

The Praxis® Study Companion

Algebra I

5162



Welcome to *The Praxis*® Study Companion

Prepare to Show What You Know

You have been working to acquire the knowledge and skills you need for your teaching career. Now you are ready to demonstrate your abilities by taking a *Praxis*® test.

Using the *Praxis*® Study Companion is a smart way to prepare for the test so you can do your best on test day. This guide can help keep you on track and make the most efficient use of your study time.

The Study Companion contains practical information and helpful tools, including:

- An overview of the *Praxis* tests
- Specific information on the *Praxis* test you are taking
- A template study plan
- Study topics
- Practice questions and explanations of correct answers
- Test-taking tips and strategies
- Frequently asked questions
- Links to more detailed information

So where should you start? Begin by reviewing this guide in its entirety and note those sections that you need to revisit. Then you can create your own personalized study plan and schedule based on your individual needs and how much time you have before test day.

Keep in mind that study habits are individual. There are many different ways to successfully prepare for your test. Some people study better on their own, while others prefer a group dynamic. You may have more energy early in the day, but another test taker may concentrate better in the evening. So use this guide to develop the approach that works best for you.

Your teaching career begins with preparation. Good luck!

Know What to Expect

Which tests should I take?

Each state or agency that uses the *Praxis* tests sets its own requirements for which test or tests you must take for the teaching area you wish to pursue.

Before you register for a test, confirm your state or agency's testing requirements at www.ets.org/praxis/states.

How are the *Praxis* tests given?

Praxis tests are given on computer. Other formats are available for test takers approved for accommodations (see page 34).

What should I expect when taking the test on computer?

When taking the test on computer, you can expect to be asked to provide proper identification at the test center. Once admitted, you will be given the opportunity to learn how the computer interface works (how to answer questions, how to skip questions, how to go back to questions you skipped, etc.) before the testing time begins. Watch the [What to Expect on Test Day](#) video to see what the experience is like.

Where and when are the *Praxis* tests offered?

You can select the test center that is most convenient for you. The *Praxis* tests are administered through an international network of test centers, which includes Prometric® Testing Centers, some universities, and other locations throughout the world.

Testing schedules may differ, so see the *Praxis* web site for more detailed test registration information at www.ets.org/praxis/register.

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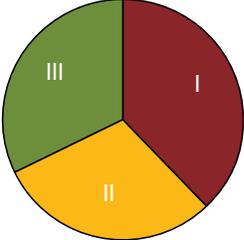
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1. Learn About Your Test

Learn about the specific test you will be taking

Algebra I (5162)

Test at a Glance			
Test Name	Algebra I		
Test Code	5162		
Time	150 minutes		
Number of Questions	60		
Format	Selected-response and numeric-entry questions; on-screen graphing calculator provided.		
Test Delivery	Computer delivered		
	Content Categories	Approximate Number of Questions	Approximate Percentage of Examination
	I. Principles of Algebra	23	38%
II. Functions	18	30%	
III. Number and Quantity; Probability and Statistics	19	32%	

About This Test

The *Praxis* Algebra I test is designed to assess the mathematical knowledge and competencies necessary for a beginning Algebra I teacher. Examinees have typically completed a bachelor's program with an emphasis in mathematics or mathematics education. The examinee will be required to understand and work with mathematical concepts, to reason mathematically, to make conjectures, to see patterns, to justify statements using informal logical arguments, and to construct simple proofs. Additionally, the examinee will be expected to solve problems by integrating knowledge from different areas of mathematics, to use various representations of concepts, to solve problems that have several solution paths, and to develop mathematical models and use them to solve real-world problems.

The test is not designed to be aligned with any particular school mathematics curriculum, but it is intended to be consistent with the recommendations of national studies on mathematics education, such as the National Governors Association Center for Best Practices and the Council of Chief State School Officers Common Core State Standards in Mathematics (2010), the National Council of Teachers of Mathematics (NCTM) and the Council of the Accreditation of Educator Preparation (CAEP) NCTM CAEP Standards (2012), and the NCTM Principles and Standards for School Mathematics (2000).

This test may contain some questions that will not count toward your score.

Test Specifications

Test specifications describe the knowledge and skills measured by the test. Study topics to help you prepare to answer test questions can be found on page 28.

I. Principles of Algebra

A. Understands how to write algebraic expressions in equivalent forms

1. Interprets the parts of an expression (e.g., terms, factors, coefficients)
2. Uses the structure of an expression to identify ways to rewrite it
3. Understands how to rewrite quadratic expressions for specific purposes (e.g., factoring/finding zeros, completing the square/finding maxima or minima)
4. Uses the properties of exponents to rewrite expressions for exponential functions

B. Understands how to perform arithmetic operations on polynomials

1. Adds, subtracts, and multiplies polynomials

C. Understands how to create equations and inequalities that describe relationships

1. Creates equations and inequalities in one variable and uses them to solve problems and graph solutions on the number line
2. Creates equations and inequalities to represent relationships between quantities, solves problems, and graphs them on the coordinate plane with labels and scales
3. Represents constraints by equations, inequalities, or systems of equations and/or inequalities and interprets solutions as viable or nonviable options in a modeling context
4. Rearranges formulas to highlight a quantity of interest (e.g., solve $d = rt$ for t)

D. Understands how to justify the reasoning process used to solve equations

1. Explains each step in solving a simple equation

E. Understands how varied techniques (e.g., graphical, algebraic) are used to solve equations and inequalities

1. Solves linear equations and inequalities, including equations with coefficients represented by letters
2. Uses the method of completing the square to transform any quadratic equation in x into the equivalent form $(x - p)^2 = q$

3. Solves equations using a variety of methods (e.g., using graphs, using the quadratic formula, factoring)
4. Uses different methods (e.g., discriminant analysis, graphical analysis) to determine the nature of the solutions of a quadratic equation

F. Understands how varied techniques (e.g., graphical, algebraic) are used to solve systems of equations and inequalities

1. Explains why, when solving a system of two equations using the elimination method, replacing one or both equations with a scalar multiple produces a system with the same solutions as the solutions of the original system
2. Solves a system consisting of two linear equations in two variables algebraically and graphically
3. Solves a system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically
4. Explains why the x -coordinates of the intersection points of the graphs of $y = f(x)$ and $y = g(x)$ are the solutions of $f(x) = g(x)$
5. Finds the solutions of $f(x) = g(x)$ approximately (e.g., uses technology to graph the functions, makes tables of values, finds successive approximations); includes cases where $f(x)$ and/or $g(x)$ are linear, quadratic, or exponential functions
6. Graphs the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality) and graphs the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes

G. Understands the concept of rate of change of nonlinear functions

1. Calculates and interprets the average rate of change of a function presented symbolically, numerically, or graphically over a specified interval

H. Understands the concepts of intercept(s) of a line and slope as a rate of change

1. Calculates and interprets the intercepts of a line
2. Calculates and interprets the slope of a line presented symbolically, numerically, or graphically

- Estimates the rate of change of a linear function from a graph

II. Functions

A. Understands the function concept and the use of function notation

- Understands that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range
- Uses function notation, evaluates functions, and interprets statements that use function notation in terms of a context
- Recognizes that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers
- Determines the domain and range of a function from a function rule (e.g., $f(x) = 2x + 1$), graph, set of ordered pairs, or table

B. Understands how function behavior is analyzed using different representations (e.g., graphs, mappings, tables)

- For a function that models a relationship between two quantities, interprets key features of graphs and tables (e.g., increasing/decreasing, maximum/minimum) in terms of the quantities
- Given a verbal description of a relation, sketches graphs that show key features of that relation
- Graphs functions (i.e., linear, quadratic, exponential, piecewise, absolute value, step) expressed symbolically and identifies key features of the graph
- Writes a function that is defined by an expression in different but equivalent forms to reveal different properties of the function (e.g., zeros, extreme values, symmetry of the graph)
- Interprets the behavior of exponential functions (e.g., growth, decay)
- Understands how to determine whether a function is odd, even, or neither, and any resulting symmetries

C. Understands how functions and relations are used to model relationships between quantities

- Writes a function that relates two quantities
- Determines an explicit expression or a recursive process that builds a function from a context

- Writes arithmetic and geometric sequences both recursively and with an explicit formula, and uses them to model situations
- Translates between recursive and explicit forms of arithmetic and geometric sequences

D. Understands how new functions are obtained from existing functions (e.g., transformations, inverses)

- Describes how the graph of $g(x)$ is related to the graph of $f(x)$, where $g(x) = f(x) + k$, $g(x) = kf(x)$, $g(x) = f(kx)$, or $g(x) = f(x + k)$ for specific values of k (both positive and negative) and finds the value of k given the graphs
- Determines whether a function has an inverse and writes an expression for the inverse
- Combines standard function types using arithmetic operations
- Performs domain analysis on functions resulting from arithmetic operations

E. Understands differences between linear, quadratic, and exponential models, including how their equations are created and used to solve problems

- Understands that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals
- Recognizes situations in which one quantity changes at a constant rate per unit interval relative to another
- Recognizes situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another
- Constructs linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two ordered pairs (including reading these from a table)
- Observes that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function
- Interprets the parameters in a linear or exponential function in terms of a context (e.g., $A(t) = Pe^{rt}$)
- Uses quantities that are inversely related to model phenomena

III. Number and Quantity; Probability and Statistics

A. Understands the properties of radicals and exponents

1. Performs operations involving exponents, including negative and rational exponents
2. Demonstrates an understanding of the properties of exponential expressions
3. Uses the properties of radicals and exponents to rewrite expressions that have radicals or rational exponents
4. Represents and compares very large and very small numbers (e.g., scientific notation, orders of magnitude)
5. Uses order of magnitude to estimate very large and very small numbers
6. Performs calculations on numbers in scientific notation

B. Understands the properties of rational and irrational numbers

1. Recognizes that the sum or product of two rational numbers is rational
2. Recognizes that the sum of a rational number and an irrational number is irrational
3. Recognizes that the product of a nonzero rational number and an irrational number is irrational
4. Recognizes that the sum or product of two irrational numbers can be rational or irrational

C. Understands how to reason quantitatively and use units to solve problems

1. Uses units as a way to understand problems and guide the solution of multistep problems
2. Chooses and interprets units consistently in formulas
3. Chooses and interprets the scale and the origin in graphs and data displays
4. Recognizes the reasonableness of results within the context of a given problem
5. Chooses a level of accuracy appropriate to limitations on measurement when reporting quantities

D. Understands how to summarize, represent, and interpret data collected from measurements on a single variable (e.g., boxplots, dotplots, normal distributions)

1. Represents data with plots on the real number line (e.g., dotplots, histograms, and boxplots)

2. Uses statistics appropriate to the shape of the data distribution to compare center (e.g., median, mean) and spread (e.g., interquartile range, standard deviation) of two or more different data sets
3. Interprets differences in shape, center, and spread in the context of the data sets, accounting for possible effects of outliers

E. Understands how to summarize, represent, and interpret data collected from measurements on two variables, either categorical or quantitative (e.g., scatterplots, time series)

1. Summarizes and interprets categorical data for two categories in two-way frequency tables (e.g., joint, marginal, conditional relative frequencies)
2. Recognizes possible associations and trends in the data
3. Represents data for two quantitative variables on a scatterplot, and describes how the variables are related

F. Understands how to create and interpret linear regression models (e.g., rate of change, intercepts, correlation coefficient)

1. Uses technology to fit a function to data (i.e., linear regression) and determines a linear correlation coefficient
2. Uses functions fitted to data to solve problems in the context of the data
3. Assesses the fit of a function by plotting and analyzing residuals
4. Interprets the slope and the intercept of a regression line in the context of the data
5. Interprets a linear correlation coefficient
6. Distinguishes between correlation and causation

G. Understands how to compute probabilities of simple and compound events

1. Calculates probabilities of simple and compound events

2. Familiarize Yourself with Test Questions

Become comfortable with the types of questions you'll find on the Praxis tests

The *Praxis* assessments include a variety of question types: constructed response (for which you write a response of your own); selected response, for which you select one or more answers from a list of choices or make another kind of selection (e.g., by clicking on a sentence in a text or by clicking on part of a graphic); and numeric entry, for which you enter a numeric value in an answer field. You may be familiar with these question formats from taking other standardized tests. If not, familiarize yourself with them so you don't spend time during the test figuring out how to answer them.

Understanding Computer-Delivered Questions

Questions on computer-delivered tests are interactive in the sense that you answer by selecting an option or entering text on the screen. If you see a format you are not familiar with, read the directions carefully. The directions always give clear instructions on how you are expected to respond.

For most questions, you respond by clicking an oval to select a single answer from a list of answer choices.

However, interactive question types may also ask you to respond by:

- **Clicking more than one oval** to select answers from a list of choices.
- **Typing in an entry box.** When the answer is a number, you may be asked to enter a numerical answer. Some questions may have more than one place to enter a response.
- **Clicking check boxes.** You may be asked to click check boxes instead of an oval when more than one choice within a set of answers can be selected.
- **Clicking parts of a graphic.** In some questions, you will select your answers by clicking on a location (or locations) on a graphic such as a map or chart, as opposed to choosing your answer from a list.
- **Clicking on sentences.** In questions with reading passages, you may be asked to choose your answers by clicking on a sentence (or sentences) within the reading passage.
- **Dragging and dropping answer choices into targets on the screen.** You may be asked to select answers from a list of choices and drag your answers to the appropriate location in a table, paragraph of text or graphic.
- **Selecting answer choices from a drop-down menu.** You may be asked to choose answers by selecting choices from a drop-down menu (e.g., to complete a sentence).

Remember that with every question you will get clear instructions.

Perhaps the best way to understand computer-delivered questions is to view the [Computer-delivered Testing Demonstration](#) on the Praxis web site to learn how a computer-delivered test works and see examples of some types of questions you may encounter.

Understanding Selected-Response Questions

Many selected-response questions begin with the phrase “which of the following.” Take a look at this example:

Which of the following is a flavor made from beans?

- (A) Strawberry
- (B) Cherry
- (C) Vanilla
- (D) Mint

How would you answer this question?

All of the answer choices are flavors. Your job is to decide which of the flavors is the one made from beans.

Try following these steps to select the correct answer.

- 1) **Limit your answer to the choices given.** You may know that chocolate and coffee are also flavors made from beans, but they are not listed. Rather than thinking of other possible answers, focus only on the choices given (“which of the following”).
- 2) **Eliminate incorrect answers.** You may know that strawberry and cherry flavors are made from fruit and that mint flavor is made from a plant. That leaves vanilla as the only possible answer.
- 3) **Verify your answer.** You can substitute “vanilla” for the phrase “which of the following” and turn the question into this statement: “Vanilla is a flavor made from beans.” This will help you be sure that your answer is correct. If you’re still uncertain, try substituting the other choices to see if they make sense. You may want to use this technique as you answer selected-response questions on the practice tests.

Try a more challenging example

The vanilla bean question is pretty straightforward, but you’ll find that more challenging questions have a similar structure. For example:

Entries in outlines are generally arranged according to which of the following relationships of ideas?

- (A) Literal and inferential
- (B) Concrete and abstract
- (C) Linear and recursive
- (D) Main and subordinate

You’ll notice that this example also contains the phrase “which of the following.” This phrase helps you determine that your answer will be a “relationship of ideas” from the choices provided. You are supposed to find the choice that describes how entries, or ideas, in outlines are related.

Sometimes it helps to put the question in your own words. Here, you could paraphrase the question in this way: “How are outlines usually organized?” Since the ideas in outlines usually appear as main ideas and subordinate ideas, the answer is (D).

QUICK TIP: Don't be intimidated by words you may not understand. It might be easy to be thrown by words like "recursive" or "inferential." Read carefully to understand the question and look for an answer that fits. An outline is something you are probably familiar with and expect to teach to your students. So slow down, and use what you know.

Watch out for selected-response questions containing "NOT," "LEAST," and "EXCEPT"

This type of question asks you to select the choice that does not fit. You must be very careful because it is easy to forget that you are selecting the negative. This question type is used in situations in which there are several good solutions or ways to approach something, but also a clearly wrong way.

How to approach questions about graphs, tables, or reading passages

When answering questions about graphs, tables, or reading passages, provide only the information that the questions ask for. In the case of a map or graph, you might want to read the questions first, and then look at the map or graph. In the case of a long reading passage, you might want to go ahead and read the passage first, noting places you think are important, and then answer the questions. Again, the important thing is to be sure you answer the questions as they refer to the material presented. So read the questions carefully.

How to approach unfamiliar formats

New question formats are developed from time to time to find new ways of assessing knowledge. Tests may include audio and video components, such as a movie clip or animation, instead of a map or reading passage. Other tests may allow you to zoom in on details in a graphic or picture.

Tests may also include interactive questions. These questions take advantage of technology to assess knowledge and skills in ways that standard selected-response questions cannot. If you see a format you are not familiar with, **read the directions carefully**. The directions always give clear instructions on how you are expected to respond.

QUICK TIP: Don't make the questions more difficult than they are. Don't read for hidden meanings or tricks. There are no trick questions on *Praxis* tests. They are intended to be serious, straightforward tests of your knowledge.

Understanding Constructed-Response Questions

Constructed-response questions require you to demonstrate your knowledge in a subject area by creating your own response to particular topics. Essays and short-answer questions are types of constructed-response questions.

For example, an essay question might present you with a topic and ask you to discuss the extent to which you agree or disagree with the opinion stated. You must support your position with specific reasons and examples from your own experience, observations, or reading.

Take a look at a few sample essay topics:

- "Celebrities have a tremendous influence on the young, and for that reason, they have a responsibility to act as role models."
- "We are constantly bombarded by advertisements—on television and radio, in newspapers and magazines, on highway signs, and the sides of buses. They have become too pervasive. It's time to put limits on advertising."
- "Advances in computer technology have made the classroom unnecessary, since students and teachers are able to communicate with one another from computer terminals at home or at work."

Keep these things in mind when you respond to a constructed-response question

- 1) **Answer the question accurately.** Analyze what each part of the question is asking you to do. If the question asks you to describe or discuss, you should provide more than just a list.
- 2) **Answer the question completely.** If a question asks you to do three distinct things in your response, you should cover all three things for the best score. Otherwise, no matter how well you write, you will not be awarded full credit.
- 3) **Answer the question that is asked.** Do not change the question or challenge the basis of the question. You will receive no credit or a low score if you answer another question or if you state, for example, that there is no possible answer.
- 4) **Give a thorough and detailed response.** You must demonstrate that you have a thorough understanding of the subject matter. However, your response should be straightforward and not filled with unnecessary information.
- 5) **Reread your response.** Check that you have written what you thought you wrote. Be sure not to leave sentences unfinished or omit clarifying information.

QUICK TIP: You may find that it helps to take notes on scratch paper so that you don't miss any details. Then you'll be sure to have all the information you need to answer the question.

3. Practice with Sample Test Questions

Answer practice questions and find explanations for correct answers

Sample Test Questions

This test is available via computer delivery. To illustrate what the computer-delivered test looks like, the following sample question shows an actual screen used in a computer-delivered test. For the purposes of this guide, sample questions are provided as they would appear in a paper-delivered test.

The screenshot shows a computer-delivered test interface. At the top left, the logo for ETS PRAXIS is visible. To the right of the logo is a navigation bar with buttons for 'Calc', 'Mark', 'Review', 'Help', 'Back', and 'Next'. Below the navigation bar, the text 'Mathematics CKT | Question 1 of 52' is displayed on the left, and '01:24:57 Hide Time' is displayed on the right. The main content area contains a word problem: 'Riding on a school bus are 20 students in ninth grade, 10 students in tenth grade, 9 students in eleventh grade, and 7 students in twelfth grade. Approximately what percent of the students on the bus are in ninth grade?'. To the right of the question are four radio button options: '23%', '43%', '46%', and '76%'. At the bottom of the question area, there is a grey button that says 'Click on your choices.'

The sample questions that follow illustrate the kinds of questions in the test. They are not, however, representative of the entire scope of the test in either content or difficulty. Answers with explanations follow the questions.

- Which of the following is equivalent to the expression $2x^2 + 5x - 3$ for all numbers x ?
 - $(2x - 3)(x + 1)$
 - $(2x - 1)(x + 3)$
 - $(2x + 1)(x - 3)$
 - $(2x + 3)(x - 1)$
- In order to raise money for a class trip, students are selling chocolate bars for \$3 each and cups of popcorn for \$4 each at a basketball game. Their goal is to make at least \$400 in revenue during the game. If x represents the number of chocolate bars sold and y represents the number of cups of popcorn sold, which of the following inequalities describes the situation where the students meet their goal?
 - $3x + 4y \leq 400$
 - $3x + 4y \geq 400$
 - $4x + 3y \leq 400$
 - $4x + 3y \geq 400$

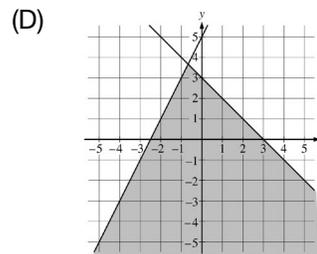
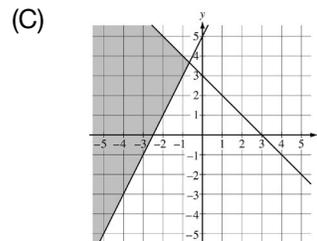
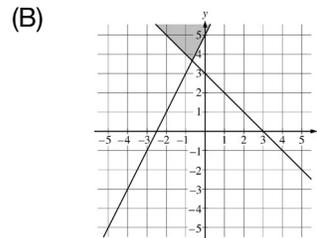
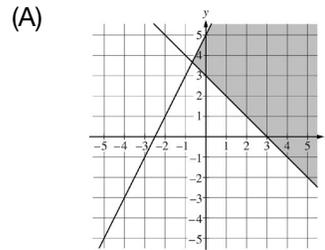
- For the following question, select all the answer choices that apply.

If the quadratic equation $x^2 + kx + 1 = 0$, where k is a real number constant, has no real solutions x , which of the following could be true?

Select all that apply.

- $k = -1$
- $k = 0$
- $k = 1$
- $k = 2$
- $k = 3$

- In which of the following xy -planes does the shaded region represent the solution set to the system of inequalities $y \leq 2x + 5$ and $y \geq -x + 3$?



- The graph of the equation $-6x + 8y = 24$ intersects
 - the x -axis at $(-3, 0)$ and the y -axis at $(0, 4)$
 - the x -axis at $(3, 0)$ and the y -axis at $(0, -4)$
 - the x -axis at $(-4, 0)$ and the y -axis at $(0, 3)$
 - the x -axis at $(4, 0)$ and the y -axis at $(0, -3)$

6. For the following question, enter your answer in the answer box.

$$f(x) = 0.2x + 34.5$$

The function above models the top speed f , in miles per hour, of various roller coasters at certain amusement parks in terms of the roller coaster's largest drop x , in feet. According to the model, if the largest drop for a roller coaster is 170 feet, what is the top speed, in miles per hour, of the roller coaster?

miles per hour

7. $d(t) = -4.9t^2 + v_0t + d_0$

The function shown relates the height d , in meters, of a ball thrown upward with an initial velocity v_0 and an initial height d_0 to the time t , in seconds, after it is thrown. What is the maximum height, to the nearest meter, reached by a ball thrown upward at an initial velocity of 20 meters per second from a height of 15 meters?

- (A) 20
(B) 32
(C) 35
(D) 76

Hours	Population
0	100
1	250
2	625

8. A biologist is studying the growth rate of bacteria in a sample. The table above shows the number of bacteria at 1-hour intervals. The biologist determines that a recursive sequence model of the population is $p_0 = 100$ and $p_n = 2.5p_{n-1}$ for all integers $n \geq 1$, where p_n is the population after n hours. Which of the following equations is an explicit sequence model of the population of bacteria in the sample?

- (A) $p_n = 150n + 100$
(B) $p_n = 100(2.5)^n$
(C) $p_n = 100(2.5n)$
(D) $p_n = 2.5(100)^n$

$$f(x) = 3x + 7, \quad g(x) = \frac{1}{3x + 7}, \quad h(x) = \frac{x}{3} - 7, \quad k(x) = \frac{x - 7}{3}$$

9. Functions f , g , h , and k are defined as shown for all real numbers x . Which of the following is the inverse function of function f ?
- (A) f
(B) g
(C) h
(D) k

10. For the following question, select **all** the answer choices that apply.

Which of the following situations can be modeled with a linear function?

Select **all** that apply.

- (A) The amount of money in a savings account at the end of each year in terms of the number of years after 2016, when the amount of money in the account at the end of each year increases by 3 percent
- (B) The number of books in a library at the end of each month in terms of the number of months after January 2016, when the number of books in the library increases by 30 every month
- (C) The total charged by a mechanic in terms of the number of hours worked, when the mechanic charges a starting fee of \$50 plus \$90 for each hour worked

11. Which of the following is equivalent to

$$\frac{(\sqrt{x})(x^3)}{\left(x^{-\frac{3}{2}}\right)(x^{-2})}$$
 for all positive numbers x ?

- (A) 1
- (B) x^3
- (C) x^5
- (D) x^7

12. For the following question, select **all** the answer choices that apply.

Which of the following are irrational numbers?

Select **all** that apply.

- (A) $(3-\sqrt{2})+(5+\sqrt{2})$
- (B) $\frac{\pi}{2} + \left(\frac{-\pi}{2}\right)$
- (C) $e^2 + \frac{2}{3}$
- (D) $\frac{4}{5} + (2+\sqrt{9})$
- (E) $(8-\sqrt{7}) + \frac{7}{8}$

13. A distance of $1\frac{1}{3}$ inches on a city map represents an actual distance of $1\frac{3}{5}$ miles.

What is the actual distance, in miles, represented by a distance of 1 inch on the map?

- (A) $1\frac{1}{8}$
- (B) $1\frac{1}{6}$
- (C) $1\frac{1}{5}$
- (D) $1\frac{1}{4}$

14. Ms. Butler surveyed her class of students to see how many minutes they studied the night before a quiz. She created a scatterplot of the data, plotting the minutes each student studied on the x -axis and the students' grades on the quiz on the y -axis. The teacher found that the correlation coefficient between the two variables is 0.85. Which of the following is a correct interpretation of the correlation coefficient?
- (A) There is evidence that 85% of the students who studied for the quiz passed the quiz.
 - (B) There is evidence that for every minute a student studied for the quiz, the student's grade on the quiz increased by 0.85 points.
 - (C) There is evidence of a strong positive linear relationship between grades on the quiz and the time studied the night before.
 - (D) There is evidence that a high grade on a quiz is caused by an increase in the time studied for the quiz the night before.
15. A company party is attended by 16 male and 9 female employees. Two door prizes are to be awarded by 2 random selections from those in attendance. No one can win both prizes. What is the probability that both winners will be females?
- (A) $\frac{2}{5}$
 - (B) $\frac{3}{25}$
 - (C) $\frac{8}{125}$
 - (D) $\frac{81}{625}$

Answers to Sample Questions

1. The correct answer is (B).

$$\begin{aligned} 2x^2 + 5x - 3 &= 2x^2 + 6x - x - 3 \\ &= 2x(x + 3) - (x + 3) \\ &= (2x - 1)(x + 3) \end{aligned}$$

Alternative solution: The correct answer is (B). Consider each choice.

(A) $(2x - 3)(x + 1) = 2x^2 + 2x - 3x - 3 = 2x^2 - x - 3$

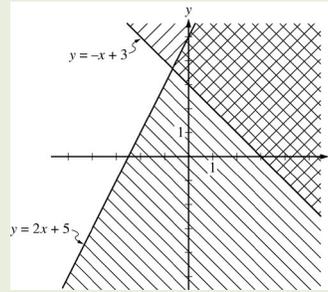
(B) $(2x - 1)(x + 3) = 2x^2 + 6x - x - 3 = 2x^2 + 5x - 3$

(C) $(2x + 1)(x - 3) = 2x^2 - 6x + x - 3 = 2x^2 - 5x - 3$

(D) $(2x + 3)(x - 1) = 2x^2 - 2x + 3x - 3 = 2x^2 + x - 3$

2. The correct answer is (B). The revenue from the sale of chocolate bars is 3 dollars times the number of chocolate bars sold (which is x), or $3x$ dollars. The revenue from the sale of popcorn is 4 dollars times the number of cups of popcorn sold (which is y), or $4y$ dollars. So, the total revenue is $3x + 4y$ dollars. Since the students must sell enough chocolate bars and cups of popcorn to make the total revenue at least 400 dollars, it follows that $3x + 4y \geq 400$.

3. The correct answers are (A), (B), and (C). A general quadratic equation $ax^2 + bx + c = 0$, where $a \neq 0$ and a , b , and c are real number constants, has no real solutions if and only if the discriminant $b^2 - 4ac$ is negative. The discriminant of the quadratic polynomial $x^2 + kx + 1$ is $k^2 - 4(1)(1)$, or $k^2 - 4$. So, $k^2 - 4 < 0$, which is equivalent to $-2 < k < 2$. The only values of k in the choices that satisfy the inequalities $-2 < k < 2$ are -1 , 0 , and 1 .



4. The correct answer is (A). The solution set of inequality $y \leq 2x + 5$ consists of all the points in the xy -plane that are on or below the line $y = 2x + 5$. The solution set of inequality $y \geq -x + 3$ consists of all the points in the xy -plane that are on or above the line $y = -x + 3$. So, the solution set of the system of inequalities $y \leq 2x + 5$ and $y \geq -x + 3$ consists of all the points in the xy -plane that are on or below the graph of $y = 2x + 5$ **and** on or above the graph of $y = -x + 3$ (see the cross-hatched area in the figure above).

5. The correct answer is (C). To find the x -coordinate of the point where the line with equation $-6x + 8y = 24$ intersects the x -axis, set $y = 0$ in the equation $-6x + 8y = 24$ and solve for x .

$$\begin{aligned} -6x + 8y &= 24 \\ -6x + 8(0) &= 24 \\ -6x &= 24 \\ x &= -4 \end{aligned}$$

To find the y -coordinate of the point where the line with equation $-6x + 8y = 24$ intersects the y -axis, set $x = 0$ in the equation $-6x + 8y = 24$ and solve for y .

$$\begin{aligned} -6x + 8y &= 24 \\ -6(0) + 8y &= 24 \\ 8y &= 24 \\ y &= 3 \end{aligned}$$

First alternative solution: The correct answer is (C). The slope-intercept form of the equation $-6x + 8y = 24$ is $y = \frac{3}{4}x + 3$, where the slope is $\frac{3}{4}$ and the y -intercept is

3. Only choice (C) contains the correct y -intercept value.

Second alternative solution: The correct answer is (C). You can plug the coordinates of the points given in the choices to see which points satisfy the equation. Only choice (C) contains two points that satisfy the equation.

6. The correct answer is 68.5 miles per hour. The function $f(x) = 0.2x + 34.5$ models the top speed of a roller coaster, in miles per hour, where x is the largest drop, in feet. So, if the largest drop is 170 feet, the top speed would be $f(170)$, which equals $0.2(170) + 34.5$, or 68.5 miles per hour.

7. The correct answer is (C). Recall that the vertex of the parabola with equation $y = ax^2 + bx + c$ has x -coordinate $-\frac{b}{2a}$. Since the ball is thrown upward

with an initial velocity of 20 meters per second from a height of 15 meters, the height of the ball at time t seconds is $d(t) = -4.9t^2 + 20t + 15$. The maximum

height is obtained when $t = -\frac{20}{2(-4.9)}$, or

approximately $t = 2.04$. Since $d(2.04) = 35.40816$, the

maximum height is approximately 35.4 meters.

Alternative solution: The correct answer is (C). Recall that when the equation of a parabola in the xy -plane is written in the standard form $y = a(x-h)^2 + k$ the coordinates of the vertex of the parabola are (h, k) . To find the maximum height, use the completing-the-square method to write $d(t) = -4.9t^2 + 20t + 15$ in the form $d(t) = a(t-h)^2 + k$, as shown below.

$$\begin{aligned} d(t) &= -4.9t^2 + 20t + 15 \\ &= -4.9\left(t^2 - 2 \cdot \frac{10}{4.9} \cdot t\right) + 15 \\ &= -4.9\left(t^2 - 2 \cdot \frac{10}{4.9} \cdot t + \left(\frac{10}{4.9}\right)^2\right) + 15 + 4.9\left(\frac{10}{4.9}\right)^2 \\ &= -4.9\left(t - \frac{10}{4.9}\right)^2 + 15 + \frac{100}{4.9} \end{aligned}$$

The graph of the function d is a parabola that opens downward and that has a vertex at the point with

coordinates $(h, k) = \left(\frac{10}{4.9}, 15 + \frac{100}{4.9}\right)$. So, the maximum

height is reached at time $t = h = \frac{10}{4.9}$ seconds, or

approximately $t = 2.04$. The maximum height is

$d\left(\frac{10}{4.9}\right) = k = 15 + \frac{100}{4.9}$ meters, or approximately 35.4

meters.

8. The correct answer is (B).

$$\begin{aligned} p_0 &= 100 = 100(2.5)^0 \\ p_1 &= 2.5p_0 = 2.5 \times 100(2.5)^0 = 100(2.5)^1 \\ p_2 &= 2.5p_1 = 2.5 \times 100(2.5)^1 = 100(2.5)^2 \\ p_3 &= 2.5p_2 = 2.5 \times 100(2.5)^2 = 100(2.5)^3 \\ p_4 &= 2.5p_3 = 2.5 \times 100(2.5)^3 = 100(2.5)^4 \\ &\vdots \end{aligned}$$

So, in general, the population after n hours is

$$p_n = 100(2.5)^n.$$

9. The correct answer is (D). Recall that if (a, b) is contained in the graph of a function, then (b, a) is contained in the graph of the inverse function. Therefore, to find the inverse function of function f is to replace x with y and y with x , which gives you $x = 3y + 7$, and then to solve the new equation for y , as shown below.

$$\begin{aligned} x &= 3y + 7 \\ 3y &= x - 7 \\ y &= \frac{x - 7}{3} \end{aligned}$$

Therefore, $y = \frac{x - 7}{3}$ is the inverse function of

$$y = 3x + 7.$$

10. The correct answers are (B) and (C). Consider each choice.

Choice (A): The amount of money in the savings account increases each year by 3 percent, so the actual increase each year is not the same dollar amount. For example, if the balance in the account in 2016 was \$10,000, the balance in 1 year would increase by $(0.03)(\$10,000)$, or \$300, and the increase a year later would be $(0.03)(\$10,300)$, or \$309. So, this situation cannot be modeled with a linear function.

Choice (B): The number of books in the library increases by 30 each month. If, for example, the initial number of books on January 2016 was n , and if y is the number of books after x months, then $y = 30x + n$, which is a linear function.

Choice (C): The total amount the mechanic charges increases by \$90 for each hour worked, after an initial fee of \$50. So, if y equals the mechanic's total charge, in dollars, for x hours of work, then $y = 90x + 50$, which is a linear function.

11. The correct answer is (D).

$$\begin{aligned} \frac{(\sqrt{x})(x^3)}{\left(x^{-\frac{3}{2}}\right)(x^{-2})} &= \frac{x^{\frac{1}{2}+3}}{x^{-\frac{3}{2}-2}} \\ &= \frac{x^{\frac{7}{2}}}{x^{-\frac{7}{2}}} \\ &= x^{\frac{7}{2}} \times x^{\frac{7}{2}} \\ &= x^{\frac{7}{2}+\frac{7}{2}} \\ &= x^7 \end{aligned}$$

12. The correct answers are (C) and (E). Consider each choice.

Choice (A): $(3 - \sqrt{2}) + (5 + \sqrt{2}) = 3 - \sqrt{2} + 5 + \sqrt{2} = 8$,

which is a rational number.

Choice (B): $\frac{\pi}{2} + \frac{-\pi}{2} = \frac{\pi - \pi}{2} = \frac{0}{2} = 0$, which is a rational number.

Choice (C): $e^2 + \frac{2}{3}$, which is the sum of an irrational number and a rational number; therefore, the sum is an irrational number.

Choice (D): $\frac{4}{5} + (2 + \sqrt{9}) = \frac{4}{5} + (2 + 3) = \frac{4}{5} + 5 = 5.8$, which is a rational number.

Choice (E): $(8 - \sqrt{7}) + \frac{7}{8} = \left(8 + \frac{7}{8}\right) - \sqrt{7} = 8.875 - \sqrt{7}$,

which is the difference between a rational number and an irrational number; therefore, the difference is an irrational number.

13. The correct answer is (C). The ratio between the distance, in inches, on the map and the actual distance,

in miles, is $\frac{1\frac{1}{3}}{1\frac{3}{5}}$, which equals $\frac{\frac{4}{3}}{\frac{8}{5}} = \frac{4}{3} \times \frac{5}{8} = \frac{20}{24} = \frac{5}{6}$. So,

every 5 inches on the map corresponds to 6 actual miles, which means that 1 inch on the map corresponds to $6 \div 5$, or $1\frac{1}{5}$, actual miles.

Alternative solution: Create a proportion relating miles to inches, as shown below, and then solve for x .

$$\frac{x \text{ miles}}{1 \text{ inch}} = \frac{1\frac{3}{5} \text{ miles}}{1\frac{1}{3} \text{ inches}}$$

14. The correct answer is (C). It is given that the correlation between number of minutes of study and grades on a quiz is 0.85. There is no evidence that 85% of the students who studied for the quiz passed it. Since we do not actually have the linear regression line to analyze, we do not know what increase in a student's grade corresponds to the number of minutes of study time. And a correlation between any two variables does **not** in itself indicate that one variable **causes** change in the other, or vice versa. However, the correlation of 0.85 does indicate a strong positive linear relationship between grades on the quiz and the amount of time studying for the quiz.

15. The correct answer is (B). There are 16 male and 9 female employees at the party. Two random selections are to be made from those in attendance. The probability that the first selection will be a female is

$$\frac{9}{16+9}, \text{ or } \frac{9}{25}.$$

And since no one can win both prizes, the probability that the second drawing will be a female is 8, the number of females who were not chosen on the first selection, divided by 24, the number of attendees who were not chosen on the first selection. So, the probability that both prizes will be

won by females is $\left(\frac{9}{25}\right)\left(\frac{8}{24}\right)$, or $\frac{3}{25}$.

Alternative solution: The probability is the number of combinations of 2 females chosen from 9 females divided by the number of combinations of 2 people chosen from 25 people. The number of combinations of 2 females chosen from 9 females is "9 choose 2," or

$$\binom{9}{2} = \frac{9 \cdot 8}{2} = 36.$$

The number of combinations of 2 people chosen from 25 people is "25

choose 2," or equivalently $\binom{25}{2} = \frac{25 \cdot 24}{2} = 300$. So, the

$$\text{probability is } \frac{\binom{9}{2}}{\binom{25}{2}} = \frac{36}{300} = \frac{3}{25}.$$

4. Determine Your Strategy for Success

Set clear goals and deadlines so your test preparation is focused and efficient

Effective *Praxis* test preparation doesn't just happen. You'll want to set clear goals and deadlines for yourself along the way. Otherwise, you may not feel ready and confident on test day.

1) Learn what the test covers.

You may have heard that there are several different versions of the same test. It's true. You may take one version of the test and your friend may take a different version a few months later. Each test has different questions covering the same subject area, but both versions of the test measure the same skills and content knowledge.

You'll find specific information on the test you're taking on page 5, which outlines the content categories that the test measures and what percentage of the test covers each topic. Visit www.ets.org/praxis/testprep for information on other *Praxis* tests.

2) Assess how well you know the content.

Research shows that test takers tend to overestimate their preparedness—this is why some test takers assume they did well and then find out they did not pass.

The *Praxis* tests are demanding enough to require serious review of likely content, and the longer you've been away from the content, the more preparation you will most likely need. If it has been longer than a few months since you've studied your content area, make a concerted effort to prepare.

3) Collect study materials.

Gathering and organizing your materials for review are critical steps in preparing for the *Praxis* tests. Consider the following reference sources as you plan your study:

- Did you take a course in which the content area was covered? If yes, do you still have your books or your notes?
- Does your local library have a high school-level textbook in this area? Does your college library have a good introductory college-level textbook in this area?

Practice materials are available for purchase for many *Praxis* tests at www.ets.org/praxis/testprep. Test preparation materials include sample questions and answers with explanations.

4) Plan and organize your time.

You can begin to plan and organize your time while you are still collecting materials. Allow yourself plenty of review time to avoid cramming new material at the end. Here are a few tips:

- Choose a test date far enough in the future to leave you plenty of preparation time. Test dates can be found at www.ets.org/praxis/register/dates_centers.
- Work backward from that date to figure out how much time you will need for review.
- Set a realistic schedule—and stick to it.

5) Practice explaining the key concepts.

Praxis tests with constructed-response questions assess your ability to explain material effectively. As a teacher, you'll need to be able to explain concepts and processes to students in a clear, understandable way. What are the major concepts you will be required to teach? Can you explain them in your own words accurately, completely, and clearly? Practice explaining these concepts to test your ability to effectively explain what you know.

6) Understand how questions will be scored.

Scoring information can be found on page 37.

7) Develop a study plan.

A study plan provides a road map to prepare for the *Praxis* tests. It can help you understand what skills and knowledge are covered on the test and where to focus your attention. Use the study plan template on page 26 to organize your efforts.

And most important—get started!

Would a Study Group Work for You?

Using this guide as part of a study group

People who have a lot of studying to do sometimes find it helpful to form a study group with others who are working toward the same goal. Study groups give members opportunities to ask questions and get detailed answers. In a group, some members usually have a better understanding of certain topics, while others in the group may be better at other topics. As members take turns explaining concepts to one another, everyone builds self-confidence.

If the group encounters a question that none of the members can answer well, the group can go to a teacher or other expert and get answers efficiently. Because study groups schedule regular meetings, members study in a more disciplined fashion. They also gain emotional support. The group should be large enough so that multiple people can contribute different kinds of knowledge, but small enough so that it stays focused. Often, three to six members is a good size.

Here are some ways to use this guide as part of a study group:

- **Plan the group's study program.** Parts of the study plan template, beginning on page 26 can help to structure your group's study program. By filling out the first five columns and sharing the worksheets, everyone will learn more about your group's mix of abilities and about the resources, such as textbooks, that members can share with the group. In the sixth column ("Dates I will study the content"), you can create an overall schedule for your group's study program.
- **Plan individual group sessions.** At the end of each session, the group should decide what specific topics will be covered at the next meeting and who will present each topic. Use the topic headings and subheadings in the Test at a Glance table on page 5 to select topics, and then select practice questions, beginning on page 13.
- **Prepare your presentation for the group.** When it's your turn to present, prepare something that is more than a lecture. Write two or three original questions to pose to the group. Practicing writing actual questions can help you better understand the topics covered on the test as well as the types of questions you will encounter on the test. It will also give other members of the group extra practice at answering questions.

- **Take a practice test together.** The idea of a practice test is to simulate an actual administration of the test, so scheduling a test session with the group will add to the realism and may also help boost everyone's confidence. Remember, complete the practice test using only the time that will be allotted for that test on your administration day.
- **Learn from the results of the practice test.** Review the results of the practice test, including the number of questions answered correctly in each content category. For tests that contain constructed-response questions, look at the Sample Test Questions section, which also contain sample responses to those questions and shows how they were scored. Then try to follow the same guidelines that the test scorers use.
- **Be as critical as you can.** You're not doing your study partner(s) any favors by letting them get away with an answer that does not cover all parts of the question adequately.
- **Be specific.** Write comments that are as detailed as the comments about the sample responses. Indicate where and how your study partner(s) are doing an inadequate job of answering the question. Writing notes in the margins of the answer sheet may also help.
- **Be supportive.** Include comments that point out what your study partner(s) got right.

Then plan one or more study sessions based on aspects of the questions on which group members performed poorly. For example, each group member might be responsible for rewriting one paragraph of a response in which someone else did an inadequate job.

Whether you decide to study alone or with a group, remember that the best way to prepare is to have an organized plan. The plan should set goals based on specific topics and skills that you need to learn, and it should commit you to a realistic set of deadlines for meeting those goals. Then you need to discipline yourself to stick with your plan and accomplish your goals on schedule.

5. Develop Your Study Plan

Develop a personalized study plan and schedule

Planning your study time is important because it will help ensure that you review all content areas covered on the test. Use the sample study plan below as a guide. It shows a plan for the *Core Academic Skills for Educators: Reading* test. Following that is a study plan template that you can fill out to create your own plan. Use the “Learn about Your Test” and “Test Specifications” information beginning on page 5 to help complete it.

Use this worksheet to:

- 1. Define Content Areas:** List the most important content areas for your test as defined in chapter 1.
- 2. Determine Strengths and Weaknesses:** Identify your strengths and weaknesses in each content area.
- 3. Identify Resources:** Identify the books, courses, and other resources you plan to use for each content area.
- 4. Study:** Create and commit to a schedule that provides for regular study periods.

Praxis Test Name (Test Code): Core Academic Skills for Educators: Reading (5712)

Test Date: 9/15/18

Content covered	Description of content	How well do I know the content? (scale 1–5)	What resources do I have/need for the content?	Where can I find the resources I need?	Dates I will study the content	Date completed
Key Ideas and Details						
Close reading	Draw inferences and implications from the directly stated content of a reading selection	3	Middle school English text book	College library, middle school teacher	7/15/18	7/15/18
Determining Ideas	Identify summaries or paraphrases of the main idea or primary purpose of a reading selection	3	Middle school English text book	College library, middle school teacher	7/17/18	7/17/18
Determining Ideas	Identify summaries or paraphrases of the supporting ideas and specific details in a reading selection	3	Middle and high school English text book	College library, middle and high school teachers	7/20/18	7/21/18
Craft, Structure, and Language Skills						
Interpreting tone	Determine the author's attitude toward material discussed in a reading selection	4	Middle and high school English text book	College library, middle and high school teachers	7/25/18	7/26/18
Analysis of structure	Identify key transition words and phrases in a reading selection and how they are used	3	Middle and high school English text book, dictionary	College library, middle and high school teachers	7/25/18	7/27/18
Analysis of structure	Identify how a reading selection is organized in terms of cause/effect, compare/contrast, problem/solution, etc.	5	High school text book, college course notes	College library, course notes, high school teacher, college professor	8/1/18	8/1/18
Author's purpose	Determine the role that an idea, reference, or piece of information plays in an author's discussion or argument	5	High school text book, college course notes	College library, course notes, high school teacher, college professor	8/1/18	8/1/18

(continued on next page)

Content covered	Description of content	How well do I know the content? (scale 1–5)	What resources do I have/need for the content?	Where can I find the resources I need?	Dates I will study the content	Date completed
Language in different contexts	Determine whether information presented in a reading selection is presented as fact or opinion	4	High school text book, college course notes	College library, course notes, high school teacher, college professor	8/1/18	8/1/18
Contextual meaning	Identify the meanings of words as they are used in the context of a reading selection	2	High school text book, college course notes	College library, course notes, high school teacher, college professor	8/1/18	8/1/18
Figurative Language	Understand figurative language and nuances in word meanings	2	High school text book, college course notes	College library, course notes, high school teacher, college professor	8/8/18	8/8/18
Vocabulary range	Understand a range of words and phrases sufficient for reading at the college and career readiness level	2	High school text book, college course notes	College library, course notes, high school teacher, college professor	8/15/18	8/17/18
Integration of Knowledge and Ideas						
Diverse media and formats	Analyze content presented in diverse media and formats, including visually and quantitatively, as well as in words	2	High school text book, college course notes	College library, course notes, high school teacher, college professor	8/22/18	8/24/18
Evaluation of arguments	Identify the relationship among ideas presented in a reading selection	4	High school text book, college course notes	College library, course notes, high school teacher, college professor	8/24/18	8/24/18
Evaluation of arguments	Determine whether evidence strengthens, weakens, or is relevant to the arguments in a reading selection	3	High school text book, college course notes	College library, course notes, high school teacher, college professor	8/27/18	8/27/18
Evaluation of arguments	Determine the logical assumptions upon which an argument or conclusion is based	5	High school text book, college course notes	College library, course notes, high school teacher, college professor	8/28/18	8/30/18
Evaluation of arguments	Draw conclusions from material presented in a reading selection	5	High school text book, college course notes	College library, course notes, high school teacher, college professor	8/30/18	8/31/18
Comparison of texts	Recognize or predict ideas or situations that are extensions of or similar to what has been presented in a reading selection	4	High school text book, college course notes	College library, course notes, high school teacher, college professor	9/3/18	9/4/18
Comparison of texts	Apply ideas presented in a reading selection to other situations	2	High school text book, college course notes	College library, course notes, high school teacher, college professor	9/5/18	9/6/18

6. Study Topics

Explore in detail the content that this test covers

Introduction

The Algebra I test is designed to measure the knowledge and skills necessary for a beginning teacher.

This chapter is intended to help you organize your preparation for the test and to give you a clear indication of the depth and breadth of the knowledge required for success on the test.

Virtually all accredited programs address the topics covered by the test; however, you are not expected to be an expert on all aspects of the topics that follow.

You are likely to find that the topics below are covered by most introductory textbooks. Consult materials and resources, including lecture and laboratory notes, from all your coursework. You should be able to match up specific topics and subtopics with what you have covered in your courses.

Try not to be overwhelmed by the volume and scope of content knowledge in this guide. Although a specific term may not seem familiar as you see it here, you might find you can understand it when applied to a real-life situation. Many of the items on the actual test will provide you with a context to apply to these topics or terms.

Discussion Areas

Interspersed throughout the study topics are discussion areas, presented as open-ended questions or statements. These discussion areas are intended to help test your knowledge of fundamental concepts and your ability to apply those concepts to situations in the classroom or the real world. Most of the areas require you to combine several pieces of knowledge to formulate an integrated understanding and response. If you spend time on these areas, you will gain increased understanding and facility with the subject matter covered on the test. You may want to discuss these areas and your answers with a teacher or mentor.

Note that this study companion *does not provide answers for the discussion area questions*, but thinking about the answers to them will help improve your understanding of fundamental concepts and will probably help you answer a broad range of questions on the test.

Study Topics

I. Principles of Algebra

- A. Understands how to write algebraic expressions in equivalent forms
- B. Understands how to perform arithmetic operations on polynomials
- C. Understands how to create equations and inequalities that describe relationships
- D. Understands how to justify the reasoning process used to solve equations
- E. Understands how varied techniques (e.g., graphical, algebraic) are used to solve equations and inequalities
- F. Understands how varied techniques (e.g., graphical, algebraic) are used to solve systems of equations and inequalities
- G. Understands the concept of rate of change of nonlinear functions
- H. Understands the concepts of intercept(s) of a line and slope as a rate of change

Discussion areas: Principles of Algebra

- Can you identify the difference between an equation and an expression?
- Can you use properties of exponents to rewrite exponential expressions?
- Can you rewrite quadratic expressions to find zeros and relative extrema of functions?
- Can you add, subtract, and multiply polynomials?
- Can you factor polynomials?
- Can you recognize, use, and verify polynomial identities?
- Can you use the graph of a quadratic function to identify the types and multiplicities of the zeros of the function?
- Can you find and use zeros to sketch the graph of a function?
- Can you add, subtract, multiply, and divide rational expressions?
- Can you use linear equations or linear inequalities to model real-life problems?
- Can you solve linear equations and linear inequalities algebraically?
- Can you graph the solution of a linear inequality in one variable on the number line and the solution of a linear inequality in two variables on the coordinate plane?
- Can you solve for the variable of interest in a formula?
- Can you identify when extraneous solutions may occur in equations and eliminate those extraneous solutions?
- Can you solve quadratic equations with real solutions and complex solutions?
- Can you solve quadratic equations by factoring or using the quadratic formula?
- Can you use the discriminant to identify the types and multiplicities of the roots of a quadratic equation?
- Can you solve a system consisting of two linear equations in two variables algebraically?
- Can you solve a system consisting of two linear equations in two variables by graphing?
- Can you solve a system consisting of a linear equation and a quadratic equation in two variables algebraically?
- Can you solve a system consisting of a linear equation and a quadratic equation in two variables by graphing?
- Can you graph the solution of a system of inequalities in two variables in the coordinate plane?
- Can you find the intersection(s) of two curves algebraically or using technology?
- Can you calculate the average rate of change for functions?
- Can you calculate and interpret the intercepts and slope of a line?

II. Functions

- A. Understands the function concept and the use of function notation
- B. Understands how function behavior is analyzed using different representations (e.g., graphs, mappings, tables)
- C. Understands how functions and relations are used to model relationships between quantities
- D. Understands how new functions are obtained from existing functions (e.g., transformations, inverses)
- E. Understands differences between linear, quadratic, and exponential models, including how their equations are created and used to solve problems

Discussion areas: Functions

- Can you recognize function notation and understand that for each input, the function produces one and only one output?
- Can you determine whether a relation is a function numerically, algebraically, as a set of ordered pairs, and graphically?
- Can you recognize the domain as the set of valid inputs for a function and the range as the set of resulting outputs, and can you find these for a given function?
- Can you evaluate a function that is given algebraically or graphically?
- Can you find the zeros, extreme values, intervals of increasing or decreasing, and symmetry of a function given a graph, algebraic representation, or verbal description?
- Can you graph linear, quadratic, polynomial, exponential, square root, piecewise, absolute value, and step functions?
- Can you determine whether an exponential function will grow or decay and at what rate?
- Can you determine if a function is even, odd, or neither?
- Can you create a function that models a relationship between two described quantities?
- Can you recognize and define sequences as recursive or explicit functions?
- Can you take one or more functions and create another function using functional operations, function composition, and transformations?
- Can you identify the domain and range of the sum, product, difference, quotient, or composition of two functions?
- Can you find the inverse of a given function?
- Can you determine whether two functions are inverses graphically and analytically?
- Can you determine if two functions, given as sets of ordered pairs, are inverse functions of each other?
- Can you determine the type of function (linear, quadratic, exponential) that best fits a given scenario or situation?
- Can you do problems involving direct, inverse, and other proportional relationships between two or more quantities?

III. Number and Quantity; Probability and Statistics

- A. Understands the properties of radicals and exponents
- B. Understands the properties of rational and irrational numbers
- C. Understands how to reason quantitatively and use units to solve problems
- D. Understands how to summarize, represent, and interpret data collected from measurements on a single variable (e.g., boxplots, dotplots, normal distributions)
- E. Understands how to summarize, represent, and interpret data collected from measurements on two variables, either categorical or quantitative (e.g., scatterplots, time series)
- F. Understands how to create and interpret linear regression models (e.g., rate of change, intercepts, correlation coefficient)
- G. Understands how to compute probabilities of simple and compound events

**Discussion areas: Number and Quantity;
Probability and Statistics**

- Can you use the properties of positive, negative, and rational exponents to simplify and rearrange expressions?
- Can you simplify expressions that contain radicals or rational exponents?
- Can you define and use negative exponents?
- Can you apply the order of operations in arithmetic computations?
- Can you identify and represent very small and very large numbers in scientific notation?
- Can you do calculations involving scientific notation?
- Can you identify the result of arithmetic operations on rational and irrational numbers as either rational or irrational?
- Can you compute or identify a ratio or rate?
- Can you use proportional relationships to compute percents?
- Can you convert between units—for example, converting inches to meters?
- Can you solve problems using units to guide the solution?
- Can you solve measurement problems involving time, length, temperature, volume, and mass?
- Can you recognize the reasonableness of results within the context of a problem?
- Can you create graphs such as histograms, line graphs, bar graphs, dotplots, circle graphs, scatterplots, stem-and-leaf plots, and boxplots from a given set of data?
- Can you understand and interpret simple diagrams of data sets presented in various forms, including tables, charts, histograms, line graphs, bar graphs, dotplots, circle graphs, scatterplots, stem-and-leaf plots, timelines, number lines, and boxplots?
- Can you determine measures of center and spread for single-variable data presented in a variety of formats?
- Can you determine the differences between mean, median, and mode, including advantages and disadvantages of each?
- Can you identify possible effects of outliers on the shape, center, and spread of data sets?
- Can you analyze data presented in scatterplots and use this analysis to predict associations or trends between two variables?
- Can you use functions fitted to data to solve problems?
- Can you construct and interpret two-way frequency tables?
- Can you calculate the correlation coefficient between two variables and discuss the possibility of causation, causation by a third event, and coincidence?
- Can you use the correlation coefficient and explain what various values of that number mean?
- Can you calculate probabilities of compound events and understand the idea of independent events?
- Can you compute the probability of a single outcome occurring, one of multiple outcomes occurring, and an outcome occurring given certain conditions?
- Can you use appropriate counting principles to determine probabilities?

7. Review Smart Tips for Success

Follow test-taking tips developed by experts

Learn from the experts. Take advantage of the following answers to questions you may have and practical tips to help you navigate the *Praxis* test and make the best use of your time.

Should I guess?

Yes. Your score is based on the number of questions you answer correctly, with no penalty or subtraction for an incorrect answer. When you don't know the answer to a question, try to eliminate any obviously wrong answers and then guess at the correct one. Try to pace yourself so that you have enough time to carefully consider every question.

Can I answer the questions in any order?

You can answer the questions in order or skip questions and come back to them later. If you skip a question, you can also mark it so that you can remember to return and answer it later. Remember that questions left unanswered are treated the same as questions answered incorrectly, so it is to your advantage to answer every question.

Are there trick questions on the test?

No. There are no hidden meanings or trick questions. All of the questions on the test ask about subject matter knowledge in a straightforward manner.

Are there answer patterns on the test?

No. You might have heard this myth: the answers on tests follow patterns. Another myth is that there will never be more than two questions in a row with the correct answer in the same position among the choices. Neither myth is true. Select the answer you think is correct based on your knowledge of the subject.

Can I write on the scratch paper I am given?

Yes. You can work out problems on the scratch paper, make notes to yourself, or write anything at all. Your scratch paper will be destroyed after you are finished with it, so use it in any way that is helpful to you. But make sure to select or enter your answers on the computer.

Smart Tips for Taking the Test

- 1. Skip the questions you find extremely difficult.** Rather than trying to answer these on your first pass through the test, you may want to leave them blank and mark them so that you can return to them later. Pay attention to the time as you answer the rest of the questions on the test, and try to finish with 10 or 15 minutes remaining so that you can go back over the questions you left blank. Even if you don't know the answer the second time you read the questions, see if you can narrow down the possible answers, and then guess. Your score is based on the number of right answers, so it is to your advantage to answer every question.

2. **Keep track of the time.** The on-screen clock will tell you how much time you have left. You will probably have plenty of time to answer all of the questions, but if you find yourself becoming bogged down, you might decide to move on and come back to any unanswered questions later.
3. **Read all of the possible answers before selecting one.** For questions that require you to select more than one answer, or to make another kind of selection, consider the most likely answers given what the question is asking. Then reread the question to be sure the answer(s) you have given really answer the question. Remember, a question that contains a phrase such as “Which of the following does NOT . . .” is asking for the one answer that is NOT a correct statement or conclusion.
4. **Check your answers.** If you have extra time left over at the end of the test, look over each question and make sure that you have answered it as you intended. Many test takers make careless mistakes that they could have corrected if they had checked their answers.
5. **Don’t worry about your score when you are taking the test.** No one is expected to answer all of the questions correctly. Your score on this test is not analogous to your score on the *GRE*[®] or other tests. It doesn’t matter on the *Praxis* tests whether you score very high or barely pass. If you meet the minimum passing scores for your state and you meet the state’s other requirements for obtaining a teaching license, you will receive a license. In other words, what matters is meeting the minimum passing score. You can find passing scores for all states that use the *Praxis* tests at <https://www.ets.org/praxis/institutions/scores/passing/> or on the web site of the state for which you are seeking certification/licensure.
6. **Use your energy to take the test, not to get frustrated by it.** Getting frustrated only increases stress and decreases the likelihood that you will do your best. Highly qualified educators and test development professionals, all with backgrounds in teaching, worked diligently to make the test a fair and valid measure of your knowledge and skills. Your state painstakingly reviewed the test before adopting it as a licensure requirement. The best thing to do is concentrate on answering the questions.

8. Check on Testing Accommodations

See if you qualify for accommodations to take the Praxis test

What if English is not my primary language?

Praxis tests are given only in English. If your primary language is not English (PLNE), you may be eligible for extended testing time. For more details, visit www.ets.org/praxis/register/plne_accommodations/.

What if I have a disability or other health-related need?

The following accommodations are available for *Praxis* test takers who meet the Americans with Disabilities Act (ADA) Amendments Act disability requirements:

- Extended testing time
- Additional rest breaks
- Separate testing room
- Writer/recorder of answers
- Test reader
- Sign language interpreter for spoken directions only
- Perkins Braille
- Braille slate and stylus
- Printed copy of spoken directions
- Oral interpreter
- Audio test
- Braille test
- Large print test book
- Large print answer sheet
- Listening section omitted

For more information on these accommodations, visit www.ets.org/praxis/register/disabilities.

Note: Test takers who have health-related needs requiring them to bring equipment, beverages, or snacks into the testing room or to take extra or extended breaks must request these accommodations by following the procedures described in the *Bulletin Supplement for Test Takers with Disabilities or Health-Related Needs* (PDF), which can be found at https://www.ets.org/s/praxis/pdf/bulletin_supplement_test_takers_with_disabilities_health_needs.pdf.

You can find additional information on available resources for test takers with disabilities or health-related needs at www.ets.org/disabilities.

9. Do Your Best on Test Day

Get ready for test day so you will be calm and confident

You followed your study plan. You prepared for the test. Now it's time to prepare for test day.

Plan to end your review a day or two before the actual test date so you avoid cramming. Take a dry run to the test center so you're sure of the route, traffic conditions, and parking. Most of all, you want to eliminate any unexpected factors that could distract you from your ultimate goal—passing the *Praxis* test!

On the day of the test, you should:

- be well rested
- wear comfortable clothes and dress in layers
- eat before you take the test
- bring an acceptable and valid photo identification with you
- bring an approved calculator only if one is specifically permitted for the test you are taking (see Calculator Use, at http://www.ets.org/praxis/test_day/policies/calculators)
- be prepared to stand in line to check in or to wait while other test takers check in

You can't control the testing situation, but you can control yourself. Stay calm. The supervisors are well trained and make every effort to provide uniform testing conditions, but don't let it bother you if the test doesn't start exactly on time. You will have the allotted amount of time once it does start.

You can think of preparing for this test as training for an athletic event. Once you've trained, prepared, and rested, give it everything you've got.

What items am I restricted from bringing into the test center?

You cannot bring into the test center personal items such as:

- handbags, knapsacks, or briefcases
- water bottles or canned or bottled beverages
- study materials, books, or notes
- pens, pencils, scrap paper, or calculators, unless specifically permitted for the test you are taking (see Calculator Use, at http://www.ets.org/praxis/test_day/policies/calculators)
- any electronic, photographic, recording, or listening devices

Personal items are not allowed in the testing room and will not be available to you during the test or during breaks. You may also be asked to empty your pockets. At some centers, you will be assigned a space to store your belongings, such as handbags and study materials. Some centers do not have secure storage space available, so please plan accordingly.

Test centers assume no responsibility for your personal items.

If you have health-related needs requiring you to bring equipment, beverages or snacks into the testing room or to take extra or extended breaks, you need to request accommodations in advance. Procedures for requesting accommodations are described in the [Bulletin Supplement for Test Takers with Disabilities or Health-related Needs \(PDF\)](#).

Note: All cell phones, smart phones (e.g., Android® devices, iPhones®, etc.), and other electronic, photographic, recording, or listening devices are strictly prohibited from the test center. If you are seen with such a device, you will be dismissed from the test, your test scores will be canceled, and you will forfeit your test fees. If you are seen *using* such a device, the device will be confiscated and inspected. For more information on what you can bring to the test center, visit www.ets.org/praxis/test_day/bring.

Are You Ready?

Complete this checklist to determine whether you are ready to take your test.

- Do you know the testing requirements for the license or certification you are seeking in the state(s) where you plan to teach?
- Have you followed all of the test registration procedures?
- Do you know the topics that will be covered in each test you plan to take?
- Have you reviewed any textbooks, class notes, and course readings that relate to the topics covered?
- Do you know how long the test will take and the number of questions it contains?
- Have you considered how you will pace your work?
- Are you familiar with the types of questions for your test?
- Are you familiar with the recommended test-taking strategies?
- Have you practiced by working through the practice questions in this study companion or in a study guide or practice test?
- If constructed-response questions are part of your test, do you understand the scoring criteria for these questions?
- If you are repeating a *Praxis* test, have you analyzed your previous score report to determine areas where additional study and test preparation could be useful?

If you answered “yes” to the questions above, your preparation has paid off. Now take the *Praxis* test, do your best, pass it—and begin your teaching career!

10. Understand Your Scores

Understand how tests are scored and how to interpret your test scores

Of course, passing the *Praxis* test is important to you so you need to understand what your scores mean and what your state requirements are.

What are the score requirements for my state?

States, institutions, and associations that require the tests set their own passing scores. Visit www.ets.org/praxis/states for the most up-to-date information.

If I move to another state, will my new state accept my scores?

The *Praxis* tests are part of a national testing program, meaning that they are required in many states for licensure. The advantage of a national program is that if you move to another state that also requires *Praxis* tests, you can transfer your scores. Each state has specific test requirements and passing scores, which you can find at www.ets.org/praxis/states.

How do I know whether I passed the test?

Your score report will include information on passing scores for the states you identified as recipients of your test results. If you test in a state with automatic score reporting, you will also receive passing score information for that state.

A list of states and their passing scores for each test are available online at www.ets.org/praxis/states.

What your *Praxis* scores mean

You received your score report. Now what does it mean? It's important to interpret your score report correctly and to know what to do if you have questions about your scores.

Visit http://www.ets.org/s/praxis/pdf/sample_score_report.pdf to see a sample score report.

To access *Understanding Your Praxis Scores*, a document that provides additional information on how to read your score report, visit www.ets.org/praxis/scores/understand.

Put your scores in perspective

Your score report indicates:

- Your score and whether you passed
- The range of possible scores
- The raw points available in each content category
- The range of the middle 50 percent of scores on the test

If you have taken the same *Praxis* test or other *Praxis* tests in the last 10 years, your score report also lists the highest score you earned on each test taken.

Content category scores and score interpretation

Questions on the *Praxis* tests are categorized by content. To help you in future study or in preparing to retake the test, your score report shows how many raw points you earned in each content category. Compare your “raw points earned” with the maximum points you could have earned (“raw points available”). The greater the difference, the greater the opportunity to improve your score by further study.

Score scale changes

ETS updates *Praxis* tests on a regular basis to ensure they accurately measure the knowledge and skills that are required for licensure. When tests are updated, the meaning of the score scale may change, so requirements may vary between the new and previous versions. All scores for previous, discontinued tests are valid and reportable for 10 years, provided that your state or licensing agency still accepts them.

These resources may also help you interpret your scores:

- *Understanding Your Praxis Scores* (PDF), found at www.ets.org/praxis/scores/understand
- *Praxis Passing Scores*, found at <https://www.ets.org/praxis/institutions/scores/passing/>
- State requirements, found at www.ets.org/praxis/states

Appendix: Other Questions You May Have

Here is some supplemental information that can give you a better understanding of the *Praxis* tests.

What do the *Praxis* tests measure?

The *Praxis* tests measure the specific knowledge and skills that beginning teachers need. The tests do not measure an individual's disposition toward teaching or potential for success, nor do they measure your actual teaching ability. The assessments are designed to be comprehensive and inclusive but are limited to what can be covered in a finite number of questions and question types. Teaching requires many complex skills that are typically measured in other ways, including classroom observation, video recordings, and portfolios.

Ranging from Agriculture to World Languages, there are more than 80 *Praxis* tests, which contain selected-response questions or constructed-response questions, or a combination of both.

Who takes the tests and why?

Some colleges and universities use the *Praxis* Core Academic Skills for Educators tests (Reading, Writing, and Mathematics) to evaluate individuals for entry into teacher education programs. The assessments are generally taken early in your college career. Many states also require Core Academic Skills test scores as part of their teacher licensing process.

Individuals entering the teaching profession take the *Praxis* content and pedagogy tests as part of the teacher licensing and certification process required by many states. In addition, some professional associations and organizations require *Praxis* Subject Assessments for professional licensing.

Do all states require these tests?

The *Praxis* tests are currently required for teacher licensure in approximately 40 states and United States territories. These tests are also used by several professional licensing agencies and by several hundred colleges and universities. Teacher candidates can test in one state and submit their scores in any other state that requires *Praxis* testing for licensure. You can find details at www.ets.org/praxis/states.

What is licensure/certification?

Licensure in any area—medicine, law, architecture, accounting, cosmetology—is an assurance to the public that the person holding the license possesses sufficient knowledge and skills to perform important occupational activities safely and effectively. In the case of teacher licensing, a license tells the public that the individual has met predefined competency standards for beginning teaching practice.

Because a license makes such a serious claim about its holder, licensure tests are usually quite demanding. In some fields, licensure tests have more than one part and last for more than one day. Candidates for licensure in all fields plan intensive study as part of their professional preparation. Some join study groups, others study alone. But preparing to take a licensure test is, in all cases, a professional activity. Because a licensure exam surveys a broad body of knowledge, preparing for a licensure exam takes planning, discipline, and sustained effort.

Why does my state require the *Praxis* tests?

Your state chose the *Praxis* tests because they assess the breadth and depth of content—called the “domain”—that your state wants its teachers to possess before they begin to teach. The level of content knowledge, reflected in the passing score, is based on recommendations of panels of teachers and teacher educators in

each subject area. The state licensing agency and, in some states, the state legislature ratify the passing scores that have been recommended by panels of teachers.

How were the tests developed?

ETS consulted with practicing teachers and teacher educators around the country during every step of the *Praxis* test development process. First, ETS asked them what knowledge and skills a beginning teacher needs to be effective. Their responses were then ranked in order of importance and reviewed by hundreds of teachers.

After the results were analyzed and consensus was reached, guidelines, or specifications, for the selected-response and constructed-response tests were developed by teachers and teacher educators. Following these guidelines, teachers and professional test developers created test questions that met content requirements and [*ETS Standards for Quality and Fairness*](#).*

When your state adopted the research-based *Praxis* tests, local panels of teachers and teacher educators evaluated each question for its relevance to beginning teachers in your state. During this “validity study,” the panel also provided a passing-score recommendation based on how many of the test questions a beginning teacher in your state would be able to answer correctly. Your state’s licensing agency determined the final passing-score requirement.

ETS follows well-established industry procedures and standards designed to ensure that the tests measure what they are intended to measure. When you pass the *Praxis* tests your state requires, you are proving that you have the knowledge and skills you need to begin your teaching career.

How are the tests updated to ensure the content remains current?

Praxis tests are reviewed regularly. During the first phase of review, ETS conducts an analysis of relevant state and association standards and of the current test content. State licensure titles and the results of relevant job analyses are also considered. Revised test questions are then produced following the standard test development methodology. National advisory committees may also be convened to review and revise existing test specifications and to evaluate test forms for alignment with the specifications.

How long will it take to receive my scores?

Scores for tests that do not include constructed-response questions are available on screen immediately after the test. Scores for tests that contain constructed-response questions or essays aren’t available immediately after the test because of the scoring process involved. Official score reports are available to you and your designated score recipients approximately two to three weeks after the test date for tests delivered continuously, or two to three weeks after the testing window closes for other tests. See the test dates and deadlines calendar at www.ets.org/praxis/register/dates_centers for exact score reporting dates.

Can I access my scores on the web?

All test takers can access their test scores via My *Praxis* Account free of charge for one year from the posting date. This online access replaces the mailing of a paper score report.

The process is easy—simply log into My *Praxis* Account at www.ets.org/praxis and click on your score report. If you do not already have a *Praxis* account, you must create one to view your scores.

Note: You must create a *Praxis* account to access your scores, even if you registered by mail or phone.

*[*ETS Standards for Quality and Fairness*](#) (2014, Princeton, N.J.) are consistent with the [*Standards for Educational and Psychological Testing*](#), industry standards issued jointly by the American Educational Research Association, the American Psychological Association, and the National Council on Measurement in Education (2014, Washington, D.C.).

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Let the Praxis® Study Companion guide you.

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