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## XII. Mathematics, Grade 6

# Grade 6 Mathematics Test

The spring 2017 grade 6 Mathematics test was a next-generation assessment, featuring a new test design and new item types. The test was administered in two formats: a computer-based version and a paper-based version. The test included both operational items, which count toward a student's score, and matrix items. The matrix portion of the test consisted of field-test questions that do not count toward a student's score.

In general, all students were administered the same operational items, regardless of whether they took the computer-based test or the paper-based test. In some instances, the wording or content of a paper item differed slightly from the computer-based version. More information about the differences between the computer-based and paper-based tests will be posted to the MCAS website at [www.doe.mass.edu/mcas/](http://www.doe.mass.edu/mcas/).

This document displays the **paper-based versions** of the 2017 operational items that have been released. The **computer-based versions** of the released items are available on the MCAS Resource Center website at [mcas.pearsonsupport.com](http://mcas.pearsonsupport.com).

## Test Sessions and Content Overview

The grade 6 Mathematics test was made up of two separate test sessions. Each session included selected-response, short-answer, and constructed-response questions. On the paper-based test, the selected-response questions were multiple-choice items and multiple-select items, in which students select the correct answer(s) from among several answer options.

## Standards and Reporting Categories

The grade 6 Mathematics test was based on standards in the five domains for grade 6 in the *Massachusetts Curriculum Framework for Mathematics* (March 2011). The grade 6 standards can be found on pages 53–58 in the *Framework*, and the five domains are listed below.

- Ratios and Proportional Relationships
- The Number System
- Expressions and Equations
- Geometry
- Statistics and Probability

The *Massachusetts Curriculum Framework for Mathematics* is available on the Department website at [www.doe.mass.edu/frameworks/current.html](http://www.doe.mass.edu/frameworks/current.html).

Mathematics test results are reported under five MCAS reporting categories, which are identical to the five framework domains listed above.

The tables at the conclusion of this chapter provide the following information about each released and unreleased operational item: reporting category, standard(s) covered, item type, and item description. The correct answers for released selected-response and short-answer questions are also displayed in the released item table.

## Reference Materials and Tools

Each student taking the paper-based version of the grade 6 Mathematics test was provided with a plastic ruler and a grade 6 Mathematics Reference Sheet. A copy of the reference sheet follows the final question in this chapter. An image of the ruler is not reproduced in this publication.

During both Mathematics test sessions, the use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only. No calculators, other reference tools, or materials were allowed.

# Grade 6 Mathematics

This session contains 5 questions.

*You may use your reference sheet during this session.  
You may **not** use a calculator during this session.*



## Directions

Read each question carefully and then answer it as well as you can. You must record all answers in your Student Answer Booklet.

For some questions, you will mark your answers by filling in the circles in your Student Answer Booklet. Make sure you darken the circles completely. Do not make any marks outside of the circles. If you need to change an answer, be sure to erase your first answer completely.

For other questions, you will need to fill in an answer grid. Directions for completing questions with answer grids are provided on the next page.

If a question asks you to show or explain your work, you must do so to receive full credit. Write your response in the space provided in your Student Answer Booklet. Only responses written within the provided space will be scored.



# Mathematics

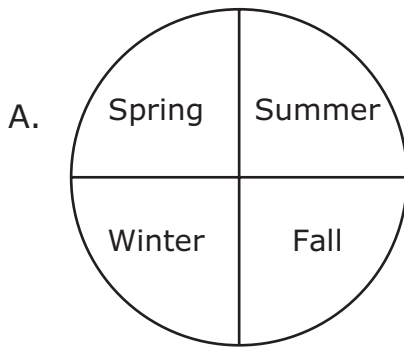
- 1 Rasheed conducted a survey at his school. He asked each student to name one favorite season of the year. The results of Rasheed's survey are shown in this chart.

**Students' Favorite Season of the Year**

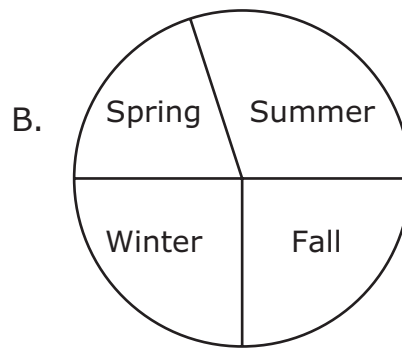
Season of the Year	Number of Students
Spring	120
Summer	180
Fall	150
Winter	150

Which of the following circle graphs appears to correctly represent the results of Rasheed's survey?

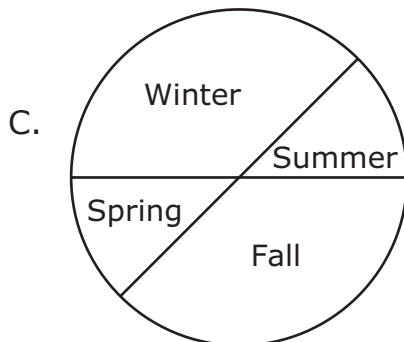
**Students' Favorite Season of the Year**



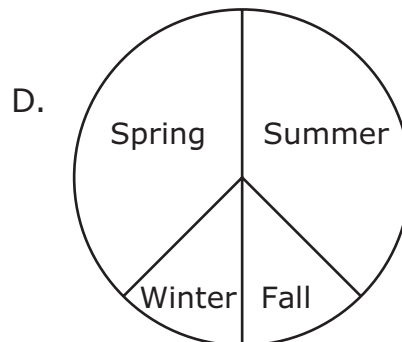
**Students' Favorite Season of the Year**



**Students' Favorite Season of the Year**

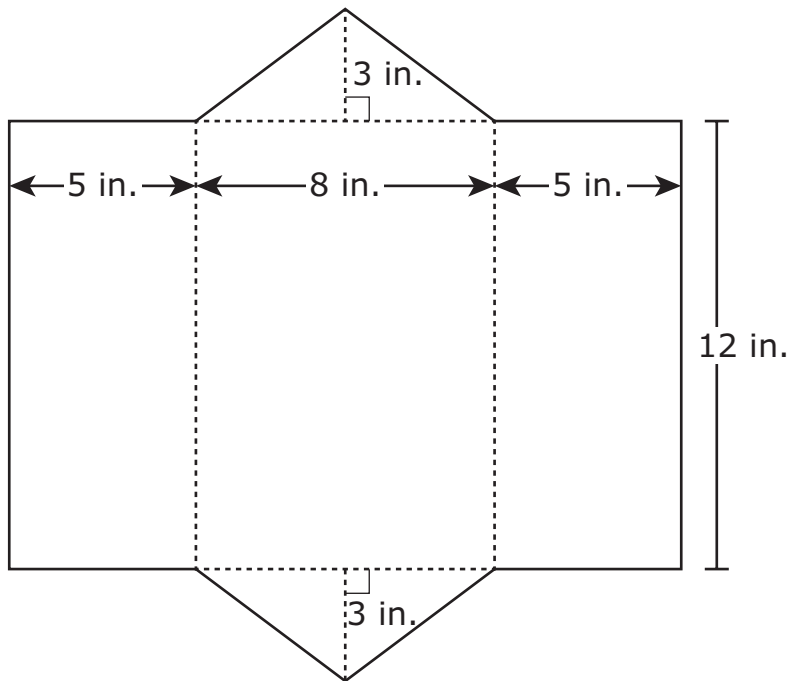


**Students' Favorite Season of the Year**



## Mathematics

- 2 The net of a triangular prism and some of its dimensions are shown in the diagram.



What is the total surface area, in square inches, of the triangular prism?

Enter your answer in the box.

## Mathematics

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- 3 Jasmine is solving this equation.

$$\frac{x}{4} = 9$$

What value of  $x$  makes Jasmine's equation true?

- A. 5
- B. 9
- C. 13
- D. 36

## Mathematics

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- 4 Mr. Johnson's class has 24 students.
- There are 18 students in the class who study Spanish.
  - The other students in the class study French.

In Mr. Johnson's class, which of the following is the ratio of students who study French to students who study Spanish?

- A. 1:3
- B. 1:4
- C. 2:3
- D. 3:4



## Mathematics

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- 5 This table shows the relationship between the number of pies sold at a farm and the total profit made, in dollars, from the pies sold at the farm.

**Profit Made from Pies Sold**

Number of Pies Sold, $n$	Profit Made, $p$ (dollars)
2	8
4	16
6	24
8	32

### Part A

Based on the table, what is the profit made, in dollars, from each pie sold at the farm? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

### Part B

Write an equation that can be used to find  $p$ , the total profit made, in dollars, when  $n$  pies are sold at the farm.

Enter your equation in the space provided.

### Part C

Use the equation you wrote in Part B to calculate the profit made, in dollars, when 15 pies are sold at the farm. Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

### Part D

One day, the farm made a profit of \$144 from the pies sold. How many pies were sold at the farm on that day? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

**CONVERSIONS**

1 cup = 8 fluid ounces

1 pint = 2 cups

1 quart = 2 pints

1 gallon = 4 quarts

1 gallon  $\approx$  3.785 liters

1 liter  $\approx$  0.264 gallon

1 liter = 1000 cubic centimeters

1 inch = 2.54 centimeters

1 meter  $\approx$  39.37 inches

1 mile = 5280 feet

1 mile = 1760 yards

1 mile  $\approx$  1.609 kilometers

1 kilometer  $\approx$  0.62 mile

1 pound = 16 ounces

1 pound  $\approx$  0.454 kilogram

1 kilogram  $\approx$  2.2 pounds

1 ton = 2000 pounds

**AREA ( $A$ ) FORMULAS**

square . . . . .  $A = s^2$

rectangle . . . . .  $A = bh$

OR

$A = lw$

parallelogram . . . . .  $A = bh$

triangle . . . . .  $A = \frac{1}{2}bh$

( $b$  = length of base;  $h$  = height)

circle . . . . .  $A = \pi r^2$

( $r$  = radius)

**CIRCLE FORMULAS**

area . . . . .  $A = \pi r^2$

circumference . . . . .  $C = 2\pi r$

OR

$C = \pi d$

( $d$  = diameter)

**VOLUME ( $V$ ) FORMULAS**

right rectangular prism . . . . .  $V = lwh$

( $l$  = length;  $w$  = width;  $h$  = height)

OR

$V = Bh$

( $B$  = area of base;  $h$  = height)

**Grade 6 Mathematics**  
**Spring 2017 Released Operational Items:**  
**Reporting Categories, Standards, Item Descriptions, and Correct Answers**

Item No.	Page No.	Reporting Category	Standard	Item Type*	Description	Correct Answer**
1	167	<i>Statistics and Probability</i>	6.SP.2.04	SR	Determine which circle graph represents given data.	B
2	168	<i>Geometry</i>	6.G.1.04	SA	Determine the surface area of a three-dimensional figure given its net.	240 square inches
3	169	<i>Expressions and Equations</i>	6.EE.2.07	SR	Find the value of the unknown variable in an equation that represents a real-world context.	D
4	170	<i>Ratios and Proportional Relationships</i>	6.RP.1.01	SR	Determine which ratio describes a given ratio relationship in a real-world context.	A
5	171	<i>Expressions and Equations</i>	6.EE.3.09	CR	Analyze the relationship between the variables in a table to create and solve an equation that represents a given real-world context.	

\* Mathematics item types are: selected-response (SR), short-answer (SA), and constructed-response (CR).

\*\*Answers are provided here for selected-response and short-answer items only. Sample responses and scoring guidelines for any constructed-response items will be posted to the Department's website later this year.

**Grade 6 Mathematics**  
**Spring 2017 Unreleased Operational Items:**  
**Reporting Categories, Standards, and Item Descriptions**

Item No.	Reporting Category	Standard	Item Type*	Description
6	<i>Expressions and Equations</i>	6.EE.3.09	SA	Analyze the relationship in an input-output table, and determine the value of the output given the value of a new input.
7	<i>Geometry</i>	6.G.1.03	SA	Determine which coordinate plane shows a triangle with the given vertices, and use the coordinates of two vertices to determine the length of a side.
8	<i>The Number System</i>	6.NS.2.04	SR	Given an expression, use the distributive property to select an equivalent expression.
9	<i>Statistics and Probability</i>	6.SP.2.04	SR	Determine which histogram represents the data from a real-world context.
10	<i>The Number System</i>	6.NS.2.02	SA	Find the quotient of two multi-digit whole numbers.
11	<i>Ratios and Proportional Relationships</i>	6.RP.1.03	SA	Solve multiple unit rate problems based on given real-world context.

Item No.	Reporting Category	Standard	Item Type*	Description
12	<i>Expressions and Equations</i>	6.EE.2.06	SR	Determine which expression represents a given real-world situation.
13	<i>Geometry</i>	6.G.1.01	CR	Solve real-world problems involving measurements of circles.
14	<i>The Number System</i>	6.NS.2.03	SA	Find the difference of two multi-digit decimals.
15	<i>The Number System</i>	6.NS.1.01	CR	Solve a real-world problem involving quotients of fractions.
16	<i>Expressions and Equations</i>	6.EE.2.05	SR	Find the value of the unknown variable in an equation.
17	<i>Statistics and Probability</i>	6.SP.2.05	SR	Determine which statements about the mean, median, interquartile range, and mean absolute deviation describe the data in a given box plot.
18	<i>Expressions and Equations</i>	6.EE.1.02	SR	Find the value of the unknown variable in an expression that represents a real-world context.
19	<i>Statistics and Probability</i>	6.SP.2.05	SR	Determine the mean absolute deviation based on data collected from a real-world context.
20	<i>The Number System</i>	6.NS.3.05	SR	Select the quantities as they relate to the meaning of zero in a given real-world context.
21	<i>Expressions and Equations</i>	6.EE.2.07	SA	Find the value of the unknown variable in a given equation.
22	<i>Statistics and Probability</i>	6.SP.1.02	SR	Determine which dot plot represents data from a real-world context.
23	<i>Expressions and Equations</i>	6.EE.2.08	SR	Determine which number line shows the solution set of a given inequality.
24	<i>Ratios and Proportional Relationships</i>	6.RP.1.03	SA	Solve multiple unit rate problems based on given real-world context.
25	<i>Expressions and Equations</i>	6.EE.1.04	SR	Determine which expressions are equivalent to a given expression.
26	<i>Statistics and Probability</i>	6.SP.2.04	SR	Interpret a circle graph to solve a real-world problem.
27	<i>Expressions and Equations</i>	6.EE.2.07	SA	Determine which equations represent a given real-world context, and solve a problem based on the same context.
28	<i>Expressions and Equations</i>	6.EE.1.01	SR	Determine which expression involving a whole-number exponent represents a given multi-digit whole number.
29	<i>Statistics and Probability</i>	6.SP.2.05	SA	Solve a real-world problem given the measure of center that describes the situation.
30	<i>Statistics and Probability</i>	6.SP.2.04	SR	Interpret a dot plot to solve a real-world problem.
31	<i>Ratios and Proportional Relationships</i>	6.RP.1.03	SA	Solve real-world problems involving percents.
32	<i>Geometry</i>	6.G.1.02	SR	Find the volume of a given right rectangular prism.
33	<i>Expressions and Equations</i>	6.EE.2.06	SR	Determine which expression represents a given real-world context.
34	<i>The Number System</i>	6.NS.1.01	CR	Solve a real-world problem involving quotients of fractions.

\* Mathematics item types are: selected-response (SR), short-answer (SA), and constructed-response (CR).