

Teaching with



for Math Prep for Accounting

*Advanced Customer Solutions*

ALEKS Corporation

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## 1 The ALEKS Educational Paradigm [paradigm]

ALEKS is based on the understanding 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 difficult) and boredom (from material that is too easy). Students are engaged in the learning process, and grow in confidence and independence as they use the program. ALEKS periodically reassesses students to test their retention of new knowledge, and if they forget what was once learned, ALEKS smoothly and efficiently guides them through necessary review and reinforcement. With time and persistence, every ALEKS student will progress toward mastery, in a way clearly visible to both student and instructor.

It is normal for students to be in disparate knowledge states; 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 students to progress as a unified group. ALEKS will permit a student to work on any topic in the category "ready to learn," a 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 and excitement in learning. 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 math in a broader and richer way.

ALEKS gives the instructor a set of powerful resources. Various styles of use of ALEKS are possible. The following should be understood as suggestions, designed to give instructors a sense of the possibilities offered by ALEKS's extensive library of tools.

## **2 The Instructor and ALEKS [teacherandaleks]**

ALEKS is often used in regular classroom settings.

The instructor in an ALEKS course need not be collecting, correcting, or distributing papers, organizing groups, managing materials, giving instructions, or supervising activities. The instructor in an ALEKS course may be just as busy teaching mathematics 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, and 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 especially 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. 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 (Sec. 3).

Students will be assessed at the beginning of their use of ALEKS (following Registration and the Tutorial), and at regular intervals after that. The instructor does not need to supervise all ALEKS assessments; normally, students will be using ALEKS both in and out of the 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 inaccurate 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 that the students' work in the Learning Mode be productive from the start. For the instructor's own information, other supervised as-

assessments may also be held at regular intervals to provide accurate “snapshots” of overall progress by the course (Sec. 10). We suggest that such supervised assessments be scheduled at the midpoint and end of the class. Also, any assessment results which may be used as a component in the students’ grades should, of course, be obtained from supervised assessments (Sec. 13).

**NOTE.** In cases where students do not seem to be making adequate progress in ALEKS, the student may have received help, or inappropriately used a calculator on an unsupervised assessment, skewing the assessment results and leading to inappropriate material in the Learning Mode. This can be corrected by requesting a new assessment for the student.

### 3 Planning the ALEKS Course [planning]

Planning a course with ALEKS can be simpler than planning other kinds of courses. The instructor has 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 not necessary for the instructor 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. Instructors can, however, plan focused small-group instruction from week to week (Sec. 5).

It is important to make ALEKS an integral part of the course requirements and grading scheme. The main factor influencing the success of students using ALEKS is the time that they spend in it. This means that the students must be required to spend a suitable amount of time in ALEKS on a weekly basis. (A minimum of three hours is recommended.) They should be informed of this at the beginning of the course, and the instructor should monitor their fulfillment of this obligation. The amount of time required must be reasonable and in balance with other requirements for the course; the instructor should not simply include an ALEKS requirement without reducing the other requirements that the students have to fulfill. For example, the quantity of homework problems may be reduced, as the students will be solving problems in their ALEKS sessions.

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.

One 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 can also be used; 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 or the “Time and Topic” report. This page can be printed out every week for record-keeping. In rare cases, students may try to fool ALEKS by logging on to their accounts and doing something else; this can be seen when the number of items gained per hour is far too low. 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 (“Report for a particular student in this course (pie chart)”), under “Learning Log,” or, better, the “Time and Topic” report.

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, see Sec. 13.

## 4 Preparing Your Students [preparingstudents]

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

### **Difficulty of Assessment Questions**

The ALEKS Initial Assessment is always comprehensive, in order to achieve the highest 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; otherwise 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 the assessment), students will be provided only material that they are prepared to learn.

**Length of Assessments**

The number of questions asked in an ALEKS assessment varies. Normally, an assessment in Math Prep for Accounting requires between 20 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 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 just explaining or rephrasing a question, assessment results may be inaccurate and the student's learning in ALEKS may initially be hindered. Be sure students understand that the purpose of the Initial Assessment is to gain a precise, detailed understanding of what they know, so that in Learning Mode they are given material they are ready to learn. It is not a "test" to pass or fail, and they will not receive a grade on an ALEKS assessment (unless the instructor chooses to use assessments for grading).

## 5 Focused Instruction with ALEKS [focusedinstruction]

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. 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 "high-

est” topics in the student’s knowledge state, called the “inner fringe”). (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 can be reviewed by clicking the “Review” button.) When the students are logged on to ALEKS, these two types 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 can enter the Instructor Module and select the course, then click on “Reports” and select the “ALEKS Pie” report. This report represents the average student in the given course, and displays the weaknesses and strengths of the course as a whole. The “Show” drop-down box can be used to filter the report by “Current Learning,” “Most Recent Assessment,” or “Initial Assessment.” Complete details on which topics students have mastered, not mastered, and are ready to learn in the course are available in the section below the pie chart and can be viewed by Objectives (if textbook integration or intermediate objectives are being used) or ALEKS Table of Contents.

Using the Average Report we can see a breakdown of student mastery for each topic, send messages directly to students, and view additional topics that a group of students is ready to learn. The purpose of this analysis is that the instructor may pick one or more topics from the list and schedule small-group sessions of focused instruction.

The following are examples that illustrate how these features may be used.

### **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 name of a course in Math Prep for Accounting, selects “Reports”, and clicks “ALEKS Pie” to access the 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.

**Example 2: Intermediate**

On a weekend afternoon, the instructor logs on to ALEKS, selects the name of a course in Math Prep for Accounting, and then opens the “Average report (pie chart).” After a look at the pie chart, the instructor selects “Current Learning” from the “Show” drop-down box, and clicks “OK.” Next the instructor clicks on the “View all topics” toggle, in either the ALEKS tab or the Objectives tab, and when the list of topics appears, the instructor scans this list for items of particular difficulty. “Ordering Numbers with Exponents” 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, selects the name of a course in Math Prep for Accounting, and then opens the “Average report (pie chart).” After a look at the pie chart, the instructor selects “Current Learning” from the “Show” drop-down box, and clicks “OK.” Next the instructor clicks on the “View all topics” toggle, in either the ALEKS tab or the Objectives tab, and the list of topics appears, clearly showing what students have mastered, not mastered and are ready to learn. The experience and expertise of the instructor are used to used to plan with this information. 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.” 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. 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 “Mastered,” 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 may be using the coordinate plane for the first time. 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.

## 6 Models of Classroom Integration [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 to 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. 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 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 though 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 (Sec. 3); 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; conversely, students who do not seem to make adequate progress should be contacted promptly.

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

## 7 **Monitoring Student Use [monitoringuse]**

In the day-to-day use of ALEKS by a class, a principal concern of the instructor is to monitor that students are using ALEKS regularly and for at least the required amount of time. The most convenient place to find this information is the "Time and Topic report for all students" (under "Reports"). Each student's name is displayed on this page along with the total number of hours that student has spent logged on to the system. There is also a breakdown of how much time the student has spent in ALEKS on a daily basis. Students can see this same breakdown of daily usage in their own accounts by using the "Report" link.

It is also important that critical assessments be supervised by the instructor, to ensure that valid results are received (Sec. 2).

## 8 Monitoring the Progress of a Course [monitoring-courseprogress]

The instructor can also use the bar graphs on the “Learning progress since latest assessment” page to see how close each student is to mastery of the subject matter. Keep 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 “Total progress” report. This displays the difference between the students’ knowledge on their first and their most recent assessments.

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 particular student in this course” for the student.

## 9 Monitoring Individual Progress [monitoringindividualprogress]

On the page “Progress report for a particular 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.

Use caution 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 Mode 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. Part of the power of the ALEKS system is that it does not expect students to behave like machines, but makes allowance for individual differences.

**NOTE.** In cases where a student moves backward in his or her mastery, the instructor should contact the student. If the student did not take the assessment seriously enough, a new one can be requested.

## 10 Ordering Assessments [orderingassessments]

Following the Initial Assessment (which should be taken under the instructor’s supervision), the ALEKS system will automatically schedule other assessments as needed to guide the students’ 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.

## 11 Independent Study and Distance Learning [independentstudy]

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.

## 12 The ALEKS Knowledge Structure [structure]

Each ALEKS subject, such as Math Prep for Accounting, has a knowledge structure associated with it. The number of items comprised in a knowledge structure ranges roughly between 200 and 500 topics. 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 affects 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 accurate.

The structure is also crucial in the ALEKS Learning Mode. Using the structure of a given course product, the system knows precisely which items are in the inner fringe and outer fringe of each of the knowledge states in ALEKS. 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.



## 13 Learning Rates in ALEKS [learningratesinaleks]

ALEKS allows instructors to flexibly evaluate and interpret student learning. There are three criteria, which can be used in any combination: percentage of course goals mastered, total hours spent in ALEKS, and average items gained per hour 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.

Instructions on how to access the learning rates feature can be found in the **Instructor’s Manual** under “Assign Learning Rates,” in the chapter “Advanced Instructor Module: Course Reports.”

Any of these criteria that is set to “Public” will be 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). This will only make sense when the students are close to finishing the course, and may cause confusion if the grades are made “Public” before then.

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 hour, for example, might be set to some minimum value like 1 (in an Algebra class requiring 1 topic of work in ALEKS per hour as a minimum). Now, the instructor would not want to send the message to the students that 1 items gained per hour 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.