currently covered by ALEKS) the specialized tools of

Knowledge Space theory make it possible for the system to accommodate literally billions of possible individual learning paths implied by the relations among states. ALEKS does not embody a particular philosophy of teaching mathematics or statistics; rather, it is compatible with any pedagogical approach.

11.4 Assessments & Reports

Much of the power of ALEKS comes from its capacity for accurately and efficiently assessing the current state of a learner's knowledge.

What is an ALEKS assessment?

[**Chapter 4**] An assessment by the ALEKS system consists of a sequence of mathematical problems posed to the student. The answers are in the form of mathematical expressions and constructions produced by the system's input tools (no multiple choice). The student is encouraged to answer "I don't know" where this is appropriate. During an ALEKS assessment, the student is not told whether answers are correct or incorrect. The assessment is adaptive. Each question after the first is chosen on the basis of answers previously submitted. Assessment problems (like practice problems) are algorithmically generated with random numerical values. The length of the assessment is variable, between 15 and 35 questions. There are no time constraints, but many assessments can take less than a half-hour and few more than an hour. Students taking an assessment need to have paper and pencil. Calculators are not permitted in some areas in ALEKS, but a basic calculator is part of ALEKS. Calculators are not permitted in assessments for Basic Math, but simple calculators without graphing or symbolic functions are permitted for Algebra. A basic calculator is part of ALEKS.

No help whatsoever should be given to students taking an assessment, not even rephrasing problems. Outside help can easily lead to false assessment results and hinder subsequent work in the ALEKS Learning Mode.

Students are always assessed when they first register with the ALEKS system. It is highly advisable that all assessments from which the instructor uses data in any way (such as for placement) take place under the instructor's supervision. At a minimum, the initial assessment must be supervised.

How does the ALEKS assessment work?

[**Sec. 10.2.5**] In assessing a student's knowledge, the system is in fact determining which of the feasible knowledge states for that subject corresponds to the student's current knowledge. The assessment is probabilistic, so that it is not fooled by careless errors. (Lucky guesses are very rare, because multiple choice answers are not used.) Likelihood values (values for the likelihood that the student is in a particular knowledge state) are spread out over the states belonging to the structure. With each correct answer, the likelihood of states containing the item for which a correct answer was given is raised and that of states not containing

the item lowered. The reverse occurs for incorrect answers or “I don’t know.” At each step of the assessment, the system attempts to choose an item for which it estimates (based on current likelihood values) the student has about a fifty-fifty chance of success; such questions are maximally informative. When the likelihood values of a few states are extremely high and those of all the rest are extremely low (in technical terms, when the entropy of the structure is lower than a certain threshold value), the assessment ends and results are produced.

If a student makes a careless error or lucky guess, this will appear inconsistent with the general tendency of the student’s responses and the system will “probe” that area of knowledge until it is sure. For this reason, inconsistent assessments (often resulting from lack of concentration) may require more questions.

How should I interpret the assessment report?

[**Sec. 4.13**] The results of an ALEKS assessment are shown in the form of one or more pie charts. A pie chart corresponds to a subject matter (domain) or to the curriculum of a particular course. Each slice of the pie corresponds to a general topic. The degree to which the slice is filled in with solid color shows how close the student is to mastering that area. Where courses are being taken in sequence, there may be pie charts showing the previous and/or subsequent courses in that sequence.

An extremely important aspect of the pie charts is their indication of what a student is currently most “ready to learn” (that is, the “outer fringe” of the student’s current knowledge state). These items are listed beneath the pie charts in an Assessment Report and are also given through the pie charts themselves. When the mouse pointer is placed over a slice of the pie, a list pops out showing the concepts that the student is most “ready to learn” in that part of the curriculum. Clicking on any of these concepts takes the student into the Learning Mode to work on it. The pie charts are displayed following assessments, after a concept has been worked on in the Learning Mode, and when a student clicks on “MyPie” to change topics. At any given time, a student can only choose to work on concepts that the student is currently most “ready to learn.” This number may vary between two and a dozen, depending on what part of the structure is involved.

11.5 Learning Mode

Students spend by far the greatest part of their time in ALEKS in the Learning Mode. The features of the Learning Mode are designed to provide a maximum of support to the student’s growing mastery of course materials.

What is the Learning Mode?

[**Chapter 5**] The Learning Mode in ALEKS contains features to help students practice and master specific mathematical concepts and skills. In the Learning Mode, students are always working on a specific concept that they have chosen and

that, in the system's estimation, they are fully prepared to master. If the learner successfully solves an appropriate number of problems based on that concept, the system will tentatively determine that it has been mastered and offer a new choice of topics. If the student has difficulty, the system will attempt to diagnose and interpret the student's errors. It will also provide explanations of how to solve problems and definitions of mathematical terms. It may suggest the name of a classmate who can help. If the student is unable to master the concept right now, or if the student wishes to change topics, a new choice of topics will be offered. After a certain time has been spent in the Learning Mode, or after a certain amount of progress has been made, the student will be reassessed automatically (unless the instructor has already requested a new assessment).

What is the relationship between the Assessment Mode and the Learning Mode in ALEKS?

The Assessment and Learning Modes work together in a cyclical fashion, beginning with the initial assessment. A student is assessed, and the results of the assessment serve as a basis for the student's entry into the Learning Mode (the student works on concepts that the assessment showed that student most "ready to learn"). After a certain time in the Learning Mode, during which the results of the previous assessment are tentatively updated according to whether the student masters or fails to master new concepts, the student is reassessed and the cycle begins again. In this sense, ALEKS is an interactive learning system guided and powered by ongoing diagnostic assessment.

11.6 Educational Use

ALEKS also provides a full range of features for successful integration into a variety of teaching styles and course plans.

What is the best way to use ALEKS with my course?

The greatest factor in successful use of ALEKS is regular, structured use, with close monitoring of student progress by the instructor. We recommend scheduling regular lab sessions with ALEKS, totalling a minimum of three hours per week, as part of your course requirements. Not every lab session need be supervised by the instructor, but the initial assessment certainly should be. Any other interim and concluding assessments scheduled specially by the instructor normally should also be supervised.

This having been said, there has been successful use of ALEKS in a very wide variety of contexts and structures, including independent study. ALEKS Corporation is happy to consult with instructors on the best way to use ALEKS with their students.

Can ALEKS be used with handicapped and learning-disability students? Is ALEKS a remedial tool?

ALEKS is designed to help all students who can read sufficiently to understand what it says, and who can use a computer. It has been used successfully with students exhibiting a range of learning disabilities. Students with reading difficulties can also use it, provided that there is someone on hand to help them as needed. The system does not currently contain facilities for audio output.

What burden will ALEKS place on our computer lab and Lab Director/LAN Administrator?

Normally ALEKS requires very little support from local computer technicians, given the automatic installation and maintenance of the ALEKS plugin. Most of the time, however, the lab administrator will need to assist with installation in order to overcome security obstacles (for excellent reasons, college computer labs tend to prevent students from installing their own software). In a few cases, the presence of a “firewall” or other security measures may require some action on the technician’s part for successful installation. Again, ALEKS Corporation stands ready to assist with problems of this nature.

Does ALEKS need to be used with a particular textbook or curriculum?

ALEKS is designed to be used with any syllabus, curriculum, or textbook. The system may also be referenced or linked to a textbook or online applications for particular courses. The fundamental idea of the ALEKS system is to allow students to pursue individualized paths to mastery of the subject matter. For this reason instructors may very commonly find their students learning material that has not yet been covered in the course. This should be regarded as a sign of the system’s effective use.

Does ALEKS have special features for educators?

[**Chapters B.13, 7, 8**] Students’ use of ALEKS and their progress toward mastery can be monitored using the facilities of the Instructor Module. The Instructor Module (called Administrator Module when it includes more than one college) also enables instructors and administrators to establish the syllabi and standards used by ALEKS, to configure accounts, to find statistics on multi-campus community college system use, and to exchange messages. An instructor or administrator who has been registered with ALEKS enters the Instructor Module immediately upon login.

What are Results & Progress? What are Standards & Syllabi?

There are two parts of the Instructor Module, “Results & Progress” and “Standards & Syllabi.” The former is by far the more commonly used. It contains information on system use and progress by students and groups, as well as all necessary facilities for account and database management. The latter is used strategically, to define the standards and syllabi that will be used over extended periods of time by colleges. Actions taken in “Standards & Syllabi” should be the outcome of well-considered multi-campus community college system decisions.

How does ALEKS define standards and syllabi?

[**Chapter B.13, 8**] In ALEKS, a syllabus is a set of items belonging to a domain that is determined to be the goal for mastery in a particular course. In a typical

situation, the syllabus of a college Introductory Chemistry course will be the entire set of items for Introductory Chemistry. In a typical situation, the syllabus of a college Basic Math course will be the entire set of items for Basic Math. The syllabus is, if not equivalent to the entire domain, is defined by selection of a particular subset of the domain. This is done in the Syllabus Editor by adding and removing checkmarks next to the names of items. A “Standard” in ALEKS is a group of syllabi considered to constitute a logical, integrated sequence.

How can I use ALEKS Corporation Customer Support?

[Sec. 12] You can contact ALEKS Corporation using the information in Chapter 10 of this manual. We request that this information not be given to students.

ALEKS Corporation does not provide technical or other support directly to students using ALEKS in college courses. Students should approach their instructor first with any questions or problems regarding the use of ALEKS. Questions the instructor is unable to answer can then be brought to our attention.

Chapter 12

Support

NOTE. Troubleshooting information is found in Appendix A.10 of this Instructor's Manual. Most problems can be resolved using this brief reference.

Current information on ALEKS is available at the ALEKS website:

<http://www.aleks.com>

Technical support and consultation on the effective use of ALEKS is provided to educators by ALEKS Corporation. Please contact the support group by email:

highed-support@aleks.com

by telephone:

(714) 619-7090

or by fax:

(714) 245-7190

NOTE. We ask that students using ALEKS not contact us directly, but approach their instructors first. It is hoped that the information in this **Instructor's Manual** will enable instructors to answer many of their students' questions.

We also welcome any and all comments and feedback on ALEKS. Here is our mailing address:

ALEKS Corporation Customer Support
15641 Red Hill Avenue, Suite 150
Tustin, CA 92780

Appendix A

ALEKS Student User's Guide

A.1 Preface

Welcome to ALEKS! You are about to discover one of the most powerful educational tools available for learning mathematicsIntroductory Chemistry. Combining advanced learning technology with the flexibility of the Internet, the ALEKS system provides a “smart” interactive tutoring system with unmatched features and capabilities. Richly supplied with illustrations and reference materials, ALEKS constantly challenges you and supplies extensive feedback on what you have accomplished. ALEKS will always help you select the ideal topic to work on now.

That way you learn concepts in the order that's best for you. ALEKS provides individualized, one-on-one instruction that fits your schedule. It is available wherever you access the Web.

ALEKS was developed with support from the National Science Foundation. It is based on a field of Mathematical Cognitive Science called “Knowledge Spaces.” The purpose of research in Knowledge Spaces is to model human knowledge of any subject for quick, precise assessment and efficient guided learning in interactive computer programs.

The ALEKS system is self-explanatory and includes online instructions and feedback. This booklet contains basic information to help you begin using ALEKS. Instructors using ALEKS with their courses are provided with an Instructor's Manual containing complete information on the system's operation. They should be able to answer any questions beyond those dealt with in these pages.

NOTE. ALEKS is designed for use without help from a manual. Your instructor will assist you in registering with the system and beginning to use it. If questions arise, or if you want to learn more about ALEKS, use this Guide. It is intended as a convenient and concise reference.

Only registered users can keep an account on ALEKS. (Anyone may try the system as a guest.) Two or more persons cannot use the same ALEKS

account. The system will regard them as a single person and give incorrect guidance.

A.2 System Requirements

The system requirements for ALEKS are such that it can be used on nearly any computer that is connected to the Internet.

PC Requirements

You can use ALEKS on any PC with a Pentium or equivalent (AMD, etc.) processor of 166 MHz or more or any Pentium II, III, or later processor. At least 32 MB of RAM are required. Your operating system must be Windows 98 / 2000 / ME / XP / NT4.0 or higher.

The following popular web browsers are compatible with ALEKS on PCs: Internet Explorer 6.0 or higher, Firefox 1.0 or higher, Netscape Communicator 7.1 or higher, and Mozilla 1.6 or higher.

Macintosh Requirements

ALEKS can be used on a PowerMac or iMac with at least 32 MB of RAM and operating system Mac OS 10.2 or higher. With MacOS 10.3 or higher and the latest software updates from Apple, Safari is a supported browser. With MacOS 10.2 or higher, compatible browsers are Firefox 1.0 or higher, and Netscape Communicator 7.2 or higher.

Internet Access

ALEKS is used over the World Wide Web. You must have an Internet connection by dial-up modem (at least 28k) or any other kind of access to the Internet (cable, ISDN, DSL, AOL, etc.).

A.3 Registration and Installation

Before You Begin. In order to register as an ALEKS user you need the **Access Code** (20 characters) inside the back cover of this booklet. You also need a **Course Code** (10 characters) provided by your instructor. In order to register as an ALEKS user you need the **Access Code** inside the back cover of this booklet or purchased over the Internet directly from ALEKS Corporation. You also need a **Course Code** provided by your instructor. When you register with the ALEKS system, your name is entered into the database and records of your progress are kept. If the ALEKS plugin has not been installed on the computer being used for registration, it will be installed automatically as part of this procedure.

1. Go to the ALEKS website by typing in the following address:

<http://www.aleks.com>



Figure A.1: The ALEKS Website

NOTE. If you are typing this URL by hand, pay careful attention to the spelling “aleks.” Also, the other ALEKS websites you might find using a search engine will not work for you. You will be able to register **only** at the address given above.

For your convenience, add a “Bookmark” or “Favorite” at this location. This is the site where you will log on to your account.

2. Click on “SIGN UP NOW” in the upper left-hand corner of the window (Fig. A.1).
3. At the beginning of registration you will be asked for your **Course Code**. The Course Code is supplied by your instructor. Enter this in the spaces provided, on the left-hand part of the window, and click on “Continue” (Fig. A.2).
4. To continue your registration you will be asked for your **Access Code**. It is on a sticker inside the back cover of this booklet. Enter the Access Code in the spaces provided and click on “Continue” (Fig. A.3).

To continue your registration you will be asked for your **Access Code**. It is on a sticker inside the back cover of this booklet, or can be purchased directly from ALEKS Corporation by using the link on this page. Enter the Access Code in the spaces provided and click on “Continue” (Fig. A.3). Answer the questions to complete your registration. Among other questions, you may be asked to enter your email address. Supplying this information enables your site administrator to help you with problems more quickly. You will also be able to enter your Student ID number. (Both email and Student ID are optional information.)

5. At the end of registration you will be given a Login Name and Password. Write these down and keep them in a safe place. You will need them to return to the

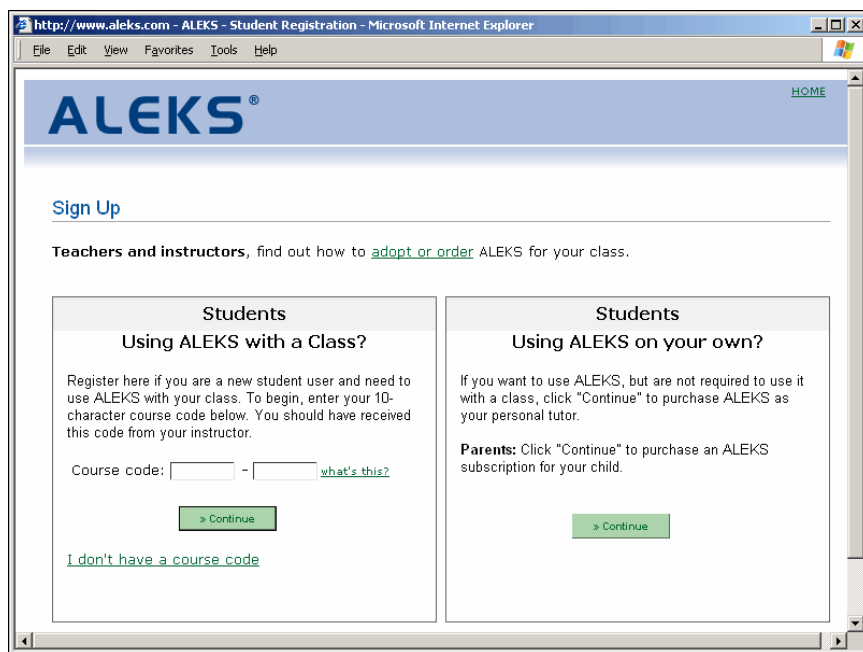


Figure A.2: Course Code

system (See Sec. A.6). You can change your Password at any time (See Sec. A.5.5).

NOTE. If you do not have a current plugin, one will be installed. Do not interrupt this process until a message appears saying that the installation is complete. Then you will need to quit your Web browser (“Exit,” “Close,” or “Quit” under the “File” menu), open your Web browser again, and go back to the ALEKS website (use your Bookmark/Favorite).

NOTE. Your Login Name and Password can be typed with upper- or lower-case letters. Neither may contain spaces or punctuation. If you forget your Password but you did enter your email address in ALEKS, click on the link underneath the Password field on the ALEKS home page (“Did you forget your password?”).

A.4 Tutorial

The ALEKS system avoids multiple-choice questions. Most answers are complete mathematical expressions and constructions. The ALEKS system avoids multiple-choice questions. After registration, the ALEKS Tutorial will teach you to use the simple tools needed for your course (Fig. A.4). There is plenty of feedback to help you complete it successfully.

NOTE. The Tutorial is not intended to teach mathematics introductory chemistry. It just trains you to use the ALEKS input tool (called the “Answer Editor”). Online help is also available while you are using ALEKS; just click the “Help” button, which gives

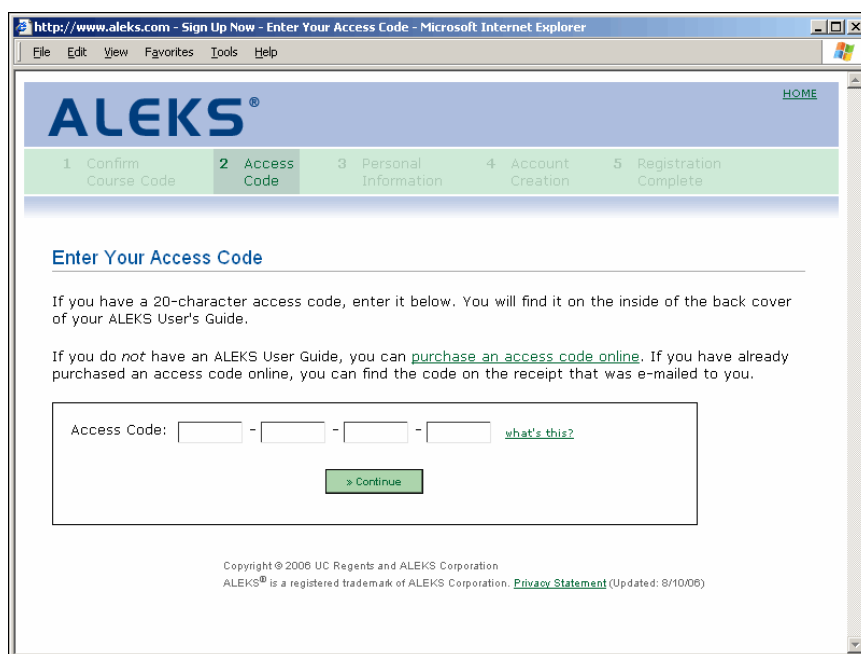


Figure A.3: Access Code

you access to the sections of the Tutorial (See Sec. A.5.5).

A.5 Assessments and Learning

A.5.1 Assessments

Instruction through ALEKS is guided by precise understanding of your knowledge of the subject. This information is obtained by assessments in which the system asks you to solve a series of problems. (The system's estimate of your knowledge is also updated when you make progress in the Learning Mode.) Your first assessment occurs immediately after the Registration and Tutorial.

NOTE. Your instructor may require that the first assessment be taken under supervision. **Don't try to begin your initial assessment at home until you find out where your instructor wants you to take it.** Additional assessments may be scheduled for you by the instructor. These may or may not need to be supervised, depending on the instructor's preference. The ALEKS system also prompts "automatic" assessments when you have spent a certain amount of time on the system or have made a certain amount of progress.

NOTE. Your instructor may require that the first assessment be taken under supervision. **Don't try to begin your initial assessment at home until you find**

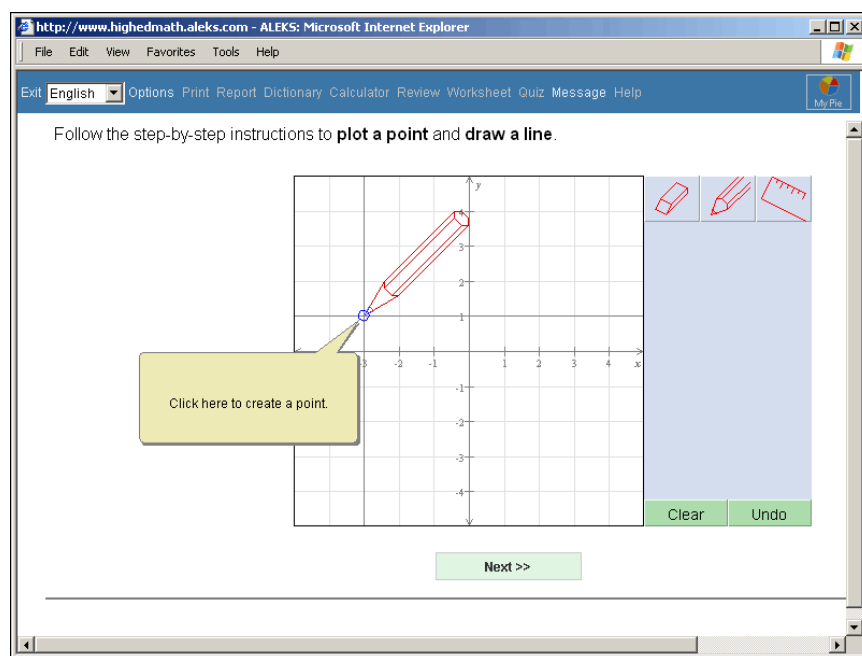


Figure A.4: The Answer Editor (Tutorial)

out where your instructor wants you to take it. Additional assessments may be scheduled for you by the instructor. These may or may not need to be supervised, depending on the instructor's preference. The ALEKS system also prompts "automatic" assessments when you have made a certain amount of progress.

A.5.2 Results

Assessment results are presented in the form of a color-coded pie chart. Slices of the pie chart correspond to parts of the syllabus. The relative size of the slices represents the importance of each topic area for the syllabus. The solidly colored part of a slice indicates how close you are to mastering that part of the syllabus.

NOTE. You may see more than one pie chart displayed following an assessment when you are progressing through a series of courses or units. (Your knowledge in the previous and/or subsequent units is also displayed.)

A.5.3 Learning Mode

Following the presentation of assessment results, the system will display a pie chart navigation tool ("MyPie") (Fig. A.5). By placing the mouse pointer over slices of the pie, you can see which concepts you are now most ready to learn.

Not all slices will contain concepts at any given time. They may have been mastered

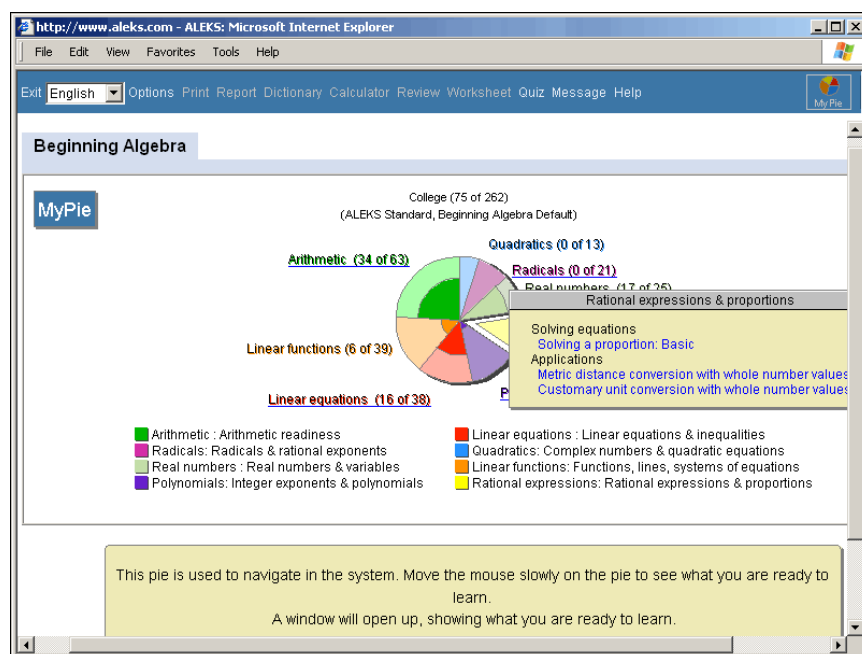


Figure A.5: Assessment Report

already, or work may need to be done in other slices before they become available. The concept you click on becomes your entry into the Learning Mode. The system will help you in seeking to master that concept and “add it to your pie.”

A.5.4 Progress in the Learning Mode

In the Learning Mode, you are given practice problems based on the chosen topic. In addition, you receive explanations of how to solve this kind of problem and have access to a dictionary of mathematical concepts. Underlined mathematical terms are links to the dictionary. Click on any term to get a complete definition. the ALEKSPedia. Underlined mathematical terms are links to the ALEKSPedia. Click on any term to get a complete definition and additional information on the given topic. By entering the ALEKSPedia, you have the ability to go backward within the material and read or review the information leading to where you are now. There are also a number of interactive boxes illustrating certain topic ideas. The system will require a number of correct answers before it assumes that you have mastered the concept. Then it “adds it to your pie.” At this point, a revised pie chart will be shown reflecting your new knowledge. You will be able to choose a new concept to begin. If you make mistakes, more correct answers may be required. If you tire of this topic and wish to choose another, you can click on “MyPie” near the top of the window. This will make you exit the topic and you will return to your pie chart for a new choice. If you make repeated errors on a given concept, the system will conclude that the concept was not mastered.

It will offer you a new choice of other concepts.

A.5.5 Additional Features

All buttons described below are available in the Learning Mode. In the Assessment Mode, only the “Options,” “Exit,” and “Help” buttons are active. In the Assessment Mode, only the “Exit,” “Options,” “Report,” “Quiz,” “Message,” and “Help” buttons are active.

Options

If you want to change your Password, click on the “Options” button. This page also shows the total number of hours you have spent using ALEKS.

Report

Any time you wish to look at your assessment reports, click on “Report.” Choose any date from the menu and click “OK.”

Dictionary

To search the online dictionary of mathematical terms, click “Dictionary.” To search the online dictionary of mathematical terms and enter the ALEKSPedia, click “Dictionary.”

Review

To review past material, use the “Review” button.

Worksheet

To print out an individualized homework sheet based on your most recent work in ALEKS, use the “Worksheet” button.

Quiz

To see the results of quizzes you have taken in ALEKS or to begin a quiz assigned to you by your instructor, use the “Quiz” button.

Messages

Your instructor can send you messages via ALEKS. You see new messages when you log on. You can also check for messages by clicking on the “Message” button. Your instructor can choose to let you reply to messages as well.

Help

For online help with the use of the Answer Editor, click “Help.”

MyPie

Clicking “MyPie” gives you a pie chart summarizing your current mastery. You can use this pie chart to choose a new concept.

A.6 Logging on to Your Account

Here are concise instructions for accessing your ALEKS account.

1. You always log on from the ALEKS website:

<http://www.aleks.com>

Use the “Bookmark” or “Favorite” for this site if you made one (See Sec. A.3). Remember that you may find other ALEKS websites via a search engine, but this is the only one with your account.

2. On the login page, enter your Login Name and Password provided at the time of registration (See Sec. A.3). Be sure to type these correctly, without any spaces or punctuation.
3. If you enter your Login Name and Password correctly, your browser will begin accessing the plugin to start ALEKS. This takes a few seconds. You will then come to the place you left off in your previous ALEKS session, or begin using ALEKS as a first-time user.

NOTE. If you forget your Login Name or Password, use the link on the ALEKS home page marked “Did you forget your password?” If you entered an email address at registration time and you remember your Login Name, your Password will be sent to you by email. Otherwise, please contact your instructor. It is a good idea to change your Password to one you will remember easily but is difficult for others to guess (See Sec. A.5.5).

A.7 Installation on Additional Machines

Before You Begin. Installing ALEKS means installing the ALEKS plugin. This is the software used by your web browser to access and run ALEKS. You can access your ALEKS account from any computer that meets the system requirements and has had the ALEKS plugin installed. You cannot use ALEKS without the ALEKS plugin that is installed over the World Wide Web.

1. Go to the ALEKS website:

<http://www.aleks.com>

Add a “Bookmark” or “Favorite” at this location.

2. Use your Login Name and Password to log on (See Sec. A.3).
3. When you log on to ALEKS, the system will automatically check to see if your system is compatible and if you have the most recent version of the ALEKS plugin. If you do not have a current plugin, it will download the plugin and ask your permission to install. After you grant permission, it will install the (new) plugin.

Do not interrupt the installation process until a message appears stating that the installation is complete and asks you to restart your browser. You will need to quit your Web browser (“Exit,” “Close,” or “Quit” under the “File” menu), open your Web browser again, and go back to the ALEKS website (use your Bookmark/Favorite).

A.8 Guidelines for Effective Use

Please take note of the following important suggestions for successful use of ALEKS.

Supplementary Materials

You should have pencil and paper ready for all assessments and for use in the Learning Mode. Basic calculators should be used only when you are instructed to do so. (A basic calculator is part of ALEKS.)

Assessments

You should not ask for, nor receive any help during assessments. Not even explanations or rephrasing of problems are permitted. If you receive help, the system will get a wrong idea of what you are most ready to learn, and this will hold up your progress. If you think you don't know the answer, you should click “I don't know.” (Don't guess!)

Learning Mode

You should learn to use the special features of the Learning Mode, especially the explanations and the mathematical dictionary.ALEKSPedia.

A button marked “Ask a Friend” may also appear from time to time. Clicking on this button will prompt the system to suggest the name of a classmate who has mastered the concept.

Regular Use

Nothing is more important to your progress than regular use of the system. Three hours per week is a recommended minimum.

Put ALEKS into your weekly schedule and stick to it!

A.9 Frequently Asked Questions

For further information on any of these questions, follow the references provided to other sections of this Guide.

What are the rules for taking an assessment in ALEKS?

[Sec. A.8] You must have paper and pencil when taking an assessment in ALEKS. A basic calculator should be used only when you are instructed to do so. For Introductory Chemistry, a simple calculator is permitted. A basic calculator is part

of ALEKS. No help whatsoever is permitted, not even to the extent of rephrasing a problem.

Cheating is not a danger, since each student is given different problem-types in different sequences. Even if, by chance, two students sitting next to one another were to get the same problem-type at the same time, the actual problems would almost certainly have different numerical values and require different answers.

During the assessment, you are not told if your answer is right or wrong. In the Learning Mode, however, you are always told if you made a mistake, and often what that mistake was. **The assessment is not a test.** Its main purpose is to determine what you are most ready to learn and help you make the best progress possible toward mastery.

How do I add concepts to my pie?

[Sec. A.5.4] You fill in your pie and achieve mastery in the subject matter by working in the Learning Mode on concepts and skills that the assessment has determined you are most “ready to learn.” When you master a concept in the Learning Mode by successfully solving an appropriate number of problems, you will see that your pie chart has been changed by the addition of that concept. The goal is to fill the pie in completely.

Why is it that I mastered all the concepts in the Learning Mode, but my assessment still says I have concepts to learn?

In the Learning Mode, you are always working on one concept at a time, whereas assessments are cumulative and evaluate you on everything in the given subject matter. It may be more difficult to show mastery of concepts you have recently worked on, when you are being quizzed on many different topics at the same time. For this reason, your assessment results may not exactly match what you had mastered in the Learning Mode. This is normal and simply means that you should keep working in the system. (Sometimes the opposite also occurs. That is, progress in the assessment turns out to be faster than in the Learning Mode.)

Why doesn't my pie chart show any concepts from a category if I haven't filled in that category yet?

[Sec. A.5.3] You are completely “ready to learn” a set of concepts or skills when you have mastered all the prerequisite concepts or skills that they demand. To take an elementary example, in order to learn “addition of two-digit numbers with carry” you might have to first learn “addition of two-digit numbers without carry” and nothing else. Your pie chart will not offer you concepts to work on if you are not ideally ready to begin learning them, that is, they have prerequisites you have not yet mastered.

For this reason, your pie chart may show that you have only mastered 8 out of 10 concepts for a particular slice of the pie (a particular part of the curriculum), but the pie chart says you have no concepts available from that slice to work on. This means that the concepts you have left to master have prerequisites in other areas of the curriculum that you must master first.

Keep working in the other slices, and eventually the concepts in that slice will “open up.”

What is the difference between “Explain” and “Practice”?

When you begin working on a particular concept in the Learning Mode, you will be shown the name of the concept, a sample problem, and a choice between “Practice” and “Explain.” If you think you know how to solve the problem, you can click “Practice.” You will be given a chance to solve the same problem that was initially displayed. If you are not sure, you can click “Explain” to produce an explanation of how to solve the displayed sample problem.

At the bottom of the Explanation page you have the “Practice” button, and sometimes other options for more detailed explanations and help. The Explanation page may also contain a link or reference to a textbook used with the course. If you click the “Practice” button following an explanation, you are offered a different problem of the same type, not the one whose solution was explained. In order to master the concept and add it to your pie, you must successfully solve a certain number of “Practice” problems. If you wish to choose a new concept, you can click the “MyPie” button on the ALEKS menu bar.

You should **not** use your browser’s “Back” and “Forward” buttons while logged on to ALEKS. Doing so will not help you make progress and may cause temporary software errors.

How can I best use the Learning Mode to help me learn?

[Sec. A.5.4] In the Learning Mode, you should do your best to solve the problems that are offered to you. You should not lightly change topics or stop before the system tells you that you are done or suggests choosing another concept.

You should get to know the features of the Learning Mode, especially the explanations and the mathematical dictionary.ALEKSPedia. The Learning Mode will always tell you if your answer is correct or not. In many cases it will provide information on the kind of error you may have made. You should pay attention to this feedback and be sure to understand it.

Keep in mind that ALEKS is always giving you material that, in its estimation, you are ideally ready to learn. It does not offer material you have already mastered, except in the Review mode. To go back to concepts you have already worked on, click the “Review” button on the ALEKS menu bar.

How does ALEKS create practice problems?

ALEKS creates both Assessment and Practice problems by means of computer algorithms, based on the definition of a particular concept or skill to be mastered. Thus, a particular concept or problem-type may serve as the basis for a very large number of specific problems, each with different numerical values and sometimes (as in the case of applied problems) differing in other ways as well. With ALEKS, you cannot “learn the test” or “teach to the test.”

What happens if I don’t learn a concept (or I get tired of working on a concept)?

[**Sec. A.5.4**] You must answer what the system judges to be an appropriate number of Practice problems correctly to add a concept to your pie. If you make mistakes, you must answer more. ALEKS will always tell you when you have mastered the concept. If you wish to stop working on a concept and choose another one, you can click on “MyPie.” It is usually better to master the concept you are working on, unless the system tells you to switch. If you are clearly not making progress, ALEKS will suggest that you work on something else.

Why is ALEKS giving me a new assessment?

[**Sec. A.5.1**] New assessments may be prompted automatically by ALEKS when you have spent sufficient time in the Learning Mode or when you have made adequate progress. Your instructor may also request an assessment for you personally, or for everyone in the course. In this case it may be stipulated that the assessment must be taken at school. (If you attempt to work at home when an assessment has been ordered to be done at school, ALEKS will deny access and tell you that you need to log on from school.)

Why do I need to take a Tutorial to use ALEKS?

[**Sec. A.4**] The Tutorial is a brief interactive training program that teaches you to use the ALEKS input tools, or “Answer Editor.”

ALEKS avoids multiple-choice questions. It almost always requires that answers be given in the form of numbers, mathematical expressions and geometrical and other constructions. ALEKS avoids multiple-choice questions. It almost always requires that answers be given in the form of complete expressions. The Answer Editor is a flexible set of tools enabling you to provide such answers. Although the Answer Editor is easy to use, the Tutorial will make sure you are completely proficient with it before beginning the ALEKS system. The Tutorial guides you through every step of learning to use the Answer Editor.

What can I do if I make a mistake entering an answer?

If you make an error entering an answer with the Answer Editor, you should click on “Undo” to go back one step, or on “Clear” to start over. You can also use the “Backspace” key on your keyboard in the usual way.

NOTE. You cannot use “Undo” or the “Back” button on your browser to go back if you have submitted an answer by clicking on “Next.” If you realize that the answer you submitted is incorrect, you should not be concerned; the system will most likely recognize this as a careless error based on your other answers and make allowances for it.

What are the icon buttons for?

The icon buttons are used to enter mathematical symbols and to create forms for mathematical expressions. In some cases the keyboard equivalents for icon buttons can be used.

The icon buttons are used to enter symbols and to create forms.

Why doesn't anything appear when I type?

[Sec. A.10] In order to type input in the Answer Editor, you must first click on a blue box. Each blue box in the input area corresponds to a mathematical expression. When you click on an icon button for a complex expression, it may place more than one blue box in the space, one for each part of the expression. Each blue box must be filled in for a complete expression. For instance, when you click on the “Exponent” icon button, you get two blue boxes. The big one is for entering the base, and a smaller one that is raised and to the right is used to enter the exponent.

How do I get help while using ALEKS?

[Sec. A.5.5] You can get help using the Answer Editor by clicking the “Help” button on the ALEKS menu bar.

Can my instructor or friend help me (or can I use a calculator) in the Learning Mode?

[Sec. A.8] Help and collaboration are allowed in the Learning Mode. Keep in mind, however, that if you get too much help, the system will start giving you problems that you are not prepared to solve. As a general rule, you can get help with one Practice problem, but you should solve the others yourself.

You need paper and pencil for the Learning Mode, just as you did for the assessment. ALEKS provides a calculator when appropriate; when the Calculator button is active, the use of the calculator is permitted (See Sec. A.5.5).

Why are some of the words I see underlined?

[Sec. A.5.5] Underlined words in the Learning Mode are links to the online mathematical dictionary and ALEKSPedia. You can click on any underlined word to see its definition. You can also access the Dictionary by clicking the “Dictionary” button on the ALEKS menu bar. The Dictionary is not available during assessment.

Note that the Dictionary is opened in a new window. When you are finished reading the definition, you can close or “Minimize” the window, and you will see the previous screen. Clicking “Back” on the browser won’t work.

What is the “Ask a Friend” button for?

[Sec. A.8] The “Ask a Friend” button sometimes appears when you are having difficulty with a particular concept. When you click on the button, the system suggests the name of a classmate who has mastered the concept and may be able to help you.

How can I change my Password?

[Sec. A.5.5] You can change your Password by clicking the “Options” button on the ALEKS menu bar.

How can I review material I have already worked on?

[Sec. A.5.5] You can click on the “Review” button to work on material you have already spent time on.

How can I see the reports from previous assessments?

[Sec. A.5.5] To see any of your assessment reports, click on “Report” (on the ALEKS menu bar).

How can I choose a new topic to work on?

[Sec. A.5.5] To see your current pie chart and choose a new concept in the Learning Mode, click on “MyPie” (on the ALEKS menu bar), move around on the pie, and choose a new concept in the Learning Mode.

How can I print something in ALEKS?

[Sec. A.10] To print the contents of the screen, you can click on “Print” in the ALEKS menu bar. This produces a new, printable window (ALEKS output is not normally printable). Depending on your browser, you may also have to click the browser’s “Print” button. When you are done, you can close the new window.

What should I do if it’s taking too long for a new page to load (or if the program freezes)?

[Sec. A.10] It shouldn’t take more than a few seconds for ALEKS to respond when you click on any button. If you experience delay, freezing, or crashing, your first step is to click on the small “A” button in the upper right corner. If this doesn’t work, you can click your browser’s “Reload” or “Refresh” button. If this doesn’t work, you can close your browser and restart it. In extreme cases, use Ctrl-Alt-Delete (Cmd-Opt-Esc on Macintosh). You will come back to the exact place you left off after you log back on to ALEKS.

How do I exit the ALEKS program?

To leave ALEKS, you can click the “Exit” button on the ALEKS menu bar or simply close your browser. ALEKS always remembers where you left off and brings you back to that place.

Why do I have to log on to ALEKS?

[Sec. A.1] The fact that ALEKS is used over the Internet means that you can access it from your college or from home. As a registered user of ALEKS, you have an account on the server that contains a record of all the work you have done.

Your instructor and administrators at your college have access to these records. They can monitor your progress and use of the system as well as carry out administrative functions. Web access also means that there is almost no maintenance or technical preparation required—no disks, CDs, peripherals, or backup procedures.

What if I have a question or problem using ALEKS?

If you have a question or problem using ALEKS that is not answered here, please contact your instructor. Your instructor has been provided with extensive information on the operation of ALEKS and should be able to answer almost any question you may have.

What if I forget my Login Name or Password?

If you forget your Login Name or Password, you can use the link on the ALEKS home page marked “Did you forget your password?” If you entered an email address at registration time and you remember your Login Name, the password will be sent to you by email. Otherwise, please contact your instructor.

A.10 Troubleshooting

Difficulties in using ALEKS can very often be resolved by following the suggestions given in this section.

Login Not Successful

First of all, be careful to type your Login Name and Password correctly, with no spaces or punctuation. Then, be sure you have accessed the correct ALEKS website. There is more than one ALEKS website, and only the one at which you registered contains your account. Use the URL provided in this booklet rather than looking for “aleks” via a search engine.

Typed Input Does Not Appear

If you have trouble entering numbers or symbols in the Answer Editor, be sure that you have clicked on a blue box and that the pointer is within the answer area (the rectangle containing the blue boxes).

NOTE. It is not always possible to use the number keys on your keyboard's right-hand “keypad” (check that “Num Lock” has been pressed).

Mixed Number Difficulties

The Answer Editor is easy to use. One warning, however: mixed numbers must be entered using the Mixed Number icon, not by entering the whole part and then using the Fraction icon.

Freezing and Slow Response

If you are logged on to ALEKS and the program is either not responding or taking too long to load a new page, one of the following three actions may help (try them in the order given):

1. click on the small “A” in the upper right-hand corner of the ALEKS window;
2. click on your browser's “Reload” (or “Refresh”) button;
3. close the browser and log on again (the system will bring you back to where you left off); if you cannot close the browser use Ctrl-Alt-Delete (PC) or Cmd-Opt-Esc (Macintosh) and end the task (or reboot, if all else fails).

Open applications, other than the web browser that you are using to access ALEKS, are another cause of slowness. Closing these applications may correct the problem.

If slowness persists, it is most likely due to a problem in the local network. Bring this to the attention of your instructor.

Lengthy Assessment

It is impossible to know how many questions will be asked in an assessment. The number of questions asked does not reflect your knowledge of the subject matter. It may reflect the consistency of your effort or concentration.

Reduction of Pie chart

You may observe a loss of concepts in your pie chart following an assessment. This is not a malfunction in the system, but results from errors made by you

on material you had previously seemed to master. Don't worry: that is the way the system works. In particular, it is not unusual to have a "bad" assessment, one that, for external reasons (bad mood, distractions, etc.), does not reflect your actual knowledge. ALEKS will quickly bring you back to where you belong.

Repeated Final Assessments

You may need to take more than one final assessment even after you have filled in your pie (in the Learning Mode). This is normal, since mastery is determined by the assessment, not by the Learning Mode. The system needs to confirm (in the assessment) that the entire curriculum has been mastered.

Printing Problems

To print ALEKS output (for instance, an Assessment Report) you must press the ALEKS "Print" button (on the ALEKS menu bar). This opens a new browser window containing the contents of the previous window in the form of a "Print Preview." When this page has been printed it should be closed to return to the normal ALEKS interface.

Appendix B

Syllabi in ALEKS

B.1 Basic Math

Whole Numbers

arith066 Expanded form
arith643 Expanded form with zeros
arith028 Numeral translation: Problem type 1
arith060 Numeral translation: Problem type 2
arith001 Addition without carry
arith050 Addition with carry
arith630 Addition with carry to the hundreds place
arith012 Addition of large numbers
arith007 Subtraction without borrowing
arith006 Subtraction with borrowing
arith682 Subtraction with multiple regrouping steps
arith637 Subtraction and regrouping with zeros
arith613 Word problem using addition or subtraction
arith008 One-digit multiplication
arith679 Multiplication by 10, 100, and 1000
arith003 Multiplication without carry
arith004 Multiplication with carry
arith615 Introduction to multiplication of large numbers
arith632 Multiplication with trailing zeros: Problem type 1
arith638 Multiplication with trailing zeros: Problem type 2
arith014 Multiplication of large numbers
arith075 Simple division
arith052 Division without carry
arith005 Division with carry
arith680 Division with trailing zeros: Problem type 1

arith649 Division with trailing zeros: Problem type 2
arith650 Division involving quotients with intermediate zeros
arith644 Word problem on quotient and remainder
arith023 Word problem using division
arith614 Basic word problem using multiplication or division
arith651 Introduction to inequalities
arith077 Ordering large numbers
arith078 Rounding: Problem type 1
arith061 Rounding: Problem type 2
arith101 Estimating a sum
arith102 Estimating a difference
arith604 Estimating a product or quotient
arith103 Average of two numbers
arith645 Introduction to parentheses
arith681 Introduction to order of operations
arith048 Order of operations: Problem type 1
arith051 Order of operations: Problem type 2
arith655 Introduction to properties of addition
arith656 Introduction to properties of multiplication
arith657 Introduction to the distributive property
arith647 Divisibility rules for 2, 5, and 10
arith648 Divisibility rules for 3 and 9
arith056 Factors
arith034 Prime numbers
arith035 Prime number factorization
arith033 Greatest common factor
arith070 Least common multiple

Fractions

arith623 Introduction to fractions
arith665 Introduction to equivalent fractions
arith212 Equivalent fractions
arith666 Introduction to reduced fractions
arith067 Reduced fraction
arith044 Ordering fractions with same denominator
arith091 Ordering fractions with same numerator
arith092 Ordering fractions
arith667 Plotting fractions on a number line
arith618 Addition or subtraction of fractions with the same denominator
arith664 Introduction to addition or subtraction of fractions with different denominators
arith230 Addition or subtraction of fractions with different denominators

arith100 Fractional part of a circle
arith088 The reciprocal of a number
arith079 Product of a unit fraction and a whole number
arith009 Unit fraction multiplication
arith086 Product of a fraction and a whole number
arith053 Fraction multiplication
arith095 Word problem with fractions
arith022 Fraction division
arith662 Introduction to mixed numbers and improper fractions
arith015 Writing an improper fraction as a mixed number
arith619 Writing a mixed number as an improper fraction
arith215 Addition or subtraction of mixed numbers with same denominator
arith084 Addition of mixed numbers with same denominator and carry
arith216 Subtraction of mixed numbers with same denominator and borrowing
arith085 Addition or subtraction of mixed numbers with different denominators
arith020 Mixed number multiplication: Problem type 1
arith076 Mixed number multiplication: Problem type 2
arith068 Mixed number division

Decimals, Proportion and Percent

arith220 Decimal place value
arith221 Rounding decimals
arith608 Ordering decimals
arith609 Ordering fractions and decimals
arith670 Introduction to writing a decimal as a fraction
arith087 Converting a decimal to a fraction
arith671 Introduction to converting a fraction to a decimal
arith222 Converting a fraction to a terminating decimal
arith089 Converting a fraction to a repeating decimal
arith672 Introduction to writing a decimal as a mixed number
arith223 Converting a mixed number to a decimal
arith624 Addition of aligned decimals
arith625 Subtraction of aligned decimals
arith626 Word problem with one decimal operation: Problem type 1
arith627 Word problem with one decimal operation: Problem type 2
arith082 Multiplication of a decimal by a power of ten
arith017 Multiplication of a decimal by a whole number
arith055 Decimal multiplication: Problem type 1
arith224 Word problem using decimal addition and multiplication
arith083 Division of a decimal by a power of ten
arith081 Division of a decimal by a whole number
arith019 Decimal division

arith045 Word problem with powers of ten
arith227 Word problem using decimal subtraction and division
arith663 Introduction to ratios
arith228 Basic word problem on rates
alge218 Word problem on rates
alge272 Solving a proportion: Basic
arith064 Simple word problem on proportions
arith610 Word problem on proportions: Problem type 1
arith611 Word problem on proportions: Problem type 2
alge063 Word problem on mixed number proportions
arith063 Word problem with clocks
arith674 Introduction to percent
arith226 Converting between percentages and decimals
arith090 Converting a percentage to a fraction
arith002 Converting a fraction to a percentage
arith030 Percentage of a whole number
arith069 Writing a ratio as a percentage
arith074 Word problem on percentage: Problem type 1
arith031 Word problem on percentage: Problem type 2
arith225 Word problem on percentage: Problem type 3
arith232 Simple interest

Measurement and Data Analysis

mstat035 Conversions involving measurements in feet and inches
mstat036 Adding customary units of length
unit005 Customary unit conversion with whole number values
unit006 Customary unit conversion with whole number values, two-step conversion
unit007 Customary unit conversion with mixed number values
unit008 Customary unit conversion with mixed number values, two-step conversion
unit009 Customary area unit conversion with whole number values
unit001 Metric distance conversion with whole number values
unit002 Metric mass or capacity conversion with whole number values
unit003 Metric distance conversion with decimal values
unit004 Metric conversion with decimal values, two-step conversion
unit010 Metric area unit conversion with decimal number values
unit012 Time unit conversion with whole number values
unit034 Conversion between metric and customary unit systems
unit035 Conversion between compound units, basic problem
unit036 Conversion between compound units, advanced problem
time006 Adding time
time007 Subtracting time
mstat004 Histograms for numerical data

mstat005 Bar graphs for non-numerical data
mstat024 Interpreting bar graphs
mstat044 Double bar graphs
mstat007 Interpreting line graphs
alge263 Interpreting the graphs of two functions
stat804 Interpreting circle graphs or pie charts
stat801 Computations from circle graphs
mstat003 Mode of a data set
mstat028 Mean and median of a data set
stat803 Finding the value for a new score that will yield a given mean
mstat006 Box-and-whisker plots
mstat014 Random samples and prediction
mstat026 Introduction to probability of an event
mstat010 Probability of an event
stat112 Die rolling

Geometry

geom349 Naming segments, rays, and lines
geom151 Measuring an angle with the protractor
geom303 Acute, obtuse, and right angles
geom039 Supplementary and complementary angles
geom305 Supplementary and vertical angles
geom304 Corresponding and alternate angles
geom306 Acute, obtuse, and right triangles
geom307 Scalene, isosceles, and equilateral triangles
geom001 Sum of the angle measures of a triangle
geom801 Area of a triangle
geom310 Classifying quadrilaterals
geom532 Classifying parallelograms
geom339 Perimeter of a polygon
geom300 Perimeter of a square or a rectangle
geom353 Perimeter of a piecewise rectangular figure
geom078 Sides of polygons having the same perimeter
geom019 Area of a square or a rectangle
geom217 Finding the side length of a rectangle given its perimeter or area
geom350 Distinguishing between area and perimeter
geom351 Areas of rectangles with the same perimeter
geom340 Area of a piecewise rectangular figure
geom022 Area of a parallelogram
geom023 Area of a trapezoid
geom344 Area involving rectangles and triangles
geom142 Area between two rectangles

geom016 Circumference of a circle
geom301 Perimeter involving rectangles and circles
geom838 Circumference ratios
geom802 Circumference and area of a circle
geom036 Area between two concentric circles
geom302 Area involving rectangles and circles
geom214 Area involving inscribed figures
geom311 Volume of a cube or a rectangular prism
geom505 Volume of a piecewise rectangular prism
geom033 Volume of a pyramid
geom035 Volume of a cylinder
geom086 Volume of a cone
geom841 Volume of a sphere
geom092 Rate of filling of a solid
arith016 Square root of a perfect square
arith601 Square root of a rational perfect square
arith602 Estimating a square root
geom044 Pythagorean Theorem
geom037 Similar polygons
geom038 Similar right triangles
geom337 Indirect measurement

Signed Numbers and Introduction to Algebra

alge286 Plotting integers on a number line
arith071 Absolute value of a number
arith104 Operations with absolute value
arith200 Integer addition: Problem type 1
arith108 Integer addition: Problem type 2
arith107 Integer subtraction
arith231 Integer multiplication and division
arith605 Plotting rational numbers on a number line
arith106 Signed fractions addition
arith105 Signed fractions multiplication
arith234 Signed decimal addition
arith233 Introduction to exponents
arith683 Powers of 10: Positive exponent
arith684 Powers of 10: Negative exponent
arith047 Evaluating expressions with exponents: Problem type 1
arith049 Evaluating expressions with exponents: Problem type 2
arith600 Exponents and order of operations
arith036 Scientific notation with positive exponent
arith037 Scientific notation with negative exponent

alge005 Evaluation of a linear expression in two variables
alge606 Distributive property, simple
alge604 Distributive Property, advanced
alge607 Combining like terms, basic
alge663 Combining like terms, advanced
alge602 Writing a mathematical expression
alge009 Additive property of equality: Problem type 1
alge800 Additive property of equality with decimals
alge801 Additive property of equality with fractions
alge010 Additive property of equality: Problem type 2
alge266 Additive property of equality: Problem type 3
alge008 Multiplicative property of equality: Problem type 1
alge802 Multiplicative property of equality with fractions
alge012 Multiplicative property of equality: Problem type 2
alge006 Solving a linear equation: Problem type 1
alge208 Solving a linear equation: Problem type 2
alge200 Solving a linear equation: Problem type 3
alge011 Solving a linear equation with several occurrences of the variable: Problem type 1
alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
alge013 Solving a linear equation with several occurrences of the variable: Problem type 3
alge209 Solving a linear equation with several occurrences of the variable: Problem type 4
alge016 Translating sentences into mathematical equations
alge014 Solving a word problem using a linear equation: Problem type 1
alge219 Solving a word problem using a linear equation: Problem type 2
alge173 Solving a word problem using a linear equation: Problem type 3

B.2 Pre-Algebra

Whole Numbers

arith066 Expanded form
arith643 Expanded form with zeros
arith028 Numeral translation: Problem type 1
arith060 Numeral translation: Problem type 2
arith001 Addition without carry
arith050 Addition with carry
arith630 Addition with carry to the hundreds place
arith012 Addition of large numbers

arith007 Subtraction without borrowing
arith006 Subtraction with borrowing
arith682 Subtraction with multiple regrouping steps
arith637 Subtraction and regrouping with zeros
arith613 Word problem using addition or subtraction
arith008 One-digit multiplication
arith003 Multiplication without carry
arith004 Multiplication with carry
arith615 Introduction to multiplication of large numbers
arith632 Multiplication with trailing zeros: Problem type 1
arith638 Multiplication with trailing zeros: Problem type 2
arith014 Multiplication of large numbers
arith075 Simple division
arith052 Division without carry
arith005 Division with carry
arith680 Division with trailing zeros: Problem type 1
arith649 Division with trailing zeros: Problem type 2
arith650 Division involving quotients with intermediate zeros
arith023 Word problem using division
arith614 Basic word problem using multiplication or division
arith651 Introduction to inequalities
arith077 Ordering large numbers
arith078 Rounding: Problem type 1
arith061 Rounding: Problem type 2
arith101 Estimating a sum
arith102 Estimating a difference
arith604 Estimating a product or quotient
arith103 Average of two numbers
arith645 Introduction to parentheses
arith048 Order of operations: Problem type 1
arith051 Order of operations: Problem type 2
alge285 Evaluating a simple algebraic expression: Problem type 3
arith655 Introduction to properties of addition
arith656 Introduction to properties of multiplication
arith657 Introduction to the distributive property
arith056 Factors
arith034 Prime numbers
arith035 Prime number factorization
arith033 Greatest common factor
arith070 Least common multiple
arith240 Word problem with common multiples

Fractions and Proportions

arith623 Introduction to fractions
arith663 Introduction to ratios
arith665 Introduction to equivalent fractions
arith212 Equivalent fractions
arith067 Reduced fraction
arith667 Plotting fractions on a number line
arith044 Ordering fractions with same denominator
arith091 Ordering fractions with same numerator
arith092 Ordering fractions
arith618 Addition or subtraction of fractions with the same denominator
arith230 Addition or subtraction of fractions with different denominators
arith100 Fractional part of a circle
arith088 The reciprocal of a number
arith079 Product of a unit fraction and a whole number
arith009 Unit fraction multiplication
arith086 Product of a fraction and a whole number
arith053 Fraction multiplication
arith095 Word problem with fractions
arith022 Fraction division
arith662 Introduction to mixed numbers and improper fractions
arith015 Writing an improper fraction as a mixed number
arith619 Writing a mixed number as an improper fraction
arith215 Addition or subtraction of mixed numbers with same denominator
arith084 Addition of mixed numbers with same denominator and carry
arith216 Subtraction of mixed numbers with same denominator and borrowing
arith085 Addition or subtraction of mixed numbers with different denominators
arith020 Mixed number multiplication: Problem type 1
arith076 Mixed number multiplication: Problem type 2
arith068 Mixed number division
arith228 Basic word problem on rates
alge218 Word problem on rates
alge272 Solving a proportion: Basic
alge271 Solving a proportion: Advanced
arith064 Simple word problem on proportions
arith610 Word problem on proportions: Problem type 1
arith611 Word problem on proportions: Problem type 2

Decimals and Percents

arith220 Decimal place value
arith221 Rounding decimals
arith608 Ordering decimals
arith609 Ordering fractions and decimals

arith671 Introduction to converting a fraction to a decimal
arith087 Converting a decimal to a fraction
arith222 Converting a fraction to a terminating decimal
arith089 Converting a fraction to a repeating decimal
arith672 Introduction to writing a decimal as a mixed number
arith223 Converting a mixed number to a decimal
arith624 Addition of aligned decimals
arith625 Subtraction of aligned decimals
arith626 Word problem with one decimal operation: Problem type 1
arith627 Word problem with one decimal operation: Problem type 2
arith082 Multiplication of a decimal by a power of ten
arith017 Multiplication of a decimal by a whole number
arith055 Decimal multiplication: Problem type 1
arith045 Word problem with powers of ten
arith224 Word problem using decimal addition and multiplication
arith083 Division of a decimal by a power of ten
arith081 Division of a decimal by a whole number
arith019 Decimal division
arith227 Word problem using decimal subtraction and division
arith674 Introduction to percent
arith226 Converting between percentages and decimals
arith090 Converting a percentage to a fraction
arith002 Converting a fraction to a percentage
arith030 Percentage of a whole number
arith069 Writing a ratio as a percentage
arith074 Word problem on percentage: Problem type 1
arith031 Word problem on percentage: Problem type 2
arith225 Word problem on percentage: Problem type 3
arith232 Simple interest
stat804 Interpreting circle graphs or pie charts
stat801 Computations from circle graphs
mstat014 Random samples and prediction

Measurement, Data and Probability

mstat035 Conversions involving measurements in feet and inches
mstat036 Adding customary units of length
unit005 Customary unit conversion with whole number values
unit006 Customary unit conversion with whole number values, two-step conversion
unit007 Customary unit conversion with mixed number values
unit008 Customary unit conversion with mixed number values, two-step conversion
unit009 Customary area unit conversion with whole number values
unit001 Metric distance conversion with whole number values

unit002 Metric mass or capacity conversion with whole number values
unit003 Metric distance conversion with decimal values
unit004 Metric conversion with decimal values, two-step conversion
unit010 Metric area unit conversion with decimal number values
unit012 Time unit conversion with whole number values
unit034 Conversion between metric and customary unit systems
mstat004 Histograms for numerical data
mstat005 Bar graphs for non-numerical data
mstat024 Interpreting bar graphs
mstat044 Double bar graphs
mstat007 Interpreting line graphs
mstat003 Mode of a data set
mstat028 Mean and median of a data set
stat803 Finding the value for a new score that will yield a given mean
mstat029 How changing a value affects the mean and median
mstat006 Box-and-whisker plots
mstat026 Introduction to probability of an event
mstat010 Probability of an event
mstat041 Tree diagrams

Variable Expressions and Polynomials

alge286 Plotting integers on a number line
arith605 Plotting rational numbers on a number line
arith071 Absolute value of a number
arith104 Operations with absolute value
arith200 Integer addition: Problem type 1
arith108 Integer addition: Problem type 2
arith107 Integer subtraction
arith231 Integer multiplication and division
arith106 Signed fractions addition
arith105 Signed fractions multiplication
arith234 Signed decimal addition
alge005 Evaluation of a linear expression in two variables
alge004 Evaluation of a polynomial in one variable
alge606 Distributive property, simple
alge604 Distributive Property, advanced
alge607 Combining like terms, basic
alge663 Combining like terms, advanced
alge602 Writing a mathematical expression
arith233 Introduction to exponents
arith047 Evaluating expressions with exponents: Problem type 1
arith049 Evaluating expressions with exponents: Problem type 2

arith600 Exponents and order of operations
alge024 Product rule of exponents
alge027 Power rule: Positive exponents
arith029 Ordering numbers with positive exponents
alge029 Simplifying a polynomial expression
alge037 Greatest common factor of two monomials
alge030 Multiplying monomials
alge033 Multiplying two binomials
alge032 Squaring a binomial
alge180 Multiplying polynomials
arith016 Square root of a perfect square
arith601 Square root of a rational perfect square
arith602 Estimating a square root
arith093 Square root simplification
arith032 Square root addition

Equations and Graphs

alge009 Additive property of equality: Problem type 1
alge800 Additive property of equality with decimals
alge801 Additive property of equality with fractions
alge010 Additive property of equality: Problem type 2
alge266 Additive property of equality: Problem type 3
alge008 Multiplicative property of equality: Problem type 1
alge802 Multiplicative property of equality with fractions
alge012 Multiplicative property of equality: Problem type 2
alge006 Solving a linear equation: Problem type 1
alge208 Solving a linear equation: Problem type 2
alge200 Solving a linear equation: Problem type 3
alge011 Solving a linear equation with several occurrences of the variable: Problem type 1
alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
alge013 Solving a linear equation with several occurrences of the variable: Problem type 3
alge209 Solving a linear equation with several occurrences of the variable: Problem type 4
alge016 Translating sentences into mathematical equations
alge014 Solving a word problem using a linear equation: Problem type 1
alge219 Solving a word problem using a linear equation: Problem type 2
alge173 Solving a word problem using a linear equation: Problem type 3
alge704 Solving a word problem using a linear equation: Problem type 4
fun005 Finding a function rule: Problem type 1

alge807 Finding the next terms of a simple sequence
alge064 Reading a point in the coordinate plane
alge067 Plotting a point in the coordinate plane
alge066 Solutions to a linear equation in two variables: Problem type 1
alge216 Solutions to a linear equation in two variables: Problem type 2
alge210 X- and y-intercepts of a line given the equation in standard form
alge197 Graphing a line given the x- and y-intercepts
alge194 Graphing a line given its equation in slope-intercept form
alge195 Graphing a line given its equation in standard form
alge198 Graphing a vertical or horizontal line
alge252 Graphing a parabola: Problem type 1

Geometry

geom349 Naming segments, rays, and lines
geom151 Measuring an angle with the protractor
geom152 Drawing an angle with the protractor
geom303 Acute, obtuse, and right angles
geom039 Supplementary and complementary angles
geom304 Corresponding and alternate angles
geom305 Supplementary and vertical angles
geom500 Vertical angles and linear pairs
geom306 Acute, obtuse, and right triangles
geom307 Scalene, isosceles, and equilateral triangles
geom801 Area of a triangle
geom001 Sum of the angle measures of a triangle
geom908 Solving a triangle: Problem type 1
geom044 Pythagorean Theorem
geom310 Classifying quadrilaterals
geom300 Perimeter of a square or a rectangle
geom339 Perimeter of a polygon
geom217 Finding the side length of a rectangle given its perimeter or area
geom078 Sides of polygons having the same perimeter
geom353 Perimeter of a piecewise rectangular figure
geom350 Distinguishing between area and perimeter
geom351 Areas of rectangles with the same perimeter
geom019 Area of a square or a rectangle
geom340 Area of a piecewise rectangular figure
geom022 Area of a parallelogram
geom023 Area of a trapezoid
geom142 Area between two rectangles
geom344 Area involving rectangles and triangles
geom143 Area and perimeter of a rectangle

geom347 Introduction to circle: diameter, radius, and chord
geom016 Circumference of a circle
geom802 Circumference and area of a circle
geom218 Finding the radius or the diameter of a circle given its circumference
geom838 Circumference ratios
geom301 Perimeter involving rectangles and circles
geom036 Area between two concentric circles
geom302 Area involving rectangles and circles
geom214 Area involving inscribed figures
geom311 Volume of a cube or a rectangular prism
geom505 Volume of a piecewise rectangular prism
geom090 Volume of a triangular prism
geom033 Volume of a pyramid
geom035 Volume of a cylinder
geom092 Rate of filling of a solid
geom086 Volume of a cone
geom841 Volume of a sphere
geom219 Nets of solids
geom345 Surface area of a solid made of unit cubes
geom031 Surface area of a cube or a rectangular prism
geom034 Surface area of a cylinder
geom842 Surface area of a sphere
geom037 Similar polygons
geom038 Similar right triangles
geom337 Indirect measurement

B.3 Beginning Algebra

Arithmetic readiness

arith048 Order of operations: Problem type 1
arith051 Order of operations: Problem type 2
arith056 Factors
arith034 Prime numbers
arith035 Prime number factorization
arith033 Greatest common factor
arith070 Least common multiple
arith240 Word problem with common multiples
arith064 Simple word problem on proportions
arith212 Equivalent fractions
arith067 Reduced fraction
arith092 Ordering fractions

arith618 Addition or subtraction of fractions with the same denominator
arith230 Addition or subtraction of fractions with different denominators
arith100 Fractional part of a circle
arith088 The reciprocal of a number
arith079 Product of a unit fraction and a whole number
arith009 Unit fraction multiplication
arith086 Product of a fraction and a whole number
arith053 Fraction multiplication
arith022 Fraction division
arith095 Word problem with fractions
arith015 Writing an improper fraction as a mixed number
arith619 Writing a mixed number as an improper fraction
arith084 Addition of mixed numbers with same denominator and carry
arith216 Subtraction of mixed numbers with same denominator and borrowing
arith085 Addition or subtraction of mixed numbers with different denominators
arith020 Mixed number multiplication: Problem type 1
arith068 Mixed number division
arith220 Decimal place value
arith221 Rounding decimals
arith087 Converting a decimal to a fraction
arith222 Converting a fraction to a terminating decimal
arith089 Converting a fraction to a repeating decimal
arith223 Converting a mixed number to a decimal
arith082 Multiplication of a decimal by a power of ten
arith017 Multiplication of a decimal by a whole number
arith055 Decimal multiplication: Problem type 1
arith083 Division of a decimal by a power of ten
arith081 Division of a decimal by a whole number
arith019 Decimal division
arith626 Word problem with one decimal operation: Problem type 1
arith627 Word problem with one decimal operation: Problem type 2
arith224 Word problem using decimal addition and multiplication
arith227 Word problem using decimal subtraction and division
arith226 Converting between percentages and decimals
arith090 Converting a percentage to a fraction
arith002 Converting a fraction to a percentage
arith030 Percentage of a whole number
arith069 Writing a ratio as a percentage
arith074 Word problem on percentage: Problem type 1
arith031 Word problem on percentage: Problem type 2
arith225 Word problem on percentage: Problem type 3
arith232 Simple interest
geom039 Supplementary and complementary angles
geom300 Perimeter of a square or a rectangle

geom339 Perimeter of a polygon
geom019 Area of a square or a rectangle
geom801 Area of a triangle
geom340 Area of a piecewise rectangular figure
geom142 Area between two rectangles
geom022 Area of a parallelogram
geom023 Area of a trapezoid
geom802 Circumference and area of a circle
geom302 Area involving rectangles and circles
geom214 Area involving inscribed figures
geom311 Volume of a cube or a rectangular prism
geom035 Volume of a cylinder
arith103 Average of two numbers
mstat028 Mean and median of a data set
mstat003 Mode of a data set
mstat014 Random samples and prediction
mstat024 Interpreting bar graphs
stat801 Computations from circle graphs
stat804 Interpreting circle graphs or pie charts

Real numbers and variables

arith605 Plotting rational numbers on a number line
arith200 Integer addition: Problem type 1
arith108 Integer addition: Problem type 2
arith107 Integer subtraction
arith231 Integer multiplication and division
arith106 Signed fractions addition
arith105 Signed fractions multiplication
arith234 Signed decimal addition
arith233 Introduction to exponents
arith047 Evaluating expressions with exponents: Problem type 1
arith049 Evaluating expressions with exponents: Problem type 2
arith600 Exponents and order of operations
arith016 Square root of a perfect square
arith602 Estimating a square root
arith071 Absolute value of a number
arith104 Operations with absolute value
alge001 Integers and rational numbers
alge002 Integers, rational numbers, and irrational numbers
alge187 Properties of addition
alge188 Properties of real numbers
alge005 Evaluation of a linear expression in two variables

alge004 Evaluation of a polynomial in one variable
alge606 Distributive property, simple
alge604 Distributive Property, advanced
alge607 Combining like terms, basic
alge602 Writing a mathematical expression

Linear equations and inequalities

alge009 Additive property of equality: Problem type 1
alge010 Additive property of equality: Problem type 2
alge266 Additive property of equality: Problem type 3
alge800 Additive property of equality with decimals
alge801 Additive property of equality with fractions
alge008 Multiplicative property of equality: Problem type 1
alge012 Multiplicative property of equality: Problem type 2
alge802 Multiplicative property of equality with fractions
alge803 Using two steps to solve an equation
alge006 Solving a linear equation: Problem type 1
alge208 Solving a linear equation: Problem type 2
alge200 Solving a linear equation: Problem type 3
alge011 Solving a linear equation with several occurrences of the variable: Problem type 1
alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
alge013 Solving a linear equation with several occurrences of the variable: Problem type 3
alge209 Solving a linear equation with several occurrences of the variable: Problem type 4
alge179 Solving a linear equation with several occurrences of the variable: Problem type 5
alge015 Writing an inequality
alge186 Writing a compound inequality
alge019 Solving a linear inequality: Problem type 1
alge020 Solving a linear inequality: Problem type 2
alge021 Solving a linear inequality: Problem type 3
alge207 Solving a linear inequality: Problem type 4
alge017 Graphing a linear inequality on the number line
alge166 Graphing a compound linear inequality on the number line
alge016 Translating sentences into mathematical equations
alge810 Introduction to algebraic symbol manipulation
alge160 Algebraic symbol manipulation
alge014 Solving a word problem using a linear equation: Problem type 1
alge219 Solving a word problem using a linear equation: Problem type 2

alge173 Solving a word problem using a linear equation: Problem type 3
alge704 Solving a word problem using a linear equation: Problem type 4
alge270 Simple absolute value equation
stat803 Finding the value for a new score that will yield a given mean
geom001 Sum of the angle measures of a triangle
geom500 Vertical angles and linear pairs
geom502 Solving triangles: Basic
geom217 Finding the side length of a rectangle given its perimeter or area
geom143 Area and perimeter of a rectangle
alge022 Word problem with linear inequalities

Functions, lines, systems of equations

set001 Set builder notation
set002 Union and intersection of finite sets
set004 Set builder and interval notation
fun001 Function tables
fun002 Graphing integer functions
fun016 Domain and range: Problem type 1
fun010 Vertical line test
alge064 Reading a point in the coordinate plane
alge067 Plotting a point in the coordinate plane
alge197 Graphing a line given the x- and y-intercepts
alge194 Graphing a line given its equation in slope-intercept form
alge195 Graphing a line given its equation in standard form
alge196 Graphing a line through a given point with a given slope
alge198 Graphing a vertical or horizontal line
alge018 Graphing a linear inequality in the plane: Problem type 1
alge225 Graphing a linear inequality in the plane: Problem type 2
alge701 Writing equations and drawing graphs to fit a narrative
alge168 Graphing an equation involving absolute value in the plane
alge066 Solutions to a linear equation in two variables: Problem type 1
alge216 Solutions to a linear equation in two variables: Problem type 2
alge069 Y-intercept of a line
alge210 X- and y-intercepts of a line given the equation in standard form
alge631 Finding the slope of a line given its equation
alge637 Determining the slope of a line given its graph
alge070 Writing an equation of a line given the slope and the y-intercept
alge071 Writing the equation of a line given the slope and a point on the line
alge072 Writing the equation of the line through two given points
alge073 Writing the equations of vertical and horizontal lines through a given point
alge805 Application problem with a linear function: Problem type 1
alge806 Application problem with a linear function: Problem type 2

geom807 Slopes of parallel and perpendicular lines: Problem type 1
geom808 Slopes of parallel and perpendicular lines: Problem type 2
mstat007 Interpreting line graphs
alge263 Interpreting the graphs of two functions
mstat023 Scatterplots and correlation
alge075 Classifying a system of linear equations
alge076 Solving a system of linear equations
alge078 Solving a word problem using a system of linear equations: Problem type 1
alge184 Solving a word problem using a system of linear equations: Problem type 2
alge224 Solving a word problem using a system of linear equations: Problem type 3
alge192 Solving a word problem using a system of linear equations: Problem type 4
alge172 Solving a word problem using a system of linear equations: Problem type 5
alge079 Graphing a system of linear inequalities
pcalc093 Solving a word problem using a system of linear inequalities

Integer exponents and polynomials

alge024 Product rule of exponents
arith042 Writing a positive number without a negative exponent
arith043 Writing a negative number without a negative exponent
alge027 Power rule: Positive exponents
alge025 Power rule: Negative exponents
alge030 Multiplying monomials
alge028 Product rule of exponents in a multivariate monomial
arith029 Ordering numbers with positive exponents
arith024 Ordering numbers with negative exponents
arith036 Scientific notation with positive exponent
arith037 Scientific notation with negative exponent
scinot002 Multiplying and dividing numbers written in scientific notation
alge177 Solving a word problem using an exponential equation: Problem type 1
alge663 Combining like terms, advanced
alge029 Simplifying a polynomial expression
alge033 Multiplying two binomials
alge032 Squaring a binomial
alge180 Multiplying polynomials
alge031 Degree of a multivariate polynomial
alge708 Polynomial long division: Linear divisor
alge709 Polynomial long division: Quadratic divisor
alge039 Factoring a quadratic with leading coefficient 1
alge040 Factoring a quadratic with leading coefficient greater than 1
alge043 Factoring a perfect square
alge265 Factoring a quadratic polynomial in two variables
alge041 Factoring a product of a quadratic trinomial and a monomial

alge624 Factoring a difference of squares
alge042 Factoring with repeated use of the difference of squares formula
alge037 Greatest common factor of two monomials
alge038 Factoring a multivariate polynomial by grouping: Problem type 1
alge181 Factoring a multivariate polynomial by grouping: Problem type 2
alge044 Factoring a sum or difference of two cubes

Rational expressions and proportions

alge053 Multiplying rational expressions: Problem type 1
alge620 Multiplying rational expressions: Problem type 2
alge054 Dividing rational expressions
alge059 Ordering fractions with variables
alge058 Complex fraction: Problem type 1
alge162 Complex Fraction: Problem type 2
alge056 Adding rational expressions with common denominator
alge057 Adding rational expressions
alge055 Least common multiple of two monomials
alge226 Adding rational expressions with different denominators
alge622 Adding and subtracting rational expressions: Problem type 1
alge661 Adding and subtracting rational expressions: Problem type 2
alge710 Simplifying a ratio of polynomials: Problem type 1
alge034 Ratio of multivariate polynomials
alge272 Solving a proportion: Basic
alge271 Solving a proportion: Advanced
alge049 Restriction on variable in a denominator
alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1
alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2
alge206 Solving a rational equation that simplifies to a linear equation: Problem type 3
alge212 Solving a rational equation that simplifies to a quadratic equation: Problem type 1
alge062 Solving a rational equation that simplifies to a quadratic equation: Problem type 2
alge047 Solving a rational equation that simplifies to a quadratic equation: Problem type 3
arith228 Basic word problem on rates
alge218 Word problem on rates
arith612 Word problem involving multiple rates
arith610 Word problem on proportions: Problem type 1
arith611 Word problem on proportions: Problem type 2
alge220 Word problem on inverse proportions
alge175 Word problem on direct variation
alge176 Word problem on inverse variation

geom037 Similar polygons
geom337 Indirect measurement
unit001 Metric distance conversion with whole number values
unit005 Customary unit conversion with whole number values
unit034 Conversion between metric and customary unit systems
unit035 Conversion between compound units, basic problem
unit036 Conversion between compound units, advanced problem
geom036 Area between two concentric circles
geom092 Rate of filling of a solid

Radicals and rational exponents

arith601 Square root of a rational perfect square
alge264 Square root of a perfect square monomial
arith093 Square root simplification
alge080 Simplifying a radical expression: Problem type 1
alge275 Simplifying a radical expression: Problem type 2
arith032 Square root addition
alge084 Simplifying a sum of radical expressions
arith039 Square root multiplication
alge640 Simplifying a product of radical expressions
alge276 Simplifying a product of radical expressions using the distributive property
alge086 Rationalizing the denominator of a radical expression
alge088 Rationalizing the denominator of a radical expression using conjugates
alge089 Solving an equation with radicals: Problem type 1
alge090 Solving an equation with radicals: Problem type 2
alge091 Solving an equation with radicals: Problem type 3
alge182 Solving an equation with radicals: Problem type 4
alge213 Domain of a square root function
geom044 Pythagorean Theorem
alge132 Distance between two points in the plane
arith094 Cube root of an integer
alge273 Simplifying a higher radical: Problem type 1
alge811 Simplifying a higher radical: Problem type 2
alge092 Even root property
alge227 Solving an equation with exponent using the even-root property
alge812 Converting between radical form and exponent form
alge250 Rational exponents: Basic
alge251 Rational exponents: Negative exponents and fractional bases
alge249 Rational exponents: Powers of powers

Complex numbers and quadratic equations

pcalc048 Adding and subtracting complex numbers
pcalc049 Multiplying complex numbers
pcalc050 Dividing complex numbers
pcalc051 Solving a quadratic equation with imaginary roots
pcalc053 Simplifying a power of i
alge681 Solving equations written in factored form
alge045 Finding the roots of a quadratic equation with leading coefficient 1
alge048 Finding the roots of a quadratic equation with leading coefficient greater than 1
alge211 Solving a quadratic equation needing simplification
alge703 Solving a word problem using a quadratic equation with rational roots
alge094 Completing the square
alge095 Solving a quadratic equation using the quadratic formula
alge214 Discriminant of a quadratic equation
alge524 Solving a word problem using a quadratic equation with irrational roots
fun019 Sum, difference, and product of two functions
fun022 Composition of two functions: Basic
Finding the x -intercept(s) and the vertex of a parabola (alge277) Browse: Question, Explanation
alge252 Graphing a parabola: Problem type 1
alge253 Graphing a parabola: Problem type 2
alge254 Graphing a parabola: Problem type 3
alge262 Graphing a simple cubic function

B.4 High School Geometry

Arithmetic and algebra readiness

arith048 Order of operations: Problem type 1
arith051 Order of operations: Problem type 2
arith056 Factors
arith070 Least common multiple
arith212 Equivalent fractions
arith067 Reduced fraction
arith230 Addition or subtraction of fractions with different denominators
arith086 Product of a fraction and a whole number
arith053 Fraction multiplication
arith022 Fraction division
arith015 Writing an improper fraction as a mixed number
arith220 Decimal place value
arith221 Rounding decimals
arith030 Percentage of a whole number

arith071 Absolute value of a number
arith200 Integer addition: Problem type 1
arith108 Integer addition: Problem type 2
arith107 Integer subtraction
arith231 Integer multiplication and division
alge005 Evaluation of a linear expression in two variables
alge004 Evaluation of a polynomial in one variable
alge016 Translating sentences into mathematical equations
alge606 Distributive property, simple
alge607 Combining like terms, basic
alge007 Additive property of equality: Problem type 3
alge012 Multiplicative property of equality: Problem type 2
alge006 Solving a linear equation: Problem type 1
alge208 Solving a linear equation: Problem type 2
alge011 Solving a linear equation with several occurrences of the variable: Problem type 1
alge019 Solving a linear inequality: Problem type 1
alge017 Graphing a linear inequality on the number line
alge166 Graphing a compound linear inequality on the number line
alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1
alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2
arith047 Evaluating expressions with exponents: Problem type 1
arith016 Square root of a perfect square
arith093 Square root simplification
alge086 Rationalizing the denominator of a radical expression

Plane geometry

glogic001 Conditional statements and negations
glogic005 The converse, inverse, and contrapositive of a conditional statement
glogic008 Conditional statements and deductive reasoning
geom151 Measuring an angle with the protractor
geom152 Drawing an angle with the protractor
geom303 Acute, obtuse, and right angles
geom039 Supplementary and complementary angles
geom304 Corresponding and alternate angles
geom800 Identifying linear pairs and vertical angles
geom500 Vertical angles and linear pairs
geom503 Angles and parallel lines
geom159 Constructing congruent angles
geom158 Constructing an angle bisector
geom516 Angle addition and angle bisectors
geom154 Constructing the perpendicular bisector of a line segment

geom150 Constructing a pair of perpendicular lines
geom157 Constructing a pair of parallel lines
geom616 Introduction to proofs: Justifying statements
geom614 Proofs involving segment congruence
geom611 Congruent angles
geom610 Angles and parallel lines
geom306 Acute, obtuse, and right triangles
geom307 Scalene, isosceles, and equilateral triangles
geom001 Sum of the angle measures of a triangle
geom809 Relationship between angle measures and side lengths of a triangle
geom504 Triangle inequality
geom507 Right triangles and geometric mean
geom520 Identifying and naming congruent triangles
geom502 Solving triangles: Basic
geom908 Solving a triangle: Problem type 1
geom309 Solving a triangle: Problem type 2
geom044 Pythagorean Theorem
geom068 Computing an area using the Pythagorean Theorem
geom617 Congruent triangles: Problem type 1
geom612 Congruent triangles: Problem type 2
geom613 Congruent triangles: Problem type 3
proof by contradiction Indirect proof
geom310 Classifying quadrilaterals
geom523 Classifying quadrilaterals: Advanced problem
geom524 Hierarchy of quadrilateral figures
geom528 Properties of parallelograms: Problem type 1
geom527 Properties of parallelograms: Problem type 2
geom522 Interior angles of convex polygons
geom343 Identifying central angles, inscribed angles, arcs, chords, and tangents of a circle
geom514 Inscribed angles of a circle
geom515 Tangents of a circle
geom512 Central angles and inscribed angles of a circle
geom511 Lengths of chords, secants, and tangents
geom513 Angles of intersecting secants and tangents
geom037 Similar polygons
geom510 Triangles and parallel lines
geom038 Similar right triangles
geom337 Indirect measurement
geom508 Length, area, and volume ratios of similar figures

Lengths, areas, and volumes

geom525 Computing distances on the number line
geom526 Midpoint of a number line segment
geom521 Segment addition and midpoints
geom300 Perimeter of a square or a rectangle
geom339 Perimeter of a polygon
geom078 Sides of polygons having the same perimeter
geom019 Area of a square or a rectangle
geom143 Area and perimeter of a rectangle
geom340 Area of a piecewise rectangular figure
geom801 Area of a triangle
geom022 Area of a parallelogram
geom023 Area of a trapezoid
geom142 Area between two rectangles
geom213 Area of a regular polygon
geom802 Circumference and area of a circle
geom301 Perimeter involving rectangles and circles
geom838 Circumference ratios
geom805 Arc length and area of a sector of a circle
geom036 Area between two concentric circles
geom302 Area involving rectangles and circles
geom211 Area involving rectangles and circles: Advanced problem
mstat011 Area as probability
geom311 Volume of a cube or a rectangular prism
geom505 Volume of a piecewise rectangular prism
geom090 Volume of a triangular prism
geom033 Volume of a pyramid
geom035 Volume of a cylinder
geom086 Volume of a cone
geom092 Rate of filling of a solid
geom133 Ratio of volumes
geom841 Volume of a sphere
geom031 Surface area of a cube or a rectangular prism
geom091 Surface area of a triangular prism
geom034 Surface area of a cylinder
geom338 Surface area involving prisms or cylinders
geom842 Surface area of a sphere

Analytic geometry

alge067 Plotting a point in the coordinate plane
alge191 Midpoint of a line segment in the plane
alge132 Distance between two points in the plane
alge197 Graphing a line given the x- and y-intercepts

alge194 Graphing a line given its equation in slope-intercept form
alge210 X- and y-intercepts of a line given the equation in standard form
alge195 Graphing a line given its equation in standard form
alge196 Graphing a line through a given point with a given slope
alge637 Determining the slope of a line given its graph
alge631 Finding the slope of a line given its equation
geom807 Slopes of parallel and perpendicular lines: Problem type 1
geom808 Slopes of parallel and perpendicular lines: Problem type 2
alge070 Writing an equation of a line given the slope and the y-intercept
alge071 Writing the equation of a line given the slope and a point on the line
alge072 Writing the equation of the line through two given points
pcalc605 Graphing a circle given its equation in standard form
pcalc065 Writing an equation of a circle given its center and a point on the circle
pcalc066 Writing an equation of a circle given the endpoints of a diameter

Transformations, trigonometry, and vectors

geom330 Translation of a polygon
geom331 Coordinates of translated points
geom332 Reflection of a polygon over a vertical or horizontal line
geom333 Coordinates of points reflected over an axis
geom334 Drawing lines of symmetry
geom335 Rotation of a figure about the origin
geom336 Dilation
geom506 Special right triangles
pcalc600 Sine, cosine, and tangent ratios
pcalc601 Using a trigonometric ratio to find a side length in a right triangle
pcalc602 Using a trigonometric ratio to find an angle measure in a right triangle
geom212 Circles inscribed in and circumscribed around regular polygons
pcalc739 Multiplication of a vector by a scalar
pcalc725 Linear combination of vectors: Algebraic approach
pcalc726 Linear combination of vectors: Geometric approach
pcalc060 Magnitude of a vector
vector002 Calculating the magnitude and direction of a vector
vector005 Finding the components of a vector
pcalc063 Translation of a vector

B.5 Intermediate Algebra

Real numbers and linear equations

arith605 Plotting rational numbers on a number line
arith071 Absolute value of a number
arith104 Operations with absolute value
arith106 Signed fractions addition
arith105 Signed fractions multiplication
arith234 Signed decimal addition
arith047 Evaluating expressions with exponents: Problem type 1
arith049 Evaluating expressions with exponents: Problem type 2
alge005 Evaluation of a linear expression in two variables
alge004 Evaluation of a polynomial in one variable
arith600 Exponents and order of operations
arith016 Square root of a perfect square
alge001 Integers and rational numbers
alge002 Integers, rational numbers, and irrational numbers
alge602 Writing a mathematical expression
alge016 Translating sentences into mathematical equations
alge015 Writing an inequality
alge186 Writing a compound inequality
alge606 Distributive property, simple
alge604 Distributive Property, advanced
alge607 Combining like terms, basic
alge663 Combining like terms, advanced
alge187 Properties of addition
alge188 Properties of real numbers
alge010 Additive property of equality: Problem type 2
alge266 Additive property of equality: Problem type 3
alge802 Multiplicative property of equality with fractions
alge008 Multiplicative property of equality: Problem type 1
alge012 Multiplicative property of equality: Problem type 2
alge006 Solving a linear equation: Problem type 1
alge208 Solving a linear equation: Problem type 2
alge200 Solving a linear equation: Problem type 3
alge011 Solving a linear equation with several occurrences of the variable: Problem type 1
alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
alge013 Solving a linear equation with several occurrences of the variable: Problem type 3
alge209 Solving a linear equation with several occurrences of the variable: Problem type 4
alge179 Solving a linear equation with several occurrences of the variable: Problem type 5
alge810 Introduction to algebraic symbol manipulation
alge160 Algebraic symbol manipulation

alge019 Solving a linear inequality: Problem type 1
alge020 Solving a linear inequality: Problem type 2
alge021 Solving a linear inequality: Problem type 3
alge207 Solving a linear inequality: Problem type 4
alge017 Graphing a linear inequality on the number line
alge166 Graphing a compound linear inequality on the number line
alge014 Solving a word problem using a linear equation: Problem type 1
alge219 Solving a word problem using a linear equation: Problem type 2
alge173 Solving a word problem using a linear equation: Problem type 3
alge704 Solving a word problem using a linear equation: Problem type 4
alge022 Word problem with linear inequalities
mstat014 Random samples and prediction
arith232 Simple interest
stat801 Computations from circle graphs
arith074 Word problem on percentage: Problem type 1
arith031 Word problem on percentage: Problem type 2
arith225 Word problem on percentage: Problem type 3
stat803 Finding the value for a new score that will yield a given mean
geom300 Perimeter of a square or a rectangle
geom078 Sides of polygons having the same perimeter
geom019 Area of a square or a rectangle
geom217 Finding the side length of a rectangle given its perimeter or area
geom143 Area and perimeter of a rectangle
geom311 Volume of a cube or a rectangular prism
geom802 Circumference and area of a circle
geom036 Area between two concentric circles
geom031 Surface area of a cube or a rectangular prism
geom034 Surface area of a cylinder
geom035 Volume of a cylinder
geom092 Rate of filling of a solid
geom500 Vertical angles and linear pairs
geom502 Solving triangles: Basic
alge270 Simple absolute value equation
alge103 Solving an equation involving absolute value: Basic
alge167 Solving an equation involving absolute value: Advanced
alge169 Solving an inequality involving absolute value
alge170 Solving an inequality involving absolute value: Basic

Graphs and linear functions

alge064 Reading a point in the coordinate plane
alge067 Plotting a point in the coordinate plane
alge066 Solutions to a linear equation in two variables: Problem type 1

alge216 Solutions to a linear equation in two variables: Problem type 2
alge197 Graphing a line given the x- and y-intercepts
alge194 Graphing a line given its equation in slope-intercept form
alge195 Graphing a line given its equation in standard form
alge196 Graphing a line through a given point with a given slope
alge637 Determining the slope of a line given its graph
alge198 Graphing a vertical or horizontal line
alge210 X- and y-intercepts of a line given the equation in standard form
alge631 Finding the slope of a line given its equation
alge070 Writing an equation of a line given the slope and the y-intercept
alge071 Writing the equation of a line given the slope and a point on the line
alge072 Writing the equation of the line through two given points
alge073 Writing the equations of vertical and horizontal lines through a given point
alge701 Writing equations and drawing graphs to fit a narrative
alge805 Application problem with a linear function: Problem type 1
alge806 Application problem with a linear function: Problem type 2
geom807 Slopes of parallel and perpendicular lines: Problem type 1
geom808 Slopes of parallel and perpendicular lines: Problem type 2
alge018 Graphing a linear inequality in the plane: Problem type 1
alge225 Graphing a linear inequality in the plane: Problem type 2
set001 Set builder notation
set002 Union and intersection of finite sets
set004 Set builder and interval notation
set005 Union and intersection of intervals
fun001 Function tables
fun002 Graphing integer functions
fun016 Domain and range: Problem type 1
fun004 Domain and range: Problem type 2
fun010 Vertical line test

Systems of linear equations

alge075 Classifying a system of linear equations
alge076 Solving a system of linear equations
alge077 Creating an inconsistent system of linear equations
alge263 Interpreting the graphs of two functions
alge079 Graphing a system of linear inequalities
pcalc095 Linear programming
pcalc094 Solving a word problem using linear programming
alge078 Solving a word problem using a system of linear equations: Problem type 1
alge184 Solving a word problem using a system of linear equations: Problem type 2
alge224 Solving a word problem using a system of linear equations: Problem type 3
alge192 Solving a word problem using a system of linear equations: Problem type 4

alge172 Solving a word problem using a system of linear equations: Problem type 5
pcalc093 Solving a word problem using a system of linear inequalities
pcalc709 Addition of matrices and multiplication of a matrix by a scalar
pcalc042 Finding the determinant of a 2x2 matrix
pcalc043 Finding the determinant of a 3x3 matrix
pcalc045 Cramer's rule: Problem type 1
pcalc047 Cramer's rule: Problem type 2
pcalc712 Gauss-Jordan elimination with a 2x2 matrix
pcalc046 Augmented matrix and solution set of a system of linear equations

Exponents and polynomials

alge024 Product rule of exponents
alge030 Multiplying monomials
alge027 Power rule: Positive exponents
arith042 Writing a positive number without a negative exponent
arith043 Writing a negative number without a negative exponent
alge025 Power rule: Negative exponents
alge028 Product rule of exponents in a multivariate monomial
arith029 Ordering numbers with positive exponents
arith024 Ordering numbers with negative exponents
arith036 Scientific notation with positive exponent
arith037 Scientific notation with negative exponent
scinot002 Multiplying and dividing numbers written in scientific notation
alge031 Degree of a multivariate polynomial
alge029 Simplifying a polynomial expression
alge033 Multiplying two binomials
alge032 Squaring a binomial
alge180 Multiplying polynomials
alge708 Polynomial long division: Linear divisor
alge709 Polynomial long division: Quadratic divisor
pcalc117 Synthetic division
alge039 Factoring a quadratic with leading coefficient 1
alge040 Factoring a quadratic with leading coefficient greater than 1
alge265 Factoring a quadratic polynomial in two variables
alge043 Factoring a perfect square
alge041 Factoring a product of a quadratic trinomial and a monomial
alge045 Finding the roots of a quadratic equation with leading coefficient 1
alge048 Finding the roots of a quadratic equation with leading coefficient greater than 1
alge211 Solving a quadratic equation needing simplification
alge681 Solving equations written in factored form
alge046 Roots of a product of polynomials

alge703 Solving a word problem using a quadratic equation with rational roots
alge163 Writing a quadratic equation given the roots and the leading coefficient
alge624 Factoring a difference of squares
alge042 Factoring with repeated use of the difference of squares formula
alge044 Factoring a sum or difference of two cubes
alge037 Greatest common factor of two monomials
alge055 Least common multiple of two monomials
alge038 Factoring a multivariate polynomial by grouping: Problem type 1
alge181 Factoring a multivariate polynomial by grouping: Problem type 2

Rational expressions and functions

alge053 Multiplying rational expressions: Problem type 1
alge620 Multiplying rational expressions: Problem type 2
alge054 Dividing rational expressions
alge058 Complex fraction: Problem type 1
alge162 Complex Fraction: Problem type 2
alge056 Adding rational expressions with common denominator
alge057 Adding rational expressions
alge226 Adding rational expressions with different denominators
alge622 Adding and subtracting rational expressions: Problem type 1
alge661 Adding and subtracting rational expressions: Problem type 2
alge034 Ratio of multivariate polynomials
alge710 Simplifying a ratio of polynomials: Problem type 1
alge682 Simplifying a ratio of polynomials: Problem type 2
alge049 Restriction on variable in a denominator
alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1
alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2
alge206 Solving a rational equation that simplifies to a linear equation: Problem type 3
alge212 Solving a rational equation that simplifies to a quadratic equation: Problem type 1
alge062 Solving a rational equation that simplifies to a quadratic equation: Problem type 2
alge047 Solving a rational equation that simplifies to a quadratic equation: Problem type 3
pcalc108 Sketching the graph of a rational function: Problem type 1
alge218 Word problem on rates
arith228 Basic word problem on rates
alge271 Solving a proportion: Advanced
arith610 Word problem on proportions: Problem type 1
arith611 Word problem on proportions: Problem type 2
arith612 Word problem involving multiple rates
alge059 Ordering fractions with variables

alge220 Word problem on inverse proportions
geom037 Similar polygons
alge175 Word problem on direct variation
alge176 Word problem on inverse variation
geom133 Ratio of volumes
geom138 Circumference ratios

Radicals and quadratic equations

arith601 Square root of a rational perfect square
arith093 Square root simplification
alge264 Square root of a perfect square monomial
alge080 Simplifying a radical expression: Problem type 1
alge275 Simplifying a radical expression: Problem type 2
arith032 Square root addition
alge084 Simplifying a sum of radical expressions
arith039 Square root multiplication
alge640 Simplifying a product of radical expressions
alge082 Simplifying a product of radical expressions: Problem type 3
alge276 Simplifying a product of radical expressions using the distributive property
alge086 Rationalizing the denominator of a radical expression
alge088 Rationalizing the denominator of a radical expression using conjugates
geom044 Pythagorean Theorem
alge089 Solving an equation with radicals: Problem type 1
alge090 Solving an equation with radicals: Problem type 2
alge091 Solving an equation with radicals: Problem type 3
alge182 Solving an equation with radicals: Problem type 4
arith094 Cube root of an integer
alge273 Simplifying a higher radical: Problem type 1
alge811 Simplifying a higher radical: Problem type 2
alge092 Even root property
alge093 Odd root property
alge227 Solving an equation with exponent using the even-root property
alge228 Solving an equation with exponent using the odd-root property
alge250 Rational exponents: Basic
alge251 Rational exponents: Negative exponents and fractional bases
alge249 Rational exponents: Powers of powers
alge812 Converting between radical form and exponent form
alge230 Solving an equation with positive rational exponent
alge231 Solving an equation with negative rational exponent
pcalc048 Adding and subtracting complex numbers
pcalc049 Multiplying complex numbers
pcalc050 Dividing complex numbers

pcalc053 Simplifying a power of i
alge094 Completing the square
alge095 Solving a quadratic equation using the quadratic formula
pcalc051 Solving a quadratic equation with imaginary roots
alge214 Discriminant of a quadratic equation
alge193 Discriminant of a quadratic equation with parameter
alge524 Solving a word problem using a quadratic equation with irrational roots
alge771 Solving a quadratic inequality
alge252 Graphing a parabola: Problem type 1
alge253 Graphing a parabola: Problem type 2
alge254 Graphing a parabola: Problem type 3
Finding the x -intercept(s) and the vertex of a parabola (alge277) Browse: Question, Explanation
alge255 Graphing a quadratic inequality

Functions and logarithms

fun019 Sum, difference, and product of two functions
alge213 Domain of a square root function
alge185 Vertical translation of the graph of a function
fun020 Vertical and horizontal translations of the graph of a function
fun011 Horizontal line test
fun012 Inverse functions: Basic
alge130 Inverse functions: Advanced
fun021 Composition of two functions: Domain and range
fun022 Composition of two functions: Basic
alge129 Composition of two functions: Advanced
fun023 Piecewise-defined functions
alge108 Exponential and logarithmic equations
alge232 Evaluating a logarithmic expression
pcalc708 Basic properties of logarithms
alge107 Change of base for logarithms
alge233 Solving a logarithmic equation: Problem type 1
alge113 Solving a logarithmic equation: Problem type 2
alge111 Solving an exponential equation: Problem type 1
alge112 Solving an exponential equation: Problem type 2
alge177 Solving a word problem using an exponential equation: Problem type 1
alge178 Solving a word problem using an exponential equation: Problem type 2
pcalc737 Solving a word problem using an exponential equation: Problem type 3
alge262 Graphing a simple cubic function
alge168 Graphing an equation involving absolute value in the plane
alge712 Sketching the graph of an exponential function: Basic
pcalc103 Sketching the graph of an exponential function: Advanced

pcalc104 Sketching the graph of a logarithmic function
pcalc102 Translating the graph of a logarithmic or exponential function

Conic sections and sequences

alge191 Midpoint of a line segment in the plane
alge132 Distance between two points in the plane
pcalc067 Graphing a parabola with a horizontal or a vertical axis
pcalc068 Writing an equation of a parabola given the vertex and the focus
pcalc069 Finding the focus of a parabola
pcalc605 Graphing a circle given its equation in standard form
pcalc064 Graphing a circle given its equation in general form
pcalc065 Writing an equation of a circle given its center and a point on the circle
pcalc066 Writing an equation of a circle given the endpoints of a diameter
pcalc070 Graph of an ellipse centered at the origin
pcalc734 Graphing an ellipse given its equation in standard form
pcalc071 Graphing an ellipse given its equation in general form
pcalc075 Graph of a hyperbola centered at the origin
pcalc735 Graphing a hyperbola given its equation in standard form
pcalc076 Graphing a hyperbola given its equation in general form
pcalc098 Solving a system of nonlinear equations
pcalc096 Graphing a system of nonlinear inequalities: Problem type 1
pcalc097 Graphing a system of nonlinear inequalities: Problem type 2
pcalc736 Classifying conics given their equations
pcalc080 Finding the first terms of a sequence
pcalc715 Arithmetic sequences
pcalc717 Geometric sequences
pcalc718 Sum of the first n terms of an arithmetic sequence
pcalc719 Sum of the first n terms of a geometric sequence
pcalc720 Sum of a geometric series
pcalc082 Factorial expressions
pcalc087 Binomial formula

B.6 Trigonometry

Algebra review

alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
alge013 Solving a linear equation with several occurrences of the variable: Problem type 3

alge209 Solving a linear equation with several occurrences of the variable: Problem type 4

alge179 Solving a linear equation with several occurrences of the variable: Problem type 5

alge173 Solving a word problem using a linear equation: Problem type 3

alge014 Solving a word problem using a linear equation: Problem type 1

alge020 Solving a linear inequality: Problem type 2

alge021 Solving a linear inequality: Problem type 3

alge076 Solving a system of linear equations

alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1

alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2

alge206 Solving a rational equation that simplifies to a linear equation: Problem type 3

alge029 Simplifying a polynomial expression

alge030 Multiplying monomials

alge180 Multiplying polynomials

alge705 Factoring a quadratic with leading coefficient 1

alge040 Factoring a quadratic with leading coefficient greater than 1

alge624 Factoring a difference of squares

alge024 Product rule of exponents

alge027 Power rule: Positive exponents

alge080 Simplifying a radical expression: Problem type 1

alge086 Rationalizing the denominator of a radical expression

alge250 Rational exponents: Basic

pcalc048 Adding and subtracting complex numbers

pcalc049 Multiplying complex numbers

set004 Set builder and interval notation

set005 Union and intersection of intervals

fun018 Introduction to functions: Notation and graphs

fun016 Domain and range: Problem type 1

fun010 Vertical line test

fun019 Sum, difference, and product of two functions

alge185 Vertical translation of the graph of a function

fun020 Vertical and horizontal translations of the graph of a function

fun022 Composition of two functions: Basic

fun012 Inverse functions: Basic

alge194 Graphing a line given its equation in slope-intercept form

alge195 Graphing a line given its equation in standard form

alge071 Writing the equation of a line given the slope and a point on the line

alge196 Graphing a line through a given point with a given slope

alge631 Finding the slope of a line given its equation

alge637 Determining the slope of a line given its graph

alge072 Writing the equation of the line through two given points

alge073 Writing the equations of vertical and horizontal lines through a given point

alge198 Graphing a vertical or horizontal line

alge045 Finding the roots of a quadratic equation with leading coefficient 1
alge048 Finding the roots of a quadratic equation with leading coefficient greater than 1
alge094 Completing the square
alge095 Solving a quadratic equation using the quadratic formula
alge252 Graphing a parabola: Problem type 1
alge253 Graphing a parabola: Problem type 2
alge710 Simplifying a ratio of polynomials: Problem type 1
alge681 Solving equations written in factored form
pcalc053 Simplifying a power of i

Right triangle trigonometry and trigonometric values

pcalc001 Converting between a decimal degree and degrees-minutes-seconds
pcalc002 Converting between degree and radian measure
pcalc003 Coterminal angles
pcalc005 Arc length and central angle measure
pcalc006 Sketching an angle in standard position
geom506 Special right triangles
pcalc600 Sine, cosine, and tangent ratios
pcalc601 Using a trigonometric ratio to find a side length in a right triangle
pcalc602 Using a trigonometric ratio to find an angle measure in a right triangle
pcalc007 Common angles and trigonometric functions
pcalc008 Finding trigonometric ratios given a right triangle
pcalc011 Finding values of trigonometric functions given information about an angle: Problem type 1
pcalc012 Finding values of trigonometric functions given information about an angle: Problem type 2
pcalc013 Finding values of trigonometric functions given information about an angle: Problem type 3

Trigonometric functions

pcalc107 Sketching the graph of a sine or cosine function: Problem type 1
pcalc106 Sketching the graph of a sine or cosine function: Problem type 2
pcalc014 Sketching the graph of a sine or cosine function: Problem type 3
pcalc017 Sketching the graph of a secant or cosecant function
pcalc105 Sketching the graph of a tangent or cotangent function: Problem type 1
pcalc015 Sketching the graph of a tangent or cotangent function: Problem type 2
pcalc016 Values of inverse trigonometric functions
pcalc018 Composition of a trigonometric function and an inverse trigonometric function: Problem type 1

pcalc019 Composition of a trigonometric function and an inverse trigonometric function: Problem type 2

pcalc036 Composition of a trigonometric function and an inverse trigonometric function: Problem type 3

Trigonometric identities and equations

pcalc126 Cofunction identities

pcalc029 Sum and difference identities

pcalc124 Product-to-sum and sum-to-product identities

pcalc030 Double-angle identities

pcalc110 Verifying a trigonometric identity

pcalc034 Proving a trigonometric identity: Problem type 1

pcalc435 Proving trigonometric identities: Problem type 2

pcalc400 Proving trigonometric identities: Problem type 3

pcalc401 Proving trigonometric identities: Problem type 4

pcalc020 Solving a basic trigonometric equation involving sine or cosine

pcalc021 Solving a basic trigonometric equation involving tangent, cotangent, secant, or cosecant

pcalc022 Solving a trigonometric equation involving a squared function

pcalc024 Solving a trigonometric equation involving more than one function

pcalc025 Solving a trigonometric equation involving an angle multiplied by a constant

pcalc026 Solving a trigonometric equation using sum and difference identities

pcalc027 Solving a trigonometric equation using double-angle identities

pcalc028 Solving a trigonometric equation using half-angle identities

pcalc127 Solving a trigonometric inequality

Applications of trigonometry

pcalc031 Solving a triangle with the law of sines: Problem type 1

pcalc032 Solving a triangle with the law of sines: Problem type 2

pcalc033 Solving a triangle with the law of cosines

pcalc060 Magnitude of a vector

pcalc729 Unit vectors

pcalc739 Multiplication of a vector by a scalar

pcalc063 Translation of a vector

pcalc725 Linear combination of vectors: Algebraic approach

pcalc726 Linear combination of vectors: Geometric approach

vector002 Calculating the magnitude and direction of a vector

vector005 Finding the components of a vector

pcalc727 Solving a word problem using vectors

pcalc728 Dot product

pcalc730 Finding the angle between two vectors
 vector006 Finding the component of a vector along another vector
 pcalc055 Plotting a point in polar coordinates
 pcalc056 Converting rectangular coordinates to polar coordinates
 pcalc057 Converting polar coordinates to rectangular coordinates
 pcalc058 Converting an equation written in rectangular coordinates to one written in polar form
 pcalc059 Converting an equation written in polar form to one written in rectangular coordinates
 pcalc052 Writing a complex number in trigonometric form
 pcalc054 De Moivre's theorem
 pcalc724 Finding the n th roots of a number

B.7 PreCalculus without Trigonometry / College Algebra

Algebra review

alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
 alge013 Solving a linear equation with several occurrences of the variable: Problem type 3
 alge209 Solving a linear equation with several occurrences of the variable: Problem type 4
 alge179 Solving a linear equation with several occurrences of the variable: Problem type 5
 alge173 Solving a word problem using a linear equation: Problem type 3
 alge014 Solving a word problem using a linear equation: Problem type 1
 alge219 Solving a word problem using a linear equation: Problem type 2
 alge704 Solving a word problem using a linear equation: Problem type 4
 alge020 Solving a linear inequality: Problem type 2
 alge021 Solving a linear inequality: Problem type 3
 alge207 Solving a linear inequality: Problem type 4
 alge103 Solving an equation involving absolute value: Basic
 alge167 Solving an equation involving absolute value: Advanced
 alge170 Solving an inequality involving absolute value: Basic
 alge169 Solving an inequality involving absolute value
 alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1
 alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2
 alge206 Solving a rational equation that simplifies to a linear equation: Problem type 3
 alge029 Simplifying a polynomial expression
 alge030 Multiplying monomials
 alge180 Multiplying polynomials

alge705 Factoring a quadratic with leading coefficient 1
alge040 Factoring a quadratic with leading coefficient greater than 1
alge041 Factoring a product of a quadratic trinomial and a monomial
alge624 Factoring a difference of squares
alge042 Factoring with repeated use of the difference of squares formula
alge044 Factoring a sum or difference of two cubes
alge038 Factoring a multivariate polynomial by grouping: Problem type 1
alge024 Product rule of exponents
alge027 Power rule: Positive exponents
alge025 Power rule: Negative exponents
alge028 Product rule of exponents in a multivariate monomial
scinot001 Converting between decimal numbers and numbers written in scientific notation
scinot002 Multiplying and dividing numbers written in scientific notation
alge080 Simplifying a radical expression: Problem type 1
alge084 Simplifying a sum of radical expressions
alge640 Simplifying a product of radical expressions
alge086 Rationalizing the denominator of a radical expression
alge088 Rationalizing the denominator of a radical expression using conjugates
alge089 Solving an equation with radicals: Problem type 1
alge091 Solving an equation with radicals: Problem type 3
alge182 Solving an equation with radicals: Problem type 4
alge250 Rational exponents: Basic
alge251 Rational exponents: Negative exponents and fractional bases
alge249 Rational exponents: Powers of powers

Functions and graphs

set004 Set builder and interval notation
set005 Union and intersection of intervals
fun018 Introduction to functions: Notation and graphs
fun016 Domain and range: Problem type 1
fun004 Domain and range: Problem type 2
fun010 Vertical line test
pcalc114 Even and odd functions
fun019 Sum, difference, and product of two functions
alge185 Vertical translation of the graph of a function
fun020 Vertical and horizontal translations of the graph of a function
fun023 Piecewise-defined functions
alge194 Graphing a line given its equation in slope-intercept form
alge195 Graphing a line given its equation in standard form
alge071 Writing the equation of a line given the slope and a point on the line
alge196 Graphing a line through a given point with a given slope

alge631 Finding the slope of a line given its equation
alge637 Determining the slope of a line given its graph
alge072 Writing the equation of the line through two given points
alge073 Writing the equations of vertical and horizontal lines through a given point
alge198 Graphing a vertical or horizontal line
geom807 Slopes of parallel and perpendicular lines: Problem type 1
geom808 Slopes of parallel and perpendicular lines: Problem type 2
alge701 Writing equations and drawing graphs to fit a narrative
alge018 Graphing a linear inequality in the plane: Problem type 1
alge225 Graphing a linear inequality in the plane: Problem type 2
alge168 Graphing an equation involving absolute value in the plane
fun021 Composition of two functions: Domain and range
fun022 Composition of two functions: Basic
alge129 Composition of two functions: Advanced
fun011 Horizontal line test
fun012 Inverse functions: Basic
alge130 Inverse functions: Advanced

Polynomial and rational functions

alge045 Finding the roots of a quadratic equation with leading coefficient 1
alge048 Finding the roots of a quadratic equation with leading coefficient greater than 1
alge094 Completing the square
alge095 Solving a quadratic equation using the quadratic formula
alge707 Finding the discriminant of a quadratic equation
alge703 Solving a word problem using a quadratic equation with rational roots
alge524 Solving a word problem using a quadratic equation with irrational roots
alge771 Solving a quadratic inequality
alge252 Graphing a parabola: Problem type 1
alge253 Graphing a parabola: Problem type 2
alge254 Graphing a parabola: Problem type 3
alge255 Graphing a quadratic inequality
alge708 Polynomial long division: Linear divisor
alge709 Polynomial long division: Quadratic divisor
pcalc117 Synthetic division
pcalc118 Remainder theorem
alge710 Simplifying a ratio of polynomials: Problem type 1
pcalc092 Partial fraction decomposition
alge681 Solving equations written in factored form
alge211 Solving a quadratic equation needing simplification
pcalc700 Finding a polynomial of a given degree with given zeros
pcalc123 Using a given zero to write a polynomial as a product of linear factors

pcalc701 Finding all potential zeros of a polynomial given by the rational zeros theorem
pcalc702 Using the rational zeros theorem to find zeros of a polynomial
pcalc704 Solving a word problem involving a polynomial of degree 3
pcalc048 Adding and subtracting complex numbers
pcalc049 Multiplying complex numbers
pcalc050 Dividing complex numbers
pcalc053 Simplifying a power of i
pcalc051 Solving a quadratic equation with imaginary roots
pcalc705 N zeros theorem and conjugate zeros theorem
pcalc703 Using the conjugate zeros theorem to find all zeros of a polynomial
pcalc115 Solving a word problem by finding a local extremum of a polynomial function
pcalc738 Inferring properties of a polynomial function from its graph
pcalc108 Sketching the graph of a rational function: Problem type 1
pcalc109 Sketching the graph of a rational function: Problem type 2
pcalc706 Choosing the form of a rational function given its graph

Exponential and logarithmic functions

alge108 Exponential and logarithmic equations
alge232 Evaluating a logarithmic expression
pcalc708 Basic properties of logarithms
alge107 Change of base for logarithms
alge233 Solving a logarithmic equation: Problem type 1
alge113 Solving a logarithmic equation: Problem type 2
alge111 Solving an exponential equation: Problem type 1
alge112 Solving an exponential equation: Problem type 2
alge177 Solving a word problem using an exponential equation: Problem type 1
alge178 Solving a word problem using an exponential equation: Problem type 2
pcalc737 Solving a word problem using an exponential equation: Problem type 3
alge712 Sketching the graph of an exponential function: Basic
pcalc103 Sketching the graph of an exponential function: Advanced
pcalc104 Sketching the graph of a logarithmic function
pcalc102 Translating the graph of a logarithmic or exponential function

Systems of linear equations and matrices

alge075 Classifying a system of linear equations
alge076 Solving a system of linear equations
alge077 Creating an inconsistent system of linear equations
pcalc099 Consistency and independence of a system of linear equations
alge078 Solving a word problem using a system of linear equations: Problem type 1
alge184 Solving a word problem using a system of linear equations: Problem type 2

alge224 Solving a word problem using a system of linear equations: Problem type 3
alge192 Solving a word problem using a system of linear equations: Problem type 4
alge172 Solving a word problem using a system of linear equations: Problem type 5
alge079 Graphing a system of linear inequalities
pcalc093 Solving a word problem using a system of linear inequalities
pcalc095 Linear programming
pcalc094 Solving a word problem using linear programming
pcalc709 Addition of matrices and multiplication of a matrix by a scalar
pcalc039 Multiplication of matrices: Basic
pcalc710 Multiplication of matrices: Advanced
pcalc042 Finding the determinant of a 2x2 matrix
pcalc043 Finding the determinant of a 3x3 matrix
pcalc040 Finding the inverse of a 2x2 matrix
pcalc041 Finding the inverse of a 3x3 matrix
pcalc045 Cramer's rule: Problem type 1
pcalc047 Cramer's rule: Problem type 2
pcalc711 Using the inverse of a matrix to solve a system of linear equations
pcalc712 Gauss-Jordan elimination with a 2x2 matrix
pcalc046 Augmented matrix and solution set of a system of linear equations

Sequences, series, and probability

pcalc080 Finding the first terms of a sequence
pcalc713 Arithmetic and geometric sequences: Identifying and writing in standard form
pcalc715 Arithmetic sequences
pcalc717 Geometric sequences
pcalc718 Sum of the first n terms of an arithmetic sequence
pcalc719 Sum of the first n terms of a geometric sequence
pcalc720 Sum of a geometric series
pcalc082 Factorial expressions
pcalc088 Permutations and combinations: Problem type 1
pcalc089 Permutations and combinations: Problem type 2
pcalc090 Permutations and combinations: Problem type 3
pcalc087 Binomial formula
stat117 Probabilities of draws with replacement
stat118 Probabilities of draws without replacement
stat119 Venn diagrams: Two events
stat101 Venn diagrams: Word problems
stat106 Outcomes and event probability
stat112 Die rolling
stat114 Probability of intersection or union: Word problems
stat115 Independent events: Basic
stat120 Probability of union: Basic

stat109 Intersection and conditional probability

Conic sections

pcalc067 Graphing a parabola with a horizontal or a vertical axis
pcalc068 Writing an equation of a parabola given the vertex and the focus
pcalc069 Finding the focus of a parabola
pcalc605 Graphing a circle given its equation in standard form
pcalc064 Graphing a circle given its equation in general form
pcalc065 Writing an equation of a circle given its center and a point on the circle
pcalc066 Writing an equation of a circle given the endpoints of a diameter
pcalc734 Graphing an ellipse given its equation in standard form
pcalc071 Graphing an ellipse given its equation in general form
pcalc072 Finding the foci of an ellipse
pcalc073 Writing an equation of an ellipse given the foci and the major axis length
pcalc074 Writing an equation of an ellipse given the center, an endpoint of an axis, and the length of the other axis
pcalc735 Graphing a hyperbola given its equation in standard form
pcalc076 Graphing a hyperbola given its equation in general form
pcalc077 Finding the foci of a hyperbola
pcalc078 Writing an equation of a hyperbola given the foci and the vertices
pcalc079 Writing an equation of a hyperbola given the foci and the asymptotes
alge191 Midpoint of a line segment in the plane
alge132 Distance between two points in the plane
pcalc736 Classifying conics given their equations
pcalc098 Solving a system of nonlinear equations
pcalc096 Graphing a system of nonlinear inequalities: Problem type 1

B.8 College Algebra with Trigonometry

Algebra review

alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
alge013 Solving a linear equation with several occurrences of the variable: Problem type 3
alge209 Solving a linear equation with several occurrences of the variable: Problem type 4
alge179 Solving a linear equation with several occurrences of the variable: Problem type 5
alge173 Solving a word problem using a linear equation: Problem type 3

alge014 Solving a word problem using a linear equation: Problem type 1
alge219 Solving a word problem using a linear equation: Problem type 2
alge704 Solving a word problem using a linear equation: Problem type 4
alge020 Solving a linear inequality: Problem type 2
alge021 Solving a linear inequality: Problem type 3
alge207 Solving a linear inequality: Problem type 4
alge103 Solving an equation involving absolute value: Basic
alge167 Solving an equation involving absolute value: Advanced
alge170 Solving an inequality involving absolute value: Basic
alge169 Solving an inequality involving absolute value
alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1
alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2
alge206 Solving a rational equation that simplifies to a linear equation: Problem type 3
alge029 Simplifying a polynomial expression
alge030 Multiplying monomials
alge180 Multiplying polynomials
alge705 Factoring a quadratic with leading coefficient 1
alge040 Factoring a quadratic with leading coefficient greater than 1
alge041 Factoring a product of a quadratic trinomial and a monomial
alge624 Factoring a difference of squares
alge042 Factoring with repeated use of the difference of squares formula
alge044 Factoring a sum or difference of two cubes
alge038 Factoring a multivariate polynomial by grouping: Problem type 1
alge024 Product rule of exponents
alge027 Power rule: Positive exponents
alge025 Power rule: Negative exponents
alge028 Product rule of exponents in a multivariate monomial
scinot001 Converting between decimal numbers and numbers written in scientific notation
scinot002 Multiplying and dividing numbers written in scientific notation
alge080 Simplifying a radical expression: Problem type 1
alge084 Simplifying a sum of radical expressions
alge640 Simplifying a product of radical expressions
alge086 Rationalizing the denominator of a radical expression
alge088 Rationalizing the denominator of a radical expression using conjugates
alge089 Solving an equation with radicals: Problem type 1
alge091 Solving an equation with radicals: Problem type 3
alge182 Solving an equation with radicals: Problem type 4
alge250 Rational exponents: Basic
alge251 Rational exponents: Negative exponents and fractional bases
alge249 Rational exponents: Powers of powers

Functions and graphs

set004 Set builder and interval notation
set005 Union and intersection of intervals
fun018 Introduction to functions: Notation and graphs
fun016 Domain and range: Problem type 1
fun004 Domain and range: Problem type 2
fun010 Vertical line test
pcalc114 Even and odd functions
fun019 Sum, difference, and product of two functions
alge185 Vertical translation of the graph of a function
fun020 Vertical and horizontal translations of the graph of a function
fun023 Piecewise-defined functions
alge194 Graphing a line given its equation in slope-intercept form
alge195 Graphing a line given its equation in standard form
alge071 Writing the equation of a line given the slope and a point on the line
alge196 Graphing a line through a given point with a given slope
alge631 Finding the slope of a line given its equation
alge637 Determining the slope of a line given its graph
alge072 Writing the equation of the line through two given points
alge073 Writing the equations of vertical and horizontal lines through a given point
alge198 Graphing a vertical or horizontal line
geom807 Slopes of parallel and perpendicular lines: Problem type 1
geom808 Slopes of parallel and perpendicular lines: Problem type 2
alge701 Writing equations and drawing graphs to fit a narrative
alge018 Graphing a linear inequality in the plane: Problem type 1
alge225 Graphing a linear inequality in the plane: Problem type 2
alge168 Graphing an equation involving absolute value in the plane
fun021 Composition of two functions: Domain and range
fun022 Composition of two functions: Basic
alge129 Composition of two functions: Advanced
fun011 Horizontal line test
fun012 Inverse functions: Basic
alge130 Inverse functions: Advanced

Polynomial and rational functions

alge045 Finding the roots of a quadratic equation with leading coefficient 1
alge048 Finding the roots of a quadratic equation with leading coefficient greater than 1
alge094 Completing the square
alge095 Solving a quadratic equation using the quadratic formula
alge707 Finding the discriminant of a quadratic equation
alge703 Solving a word problem using a quadratic equation with rational roots
alge524 Solving a word problem using a quadratic equation with irrational roots

alge771 Solving a quadratic inequality
alge252 Graphing a parabola: Problem type 1
alge253 Graphing a parabola: Problem type 2
alge254 Graphing a parabola: Problem type 3
alge255 Graphing a quadratic inequality
alge708 Polynomial long division: Linear divisor
alge709 Polynomial long division: Quadratic divisor
pcalc117 Synthetic division
pcalc118 Remainder theorem
alge710 Simplifying a ratio of polynomials: Problem type 1
pcalc092 Partial fraction decomposition
alge681 Solving equations written in factored form
alge211 Solving a quadratic equation needing simplification
pcalc700 Finding a polynomial of a given degree with given zeros
pcalc123 Using a given zero to write a polynomial as a product of linear factors
pcalc701 Finding all potential zeros of a polynomial given by the rational zeros theorem
pcalc702 Using the rational zeros theorem to find zeros of a polynomial
pcalc704 Solving a word problem involving a polynomial of degree 3
pcalc048 Adding and subtracting complex numbers
pcalc049 Multiplying complex numbers
pcalc050 Dividing complex numbers
pcalc053 Simplifying a power of i
pcalc051 Solving a quadratic equation with imaginary roots
pcalc705 N zeros theorem and conjugate zeros theorem
pcalc703 Using the conjugate zeros theorem to find all zeros of a polynomial
pcalc115 Solving a word problem by finding a local extremum of a polynomial function
pcalc738 Inferring properties of a polynomial function from its graph
pcalc108 Sketching the graph of a rational function: Problem type 1
pcalc109 Sketching the graph of a rational function: Problem type 2
pcalc706 Choosing the form of a rational function given its graph

Exponential and logarithmic functions

alge108 Exponential and logarithmic equations
alge232 Evaluating a logarithmic expression
pcalc708 Basic properties of logarithms
alge107 Change of base for logarithms
alge233 Solving a logarithmic equation: Problem type 1
alge113 Solving a logarithmic equation: Problem type 2
alge111 Solving an exponential equation: Problem type 1
alge112 Solving an exponential equation: Problem type 2
alge177 Solving a word problem using an exponential equation: Problem type 1
alge178 Solving a word problem using an exponential equation: Problem type 2

pcalc737 Solving a word problem using an exponential equation: Problem type 3
alge712 Sketching the graph of an exponential function: Basic
pcalc103 Sketching the graph of an exponential function: Advanced
pcalc104 Sketching the graph of a logarithmic function
pcalc102 Translating the graph of a logarithmic or exponential function

Trigonometry

pcalc001 Converting between a decimal degree and degrees-minutes-seconds
pcalc002 Converting between degree and radian measure
pcalc003 Coterminal angles
pcalc005 Arc length and central angle measure
pcalc006 Sketching an angle in standard position
geom506 Special right triangles
pcalc600 Sine, cosine, and tangent ratios
pcalc601 Using a trigonometric ratio to find a side length in a right triangle
pcalc602 Using a trigonometric ratio to find an angle measure in a right triangle
pcalc007 Common angles and trigonometric functions
pcalc008 Finding trigonometric ratios given a right triangle
pcalc011 Finding values of trigonometric functions given information about an angle:
Problem type 1
pcalc012 Finding values of trigonometric functions given information about an angle:
Problem type 2
pcalc013 Finding values of trigonometric functions given information about an angle:
Problem type 3
pcalc107 Sketching the graph of a sine or cosine function: Problem type 1
pcalc106 Sketching the graph of a sine or cosine function: Problem type 2
pcalc014 Sketching the graph of a sine or cosine function: Problem type 3
pcalc017 Sketching the graph of a secant or cosecant function
pcalc105 Sketching the graph of a tangent or cotangent function: Problem type 1
pcalc015 Sketching the graph of a tangent or cotangent function: Problem type 2
pcalc016 Values of inverse trigonometric functions
pcalc018 Composition of a trigonometric function and an inverse trigonometric func-
tion: Problem type 1
pcalc019 Composition of a trigonometric function and an inverse trigonometric func-
tion: Problem type 2
pcalc036 Composition of a trigonometric function and an inverse trigonometric func-
tion: Problem type 3
pcalc126 Cofunction identities
pcalc029 Sum and difference identities
pcalc124 Product-to-sum and sum-to-product identities
pcalc030 Double-angle identities
pcalc110 Verifying a trigonometric identity

pcalc034 Proving a trigonometric identity: Problem type 1
pcalc435 Proving trigonometric identities: Problem type 2
pcalc400 Proving trigonometric identities: Problem type 3
pcalc401 Proving trigonometric identities: Problem type 4
pcalc020 Solving a basic trigonometric equation involving sine or cosine
pcalc021 Solving a basic trigonometric equation involving tangent, cotangent, secant, or cosecant
pcalc022 Solving a trigonometric equation involving a squared function
pcalc024 Solving a trigonometric equation involving more than one function
pcalc025 Solving a trigonometric equation involving an angle multiplied by a constant
pcalc026 Solving a trigonometric equation using sum and difference identities
pcalc027 Solving a trigonometric equation using double-angle identities
pcalc028 Solving a trigonometric equation using half-angle identities
pcalc127 Solving a trigonometric inequality
pcalc031 Solving a triangle with the law of sines: Problem type 1
pcalc032 Solving a triangle with the law of sines: Problem type 2
pcalc033 Solving a triangle with the law of cosines
pcalc060 Magnitude of a vector
pcalc729 Unit vectors
pcalc739 Multiplication of a vector by a scalar
pcalc063 Translation of a vector
pcalc725 Linear combination of vectors: Algebraic approach
pcalc726 Linear combination of vectors: Geometric approach
vector002 Calculating the magnitude and direction of a vector
vector005 Finding the components of a vector
pcalc727 Solving a word problem using vectors
pcalc728 Dot product
pcalc730 Finding the angle between two vectors
vector006 Finding the component of a vector along another vector
pcalc055 Plotting a point in polar coordinates
pcalc056 Converting rectangular coordinates to polar coordinates
pcalc057 Converting polar coordinates to rectangular coordinates
pcalc058 Converting an equation written in rectangular coordinates to one written in polar form
pcalc059 Converting an equation written in polar form to one written in rectangular coordinates
pcalc052 Writing a complex number in trigonometric form
pcalc054 De Moivre's theorem
pcalc724 Finding the n th roots of a number

Systems of linear equations and matrices

alge075 Classifying a system of linear equations

alge076 Solving a system of linear equations
alge077 Creating an inconsistent system of linear equations
pcalc099 Consistency and independence of a system of linear equations
alge078 Solving a word problem using a system of linear equations: Problem type 1
alge184 Solving a word problem using a system of linear equations: Problem type 2
alge224 Solving a word problem using a system of linear equations: Problem type 3
alge192 Solving a word problem using a system of linear equations: Problem type 4
alge172 Solving a word problem using a system of linear equations: Problem type 5
alge079 Graphing a system of linear inequalities
pcalc093 Solving a word problem using a system of linear inequalities
pcalc095 Linear programming
pcalc094 Solving a word problem using linear programming
pcalc709 Addition of matrices and multiplication of a matrix by a scalar
pcalc039 Multiplication of matrices: Basic
pcalc710 Multiplication of matrices: Advanced
pcalc042 Finding the determinant of a 2x2 matrix
pcalc043 Finding the determinant of a 3x3 matrix
pcalc040 Finding the inverse of a 2x2 matrix
pcalc041 Finding the inverse of a 3x3 matrix
pcalc045 Cramer's rule: Problem type 1
pcalc047 Cramer's rule: Problem type 2
pcalc711 Using the inverse of a matrix to solve a system of linear equations
pcalc712 Gauss-Jordan elimination with a 2x2 matrix
pcalc046 Augmented matrix and solution set of a system of linear equations

Sequences, series, and probability

pcalc080 Finding the first terms of a sequence
pcalc713 Arithmetic and geometric sequences: Identifying and writing in standard form
pcalc715 Arithmetic sequences
pcalc717 Geometric sequences
pcalc718 Sum of the first n terms of an arithmetic sequence
pcalc719 Sum of the first n terms of a geometric sequence
pcalc720 Sum of a geometric series
pcalc082 Factorial expressions
pcalc088 Permutations and combinations: Problem type 1
pcalc089 Permutations and combinations: Problem type 2
pcalc090 Permutations and combinations: Problem type 3
pcalc087 Binomial formula
stat117 Probabilities of draws with replacement
stat118 Probabilities of draws without replacement
stat119 Venn diagrams: Two events
stat101 Venn diagrams: Word problems

stat106 Outcomes and event probability
stat112 Die rolling
stat114 Probability of intersection or union: Word problems
stat115 Independent events: Basic
stat120 Probability of union: Basic
stat109 Intersection and conditional probability

Conic sections

pcalc067 Graphing a parabola with a horizontal or a vertical axis
pcalc068 Writing an equation of a parabola given the vertex and the focus
pcalc069 Finding the focus of a parabola
pcalc605 Graphing a circle given its equation in standard form
pcalc064 Graphing a circle given its equation in general form
pcalc065 Writing an equation of a circle given its center and a point on the circle
pcalc066 Writing an equation of a circle given the endpoints of a diameter
pcalc734 Graphing an ellipse given its equation in standard form
pcalc071 Graphing an ellipse given its equation in general form
pcalc072 Finding the foci of an ellipse
pcalc073 Writing an equation of an ellipse given the foci and the major axis length
pcalc074 Writing an equation of an ellipse given the center, an endpoint of an axis, and the length of the other axis
pcalc735 Graphing a hyperbola given its equation in standard form
pcalc076 Graphing a hyperbola given its equation in general form
pcalc077 Finding the foci of a hyperbola
pcalc078 Writing an equation of a hyperbola given the foci and the vertices
pcalc079 Writing an equation of a hyperbola given the foci and the asymptotes
alge191 Midpoint of a line segment in the plane
alge132 Distance between two points in the plane
pcalc736 Classifying conics given their equations
pcalc098 Solving a system of nonlinear equations
pcalc096 Graphing a system of nonlinear inequalities: Problem type 1

B.9 PreCalculus

Algebra review

alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
alge013 Solving a linear equation with several occurrences of the variable: Problem type 3

alge209 Solving a linear equation with several occurrences of the variable: Problem type 4

alge179 Solving a linear equation with several occurrences of the variable: Problem type 5

alge173 Solving a word problem using a linear equation: Problem type 3

alge014 Solving a word problem using a linear equation: Problem type 1

alge219 Solving a word problem using a linear equation: Problem type 2

alge704 Solving a word problem using a linear equation: Problem type 4

alge020 Solving a linear inequality: Problem type 2

alge021 Solving a linear inequality: Problem type 3

alge207 Solving a linear inequality: Problem type 4

alge103 Solving an equation involving absolute value: Basic

alge167 Solving an equation involving absolute value: Advanced

alge170 Solving an inequality involving absolute value: Basic

alge169 Solving an inequality involving absolute value

alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1

alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2

alge206 Solving a rational equation that simplifies to a linear equation: Problem type 3

alge029 Simplifying a polynomial expression

alge030 Multiplying monomials

alge180 Multiplying polynomials

alge705 Factoring a quadratic with leading coefficient 1

alge040 Factoring a quadratic with leading coefficient greater than 1

alge041 Factoring a product of a quadratic trinomial and a monomial

alge624 Factoring a difference of squares

alge042 Factoring with repeated use of the difference of squares formula

alge044 Factoring a sum or difference of two cubes

alge038 Factoring a multivariate polynomial by grouping: Problem type 1

alge024 Product rule of exponents

alge027 Power rule: Positive exponents

alge025 Power rule: Negative exponents

alge028 Product rule of exponents in a multivariate monomial

scinot001 Converting between decimal numbers and numbers written in scientific notation

scinot002 Multiplying and dividing numbers written in scientific notation

alge080 Simplifying a radical expression: Problem type 1

alge084 Simplifying a sum of radical expressions

alge640 Simplifying a product of radical expressions

alge086 Rationalizing the denominator of a radical expression

alge088 Rationalizing the denominator of a radical expression using conjugates

alge089 Solving an equation with radicals: Problem type 1

alge091 Solving an equation with radicals: Problem type 3

alge182 Solving an equation with radicals: Problem type 4

alge250 Rational exponents: Basic

alge251 Rational exponents: Negative exponents and fractional bases
alge249 Rational exponents: Powers of powers

Functions and graphs

set004 Set builder and interval notation
set005 Union and intersection of intervals
fun018 Introduction to functions: Notation and graphs
fun016 Domain and range: Problem type 1
fun004 Domain and range: Problem type 2
fun010 Vertical line test
pcalc114 Even and odd functions
fun019 Sum, difference, and product of two functions
alge185 Vertical translation of the graph of a function
fun020 Vertical and horizontal translations of the graph of a function
fun023 Piecewise-defined functions
alge194 Graphing a line given its equation in slope-intercept form
alge195 Graphing a line given its equation in standard form
alge071 Writing the equation of a line given the slope and a point on the line
alge196 Graphing a line through a given point with a given slope
alge631 Finding the slope of a line given its equation
alge637 Determining the slope of a line given its graph
alge072 Writing the equation of the line through two given points
alge073 Writing the equations of vertical and horizontal lines through a given point
alge198 Graphing a vertical or horizontal line
geom807 Slopes of parallel and perpendicular lines: Problem type 1
geom808 Slopes of parallel and perpendicular lines: Problem type 2
alge701 Writing equations and drawing graphs to fit a narrative
alge018 Graphing a linear inequality in the plane: Problem type 1
alge225 Graphing a linear inequality in the plane: Problem type 2
alge168 Graphing an equation involving absolute value in the plane
fun021 Composition of two functions: Domain and range
fun022 Composition of two functions: Basic
alge129 Composition of two functions: Advanced
fun011 Horizontal line test
fun012 Inverse functions: Basic
alge130 Inverse functions: Advanced

Polynomial and rational functions

alge045 Finding the roots of a quadratic equation with leading coefficient 1
alge048 Finding the roots of a quadratic equation with leading coefficient greater than

1

alge094 Completing the square
alge095 Solving a quadratic equation using the quadratic formula
alge707 Finding the discriminant of a quadratic equation
alge703 Solving a word problem using a quadratic equation with rational roots
alge524 Solving a word problem using a quadratic equation with irrational roots
alge771 Solving a quadratic inequality
alge252 Graphing a parabola: Problem type 1
alge253 Graphing a parabola: Problem type 2
alge254 Graphing a parabola: Problem type 3
alge255 Graphing a quadratic inequality
alge708 Polynomial long division: Linear divisor
alge709 Polynomial long division: Quadratic divisor
pcalc117 Synthetic division
pcalc118 Remainder theorem
alge710 Simplifying a ratio of polynomials: Problem type 1
pcalc092 Partial fraction decomposition
alge681 Solving equations written in factored form
alge211 Solving a quadratic equation needing simplification
pcalc700 Finding a polynomial of a given degree with given zeros
pcalc123 Using a given zero to write a polynomial as a product of linear factors
pcalc701 Finding all potential zeros of a polynomial given by the rational zeros theorem
pcalc702 Using the rational zeros theorem to find zeros of a polynomial
pcalc704 Solving a word problem involving a polynomial of degree 3
pcalc048 Adding and subtracting complex numbers
pcalc049 Multiplying complex numbers
pcalc050 Dividing complex numbers
pcalc053 Simplifying a power of i
pcalc051 Solving a quadratic equation with imaginary roots
pcalc705 N zeros theorem and conjugate zeros theorem
pcalc703 Using the conjugate zeros theorem to find all zeros of a polynomial
pcalc115 Solving a word problem by finding a local extremum of a polynomial function
pcalc738 Inferring properties of a polynomial function from its graph
pcalc108 Sketching the graph of a rational function: Problem type 1
pcalc109 Sketching the graph of a rational function: Problem type 2
pcalc706 Choosing the form of a rational function given its graph

Exponential and logarithmic functions

alge108 Exponential and logarithmic equations
alge232 Evaluating a logarithmic expression
pcalc708 Basic properties of logarithms
alge107 Change of base for logarithms

alge233 Solving a logarithmic equation: Problem type 1
 alge113 Solving a logarithmic equation: Problem type 2
 alge111 Solving an exponential equation: Problem type 1
 alge112 Solving an exponential equation: Problem type 2
 alge177 Solving a word problem using an exponential equation: Problem type 1
 alge178 Solving a word problem using an exponential equation: Problem type 2
 pcalc737 Solving a word problem using an exponential equation: Problem type 3
 alge712 Sketching the graph of an exponential function: Basic
 pcalc103 Sketching the graph of an exponential function: Advanced
 pcalc104 Sketching the graph of a logarithmic function
 pcalc102 Translating the graph of a logarithmic or exponential function

Trigonometry

pcalc001 Converting between a decimal degree and degrees-minutes-seconds
 pcalc002 Converting between degree and radian measure
 pcalc003 Coterminal angles
 pcalc005 Arc length and central angle measure
 pcalc006 Sketching an angle in standard position
 geom506 Special right triangles
 pcalc600 Sine, cosine, and tangent ratios
 pcalc601 Using a trigonometric ratio to find a side length in a right triangle
 pcalc602 Using a trigonometric ratio to find an angle measure in a right triangle
 pcalc007 Common angles and trigonometric functions
 pcalc008 Finding trigonometric ratios given a right triangle
 pcalc011 Finding values of trigonometric functions given information about an angle:
 Problem type 1
 pcalc012 Finding values of trigonometric functions given information about an angle:
 Problem type 2
 pcalc013 Finding values of trigonometric functions given information about an angle:
 Problem type 3
 pcalc107 Sketching the graph of a sine or cosine function: Problem type 1
 pcalc106 Sketching the graph of a sine or cosine function: Problem type 2
 pcalc014 Sketching the graph of a sine or cosine function: Problem type 3
 pcalc017 Sketching the graph of a secant or cosecant function
 pcalc105 Sketching the graph of a tangent or cotangent function: Problem type 1
 pcalc015 Sketching the graph of a tangent or cotangent function: Problem type 2
 pcalc016 Values of inverse trigonometric functions
 pcalc018 Composition of a trigonometric function and an inverse trigonometric func-
 tion: Problem type 1
 pcalc019 Composition of a trigonometric function and an inverse trigonometric func-
 tion: Problem type 2
 pcalc036 Composition of a trigonometric function and an inverse trigonometric func-

tion: Problem type 3
pcalc126 Cofunction identities
pcalc029 Sum and difference identities
pcalc124 Product-to-sum and sum-to-product identities
pcalc030 Double-angle identities
pcalc110 Verifying a trigonometric identity
pcalc034 Proving a trigonometric identity: Problem type 1
pcalc435 Proving trigonometric identities: Problem type 2
pcalc400 Proving trigonometric identities: Problem type 3
pcalc401 Proving trigonometric identities: Problem type 4
pcalc020 Solving a basic trigonometric equation involving sine or cosine
pcalc021 Solving a basic trigonometric equation involving tangent, cotangent, secant, or cosecant
pcalc022 Solving a trigonometric equation involving a squared function
pcalc024 Solving a trigonometric equation involving more than one function
pcalc025 Solving a trigonometric equation involving an angle multiplied by a constant
pcalc026 Solving a trigonometric equation using sum and difference identities
pcalc027 Solving a trigonometric equation using double-angle identities
pcalc028 Solving a trigonometric equation using half-angle identities
pcalc127 Solving a trigonometric inequality
pcalc031 Solving a triangle with the law of sines: Problem type 1
pcalc032 Solving a triangle with the law of sines: Problem type 2
pcalc033 Solving a triangle with the law of cosines
pcalc060 Magnitude of a vector
pcalc729 Unit vectors
pcalc739 Multiplication of a vector by a scalar
pcalc063 Translation of a vector
pcalc725 Linear combination of vectors: Algebraic approach
pcalc726 Linear combination of vectors: Geometric approach
vector002 Calculating the magnitude and direction of a vector
vector005 Finding the components of a vector
pcalc727 Solving a word problem using vectors
pcalc728 Dot product
pcalc730 Finding the angle between two vectors
vector006 Finding the component of a vector along another vector
pcalc055 Plotting a point in polar coordinates
pcalc056 Converting rectangular coordinates to polar coordinates
pcalc057 Converting polar coordinates to rectangular coordinates
pcalc058 Converting an equation written in rectangular coordinates to one written in polar form
pcalc059 Converting an equation written in polar form to one written in rectangular coordinates
pcalc052 Writing a complex number in trigonometric form
pcalc054 De Moivre's theorem

pcalc724 Finding the n th roots of a number

Systems of linear equations and matrices

alge075 Classifying a system of linear equations

alge076 Solving a system of linear equations

alge077 Creating an inconsistent system of linear equations

pcalc099 Consistency and independence of a system of linear equations

alge078 Solving a word problem using a system of linear equations: Problem type 1

alge184 Solving a word problem using a system of linear equations: Problem type 2

alge224 Solving a word problem using a system of linear equations: Problem type 3

alge192 Solving a word problem using a system of linear equations: Problem type 4

alge172 Solving a word problem using a system of linear equations: Problem type 5

alge079 Graphing a system of linear inequalities

pcalc093 Solving a word problem using a system of linear inequalities

pcalc095 Linear programming

pcalc094 Solving a word problem using linear programming

pcalc709 Addition of matrices and multiplication of a matrix by a scalar

pcalc039 Multiplication of matrices: Basic

pcalc710 Multiplication of matrices: Advanced

pcalc042 Finding the determinant of a 2×2 matrix

pcalc043 Finding the determinant of a 3×3 matrix

pcalc040 Finding the inverse of a 2×2 matrix

pcalc041 Finding the inverse of a 3×3 matrix

pcalc045 Cramer's rule: Problem type 1

pcalc047 Cramer's rule: Problem type 2

pcalc711 Using the inverse of a matrix to solve a system of linear equations

pcalc712 Gauss-Jordan elimination with a 2×2 matrix

pcalc046 Augmented matrix and solution set of a system of linear equations

Sequences, series, and probability

pcalc080 Finding the first terms of a sequence

pcalc713 Arithmetic and geometric sequences: Identifying and writing in standard form

pcalc715 Arithmetic sequences

pcalc717 Geometric sequences

pcalc718 Sum of the first n terms of an arithmetic sequence

pcalc719 Sum of the first n terms of a geometric sequence

pcalc720 Sum of a geometric series

pcalc082 Factorial expressions

pcalc088 Permutations and combinations: Problem type 1

pcalc089 Permutations and combinations: Problem type 2

pcalc090 Permutations and combinations: Problem type 3
pcalc087 Binomial formula
stat117 Probabilities of draws with replacement
stat118 Probabilities of draws without replacement
stat119 Venn diagrams: Two events
stat101 Venn diagrams: Word problems
stat106 Outcomes and event probability
stat112 Die rolling
stat114 Probability of intersection or union: Word problems
stat115 Independent events: Basic
stat120 Probability of union: Basic
stat109 Intersection and conditional probability

Conic sections

pcalc067 Graphing a parabola with a horizontal or a vertical axis
pcalc068 Writing an equation of a parabola given the vertex and the focus
pcalc069 Finding the focus of a parabola
pcalc605 Graphing a circle given its equation in standard form
pcalc064 Graphing a circle given its equation in general form
pcalc065 Writing an equation of a circle given its center and a point on the circle
pcalc066 Writing an equation of a circle given the endpoints of a diameter
pcalc734 Graphing an ellipse given its equation in standard form
pcalc071 Graphing an ellipse given its equation in general form
pcalc072 Finding the foci of an ellipse
pcalc073 Writing an equation of an ellipse given the foci and the major axis length
pcalc074 Writing an equation of an ellipse given the center, an endpoint of an axis, and the length of the other axis
pcalc735 Graphing a hyperbola given its equation in standard form
pcalc076 Graphing a hyperbola given its equation in general form
pcalc077 Finding the foci of a hyperbola
pcalc078 Writing an equation of a hyperbola given the foci and the vertices
pcalc079 Writing an equation of a hyperbola given the foci and the asymptotes
alge191 Midpoint of a line segment in the plane
alge132 Distance between two points in the plane
pcalc736 Classifying conics given their equations
pcalc098 Solving a system of nonlinear equations
pcalc096 Graphing a system of nonlinear inequalities: Problem type 1

B.10 Preparation for Calculus

Rational numbers

arith010 Addition of fractions with same denominator
arith054 Addition of fractions with different denominators
arith212 Equivalent fractions
arith022 Fraction division
arith067 Reduced fraction
arith009 Unit fraction multiplication
arith053 Fraction multiplication
arith079 Product of a unit fraction and a whole number
arith086 Product of a fraction and a whole number
arith044 Ordering fractions with same denominator
arith091 Ordering fractions with same numerator
arith092 Ordering fractions
arith088 The reciprocal of a number
arith080 Subtraction of fractions with different denominators
arith096 Subtraction of fractions with same denominator
arith100 Fractional part of a circle
arith002 Converting a fraction to a percentage
arith030 Percentage of a whole number
arith069 Writing a ratio as a percentage
arith090 Converting a percentage to a fraction
arith226 Converting between percentages and decimals
arith064 Simple word problem on proportions
arith071 Absolute value of a number
arith104 Operations with absolute value
arith106 Signed fractions addition
arith107 Integer subtraction
arith108 Integer addition: Problem type 2
arith200 Integer addition: Problem type 1
arith202 Integer division
arith105 Signed fractions multiplication
arith201 Integer multiplication
arith056 Factors
arith033 Greatest common factor
arith070 Least common multiple
arith035 Prime number factorization
arith034 Prime numbers
alge001 Integers and rational numbers
alge002 Integers, rational numbers, and irrational numbers
alge187 Properties of addition
alge188 Properties of real numbers

Linear algebra

- alge005 Evaluation of a linear expression in two variables
- alge103 Solving an equation involving absolute value: Basic
- alge167 Solving an equation involving absolute value: Advanced
- alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
- alge011 Solving a linear equation with several occurrences of the variable: Problem type 1
- alge013 Solving a linear equation with several occurrences of the variable: Problem type 3
- alge179 Solving a linear equation with several occurrences of the variable: Problem type 5
- alge209 Solving a linear equation with several occurrences of the variable: Problem type 4
- alge007 Additive property of equality: Problem type 3
- alge009 Additive property of equality: Problem type 1
- alge010 Additive property of equality: Problem type 2
- alge006 Solving a linear equation: Problem type 1
- alge208 Solving a linear equation: Problem type 2
- alge008 Multiplicative property of equality: Problem type 1
- alge012 Multiplicative property of equality: Problem type 2
- alge200 Solving a linear equation: Problem type 3
- alge076 Solving a system of linear equations
- alge077 Creating an inconsistent system of linear equations
- alge168 Graphing an equation involving absolute value in the plane
- alge170 Solving an inequality involving absolute value: Basic
- alge194 Graphing a line given its equation in slope-intercept form
- alge195 Graphing a line given its equation in standard form
- alge196 Graphing a line through a given point with a given slope
- alge197 Graphing a line given the x- and y-intercepts
- alge198 Graphing a vertical or horizontal line
- alge064 Reading a point in the coordinate plane
- alge066 Solutions to a linear equation in two variables: Problem type 1
- alge067 Plotting a point in the coordinate plane
- alge132 Distance between two points in the plane
- alge191 Midpoint of a line segment in the plane
- alge216 Solutions to a linear equation in two variables: Problem type 2
- alge069 Y-intercept of a line
- alge070 Writing an equation of a line given the slope and the y-intercept
- alge071 Writing the equation of a line given the slope and a point on the line
- alge072 Writing the equation of the line through two given points

alge073 Writing the equations of vertical and horizontal lines through a given point
alge074 Writing the equation of the line through a given point and parallel to a given line
alge210 X- and y-intercepts of a line given the equation in standard form

Exponents and rational expressions

arith094 Cube root of an integer
arith024 Ordering numbers with negative exponents
arith042 Writing a positive number without a negative exponent
arith043 Writing a negative number without a negative exponent
arith029 Ordering numbers with positive exponents
arith047 Evaluating expressions with exponents: Problem type 1
arith049 Evaluating expressions with exponents: Problem type 2
arith016 Square root of a perfect square
arith032 Square root addition
arith039 Square root multiplication
arith093 Square root simplification
alge024 Product rule of exponents
alge025 Power rule: Negative exponents
alge027 Power rule: Positive exponents
alge028 Product rule of exponents in a multivariate monomial
alge049 Restriction on variable in a denominator
alge059 Ordering fractions with variables
alge160 Algebraic symbol manipulation
alge175 Word problem on direct variation
alge176 Word problem on inverse variation
alge220 Word problem on inverse proportions
alge047 Solving a rational equation that simplifies to a quadratic equation: Problem type 3
alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1
alge062 Solving a rational equation that simplifies to a quadratic equation: Problem type 2
alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2
alge206 Solving a rational equation that simplifies to a linear equation: Problem type 3
alge212 Solving a rational equation that simplifies to a quadratic equation: Problem type 1
alge034 Ratio of multivariate polynomials
alge053 Multiplying rational expressions: Problem type 1
alge054 Dividing rational expressions
alge056 Adding rational expressions with common denominator
alge057 Adding rational expressions
alge058 Complex fraction: Problem type 1

alge162 Complex Fraction: Problem type 2
alge226 Adding rational expressions with different denominators
alge080 Simplifying a radical expression: Problem type 1
alge086 Rationalizing the denominator of a radical expression
alge088 Rationalizing the denominator of a radical expression using conjugates
alge085 Simplifying a product of radical expressions: Problem type 1
alge087 Simplifying a product of radical expressions: Problem type 2
alge092 Even root property
alge093 Odd root property
alge227 Solving an equation with exponent using the even-root property
alge228 Solving an equation with exponent using the odd-root property
alge230 Solving an equation with positive rational exponent
alge231 Solving an equation with negative rational exponent
alge089 Solving an equation with radicals: Problem type 1
alge090 Solving an equation with radicals: Problem type 2

Polynomials

alge037 Greatest common factor of two monomials
alge055 Least common multiple of two monomials
alge042 Factoring with repeated use of the difference of squares formula
alge044 Factoring a sum or difference of two cubes
alge039 Factoring a quadratic with leading coefficient 1
alge040 Factoring a quadratic with leading coefficient greater than 1
alge041 Factoring a product of a quadratic trinomial and a monomial
alge043 Factoring a perfect square
alge094 Completing the square
alge004 Evaluation of a polynomial in one variable
alge029 Simplifying a polynomial expression
alge031 Degree of a multivariate polynomial
alge035 Division of a polynomial by a binomial with no remainder
alge036 Division of a polynomial by a binomial with remainder
alge030 Multiplying monomials
alge032 Squaring a binomial
alge033 Multiplying two binomials
alge180 Multiplying polynomials
alge050 Ratio of quadratic polynomials: Problem type 1
alge051 Ratio of quadratic polynomials: Problem type 2
alge052 Ratio of quadratic polynomials: Problem type 3
pcalc092 Partial fraction decomposition
alge214 Discriminant of a quadratic equation
alge096 Graphing a parabola
alge045 Finding the roots of a quadratic equation with leading coefficient 1

alge046 Roots of a product of polynomials
alge048 Finding the roots of a quadratic equation with leading coefficient greater than 1
alge211 Solving a quadratic equation needing simplification
alge095 Solving a quadratic equation using the quadratic formula
alge193 Discriminant of a quadratic equation with parameter
alge163 Writing a quadratic equation given the roots and the leading coefficient

Functions

alge125 Sum of two linear functions
alge129 Composition of two functions: Advanced
alge128 Range of a real function
alge213 Domain of a square root function
alge130 Inverse functions: Advanced
alge126 Product of two linear functions
alge131 Horizontal translation of the graph of a function
alge185 Vertical translation of the graph of a function

Exponentials and logarithms

alge104 Product rule for logarithms
alge106 Power rule for logarithms
alge107 Change of base for logarithms
alge108 Exponential and logarithmic equations
alge232 Evaluating a logarithmic expression
alge111 Solving an exponential equation: Problem type 1
alge112 Solving an exponential equation: Problem type 2
alge113 Solving a logarithmic equation: Problem type 2
alge233 Solving a logarithmic equation: Problem type 1
pcalc102 Translating the graph of a logarithmic or exponential function
pcalc103 Sketching the graph of an exponential function: Advanced
pcalc104 Sketching the graph of a logarithmic function

Trigonometry

pcalc064 Graphing a circle given its equation in general form
pcalc002 Converting between degree and radian measure
pcalc003 Coterminal angles
pcalc006 Sketching an angle in standard position
pcalc016 Values of inverse trigonometric functions

- pcalc018 Composition of a trigonometric function and an inverse trigonometric function: Problem type 1
- pcalc019 Composition of a trigonometric function and an inverse trigonometric function: Problem type 2
- pcalc036 Composition of a trigonometric function and an inverse trigonometric function: Problem type 3
- pcalc020 Solving a basic trigonometric equation involving sine or cosine
- pcalc021 Solving a basic trigonometric equation involving tangent, cotangent, secant, or cosecant
- pcalc022 Solving a trigonometric equation involving a squared function
- pcalc023 Trigonometric equations involving squared functions: Problem type 2
- pcalc024 Solving a trigonometric equation involving more than one function
- pcalc025 Solving a trigonometric equation involving an angle multiplied by a constant
- pcalc026 Solving a trigonometric equation using sum and difference identities
- pcalc027 Solving a trigonometric equation using double-angle identities
- pcalc028 Solving a trigonometric equation using half-angle identities
- pcalc107 Sketching the graph of a sine or cosine function: Problem type 1
- pcalc007 Common angles and trigonometric functions
- pcalc008 Finding trigonometric ratios given a right triangle
- pcalc009 Solving a right triangle
- pcalc010 Application problem using right triangle trigonometry
- pcalc011 Finding values of trigonometric functions given information about an angle: Problem type 1
- pcalc012 Finding values of trigonometric functions given information about an angle: Problem type 2
- pcalc013 Finding values of trigonometric functions given information about an angle: Problem type 3
- pcalc030 Double-angle identities
- pcalc055 Plotting a point in polar coordinates
- pcalc056 Converting rectangular coordinates to polar coordinates
- pcalc057 Converting polar coordinates to rectangular coordinates
- pcalc058 Converting an equation written in rectangular coordinates to one written in polar form
- pcalc059 Converting an equation written in polar form to one written in rectangular coordinates

B.11 Math Prep for College Physics

Arithmetic

- arith010 Addition of fractions with same denominator
- arith096 Subtraction of fractions with same denominator

arith079 Product of a unit fraction and a whole number
arith086 Product of a fraction and a whole number
arith009 Unit fraction multiplication
arith053 Fraction multiplication
arith212 Equivalent fractions
arith054 Addition of fractions with different denominators
arith080 Subtraction of fractions with different denominators
arith067 Reduced fraction
arith106 Signed fractions addition
arith105 Signed fractions multiplication
arith022 Fraction division
arith015 Writing an improper fraction as a mixed number
arith220 Decimal place value
arith221 Rounding decimals
arith078 Rounding: Problem type 1
arith061 Rounding: Problem type 2
arith030 Percentage of a whole number
geom133 Ratio of volumes
arith002 Converting a fraction to a percentage
arith069 Writing a ratio as a percentage
arith226 Converting between percentages and decimals
arith222 Converting a fraction to a terminating decimal
arith089 Converting a fraction to a repeating decimal
arith223 Converting a mixed number to a decimal
arith087 Converting a decimal to a fraction
unit003 Metric distance conversion with decimal values
unit004 Metric conversion with decimal values, two-step conversion
unit010 Metric area unit conversion with decimal number values
arith101 Estimating a sum
arith102 Estimating a difference
scinot004 Order of magnitude estimation
arith071 Absolute value of a number
arith104 Operations with absolute value
arith029 Ordering numbers with positive exponents
arith024 Ordering numbers with negative exponents
arith042 Writing a positive number without a negative exponent
arith047 Evaluating expressions with exponents: Problem type 1
arith049 Evaluating expressions with exponents: Problem type 2
arith016 Square root of a perfect square
arith093 Square root simplification
arith039 Square root multiplication
alge085 Simplifying a product of radical expressions: Problem type 1
alge086 Rationalizing the denominator of a radical expression
alge250 Rational exponents: Basic

alge251 Rational exponents: Negative exponents and fractional bases
arith082 Multiplication of a decimal by a power of ten
arith083 Division of a decimal by a power of ten
scinot001 Converting between decimal numbers and numbers written in scientific notation
scinot002 Multiplying and dividing numbers written in scientific notation
scinot003 Calculating positive powers of scientific notation

Geometry

geom300 Perimeter of a square or a rectangle
geom301 Perimeter involving rectangles and circles
geom302 Area involving rectangles and circles
geom339 Perimeter of a polygon
geom078 Sides of polygons having the same perimeter
geom016 Circumference of a circle
geom138 Circumference ratios
geom019 Area of a square or a rectangle
geom340 Area of a piecewise rectangular figure
geom143 Area and perimeter of a rectangle
geom021 Area of a triangle
geom020 Area of an obtuse triangle
geom022 Area of a parallelogram
geom026 Area of a circle
geom126 Area of a sector of a circle
geom031 Surface area of a cube or a rectangular prism
geom034 Surface area of a cylinder
geom342 Surface area of a sphere
geom311 Volume of a cube or a rectangular prism
geom035 Volume of a cylinder
geom341 Volume of a sphere
geom303 Acute, obtuse, and right angles
geom151 Measuring an angle with the protractor
geom152 Drawing an angle with the protractor
alge132 Distance between two points in the plane
alge191 Midpoint of a line segment in the plane
geom039 Supplementary and complementary angles
geom500 Vertical angles and linear pairs
geom306 Acute, obtuse, and right triangles
geom001 Sum of the angle measures of a triangle
geom308 Solving a triangle: Problem type 1

Algebra

alge016 Translating sentences into mathematical equations
alge602 Writing a mathematical expression
alge005 Evaluation of a linear expression in two variables
alge004 Evaluation of a polynomial in one variable
alge160 Algebraic symbol manipulation
alge606 Distributive property, simple
alge604 Distributive Property, advanced
alge607 Combining like terms, basic
alge009 Additive property of equality: Problem type 1
alge010 Additive property of equality: Problem type 2
alge007 Additive property of equality: Problem type 3
alge008 Multiplicative property of equality: Problem type 1
alge012 Multiplicative property of equality: Problem type 2
alge006 Solving a linear equation: Problem type 1
alge208 Solving a linear equation: Problem type 2
alge200 Solving a linear equation: Problem type 3
alge011 Solving a linear equation with several occurrences of the variable: Problem type 1
alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
alge013 Solving a linear equation with several occurrences of the variable: Problem type 3
alge209 Solving a linear equation with several occurrences of the variable: Problem type 4
alge179 Solving a linear equation with several occurrences of the variable: Problem type 5
alge103 Solving an equation involving absolute value: Basic
alge167 Solving an equation involving absolute value: Advanced
alge219 Solving a word problem using a linear equation: Problem type 2
alge175 Word problem on direct variation
alge176 Word problem on inverse variation
alge218 Word problem on rates
alge075 Classifying a system of linear equations
alge076 Solving a system of linear equations
alge216 Solutions to a linear equation in two variables: Problem type 2
alge224 Solving a word problem using a system of linear equations: Problem type 3
alge192 Solving a word problem using a system of linear equations: Problem type 4
alge663 Combining like terms, advanced
alge024 Product rule of exponents
alge028 Product rule of exponents in a multivariate monomial
alge027 Power rule: Positive exponents
alge029 Simplifying a polynomial expression
alge030 Multiplying monomials
alge033 Multiplying two binomials

alge032 Squaring a binomial
alge180 Multiplying polynomials
alge037 Greatest common factor of two monomials
alge039 Factoring a quadratic with leading coefficient 1
alge043 Factoring a perfect square
alge624 Factoring a difference of squares
alge038 Factoring a multivariate polynomial by grouping: Problem type 1
alge045 Finding the roots of a quadratic equation with leading coefficient 1
alge095 Solving a quadratic equation using the quadratic formula
alge214 Discriminant of a quadratic equation
alge524 Solving a word problem using a quadratic equation with irrational roots
alge049 Restriction on variable in a denominator
alge050 Ratio of quadratic polynomials: Problem type 1
alge051 Ratio of quadratic polynomials: Problem type 2
alge058 Complex fraction: Problem type 1
alge162 Complex Fraction: Problem type 2
alge053 Multiplying rational expressions: Problem type 1
alge054 Dividing rational expressions
alge057 Adding rational expressions
alge056 Adding rational expressions with common denominator
alge226 Adding rational expressions with different denominators
alge622 Adding and subtracting rational expressions: Problem type 1
alge055 Least common multiple of two monomials
alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1
alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2
alge206 Solving a rational equation that simplifies to a linear equation: Problem type 3
alge062 Solving a rational equation that simplifies to a quadratic equation: Problem type 2
alge080 Simplifying a radical expression: Problem type 1
alge640 Simplifying a product of radical expressions
alge082 Simplifying a product of radical expressions: Problem type 3
alge084 Simplifying a sum of radical expressions
alge089 Solving an equation with radicals: Problem type 1
alge090 Solving an equation with radicals: Problem type 2
alge092 Even root property
alge093 Odd root property
alge177 Solving a word problem using an exponential equation: Problem type 1
alge178 Solving a word problem using an exponential equation: Problem type 2
alge104 Product rule for logarithms
alge106 Power rule for logarithms
alge232 Evaluating a logarithmic expression
pcalc103 Sketching the graph of an exponential function: Advanced
pcalc104 Sketching the graph of a logarithmic function

Graphing and data analysis

alge066 Solutions to a linear equation in two variables: Problem type 1
alge064 Reading a point in the coordinate plane
alge067 Plotting a point in the coordinate plane
alge194 Graphing a line given its equation in slope-intercept form
alge195 Graphing a line given its equation in standard form
alge197 Graphing a line given the x- and y-intercepts
alge198 Graphing a vertical or horizontal line
alge196 Graphing a line through a given point with a given slope
alge069 Y-intercept of a line
alge210 X- and y-intercepts of a line given the equation in standard form
alge637 Determining the slope of a line given its graph
alge631 Finding the slope of a line given its equation
alge073 Writing the equations of vertical and horizontal lines through a given point
alge070 Writing an equation of a line given the slope and the y-intercept
alge071 Writing the equation of a line given the slope and a point on the line
alge072 Writing the equation of the line through two given points
alge225 Graphing a linear inequality in the plane: Problem type 2
alge018 Graphing a linear inequality in the plane: Problem type 1
alge079 Graphing a system of linear inequalities
alge252 Graphing a parabola: Problem type 1
alge253 Graphing a parabola: Problem type 2
pcalc070 Graph of an ellipse centered at the origin
pcalc075 Graph of a hyperbola centered at the origin
mstat001 Mean of a data set
mstat004 Histograms for numerical data
mstat005 Bar graphs for non-numerical data
mstat007 Interpreting line graphs

Trigonometry and vectors

pcalc002 Converting between degree and radian measure
pcalc006 Sketching an angle in standard position
pcalc120 Solving a right triangle
pcalc008 Finding trigonometric ratios given a right triangle
pcalc010 Application problem using right triangle trigonometry
geom044 Pythagorean Theorem
pcalc107 Sketching the graph of a sine or cosine function: Problem type 1
pcalc106 Sketching the graph of a sine or cosine function: Problem type 2
pcalc014 Sketching the graph of a sine or cosine function: Problem type 3
vector002 Calculating the magnitude and direction of a vector
vector005 Finding the components of a vector

vector006 Finding the component of a vector along another vector
pcalc060 Magnitude of a vector
pcalc062 Addition and subtraction of vectors
pcalc063 Translation of a vector
pcalc061 Scalar multiplication of a vector

B.12 Introduction to Statistics

Mathematical Readiness

arith048 Order of operations: Problem type 1
arith051 Order of operations: Problem type 2
arith220 Decimal place value
arith221 Rounding decimals
arith226 Converting between percentages and decimals
arith030 Percentage of a whole number
arith069 Writing a ratio as a percentage
arith090 Converting a percentage to a fraction
arith002 Converting a fraction to a percentage
stat022 Summation of indexed data
alge006 Solving a linear equation: Problem type 1
alge011 Solving a linear equation with several occurrences of the variable: Problem type 1
alge013 Solving a linear equation with several occurrences of the variable: Problem type 3
alge256 Y-intercept of a line
alge257 X- and y-intercepts of a line given the equation in standard form
alge070 Writing an equation of a line given the slope and the y-intercept
alge197 Graphing a line given the x- and y-intercepts
alge194 Graphing a line given its equation in slope-intercept form
alge196 Graphing a line through a given point with a given slope

Descriptive Statistics

stat904 Interpreting pie charts
stat901 Computations from pie charts
stat844 Double bar charts
stat702 Histograms for grouped data
stat703 Frequency polygons for grouped data
stat717 Interpreting relative frequency histograms
stat718 Cumulative distributions and ogives

stat164 Comparing means without calculation
stat165 Comparing standard deviations without calculation
stat023 Box-and-whisker plots
stat831 Interpreting a stem-and-leaf display
stat827 Using back-to-back stem-and-leaf displays to compare data sets
stat706 Mean, median, and mode: Computations
stat902 Rejecting unreasonable claims based on average statistics
stat007 Weighted mean: Tabular data
stat719 Estimating the mean of grouped data
stat009 Percentiles
stat021 Population standard deviation
stat011 Sample standard deviation
stat729 Estimating the standard deviation of grouped data
stat730 Chebyshev's theorem and the empirical rule
stat798 Mean, median, and mode: Comparisons
stat025 Transforming the mean and standard deviation of data sets
stat905 Making reasonable inferences based on proportion statistics

Probability

stat782 Factorial expressions
stat788 Combinations
stat789 Permutations
stat790 Permutations, combinations, and the multiplication principle for counting
stat117 Probabilities of draws with replacement
stat118 Probabilities of draws without replacement
stat119 Venn diagrams: Two events
stat100 Venn diagrams: Three events
stat101 Venn diagrams: Word problems
stat106 Outcomes and event probability
stat226 Die rolling
stat114 Probability of intersection or union: Word problems
stat115 Independent events: Basic
stat120 Probability of union: Basic
stat104 Mutually exclusive events: Two events
stat102 Mutually exclusive events: Three events
stat850 Probability of independent events
stat105 Independent events: Two events
stat103 Independent events: Three events
stat113 The curious die
stat020 Calculating relative frequencies in a contingency table
stat116 Conditional probability: Basic
stat851 Probability of dependent events

stat109 Intersection and conditional probability
stat107 Conditional probability: Mutually exclusive events
stat108 Conditional probability: Independent events
stat756 Tree diagrams for conditional probabilities
stat110 Law of total probabilities
stat111 Bayes' theorem

Random Variables and Distributions

stat777 Classification of variables and levels of measurement
stat142 Discrete versus continuous variables
stat151 Discrete probability distribution: Basic
stat143 Discrete probability distribution: Word problems
stat149 Cumulative distribution function
stat150 Expectation and variance of a random variable
stat153 Rules for expectation and variance of random variables
stat145 Marginal distributions of two discrete random variables
stat146 Joint distributions of dependent or independent random variables
stat147 Probabilities of two random variables given their joint distribution
stat148 Conditional probabilities of two random variables given their joint distribution
stat156 Binomial problems: Mean and standard deviation
stat174 Binomial problems: Basic
stat155 Binomial problems: Advanced
stat157 Standard normal probabilities
stat760 Standard normal values: Basic
stat160 Standard normal values: Advanced
stat159 Normal versus standard normal density curves
stat161 Normal distribution raw scores
stat162 Mean and deviation of a normal distribution
stat163 Normal distribution: Word problems
stat173 t distribution
stat170 Chi-square distribution
stat171 F distribution
stat187 Normal approximation to binomial
stat185 Central limit theorem: Sample mean
stat186 Central limit theorem: Sample sum
stat188 Central limit theorem: Sample proportion

Confidence Intervals and Hypothesis Testing

stat200 Selecting a distribution for inferences on the population mean
stat201 Confidence interval for the population mean: Use of the standard normal

stat202 Confidence interval for the population mean: Use of the t distribution
stat203 Confidence interval for a population proportion
stat204 Confidence interval for the population standard deviation
stat205 Confidence interval for the difference of population means: Use of the standard normal
stat206 Confidence interval for the difference of population means: Use of the t distribution
stat207 Confidence interval for the difference of population proportions
stat208 Confidence interval for the ratio of population variances
stat755 Choosing an appropriate sample size
stat190 Type I and Type II errors
stat192 Type I and Type II errors and power
stat194 Effect size, sample size, and power
stat300 Determining null and alternative hypotheses
stat301 Hypothesis test for the population mean: Z test
stat302 Hypothesis test for the population mean: t test
stat303 Hypothesis test for a population proportion
stat304 Hypothesis test for the population variance or standard deviation
stat305 Hypothesis test for the difference of population means: Z test
stat309 Hypothesis test for the difference of population means: Paired comparisons
stat306 Hypothesis test for the difference of population means: t test
stat307 Hypothesis test for the difference of population proportions
stat308 Hypothesis test for the ratio of population variances

Regression and Correlation

stat339 Sketching the least-squares regression line
stat333 Linear relationship and the sample correlation coefficient
stat340 Predictions from the least-squares regression line
stat930 Computing the sample correlation coefficient and the coefficients for the least-squares regression line
stat931 Explained and unexplained variation and the least-squares regression line
stat325 Confidence intervals and prediction intervals from simple linear regression
stat947 Hypothesis tests for the correlation coefficient and the slope of the least-squares regression line
stat400 Interpreting the regression coefficients
stat401 Identifying degrees of freedom
stat402 ANOVA table: Problem type 1
stat403 ANOVA table: Problem type 2
stat404 F test of a multiple regression model
stat405 t test of a multiple regression model

ANOVA, Chi-square and Nonparametric Tests

stat422 ANOVA: Mean squares and the common population variance
stat423 ANOVA: Degrees of freedom and the F statistic
stat424 ANOVA: Hypothesis tests and the ANOVA table
stat430 One-way, repeated-measures ANOVA
stat442 Interpreting group means from a factorial design
stat443 Two-way, independent-samples ANOVA
stat440 Selecting among t tests and ANOVA tests
stat319 Contingency tables: Expected frequencies
stat320 Chi-square goodness-of-fit test
stat321 Chi-square test of independence
stat326 Sign test
stat327 Wilcoxon signed-ranks test

Quality Control

stat600 Interpreting a control chart
stat601 R charts
stat602 x-bar charts
stat603 p charts

B.13 Basic Math

Whole Numbers

arith066 Expanded form
arith643 Expanded form with zeros
arith028 Numeral translation: Problem type 1
arith060 Numeral translation: Problem type 2
arith001 Addition without carry
arith050 Addition with carry
arith630 Addition with carry to the hundreds place
arith012 Addition of large numbers
arith007 Subtraction without borrowing
arith006 Subtraction with borrowing
arith682 Subtraction with multiple regrouping steps
arith637 Subtraction and regrouping with zeros
arith613 Word problem using addition or subtraction
arith008 One-digit multiplication
arith679 Multiplication by 10, 100, and 1000
arith003 Multiplication without carry

arith004 Multiplication with carry
arith615 Introduction to multiplication of large numbers
arith632 Multiplication with trailing zeros: Problem type 1
arith638 Multiplication with trailing zeros: Problem type 2
arith014 Multiplication of large numbers
arith075 Simple division
arith052 Division without carry
arith005 Division with carry
arith680 Division with trailing zeros: Problem type 1
arith649 Division with trailing zeros: Problem type 2
arith650 Division involving quotients with intermediate zeros
arith644 Word problem on quotient and remainder
arith023 Word problem using division
arith614 Basic word problem using multiplication or division
arith651 Introduction to inequalities
arith077 Ordering large numbers
arith078 Rounding: Problem type 1
arith061 Rounding: Problem type 2
arith101 Estimating a sum
arith102 Estimating a difference
arith604 Estimating a product or quotient
arith103 Average of two numbers
arith645 Introduction to parentheses
arith681 Introduction to order of operations
arith048 Order of operations: Problem type 1
arith051 Order of operations: Problem type 2
arith655 Introduction to properties of addition
arith656 Introduction to properties of multiplication
arith657 Introduction to the distributive property
arith647 Divisibility rules for 2, 5, and 10
arith648 Divisibility rules for 3 and 9
arith056 Factors
arith034 Prime numbers
arith035 Prime number factorization
arith033 Greatest common factor
arith070 Least common multiple

Fractions

arith623 Introduction to fractions
arith665 Introduction to equivalent fractions
arith212 Equivalent fractions
arith666 Introduction to reduced fractions

arith067 Reduced fraction
arith044 Ordering fractions with same denominator
arith091 Ordering fractions with same numerator
arith092 Ordering fractions
arith667 Plotting fractions on a number line
arith618 Addition or subtraction of fractions with the same denominator
arith664 Introduction to addition or subtraction of fractions with different denominators
arith230 Addition or subtraction of fractions with different denominators
arith100 Fractional part of a circle
arith088 The reciprocal of a number
arith079 Product of a unit fraction and a whole number
arith009 Unit fraction multiplication
arith086 Product of a fraction and a whole number
arith053 Fraction multiplication
arith095 Word problem with fractions
arith022 Fraction division
arith662 Introduction to mixed numbers and improper fractions
arith015 Writing an improper fraction as a mixed number
arith619 Writing a mixed number as an improper fraction
arith215 Addition or subtraction of mixed numbers with same denominator
arith084 Addition of mixed numbers with same denominator and carry
arith216 Subtraction of mixed numbers with same denominator and borrowing
arith085 Addition or subtraction of mixed numbers with different denominators
arith020 Mixed number multiplication: Problem type 1
arith076 Mixed number multiplication: Problem type 2
arith068 Mixed number division

Decimals, Proportion and Percent

arith220 Decimal place value
arith221 Rounding decimals
arith608 Ordering decimals
arith609 Ordering fractions and decimals
arith670 Introduction to writing a decimal as a fraction
arith087 Converting a decimal to a fraction
arith671 Introduction to converting a fraction to a decimal
arith222 Converting a fraction to a terminating decimal
arith089 Converting a fraction to a repeating decimal
arith672 Introduction to writing a decimal as a mixed number
arith223 Converting a mixed number to a decimal
arith624 Addition of aligned decimals
arith625 Subtraction of aligned decimals

arith626 Word problem with one decimal operation: Problem type 1
arith627 Word problem with one decimal operation: Problem type 2
arith082 Multiplication of a decimal by a power of ten
arith017 Multiplication of a decimal by a whole number
arith055 Decimal multiplication: Problem type 1
arith224 Word problem using decimal addition and multiplication
arith083 Division of a decimal by a power of ten
arith081 Division of a decimal by a whole number
arith019 Decimal division
arith045 Word problem with powers of ten
arith227 Word problem using decimal subtraction and division
arith663 Introduction to ratios
arith228 Basic word problem on rates
alge218 Word problem on rates
alge272 Solving a proportion: Basic
arith064 Simple word problem on proportions
arith610 Word problem on proportions: Problem type 1
arith611 Word problem on proportions: Problem type 2
alge063 Word problem on mixed number proportions
arith063 Word problem with clocks
arith674 Introduction to percent
arith226 Converting between percentages and decimals
arith090 Converting a percentage to a fraction
arith002 Converting a fraction to a percentage
arith030 Percentage of a whole number
arith069 Writing a ratio as a percentage
arith074 Word problem on percentage: Problem type 1
arith031 Word problem on percentage: Problem type 2
arith225 Word problem on percentage: Problem type 3
arith232 Simple interest

Measurement and Data Analysis

mstat035 Conversions involving measurements in feet and inches
mstat036 Adding customary units of length
unit005 Customary unit conversion with whole number values
unit006 Customary unit conversion with whole number values, two-step conversion
unit007 Customary unit conversion with mixed number values
unit008 Customary unit conversion with mixed number values, two-step conversion
unit009 Customary area unit conversion with whole number values
unit001 Metric distance conversion with whole number values
unit002 Metric mass or capacity conversion with whole number values
unit003 Metric distance conversion with decimal values

unit004 Metric conversion with decimal values, two-step conversion
unit010 Metric area unit conversion with decimal number values
unit012 Time unit conversion with whole number values
unit034 Conversion between metric and customary unit systems
unit035 Conversion between compound units, basic problem
unit036 Conversion between compound units, advanced problem
time006 Adding time
time007 Subtracting time
mstat004 Histograms for numerical data
mstat005 Bar graphs for non-numerical data
mstat024 Interpreting bar graphs
mstat044 Double bar graphs
mstat007 Interpreting line graphs
alge263 Interpreting the graphs of two functions
stat804 Interpreting circle graphs or pie charts
stat801 Computations from circle graphs
mstat003 Mode of a data set
mstat028 Mean and median of a data set
stat803 Finding the value for a new score that will yield a given mean
mstat006 Box-and-whisker plots
mstat014 Random samples and prediction
mstat026 Introduction to probability of an event
mstat010 Probability of an event
stat112 Die rolling

Geometry

geom349 Naming segments, rays, and lines
geom151 Measuring an angle with the protractor
geom303 Acute, obtuse, and right angles
geom039 Supplementary and complementary angles
geom305 Supplementary and vertical angles
geom304 Corresponding and alternate angles
geom306 Acute, obtuse, and right triangles
geom307 Scalene, isosceles, and equilateral triangles
geom001 Sum of the angle measures of a triangle
geom801 Area of a triangle
geom310 Classifying quadrilaterals
geom532 Classifying parallelograms
geom339 Perimeter of a polygon
geom300 Perimeter of a square or a rectangle
geom353 Perimeter of a piecewise rectangular figure
geom078 Sides of polygons having the same perimeter

geom019 Area of a square or a rectangle
geom217 Finding the side length of a rectangle given its perimeter or area
geom350 Distinguishing between area and perimeter
geom351 Areas of rectangles with the same perimeter
geom340 Area of a piecewise rectangular figure
geom022 Area of a parallelogram
geom023 Area of a trapezoid
geom344 Area involving rectangles and triangles
geom142 Area between two rectangles
geom016 Circumference of a circle
geom301 Perimeter involving rectangles and circles
geom838 Circumference ratios
geom802 Circumference and area of a circle
geom036 Area between two concentric circles
geom302 Area involving rectangles and circles
geom214 Area involving inscribed figures
geom311 Volume of a cube or a rectangular prism
geom505 Volume of a piecewise rectangular prism
geom033 Volume of a pyramid
geom035 Volume of a cylinder
geom086 Volume of a cone
geom841 Volume of a sphere
geom092 Rate of filling of a solid
arith016 Square root of a perfect square
arith601 Square root of a rational perfect square
arith602 Estimating a square root
geom044 Pythagorean Theorem
geom037 Similar polygons
geom038 Similar right triangles
geom337 Indirect measurement

Signed Numbers and Introduction to Algebra

alge286 Plotting integers on a number line
arith071 Absolute value of a number
arith104 Operations with absolute value
arith200 Integer addition: Problem type 1
arith108 Integer addition: Problem type 2
arith107 Integer subtraction
arith231 Integer multiplication and division
arith605 Plotting rational numbers on a number line
arith106 Signed fractions addition
arith105 Signed fractions multiplication

arith234 Signed decimal addition
arith233 Introduction to exponents
arith683 Powers of 10: Positive exponent
arith684 Powers of 10: Negative exponent
arith047 Evaluating expressions with exponents: Problem type 1
arith049 Evaluating expressions with exponents: Problem type 2
arith600 Exponents and order of operations
arith036 Scientific notation with positive exponent
arith037 Scientific notation with negative exponent
alge005 Evaluation of a linear expression in two variables
alge606 Distributive property, simple
alge604 Distributive Property, advanced
alge607 Combining like terms, basic
alge663 Combining like terms, advanced
alge602 Writing a mathematical expression
alge009 Additive property of equality: Problem type 1
alge800 Additive property of equality with decimals
alge801 Additive property of equality with fractions
alge010 Additive property of equality: Problem type 2
alge266 Additive property of equality: Problem type 3
alge008 Multiplicative property of equality: Problem type 1
alge802 Multiplicative property of equality with fractions
alge012 Multiplicative property of equality: Problem type 2
alge006 Solving a linear equation: Problem type 1
alge208 Solving a linear equation: Problem type 2
alge200 Solving a linear equation: Problem type 3
alge011 Solving a linear equation with several occurrences of the variable: Problem type 1
alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
alge013 Solving a linear equation with several occurrences of the variable: Problem type 3
alge209 Solving a linear equation with several occurrences of the variable: Problem type 4
alge016 Translating sentences into mathematical equations
alge014 Solving a word problem using a linear equation: Problem type 1
alge219 Solving a word problem using a linear equation: Problem type 2
alge173 Solving a word problem using a linear equation: Problem type 3

B.14 Pre-Algebra

Whole Numbers

arith066 Expanded form
arith643 Expanded form with zeros
arith028 Numeral translation: Problem type 1
arith060 Numeral translation: Problem type 2
arith001 Addition without carry
arith050 Addition with carry
arith630 Addition with carry to the hundreds place
arith012 Addition of large numbers
arith007 Subtraction without borrowing
arith006 Subtraction with borrowing
arith682 Subtraction with multiple regrouping steps
arith637 Subtraction and regrouping with zeros
arith613 Word problem using addition or subtraction
arith008 One-digit multiplication
arith003 Multiplication without carry
arith004 Multiplication with carry
arith615 Introduction to multiplication of large numbers
arith632 Multiplication with trailing zeros: Problem type 1
arith638 Multiplication with trailing zeros: Problem type 2
arith014 Multiplication of large numbers
arith075 Simple division
arith052 Division without carry
arith005 Division with carry
arith680 Division with trailing zeros: Problem type 1
arith649 Division with trailing zeros: Problem type 2
arith650 Division involving quotients with intermediate zeros
arith023 Word problem using division
arith614 Basic word problem using multiplication or division
arith651 Introduction to inequalities
arith077 Ordering large numbers
arith078 Rounding: Problem type 1
arith061 Rounding: Problem type 2
arith101 Estimating a sum
arith102 Estimating a difference
arith604 Estimating a product or quotient
arith103 Average of two numbers
arith645 Introduction to parentheses
arith048 Order of operations: Problem type 1
arith051 Order of operations: Problem type 2
alge285 Evaluating a simple algebraic expression: Problem type 3
arith655 Introduction to properties of addition
arith656 Introduction to properties of multiplication
arith657 Introduction to the distributive property
arith056 Factors

arith034 Prime numbers
arith035 Prime number factorization
arith033 Greatest common factor
arith070 Least common multiple
arith240 Word problem with common multiples

Fractions and Proportions

arith623 Introduction to fractions
arith663 Introduction to ratios
arith665 Introduction to equivalent fractions
arith212 Equivalent fractions
arith067 Reduced fraction
arith667 Plotting fractions on a number line
arith044 Ordering fractions with same denominator
arith091 Ordering fractions with same numerator
arith092 Ordering fractions
arith618 Addition or subtraction of fractions with the same denominator
arith230 Addition or subtraction of fractions with different denominators
arith100 Fractional part of a circle
arith088 The reciprocal of a number
arith079 Product of a unit fraction and a whole number
arith009 Unit fraction multiplication
arith086 Product of a fraction and a whole number
arith053 Fraction multiplication
arith095 Word problem with fractions
arith022 Fraction division
arith662 Introduction to mixed numbers and improper fractions
arith015 Writing an improper fraction as a mixed number
arith619 Writing a mixed number as an improper fraction
arith215 Addition or subtraction of mixed numbers with same denominator
arith084 Addition of mixed numbers with same denominator and carry
arith216 Subtraction of mixed numbers with same denominator and borrowing
arith085 Addition or subtraction of mixed numbers with different denominators
arith020 Mixed number multiplication: Problem type 1
arith076 Mixed number multiplication: Problem type 2
arith068 Mixed number division
arith228 Basic word problem on rates
alge218 Word problem on rates
alge272 Solving a proportion: Basic
alge271 Solving a proportion: Advanced
arith064 Simple word problem on proportions
arith610 Word problem on proportions: Problem type 1

arith611 Word problem on proportions: Problem type 2

Decimals and Percents

arith220 Decimal place value
arith221 Rounding decimals
arith608 Ordering decimals
arith609 Ordering fractions and decimals
arith671 Introduction to converting a fraction to a decimal
arith087 Converting a decimal to a fraction
arith222 Converting a fraction to a terminating decimal
arith089 Converting a fraction to a repeating decimal
arith672 Introduction to writing a decimal as a mixed number
arith223 Converting a mixed number to a decimal
arith624 Addition of aligned decimals
arith625 Subtraction of aligned decimals
arith626 Word problem with one decimal operation: Problem type 1
arith627 Word problem with one decimal operation: Problem type 2
arith082 Multiplication of a decimal by a power of ten
arith017 Multiplication of a decimal by a whole number
arith055 Decimal multiplication: Problem type 1
arith045 Word problem with powers of ten
arith224 Word problem using decimal addition and multiplication
arith083 Division of a decimal by a power of ten
arith081 Division of a decimal by a whole number
arith019 Decimal division
arith227 Word problem using decimal subtraction and division
arith674 Introduction to percent
arith226 Converting between percentages and decimals
arith090 Converting a percentage to a fraction
arith002 Converting a fraction to a percentage
arith030 Percentage of a whole number
arith069 Writing a ratio as a percentage
arith074 Word problem on percentage: Problem type 1
arith031 Word problem on percentage: Problem type 2
arith225 Word problem on percentage: Problem type 3
arith232 Simple interest
stat804 Interpreting circle graphs or pie charts
stat801 Computations from circle graphs
mstat014 Random samples and prediction

Measurement, Data and Probability

mstat035 Conversions involving measurements in feet and inches
mstat036 Adding customary units of length
unit005 Customary unit conversion with whole number values
unit006 Customary unit conversion with whole number values, two-step conversion
unit007 Customary unit conversion with mixed number values
unit008 Customary unit conversion with mixed number values, two-step conversion
unit009 Customary area unit conversion with whole number values
unit001 Metric distance conversion with whole number values
unit002 Metric mass or capacity conversion with whole number values
unit003 Metric distance conversion with decimal values
unit004 Metric conversion with decimal values, two-step conversion
unit010 Metric area unit conversion with decimal number values
unit012 Time unit conversion with whole number values
unit034 Conversion between metric and customary unit systems
mstat004 Histograms for numerical data
mstat005 Bar graphs for non-numerical data
mstat024 Interpreting bar graphs
mstat044 Double bar graphs
mstat007 Interpreting line graphs
mstat003 Mode of a data set
mstat028 Mean and median of a data set
stat803 Finding the value for a new score that will yield a given mean
mstat029 How changing a value affects the mean and median
mstat006 Box-and-whisker plots
mstat026 Introduction to probability of an event
mstat010 Probability of an event
mstat041 Tree diagrams

Variable Expressions and Polynomials

alge286 Plotting integers on a number line
arith605 Plotting rational numbers on a number line
arith071 Absolute value of a number
arith104 Operations with absolute value
arith200 Integer addition: Problem type 1
arith108 Integer addition: Problem type 2
arith107 Integer subtraction
arith231 Integer multiplication and division
arith106 Signed fractions addition
arith105 Signed fractions multiplication
arith234 Signed decimal addition
alge005 Evaluation of a linear expression in two variables
alge004 Evaluation of a polynomial in one variable

alge606 Distributive property, simple
alge604 Distributive Property, advanced
alge607 Combining like terms, basic
alge663 Combining like terms, advanced
alge602 Writing a mathematical expression
arith233 Introduction to exponents
arith047 Evaluating expressions with exponents: Problem type 1
arith049 Evaluating expressions with exponents: Problem type 2
arith600 Exponents and order of operations
alge024 Product rule of exponents
alge027 Power rule: Positive exponents
arith029 Ordering numbers with positive exponents
alge029 Simplifying a polynomial expression
alge037 Greatest common factor of two monomials
alge030 Multiplying monomials
alge033 Multiplying two binomials
alge032 Squaring a binomial
alge180 Multiplying polynomials
arith016 Square root of a perfect square
arith601 Square root of a rational perfect square
arith602 Estimating a square root
arith093 Square root simplification
arith032 Square root addition

Equations and Graphs

alge009 Additive property of equality: Problem type 1
alge800 Additive property of equality with decimals
alge801 Additive property of equality with fractions
alge010 Additive property of equality: Problem type 2
alge266 Additive property of equality: Problem type 3
alge008 Multiplicative property of equality: Problem type 1
alge802 Multiplicative property of equality with fractions
alge012 Multiplicative property of equality: Problem type 2
alge006 Solving a linear equation: Problem type 1
alge208 Solving a linear equation: Problem type 2
alge200 Solving a linear equation: Problem type 3
alge011 Solving a linear equation with several occurrences of the variable: Problem type 1
alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
alge013 Solving a linear equation with several occurrences of the variable: Problem type 3

alge209 Solving a linear equation with several occurrences of the variable: Problem type 4
alge016 Translating sentences into mathematical equations
alge014 Solving a word problem using a linear equation: Problem type 1
alge219 Solving a word problem using a linear equation: Problem type 2
alge173 Solving a word problem using a linear equation: Problem type 3
alge704 Solving a word problem using a linear equation: Problem type 4
fun005 Finding a function rule: Problem type 1
alge807 Finding the next terms of a simple sequence
alge064 Reading a point in the coordinate plane
alge067 Plotting a point in the coordinate plane
alge066 Solutions to a linear equation in two variables: Problem type 1
alge216 Solutions to a linear equation in two variables: Problem type 2
alge210 X- and y-intercepts of a line given the equation in standard form
alge197 Graphing a line given the x- and y-intercepts
alge194 Graphing a line given its equation in slope-intercept form
alge195 Graphing a line given its equation in standard form
alge198 Graphing a vertical or horizontal line
alge252 Graphing a parabola: Problem type 1

Geometry

geom349 Naming segments, rays, and lines
geom151 Measuring an angle with the protractor
geom152 Drawing an angle with the protractor
geom303 Acute, obtuse, and right angles
geom039 Supplementary and complementary angles
geom304 Corresponding and alternate angles
geom305 Supplementary and vertical angles
geom500 Vertical angles and linear pairs
geom306 Acute, obtuse, and right triangles
geom307 Scalene, isosceles, and equilateral triangles
geom801 Area of a triangle
geom001 Sum of the angle measures of a triangle
geom908 Solving a triangle: Problem type 1
geom044 Pythagorean Theorem
geom310 Classifying quadrilaterals
geom300 Perimeter of a square or a rectangle
geom339 Perimeter of a polygon
geom217 Finding the side length of a rectangle given its perimeter or area
geom078 Sides of polygons having the same perimeter
geom353 Perimeter of a piecewise rectangular figure
geom350 Distinguishing between area and perimeter

geom351 Areas of rectangles with the same perimeter
geom019 Area of a square or a rectangle
geom340 Area of a piecewise rectangular figure
geom022 Area of a parallelogram
geom023 Area of a trapezoid
geom142 Area between two rectangles
geom344 Area involving rectangles and triangles
geom143 Area and perimeter of a rectangle
geom347 Introduction to circle: diameter, radius, and chord
geom016 Circumference of a circle
geom802 Circumference and area of a circle
geom218 Finding the radius or the diameter of a circle given its circumference
geom838 Circumference ratios
geom301 Perimeter involving rectangles and circles
geom036 Area between two concentric circles
geom302 Area involving rectangles and circles
geom214 Area involving inscribed figures
geom311 Volume of a cube or a rectangular prism
geom505 Volume of a piecewise rectangular prism
geom090 Volume of a triangular prism
geom033 Volume of a pyramid
geom035 Volume of a cylinder
geom092 Rate of filling of a solid
geom086 Volume of a cone
geom841 Volume of a sphere
geom219 Nets of solids
geom345 Surface area of a solid made of unit cubes
geom031 Surface area of a cube or a rectangular prism
geom034 Surface area of a cylinder
geom842 Surface area of a sphere
geom037 Similar polygons
geom038 Similar right triangles
geom337 Indirect measurement

B.15 Beginning Algebra

Arithmetic readiness

arith048 Order of operations: Problem type 1
arith051 Order of operations: Problem type 2
arith056 Factors
arith034 Prime numbers

arith035 Prime number factorization
arith033 Greatest common factor
arith070 Least common multiple
arith240 Word problem with common multiples
arith064 Simple word problem on proportions
arith212 Equivalent fractions
arith067 Reduced fraction
arith092 Ordering fractions
arith618 Addition or subtraction of fractions with the same denominator
arith230 Addition or subtraction of fractions with different denominators
arith100 Fractional part of a circle
arith088 The reciprocal of a number
arith079 Product of a unit fraction and a whole number
arith009 Unit fraction multiplication
arith086 Product of a fraction and a whole number
arith053 Fraction multiplication
arith022 Fraction division
arith095 Word problem with fractions
arith015 Writing an improper fraction as a mixed number
arith619 Writing a mixed number as an improper fraction
arith084 Addition of mixed numbers with same denominator and carry
arith216 Subtraction of mixed numbers with same denominator and borrowing
arith085 Addition or subtraction of mixed numbers with different denominators
arith020 Mixed number multiplication: Problem type 1
arith068 Mixed number division
arith220 Decimal place value
arith221 Rounding decimals
arith087 Converting a decimal to a fraction
arith222 Converting a fraction to a terminating decimal
arith089 Converting a fraction to a repeating decimal
arith223 Converting a mixed number to a decimal
arith082 Multiplication of a decimal by a power of ten
arith017 Multiplication of a decimal by a whole number
arith055 Decimal multiplication: Problem type 1
arith083 Division of a decimal by a power of ten
arith081 Division of a decimal by a whole number
arith019 Decimal division
arith626 Word problem with one decimal operation: Problem type 1
arith627 Word problem with one decimal operation: Problem type 2
arith224 Word problem using decimal addition and multiplication
arith227 Word problem using decimal subtraction and division
arith226 Converting between percentages and decimals
arith090 Converting a percentage to a fraction
arith002 Converting a fraction to a percentage

arith030 Percentage of a whole number
arith069 Writing a ratio as a percentage
arith074 Word problem on percentage: Problem type 1
arith031 Word problem on percentage: Problem type 2
arith225 Word problem on percentage: Problem type 3
arith232 Simple interest
geom039 Supplementary and complementary angles
geom300 Perimeter of a square or a rectangle
geom339 Perimeter of a polygon
geom019 Area of a square or a rectangle
geom801 Area of a triangle
geom340 Area of a piecewise rectangular figure
geom142 Area between two rectangles
geom022 Area of a parallelogram
geom023 Area of a trapezoid
geom802 Circumference and area of a circle
geom302 Area involving rectangles and circles
geom214 Area involving inscribed figures
geom311 Volume of a cube or a rectangular prism
geom035 Volume of a cylinder
arith103 Average of two numbers
mstat028 Mean and median of a data set
mstat003 Mode of a data set
mstat014 Random samples and prediction
mstat024 Interpreting bar graphs
stat801 Computations from circle graphs
stat804 Interpreting circle graphs or pie charts

Real numbers and variables

arith605 Plotting rational numbers on a number line
arith200 Integer addition: Problem type 1
arith108 Integer addition: Problem type 2
arith107 Integer subtraction
arith231 Integer multiplication and division
arith106 Signed fractions addition
arith105 Signed fractions multiplication
arith234 Signed decimal addition
arith233 Introduction to exponents
arith047 Evaluating expressions with exponents: Problem type 1
arith049 Evaluating expressions with exponents: Problem type 2
arith600 Exponents and order of operations
arith016 Square root of a perfect square

arith602 Estimating a square root
arith071 Absolute value of a number
arith104 Operations with absolute value
alge001 Integers and rational numbers
alge002 Integers, rational numbers, and irrational numbers
alge187 Properties of addition
alge188 Properties of real numbers
alge005 Evaluation of a linear expression in two variables
alge004 Evaluation of a polynomial in one variable
alge606 Distributive property, simple
alge604 Distributive Property, advanced
alge607 Combining like terms, basic
alge602 Writing a mathematical expression

Linear equations and inequalities

alge009 Additive property of equality: Problem type 1
alge010 Additive property of equality: Problem type 2
alge266 Additive property of equality: Problem type 3
alge800 Additive property of equality with decimals
alge801 Additive property of equality with fractions
alge008 Multiplicative property of equality: Problem type 1
alge012 Multiplicative property of equality: Problem type 2
alge802 Multiplicative property of equality with fractions
alge803 Using two steps to solve an equation
alge006 Solving a linear equation: Problem type 1
alge208 Solving a linear equation: Problem type 2
alge200 Solving a linear equation: Problem type 3
alge011 Solving a linear equation with several occurrences of the variable: Problem type 1
alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
alge013 Solving a linear equation with several occurrences of the variable: Problem type 3
alge209 Solving a linear equation with several occurrences of the variable: Problem type 4
alge179 Solving a linear equation with several occurrences of the variable: Problem type 5
alge015 Writing an inequality
alge186 Writing a compound inequality
alge019 Solving a linear inequality: Problem type 1
alge020 Solving a linear inequality: Problem type 2
alge021 Solving a linear inequality: Problem type 3

alge207 Solving a linear inequality: Problem type 4
alge017 Graphing a linear inequality on the number line
alge166 Graphing a compound linear inequality on the number line
alge016 Translating sentences into mathematical equations
alge810 Introduction to algebraic symbol manipulation
alge160 Algebraic symbol manipulation
alge014 Solving a word problem using a linear equation: Problem type 1
alge219 Solving a word problem using a linear equation: Problem type 2
alge173 Solving a word problem using a linear equation: Problem type 3
alge704 Solving a word problem using a linear equation: Problem type 4
alge270 Simple absolute value equation
stat803 Finding the value for a new score that will yield a given mean
geom001 Sum of the angle measures of a triangle
geom500 Vertical angles and linear pairs
geom502 Solving triangles: Basic
geom217 Finding the side length of a rectangle given its perimeter or area
geom143 Area and perimeter of a rectangle
alge022 Word problem with linear inequalities

Functions, lines, systems of equations

set001 Set builder notation
set002 Union and intersection of finite sets
set004 Set builder and interval notation
fun001 Function tables
fun002 Graphing integer functions
fun016 Domain and range: Problem type 1
fun010 Vertical line test
alge064 Reading a point in the coordinate plane
alge067 Plotting a point in the coordinate plane
alge197 Graphing a line given the x- and y-intercepts
alge194 Graphing a line given its equation in slope-intercept form
alge195 Graphing a line given its equation in standard form
alge196 Graphing a line through a given point with a given slope
alge198 Graphing a vertical or horizontal line
alge018 Graphing a linear inequality in the plane: Problem type 1
alge225 Graphing a linear inequality in the plane: Problem type 2
alge701 Writing equations and drawing graphs to fit a narrative
alge168 Graphing an equation involving absolute value in the plane
alge066 Solutions to a linear equation in two variables: Problem type 1
alge216 Solutions to a linear equation in two variables: Problem type 2
alge069 Y-intercept of a line
alge210 X- and y-intercepts of a line given the equation in standard form

alge631 Finding the slope of a line given its equation
alge637 Determining the slope of a line given its graph
alge070 Writing an equation of a line given the slope and the y-intercept
alge071 Writing the equation of a line given the slope and a point on the line
alge072 Writing the equation of the line through two given points
alge073 Writing the equations of vertical and horizontal lines through a given point
alge805 Application problem with a linear function: Problem type 1
alge806 Application problem with a linear function: Problem type 2
geom807 Slopes of parallel and perpendicular lines: Problem type 1
geom808 Slopes of parallel and perpendicular lines: Problem type 2
mstat007 Interpreting line graphs
alge263 Interpreting the graphs of two functions
mstat023 Scatterplots and correlation
alge075 Classifying a system of linear equations
alge076 Solving a system of linear equations
alge078 Solving a word problem using a system of linear equations: Problem type 1
alge184 Solving a word problem using a system of linear equations: Problem type 2
alge224 Solving a word problem using a system of linear equations: Problem type 3
alge192 Solving a word problem using a system of linear equations: Problem type 4
alge172 Solving a word problem using a system of linear equations: Problem type 5
alge079 Graphing a system of linear inequalities
pcalc093 Solving a word problem using a system of linear inequalities

Integer exponents and polynomials

alge024 Product rule of exponents
arith042 Writing a positive number without a negative exponent
arith043 Writing a negative number without a negative exponent
alge027 Power rule: Positive exponents
alge025 Power rule: Negative exponents
alge030 Multiplying monomials
alge028 Product rule of exponents in a multivariate monomial
arith029 Ordering numbers with positive exponents
arith024 Ordering numbers with negative exponents
arith036 Scientific notation with positive exponent
arith037 Scientific notation with negative exponent
scinot002 Multiplying and dividing numbers written in scientific notation
alge177 Solving a word problem using an exponential equation: Problem type 1
alge663 Combining like terms, advanced
alge029 Simplifying a polynomial expression
alge033 Multiplying two binomials
alge032 Squaring a binomial
alge180 Multiplying polynomials

alge031 Degree of a multivariate polynomial
alge708 Polynomial long division: Linear divisor
alge709 Polynomial long division: Quadratic divisor
alge039 Factoring a quadratic with leading coefficient 1
alge040 Factoring a quadratic with leading coefficient greater than 1
alge043 Factoring a perfect square
alge265 Factoring a quadratic polynomial in two variables
alge041 Factoring a product of a quadratic trinomial and a monomial
alge624 Factoring a difference of squares
alge042 Factoring with repeated use of the difference of squares formula
alge037 Greatest common factor of two monomials
alge038 Factoring a multivariate polynomial by grouping: Problem type 1
alge181 Factoring a multivariate polynomial by grouping: Problem type 2
alge044 Factoring a sum or difference of two cubes

Rational expressions and proportions

alge053 Multiplying rational expressions: Problem type 1
alge620 Multiplying rational expressions: Problem type 2
alge054 Dividing rational expressions
alge059 Ordering fractions with variables
alge058 Complex fraction: Problem type 1
alge162 Complex Fraction: Problem type 2
alge056 Adding rational expressions with common denominator
alge057 Adding rational expressions
alge055 Least common multiple of two monomials
alge226 Adding rational expressions with different denominators
alge622 Adding and subtracting rational expressions: Problem type 1
alge661 Adding and subtracting rational expressions: Problem type 2
alge710 Simplifying a ratio of polynomials: Problem type 1
alge034 Ratio of multivariate polynomials
alge272 Solving a proportion: Basic
alge271 Solving a proportion: Advanced
alge049 Restriction on variable in a denominator
alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1
alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2
alge206 Solving a rational equation that simplifies to a linear equation: Problem type 3
alge212 Solving a rational equation that simplifies to a quadratic equation: Problem type 1
alge062 Solving a rational equation that simplifies to a quadratic equation: Problem type 2
alge047 Solving a rational equation that simplifies to a quadratic equation: Problem type 3

arith228 Basic word problem on rates
alge218 Word problem on rates
arith612 Word problem involving multiple rates
arith610 Word problem on proportions: Problem type 1
arith611 Word problem on proportions: Problem type 2
alge220 Word problem on inverse proportions
alge175 Word problem on direct variation
alge176 Word problem on inverse variation
geom037 Similar polygons
geom337 Indirect measurement
unit001 Metric distance conversion with whole number values
unit005 Customary unit conversion with whole number values
unit034 Conversion between metric and customary unit systems
unit035 Conversion between compound units, basic problem
unit036 Conversion between compound units, advanced problem
geom036 Area between two concentric circles
geom092 Rate of filling of a solid

Radicals and rational exponents

arith601 Square root of a rational perfect square
alge264 Square root of a perfect square monomial
arith093 Square root simplification
alge080 Simplifying a radical expression: Problem type 1
alge275 Simplifying a radical expression: Problem type 2
arith032 Square root addition
alge084 Simplifying a sum of radical expressions
arith039 Square root multiplication
alge640 Simplifying a product of radical expressions
alge276 Simplifying a product of radical expressions using the distributive property
alge086 Rationalizing the denominator of a radical expression
alge088 Rationalizing the denominator of a radical expression using conjugates
alge089 Solving an equation with radicals: Problem type 1
alge090 Solving an equation with radicals: Problem type 2
alge091 Solving an equation with radicals: Problem type 3
alge182 Solving an equation with radicals: Problem type 4
alge213 Domain of a square root function
geom044 Pythagorean Theorem
alge132 Distance between two points in the plane
arith094 Cube root of an integer
alge273 Simplifying a higher radical: Problem type 1
alge811 Simplifying a higher radical: Problem type 2
alge092 Even root property

alge227 Solving an equation with exponent using the even-root property
alge812 Converting between radical form and exponent form
alge250 Rational exponents: Basic
alge251 Rational exponents: Negative exponents and fractional bases
alge249 Rational exponents: Powers of powers

Complex numbers and quadratic equations

pcalc048 Adding and subtracting complex numbers
pcalc049 Multiplying complex numbers
pcalc050 Dividing complex numbers
pcalc051 Solving a quadratic equation with imaginary roots
pcalc053 Simplifying a power of i
alge681 Solving equations written in factored form
alge045 Finding the roots of a quadratic equation with leading coefficient 1
alge048 Finding the roots of a quadratic equation with leading coefficient greater than 1
alge211 Solving a quadratic equation needing simplification
alge703 Solving a word problem using a quadratic equation with rational roots
alge094 Completing the square
alge095 Solving a quadratic equation using the quadratic formula
alge214 Discriminant of a quadratic equation
alge524 Solving a word problem using a quadratic equation with irrational roots
fun019 Sum, difference, and product of two functions
fun022 Composition of two functions: Basic
Finding the x-intercept(s) and the vertex of a parabola (alge277) Browse: Question, Explanation
alge252 Graphing a parabola: Problem type 1
alge253 Graphing a parabola: Problem type 2
alge254 Graphing a parabola: Problem type 3
alge262 Graphing a simple cubic function

B.16 High School Geometry

Arithmetic and algebra readiness

arith048 Order of operations: Problem type 1
arith051 Order of operations: Problem type 2
arith056 Factors
arith070 Least common multiple
arith212 Equivalent fractions

arith067 Reduced fraction
arith230 Addition or subtraction of fractions with different denominators
arith086 Product of a fraction and a whole number
arith053 Fraction multiplication
arith022 Fraction division
arith015 Writing an improper fraction as a mixed number
arith220 Decimal place value
arith221 Rounding decimals
arith030 Percentage of a whole number
arith071 Absolute value of a number
arith200 Integer addition: Problem type 1
arith108 Integer addition: Problem type 2
arith107 Integer subtraction
arith231 Integer multiplication and division
alge005 Evaluation of a linear expression in two variables
alge004 Evaluation of a polynomial in one variable
alge016 Translating sentences into mathematical equations
alge606 Distributive property, simple
alge607 Combining like terms, basic
alge007 Additive property of equality: Problem type 3
alge012 Multiplicative property of equality: Problem type 2
alge006 Solving a linear equation: Problem type 1
alge208 Solving a linear equation: Problem type 2
alge011 Solving a linear equation with several occurrences of the variable: Problem type 1
alge019 Solving a linear inequality: Problem type 1
alge017 Graphing a linear inequality on the number line
alge166 Graphing a compound linear inequality on the number line
alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1
alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2
arith047 Evaluating expressions with exponents: Problem type 1
arith016 Square root of a perfect square
arith093 Square root simplification
alge086 Rationalizing the denominator of a radical expression

Plane geometry

glogic001 Conditional statements and negations
glogic005 The converse, inverse, and contrapositive of a conditional statement
glogic008 Conditional statements and deductive reasoning
geom151 Measuring an angle with the protractor
geom152 Drawing an angle with the protractor
geom303 Acute, obtuse, and right angles

geom039 Supplementary and complementary angles
geom304 Corresponding and alternate angles
geom800 Identifying linear pairs and vertical angles
geom500 Vertical angles and linear pairs
geom503 Angles and parallel lines
geom159 Constructing congruent angles
geom158 Constructing an angle bisector
geom516 Angle addition and angle bisectors
geom154 Constructing the perpendicular bisector of a line segment
geom150 Constructing a pair of perpendicular lines
geom157 Constructing a pair of parallel lines
geom616 Introduction to proofs: Justifying statements
geom614 Proofs involving segment congruence
geom611 Congruent angles
geom610 Angles and parallel lines
geom306 Acute, obtuse, and right triangles
geom307 Scalene, isosceles, and equilateral triangles
geom001 Sum of the angle measures of a triangle
geom809 Relationship between angle measures and side lengths of a triangle
geom504 Triangle inequality
geom507 Right triangles and geometric mean
geom520 Identifying and naming congruent triangles
geom502 Solving triangles: Basic
geom908 Solving a triangle: Problem type 1
geom309 Solving a triangle: Problem type 2
geom044 Pythagorean Theorem
geom068 Computing an area using the Pythagorean Theorem
geom617 Congruent triangles: Problem type 1
geom612 Congruent triangles: Problem type 2
geom613 Congruent triangles: Problem type 3
proof by contradiction Indirect proof
geom310 Classifying quadrilaterals
geom523 Classifying quadrilaterals: Advanced problem
geom524 Hierarchy of quadrilateral figures
geom528 Properties of parallelograms: Problem type 1
geom527 Properties of parallelograms: Problem type 2
geom522 Interior angles of convex polygons
geom343 Identifying central angles, inscribed angles, arcs, chords, and tangents of a circle
geom514 Inscribed angles of a circle
geom515 Tangents of a circle
geom512 Central angles and inscribed angles of a circle
geom511 Lengths of chords, secants, and tangents
geom513 Angles of intersecting secants and tangents

geom037 Similar polygons
geom510 Triangles and parallel lines
geom038 Similar right triangles
geom337 Indirect measurement
geom508 Length, area, and volume ratios of similar figures

Lengths, areas, and volumes

geom525 Computing distances on the number line
geom526 Midpoint of a number line segment
geom521 Segment addition and midpoints
geom300 Perimeter of a square or a rectangle
geom339 Perimeter of a polygon
geom078 Sides of polygons having the same perimeter
geom019 Area of a square or a rectangle
geom143 Area and perimeter of a rectangle
geom340 Area of a piecewise rectangular figure
geom801 Area of a triangle
geom022 Area of a parallelogram
geom023 Area of a trapezoid
geom142 Area between two rectangles
geom213 Area of a regular polygon
geom802 Circumference and area of a circle
geom301 Perimeter involving rectangles and circles
geom838 Circumference ratios
geom805 Arc length and area of a sector of a circle
geom036 Area between two concentric circles
geom302 Area involving rectangles and circles
geom211 Area involving rectangles and circles: Advanced problem
mstat011 Area as probability
geom311 Volume of a cube or a rectangular prism
geom505 Volume of a piecewise rectangular prism
geom090 Volume of a triangular prism
geom033 Volume of a pyramid
geom035 Volume of a cylinder
geom086 Volume of a cone
geom092 Rate of filling of a solid
geom133 Ratio of volumes
geom841 Volume of a sphere
geom031 Surface area of a cube or a rectangular prism
geom091 Surface area of a triangular prism
geom034 Surface area of a cylinder
geom338 Surface area involving prisms or cylinders

geom842 Surface area of a sphere

Analytic geometry

alge067 Plotting a point in the coordinate plane
alge191 Midpoint of a line segment in the plane
alge132 Distance between two points in the plane
alge197 Graphing a line given the x- and y-intercepts
alge194 Graphing a line given its equation in slope-intercept form
alge210 X- and y-intercepts of a line given the equation in standard form
alge195 Graphing a line given its equation in standard form
alge196 Graphing a line through a given point with a given slope
alge637 Determining the slope of a line given its graph
alge631 Finding the slope of a line given its equation
geom807 Slopes of parallel and perpendicular lines: Problem type 1
geom808 Slopes of parallel and perpendicular lines: Problem type 2
alge070 Writing an equation of a line given the slope and the y-intercept
alge071 Writing the equation of a line given the slope and a point on the line
alge072 Writing the equation of the line through two given points
pcalc605 Graphing a circle given its equation in standard form
pcalc065 Writing an equation of a circle given its center and a point on the circle
pcalc066 Writing an equation of a circle given the endpoints of a diameter

Transformations, trigonometry, and vectors

geom330 Translation of a polygon
geom331 Coordinates of translated points
geom332 Reflection of a polygon over a vertical or horizontal line
geom333 Coordinates of points reflected over an axis
geom334 Drawing lines of symmetry
geom335 Rotation of a figure about the origin
geom336 Dilation
geom506 Special right triangles
pcalc600 Sine, cosine, and tangent ratios
pcalc601 Using a trigonometric ratio to find a side length in a right triangle
pcalc602 Using a trigonometric ratio to find an angle measure in a right triangle
geom212 Circles inscribed in and circumscribed around regular polygons
pcalc739 Multiplication of a vector by a scalar
pcalc725 Linear combination of vectors: Algebraic approach
pcalc726 Linear combination of vectors: Geometric approach
pcalc060 Magnitude of a vector
vector002 Calculating the magnitude and direction of a vector

vector005 Finding the components of a vector
pcalc063 Translation of a vector

B.17 Intermediate Algebra

Real numbers and linear equations

arith605 Plotting rational numbers on a number line
arith071 Absolute value of a number
arith104 Operations with absolute value
arith106 Signed fractions addition
arith105 Signed fractions multiplication
arith234 Signed decimal addition
arith047 Evaluating expressions with exponents: Problem type 1
arith049 Evaluating expressions with exponents: Problem type 2
alge005 Evaluation of a linear expression in two variables
alge004 Evaluation of a polynomial in one variable
arith600 Exponents and order of operations
arith016 Square root of a perfect square
alge001 Integers and rational numbers
alge002 Integers, rational numbers, and irrational numbers
alge602 Writing a mathematical expression
alge016 Translating sentences into mathematical equations
alge015 Writing an inequality
alge186 Writing a compound inequality
alge606 Distributive property, simple
alge604 Distributive Property, advanced
alge607 Combining like terms, basic
alge663 Combining like terms, advanced
alge187 Properties of addition
alge188 Properties of real numbers
alge010 Additive property of equality: Problem type 2
alge266 Additive property of equality: Problem type 3
alge802 Multiplicative property of equality with fractions
alge008 Multiplicative property of equality: Problem type 1
alge012 Multiplicative property of equality: Problem type 2
alge006 Solving a linear equation: Problem type 1
alge208 Solving a linear equation: Problem type 2
alge200 Solving a linear equation: Problem type 3
alge011 Solving a linear equation with several occurrences of the variable: Problem type 1
alge061 Solving a linear equation with several occurrences of the variable: Problem type

2
alge013 Solving a linear equation with several occurrences of the variable: Problem type
3
alge209 Solving a linear equation with several occurrences of the variable: Problem type
4
alge179 Solving a linear equation with several occurrences of the variable: Problem type
5
alge810 Introduction to algebraic symbol manipulation
alge160 Algebraic symbol manipulation
alge019 Solving a linear inequality: Problem type 1
alge020 Solving a linear inequality: Problem type 2
alge021 Solving a linear inequality: Problem type 3
alge207 Solving a linear inequality: Problem type 4
alge017 Graphing a linear inequality on the number line
alge166 Graphing a compound linear inequality on the number line
alge014 Solving a word problem using a linear equation: Problem type 1
alge219 Solving a word problem using a linear equation: Problem type 2
alge173 Solving a word problem using a linear equation: Problem type 3
alge704 Solving a word problem using a linear equation: Problem type 4
alge022 Word problem with linear inequalities
mstat014 Random samples and prediction
arith232 Simple interest
stat801 Computations from circle graphs
arith074 Word problem on percentage: Problem type 1
arith031 Word problem on percentage: Problem type 2
arith225 Word problem on percentage: Problem type 3
stat803 Finding the value for a new score that will yield a given mean
geom300 Perimeter of a square or a rectangle
geom078 Sides of polygons having the same perimeter
geom019 Area of a square or a rectangle
geom217 Finding the side length of a rectangle given its perimeter or area
geom143 Area and perimeter of a rectangle
geom311 Volume of a cube or a rectangular prism
geom802 Circumference and area of a circle
geom036 Area between two concentric circles
geom031 Surface area of a cube or a rectangular prism
geom034 Surface area of a cylinder
geom035 Volume of a cylinder
geom092 Rate of filling of a solid
geom500 Vertical angles and linear pairs
geom502 Solving triangles: Basic
alge270 Simple absolute value equation
alge103 Solving an equation involving absolute value: Basic
alge167 Solving an equation involving absolute value: Advanced

- alge169 Solving an inequality involving absolute value
- alge170 Solving an inequality involving absolute value: Basic

Graphs and linear functions

- alge064 Reading a point in the coordinate plane
- alge067 Plotting a point in the coordinate plane
- alge066 Solutions to a linear equation in two variables: Problem type 1
- alge216 Solutions to a linear equation in two variables: Problem type 2
- alge197 Graphing a line given the x- and y-intercepts
- alge194 Graphing a line given its equation in slope-intercept form
- alge195 Graphing a line given its equation in standard form
- alge196 Graphing a line through a given point with a given slope
- alge637 Determining the slope of a line given its graph
- alge198 Graphing a vertical or horizontal line
- alge210 X- and y-intercepts of a line given the equation in standard form
- alge631 Finding the slope of a line given its equation
- alge070 Writing an equation of a line given the slope and the y-intercept
- alge071 Writing the equation of a line given the slope and a point on the line
- alge072 Writing the equation of the line through two given points
- alge073 Writing the equations of vertical and horizontal lines through a given point
- alge701 Writing equations and drawing graphs to fit a narrative
- alge805 Application problem with a linear function: Problem type 1
- alge806 Application problem with a linear function: Problem type 2
- geom807 Slopes of parallel and perpendicular lines: Problem type 1
- geom808 Slopes of parallel and perpendicular lines: Problem type 2
- alge018 Graphing a linear inequality in the plane: Problem type 1
- alge225 Graphing a linear inequality in the plane: Problem type 2
- set001 Set builder notation
- set002 Union and intersection of finite sets
- set004 Set builder and interval notation
- set005 Union and intersection of intervals
- fun001 Function tables
- fun002 Graphing integer functions
- fun016 Domain and range: Problem type 1
- fun004 Domain and range: Problem type 2
- fun010 Vertical line test

Systems of linear equations

- alge075 Classifying a system of linear equations
- alge076 Solving a system of linear equations

alge077 Creating an inconsistent system of linear equations
alge263 Interpreting the graphs of two functions
alge079 Graphing a system of linear inequalities
pcalc095 Linear programming
pcalc094 Solving a word problem using linear programming
alge078 Solving a word problem using a system of linear equations: Problem type 1
alge184 Solving a word problem using a system of linear equations: Problem type 2
alge224 Solving a word problem using a system of linear equations: Problem type 3
alge192 Solving a word problem using a system of linear equations: Problem type 4
alge172 Solving a word problem using a system of linear equations: Problem type 5
pcalc093 Solving a word problem using a system of linear inequalities
pcalc709 Addition of matrices and multiplication of a matrix by a scalar
pcalc042 Finding the determinant of a 2x2 matrix
pcalc043 Finding the determinant of a 3x3 matrix
pcalc045 Cramer's rule: Problem type 1
pcalc047 Cramer's rule: Problem type 2
pcalc712 Gauss-Jordan elimination with a 2x2 matrix
pcalc046 Augmented matrix and solution set of a system of linear equations

Exponents and polynomials

alge024 Product rule of exponents
alge030 Multiplying monomials
alge027 Power rule: Positive exponents
arith042 Writing a positive number without a negative exponent
arith043 Writing a negative number without a negative exponent
alge025 Power rule: Negative exponents
alge028 Product rule of exponents in a multivariate monomial
arith029 Ordering numbers with positive exponents
arith024 Ordering numbers with negative exponents
arith036 Scientific notation with positive exponent
arith037 Scientific notation with negative exponent
scinot002 Multiplying and dividing numbers written in scientific notation
alge031 Degree of a multivariate polynomial
alge029 Simplifying a polynomial expression
alge033 Multiplying two binomials
alge032 Squaring a binomial
alge180 Multiplying polynomials
alge708 Polynomial long division: Linear divisor
alge709 Polynomial long division: Quadratic divisor
pcalc117 Synthetic division
alge039 Factoring a quadratic with leading coefficient 1
alge040 Factoring a quadratic with leading coefficient greater than 1

alge265 Factoring a quadratic polynomial in two variables
alge043 Factoring a perfect square
alge041 Factoring a product of a quadratic trinomial and a monomial
alge045 Finding the roots of a quadratic equation with leading coefficient 1
alge048 Finding the roots of a quadratic equation with leading coefficient greater than 1
alge211 Solving a quadratic equation needing simplification
alge681 Solving equations written in factored form
alge046 Roots of a product of polynomials
alge703 Solving a word problem using a quadratic equation with rational roots
alge163 Writing a quadratic equation given the roots and the leading coefficient
alge624 Factoring a difference of squares
alge042 Factoring with repeated use of the difference of squares formula
alge044 Factoring a sum or difference of two cubes
alge037 Greatest common factor of two monomials
alge055 Least common multiple of two monomials
alge038 Factoring a multivariate polynomial by grouping: Problem type 1
alge181 Factoring a multivariate polynomial by grouping: Problem type 2

Rational expressions and functions

alge053 Multiplying rational expressions: Problem type 1
alge620 Multiplying rational expressions: Problem type 2
alge054 Dividing rational expressions
alge058 Complex fraction: Problem type 1
alge162 Complex Fraction: Problem type 2
alge056 Adding rational expressions with common denominator
alge057 Adding rational expressions
alge226 Adding rational expressions with different denominators
alge622 Adding and subtracting rational expressions: Problem type 1
alge661 Adding and subtracting rational expressions: Problem type 2
alge034 Ratio of multivariate polynomials
alge710 Simplifying a ratio of polynomials: Problem type 1
alge682 Simplifying a ratio of polynomials: Problem type 2
alge049 Restriction on variable in a denominator
alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1
alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2
alge206 Solving a rational equation that simplifies to a linear equation: Problem type 3
alge212 Solving a rational equation that simplifies to a quadratic equation: Problem type 1
alge062 Solving a rational equation that simplifies to a quadratic equation: Problem type 2
alge047 Solving a rational equation that simplifies to a quadratic equation: Problem

type 3

pcalc108 Sketching the graph of a rational function: Problem type 1

alge218 Word problem on rates

arith228 Basic word problem on rates

alge271 Solving a proportion: Advanced

arith610 Word problem on proportions: Problem type 1

arith611 Word problem on proportions: Problem type 2

arith612 Word problem involving multiple rates

alge059 Ordering fractions with variables

alge220 Word problem on inverse proportions

geom037 Similar polygons

alge175 Word problem on direct variation

alge176 Word problem on inverse variation

geom133 Ratio of volumes

geom138 Circumference ratios

Radicals and quadratic equations

arith601 Square root of a rational perfect square

arith093 Square root simplification

alge264 Square root of a perfect square monomial

alge080 Simplifying a radical expression: Problem type 1

alge275 Simplifying a radical expression: Problem type 2

arith032 Square root addition

alge084 Simplifying a sum of radical expressions

arith039 Square root multiplication

alge640 Simplifying a product of radical expressions

alge082 Simplifying a product of radical expressions: Problem type 3

alge276 Simplifying a product of radical expressions using the distributive property

alge086 Rationalizing the denominator of a radical expression

alge088 Rationalizing the denominator of a radical expression using conjugates

geom044 Pythagorean Theorem

alge089 Solving an equation with radicals: Problem type 1

alge090 Solving an equation with radicals: Problem type 2

alge091 Solving an equation with radicals: Problem type 3

alge182 Solving an equation with radicals: Problem type 4

arith094 Cube root of an integer

alge273 Simplifying a higher radical: Problem type 1

alge811 Simplifying a higher radical: Problem type 2

alge092 Even root property

alge093 Odd root property

alge227 Solving an equation with exponent using the even-root property

alge228 Solving an equation with exponent using the odd-root property

alge250 Rational exponents: Basic
alge251 Rational exponents: Negative exponents and fractional bases
alge249 Rational exponents: Powers of powers
alge812 Converting between radical form and exponent form
alge230 Solving an equation with positive rational exponent
alge231 Solving an equation with negative rational exponent
pcalc048 Adding and subtracting complex numbers
pcalc049 Multiplying complex numbers
pcalc050 Dividing complex numbers
pcalc053 Simplifying a power of i
alge094 Completing the square
alge095 Solving a quadratic equation using the quadratic formula
pcalc051 Solving a quadratic equation with imaginary roots
alge214 Discriminant of a quadratic equation
alge193 Discriminant of a quadratic equation with parameter
alge524 Solving a word problem using a quadratic equation with irrational roots
alge771 Solving a quadratic inequality
alge252 Graphing a parabola: Problem type 1
alge253 Graphing a parabola: Problem type 2
alge254 Graphing a parabola: Problem type 3
Finding the x -intercept(s) and the vertex of a parabola (alge277) Browse: Question, Explanation
alge255 Graphing a quadratic inequality

Functions and logarithms

fun019 Sum, difference, and product of two functions
alge213 Domain of a square root function
alge185 Vertical translation of the graph of a function
fun020 Vertical and horizontal translations of the graph of a function
fun011 Horizontal line test
fun012 Inverse functions: Basic
alge130 Inverse functions: Advanced
fun021 Composition of two functions: Domain and range
fun022 Composition of two functions: Basic
alge129 Composition of two functions: Advanced
fun023 Piecewise-defined functions
alge108 Exponential and logarithmic equations
alge232 Evaluating a logarithmic expression
pcalc708 Basic properties of logarithms
alge107 Change of base for logarithms
alge233 Solving a logarithmic equation: Problem type 1
alge113 Solving a logarithmic equation: Problem type 2

alge111 Solving an exponential equation: Problem type 1
alge112 Solving an exponential equation: Problem type 2
alge177 Solving a word problem using an exponential equation: Problem type 1
alge178 Solving a word problem using an exponential equation: Problem type 2
pcalc737 Solving a word problem using an exponential equation: Problem type 3
alge262 Graphing a simple cubic function
alge168 Graphing an equation involving absolute value in the plane
alge712 Sketching the graph of an exponential function: Basic
pcalc103 Sketching the graph of an exponential function: Advanced
pcalc104 Sketching the graph of a logarithmic function
pcalc102 Translating the graph of a logarithmic or exponential function

Conic sections and sequences

alge191 Midpoint of a line segment in the plane
alge132 Distance between two points in the plane
pcalc067 Graphing a parabola with a horizontal or a vertical axis
pcalc068 Writing an equation of a parabola given the vertex and the focus
pcalc069 Finding the focus of a parabola
pcalc605 Graphing a circle given its equation in standard form
pcalc064 Graphing a circle given its equation in general form
pcalc065 Writing an equation of a circle given its center and a point on the circle
pcalc066 Writing an equation of a circle given the endpoints of a diameter
pcalc070 Graph of an ellipse centered at the origin
pcalc734 Graphing an ellipse given its equation in standard form
pcalc071 Graphing an ellipse given its equation in general form
pcalc075 Graph of a hyperbola centered at the origin
pcalc735 Graphing a hyperbola given its equation in standard form
pcalc076 Graphing a hyperbola given its equation in general form
pcalc098 Solving a system of nonlinear equations
pcalc096 Graphing a system of nonlinear inequalities: Problem type 1
pcalc097 Graphing a system of nonlinear inequalities: Problem type 2
pcalc736 Classifying conics given their equations
pcalc080 Finding the first terms of a sequence
pcalc715 Arithmetic sequences
pcalc717 Geometric sequences
pcalc718 Sum of the first n terms of an arithmetic sequence
pcalc719 Sum of the first n terms of a geometric sequence
pcalc720 Sum of a geometric series
pcalc082 Factorial expressions
pcalc087 Binomial formula

B.18 Trigonometry

Algebra review

- alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
- alge013 Solving a linear equation with several occurrences of the variable: Problem type 3
- alge209 Solving a linear equation with several occurrences of the variable: Problem type 4
- alge179 Solving a linear equation with several occurrences of the variable: Problem type 5
- alge173 Solving a word problem using a linear equation: Problem type 3
- alge014 Solving a word problem using a linear equation: Problem type 1
- alge020 Solving a linear inequality: Problem type 2
- alge021 Solving a linear inequality: Problem type 3
- alge076 Solving a system of linear equations
- alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1
- alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2
- alge206 Solving a rational equation that simplifies to a linear equation: Problem type 3
- alge029 Simplifying a polynomial expression
- alge030 Multiplying monomials
- alge180 Multiplying polynomials
- alge705 Factoring a quadratic with leading coefficient 1
- alge040 Factoring a quadratic with leading coefficient greater than 1
- alge624 Factoring a difference of squares
- alge024 Product rule of exponents
- alge027 Power rule: Positive exponents
- alge080 Simplifying a radical expression: Problem type 1
- alge086 Rationalizing the denominator of a radical expression
- alge250 Rational exponents: Basic
- pcalc048 Adding and subtracting complex numbers
- pcalc049 Multiplying complex numbers
- set004 Set builder and interval notation
- set005 Union and intersection of intervals
- fun018 Introduction to functions: Notation and graphs
- fun016 Domain and range: Problem type 1
- fun010 Vertical line test
- fun019 Sum, difference, and product of two functions
- alge185 Vertical translation of the graph of a function
- fun020 Vertical and horizontal translations of the graph of a function
- fun022 Composition of two functions: Basic
- fun012 Inverse functions: Basic
- alge194 Graphing a line given its equation in slope-intercept form

alge195 Graphing a line given its equation in standard form
alge071 Writing the equation of a line given the slope and a point on the line
alge196 Graphing a line through a given point with a given slope
alge631 Finding the slope of a line given its equation
alge637 Determining the slope of a line given its graph
alge072 Writing the equation of the line through two given points
alge073 Writing the equations of vertical and horizontal lines through a given point
alge198 Graphing a vertical or horizontal line
alge045 Finding the roots of a quadratic equation with leading coefficient 1
alge048 Finding the roots of a quadratic equation with leading coefficient greater than 1
alge094 Completing the square
alge095 Solving a quadratic equation using the quadratic formula
alge252 Graphing a parabola: Problem type 1
alge253 Graphing a parabola: Problem type 2
alge710 Simplifying a ratio of polynomials: Problem type 1
alge681 Solving equations written in factored form
pcalc053 Simplifying a power of i

Right triangle trigonometry and trigonometric values

pcalc001 Converting between a decimal degree and degrees-minutes-seconds
pcalc002 Converting between degree and radian measure
pcalc003 Coterminal angles
pcalc005 Arc length and central angle measure
pcalc006 Sketching an angle in standard position
geom506 Special right triangles
pcalc600 Sine, cosine, and tangent ratios
pcalc601 Using a trigonometric ratio to find a side length in a right triangle
pcalc602 Using a trigonometric ratio to find an angle measure in a right triangle
pcalc007 Common angles and trigonometric functions
pcalc008 Finding trigonometric ratios given a right triangle
pcalc011 Finding values of trigonometric functions given information about an angle: Problem type 1
pcalc012 Finding values of trigonometric functions given information about an angle: Problem type 2
pcalc013 Finding values of trigonometric functions given information about an angle: Problem type 3

Trigonometric functions

pcalc107 Sketching the graph of a sine or cosine function: Problem type 1
pcalc106 Sketching the graph of a sine or cosine function: Problem type 2

- pcalc014 Sketching the graph of a sine or cosine function: Problem type 3
- pcalc017 Sketching the graph of a secant or cosecant function
- pcalc105 Sketching the graph of a tangent or cotangent function: Problem type 1
- pcalc015 Sketching the graph of a tangent or cotangent function: Problem type 2
- pcalc016 Values of inverse trigonometric functions
- pcalc018 Composition of a trigonometric function and an inverse trigonometric function: Problem type 1
- pcalc019 Composition of a trigonometric function and an inverse trigonometric function: Problem type 2
- pcalc036 Composition of a trigonometric function and an inverse trigonometric function: Problem type 3

Trigonometric identities and equations

- pcalc126 Cofunction identities
- pcalc029 Sum and difference identities
- pcalc124 Product-to-sum and sum-to-product identities
- pcalc030 Double-angle identities
- pcalc110 Verifying a trigonometric identity
- pcalc034 Proving a trigonometric identity: Problem type 1
- pcalc435 Proving trigonometric identities: Problem type 2
- pcalc400 Proving trigonometric identities: Problem type 3
- pcalc401 Proving trigonometric identities: Problem type 4
- pcalc020 Solving a basic trigonometric equation involving sine or cosine
- pcalc021 Solving a basic trigonometric equation involving tangent, cotangent, secant, or cosecant
- pcalc022 Solving a trigonometric equation involving a squared function
- pcalc024 Solving a trigonometric equation involving more than one function
- pcalc025 Solving a trigonometric equation involving an angle multiplied by a constant
- pcalc026 Solving a trigonometric equation using sum and difference identities
- pcalc027 Solving a trigonometric equation using double-angle identities
- pcalc028 Solving a trigonometric equation using half-angle identities
- pcalc127 Solving a trigonometric inequality

Applications of trigonometry

- pcalc031 Solving a triangle with the law of sines: Problem type 1
- pcalc032 Solving a triangle with the law of sines: Problem type 2
- pcalc033 Solving a triangle with the law of cosines
- pcalc060 Magnitude of a vector
- pcalc729 Unit vectors
- pcalc739 Multiplication of a vector by a scalar

pcalc063 Translation of a vector
 pcalc725 Linear combination of vectors: Algebraic approach
 pcalc726 Linear combination of vectors: Geometric approach
 vector002 Calculating the magnitude and direction of a vector
 vector005 Finding the components of a vector
 pcalc727 Solving a word problem using vectors
 pcalc728 Dot product
 pcalc730 Finding the angle between two vectors
 vector006 Finding the component of a vector along another vector
 pcalc055 Plotting a point in polar coordinates
 pcalc056 Converting rectangular coordinates to polar coordinates
 pcalc057 Converting polar coordinates to rectangular coordinates
 pcalc058 Converting an equation written in rectangular coordinates to one written in polar form
 pcalc059 Converting an equation written in polar form to one written in rectangular coordinates
 pcalc052 Writing a complex number in trigonometric form
 pcalc054 De Moivre's theorem
 pcalc724 Finding the n th roots of a number

B.19 PreCalculus without Trigonometry / College Algebra

Algebra review

alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
 alge013 Solving a linear equation with several occurrences of the variable: Problem type 3
 alge209 Solving a linear equation with several occurrences of the variable: Problem type 4
 alge179 Solving a linear equation with several occurrences of the variable: Problem type 5
 alge173 Solving a word problem using a linear equation: Problem type 3
 alge014 Solving a word problem using a linear equation: Problem type 1
 alge219 Solving a word problem using a linear equation: Problem type 2
 alge704 Solving a word problem using a linear equation: Problem type 4
 alge020 Solving a linear inequality: Problem type 2
 alge021 Solving a linear inequality: Problem type 3
 alge207 Solving a linear inequality: Problem type 4
 alge103 Solving an equation involving absolute value: Basic
 alge167 Solving an equation involving absolute value: Advanced
 alge170 Solving an inequality involving absolute value: Basic

alge169 Solving an inequality involving absolute value
alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1
alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2
alge206 Solving a rational equation that simplifies to a linear equation: Problem type 3
alge029 Simplifying a polynomial expression
alge030 Multiplying monomials
alge180 Multiplying polynomials
alge705 Factoring a quadratic with leading coefficient 1
alge040 Factoring a quadratic with leading coefficient greater than 1
alge041 Factoring a product of a quadratic trinomial and a monomial
alge624 Factoring a difference of squares
alge042 Factoring with repeated use of the difference of squares formula
alge044 Factoring a sum or difference of two cubes
alge038 Factoring a multivariate polynomial by grouping: Problem type 1
alge024 Product rule of exponents
alge027 Power rule: Positive exponents
alge025 Power rule: Negative exponents
alge028 Product rule of exponents in a multivariate monomial
scinot001 Converting between decimal numbers and numbers written in scientific notation
scinot002 Multiplying and dividing numbers written in scientific notation
alge080 Simplifying a radical expression: Problem type 1
alge084 Simplifying a sum of radical expressions
alge640 Simplifying a product of radical expressions
alge086 Rationalizing the denominator of a radical expression
alge088 Rationalizing the denominator of a radical expression using conjugates
alge089 Solving an equation with radicals: Problem type 1
alge091 Solving an equation with radicals: Problem type 3
alge182 Solving an equation with radicals: Problem type 4
alge250 Rational exponents: Basic
alge251 Rational exponents: Negative exponents and fractional bases
alge249 Rational exponents: Powers of powers

Functions and graphs

set004 Set builder and interval notation
set005 Union and intersection of intervals
fun018 Introduction to functions: Notation and graphs
fun016 Domain and range: Problem type 1
fun004 Domain and range: Problem type 2
fun010 Vertical line test
pcalc114 Even and odd functions
fun019 Sum, difference, and product of two functions

alge185 Vertical translation of the graph of a function
fun020 Vertical and horizontal translations of the graph of a function
fun023 Piecewise-defined functions
alge194 Graphing a line given its equation in slope-intercept form
alge195 Graphing a line given its equation in standard form
alge071 Writing the equation of a line given the slope and a point on the line
alge196 Graphing a line through a given point with a given slope
alge631 Finding the slope of a line given its equation
alge637 Determining the slope of a line given its graph
alge072 Writing the equation of the line through two given points
alge073 Writing the equations of vertical and horizontal lines through a given point
alge198 Graphing a vertical or horizontal line
geom807 Slopes of parallel and perpendicular lines: Problem type 1
geom808 Slopes of parallel and perpendicular lines: Problem type 2
alge701 Writing equations and drawing graphs to fit a narrative
alge018 Graphing a linear inequality in the plane: Problem type 1
alge225 Graphing a linear inequality in the plane: Problem type 2
alge168 Graphing an equation involving absolute value in the plane
fun021 Composition of two functions: Domain and range
fun022 Composition of two functions: Basic
alge129 Composition of two functions: Advanced
fun011 Horizontal line test
fun012 Inverse functions: Basic
alge130 Inverse functions: Advanced

Polynomial and rational functions

alge045 Finding the roots of a quadratic equation with leading coefficient 1
alge048 Finding the roots of a quadratic equation with leading coefficient greater than 1
alge094 Completing the square
alge095 Solving a quadratic equation using the quadratic formula
alge707 Finding the discriminant of a quadratic equation
alge703 Solving a word problem using a quadratic equation with rational roots
alge524 Solving a word problem using a quadratic equation with irrational roots
alge771 Solving a quadratic inequality
alge252 Graphing a parabola: Problem type 1
alge253 Graphing a parabola: Problem type 2
alge254 Graphing a parabola: Problem type 3
alge255 Graphing a quadratic inequality
alge708 Polynomial long division: Linear divisor
alge709 Polynomial long division: Quadratic divisor
pcalc117 Synthetic division

pcalc118 Remainder theorem
alge710 Simplifying a ratio of polynomials: Problem type 1
pcalc092 Partial fraction decomposition
alge681 Solving equations written in factored form
alge211 Solving a quadratic equation needing simplification
pcalc700 Finding a polynomial of a given degree with given zeros
pcalc123 Using a given zero to write a polynomial as a product of linear factors
pcalc701 Finding all potential zeros of a polynomial given by the rational zeros theorem
pcalc702 Using the rational zeros theorem to find zeros of a polynomial
pcalc704 Solving a word problem involving a polynomial of degree 3
pcalc048 Adding and subtracting complex numbers
pcalc049 Multiplying complex numbers
pcalc050 Dividing complex numbers
pcalc053 Simplifying a power of i
pcalc051 Solving a quadratic equation with imaginary roots
pcalc705 N zeros theorem and conjugate zeros theorem
pcalc703 Using the conjugate zeros theorem to find all zeros of a polynomial
pcalc115 Solving a word problem by finding a local extremum of a polynomial function
pcalc738 Inferring properties of a polynomial function from its graph
pcalc108 Sketching the graph of a rational function: Problem type 1
pcalc109 Sketching the graph of a rational function: Problem type 2
pcalc706 Choosing the form of a rational function given its graph

Exponential and logarithmic functions

alge108 Exponential and logarithmic equations
alge232 Evaluating a logarithmic expression
pcalc708 Basic properties of logarithms
alge107 Change of base for logarithms
alge233 Solving a logarithmic equation: Problem type 1
alge113 Solving a logarithmic equation: Problem type 2
alge111 Solving an exponential equation: Problem type 1
alge112 Solving an exponential equation: Problem type 2
alge177 Solving a word problem using an exponential equation: Problem type 1
alge178 Solving a word problem using an exponential equation: Problem type 2
pcalc737 Solving a word problem using an exponential equation: Problem type 3
alge712 Sketching the graph of an exponential function: Basic
pcalc103 Sketching the graph of an exponential function: Advanced
pcalc104 Sketching the graph of a logarithmic function
pcalc102 Translating the graph of a logarithmic or exponential function

Systems of linear equations and matrices

alge075 Classifying a system of linear equations
alge076 Solving a system of linear equations
alge077 Creating an inconsistent system of linear equations
pcalc099 Consistency and independence of a system of linear equations
alge078 Solving a word problem using a system of linear equations: Problem type 1
alge184 Solving a word problem using a system of linear equations: Problem type 2
alge224 Solving a word problem using a system of linear equations: Problem type 3
alge192 Solving a word problem using a system of linear equations: Problem type 4
alge172 Solving a word problem using a system of linear equations: Problem type 5
alge079 Graphing a system of linear inequalities
pcalc093 Solving a word problem using a system of linear inequalities
pcalc095 Linear programming
pcalc094 Solving a word problem using linear programming
pcalc709 Addition of matrices and multiplication of a matrix by a scalar
pcalc039 Multiplication of matrices: Basic
pcalc710 Multiplication of matrices: Advanced
pcalc042 Finding the determinant of a 2x2 matrix
pcalc043 Finding the determinant of a 3x3 matrix
pcalc040 Finding the inverse of a 2x2 matrix
pcalc041 Finding the inverse of a 3x3 matrix
pcalc045 Cramer's rule: Problem type 1
pcalc047 Cramer's rule: Problem type 2
pcalc711 Using the inverse of a matrix to solve a system of linear equations
pcalc712 Gauss-Jordan elimination with a 2x2 matrix
pcalc046 Augmented matrix and solution set of a system of linear equations

Sequences, series, and probability

pcalc080 Finding the first terms of a sequence
pcalc713 Arithmetic and geometric sequences: Identifying and writing in standard form
pcalc715 Arithmetic sequences
pcalc717 Geometric sequences
pcalc718 Sum of the first n terms of an arithmetic sequence
pcalc719 Sum of the first n terms of a geometric sequence
pcalc720 Sum of a geometric series
pcalc082 Factorial expressions
pcalc088 Permutations and combinations: Problem type 1
pcalc089 Permutations and combinations: Problem type 2
pcalc090 Permutations and combinations: Problem type 3
pcalc087 Binomial formula
stat117 Probabilities of draws with replacement
stat118 Probabilities of draws without replacement
stat119 Venn diagrams: Two events

stat101 Venn diagrams: Word problems
stat106 Outcomes and event probability
stat112 Die rolling
stat114 Probability of intersection or union: Word problems
stat115 Independent events: Basic
stat120 Probability of union: Basic
stat109 Intersection and conditional probability

Conic sections

pcalc067 Graphing a parabola with a horizontal or a vertical axis
pcalc068 Writing an equation of a parabola given the vertex and the focus
pcalc069 Finding the focus of a parabola
pcalc605 Graphing a circle given its equation in standard form
pcalc064 Graphing a circle given its equation in general form
pcalc065 Writing an equation of a circle given its center and a point on the circle
pcalc066 Writing an equation of a circle given the endpoints of a diameter
pcalc734 Graphing an ellipse given its equation in standard form
pcalc071 Graphing an ellipse given its equation in general form
pcalc072 Finding the foci of an ellipse
pcalc073 Writing an equation of an ellipse given the foci and the major axis length
pcalc074 Writing an equation of an ellipse given the center, an endpoint of an axis, and the length of the other axis
pcalc735 Graphing a hyperbola given its equation in standard form
pcalc076 Graphing a hyperbola given its equation in general form
pcalc077 Finding the foci of a hyperbola
pcalc078 Writing an equation of a hyperbola given the foci and the vertices
pcalc079 Writing an equation of a hyperbola given the foci and the asymptotes
alge191 Midpoint of a line segment in the plane
alge132 Distance between two points in the plane
pcalc736 Classifying conics given their equations
pcalc098 Solving a system of nonlinear equations
pcalc096 Graphing a system of nonlinear inequalities: Problem type 1

B.20 College Algebra with Trigonometry

Algebra review

alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
alge013 Solving a linear equation with several occurrences of the variable: Problem type

3

alge209 Solving a linear equation with several occurrences of the variable: Problem type

4

alge179 Solving a linear equation with several occurrences of the variable: Problem type

5

alge173 Solving a word problem using a linear equation: Problem type 3

alge014 Solving a word problem using a linear equation: Problem type 1

alge219 Solving a word problem using a linear equation: Problem type 2

alge704 Solving a word problem using a linear equation: Problem type 4

alge020 Solving a linear inequality: Problem type 2

alge021 Solving a linear inequality: Problem type 3

alge207 Solving a linear inequality: Problem type 4

alge103 Solving an equation involving absolute value: Basic

alge167 Solving an equation involving absolute value: Advanced

alge170 Solving an inequality involving absolute value: Basic

alge169 Solving an inequality involving absolute value

alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1

alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2

alge206 Solving a rational equation that simplifies to a linear equation: Problem type 3

alge029 Simplifying a polynomial expression

alge030 Multiplying monomials

alge180 Multiplying polynomials

alge705 Factoring a quadratic with leading coefficient 1

alge040 Factoring a quadratic with leading coefficient greater than 1

alge041 Factoring a product of a quadratic trinomial and a monomial

alge624 Factoring a difference of squares

alge042 Factoring with repeated use of the difference of squares formula

alge044 Factoring a sum or difference of two cubes

alge038 Factoring a multivariate polynomial by grouping: Problem type 1

alge024 Product rule of exponents

alge027 Power rule: Positive exponents

alge025 Power rule: Negative exponents

alge028 Product rule of exponents in a multivariate monomial

scinot001 Converting between decimal numbers and numbers written in scientific notation

scinot002 Multiplying and dividing numbers written in scientific notation

alge080 Simplifying a radical expression: Problem type 1

alge084 Simplifying a sum of radical expressions

alge640 Simplifying a product of radical expressions

alge086 Rationalizing the denominator of a radical expression

alge088 Rationalizing the denominator of a radical expression using conjugates

alge089 Solving an equation with radicals: Problem type 1

alge091 Solving an equation with radicals: Problem type 3

alge182 Solving an equation with radicals: Problem type 4

alge250 Rational exponents: Basic
alge251 Rational exponents: Negative exponents and fractional bases
alge249 Rational exponents: Powers of powers

Functions and graphs

set004 Set builder and interval notation
set005 Union and intersection of intervals
fun018 Introduction to functions: Notation and graphs
fun016 Domain and range: Problem type 1
fun004 Domain and range: Problem type 2
fun010 Vertical line test
pcalc114 Even and odd functions
fun019 Sum, difference, and product of two functions
alge185 Vertical translation of the graph of a function
fun020 Vertical and horizontal translations of the graph of a function
fun023 Piecewise-defined functions
alge194 Graphing a line given its equation in slope-intercept form
alge195 Graphing a line given its equation in standard form
alge071 Writing the equation of a line given the slope and a point on the line
alge196 Graphing a line through a given point with a given slope
alge631 Finding the slope of a line given its equation
alge637 Determining the slope of a line given its graph
alge072 Writing the equation of the line through two given points
alge073 Writing the equations of vertical and horizontal lines through a given point
alge198 Graphing a vertical or horizontal line
geom807 Slopes of parallel and perpendicular lines: Problem type 1
geom808 Slopes of parallel and perpendicular lines: Problem type 2
alge701 Writing equations and drawing graphs to fit a narrative
alge018 Graphing a linear inequality in the plane: Problem type 1
alge225 Graphing a linear inequality in the plane: Problem type 2
alge168 Graphing an equation involving absolute value in the plane
fun021 Composition of two functions: Domain and range
fun022 Composition of two functions: Basic
alge129 Composition of two functions: Advanced
fun011 Horizontal line test
fun012 Inverse functions: Basic
alge130 Inverse functions: Advanced

Polynomial and rational functions

alge045 Finding the roots of a quadratic equation with leading coefficient 1
alge048 Finding the roots of a quadratic equation with leading coefficient greater than

1

alge094 Completing the square
alge095 Solving a quadratic equation using the quadratic formula
alge707 Finding the discriminant of a quadratic equation
alge703 Solving a word problem using a quadratic equation with rational roots
alge524 Solving a word problem using a quadratic equation with irrational roots
alge771 Solving a quadratic inequality
alge252 Graphing a parabola: Problem type 1
alge253 Graphing a parabola: Problem type 2
alge254 Graphing a parabola: Problem type 3
alge255 Graphing a quadratic inequality
alge708 Polynomial long division: Linear divisor
alge709 Polynomial long division: Quadratic divisor
pcalc117 Synthetic division
pcalc118 Remainder theorem
alge710 Simplifying a ratio of polynomials: Problem type 1
pcalc092 Partial fraction decomposition
alge681 Solving equations written in factored form
alge211 Solving a quadratic equation needing simplification
pcalc700 Finding a polynomial of a given degree with given zeros
pcalc123 Using a given zero to write a polynomial as a product of linear factors
pcalc701 Finding all potential zeros of a polynomial given by the rational zeros theorem
pcalc702 Using the rational zeros theorem to find zeros of a polynomial
pcalc704 Solving a word problem involving a polynomial of degree 3
pcalc048 Adding and subtracting complex numbers
pcalc049 Multiplying complex numbers
pcalc050 Dividing complex numbers
pcalc053 Simplifying a power of i
pcalc051 Solving a quadratic equation with imaginary roots
pcalc705 N zeros theorem and conjugate zeros theorem
pcalc703 Using the conjugate zeros theorem to find all zeros of a polynomial
pcalc115 Solving a word problem by finding a local extremum of a polynomial function
pcalc738 Inferring properties of a polynomial function from its graph
pcalc108 Sketching the graph of a rational function: Problem type 1
pcalc109 Sketching the graph of a rational function: Problem type 2
pcalc706 Choosing the form of a rational function given its graph

Exponential and logarithmic functions

alge108 Exponential and logarithmic equations
alge232 Evaluating a logarithmic expression
pcalc708 Basic properties of logarithms
alge107 Change of base for logarithms

alge233 Solving a logarithmic equation: Problem type 1
alge113 Solving a logarithmic equation: Problem type 2
alge111 Solving an exponential equation: Problem type 1
alge112 Solving an exponential equation: Problem type 2
alge177 Solving a word problem using an exponential equation: Problem type 1
alge178 Solving a word problem using an exponential equation: Problem type 2
pcalc737 Solving a word problem using an exponential equation: Problem type 3
alge712 Sketching the graph of an exponential function: Basic
pcalc103 Sketching the graph of an exponential function: Advanced
pcalc104 Sketching the graph of a logarithmic function
pcalc102 Translating the graph of a logarithmic or exponential function

Trigonometry

pcalc001 Converting between a decimal degree and degrees-minutes-seconds
pcalc002 Converting between degree and radian measure
pcalc003 Coterminal angles
pcalc005 Arc length and central angle measure
pcalc006 Sketching an angle in standard position
geom506 Special right triangles
pcalc600 Sine, cosine, and tangent ratios
pcalc601 Using a trigonometric ratio to find a side length in a right triangle
pcalc602 Using a trigonometric ratio to find an angle measure in a right triangle
pcalc007 Common angles and trigonometric functions
pcalc008 Finding trigonometric ratios given a right triangle
pcalc011 Finding values of trigonometric functions given information about an angle:
Problem type 1
pcalc012 Finding values of trigonometric functions given information about an angle:
Problem type 2
pcalc013 Finding values of trigonometric functions given information about an angle:
Problem type 3
pcalc107 Sketching the graph of a sine or cosine function: Problem type 1
pcalc106 Sketching the graph of a sine or cosine function: Problem type 2
pcalc014 Sketching the graph of a sine or cosine function: Problem type 3
pcalc017 Sketching the graph of a secant or cosecant function
pcalc105 Sketching the graph of a tangent or cotangent function: Problem type 1
pcalc015 Sketching the graph of a tangent or cotangent function: Problem type 2
pcalc016 Values of inverse trigonometric functions
pcalc018 Composition of a trigonometric function and an inverse trigonometric func-
tion: Problem type 1
pcalc019 Composition of a trigonometric function and an inverse trigonometric func-
tion: Problem type 2
pcalc036 Composition of a trigonometric function and an inverse trigonometric func-

tion: Problem type 3
pcalc126 Cofunction identities
pcalc029 Sum and difference identities
pcalc124 Product-to-sum and sum-to-product identities
pcalc030 Double-angle identities
pcalc110 Verifying a trigonometric identity
pcalc034 Proving a trigonometric identity: Problem type 1
pcalc435 Proving trigonometric identities: Problem type 2
pcalc400 Proving trigonometric identities: Problem type 3
pcalc401 Proving trigonometric identities: Problem type 4
pcalc020 Solving a basic trigonometric equation involving sine or cosine
pcalc021 Solving a basic trigonometric equation involving tangent, cotangent, secant, or cosecant
pcalc022 Solving a trigonometric equation involving a squared function
pcalc024 Solving a trigonometric equation involving more than one function
pcalc025 Solving a trigonometric equation involving an angle multiplied by a constant
pcalc026 Solving a trigonometric equation using sum and difference identities
pcalc027 Solving a trigonometric equation using double-angle identities
pcalc028 Solving a trigonometric equation using half-angle identities
pcalc127 Solving a trigonometric inequality
pcalc031 Solving a triangle with the law of sines: Problem type 1
pcalc032 Solving a triangle with the law of sines: Problem type 2
pcalc033 Solving a triangle with the law of cosines
pcalc060 Magnitude of a vector
pcalc729 Unit vectors
pcalc739 Multiplication of a vector by a scalar
pcalc063 Translation of a vector
pcalc725 Linear combination of vectors: Algebraic approach
pcalc726 Linear combination of vectors: Geometric approach
vector002 Calculating the magnitude and direction of a vector
vector005 Finding the components of a vector
pcalc727 Solving a word problem using vectors
pcalc728 Dot product
pcalc730 Finding the angle between two vectors
vector006 Finding the component of a vector along another vector
pcalc055 Plotting a point in polar coordinates
pcalc056 Converting rectangular coordinates to polar coordinates
pcalc057 Converting polar coordinates to rectangular coordinates
pcalc058 Converting an equation written in rectangular coordinates to one written in polar form
pcalc059 Converting an equation written in polar form to one written in rectangular coordinates
pcalc052 Writing a complex number in trigonometric form
pcalc054 De Moivre's theorem

pcalc724 Finding the n th roots of a number

Systems of linear equations and matrices

alge075 Classifying a system of linear equations

alge076 Solving a system of linear equations

alge077 Creating an inconsistent system of linear equations

pcalc099 Consistency and independence of a system of linear equations

alge078 Solving a word problem using a system of linear equations: Problem type 1

alge184 Solving a word problem using a system of linear equations: Problem type 2

alge224 Solving a word problem using a system of linear equations: Problem type 3

alge192 Solving a word problem using a system of linear equations: Problem type 4

alge172 Solving a word problem using a system of linear equations: Problem type 5

alge079 Graphing a system of linear inequalities

pcalc093 Solving a word problem using a system of linear inequalities

pcalc095 Linear programming

pcalc094 Solving a word problem using linear programming

pcalc709 Addition of matrices and multiplication of a matrix by a scalar

pcalc039 Multiplication of matrices: Basic

pcalc710 Multiplication of matrices: Advanced

pcalc042 Finding the determinant of a 2×2 matrix

pcalc043 Finding the determinant of a 3×3 matrix

pcalc040 Finding the inverse of a 2×2 matrix

pcalc041 Finding the inverse of a 3×3 matrix

pcalc045 Cramer's rule: Problem type 1

pcalc047 Cramer's rule: Problem type 2

pcalc711 Using the inverse of a matrix to solve a system of linear equations

pcalc712 Gauss-Jordan elimination with a 2×2 matrix

pcalc046 Augmented matrix and solution set of a system of linear equations

Sequences, series, and probability

pcalc080 Finding the first terms of a sequence

pcalc713 Arithmetic and geometric sequences: Identifying and writing in standard form

pcalc715 Arithmetic sequences

pcalc717 Geometric sequences

pcalc718 Sum of the first n terms of an arithmetic sequence

pcalc719 Sum of the first n terms of a geometric sequence

pcalc720 Sum of a geometric series

pcalc082 Factorial expressions

pcalc088 Permutations and combinations: Problem type 1

pcalc089 Permutations and combinations: Problem type 2

pcalc090 Permutations and combinations: Problem type 3
pcalc087 Binomial formula
stat117 Probabilities of draws with replacement
stat118 Probabilities of draws without replacement
stat119 Venn diagrams: Two events
stat101 Venn diagrams: Word problems
stat106 Outcomes and event probability
stat112 Die rolling
stat114 Probability of intersection or union: Word problems
stat115 Independent events: Basic
stat120 Probability of union: Basic
stat109 Intersection and conditional probability

Conic sections

pcalc067 Graphing a parabola with a horizontal or a vertical axis
pcalc068 Writing an equation of a parabola given the vertex and the focus
pcalc069 Finding the focus of a parabola
pcalc605 Graphing a circle given its equation in standard form
pcalc064 Graphing a circle given its equation in general form
pcalc065 Writing an equation of a circle given its center and a point on the circle
pcalc066 Writing an equation of a circle given the endpoints of a diameter
pcalc734 Graphing an ellipse given its equation in standard form
pcalc071 Graphing an ellipse given its equation in general form
pcalc072 Finding the foci of an ellipse
pcalc073 Writing an equation of an ellipse given the foci and the major axis length
pcalc074 Writing an equation of an ellipse given the center, an endpoint of an axis, and the length of the other axis
pcalc735 Graphing a hyperbola given its equation in standard form
pcalc076 Graphing a hyperbola given its equation in general form
pcalc077 Finding the foci of a hyperbola
pcalc078 Writing an equation of a hyperbola given the foci and the vertices
pcalc079 Writing an equation of a hyperbola given the foci and the asymptotes
alge191 Midpoint of a line segment in the plane
alge132 Distance between two points in the plane
pcalc736 Classifying conics given their equations
pcalc098 Solving a system of nonlinear equations
pcalc096 Graphing a system of nonlinear inequalities: Problem type 1

B.21 PreCalculus

Algebra review

- alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
- alge013 Solving a linear equation with several occurrences of the variable: Problem type 3
- alge209 Solving a linear equation with several occurrences of the variable: Problem type 4
- alge179 Solving a linear equation with several occurrences of the variable: Problem type 5
- alge173 Solving a word problem using a linear equation: Problem type 3
- alge014 Solving a word problem using a linear equation: Problem type 1
- alge219 Solving a word problem using a linear equation: Problem type 2
- alge704 Solving a word problem using a linear equation: Problem type 4
- alge020 Solving a linear inequality: Problem type 2
- alge021 Solving a linear inequality: Problem type 3
- alge207 Solving a linear inequality: Problem type 4
- alge103 Solving an equation involving absolute value: Basic
- alge167 Solving an equation involving absolute value: Advanced
- alge170 Solving an inequality involving absolute value: Basic
- alge169 Solving an inequality involving absolute value
- alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1
- alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2
- alge206 Solving a rational equation that simplifies to a linear equation: Problem type 3
- alge029 Simplifying a polynomial expression
- alge030 Multiplying monomials
- alge180 Multiplying polynomials
- alge705 Factoring a quadratic with leading coefficient 1
- alge040 Factoring a quadratic with leading coefficient greater than 1
- alge041 Factoring a product of a quadratic trinomial and a monomial
- alge624 Factoring a difference of squares
- alge042 Factoring with repeated use of the difference of squares formula
- alge044 Factoring a sum or difference of two cubes
- alge038 Factoring a multivariate polynomial by grouping: Problem type 1
- alge024 Product rule of exponents
- alge027 Power rule: Positive exponents
- alge025 Power rule: Negative exponents
- alge028 Product rule of exponents in a multivariate monomial
- scinot001 Converting between decimal numbers and numbers written in scientific notation
- scinot002 Multiplying and dividing numbers written in scientific notation
- alge080 Simplifying a radical expression: Problem type 1

alge084 Simplifying a sum of radical expressions
alge640 Simplifying a product of radical expressions
alge086 Rationalizing the denominator of a radical expression
alge088 Rationalizing the denominator of a radical expression using conjugates
alge089 Solving an equation with radicals: Problem type 1
alge091 Solving an equation with radicals: Problem type 3
alge182 Solving an equation with radicals: Problem type 4
alge250 Rational exponents: Basic
alge251 Rational exponents: Negative exponents and fractional bases
alge249 Rational exponents: Powers of powers

Functions and graphs

set004 Set builder and interval notation
set005 Union and intersection of intervals
fun018 Introduction to functions: Notation and graphs
fun016 Domain and range: Problem type 1
fun004 Domain and range: Problem type 2
fun010 Vertical line test
pcalc114 Even and odd functions
fun019 Sum, difference, and product of two functions
alge185 Vertical translation of the graph of a function
fun020 Vertical and horizontal translations of the graph of a function
fun023 Piecewise-defined functions
alge194 Graphing a line given its equation in slope-intercept form
alge195 Graphing a line given its equation in standard form
alge071 Writing the equation of a line given the slope and a point on the line
alge196 Graphing a line through a given point with a given slope
alge631 Finding the slope of a line given its equation
alge637 Determining the slope of a line given its graph
alge072 Writing the equation of the line through two given points
alge073 Writing the equations of vertical and horizontal lines through a given point
alge198 Graphing a vertical or horizontal line
geom807 Slopes of parallel and perpendicular lines: Problem type 1
geom808 Slopes of parallel and perpendicular lines: Problem type 2
alge701 Writing equations and drawing graphs to fit a narrative
alge018 Graphing a linear inequality in the plane: Problem type 1
alge225 Graphing a linear inequality in the plane: Problem type 2
alge168 Graphing an equation involving absolute value in the plane
fun021 Composition of two functions: Domain and range
fun022 Composition of two functions: Basic
alge129 Composition of two functions: Advanced
fun011 Horizontal line test

fun012 Inverse functions: Basic

alge130 Inverse functions: Advanced

Polynomial and rational functions

alge045 Finding the roots of a quadratic equation with leading coefficient 1

alge048 Finding the roots of a quadratic equation with leading coefficient greater than 1

alge094 Completing the square

alge095 Solving a quadratic equation using the quadratic formula

alge707 Finding the discriminant of a quadratic equation

alge703 Solving a word problem using a quadratic equation with rational roots

alge524 Solving a word problem using a quadratic equation with irrational roots

alge771 Solving a quadratic inequality

alge252 Graphing a parabola: Problem type 1

alge253 Graphing a parabola: Problem type 2

alge254 Graphing a parabola: Problem type 3

alge255 Graphing a quadratic inequality

alge708 Polynomial long division: Linear divisor

alge709 Polynomial long division: Quadratic divisor

pcalc117 Synthetic division

pcalc118 Remainder theorem

alge710 Simplifying a ratio of polynomials: Problem type 1

pcalc092 Partial fraction decomposition

alge681 Solving equations written in factored form

alge211 Solving a quadratic equation needing simplification

pcalc700 Finding a polynomial of a given degree with given zeros

pcalc123 Using a given zero to write a polynomial as a product of linear factors

pcalc701 Finding all potential zeros of a polynomial given by the rational zeros theorem

pcalc702 Using the rational zeros theorem to find zeros of a polynomial

pcalc704 Solving a word problem involving a polynomial of degree 3

pcalc048 Adding and subtracting complex numbers

pcalc049 Multiplying complex numbers

pcalc050 Dividing complex numbers

pcalc053 Simplifying a power of i

pcalc051 Solving a quadratic equation with imaginary roots

pcalc705 n zeros theorem and conjugate zeros theorem

pcalc703 Using the conjugate zeros theorem to find all zeros of a polynomial

pcalc115 Solving a word problem by finding a local extremum of a polynomial function

pcalc738 Inferring properties of a polynomial function from its graph

pcalc108 Sketching the graph of a rational function: Problem type 1

pcalc109 Sketching the graph of a rational function: Problem type 2

pcalc706 Choosing the form of a rational function given its graph

Exponential and logarithmic functions

alge108 Exponential and logarithmic equations
alge232 Evaluating a logarithmic expression
pcalc708 Basic properties of logarithms
alge107 Change of base for logarithms
alge233 Solving a logarithmic equation: Problem type 1
alge113 Solving a logarithmic equation: Problem type 2
alge111 Solving an exponential equation: Problem type 1
alge112 Solving an exponential equation: Problem type 2
alge177 Solving a word problem using an exponential equation: Problem type 1
alge178 Solving a word problem using an exponential equation: Problem type 2
pcalc737 Solving a word problem using an exponential equation: Problem type 3
alge712 Sketching the graph of an exponential function: Basic
pcalc103 Sketching the graph of an exponential function: Advanced
pcalc104 Sketching the graph of a logarithmic function
pcalc102 Translating the graph of a logarithmic or exponential function

Trigonometry

pcalc001 Converting between a decimal degree and degrees-minutes-seconds
pcalc002 Converting between degree and radian measure
pcalc003 Coterminal angles
pcalc005 Arc length and central angle measure
pcalc006 Sketching an angle in standard position
geom506 Special right triangles
pcalc600 Sine, cosine, and tangent ratios
pcalc601 Using a trigonometric ratio to find a side length in a right triangle
pcalc602 Using a trigonometric ratio to find an angle measure in a right triangle
pcalc007 Common angles and trigonometric functions
pcalc008 Finding trigonometric ratios given a right triangle
pcalc011 Finding values of trigonometric functions given information about an angle:
Problem type 1
pcalc012 Finding values of trigonometric functions given information about an angle:
Problem type 2
pcalc013 Finding values of trigonometric functions given information about an angle:
Problem type 3
pcalc107 Sketching the graph of a sine or cosine function: Problem type 1
pcalc106 Sketching the graph of a sine or cosine function: Problem type 2
pcalc014 Sketching the graph of a sine or cosine function: Problem type 3
pcalc017 Sketching the graph of a secant or cosecant function

pcalc105 Sketching the graph of a tangent or cotangent function: Problem type 1
pcalc015 Sketching the graph of a tangent or cotangent function: Problem type 2
pcalc016 Values of inverse trigonometric functions
pcalc018 Composition of a trigonometric function and an inverse trigonometric function: Problem type 1
pcalc019 Composition of a trigonometric function and an inverse trigonometric function: Problem type 2
pcalc036 Composition of a trigonometric function and an inverse trigonometric function: Problem type 3
pcalc126 Cofunction identities
pcalc029 Sum and difference identities
pcalc124 Product-to-sum and sum-to-product identities
pcalc030 Double-angle identities
pcalc110 Verifying a trigonometric identity
pcalc034 Proving a trigonometric identity: Problem type 1
pcalc435 Proving trigonometric identities: Problem type 2
pcalc400 Proving trigonometric identities: Problem type 3
pcalc401 Proving trigonometric identities: Problem type 4
pcalc020 Solving a basic trigonometric equation involving sine or cosine
pcalc021 Solving a basic trigonometric equation involving tangent, cotangent, secant, or cosecant
pcalc022 Solving a trigonometric equation involving a squared function
pcalc024 Solving a trigonometric equation involving more than one function
pcalc025 Solving a trigonometric equation involving an angle multiplied by a constant
pcalc026 Solving a trigonometric equation using sum and difference identities
pcalc027 Solving a trigonometric equation using double-angle identities
pcalc028 Solving a trigonometric equation using half-angle identities
pcalc127 Solving a trigonometric inequality
pcalc031 Solving a triangle with the law of sines: Problem type 1
pcalc032 Solving a triangle with the law of sines: Problem type 2
pcalc033 Solving a triangle with the law of cosines
pcalc060 Magnitude of a vector
pcalc729 Unit vectors
pcalc739 Multiplication of a vector by a scalar
pcalc063 Translation of a vector
pcalc725 Linear combination of vectors: Algebraic approach
pcalc726 Linear combination of vectors: Geometric approach
vector002 Calculating the magnitude and direction of a vector
vector005 Finding the components of a vector
pcalc727 Solving a word problem using vectors
pcalc728 Dot product
pcalc730 Finding the angle between two vectors
vector006 Finding the component of a vector along another vector
pcalc055 Plotting a point in polar coordinates

pcalc056 Converting rectangular coordinates to polar coordinates
pcalc057 Converting polar coordinates to rectangular coordinates
pcalc058 Converting an equation written in rectangular coordinates to one written in polar form
pcalc059 Converting an equation written in polar form to one written in rectangular coordinates
pcalc052 Writing a complex number in trigonometric form
pcalc054 De Moivre's theorem
pcalc724 Finding the n th roots of a number

Systems of linear equations and matrices

alge075 Classifying a system of linear equations
alge076 Solving a system of linear equations
alge077 Creating an inconsistent system of linear equations
pcalc099 Consistency and independence of a system of linear equations
alge078 Solving a word problem using a system of linear equations: Problem type 1
alge184 Solving a word problem using a system of linear equations: Problem type 2
alge224 Solving a word problem using a system of linear equations: Problem type 3
alge192 Solving a word problem using a system of linear equations: Problem type 4
alge172 Solving a word problem using a system of linear equations: Problem type 5
alge079 Graphing a system of linear inequalities
pcalc093 Solving a word problem using a system of linear inequalities
pcalc095 Linear programming
pcalc094 Solving a word problem using linear programming
pcalc709 Addition of matrices and multiplication of a matrix by a scalar
pcalc039 Multiplication of matrices: Basic
pcalc710 Multiplication of matrices: Advanced
pcalc042 Finding the determinant of a 2×2 matrix
pcalc043 Finding the determinant of a 3×3 matrix
pcalc040 Finding the inverse of a 2×2 matrix
pcalc041 Finding the inverse of a 3×3 matrix
pcalc045 Cramer's rule: Problem type 1
pcalc047 Cramer's rule: Problem type 2
pcalc711 Using the inverse of a matrix to solve a system of linear equations
pcalc712 Gauss-Jordan elimination with a 2×2 matrix
pcalc046 Augmented matrix and solution set of a system of linear equations

Sequences, series, and probability

pcalc080 Finding the first terms of a sequence
pcalc713 Arithmetic and geometric sequences: Identifying and writing in standard form

pcalc715 Arithmetic sequences
pcalc717 Geometric sequences
pcalc718 Sum of the first n terms of an arithmetic sequence
pcalc719 Sum of the first n terms of a geometric sequence
pcalc720 Sum of a geometric series
pcalc082 Factorial expressions
pcalc088 Permutations and combinations: Problem type 1
pcalc089 Permutations and combinations: Problem type 2
pcalc090 Permutations and combinations: Problem type 3
pcalc087 Binomial formula
stat117 Probabilities of draws with replacement
stat118 Probabilities of draws without replacement
stat119 Venn diagrams: Two events
stat101 Venn diagrams: Word problems
stat106 Outcomes and event probability
stat112 Die rolling
stat114 Probability of intersection or union: Word problems
stat115 Independent events: Basic
stat120 Probability of union: Basic
stat109 Intersection and conditional probability

Conic sections

pcalc067 Graphing a parabola with a horizontal or a vertical axis
pcalc068 Writing an equation of a parabola given the vertex and the focus
pcalc069 Finding the focus of a parabola
pcalc605 Graphing a circle given its equation in standard form
pcalc064 Graphing a circle given its equation in general form
pcalc065 Writing an equation of a circle given its center and a point on the circle
pcalc066 Writing an equation of a circle given the endpoints of a diameter
pcalc734 Graphing an ellipse given its equation in standard form
pcalc071 Graphing an ellipse given its equation in general form
pcalc072 Finding the foci of an ellipse
pcalc073 Writing an equation of an ellipse given the foci and the major axis length
pcalc074 Writing an equation of an ellipse given the center, an endpoint of an axis, and the length of the other axis
pcalc735 Graphing a hyperbola given its equation in standard form
pcalc076 Graphing a hyperbola given its equation in general form
pcalc077 Finding the foci of a hyperbola
pcalc078 Writing an equation of a hyperbola given the foci and the vertices
pcalc079 Writing an equation of a hyperbola given the foci and the asymptotes
alge191 Midpoint of a line segment in the plane
alge132 Distance between two points in the plane

pcalc736 Classifying conics given their equations
pcalc098 Solving a system of nonlinear equations
pcalc096 Graphing a system of nonlinear inequalities: Problem type 1

B.22 Preparation for Calculus

Rational numbers

arith010 Addition of fractions with same denominator
arith054 Addition of fractions with different denominators
arith212 Equivalent fractions
arith022 Fraction division
arith067 Reduced fraction
arith009 Unit fraction multiplication
arith053 Fraction multiplication
arith079 Product of a unit fraction and a whole number
arith086 Product of a fraction and a whole number
arith044 Ordering fractions with same denominator
arith091 Ordering fractions with same numerator
arith092 Ordering fractions
arith088 The reciprocal of a number
arith080 Subtraction of fractions with different denominators
arith096 Subtraction of fractions with same denominator
arith100 Fractional part of a circle
arith002 Converting a fraction to a percentage
arith030 Percentage of a whole number
arith069 Writing a ratio as a percentage
arith090 Converting a percentage to a fraction
arith226 Converting between percentages and decimals
arith064 Simple word problem on proportions
arith071 Absolute value of a number
arith104 Operations with absolute value
arith106 Signed fractions addition
arith107 Integer subtraction
arith108 Integer addition: Problem type 2
arith200 Integer addition: Problem type 1
arith202 Integer division
arith105 Signed fractions multiplication
arith201 Integer multiplication
arith056 Factors
arith033 Greatest common factor
arith070 Least common multiple

arith035 Prime number factorization
arith034 Prime numbers
alge001 Integers and rational numbers
alge002 Integers, rational numbers, and irrational numbers
alge187 Properties of addition
alge188 Properties of real numbers

Linear algebra

alge005 Evaluation of a linear expression in two variables
alge103 Solving an equation involving absolute value: Basic
alge167 Solving an equation involving absolute value: Advanced
alge061 Solving a linear equation with several occurrences of the variable: Problem type 2
alge011 Solving a linear equation with several occurrences of the variable: Problem type 1
alge013 Solving a linear equation with several occurrences of the variable: Problem type 3
alge179 Solving a linear equation with several occurrences of the variable: Problem type 5
alge209 Solving a linear equation with several occurrences of the variable: Problem type 4
alge007 Additive property of equality: Problem type 3
alge009 Additive property of equality: Problem type 1
alge010 Additive property of equality: Problem type 2
alge006 Solving a linear equation: Problem type 1
alge208 Solving a linear equation: Problem type 2
alge008 Multiplicative property of equality: Problem type 1
alge012 Multiplicative property of equality: Problem type 2
alge200 Solving a linear equation: Problem type 3
alge076 Solving a system of linear equations
alge077 Creating an inconsistent system of linear equations
alge168 Graphing an equation involving absolute value in the plane
alge170 Solving an inequality involving absolute value: Basic
alge194 Graphing a line given its equation in slope-intercept form
alge195 Graphing a line given its equation in standard form
alge196 Graphing a line through a given point with a given slope
alge197 Graphing a line given the x- and y-intercepts
alge198 Graphing a vertical or horizontal line
alge064 Reading a point in the coordinate plane
alge066 Solutions to a linear equation in two variables: Problem type 1
alge067 Plotting a point in the coordinate plane
alge132 Distance between two points in the plane

alge191 Midpoint of a line segment in the plane
alge216 Solutions to a linear equation in two variables: Problem type 2
alge069 Y-intercept of a line
alge070 Writing an equation of a line given the slope and the y-intercept
alge071 Writing the equation of a line given the slope and a point on the line
alge072 Writing the equation of the line through two given points
alge073 Writing the equations of vertical and horizontal lines through a given point
alge074 Writing the equation of the line through a given point and parallel to a given line
alge210 X- and y-intercepts of a line given the equation in standard form

Exponents and rational expressions

arith094 Cube root of an integer
arith024 Ordering numbers with negative exponents
arith042 Writing a positive number without a negative exponent
arith043 Writing a negative number without a negative exponent
arith029 Ordering numbers with positive exponents
arith047 Evaluating expressions with exponents: Problem type 1
arith049 Evaluating expressions with exponents: Problem type 2
arith016 Square root of a perfect square
arith032 Square root addition
arith039 Square root multiplication
arith093 Square root simplification
alge024 Product rule of exponents
alge025 Power rule: Negative exponents
alge027 Power rule: Positive exponents
alge028 Product rule of exponents in a multivariate monomial
alge049 Restriction on variable in a denominator
alge059 Ordering fractions with variables
alge160 Algebraic symbol manipulation
alge175 Word problem on direct variation
alge176 Word problem on inverse variation
alge220 Word problem on inverse proportions
alge047 Solving a rational equation that simplifies to a quadratic equation: Problem type 3
alge060 Solving a rational equation that simplifies to a linear equation: Problem type 1
alge062 Solving a rational equation that simplifies to a quadratic equation: Problem type 2
alge205 Solving a rational equation that simplifies to a linear equation: Problem type 2
alge206 Solving a rational equation that simplifies to a linear equation: Problem type 3
alge212 Solving a rational equation that simplifies to a quadratic equation: Problem type 1

alge034 Ratio of multivariate polynomials
alge053 Multiplying rational expressions: Problem type 1
alge054 Dividing rational expressions
alge056 Adding rational expressions with common denominator
alge057 Adding rational expressions
alge058 Complex fraction: Problem type 1
alge162 Complex Fraction: Problem type 2
alge226 Adding rational expressions with different denominators
alge080 Simplifying a radical expression: Problem type 1
alge086 Rationalizing the denominator of a radical expression
alge088 Rationalizing the denominator of a radical expression using conjugates
alge085 Simplifying a product of radical expressions: Problem type 1
alge087 Simplifying a product of radical expressions: Problem type 2
alge092 Even root property
alge093 Odd root property
alge227 Solving an equation with exponent using the even-root property
alge228 Solving an equation with exponent using the odd-root property
alge230 Solving an equation with positive rational exponent
alge231 Solving an equation with negative rational exponent
alge089 Solving an equation with radicals: Problem type 1
alge090 Solving an equation with radicals: Problem type 2

Polynomials

alge037 Greatest common factor of two monomials
alge055 Least common multiple of two monomials
alge042 Factoring with repeated use of the difference of squares formula
alge044 Factoring a sum or difference of two cubes
alge039 Factoring a quadratic with leading coefficient 1
alge040 Factoring a quadratic with leading coefficient greater than 1
alge041 Factoring a product of a quadratic trinomial and a monomial
alge043 Factoring a perfect square
alge094 Completing the square
alge004 Evaluation of a polynomial in one variable
alge029 Simplifying a polynomial expression
alge031 Degree of a multivariate polynomial
alge035 Division of a polynomial by a binomial with no remainder
alge036 Division of a polynomial by a binomial with remainder
alge030 Multiplying monomials
alge032 Squaring a binomial
alge033 Multiplying two binomials
alge180 Multiplying polynomials
alge050 Ratio of quadratic polynomials: Problem type 1

alge051 Ratio of quadratic polynomials: Problem type 2
alge052 Ratio of quadratic polynomials: Problem type 3
pcalc092 Partial fraction decomposition
alge214 Discriminant of a quadratic equation
alge096 Graphing a parabola
alge045 Finding the roots of a quadratic equation with leading coefficient 1
alge046 Roots of a product of polynomials
alge048 Finding the roots of a quadratic equation with leading coefficient greater than 1
alge211 Solving a quadratic equation needing simplification
alge095 Solving a quadratic equation using the quadratic formula
alge193 Discriminant of a quadratic equation with parameter
alge163 Writing a quadratic equation given the roots and the leading coefficient

Functions

alge125 Sum of two linear functions
alge129 Composition of two functions: Advanced
alge128 Range of a real function
alge213 Domain of a square root function
alge130 Inverse functions: Advanced
alge126 Product of two linear functions
alge131 Horizontal translation of the graph of a function
alge185 Vertical translation of the graph of a function

Exponentials and logarithms

alge104 Product rule for logarithms
alge106 Power rule for logarithms
alge107 Change of base for logarithms
alge108 Exponential and logarithmic equations
alge232 Evaluating a logarithmic expression
alge111 Solving an exponential equation: Problem type 1
alge112 Solving an exponential equation: Problem type 2
alge113 Solving a logarithmic equation: Problem type 2
alge233 Solving a logarithmic equation: Problem type 1
pcalc102 Translating the graph of a logarithmic or exponential function
pcalc103 Sketching the graph of an exponential function: Advanced
pcalc104 Sketching the graph of a logarithmic function

Trigonometry

pcalc064 Graphing a circle given its equation in general form
pcalc002 Converting between degree and radian measure
pcalc003 Coterminal angles
pcalc006 Sketching an angle in standard position
pcalc016 Values of inverse trigonometric functions
pcalc018 Composition of a trigonometric function and an inverse trigonometric function: Problem type 1
pcalc019 Composition of a trigonometric function and an inverse trigonometric function: Problem type 2
pcalc036 Composition of a trigonometric function and an inverse trigonometric function: Problem type 3
pcalc020 Solving a basic trigonometric equation involving sine or cosine
pcalc021 Solving a basic trigonometric equation involving tangent, cotangent, secant, or cosecant
pcalc022 Solving a trigonometric equation involving a squared function
pcalc023 Trigonometric equations involving squared functions: Problem type 2
pcalc024 Solving a trigonometric equation involving more than one function
pcalc025 Solving a trigonometric equation involving an angle multiplied by a constant
pcalc026 Solving a trigonometric equation using sum and difference identities
pcalc027 Solving a trigonometric equation using double-angle identities
pcalc028 Solving a trigonometric equation using half-angle identities
pcalc107 Sketching the graph of a sine or cosine function: Problem type 1
pcalc007 Common angles and trigonometric functions
pcalc008 Finding trigonometric ratios given a right triangle
pcalc009 Solving a right triangle
pcalc010 Application problem using right triangle trigonometry
pcalc011 Finding values of trigonometric functions given information about an angle: Problem type 1
pcalc012 Finding values of trigonometric functions given information about an angle: Problem type 2
pcalc013 Finding values of trigonometric functions given information about an angle: Problem type 3
pcalc030 Double-angle identities
pcalc055 Plotting a point in polar coordinates
pcalc056 Converting rectangular coordinates to polar coordinates
pcalc057 Converting polar coordinates to rectangular coordinates
pcalc058 Converting an equation written in rectangular coordinates to one written in polar form
pcalc059 Converting an equation written in polar form to one written in rectangular coordinates

B.23 Math Prep for College Physics

Arithmetic

arith010 Addition of fractions with same denominator
arith096 Subtraction of fractions with same denominator
arith079 Product of a unit fraction and a whole number
arith086 Product of a fraction and a whole number
arith009 Unit fraction multiplication
arith053 Fraction multiplication
arith212 Equivalent fractions
arith054 Addition of fractions with different denominators
arith080 Subtraction of fractions with different denominators
arith067 Reduced fraction
arith106 Signed fractions addition
arith105 Signed fractions multiplication
arith022 Fraction division
arith015 Writing an improper fraction as a mixed number
arith220 Decimal place value
arith221 Rounding decimals
arith078 Rounding: Problem type 1
arith061 Rounding: Problem type 2
arith030 Percentage of a whole number
geom133 Ratio of volumes
arith002 Converting a fraction to a percentage
arith069 Writing a ratio as a percentage
arith226 Converting between percentages and decimals
arith222 Converting a fraction to a terminating decimal
arith089 Converting a fraction to a repeating decimal
arith223 Converting a mixed number to a decimal
arith087 Converting a decimal to a fraction
unit003 Metric distance conversion with decimal values
unit004 Metric conversion with decimal values, two-step conversion
unit010 Metric area unit conversion with decimal number values
arith101 Estimating a sum
arith102 Estimating a difference
scinot004 Order of magnitude estimation
arith071 Absolute value of a number
arith104 Operations with absolute value
arith029 Ordering numbers with positive exponents
arith024 Ordering numbers with negative exponents
arith042 Writing a positive number without a negative exponent
arith047 Evaluating expressions with exponents: Problem type 1
arith049 Evaluating expressions with exponents: Problem type 2

arith016 Square root of a perfect square
arith093 Square root simplification
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