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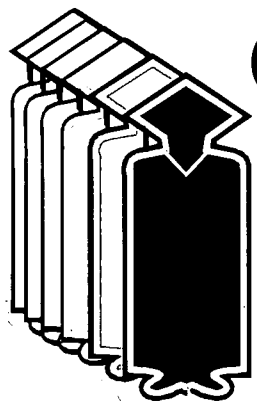
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ABSTRACT

This document contains a description of the Georgia High School Graduation Test in mathematics. The test item specifications, reflecting the Georgia State Quality Core Curriculum, are used by writers and reviewers who are responsible for the development of test items. Much of the content in the description is based on earlier test versions developed between 1994 and 1996. In its present form, the description includes the test content and the types of questions students will be expected to answer. Practical advice for test taking is also included. The test content description includes information for four areas: (1) Number and Computation (17 to 19% of the test); (2) Data Analysis (19 to 25%); (3) Measurement and Geometry (32-34% of the test); and (4) Algebra (28 to 30% of the test). (SLD)

# Georgia High School Graduation Tests



## Test Content Description *for*

# Mathematics

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# OVERVIEW

## SELECTION OF CONTENT FOR GEORGIA HIGH SCHOOL GRADUATION TESTS

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In November 1997, the State Board of Education approved the revised Quality Core Curriculum (QCC) for use in public schools throughout Georgia. This QCC serves not only as the basis for instruction in Georgia schools but for development of the Georgia High School Graduation Tests as well.

Much of the content of these *Test Content Descriptions* is based on earlier versions developed between 1994 and 1996. Those earlier versions were based on statewide surveys of Georgia high schools and numerous meetings with Georgia educators to determine which content could defensibly be included in the Georgia High School Graduation Tests. Since the publication of the earlier version of the QCC, test developers have analyzed the changes made to the original QCC document, met again with groups of Georgia teachers, and prepared the lists of QCC standards found in these *Test Content Descriptions*.

In their present form, these *Test Content Descriptions* should adequately describe not only the content that is assessed in the graduation tests but the types of questions students will be asked to answer as well. Many of the item types may be unfamiliar to students who have not had much experience with questions that require them to apply what they have learned to new situations or solve complex problems involving simple concepts. By publishing these *Test Content Descriptions*, it is the sincere desire of the Georgia Department of Education to offer encouragement to those who are preparing our students to be thinkers and problem solvers in all they do.

These *Test Content Descriptions* contain many sample test items and descriptions of how the items are developed. A careful study of these descriptions can be very helpful in preparing students for the tests. Teachers are encouraged to use these test items or others which they prepare themselves to match these descriptions to give students practice in responding to the types of items they are likely to encounter on the Georgia High School Graduation Tests. Furthermore, teachers are encouraged to use the new accompanying student guide for preparing for tests.

In preparing students to take the Georgia High School Graduation Tests, it would also be helpful to consider the practical advice concerning test taking on the following page. We have offered this material before, but it bears repeating.

## Instructions on Preparing for Tests

- 1. Read everything carefully.** Many of the science items involve descriptions, tables, charts, graphs, and other stimulus materials. All items require careful reading of the question and four answer choices. Stimulus materials will always include directions that tell students which items are based on them. Prior to reading the passage or other stimulus material, students may find it helpful to skim the questions following it to get a better idea of the purpose of their reading.
- 2. Remember that there are no trick questions.** While it is important to read each item carefully, no trick questions are included on the test. Students should not spend too much time trying to figure out what the question is actually asking. If the student has read the entire question (including all accompanying stimulus material), the real meaning and the apparent meaning should be the same. Negatively worded questions and convoluted combinations of answers (e.g., II and III only, A and B, A but not B, etc.) have not been included on the test unless absolutely necessary for clarification. Some questions require a complete reading of the entire text in order to get the correct answer.
- 3. Consider every answer choice.** Students must sometimes go beyond what is stated and draw valid inferences. They must then choose from four alternatives the answer that best addresses the question. Some of the alternatives (distractors) will be attractive because they can be obtained by incomplete or incorrect working of the problem. Such distractors are included precisely to distinguish between students who can recognize the problem to be solved and those who cannot.
- 4. Guess intelligently.** There is no correction for guessing on this test; that is, students are not penalized for guessing. Students who cannot deduce the correct answer are encouraged to guess. Guessing is made easier if the student can eliminate one or more distractors as clearly incorrect. Be warned, however, that many of the distractors are made very attractive because they are based on common mistakes students make.
- 5. Spend test time wisely.** Many tests are arranged so that the easiest items are first and the hardest are last. The Georgia High School Graduation Tests are **not** usually arranged that way. Instead, they are arranged as nearly as possible by strand and standard. Therefore, it is possible to run into several difficult items in a row, only to find much easier items later. If a portion of the test appears to be quite difficult, the student should not despair and assume that the rest of the test only gets harder. It would be better to move on, answer as many questions as possible, and then come back to the more difficult ones.
- 6. Check your work.** There are several opportunities for careless errors to enter into a student's response. The first is in the initial reading of the question (see # 1 above). The second is in the selection of a response. Students should evaluate each alternative critically to make sure it actually addresses the question (see # 3 above). The third opportunity is in the transfer of the correct answer to the answer document. Students should ask themselves two questions: "Am I on the right item number in the right section of the test?" and "Is this the answer I mean to mark?"

# MATHEMATICS

## INTRODUCTION

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This document has been designed to acquaint Georgia teachers, curriculum directors, and other educators with the content of the Georgia High School Graduation Tests in mathematics. It is based on the revised Quality Core Curriculum (QCC) approved by the State Board of Education in November 1997.

This document is a collection of test content descriptions for the mathematics component of the Georgia High School Graduation Tests. It is used by the test item writers and reviewers in test construction. Georgia teachers and other educators may also find it useful in preparing in-class tests.

### **Content Standards and Skills**

The standard exactly as it appears in the November 1997 version of the QCC is given here. In some instances, two or more standards will appear together. This pairing occurs when the standards are very similar and a single test content description has been developed to assess the cluster of standards, rather than each individual standard in that cluster.

Strand 1 standards focus on Number & Computation;  
Strand 2 standards focus on Data Analysis;  
Strand 3 standards focus on Measurement and Geometry; and  
Strand 4 standards focus on Algebra.

## Item Types

Mathematics content items will fall into one of the general categories presented in the chart below.

### ITEM TYPES Number & Computation, Data Analysis, Measurement and Geometry, Algebra

Item Type	Stimulus Characteristics	Cognitive Level	Correct Response Characteristics
1	Direct question requiring recall of facts and definitions	Low	Demonstrates knowledge of facts and basic ideas
2	Direct question requiring some interpretation or simple computation (one-step problem)	Medium	Demonstrates ability to substitute values in formulas and equations; identifies appropriate operation, unit of measure, type of graph, or geometric figure; applies problem-solving skills to real-world situations
3	Direct question requiring application of mathematical theories, analysis of more complicated problem situations (2- and 3-step problems), evaluating data, and drawing conclusions	High	Demonstrates the ability to solve complex problems, analyze data, apply mathematical principles to real-world situations, differentiate between correct and incorrect information

## Cognitive Levels

Cognitive levels are based on learning expectations, not item difficulty, although the higher level items generally prove to be more difficult.

**Low:** requires recognition only and typically deals with terminology, identification, or other low-level activities

**Medium:** requires some degree of interpretation of a problem or situation in which a mathematical principle is applied

**High:** requires a significant degree of interpretation, problem solving, and analysis (e.g., devising a solution to a problem by applying a mathematical principle)

## Sample Items

Following are sample items representing each of the types of questions and cognitive levels, along with an explanation of the correct answer.

1. The number 4:37 **most likely** represents a

- (A) distance.
- (B) score.
- (C) time.
- (D) zip code.

*Explanation:*

Of the four options given, only one (C) typically contains a colon. Thus, the other three options (distractors) can be eliminated.

This question is of item type 1, has a **low** cognitive level (it is basic recall of information) and falls under the strand **Number and Computation**.

2. Which value is greatest?

- (A)  $4^2$
- (B)  $5^2$
- (C)  $2^3$
- (D)  $3^3$

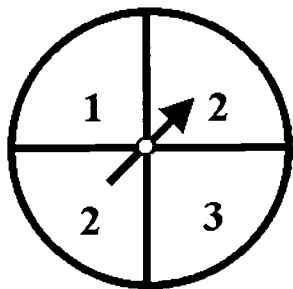
*Explanation:*

In this problem, the student needs to compute each exponential number and then compare the results to determine which is greatest. A is  $4 \times 4$ , or 16. B is  $5 \times 5$ , or 25. C is  $2 \times 2 \times 2$ , or 8. D is  $3 \times 3 \times 3$ , or 27. Thus, D is the correct answer since 27 is larger than the other three computations.

This question is of item type 2 and has a **medium** cognitive level because it requires computing the exponential numbers, then comparing the answers to find which is greatest, but does not require significant interpretation of the stem to determine the answer. This question falls under the strand **Number and Computation**.



3. Find the probability of spinning a “2” on the spinner below.



- (A) 0  
(B)  $\frac{1}{4}$   
(C)  $\frac{1}{2}$   
(D) 1

*Explanation:*

We can eliminate both A and D immediately, as A requires that the spinner would not land anywhere or that there is no “2” on the spinner, and D requires that the spinner fall on 2 all the time. Upon initial review, the obvious choice may appear to be (B),  $\frac{1}{4}$ , since there are four spaces on the spinner. However, closer scrutiny reveals that two of the sections on the spinner have the same number (2). The spinner, then, has a 2 out of 4, or  $\frac{1}{2}$ , chance of landing on 2. Thus, C is the correct answer. This question is of item type 2 and has a **medium** cognitive level because it requires some degree of interpretation beyond recall. It falls under the strand **Data Analysis**.

4. Choose the situation below where a result using approximate numbers would be expected.
- (A) the cost of two tickets to a West High baseball game  
(B) the number of buses bringing students to West High School each day  
(C) the number of people in attendance at a West High varsity football game  
(D) the number of points West High varsity basketball team scored in Tuesday night’s game

*Explanation:*

Options A, B, and D all require precise numbers in order to gather the information these distractors call for. Only option C does not require a precise number—an approximation of the number of people in attendance at the game. An exact number is not needed here as with the other three distractors. This question is of item type 1, has a **low** cognitive level, and falls under the strand **Data Analysis**.

5. The **best** estimate for the length of a boy's shoe is

- (A) 10 inches.
- (B) 10 feet.
- (C) 10 yards.
- (D) 10 miles.

*Explanation:*

The answer here must be 10 inches (A), as all the other measurements are extremely long for measuring a boy's foot. Some students may trip on option B since it mentions the word "feet."

This question has a **low** cognitive level as it requires recall of various lengths and when to use each one. The question is of item type 1 and falls under the strand **Measurement and Geometry**.

6. One gallon of paint will cover 800 square feet. How many gallons of paint are needed to cover a wall that is 8 feet high and 200 feet long?

- (A)  $\frac{1}{4}$
- (B) 2
- (C) 4
- (D) 8

*Explanation:*

This question requires students to know how to determine the area of a rectangle. The area (length  $\times$  width) of the wall in the question is  $8 \times 200$ , or 1600 feet. Dividing 1600 by 800 (the amount of paint one gallon will cover) yields the answer 2. Thus, B is the correct answer. The distractors are common mistakes made by students who do not know how to compute area. Option A is the reduction of 200 over 800. Option C is the result of 800 divided by 200. Option D comes from simply rewriting the 8 in the stem.

This question is of item type 3 and has a **high** cognitive level because it requires a student to know how to find the area of a rectangle and to know when finding the area will help solve a problem. This question falls under the strand **Measurement and Geometry**.

7. Evaluate  $(a + b) - 3c$ , when  $a = 7$ ,  $b = 8$ , and  $c = 0$ .

- (A) 0
- (B) 5
- (C) 12
- (D) 15

*Explanation:*

The easiest means of solving this problem is to plug the values of the variables into the expression. The order of operations states that operations contained within parentheses should be completed first, followed by multiplication, and then subtraction. Our expression  $(a + b) - 3c$  can be rewritten as  $(7 + 8) - 3 \times 0$ . Performing the operation in parentheses first, we get  $7 + 8 = 15$ . We next multiply  $3 \times 0$  and get 0. Our reduced expression, then, is  $15 - 0$ , or 15. Thus, the correct answer is D. The distractors may be appealing to those students who do not know how to evaluate an algebraic expression. Some students may choose A because they know that 0 times anything equals 0. Some students may choose B if they add  $7 + 8$  and then divide by 3. Finally, some students may choose C if they first add  $7 + 8$ , then subtract 3.

This question has a **high** cognitive level since it requires analysis of a given expression and the determination of the correct means of solving it. This question is of item type 1 and falls under the strand **Algebra**.

## SUMMARY OF MATHEMATICS TEST CONTENT

The following are standards from the Quality Core Curriculum in mathematics.

### **Strand 1: Number and Computation (17-19% of the test)**

#### Standards

- 2 Expresses numbers in equivalent and approximate forms and orders these forms, using appropriate tools such as calculators (includes fractions, decimals, percent; scientific notation; square and cube roots, and second and third powers of whole numbers; approximations of fractions, decimals, and percents).
- 3 Recognizes, describes, and applies certain patterns for addition and multiplication.
- 4 Selects and uses problem-solving strategies and computational tools (mental computation, calculator, estimation, paper and pencil) to solve simple problems involving career, consumer, and leisure applications; and evaluates reasonableness of results.
- 5 Determines amounts of money including price, amounts of change, discounts, sales prices, sales tax, interest, and best buy.
- 6 Uses estimation strategies such as rounding, front-end estimation, clustering, grouping, adjusting, compensation, and reference point to predict computational results.
- 7 Uses estimation and approximation to check the reasonableness of computational results.
- 9 Recognizes appropriate practical situations in which to use and to expect results with exact and approximate numbers.

### **Strand 2: Data Analysis (19-21% of the test)**

#### Standards

- 10 Uses probability correctly to predict outcomes of given events, determines the probability of an event through experiments, and differentiates odds from probability.
- 11 Collects (through surveys and experiments) and organizes data into tables, charts, graphs, and diagrams.
- 12 Organizes information using tables, charts, and a variety of graph types with appropriate labels and scales, and interprets such displays as those found in public media.
- 13 Reads and interprets tables, charts, graphs, and diagrams.
- 14 Recognizes a wide variety of occupational situations in which information is gathered and displayed, using tables, charts, and graphs.
- 15 Determines the mean, median, mode, and range of data and uses these measures to describe the set of data.
- 16 Applies simple statistical techniques to problem-solving situations.

### **Strand 3: Measurement and Geometry (32-34% of the test)**

#### Standards

- 18 Estimates measures in both customary and metric systems.
- 19 Estimates and solves problems involving measurement, including selecting appropriate tools such as calculator or mental calculation.
- 20 Applies customary or metric units of measure to determine length, area, volume/capacity, weight/mass, time, and temperature (includes evaluating reasonableness and precision of results, and reading different scales).
- 21 Identifies items from real life that are commonly measured in metric, customary, or in both systems of units, as well as recognizing the appropriate-sized units to use.
- 22 Identifies and differentiates between similar and congruent figures and identifies figures that have been transformed by rotation, reflection, and translation.
- 23 Uses proportions to find missing lengths of sides of similar figures and to enlarge or reduce figures.
- 24 Solves problems involving similar figures and scale drawings.
- 25 Graphs points in the coordinate plane, identifies the coordinates, and uses the concept of coordinates in problem situations, such as reading maps.
- 26 Finds the perimeter and area of plane figures (such as polygons, circles, composite figures) and surface area and volume of simple solids (such as rectangular prisms, pyramids, cylinders, cones, spheres).
- 27 Calculates perimeter and area of plane figures; finds appropriate measures of objects and their models prior to such calculations for basic polygons and circles.
- 29 Identifies lines, angles, circles, polygons, cylinders, cones, rectangular solids, and spheres in everyday objects.
- 30 Applies geometric properties, such as the sum of the angles of a polygon property, percent of area of a circle determined by the central angle measure in a pie chart, or parallel sides and angle relations for parallelograms, to practical drawings.
- 31 Draws and measures angles; determines the number of degrees in the interior angles of geometric figures, such as right and straight angles, circles, triangles, and quadrilaterals; and classifies angles (right, acute, obtuse, complementary, supplementary) and triangles (right, acute, obtuse, scalene, isosceles, and equilateral).
- 32 Uses the Pythagorean theorem to solve problems (includes selecting appropriate tools such as the calculator).
- 40 Applies ratios to similar geometric figures, as in scale drawings, as well as with mixtures and compound applications.

### **Strand 4: Algebra (28-30% of the test)**

#### Standards

- 33 Simplifies expressions with and without grouping symbols.
- 34 Evaluates simple algebraic expressions.
- 35 Substitutes known values in formulas and solves problems with formulas.

- 36 Identifies and applies mathematics to practical problems requiring direct and inverse proportions.
- 37 Translates words into simple algebraic expressions and equations.
- 38 Solves simple equations, including addition, subtraction, multiplication, division, proportions, and two-step equations.
- 39 Identifies ratio and proportion as they appear in applied situations and solves proportions for missing numbers in applied problems.
- 41 Solves linear inequalities in one variable and graphs the solution set on the number line.
- 42 Graphs a linear equation in two variables.
- 43 Finds the slope and intercepts of a graphed line.
- 44 Solves problems that involve systems of two linear equations in two variables.

# Test Content Descriptions

## **Mathematics QCC Standard: Number and Computation (M.9-12)**

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Expresses numbers in equivalent and approximate forms and orders these forms, using appropriate tools such as calculators (includes fractions, decimals, percent; scientific notation; square and cube roots, and second and third powers of whole numbers; approximations of fractions, decimals, and percents). (M2)

---

### **TEST CONTENT DESCRIPTION**

The focus will be on recognizing multiple representations of numbers, ordering numbers that are in similar forms or different forms, and determining which number is equivalent when numbers are not expressed in similar form. Items will be multiple-choice in format. Information will be presented verbally, and diagrams may be added for clarification. Items may require converting from one form to another (e.g., percent to decimal), identifying a point on a number line, or identifying the closest decimal equivalent to a given fraction, or finding a number "between." Most responses will be numerical, and usually all options in an item will be of the same form (i.e., all percents, all fractions). Incorrect responses should represent common errors in the ways that numbers are expressed.



## Mathematics: Number and Computation QCC Standards (M.9-12)

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### Sample Items

### ★ Key

### Cognitive Level

1. Which answer is .87 written as a percent?

- A. .87%
- B. 8.7%
- ★ C. 87%
- D. 870%

Medium

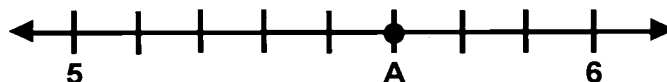
2. What is another way to express 64?

- ★ A.  $8^2$
- B.  $3^4$
- C.  $6^4$
- D.  $6.4 \times 10^2$

Medium

3. Which answer shows the number that point A represents on the graph?

A.  $5\frac{1}{2}$



★ B.  $5\frac{5}{8}$

C.  $5\frac{3}{4}$

D.  $6\frac{1}{4}$

Medium

4. Angelica read to her brother for  $\frac{1}{4}$  of an hour. How many minutes did she read?

- A. 4
- ★ B. 15
- C. 25
- D. 40

Low

## Mathematics QCC Standard: Number and Computation (M.9-12)

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Recognizes, describes, and applies certain patterns for addition and multiplication.  
(replacement for M3)

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### TEST CONTENT DESCRIPTION

The focus will be on the identification and/or application of various number properties (associative, commutative, identity, inequality, and inverse). Whenever possible, test items should include real-world examples of the number properties listed.

One type of test item will present real-world activities and ask the student to identify the activity which illustrates a specific number property. Other items will give a property and ask the student to select the appropriate numerical response.

## Mathematics QCC Standard: Number and Computation (M.9-12)

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### Sample Items

### ★ Key

### Cognitive Level

- Medium**
1. Which of the following pairs of activities could be used to illustrate the commutative property?
- A. writing on the chalkboard and erasing the chalkboard
  - ★ B. putting a dime and a quarter into a vending machine
  - C. putting on your shoes and socks
  - D. turning on a lamp at night and reading a book
- Low**
2. During the first year of operation, the noise level at the county airport was recorded as  $d$  decibels. In the second year, the noise level increased by 35 decibels, and in the third year it increased again by 40 decibels. The noise level after 3 years could be expressed as  $(d + 35) + 40$ .
- Use the associative property to write an equivalent expression.
- A.  $d = 35 + 40$
  - ★ B.  $d + (35 + 40)$
  - C.  $35d + 40$
  - D.  $d(35 + 40)$
- Low**
3. Carla knows the identity element for addition is zero. What is the identity element for multiplication?
- A. 0
  - ★ B. 1
  - C.  $\frac{1}{x}$
  - D.  $\frac{0}{x}$

## **Mathematics QCC Standard: Number and Computation (M.9-12)**

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Selects and uses problem-solving strategies and computational tools (mental computation, calculator, estimation, paper and pencil) to solve simple problems involving career, consumer, and leisure applications; and evaluates reasonableness of results. (M4)

---

### **TEST CONTENT DESCRIPTION**

The focus of this standard, for assessment purposes, will be on choosing the correct computational tool (mental computation, calculator, estimation, paper and pencil, computer) to solve simple problems. Test items will present students with familiar situations involving educational, career, consumer, and leisure applications of mathematics. Students will be asked to choose the best tool to use in each situation. The computational tools used in answer choices are limited to those listed in the expanded standard.

## Mathematics QCC Standard: Number and Computation (M.9-12)

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Sample Items

★ Key

Cognitive Level

- Medium**
1. As you drive along U.S. 41, you see a sign stating that Griffin is 28 miles away. Which would be the **most** appropriate method to estimate how long it will take you to get to Griffin at 55 miles per hour?
- A. a calculator
  - B. a computer
  - ★ C. mental arithmetic
  - D. paper and pencil
- Medium**
2. Brendan makes \$12 an hour doing yard work during the 10 weeks of summer vacation. If Brendan averages 30 hours per week, what is a reasonable estimate of what Brendan will earn during the summer?
- A. \$120.00
  - B. \$360.00
  - C. \$660.00
  - ★ D. \$3600.00

## **Mathematics QCC Standard: Number and Computation (M.9-12)**

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Determines amount of money including price, amounts of change, discounts, sales prices, sales tax, interest, and best buy. (M5)

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### **TEST CONTENT DESCRIPTION**

The focus will be on solving practical problems with consumer, career, or leisure applications. Students are to be presented with problem situations chosen from real-life applications of mathematics, such as spending money, making change, paying interest, or doing comparison shopping. The reasoning within the context of the activity should be emphasized. Computation will be minimal, and numbers used in test items will be restricted to those that can be easily manipulated without the use of calculators. Test items will present information about a money-handling situation. Graphics may be used when necessary to clarify the information in the problem. Incorrect responses should represent common mistakes in performing arithmetic operations on amounts of money or errors in finding a mathematical model for a given word problem.

**Mathematics QCC Standard: Number and Computation (M.9-12)**

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**Sample Items**

**★ Key**

**Cognitive Level**

- High**
1. If shoes which originally cost \$24.00 are selling at a 25% discount, what is the amount of the discount?
- ★ A. \$6.00
  - B. \$8.00
  - C. \$12.00
  - D. \$18.00
- High**
2. If Juanita borrows \$6,000 to buy a car at a fixed interest rate of 13% per year, how much interest must she pay if she pays the loan in full at the end of one year?
- A. \$78
  - B. \$565
  - ★ C. \$780
  - D. \$6013
- High**
3. Maureen works in a small crafts store where the cash register does not compute the sales tax. If the sales tax is 6%, what amount should Maureen add to a purchase of \$18.50?
- A. \$0.06
  - B. \$0.55
  - ★ C. \$1.11
  - D. \$1.85

## Mathematics QCC Standard: Number and Computation (M.9-12)

---

Uses estimation strategies such as rounding, front-end estimation, clustering, grouping, adjusting, compensation, and reference point to predict computational results. (M6)

Uses estimation and approximation to check the reasonableness of computational results. (M7)

---

### TEST CONTENT DESCRIPTION

Using estimation strategies (as listed in the standard), the student will predict answers and determine reasonable answers to problems which might arise in real-world situations. Estimation in a testing situation in which calculator use is encouraged is actually measured as knowledge of estimation procedures. Most questions should require the student to correctly identify an estimation procedure or apply a given procedure correctly. Test items for this standard will use estimation strategies both in solving problems and in checking the reasonableness of results.

Students will be presented with problem-solving situations they might encounter in consumer, school, career, or leisure applications of mathematics. Any realistic quantities may be used in the test items, but the situation presented in the problem should make estimation necessary. The focus will be on the estimate rather than on recognizing or naming a particular estimation strategy (e.g., clustering).

Items may be of two types:

- \* Finding the best estimate of a given set of numbers.
- \* Using estimation to verify a reasonable answer.

Correct answers will be accurate and reasonable approximations of the exact answer. Incorrect responses will be off by an order of magnitude or will reflect the incorrect use of estimation techniques. Incorrect responses may **NOT** include the precise answer. If the response items are numerical expressions, only one can be correct. The other three must be clearly incorrect.



**Mathematics QCC Standard: Number and Computation (M.9-12)**

---

**Sample Items**

**★ Key**

**Cognitive Level**

1. What is the **best** estimate of a 15% tip on a \$14.00 meal?

**Medium**

- A. \$1.00
- B. \$1.40
- ★ C. \$2.00
- D. \$2.80

2. Masheela's science grades were 95, 90, 75, 80, 90, 90. What is a reasonable estimate of her average grade in science?

**Medium**

- A. 95
- B. 90
- ★ C. 85
- D. 80

3. Estimate the sum of 62, 59, 55, 67, and 61.

**Medium**

- ★ A. 300
- B. 305
- C. 400
- D. 500

## Mathematics QCC Standard: Number and Computation (M.9-12)

---

Recognizes appropriate practical situations in which to use and to expect results with exact and approximate numbers. (M9)

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### TEST CONTENT DESCRIPTION

Test items should be chosen from practical situations such as a student might encounter at home, at school, or in a leisure or occupational setting. Most items will be in the form of a list of situations from which the student is to choose the one situation in which to use or to expect results with exact or approximate numbers. Items should only assess the student's knowledge of when exact or approximate numbers are appropriate. Items should not require the student to make exact computations or estimate approximate results. Incorrect responses should reflect confusion about situations where exact numbers and results are not expected or where approximate results and numbers are inappropriate.

## Mathematics QCC Standard: Number and Computation (M.9-12)

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### Sample Items

### ★ Key

### Cognitive Level

1. Choose the situation from the list below where a result using **approximate** numbers would **most likely** be acceptable. **Low**
- A. David made a table to show how many gold, silver, and bronze medals were won in the 1996 Atlanta Summer Olympics by the U.S., Canada, Germany, Romania, Britain, and China.
  - ★ B. The student council is planning a cookout. Scott needs to determine how many hamburgers, hot dogs, and rolls are needed for the event.
  - C. Jason is the treasurer for his band. He has to keep a record of receipts and expenses and then pay the band members out of the profits.
  - D. Tom is responsible for counting the items in stock at the supermarket so the manager will know which items he needs to re-order.
2. Choose the situation where **exact** numbers would **most likely** be involved. **Low**
- ★ A. Mr. Howard pays an electrician for installing a ceiling fan.
  - B. John wants to take Sandra out after the baseball game and checks to see if he has enough money.
  - C. Mr. Dobson is the school librarian and is asked by a reporter for the school paper how many books are in the library.
  - D. Janice is working part-time at a local supermarket. She makes a budget to help her plan how to spend the money she earns.
3. Choose the situation where **exact** numbers would **most likely** be expected. **Low**
- A. The Roselli family is preparing a budget for a two-week vacation in Tennessee.
  - B. Mack went to a rock concert last week. He told his friend Ira how many people were at the concert.
  - C. The school paper wants to report on the number of fish eggs that hatched in the library aquarium last week.
  - ★ D. Scott has been put on a 1,000 calorie-per-day diet and must plan his food intake each day so that he does not exceed that amount.
4. Choose the situation where **approximate** numbers would **most likely** be expected. **Low**
- A. Mrs. Sanders is comparing prices on a new VCR.
  - B. Mr. Haskins, the manager of a clothing store, has to figure out his weekly payroll.
  - C. Mickey is treasurer of the senior class and gives a monthly report on income and expenses.
  - ★ D. The Stewart family is driving to Alabama to visit relatives and wants to know when they will arrive.

## Mathematics QCC Standard: Probability, Statistics, and Data Analysis (M.9-12)

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Uses probability correctly to predict outcomes of given events, determines the probability of an event through experiments, and differentiates odds from probability. (M10)

---

### TEST CONTENT DESCRIPTION

The focus of the items will be on applying the rules of probability and predicting the chance of a designated outcome for a specific given event. The odds of an event (the ratio of the number of ways the event can occur to the number of ways the event cannot occur) will also be addressed.

Students are presented with situations they might encounter in everyday life—at home, at school, or in a leisure or occupational setting. The item may ask the student to determine the probability or the odds of an outcome taking place. Both single and combination (dependent or independent) events should be used in test items. Some situations in which the probability of an event occurring is either 1 or 0 should be included.

Items may be presented in verbal or pictorial form. The principal task presented to the student is to determine the probability of a given event, given sufficient information. The phrase "chance of \_\_\_\_\_ happening" should be avoided, as this is usually expressed as a percent.

All responses should be written as a ratio. Incorrect responses should reflect lack of knowledge or confusion about probabilities, such as finding the number of possible outcomes incorrectly, or incorrectly determining the number of ways an event can occur. Incorrect answers should not be other forms of the correct ratio, such as a fraction that is not simplified.

Sample Items

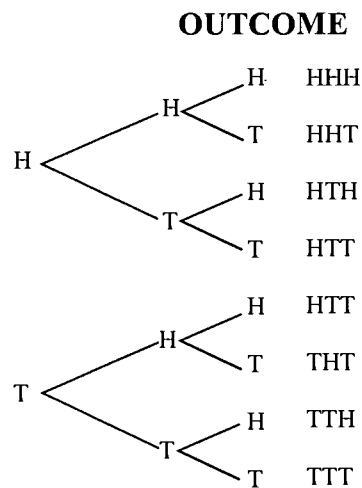
★ Key

Cognitive Level

Medium

1. Use the tree diagram to predict the probability of flipping three coins and getting all heads or all tails.

- ★ A.  $\frac{1}{4}$
- B.  $\frac{1}{2}$
- C. 1
- D. 2



Medium

2. If a coin is tossed five times and on the first four tosses it comes up tails, what is the probability of getting heads on the fifth toss?

- A. 0
- ★ B.  $\frac{1}{2}$
- C.  $\frac{4}{5}$
- D. 1

Medium

3. There are five pencils in a box; some are red and some are blue. The probability of randomly reaching into the box and selecting a red pencil is  $\frac{3}{5}$ . How many blue pencils are in the box?

- A. 1
- ★ B. 2
- C. 3
- D. 5

## Mathematics QCC Standard: Probability, Statistics, and Data Analysis (M.9-12)

---

Collects (through surveys and experiments) and organizes data into tables, charts, graphs, and diagrams. (M11)

Organizes information using tables, charts, and a variety of graph types with appropriate labels and scales, and interprets such displays as those found in public media. (M12)

---

### TEST CONTENT DESCRIPTION

Test items will present to students data from situations they might encounter in school, on the job, or in leisure settings. Since all test items will be multiple-choice in format, students cannot be asked to *construct* graphs and/or tables. Responses will show various representations of the data, and the student's task will be to identify the correct or appropriate choice.

Other types of items may present information in graph or table form and ask the student to interpret the information. In this case, the answer choices will be numerical values. Incorrect responses will reflect incorrect interpretations of data.

**Mathematics QCC Standard: Probability, Statistics, and Data Analysis (M.9-12)**

Sample Items

★ Key

Cognitive Level

Low

1. Which kind of graph is **best** used to show a percent or share of the total?
- A. bar graph
  - ★ B. circle graph
  - C. line graph
  - D. pictograph

Medium

2. Larami is making a pictograph for the high school newspaper to show the number of students in each grade who are in favor of open lunch. She summarized her data:

Grade	Number of students in favor of open lunch
Seniors	125
Juniors	150
Sophomores	75
Freshmen	50

In the pictograph, how many students could be **best** represented by this symbol?



- A. 1
- ★ B. 25
- C. 50
- D. 100

High

3. The results of a poll asking, "Who is your favorite late-night talk-show host?" are shown.

Keenan Ivory Wayans .....20%  
 David Letterman.....23%  
 Jay Leno .....32%  
 undecided.....25%

Which type of graph should be used to show the results of the poll?

- A. bar graph
- ★ B. circle graph
- C. line graph
- D. pictograph

## **Mathematics QCC Standard: Probability, Statistics, and Data Analysis (M.9-12)**

---

Reads and interprets tables, charts, graphs, and diagrams. (M13)

Recognizes a wide variety of occupational situations in which information is gathered and displayed, using tables, charts, and graphs. (M14)

---

### **TEST CONTENT DESCRIPTION**

The focus will be on interpreting tables, charts, graphs, and diagrams used in consumer, career, school, home, or leisure settings. Test items will make use of a variety of tables, such as time tables, tax tables, tables of measure, interest rate tables, and tables of squares and square roots. Venn diagrams and bar, line, circle, and picture graphs will be presented for interpretation. Diagrams, tables, charts, and graphs should be carefully drawn and labeled.

Some multiple-choice items will require numerical answer choices which may be real numbers or a range of numbers. Other multiple-choice responses will be given in words that describe or interpret problem situations. Incorrect answer choices will reflect errors in computation or interpretation of data.



Sample Items

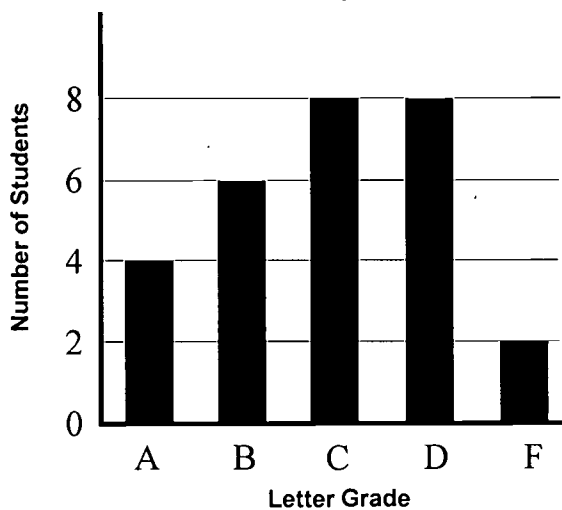
★ Key

Cognitive Level

Medium

1.

### History Grades



The distribution of grades in Mr. Paul's history class is shown on the graph above. How many more C students than A students are in his class?

- A. 0
- B. 2
- ★ C. 4
- D. 8

Medium

2. The distribution of grades in Mr. Paul's history class is illustrated by the graph. What is the ratio of A students to C students in his class?

- A. 1:4
- B. 2:1
- ★ C. 1:2
- D. 4:1

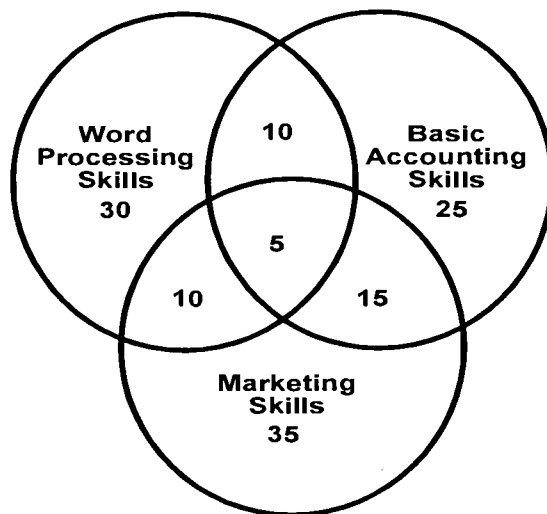
Sample Items

★ Key

Cognitive Level

Medium

3. Mr. Mangione, the Director of Human Resources at Ace Chemical Industries, constructed a diagram to illustrate the skills of applicants for positions in the office of his company.



How many applicants possess word processing, basic accounting, and marketing skills?

- ★ A. 5
- B. 10
- C. 15
- D. 20

4.

Medium

Ready-to-cook Weight (pounds)	Approximate Time at 325°F (hours)
4 to 8	3 to 4 ½
8 to 12	4 ½ to 4 □
12 to 16	4 □ to 5 □
16 to 20	5 □ to 6
20 to 24	6 to 7

Todd is planning to roast an 18-pound stuffed turkey. What is the **least** amount of time he should allow for roasting the turkey at 325°F?

- A. 4 ½ hours
- ★ B. 5 ¾ hours
- C. 6 hours
- D. 7 hours

## **Mathematics QCC Standard: Probability, Statistics, and Data Analysis (M.9-12)**

---

Determines the mean, median, mode, and range of data and uses these measures to describe the set of data. (M15)

Applies simple statistical techniques to problem-solving situations. (M16)

---

### **TEST CONTENT DESCRIPTION**

The student will be presented with data drawn from real-world situations that might occur at home, at school, on the job, or in a leisure setting. Data may be presented as a word problem or in a table or chart. This table or chart should be included in the stem of the item. Items should typically have seven or more entries for the calculation of mean, median, or mode. Bimodal or other unusual distributions should be avoided.

Incorrect responses might reflect confusion in naming the statistical measures or major miscalculations that reflect errors in applying the method of finding a particular statistical measure. Minor miscalculations should not be used as incorrect multiple-choice responses. Decimals may be rounded off; and, in any one item, each response should be carried to the same number of decimal places.

## Mathematics QCC Standards: Probability, Statistics, and Data Analysis (M.9-12)

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### Sample Items

### ★ Key

### Cognitive Level

- Medium**
1. The scores on Mrs. Jackson's physics test were 87, 92, 50, 65, 88, 87, 91, 60, 65, 75, 70, 82, 85, 89, 80, 80, 75, 77, 92, and 80. What is the range of the scores?
- ★ A. 42
  - B. 50
  - C. 78
  - D. 80
- Medium**
2. The Country Coffee Shop has seven employees. Their salaries are \$11,000, \$12,000, \$12,000, \$14,000, \$16,000, \$17,000, and \$17,500. What is the average salary of a coffee shop employee?
- A. \$6,500
  - B. \$12,000
  - C. \$14,000
  - ★ D. \$14,214
- High**
3. Helen spent a total of \$100 for five shirts. Later she bought another shirt. She spent an average of \$18.78 per shirt for the six shirts. What did Helen pay for the sixth shirt?
- ★ A. \$12.68
  - B. \$16.67
  - C. \$20.00
  - D. \$38.78
- Medium**
4. The youngest person in an audience of 600 people is thirteen years old. The range of ages is forty-five years. Which is the age of the oldest member of the audience?
- A. 32 years
  - B. 45 years
  - C. 46 years
  - ★ D. 58 years

## **Mathematics QCC Standards: Measurement and Geometry (M.9-12)**

---

Estimates measures in both customary and metric systems. (M18)

Identifies items from real life that are commonly measured in metric, customary, or both systems of units, and recognizes the appropriately sized units to use. (M21)

---

### **TEST CONTENT DESCRIPTION**

The focus of assessment items is defined in the standard. Practical, real-life situations will reflect educational, career, consumer, and leisure applications of measurement. Units of measure in this standard will include those that are used in measuring area, capacity, length, mass, temperature, time, volume, and weight.

Test items will be multiple-choice in format. Test items will present the student with a common, easily visualized, concrete object and require the student to choose the best or most reasonable unit of measurement. The keyed response must clearly satisfy the problem. Answer choices will provide one definitely appropriate measure and three clearly inappropriate measures.

## Mathematics QCC Standard: Measurement and Geometry (M.9-12)

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### Sample Items

### ★ Key

### Cognitive Level

1. Juan wants to find the distance from Savannah to Atlanta. Which would be the **best** unit of measurement to use? Low

- A. centimeter
- ★ B. kilometer
- C. meter
- D. millimeter

2. To determine the mass of a piano, which is the **most** appropriate unit of measure? Low

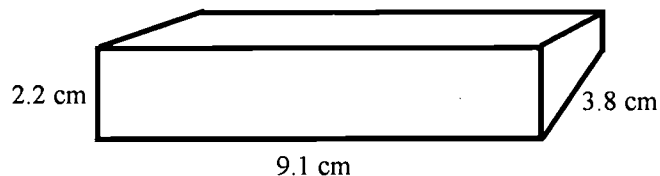
- A. grams
- B. centigrams
- C. dekagrams
- ★ D. kilograms

3. The mass of a can of soda can **best** be measured in Low

- ★ A. grams
- B. hectograms
- C. kilograms
- D. milligrams

4. Rounding off to the nearest centimeter, estimate the volume of the box pictured below. Medium

- A.  $36 \text{ cm}^3$
- B.  $63 \text{ cm}^3$
- ★ C.  $72 \text{ cm}^3$
- D.  $76 \text{ cm}^3$



## Mathematics QCC Standard: Measurement and Geometry (M.9-12)

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Estimates and solves problems involving measurement, including selecting appropriate tools such as calculator or mental calculation. (M19)

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### TEST CONTENT DESCRIPTION

The focus of the items will be on estimating and solving problems with real-life, real-world applications. Students are presented with problem-solving situations they might encounter in consumer, career, school, or leisure settings. These problems will use both customary and metric units in measuring area, capacity, length, mass, temperature, time, volume, and weight. Written items may be augmented by the use of diagrams.

Answer choices may be given as real numbers, or as a range of numbers, such as "between 40°C and 50°C." Answer choices will include measurement units where appropriate. Incorrect responses should indicate lack of knowledge or confusion about formula use, or errors in understanding appropriate units of measurement.

**Mathematics QCC Standard: Measurement and Geometry (M.9-12)**

---

**Sample Items**

**★ Key**

**Cognitive Level**

- Medium**
1. A good estimate for the weight of a member of a high school football team would be
- ★ A. 85 kilograms.
  - B. 185 kilograms.
  - C. 200 kilograms.
  - D. 370 kilograms.
- High**
2. Given that water boils at  $100^{\circ}\text{C}$  and freezes at  $0^{\circ}\text{C}$ , what would be the **most** comfortable temperature for a room in your home?
- A. between  $70^{\circ}\text{C}$  and  $80^{\circ}\text{C}$
  - B. between  $55^{\circ}\text{C}$  and  $65^{\circ}\text{C}$
  - C. between  $40^{\circ}\text{C}$  and  $50^{\circ}\text{C}$
  - ★ D. between  $20^{\circ}\text{C}$  and  $30^{\circ}\text{C}$



## **Mathematics QCC Standard: Measurement and Geometry (M.9-12)**

---

Applies customary or metric units of measure to determine length, area, volume/capacity, weight/mass, time, and temperature (includes evaluating reasonableness and precision of results, and reading different scales). (M20)

---

### **TEST CONTENT DESCRIPTION**

The student will solve problems from real-life situations that involve customary or metric units of measure. Items for this standard will assess the student's ability to use metric and customary units in determining perimeter, area, surface area, volume/capacity, weight/mass, time, and temperature. Some items will require students to recognize precision in practical situations.

Diagrams and graphics will be used to supplement the written information in the item. All of the dimensions necessary for the correct use of the formulas will be supplied either in the item stem or by means of drawings or diagrams. Geometric formulas will be supplied to the student with the test.

Answer choices will be expressed as real numbers or as ranges of real numbers. When appropriate, answer choices will include measurement units. Incorrect answer choices will reflect misuse of measurement units, computational errors, or formula misuse.

## Mathematics QCC Standard: Measurement and Geometry (M.9-12)

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### Sample Items

### ★ Key

### Cognitive Level

1. Elizabeth starts work at 8:30 a.m. and stops at 3:45 p.m. If she takes 30 minutes for lunch, what is the length of her work day? High
- A. 6.0 hours
  - ★ B. 6.75 hours
  - C. 7.0 hours
  - D. 7.5 hours
2. What is the volume of a cube that has an edge of 3 centimeters? High
- A.  $3 \text{ cm}^3$
  - B.  $9 \text{ cm}^3$
  - C.  $18 \text{ cm}^3$
  - ★ D.  $27 \text{ cm}^3$
3. If a bag has 45 ounces of bird seed, how many pounds does it contain? High
- A. between 0.2 and 0.3 pounds
  - B. between 2.0 and 2.5 pounds
  - ★ C. between 2.5 and 3.0 pounds
  - D. between 4.0 and 4.5 pounds
4. If a car travels at 55 miles per hour, about how many miles will it travel in 2.5 hours? Medium
- A. 20 miles
  - B. 60 miles
  - C. 110 miles
  - ★ D. 140 miles

## QCC Standards Measurement and Geometry (M.9-12)

---

Identifies and differentiates between similar and congruent figures and identifies figures that have been transformed by rotation, reflection, and translation. (M22)

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### TEST CONTENT DESCRIPTION

The focus will be on items giving examples of similar and congruent polygons and motion geometry. The standard includes identifying corresponding angles and sides of figures, the axis of symmetry, and the center of rotation.

In some items, students will be presented with a diagram in which they are asked to identify similar or congruent figures. Conventional symbols for congruence should be used.

Students may also be presented with a series of pattern transformations or a situation in which they are to determine the transformation that has taken place. The transformation will be one of three types:

Type 1. Rotation: moving a figure around a fixed point (called the center of rotation), which may be inside, on the edge, or outside the figure. Movement may be clockwise or counterclockwise.

Type 2. Reflection: flipping a figure over the axis of symmetry. Every point has a corresponding point in the reflected image on the opposite side of the axis of symmetry, except when the point lies on the axis.

Type 3. Translation: sliding a given figure in a certain direction. Movement of the figure is shown by vectors.

The majority of test items will present information graphically. Diagrams must be clearly drawn and correctly labeled to show either congruent or similar geometric figures or transformations. All information about angles and sides of polygons should be presented both verbally and graphically.

The incorrect responses should reflect confusion of congruency and similarity or incorrectly identified transformations.

**Mathematics QCC Standard: Measurement and Geometry (M.9-12)**

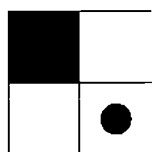
**Sample Items**

**★ Key**

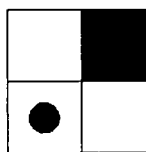
**Cognitive Level**

**Medium**

1. Study Figures I and II. Determine which transformation, if any, of Figure I is shown in Figure II?



**I**



**II**

- A. rotation
- ★ B. reflection
- C. translation
- D. no transformation

**Medium**

2. Study figures I and II. Which transformation, if any, of Figure I is shown in Figure II?



**I**



**II**

- A. no transformation
- B. reflection
- ★ C. rotation
- D. translation

**Low**

3. Sliding a geometric figure in a straight line is transformation by

- A. inversion.
- B. reflection.
- C. rotation.
- ★ D. translation.

## **Mathematics QCC Standard: Measurement and Geometry (M.9-12)**

---

Uses proportions to find missing lengths of sides of similar figures and to enlarge or reduce figures. (M23)

Solves problems involving similar figures and scale drawings. (M24)

Applies ratios to similar geometric figures, as in scale drawings, as well as with mixtures and compound applications. (M40)

---

### **TEST CONTENT DESCRIPTION**

Real-world situations provide the framework for using the concept of proportion to enlarge or reduce figures, such as photographs, posters, etc. Other test items will assess the student's ability to find the measure of sides of similar figures by setting up a proportion of known lengths. Graphics will be used to aid in the visualization of the comparison. The similar figures will not always have the same orientation, but sufficient clues will be included so that the proportion can be correctly stated.

Responses may be numerical in nature or may identify a similar side or angle. Errors will usually result from incorrect setting up of the proportion algorithm or a lack of understanding of the concept of proportion.

**Mathematics QCC Standard: Measurement and Geometry (M.9-12)**

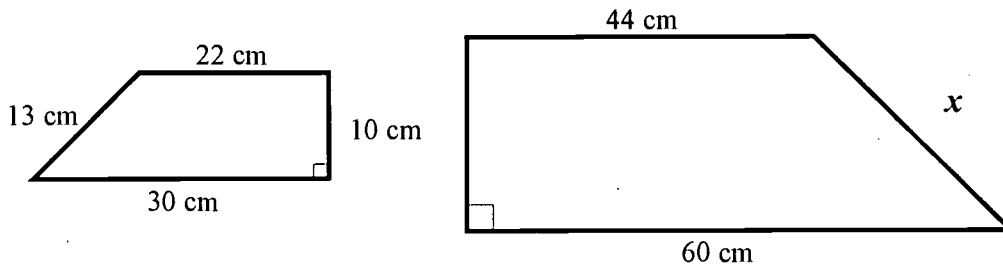
**Sample Items**

**★ Key**

**Cognitive Level**

**High**

1. Find the missing length ( $x$ ) for the pair of similar figures below.



- A. 20 cm
- ★ B. 26 cm
- C. 30 cm
- D. 39 cm

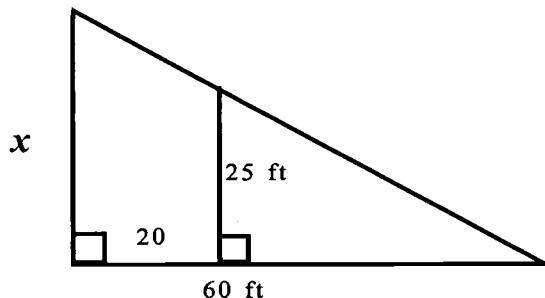
**High**

2. Henry has a picture that measures 4 inches in width and 6 inches in length. If Henry enlarges the picture to make a poster that measures 2 feet in width, how long will the poster be?

- A. 8 inches
- B. 12 inches
- C. 24 inches
- ★ D. 36 inches

**High**

3. The two right triangles are similar. Find the measure of side  $x$ .



- A. 32
- ★ B. 37.5
- C. 55
- D. 83

## Mathematics QCC Standards: Measurement and Geometry (M.9-12)

---

Graphs points in the coordinate plane, identifies the coordinates, and uses the concept of coordinates in problem situations, such as reading maps. (M25)

---

### TEST CONTENT DESCRIPTION

This standard includes the graphing of (or, in most cases, matching ordered pairs of numbers with) points in all four quadrants of the coordinate plane. Emphasis will be on distinguishing among points which differ only in the sign of their coordinates  $[(x,y)$  and  $(-x,y)]$  or in the order of their coordinates  $[(m, n)$  and  $(n, m)]$ . Points will be included which lie on the  $x$  or  $y$  axis. The graph should be very clear and the coordinates of the points unambiguous. The points should be labeled in alphabetical order from top to bottom and left to right so they can be easily located. Test items may be of two types:

Type 1: Given the coordinates of a point, identify the point in the coordinate plane.

Type 2: Given a point, choose its coordinates from four pairs of ordered numbers.

Items involving map reading will present maps with **areas**, not grid intersections, clearly labeled. According to map conventions, the  $x$  axis is labeled numerically and the  $y$  axis is labeled alphabetically.

Students will be asked to identify a specific location on the map using coordinates. Map conventions generally list the letter first, followed by the number (B7) which violates the mathematical rule of naming the coordinates in  $x, y$  order (7B). Responses of both types will be used, but all of the answers for a specific item will follow the same format.

In multiple-choice items, the incorrect response should differ in sign or order from the correct responses. Confusion of the  $x$  with the  $y$  coordinate and confusion about the signs of the coordinates in the different quadrants are the most common mistakes. Incorrect responses may give the coordinates of other points shown in the stimulus.

Mathematics QCC Standard: Measurement and Geometry (M.9-12)

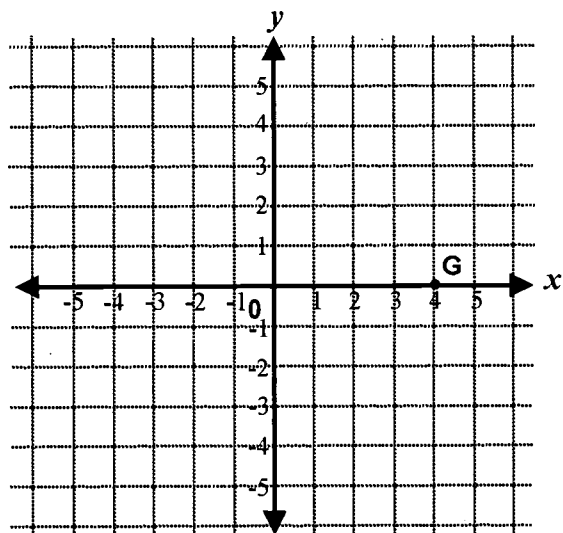
Sample Items

★ key

Cognitive Level

Medium

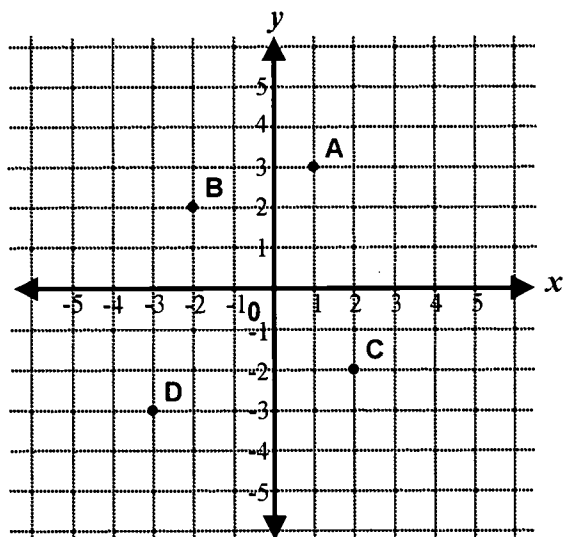
1. Give the coordinates of point G on the graph below.



- ★
- A. (0, 4)
  - B. (0, -4)
  - C. (4, 0)
  - D. (-4, 0)

Medium

2. Which point shown on the graph below has the coordinates (2, -2)?



- ★
- A. point A
  - B. point B
  - C. point C
  - D. point D



Mathematics QCC Standard: Measurement and Geometry (M.9-12)

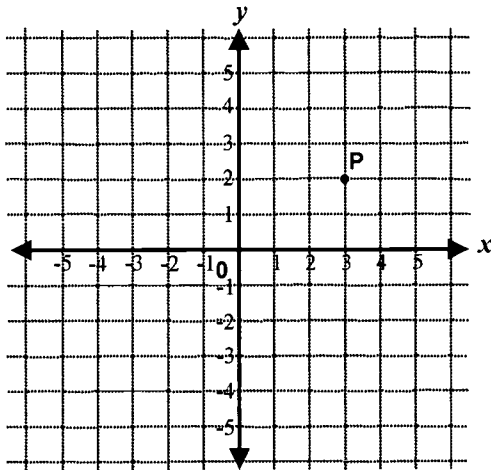
Sample Items

★ Key

Cognitive Level

Medium

3. Give the coordinates of point P on the graph below.

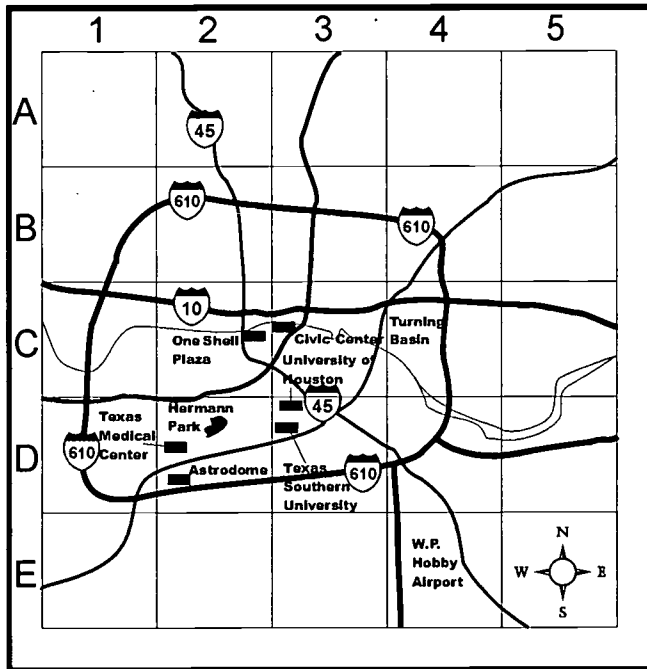


- ★ A. (4, 6)
- B. (3, 2)
- C. (6, 4)
- D. (2, 3)

Medium

4.

Downtown Houston, Texas



Which of the following indicates the square where Houston's two universities are located?

- A. 2, D
- B. 3, C
- ★ C. 3, D
- D. 3, 2

## **Mathematics QCC Standard: Measurement and Geometry (M.9-12)**

---

Finds the perimeter and area of plane figures (such as polygons, circles, composite figures) and surface area and volume of simple solids (such as rectangular prisms, pyramids, cylinders, cones, spheres). (M26)

Calculates perimeter and area of plane figures; finds appropriate measures of objects and their models prior to such calculations for basic polygons and circles. (M27)

---

### **TEST CONTENT DESCRIPTION**

This standard focuses on assessment of the student's understanding of perimeter, area, surface area, and volume as a necessary foundation for problem-solving. Students will be presented with a real-world, real-life situation or a mathematical model. Some test items will require the use of geometric formulas, and a geometric formula chart will be supplied with the test. Other items will require the student to choose the most appropriate measurement unit for a familiar real object.

Most items will be presented in both written and visual form. Graphics should be clearly drawn and correctly labeled. All of the dimensions necessary for the correct use of the formulas will be supplied either in the item stem or by means of drawings or diagrams. Extraneous information may be included.

When appropriate, answer choices will include measurement units. Incorrect answer choices will reflect formula misuse, computational errors, or misunderstanding of concepts (e.g., perimeter instead of area, area instead of volume).

Mathematics QCC Standards: Measurement and Geometry (M.9-12)

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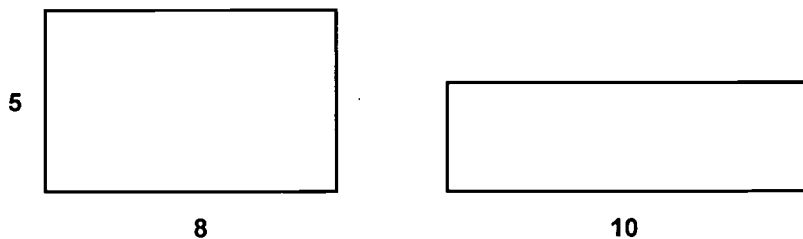
Sample Items

★ Key

Cognitive Level

Medium

1. The perimeters of the two rectangles are equal. What is the width of the second rectangle?



- ★ A. 3
- B. 5
- C. 8
- D. 10

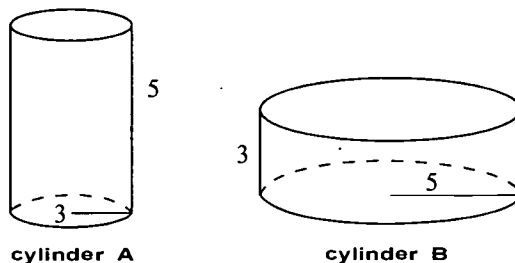
Medium

2. An irregular pentagon has a perimeter of 27". Four of its sides are 3", 4", 5" and 6". What is the length of the remaining side?

- A. 3"
- B. 7"
- ★ C. 9"
- D. 18"

High

3. The volume of a cylinder is found by using the formula  $V = \pi r^2 h$ . How do the volumes of cylinder A and cylinder B compare?



- A. The volume of cylinder A is larger.
- ★ B. The volume of cylinder B is larger.
- C. It is not possible to compare the volumes.
- D. The volumes of cylinder A and cylinder B are the same.

**Mathematics QCC Standard: Measurement and Geometry (M.9-12)**

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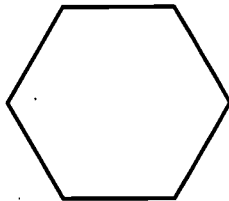
**Sample Items**

**★ Key**

**Cognitive Level**

**Medium**

4. The regular hexagon below has the same perimeter as a square with a side of twelve inches. How long is each side of the hexagon?



- A. 2 inches
- B. 3 inches
- C. 6 inches
- ★ D. 8 inches

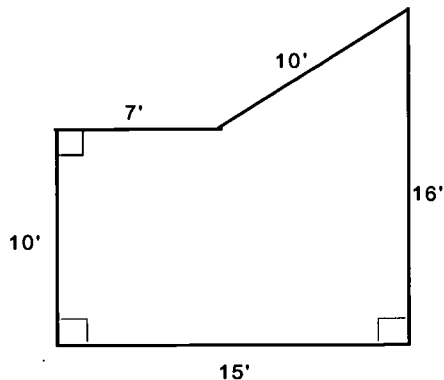
**High**

5. What is the surface area of a cube with an edge that measures 9 centimeters?

- A. 81 square centimeters
- B. 108 square centimeters
- C. 324 square centimeters
- ★ D. 486 square centimeters

**High**

6. Tim has an irregularly shaped garden, as shown below.



What is the area of his garden (in square feet)?

- A. 58 square feet
- ★ B. 174 square feet
- C. 198 square feet
- D. not enough information provided

## **Mathematics QCC Standard: Measurement and Geometry (M.9-12)**

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Identifies lines, angles, circles, polygons, cylinders, cones, rectangular solids, and spheres in everyday objects. (M29)

---

### **TEST CONTENT DESCRIPTION**

The focus will be on identifying lines, angles, circles, polygons, and other plane geometric figures in everyday objects which all students should be able to recognize.

Information will be presented to the student in written form, supplemented by diagrams when necessary for clarification. Most answer choices will present the student with a list of possible geometric shapes as listed in the standard. Incorrect answer choices will reflect misunderstanding of the geometric shape described in the item. Other items will name a geometric shape and ask students to select the object most like the shape.

**Mathematics QCC Standard: Measurement and Geometry (M.9-12)**

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**Sample Items**

**★ Key**

**Cognitive Level**

1. A shoe box is **most** like a **Low**
- A. cone.
  - B. cylinder.
  - ★ C. rectangular solid.
  - D. sphere.
2. Which item is **most** like a cylinder? **Low**
- A. basketball
  - B. box of cookies
  - ★ C. can of soup
  - D. desk
3. The strings on a guitar are examples of what kind of line segments? **Low**
- A. colinear
  - B. intersecting
  - ★ C. parallel
  - D. perpendicular
4. A telephone pole is **most** like a **Low**
- A. cone.
  - ★ B. cylinder.
  - C. rectangular solid.
  - D. sphere.

## Mathematics QCC Standard: Measurement and Geometry (M.9-12)

---

Applies geometric properties, such as the sum of the angles of a polygon property, percent of area of a circle determined by the central angle measure in a pie chart, or parallel sides and angle relations for parallelograms, to practical drawings. (M30)

---

### TEST CONTENT DESCRIPTION

The focus will be on problem-solving in consumer, career, school, home, or leisure settings. In addition to the three properties listed in the objective, test items will assess the student's knowledge of the following geometric properties:

- If two angles are vertical, then they are congruent.
- If two lines are perpendicular, then they form four right angles.
- If two parallel lines are cut by a transversal, then each pair of corresponding angles is congruent.
- If two parallel lines are cut by a transversal, then each pair of alternate interior angles is congruent.
- If two parallel lines are cut by a transversal, then each pair of consecutive interior angles is supplementary.
- If a polygon is convex, then the sum of the degree measures of the exterior angles, one at each vertex, is 360.
- If a quadrilateral is a parallelogram, then a diagonal separates it into two congruent polygons.
- All radii of a circle are congruent.

Mathematics QCC Standard: Measurement and Geometry (M.9-12)

Sample Items

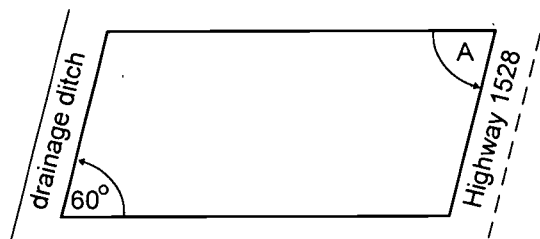
★ Key

Cognitive Level

1. Sarah's flower garden is in the shape of a hexagon. What is the sum of the degree measures of the interior angles of her garden? High

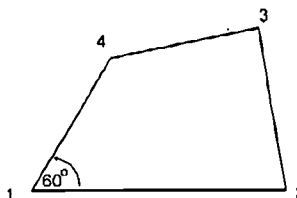
- A.  $120^\circ$
- B.  $180^\circ$
- C.  $360^\circ$
- ★ D.  $720^\circ$

2. Mr. Curtis's field, which is in the shape of a parallelogram, covers an area between Highway 1528 and a drainage ditch. What is the measure of  $\angle A$ ? High



- A.  $30^\circ$
- ★ B.  $60^\circ$
- C.  $120^\circ$
- D. There is not enough information given to determine the measure of  $\angle A$ .

3. In the figure shown here, no sides are parallel. Angle 1 has a measure of  $60^\circ$ . What must be true of the other 3 angles? High



- A. Angles 2, 3, and 4 must be right angles.
- ★ B. We cannot know the measure of the other angles.
- C. Angle 4 = 120, but we can't tell about Angles 2 and 3.
- D. The sum of Angle 2 + Angle 3 + Angle 4 must be  $360^\circ$ .



## **Mathematics QCC Standard: Measurement and Geometry (M.9-12)**

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Draws and measures angles; determines the number of degrees in the interior angles of geometric figures, such as right and straight angles, circles, triangles, and quadrilaterals; and classifies angles (right, acute, obtuse, complementary, supplementary) and triangles (right, acute, obtuse, scalene, isosceles, and equilateral). (M31)

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### **TEST CONTENT DESCRIPTION**

Content limits are defined by the list in the standard. The student will be presented with a situation that might be encountered in consumer, career, school, or leisure settings. Information about the situation will be presented verbally and graphically. The student will be asked to refer to the diagram and classify angles or triangles or determine the measure of angles pictured there. The measures of angles will also be computed from given information using the postulate for angle addition and knowledge of right, straight, supplementary, and complementary angles.

Diagrams should be clearly drawn and correctly labeled. Street maps and subdivision plots make good real-life examples of angles, triangles, and other plane geometric figures.

Incorrect responses to multiple-choice questions should be plausible and in the same form as the correct response. Incorrect responses should represent lack of knowledge of or confusion about:

1. the terms used to classify angles or triangles
2. the facts about the interior angles of plane figures
3. the facts about the measures of supplementary or complementary angles.

**Mathematics QCC Standard: Measurement and Geometry (M.9-12)**

**Sample Items**

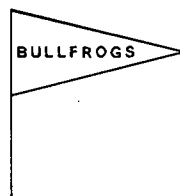
**★ Key**

**Cognitive Level**

**Medium**

1. The Pep Club is making pennants, as shown below. The angles at the top and the bottom of the pennant are equal in measure. Classify the triangle according to the lengths of its sides.

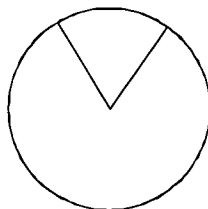
- A. acute triangle
- B. equilateral triangle
- ★ C. isosceles triangle
- D. scalene triangle



**High**

2. Tyrone wants to make a design with a circle divided into pie-shaped pieces of equal size. What is the **smallest** number of pieces Tyrone can have if he wants the central angles to be acute?

- A. 3
- B. 4
- ★ C. 5
- D. 6



**High**

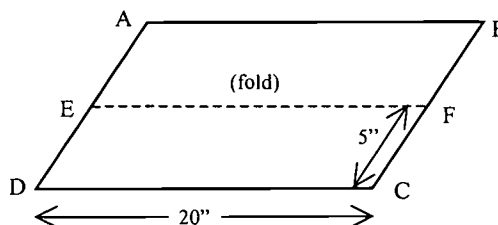
3. If  $\angle A$  and  $\angle B$  are complements, and  $\angle B$  and  $\angle C$  are complements, what must be true of  $\angle A$  and  $\angle C$ ?

- ★ A. They have the same measure.
- B. They are supplementary angles.
- C. They are complementary angles.
- D. They are interior angles of a polygon.

**Medium**

4. Judy has a piece of construction paper shaped like a parallelogram. She folds it in half as shown. What is the measure of line segment AE?

- A. 2.5 inches
- ★ B. 5.0 inches
- C. 10.0 inches
- D. 20.0 inches



Mathematics QCC Standard: Measurement and Geometry (M.9-12)

Sample Items

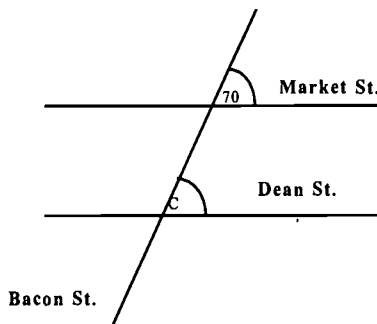
★ Key

Cognitive Level

5. Market Street and Dean Street are parallel to each other. Bacon Street crosses Market Street and Dean Street. What is the measure of  $\angle C$ ?

Low

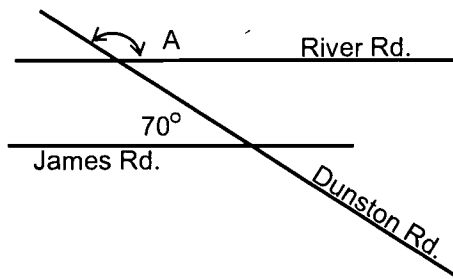
- A.  $30^\circ$
- B.  $60^\circ$
- ★ C.  $70^\circ$
- D.  $110^\circ$



6. James Road and River Road are parallel. What is the measure of  $\angle A$ ?

Medium

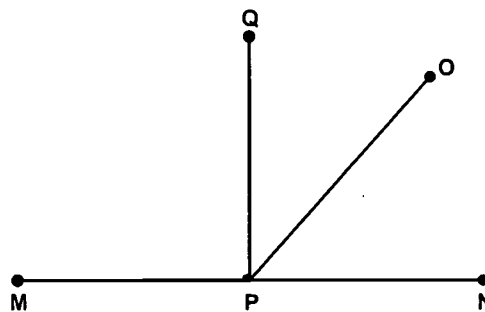
- A.  $70^\circ$
- B.  $90^\circ$
- C.  $100^\circ$
- ★ D.  $110^\circ$



7. What is the measure of  $\angle MPN$ ?

Low

- A.  $60^\circ$
- B.  $90^\circ$
- ★ C.  $180^\circ$
- D.  $360^\circ$



## **Mathematics QCC Standard: Measurement and Geometry (M.9-12)**

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Uses the Pythagorean theorem to solve problems (includes selecting appropriate tools such as the calculator). (M32)

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### **TEST CONTENT DESCRIPTION**

The focus will be on solving problems in which the Pythagorean theorem is clearly the best method to use. Some test items will require the student to recognize situations to which the Pythagorean theorem could be applied or recognize a numerical application of the Pythagorean theorem. Other test items will require the student to apply the Pythagorean theorem in a problem situation and determine a numerical answer to a problem. Whenever it is feasible, test items will be presented in real-world settings.

Quantities should be realistic to the problem and easily manipulated in the required computations. The Pythagorean "triples" will be used in many problems. Diagrams will augment the information in the text.

Measurement units will be included where appropriate. Incorrect answers will reflect conceptual misunderstanding of the Pythagorean theorem, incorrect operation or procedure, or common computational errors.

Mathematics QCC Standard: Measurement and Geometry (M.9-12)

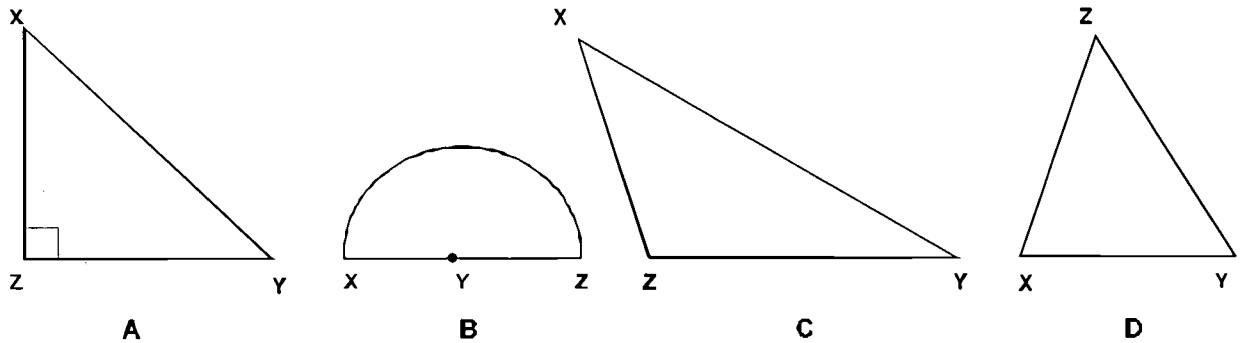
Sample Items

★ Key

Cognitive Level

Medium

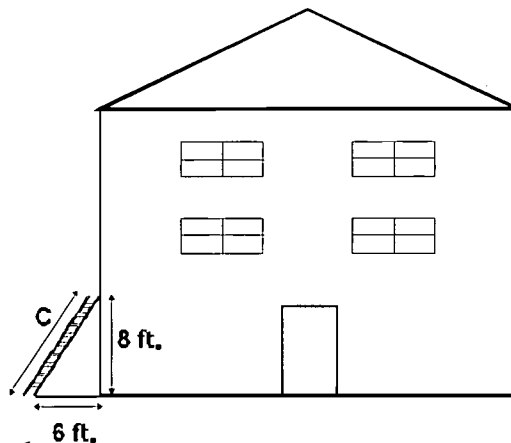
1. In which figure could the Pythagorean theorem be used to find the length of  $\overline{XY}$ ?



- ★ A. A  
 B. B  
 C. C  
 D. D

Medium

2. A ladder is placed against the side of a house, as shown. Which method should determine the length of the ladder (C)?



- A.  $C = 2 \times 8 + 2 \times 6$   
 ★ B.  $C = \sqrt{8^2 + 6^2}$   
 C.  $C = 8 + 6$   
 D.  $C = \frac{(8 \times 6)}{2}$

Mathematics QCC Standards: Measurement and Geometry (M.9-12)

Sample Items

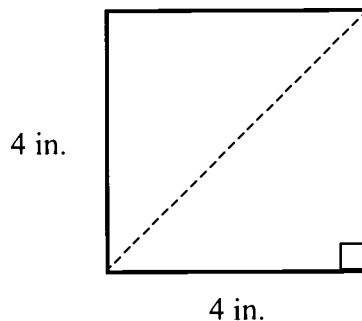
★ Key

Cognitive Level

3. A square piece of paper, each side four inches long, is folded diagonally on the dotted line, as shown. To the nearest inch, how long is the crease made in the fold?

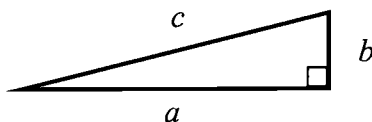
High

- A. 4 inches
- ★ B. 6 inches
- C. 8 inches
- D. 16 inches



4.

High



In the drawing above, the length of side  $a$  equals 36 inches. The length of side  $c$  is 36.5 inches. Which formula would determine the length of side  $b$ ?

- A.  $a^2 + b^2 = c^2$
- ★ B.  $c^2 - a^2 = b^2$
- C.  $a^2 - b^2 = c^2$
- D.  $a^2 + c^2 = b^2$

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

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Simplifies expressions with and without grouping symbols. (M33)

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### 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 " $\div$ " or a fraction bar may be used to indicate division. The symbol " $\times$ " 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)

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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:

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

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)

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### 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)

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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)

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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

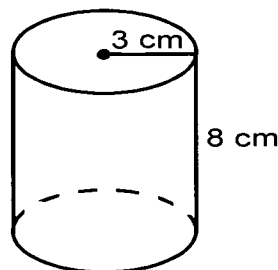
2. The hall in Ms. Jackson's house is a square, 5 feet on each side. To calculate the amount of carpet needed to cover the floor, she had to find the area of the floor. She used the formula  $A = 5^2$ , where 5 represents the length of one side. How many square feet of carpet did she need to carpet the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

$$V = \pi r^2 h$$



- A.  $75.36 \text{ cm}^3$
- ★ B.  $226.08 \text{ cm}^3$
- C.  $336.67 \text{ cm}^3$
- D.  $602.88 \text{ cm}^3$

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

---

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

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### 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)

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

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

**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)

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

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### 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)

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### 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)

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Sample Items

★ Key

Cognitive Level

1. Which operation would be used to solve the equation,  $6x = 42$ ? **Medium**
- A. addition
  - ★ B. division
  - C. multiplication
  - D. subtraction
2. What is the value of  $x$ , if  $2x + 3 = 15$ ? **High**
- A. 5
  - ★ B. 6
  - C. 9
  - D. 12
3. Solve for  $x$ , if  $\frac{2}{x} = \frac{15}{60}$  **High**
- A. 4
  - ★ B. 8
  - C. 20
  - D. 30

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

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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)**

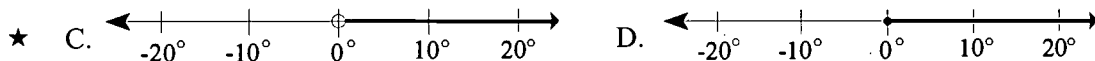
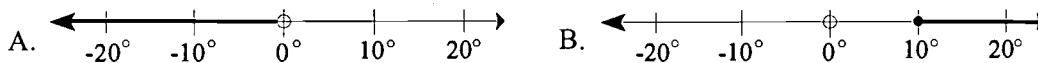
**Sample Items**

**★ Key**

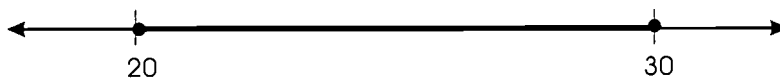
**Cognitive Level**

**High**

1. Consider the statement: Ice will melt at all temperatures above  $0^{\circ}$  Celsius. Which of the graphs below correctly describes this statement?



2.



**High**

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.  $20 \geq g \geq 30$
3. Given the inequality  $7y < 35$ , solve for  $y$ .

**Medium**

- 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.

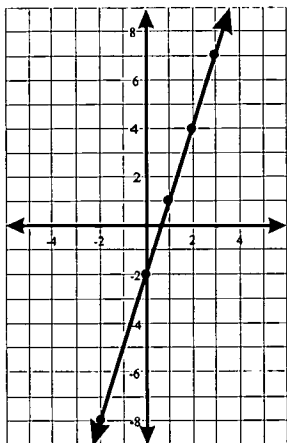
In a multiple-choice format, students cannot be asked to produce their own graphs. A completed graph may be presented, and the student will be asked to identify the appropriate equation. Another type of question will present the equation and ask the student to select the appropriate graph or the appropriate 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 ( $+$ ,  $-$ ,  $<$ ,  $>$ ,  $\leq$ ,  $\geq$ ).

Sample Items

★ Key

Cognitive Level



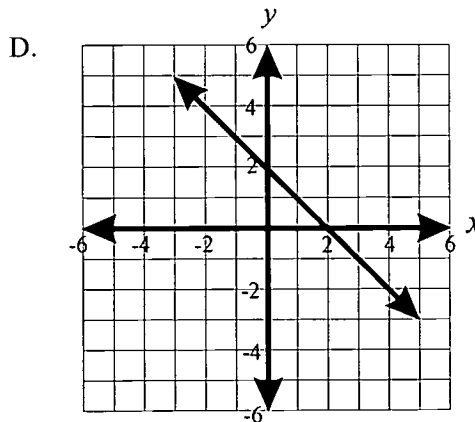
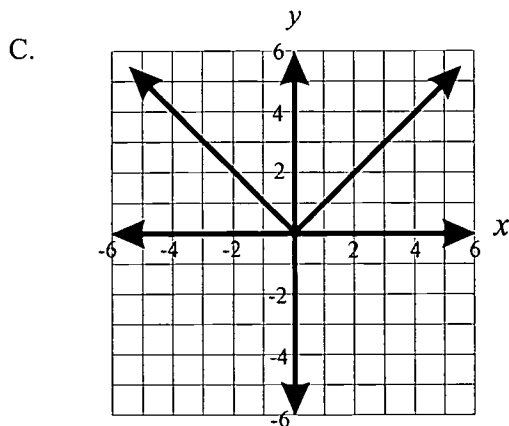
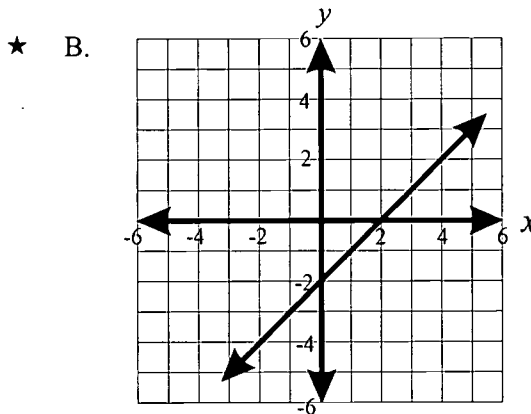
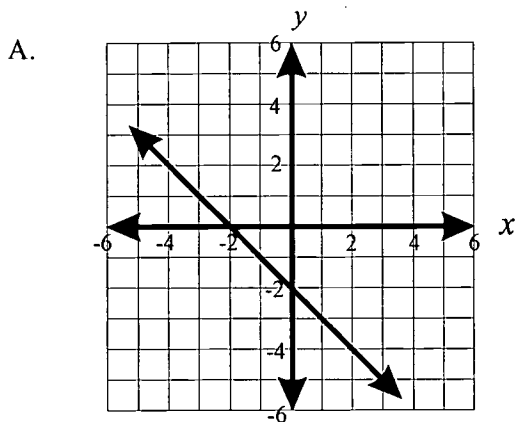
High

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.  $y = 3(x - 2)$

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

High





## 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

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

High

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

Low

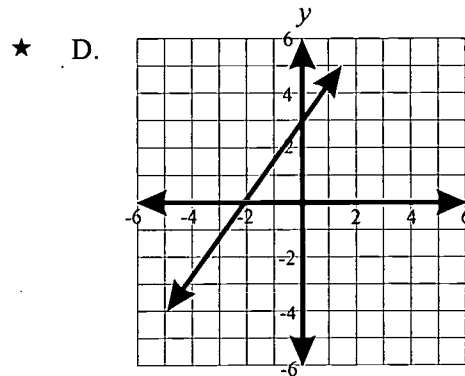
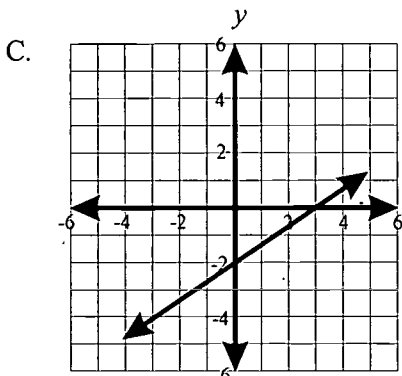
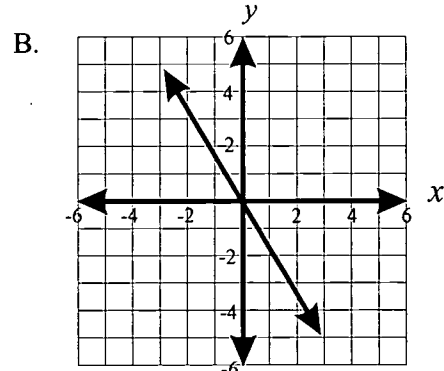
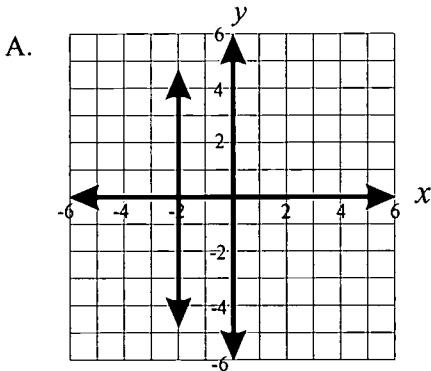
3. Given the equation  $3x - 5y - 15 = 0$ , find the x and y intercepts.

- 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?

High



## 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:

$$\begin{aligned} x + y &= 4 \\ 3x - y &= 0 \end{aligned}$$

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:

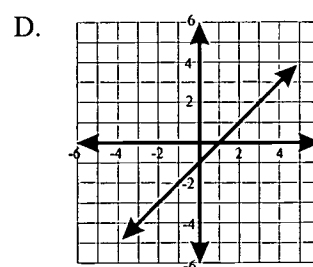
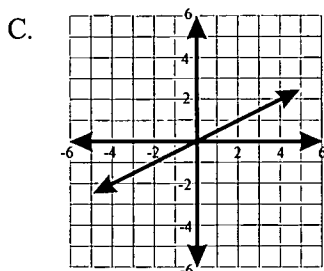
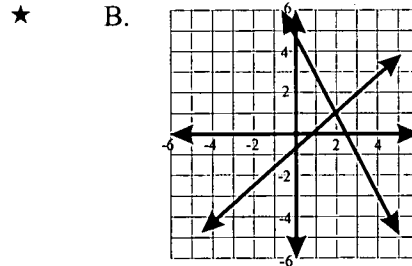
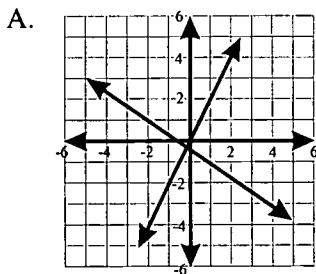
$$\begin{aligned} x + y &= 7 \\ 2x - y &= 5 \end{aligned}$$

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?



## AIMS Mathematics Addendum

On April 24, 2000, the Arizona state Board of Education passed an amendment with regard to the number of mathematics credits necessary for graduation from high school and the years in school during which these classes are to be taken. This amendment, which is effective fall, 2000, reads as follows:

"Effective with the graduating class of 2004, the two required math credits shall be taken consecutively beginning with the ninth grade and course content shall reflect Academic Standards preparation for proficiency at the high school level."

Based on this amendment, a Mathematics Task Force was assembled to study the Mathematics Proficiency Level Standards. The purpose of this meeting was to evaluate the Standards with regard to the Board's amendment and to make recommendations regarding the Standards, the two-credit AIMS-level mathematics requirement for graduation, and the impact on AIMS. The recommendations of the Mathematics Task Force to revise the AIMS mathematics blueprint were presented to, and approved by, the state Board of Education at the state Board meeting on June 26, 2000.

Ideally, the Mathematics Task Force desires all students to be exposed to all 38 concepts and 143 performance objectives that represent the Mathematics Proficiency Standards document during the students' high school careers. However, we recognize that teaching (and learning) the entire document to all students may be outside the scope and sequence of the clearly defined two-credit mathematics instruction that is required. Nevertheless, it should be noted that the Mathematics Proficiency Standards document itself DID NOT CHANGE. The purpose of the Mathematics Task Force was to clearly *identify* the Concepts and Performance Objectives for which all students will be held accountable on AIMS in order to receive a diploma, given the recent decision of the Board. There are 26 concepts and 99 performance objectives in the core curriculum. Of these, all 26 concepts and 76 performance objectives will be assessed on AIMS. We are calling these specific concepts "core" concepts. See our web page below for a look at the complete document.

[http://www.ade.az.gov/standards/math/PublicRevisedBlueprint6\\_26.pdf](http://www.ade.az.gov/standards/math/PublicRevisedBlueprint6_26.pdf)

The following pages reflect the changes made to the AIMS Mathematics blueprint as a result of these decisions. Some concepts and performance objectives have been deleted from or added to the previous blueprint. For concepts and performance objectives that have been added, we are including some representative sample questions.

### Rationale for the *AIMS Mathematics Addendum*

The Arizona Department of Education (ADE) had already printed 125,000 copies of the *High School Student Guide to AIMS* prior to the adoption of the Mathematics Task Force recommendations in June. Since the only changes to the guide are in the Mathematics content area, and only a few changes are required, we are sending this addendum in conjunction with the guide.

**Concepts and Performance Objectives  
Included on the Revised AIMS Mathematics Blueprint  
With Sample Questions For Newly Included P.O.'s**

In the table below, ALL 26 concepts and 76 p.o.'s to be assessed on AIMS are listed. Keep in mind that there are 23 other p.o.'s that are in the core curriculum that are *not* assessed on AIMS. (However, all 26 concepts in the core curriculum will be assessed on AIMS. See our web page, as noted on page 1 of this document, for a look at the complete document.) Some of these 26 concepts and 76 p.o.'s were not on the *previous* AIMS mathematics blueprint. They are bolded and marked "NEW" in this table. As is the case in the original guide, a few p.o.'s were selected for which sample questions were created as examples of how a particular p.o. may be assessed on AIMS. If there is a sample question given in this packet, it will be marked "New Sample Question #\_\_\_." Many others WERE on the previous AIMS mathematics blueprint - these are marked "Same" and are not bolded. If there are sample questions in the original guide for a particular p.o., they are marked "Original Sample Question #\_\_\_." PLEASE NOTE: Although some of the original sample questions are in short answer format, AIMS Mathematics will ONLY have multiple choice format.

Concept	P.O.	Status	Sample Question #
1M-P1		Same	
	1	Same	Original Sample Question #1
1M-P2		Same	
	1	NEW	New Sample Question #1
	3	NEW	New Sample Question #2
	4	NEW	
	5	Moved to 4M-P4.PO4	
	6	Same	
	7	Same	
	8	Same	Original Sample Question #2
2M-P1		Same	
	1	Same	Original Sample Question #8
	2	NEW	Original Sample Question #5
	4	NEW	Original Sample Question #6
	5	NEW	
	6	Same	Original Sample Question #3
2M-P3		Same	
	1	NEW	New Sample Question #3
	3	Same	

Concept	P.O.	Status	Sample Question #
2M-P4		Same	
	1	NEW	New Sample Question #4
	2	NEW	
	3	Same	
2M-P8		Same	
	1	NEW	
2M-P11		NEW	
	1	NEW	New Sample Question #5
	3	NEW	
3M-P1		Same	
	2	Same	
3M-P2		Same	
	3	NEW	New Sample Question #6
3M-P4		Same	
	1	Same	Original Sample Question #16
	2	Same	
	3	Same	
	4	Same	Original Sample Question #9

Concept	P.O.	Status	Sample Question #
3M-P6		Same	
	1	Same	
	2	Same	Original Sample Question #17
	3	Same	Original Sample Question #11
	4	Same	
	6	Same	
	7	Same	
	9	Same	Original Sample Question #10
	10	Same	
	11	Same	Original Sample Question #18
	13	NEW	
	14	Same	
3M-P7		Same	
	1	Same	
	2	Same	Original Sample Question #15
	3	NEW	
3M-P8		Same	
	1	Same	Original Sample Question #14
	2	Same	
3M-P9		Same	
	2	NEW	New Sample Question #7
4M-P1		Same	
	1	Same	Original Sample Question #23
	2	Same	
	3	Same	
4M-P2		Same	
	1	Same	
	2	Same	
	3	Same	Original Sample Question #21
	4	Same	
	6	Same	
	7	Same	Original Sample Question #24
	8	Same	Original Sample Question #19

Concept	P.O.	Status	Sample Question #
4M-P3		Same	
	1	Same	
	3	Same	
	4	NEW	New Sample Question #8
4M-P4		Same	
	1	Same	Orig. Sample Quests. #22 & 25
	2	Same	
	3	Same	
	4	Same	
4M-P5		Same	
	1	Same	Original Sample Question #20
4M-P6		Same	
	1	Same	
	2	Same	
5M-P3		Same	
	2	Same	
	3	Same	Original Sample Question #26
5M-P4		Same	
	1	Same	
	2	Same	
	4	Same	
6M-P1		Same	
	2	Same	
6M-P2		Same	
	2	NEW	New Sample Question #9
	3	Same	
	4	NEW	
6M-P3		Same	
	1	Same	
6M-P5			
	1	NEW	New Sample Question #10
	2	Same	

## NEW SAMPLE QUESTIONS

### STANDARD 1: Number Sense

**Question 1** (assesses concept 1.2.1 - determine a rational estimate of an irrational number)

Which of the following is the best estimate of  $\sqrt{12}$ ?

- A. 2.5                      B. 3  
C. 3.5                      D. 4

**Question 2** (assesses concept 1.2.3 - solve real-world problems using absolute value)

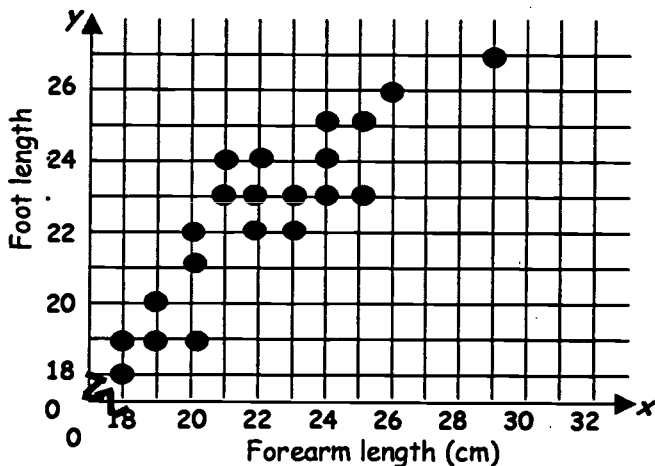
A submarine is 285 feet under the surface of the ocean. A helicopter is flying at 4,500 feet above sea level. Given that the helicopter is directly above the submarine, how far apart are they?

- A. 285 feet                  B. 4,215 feet  
C. 4,785 feet                D. 4,500 feet

### STANDARD 2: Data Analysis and Probability

**Question 3** (assesses concept 2.3.1 - draw a line which closely fits a scatter plot)

Examine the graph below which shows the forearm lengths and foot lengths of 18 students in an algebra class.



In order to approximate the best fitting line, which two points should be used to create the equation representing this line?

- A. (18, 18) and (29, 27)    B. (23, 22) and (23, 23)  
C. (21, 23) and (25, 23)    D. (19, 20) and (26, 26)

**Question 4** (assesses concept 2.4.1 - differentiate between sampling and census)

Which of the following is an example of the use of a census?

- A. All the students at XYZ High School are asked whether they ride the bus to school.  
B. All the juniors in a government class are asked their opinion about changing the school mascot.  
C. All the seniors are asked if they like calculus class.  
D. All the girls in an algebra class are asked to participate in a survey.

**Question 5** (assesses concept 2.11.1 - apply the concepts of mean, median, mode, and range to draw conclusions about data)

Nutritionists often recommend a diet that is low in fat. The table below lists the approximate fat content of some breads and crackers.

Breads & Crackers	Fat Content Per Serving* (g)
Cracked wheat bread	0.9
Whole wheat bread	1.1
Pita bread	0.6
Matzo	0.3
Graham cracker	0.5
Corn muffin	4.0
Rice cake	0.3
Tortilla	1.1
Bran muffin	5.1
Pumpernickel	1.1
*Fat content per serving may vary by manufacturer	

Adapted from "Integrated Mathematics," 1995, Houghton Mifflin Company.

What is the median of this data set?

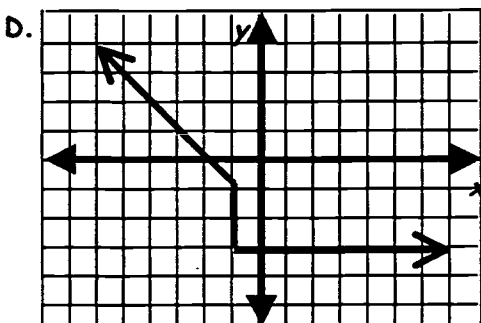
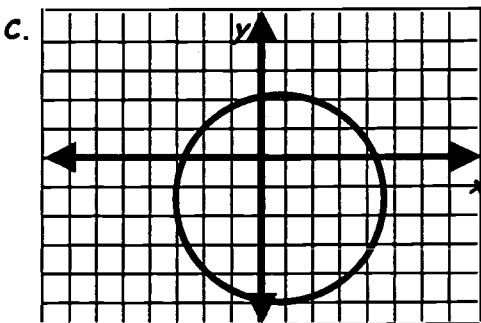
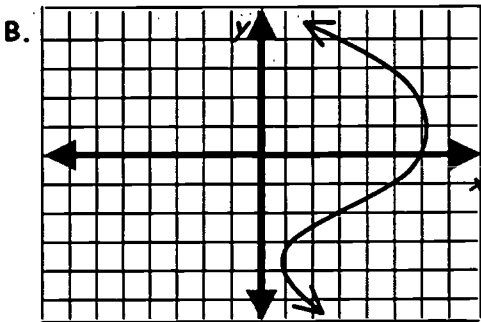
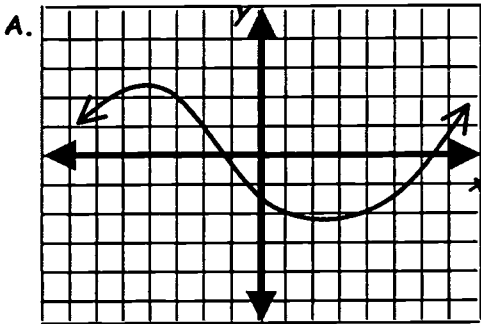
- A. 0.9                                      B. 1.0  
C. 1.1                                      D. 1.5



## STANDARD 3: Patterns, Algebra and Functions

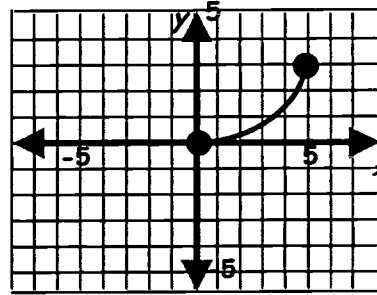
**Question 6** (assesses concept 3.2.3 - determine whether a relation is a function given the graphical representation)

Which graph below represents a function?



**Question 7** (assesses concept 3.9.2 - determine the domain and range of a relation, given the graph or a set of points)

What is the domain of the relation below?

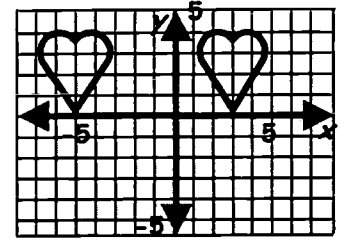
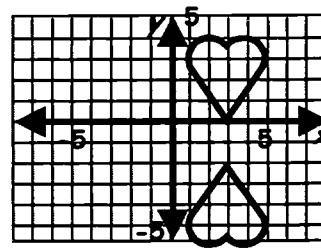


- A.  $y \leq 0$                       B.  $0 \leq x \leq 5$   
 C.  $x \leq 0$                       D.  $0 \leq y \leq 3$

## STANDARD 4: Geometry

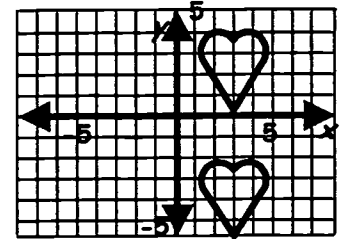
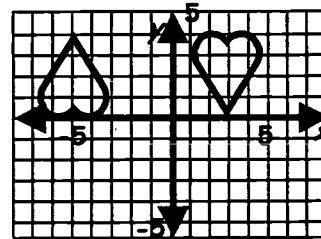
**Question 8** (assesses 4.3.4 - sketch the planar figure that is the result of a given transformation)

Which of the following graphs represents a reflection of the figure about the line  $x = -1$ ?



A.

B.



C.

D.

## STANDARD 5: Measurement and Discrete Mathematics

NOTE: There are no new concepts or performance objectives in Standard 5.

## STANDARD 6: Mathematical Structure/Logic

**Question 9** (assesses concept 6.2.2 - draw a simple valid conclusion from a given *if...then* statement...)

If an angle's measure is between  $0^\circ$  and  $90^\circ$ , then it is an acute angle. Jenny measured the angle made by two walls in her home and found the angle to be  $84^\circ$ . Which of the following conclusions is most reasonable?

- A. Jenny needs to measure another angle.
- B. The angle is a right angle.
- C. The angle is an obtuse angle.
- D. The angle is an acute angle.

**Question 10** (assesses concept 6.5.1 - determine whether a given algebraic expression and a possible simplified form are equivalent)

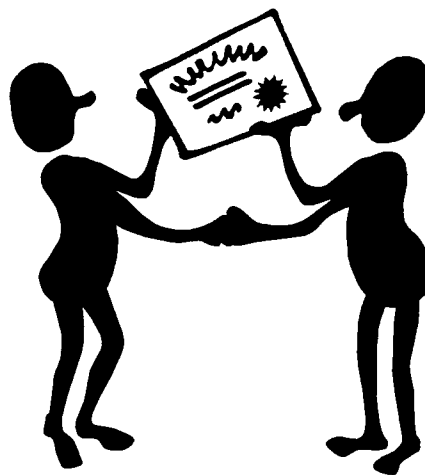
Which of the following is equivalent to the expression  $2(3x - 2y) + 4y$

- A.  $6x$
- B.  $6x + 8y$
- C.  $6x - 2y$
- D.  $2xy + 4y$

\* \* \* \* \*

### MATHEMATICS KEY

- Question #1. C
- Question #2. C
- Question #3. D
- Question #4. A
- Question #5. B
- Question #6. A
- Question #7. B
- Question #8. B
- Question #9. D
- Question #10. A



**You CAN  
do it!**



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