Georgia High School Graduation Tests

Test Content Description
for

Algebra

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Revised October 1999

Mathematics QCC Standards: Algebra (M.9-12)

Simplifies expressions with and without grouping symbols. (M33)

TEST CONTENT DESCRIPTION

The student will correctly simplify algebraic expressions or demonstrate an understanding of the concept of simplifying in algebra. Only number facts for integers from one to ten should be used. Expressions may include one or two variables. Only integers should be used as coefficients.

Information will be presented verbally. The symbol "÷" or a fraction bar may be used to indicate division. The symbol "×" should be used to indicate multiplication except in front of parentheses or brackets. All items should be multiple-choice in format. Items should be of two types:

1. The student will recognize a correct or incorrect simplification of an expression.
2. The student will choose the correctly worked solution from the options.

Incorrect choices will represent errors such as a missing operation, a computational error, or an incorrect operation.

Mathematics QCC Standard: Algebra (M.9-12)

Sample Items ★ **Key** **Cognitive Level**

Medium

1. John bought 6 apples for 10 cents each and 4 pears for 13 cents each at one store. At a second store, he bought 5 apples for 10 cents each, 6 pears for 13 cents each, and a grapefruit for 30 cents. Which expression would enable John to find out how much money he spent in the two stores?

A. 22(10 + 13) + 30
B. 6(10) + 6(13) + 30
C. 10(26) + 11(26) + 30
★ D. 10(5 + 6)+13(4 + 6) +30

High

2. Linda's math homework required her to simplify, if possible, algebraic expressions. She simplified an expression this way:

$$\frac{\cancel{3x} + 4y}{\cancel{3x}} = 4y$$

Which statement explains what Linda did?

A. She simplified the expression correctly.
★ B. She canceled incorrectly, and the answer is incorrect.
C. She should have canceled only the 3s, and the answer is incorrect.
D. She did not add the terms in the numerator, and the answer is incorrect.

Medium

3. Simplify, if possible.

$3(2n) + n$

A. $3n$
B. $6n$
★ C. $7n$
D. $9n$

Mathematics QCC Standard: Algebra (M.9-12)

Evaluates simple algebraic expressions. (M34)

TEST CONTENT DESCRIPTION

The focus will be on substituting given values for a variable in simple algebraic equations. Some items will require the student to perform the arithmetic operations indicated in the expression in order to find the value of the expression.

The algebraic expressions used in the test items will contain no more than three different variables. Exponents should be used sparingly and, when present, should be non-negative integers no greater than three. Numerical values used for substitution may be any rational number. The computation required in test items should be reasonable so that the concept of evaluating algebraic expressions is stressed.

Test items will present the student with an algebraic expression (such as $3x^2 + y$) and give values for the variables. In these items, the student will be asked to show the substitution or to find the value of the expression. In other items, a brief simulated situation will be used to present the expression, and similar responses will be required.

Answer choices will be given as real numbers or numerical expressions. Incorrect answer choices will represent conceptual misunderstandings or computational errors.

Mathematics QCC Standard: Algebra (M.9-12)

Sample Items ★ **Key** **Cognitive Level**

High

1. Lucy uses the expression 8x + 12y to determine the amount she earns each week at a pay rate of eight dollars an hour, plus time and a half for overtime. One week she worked 40 hours plus 5 hours overtime. Which expression **best** represents her total pay for the week?

   ★ A. 8 (40) + 12 (5)

   B. 8 (5) +12 (40)

   C. 20 (45)

   D. $\frac{20}{12} + \frac{12}{5}$

High

2. The number of red marbles that Jon has is shown by the expression $2x + 5$, with x representing his yellow marbles. If Jon has 9 yellow marbles, how many red marbles does he have?

   A. 7
   B. 17
   ★ C. 23
   D. 47

High

3. Find the numerical value of $2b^2 + b$ when $b = 6$.

   A. 30
   ★ B. 78
   C. 150
   D. 228

Mathematics QCC Standard: Algebra (M.9-12)

Substitutes known values in formulas and solves problems with formulas. (M35)

TEST CONTENT DESCRIPTION

Test items will be presented in situations chosen from school, consumer, career, and leisure applications of mathematics. Some test items will require the use of geometric formulas, and a geometric formula chart will be supplied with the test. Other test items will require that the formula be stated in the stem of the question. Values may be any reasonable rational numbers. Computation should be kept simple so that the concept of the standard is emphasized.

Written data presented in the problem may be augmented by diagrams when needed for clarification. All of the dimensions or other values necessary for the correct use of the formulas will be supplied either in the stem or by means of the diagram.

Answer choices will be given as real numbers or numerical expressions. Units of measurement will be included where appropriate. Incorrect answer choices will represent conceptual misunderstandings or anticipated computational errors.

Mathematics QCC Standard: Algebra (M.9-12)

Sample Items ★ **Key** **Cognitive Level**

Medium

1. Mary drives from Atlanta to Myrtle Beach in six hours. If she knows her average speed is 55 mph and wants to find the distance in miles from Atlanta to Myrtle Beach, what equation should she use? (Use the formula $d = rt$.)

★ A. $d = 55 \times 6$

B. $55 = 6d$

C. $d = \frac{55}{6}$

D. $6 = 55d$

High

2. The hall in Ms. Jackson's house is a square, 5 feet on each side. To calculate the amount of carpet needed to cover the floor, she had to find the area of the floor. She used the formula $A = 5^2$, where 5 represents the length of one side. How many square feet of carpet did she need to carpet the hall?

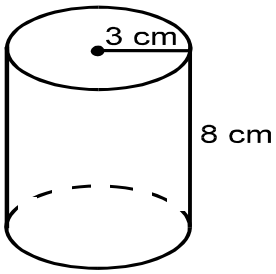
A. 5 sq. ft.
B. 10 sq. ft.
C. 20 sq. ft.
★ D. 25 sq. ft.

High

3. Determine the volume of the cylinder shown to the nearest hundredth. Use 3.14 for π.

$$\mathbf{V} = \pi r^2 h$$

A. 75.36 cm^3
★ B. 226.08 cm^3
C. 336.67 cm^3
D. 602.88 cm^3



Mathematics QCC Standard: Algebra (M.9-12)

Identifies and applies mathematics to practical problems requiring direct and inverse proportions. (M36)

TEST CONTENT DESCRIPTION

Students are to be presented with real-world, real-life situations that require the application of direct and inverse proportions in order to determine unknown quantities. The situations will be chosen from home, school, consumer, occupational or leisure activities. Any real numbers that are realistic to the situation may be used.

Test items will include items that require the student to identify the proportion that reflects the information in the problem or items that require the student to determine the exact numerical answer.

Answer choices will be a series of proportions or numerical values. Answers will include measurement units where appropriate. Incorrect answer choices will reflect incorrectly framed proportions or common computational errors.

Mathematics QCC Standard: Algebra (M.9-12)

Sample Items

Medium

1. Ramon's new car uses 5 gallons of gasoline to drive 147 miles. Which proportion should Ramon use to determine the number of gallons of gasoline (G) he will need to drive 300 miles?

★ A. $\frac{5}{147} = \frac{G}{300}$

B. $\frac{G}{147} = \frac{5}{300}$

C. $\frac{5}{G} = \frac{300}{147}$

D. $\frac{5}{147} = \frac{300}{G}$

Medium

2. The time a car takes to cover a certain distance varies inversely with the rate of speed. If it takes 3 hours to travel a certain distance at an average speed of 55 mph, which proportion can be used to determine the time (T) needed to drive the same distance at an average speed of 65 mph?

A. $\frac{3}{55} = \frac{65}{T}$

★ B. $\frac{3}{T} = \frac{65}{55}$

C. $\frac{T}{3} = \frac{65}{55}$

D. $\frac{3}{T} = \frac{55}{65}$

High

3. A cylinder of test materials weighs 108 pounds on earth and 18 pounds on the moon. How much would an astronaut weigh on the moon if she weighs 120 pounds on earth?

★ A. 20 lbs.
B. 36 lbs.
C. 60 lbs.
D. 97 lbs.

High

4. Twelve printing presses, all alike, can do a job in 3 hours. How many hours would it take 10 of these printing presses to do the same job?

A. 2.5 hours
B. 3.0 hours
★ C. 3.6 hours
D. 4.0 hours

Mathematics QCC Standard: Algebra (M.9-12)

Translates words into simple algebraic expressions and equations. (M37)

TEST CONTENT DESCRIPTION

Test items should deal with simple algebraic expressions and equations. Students will be presented with a mathematical phrase or problem clearly stated in words and will be asked to translate the words into an algebraic expression or equation. Items should cover the operations of addition ("sum," "more than," "plus," "the total of," "added to"), subtraction ("less than," "minus," "difference," "reduced," "decreased by," "diminished by," "subtracted from"), multiplication ("times," "product," "twice," "square of," "cube of," "multiplied by"), and division ("half," "divided by," "quotient of," "the ratio of"). Only linear equations should be used. Care should be taken to avoid ambiguities like "the product of x and 6 reduced by 5" which could be $6x - 5$ or $x(6 - 5)$. Given quantities should be integers or simple fractions.

All correct and incorrect responses should be written in standard algebraic notation. Incorrect responses should be the same form and contain the same variables as the correct response.

Mathematics QCC Standard: Algebra (M.9-12)

Sample Items ★ **Key** **Cognitive Level**

Medium

1. Which of the following algebraic expressions corresponds to "five reduced by the product of a number and six"?

   A. $\frac{5}{6n}$

   B. $6n - 5$

   C. $5 + 6n$

   ★ D. $5 - 6n$

Medium

2. Which of the following algebraic expressions corresponds to "the sum of x and y, multiplied by one-third of z"?

   A. $\frac{xyz}{3}$

   ★ B. $\frac{z}{3}(x + y)$

   C. $3z(x + y)$

   D. $\frac{z}{3}(x - y)$

Medium

3. Which of the following algebraic expressions corresponds to "x increased by 2 is equal to one-third of y?"

   A. $x - 2 = \frac{y}{3}$

   ★ B. $x + 2 = \frac{y}{3}$

   C. $x + 2 = 3y$

   D. $2x = \frac{y}{3}$

Medium

4. Which algebraic equation corresponds to the problem below?
   One number is 6 greater than another number. The sum of the two numbers is 38. Find the numbers.

   A. $x + 6 = 38$

   ★ B. $2x + 6 = 38$

   C. $x(6 + x) = 38$

   D. $2x = 38$

Mathematics QCC Standard: Algebra (M.9-12)

Solves simple equations, including addition, subtraction, multiplication, division, proportions, and two-step equations. (M38)

TEST CONTENT DESCRIPTION

Test items will require the student to solve an equation and identify the correct solution. Coefficients and constants in the equation should be kept simple (although fractions or decimals, as well as integers, may be used) so that the focus is on choosing the correct method of solution and applying it correctly. Complicated arithmetic computations should be avoided.

Incorrect answer choices will reflect conceptual misunderstandings and/or common algebraic or computational errors. Incorrect answer choices may reflect errors resulting from the use of the incorrect operation for the solution of the equation, or using an incorrect number in the transformation of the equation.

Mathematics QCC Standard: Algebra (M.9-12)

Sample Items ★ **Key** **Cognitive Level**

Medium

1. Which operation would be used to solve the equation, $6x = 42$?

   A. addition
   ★ B. division
   C. multiplication
   D. subtraction

High

2. What is the value of x, if $2x + 3 = 15$?

   A. 5
   ★ B. 6
   C. 9
   D. 12

High

3. Solve for x, if $\frac{2}{x} = \frac{15}{60}$

   A. 4
   ★ B. 8
   C. 20
   D. 30

Mathematics QCC Standard: Algebra (M.9-12)

Identifies ratio and proportion as they appear in applied situations and solves proportions for missing numbers in applied problems. (M39)

TEST CONTENT DESCRIPTION

Students will be presented with a situation they might encounter in everyday life. Information about the situation will be presented verbally and may be augmented by a diagram for clarification. An effort should be made to have items complex enough so that they cannot be solved without the use of algebraic methods. Given quantities and solutions should be integers, decimals, or simple fractions. Incorrect responses should reflect common errors in setting up ratios or in solving proportions, such as not having the same type of units in the same relative position.

Mathematics QCC Standard: Algebra (M.9-12)

Sample Items ★ **Key** **Cognitive Level**

Low

1. Sam is on the football team. He played in 7 games and did not play in 4. What is the ratio of the number of games he played to the total number of games?

   A. $\frac{7}{4}$

   B. $\frac{4}{7}$

   C. $\frac{4}{11}$

   ★ D. $\frac{7}{11}$

Medium

2. If one out of 5 people drink Diet Delite, how many people can be expected to drink Diet Delite in a city of 45,000 people?

   A. 900

   ★ B. 9,000

   C. 44,995

   D. 225,000

Medium

3. In an art classroom there are *r* jars of red paint and *g* jars of green paint. Which fraction expresses the ratio of jars of red paint to the total number of jars?

   A. $\frac{1}{8}$

   B. $\frac{r}{g}$

   C. $\frac{1}{g+r}$

   ★ D. $\frac{r}{g+r}$

Mathematics QCC Standard: Algebra (M.9-12)

Solves linear inequalities in one variable and graphs the solution set on the number line. (M41)

Test Content Description

The focus will be on solving linear inequalities and recognizing the correct graphing of the solution sets on a number line, using appropriate interval notation. The inequalities used in the test items will contain only one variable and will be solvable without using negative numbers.

Test items will present an inequality, such as $x < 2$ or $3x \leq 9$. The student will solve the inequality and select the correct solution set from the answer choices.

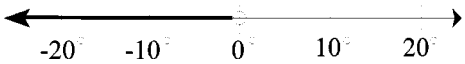
Answer choices will be a series of number lines showing one correct representation and three incorrect representations of the inequality. Incorrect answer choices may reflect conceptual errors in solving the inequality or improper interval notation. Another type of question may present a graph of an interval on a number line and ask the student to select the appropriate inequality.

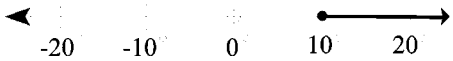
Mathematics QCC Standard: Algebra (M.9-12)

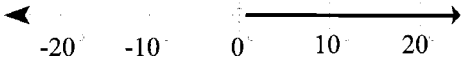
Sample Items ★ **Key** **Cognitive Level**

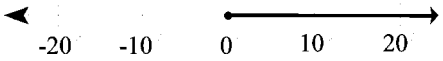
High

1. Consider the statement: Ice will melt at all temperatures above 0° Celsius. Which of the graphs below correctly describes this statement?

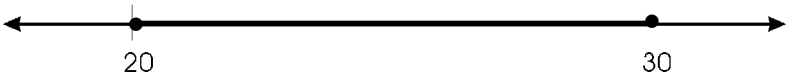
A. 

B. 

★ C. 

D. 

High

2. 

Which inequality describes the interval graphed on the number line above?

A. $20 < g < 30$
B. $20 > g > 30$
★ C. $20 \leq g \leq 30$
D. $20 \geq g \geq 30$

Medium

3. Given the inequality $7y < 35$, solve for y.

A. $y = 5$
★ B. $y < 5$
C. $y > 5$
D. $y \leq 5$

Mathematics QCC Standard: Algebra (M.9-12)

Graphs a linear equation in two variables. (M42)

TEST CONTENT DESCRIPTION

Graphing equations in two variables requires a rectangular coordinate system since solutions to these equations are ordered pairs. Since there is an infinite number of solutions, each possible pair cannot be plotted. Usually enough points are plotted to indicate a pattern. These points are connected with a line or curve to graph the equation.

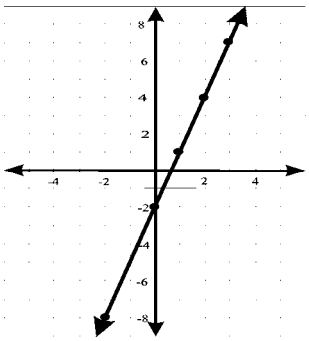
In a multiple-choice format, students cannot be asked to produce their own graphs. A completed graph may be presented, and the student will be asked to identify the appropriate equation. Another type of question will present the equation and ask the student to select the appropriate graph or the appropriate ordered pair.

Incorrect choices will represent common errors of understanding, such as reversal of the *x* and *y* axes, incorrect simplification of equations, or incorrect interpretation of mathematical symbols (+, -, <, >, ≤, ≥).

Mathematics QCC Standard: Algebra (M.9-12)

Sample Items ★ **Key** **Cognitive Level**

High



1. The graph shown at left is the graph of which of the following equations?

   A. y = 2x - 3

   B. y = 3x + 2

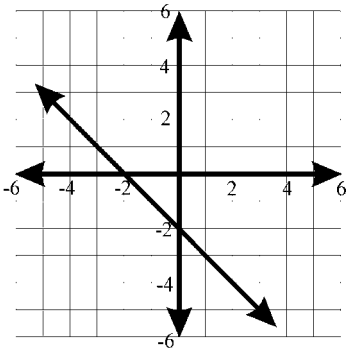
   ★ C. y = 3x - 2

   D. y = 3(x - 2)

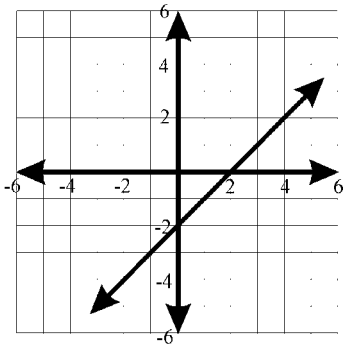
High

2. Which of the graphs below is a graph of the equation $x - y = 2$?

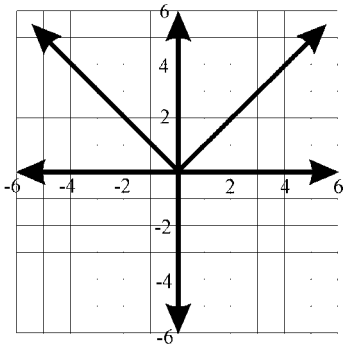
A.



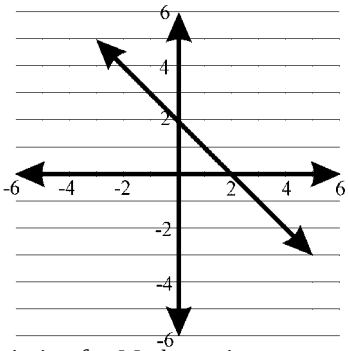
★ B.



C.



D.



Mathematics QCC Standard: Algebra (M.9-12)

Finds the slope and intercepts of a graphed line. (M43)

TEST CONTENT DESCRIPTION

The focus will be on identifying the type of slope (positive, negative, zero, undefined) and on using the *rise over run* formula to define the slope of a given line.

Test items will be multiple-choice in format. Items will test the student's understanding of terms and processes. Graphs may appear as part of the item stem or in each distractor.

Answer choices may be in the form of numerical values, ordered pairs, mathematical terms, or a series of graphs. In every case, the choices will exhibit parallel construction.

Mathematics QCC Standard: Algebra (M.9-12)

Sample Items ★ **Key** **Cognitive Level**

High

1. Which is the slope of a line that passes through the points (7, -1) and (3, 3)?

   A. $-\frac{1}{2}$ ★ B. -1 C. 1 D. 2

Low

2. Which of the following describes the slope of a line parallel to the *x* axis?

   A. positive slope
   B. negative slope
   ★ C. zero slope
   D. undefined slope

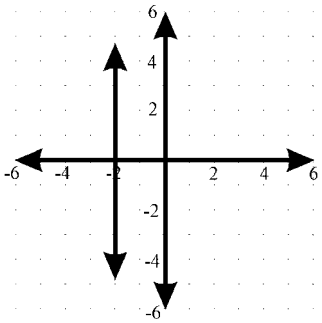
High

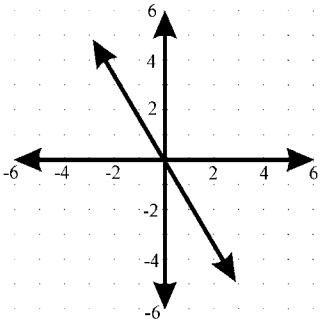
3. Given the equation $3x - 5y - 15 = 0$, find the *x* and *y* intercepts.

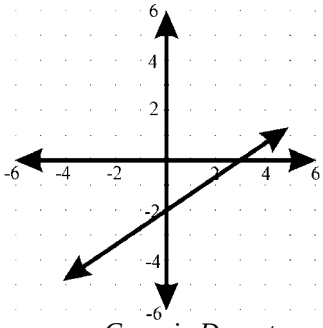
   A. (0, 3) (-5, 0)
   ★ B. (5, 0) (0, -3)
   C. (3, 0) (-5, 0)
   D. (5, 0) (0, 3)

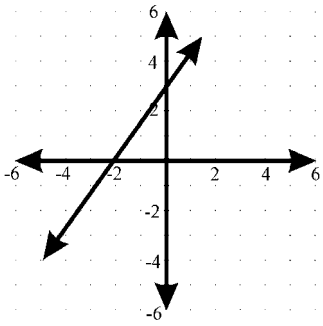
High

4. Which of the following graphs describes a linear equation where the *x*-intercept = -2 and the *y*-intercept = 3?

A.


B.


C.


★ D.


Mathematics: Algebra QCC Standards (M.9-12)

Solves problems that involve systems of two linear equations in two variables. (M44)

TEST CONTENT DESCRIPTION

Test items will present the student with a system of two linear equations with two variables x and y. The solution to this system is a particular ordered pair (x, y) which satisfies *both* equations. Systems may be solved by graphing, substitution, or elimination.

Since test items are in a multiple-choice format, most answer choices will be a series of ordered pairs. Incorrect responses will reflect an incorrect step in the substitution or elimination process.

Another type of test item will present the two equations and the solution set for x and y. The answer choices will be four graphs, and the student will select the graph that is appropriate to the solution.

Mathematics QCC Standard: Algebra (M.9-12)

Sample Items ★ **Key** **Cognitive Level**

High

1. Consider the system of the following two linear equations:

$$x + y = 4$$
$$3x - y = 0$$

Solve for x and y.

A. (1, -3)
★ B. (1, 3)
C. (-1, -3)
D. (-1, 3)

High

2. Given the system of the following two linear equations:

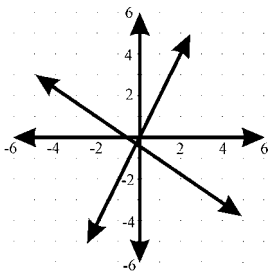
$$x + y = 7$$
$$2x - y = 5$$

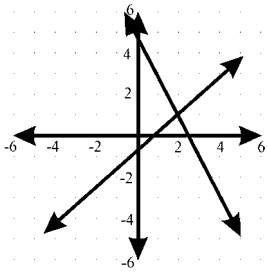
What would be the first step in eliminating the variable y?

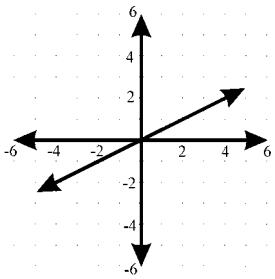
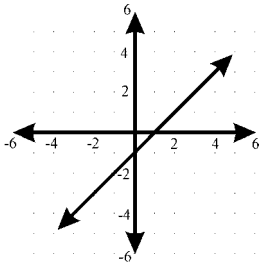
★ A. Add the two equations.
B. Multiply the two equations.
C. Multiply the first equation by –2.
D. Rewrite the equations so that they both equal zero.

High

3. The solution to the system of the linear equations $x - y - 1 = 0$ and $2x + y - 5 = 0$ is the ordered pair (2, 1). Which graph represents the correct plot of the graph of these equations?

A.


★ B.


C.


D.