South Carolina
End-of-Course Examination
Program

Teacher's Guide
and
Sample Items

Algebra 1

Issued by the

Office of Assessment
South Carolina Department of Education

Introduction

This Teacher's Guide with Sample Items has been developed to provide educators with sample questions to help prepare students for the examination and to provide important links to information about the End Of Course Examination Program (EOCEP).

Sample Items

The EOCEP for Algebra 1 is untimed and is composed of fifty test items. The Algebra 1 course standards—and therefore the examination questions—are divided into four conceptual categories: Algebra, Functions, Number and Quantity, and Statistics and Probability. Questions on the EOCEP for Algebra 1 may be multiple-choice or technology-enhanced. A test blueprint for the Algebra 1 EOCEP is available on the State Department Website as a separate document.

The items included in this guide similar to those students are likely to encounter on the EOCEP for Algebra 1. Practice with these items may be beneficial to students in preparation for the EOCEP in Algebra 1. While these sample items may be used for practice, the actual items have not been field tested and have no existing statistical values. For this reason, The Office of Assessment at the South Carolina Department of Education strongly advises against using these sample items in an attempt to "predict" how students will do on the summative assessment.

Online Tools Training (OTT)

In addition to multiple-choice items, the online version of the EOCEP for Algebra 1 contains technology-enhanced items. Teachers are encouraged to provide students with multiple opportunities to access the online tools training (OTT) located on the Insight portal for the South Carolina Online Assessments. The OTT will allow students to practice navigating representative online item types prior to testing. The OTT is accessible at the following link: https://wbte.drcedirect.com/SC/portals/sc

Links

Please visit the following links for the most up-to-date information on the following topics:

- End-of-Course Examination Program (EOCEP): http://ed.sc.gov/tests/high/eocep/
    - Here you can find more content specific information if you scroll down the page.
- EOCEP Accommodations: http://ed.sc.gov/tests/assessment-information/testing-swd/accommodations-and-customized-forms/
    - Here you can find information on accommodations.
- Office of Standards and Learning: http://ed.sc.gov/instruction/standards-learning/
    - Here you can find standards, support documents, and suggested resources.
- Online Tools Training: https://wbte.drcedirect.com/SC/portals/sc
    - Here students may practice technology enhanced items.

Part 1: Sample Test Questions

SAMPLE QUESTION 1

SCCCR-M Standard:

A1.FIF.1* Extend previous knowledge of a function to apply to general behavior and features of a function.

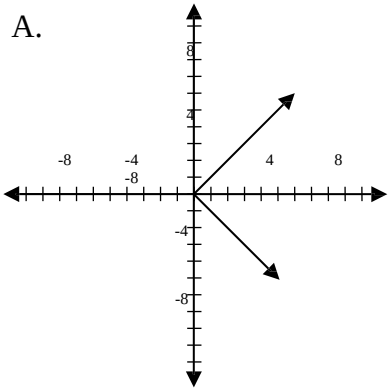
a. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range.

b. Represent a function using function notation and explain that $f(x)$ denotes the output of function f that corresponds to the input x.

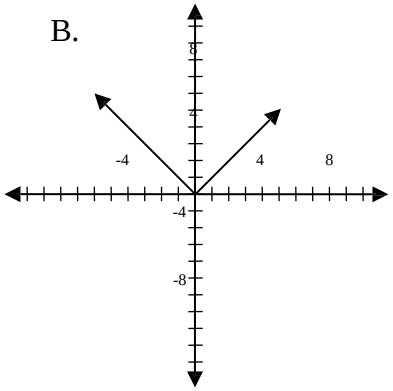
c. Understand that the graph of a function labeled as f is the set of all ordered pairs (x,y) that satisfy the equation $y=f(x)$.

1. Which graph represents a function?

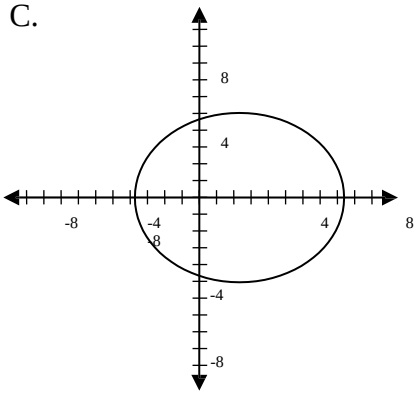
A.



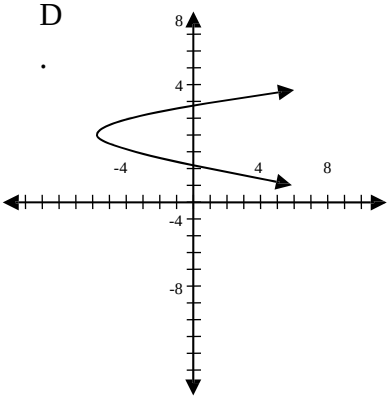
B.



C.



D.



Key:
B

This item requires the student to analyze each graph in order to classify the relationship as a function or not a function. The student must either be able to use a vertical line test or to determine how many values for y correspond to each value for x.

Common errors include confusing vertical and horizontal and confusing the definition of a relation with the definition of a function.
Other items for this standard may give the data as a table or as a set of ordered pairs.

SAMPLE QUESTION 2

SCCCR-M Standard:

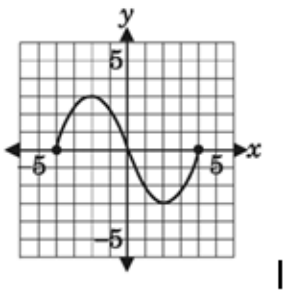
A1.FIF.1* Extend previous knowledge of a function to apply to general behavior and features of a function.

a. Understand 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.

b. Represent a function using function notation and explain that $f(x)$ denotes the output of function f that corresponds to the input x.

c. Understand that the graph of a function labeled as f is the set of all ordered pairs (x,y) that satisfy the equation $y=f(x)$.

2. A function is graphed below.



What is the domain of this function?

A. $-3 < x < 3$

B. $-4 < x < 4$

C. $-3 \leq x \leq 3$

D. $-4 \leq x \leq 4$

Key: D

This item requires the student to determine the domain of a function from a graph. The domain includes all possible values for x for which the function is defined and makes sense. The student must recognize that the endpoints of the continuous function are at $x = -4$ and at $x = 4$, so that the domain is $-4 \leq x \leq 4$.

Common errors include finding the range instead of the domain. A student failing to recognize that the domain represents possible x values for the function may incorrectly choose option A or option C. Other items for this standard may ask the student to find the range or determine reasonable values of domain or range based on an applied situation.

SAMPLE QUESTION 3

SCCCR-M Standard:

A1.NQ.2* Label and define appropriate quantities in descriptive modeling contexts.

3. Let x be any real number. Then the statement $x^3 > 0$ is true for

A. $x > 0$ only.

B. $x < 0$ only.

C. no values of x.

D. all real values of x.

Key: A

This item focuses on what happens when numbers are cubed. The student must recognize that x^3 is positive when x is positive and is negative when x is negative.

Common errors include thinking that cubing a number results in a positive number, as squaring a number does, or thinking that raising a number to the third power is the same as multiplying the number by 3.

SAMPLE QUESTION 4

SCCCR-M Standard:

A1.AAPR.1* Add, subtract, and multiply polynomials and understand that polynomials are closed under these operations. (Limit to linear; quadratic.)

4. **Which expression is equivalent to $(2x - 5) - (3x - 8)$?**

A. $-x - 13$

B. $-x + 3$

C. $2x - 16$

D. $5x - 3$

Key: B

This item focuses on using the distributive and associative properties to simplify an expression. For this standard, a problem-solving situation includes this type of item. The student must understand that subtraction of a quantity in parentheses is the same as distributing –1 over the terms in the parentheses, grouping like terms together, and combining like terms.

Common errors include not distributing the negative to both terms in the parentheses or incorrectly combining like terms. Other items for this standard may ask students to simplify or identify equivalent representations of other algebraic expressions by applying the commutative, associative, and distributive properties.

SAMPLE QUESTION 5

SCCCR-M Standard:

A1.FLQE.1* Distinguish between situations that can be modeled with linear functions or exponential functions by recognizing situations in which one quantity changes at a constant rate per unit interval as opposed to those in which a quantity changes by a constant percent rate per unit interval. *(Note: A1.FLQE.1a is not a Graduation Standard.)*

5. Which of the following situations is best represented by a linear function?
   A. The amount Jeremy tips at a restaurant is a function of the total bill. He tips 15% of the total bill.
   B. The area of a square is a function of the length of the side of the square.
   C. The distance a ball travels after being dropped is a function of acceleration and time. The distance is one-half of the acceleration multiplied by the square of the time.
   D. The length of the side of a rectangle with an area of 48 is a function of the width of the rectangle.

Key: A

This item requires the student to recognize the difference between linear and nonlinear functions in applied situations. The student must understand that a linear function is one that changes by a constant amount for each equivalent interval. For example, since the tip is a constant 15 percent of the total bill, the tip changes the same amount (15 cents) for each additional dollar of the bill. In each of the other options, the rate of change is not constant over time, and therefore does not describe a linear function.

Common errors include thinking that an increase relating to a figure that is made up of lines should be linear.

Other items for this standard may ask students to write a linear function that models a given situation or to recognize a situation that requires an exponential model.

SAMPLE QUESTION 6

SCCCR-M Standard:

A1.ACE.2* Create equations in two or more variables to represent relationships between quantities. Graph the equations on coordinate axes using appropriate labels, units, and scales. (Limit to linear; quadratic; exponential with integer exponents; direct and indirect variation.)

6. **Which equation represents the line passing through the points (–2, 4) and (2, 8)?**

A. $y = -x + 2$

B. $y = -x + 6$

C. $y = x + 4$

D. $y = x + 6$

Key: D

This item requires students to identify an equation for a line based on two points. The student may correctly determine the slope by computing

change in y = 8 – 4

and

change in x = 2 – (–2)

or by graphing the points. The student should then find the y-intercept. Finally, the student should use the slope and the y-intercept to identify the equation $y = x + 6$ as the correct answer.

Common errors include miscalculating the slope as run over rise, making errors with signs, substituting the coordinates of a point incorrectly into the equation $y = mx + b$ or $y - y_1 = m(x - x_1)$ or ignoring the intercept altogether. Other items for this standard may ask students to identify the graph or equation of a line given a context, a point and a slope, or a slope and a y- intercept.

SAMPLE QUESTION 7

SCCCR-M Standard:

A1.ACE.2* Create equations in two or more variables to represent relationships between quantities. Graph the equations on coordinate axes using appropriate labels, units, and scales. (Limit to linear; quadratic; exponential with integer exponents; direct and indirect variation.)

7. The cost of renting a table at a flea market is based on a fixed price per day plus an initial registration fee. If it costs \$45 to rent a table for one day and a total of \$90 to rent a table for four days, which of the following equations represents the total cost (c) to rent a table at the flea market for d days?

A. $c = 15(d + 30)$

B. $c = 15d + 30$

C. $c = 15d + 45$

D. $c = 15(d + 45)$

Key: B

This item requires the student to recognize that the two values needed in the equation are the initial registration fee and the fixed price per day. Here are two approaches to this problem. The fixed price per day can be determined by finding the slope of the line segment between two points—(1, 45) and (4, 90)—which is 15. Similarly, the student may reason that the difference in total cost (c) between four days and one day is \$45 and therefore that the fixed price per day is \$15. Once the fixed price per day is found, the initial registration fee can be calculated using the total cost for one day, \$45, and subtracting the fixed price per day. In either case, students are expected to understand the relationship between the equation and the situation represented by the equation.

Common errors include not recognizing which quantities are variable and which are constant. Students often miscalculate the initial fee or use an incorrect format for their equation.

SAMPLE QUESTION 8

SCCCR-M Standard:

A1.AREI.6* Solve systems of linear equations algebraically and graphically focusing on pairs of linear equations in two variables. *(Note: A1.AREI.6a and 6b are not Graduation Standards.)*

a. Solve systems of linear equations using the substitution method.
b. Solve systems of linear equations using linear combination.

8. A tour boat leaves the dock and travels to the wildlife park at 7 miles per hour (mph) for x hours. The return trip to the dock takes y hours at 15 mph. The boat ride takes a total of 3 hours.

Which system of equations best represents this situation?

A. $x + y = 3$
$7x = 15y$

B. $x = y$
$7x = 15y$

C. $x + y = 3$
$7x + 15y = 3$

D. $x = y$
$7x + 15y = 3$

Key: A

This item requires the student to write a system of linear equations. This skill is pre-requisite to solving a system of equations. The student must recognize that the distance from the dock to the wildlife park is the same, whether the tour boat is coming or going. The student must realize that the distance can be determined by multiplying the rate (miles per hour) by the number of hours, an operation that produces one equation ($7x = 15y$) that represents the equal distances. Since the total time is 3 hours, the second equation is $x + y = 3$.

Common errors are misunderstanding the given information, such as not understanding that x and y can represent different times or not recognizing that distance = rate × time.

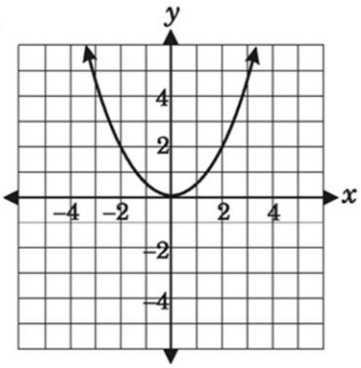
SAMPLE QUESTION 9

SCCCR-M Standard:

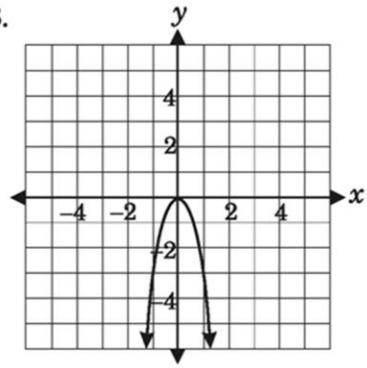
A1.FBF.3* Describe the effect of the transformations $kf(x)$, $f(x)+k$, $f(x+k)$, and combinations of such transformations on the graph of $y=f(x)$ for any real number k. Find the value of k given the graphs and write the equation of a transformed parent function given its graph. (Limit to linear; quadratic; exponential with integer exponents; vertical shift and vertical stretch.)

9. Each graph below represents an equation of the form $y = ax^2$. Which graph represents the equation with the greatest value for a?

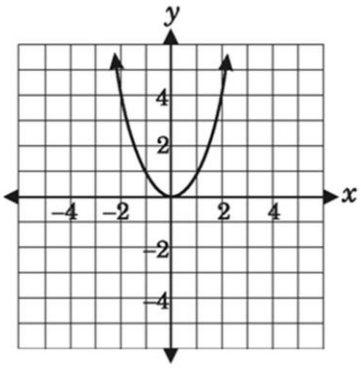
A.



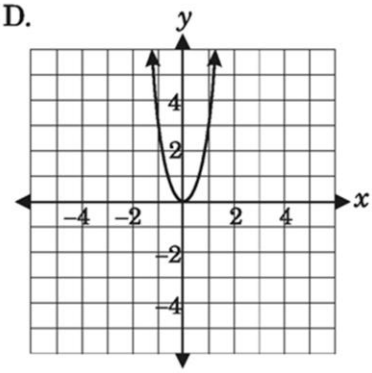
B.



C.



D.



Key: D

This item focuses on the impact of changes in the coefficient a on the graph of $y = ax^2$. The student must recognize that the larger the value of a, the steeper or narrower the graph, and that the smaller the value of a, the flatter and more open the graph.

Common errors include believing that the wider the graph, the larger the value of a, or mistaking a narrow graph that opens downward as having a large coefficient for the x^2 term. Other items for this standard may ask the student to identify a new graph based on changes to the coefficient a.

SAMPLE QUESTIONS 10 - 12

SCCCR-M Standard:

A1.FLQE.1* Distinguish between situations that can be modeled with linear functions or exponential functions by recognizing situations in which one quantity changes at a constant rate per unit interval as opposed to those in which a quantity changes by a constant percent rate per unit interval. *(Note: A1.FLQE.1a is not a Graduation Standard.)*

10. Population A is 800. It grows by 5% each month. Population B is 500. It grows by 20 each month. Which set of statements correctly describes the growth of both populations?

A. Population A is linear.
Population B is exponential.

B. Population A is exponential.
Population B is linear.

C. Population A is exponential.
Population B is exponential.

D. Population A is linear.
Population B is linear.

Key: B

These examples require the student to recognize linear and/or exponential growth.

Other items for this standard may ask students to write a linear function that models a given situation or to recognize a situation that requires an exponential model.

11. Which situation must have a linear relationship?

A. The number of bacteria in a sample doubles each hour.
B. The amount of money earned daily on a school fundraiser increased the first week and decreased the second week.
C. The total cost of stamps given that each stamp costs 48¢.
D. The amount of radiation coming from a sample, given that the amount of radiation decreases by half each hour.

Key: C

12. Which situation must have an exponential relationship?

A. The number of bacteria in a sample doubles each hour.
B. The amount of money earned daily on a school fundraiser increased the first week and decreased the second week.
C. The total cost of pieces of bubble gum is based on the fact that each piece costs 2¢.
D. The total mass of a box of baseballs depends on the number of baseballs in the box plus the mass of the box.

Key is A

SAMPLE QUESTION 13

SCCCR-M Standard:

A1.AREI.10* Explain that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.

Larry's Dairy sells butter to a local grocery. The equation $y = 2.4x$ can be used to model the relationship between the value of butter and the weight of the butter they sell. They can sell any amount of butter, up to 30 pounds. Which statement is true?

A. The equation has 30 solutions.

B. The equation has no solutions.

C. The equation has 2.4 solutions.

D. The equation has infinite solutions.

Key is D

Students should recognize that solutions to equations may include more than just whole numbers.

Common errors are limiting solutions to whole numbers or choosing a number form the prompt (2.4) as a possible answer.

Other items for this standard may include choosing the graph of the solution, recognizing that the graph is continuous in many cases. Options may also include tables of solutions.

SAMPLE QUESTION 14

SCCCR-M Standard

A1.ASE.1* Interpret the meanings of coefficients, factors, terms, and expressions based on their real-world contexts. Interpret complicated expressions as being composed of simpler expressions. (Limit to linear; quadratic; exponential.)

The height (h), in meters, of an item in d days can be modeled using the equation $h = 3\left(\frac{5}{4}\right)^d$. What does the fraction $\frac{5}{4}$ represent in this equation?

A. The final height of the object is $\frac{5}{4}$ meters.
B. The starting height of the object is $\frac{5}{4}$ meters.
C. The height of the object is multiplied by $\frac{5}{4}$ each day.
D. The height of the object increases by $\frac{5}{4}$ meters each day.

Key is C