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## XII. Mathematics, Grade 6

## Grade 6 Mathematics Test

The spring 2015 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 indicate each released and unreleased common item's reporting category and the framework standard it assesses. The correct answers for released multiple-choice and short-answer questions are also displayed in the released item table.

### Test Sessions

The grade 6 Mathematics test included two separate test sessions. Each session included multiple-choice, short-answer, and open-response questions. Approximately half of the common test items are shown on the following pages as they appeared in test booklets.

### Reference Materials and Tools

Each student taking 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

## SESSION 1

You may use your reference sheet and MCAS ruler during this session.

You may **not** use a calculator during this session.



### DIRECTIONS

This session contains six multiple-choice questions, one short-answer question, and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

1 Justin divided 403 by a number and got a quotient of 26 with a remainder of 13. What was the number Justin divided by?

- A. 13
- B. 14
- C. 15
- D. 16

2 Leigh wants to find the number of ounces of pretzels in a 4-pound container. She knows the ratio of ounces to pounds is 16:1.

Which of the following equations can Leigh use to find  $x$ , the number of ounces of pretzels in the 4-pound container?

A.  $\frac{x \text{ ounces}}{4 \text{ pounds}} = \frac{16 \text{ ounces}}{1 \text{ pound}}$

B.  $\frac{x \text{ ounces}}{4 \text{ pounds}} = \frac{1 \text{ pound}}{16 \text{ ounces}}$

C.  $\frac{4 \text{ ounces}}{x \text{ ounces}} = \frac{16 \text{ pounds}}{1 \text{ pound}}$

D.  $\frac{4 \text{ pounds}}{x \text{ ounces}} = \frac{16 \text{ pounds}}{1 \text{ ounce}}$

- 3 Which of the following is equivalent to the expression below?

$$7h + 1$$

- A.  $h + 7$
- B.  $7(h + 1)$
- C.  $(5h + 2) + 1$
- D.  $(5 + 2)h + 1$

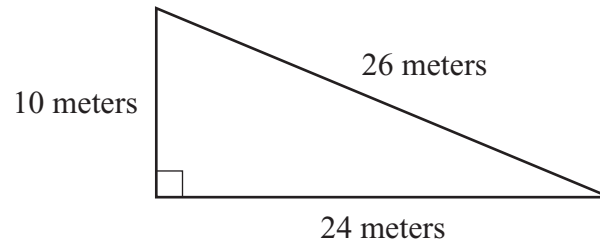
- 4 Which of the following is equivalent to the expression below?

$$3 \times 3 \times 3 \times 3$$

- A.  $3^3$
- B.  $3^4$
- C.  $4^3$
- D.  $4 \times 3$

**Question 5 is a short-answer question. Write your answer to this question in the box provided in your Student Answer Booklet. Do not write your answer in this test booklet. You may do your figuring in the test booklet.**

- 5** A right triangle and its dimensions are shown in the diagram below.



What is the area, in square meters, of the triangle?

Question 6 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 6 in the space provided in your Student Answer Booklet.

- 6 Lily wrote the expression shown in the box below.

$$6x - 3$$

- What is the coefficient of the variable in Lily's expression?
- What is the value of Lily's expression when  $x = 5$ ? Show or explain how you got your answer.

Pedro wrote an expression that is equivalent to the statement shown in the box below.

8 more than the difference of  $2x$  and 1

- What could be the expression that Pedro wrote?
- What is the difference of the value of Lily's expression when  $x = 5$  and the value of Pedro's expression when  $x = 5$ ? Show or explain how you got your answer.

Mark your answers to multiple-choice questions 7 and 8 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 7 Each meal at a school cafeteria is served with 2 portions of vegetables. What is the ratio of meals served to portions of vegetables served at the school cafeteria?
- A. 1:2
  - B. 1:3
  - C. 2:1
  - D. 3:1
- 8 Madison finished  $\frac{4}{5}$  of her homework before dinner. What percent of Madison's homework is **left** to finish?
- A. 15%
  - B. 20%
  - C. 45%
  - D. 80%

# Grade 6 Mathematics

## SESSION 2

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

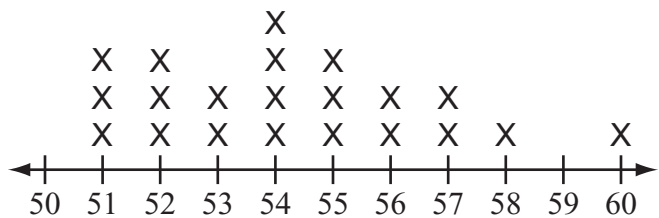


### DIRECTIONS

This session contains ten multiple-choice questions, two short-answer questions, and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 9 All of the benches in a park are red or blue. The ratio of red benches to blue benches in the park is 3:4.
- Based on this information, which of the following statements is true?
- A. For every 4 benches in the park, 3 are red.
  - B. For every 7 benches in the park, 4 are red.
  - C. For every 3 red benches in the park, there are 4 blue benches.
  - D. For every 3 red benches in the park, there are 7 blue benches.

- 10 A police officer recorded the speeds, in miles per hour, of 21 cars that passed by on a highway. The results are shown in the line plot below.



**Speeds of Cars on a Highway**  
(miles per hour)

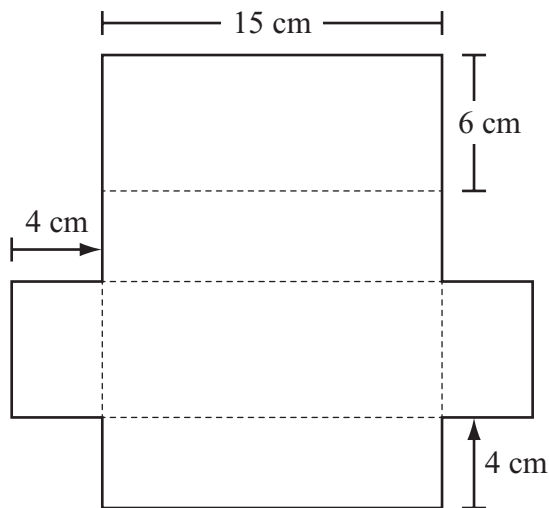
What is the total number of cars that had a recorded speed **greater than** 55 miles per hour?

- A. 6
- B. 9
- C. 12
- D. 21



- 11 Ms. Nelson needs  $5\frac{1}{2}$  yards of fabric to make 2 identical dresses. How much fabric is needed to make **each** dress?
- A.  $2\frac{3}{4}$  yards
  - B.  $2\frac{7}{8}$  yards
  - C. 3 yards
  - D. 11 yards

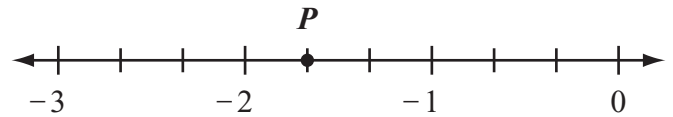
- 12 The net of a rectangular prism and some of its dimensions are shown in the diagram below.



What is the total surface area, in square centimeters, of the rectangular prism?

- A. 174
- B. 258
- C. 348
- D. 360

- 13 Which of the following numbers best represents the location of point *P* on the number line below?



- A.  $-1\frac{1}{3}$
  - B.  $-1\frac{2}{3}$
  - C.  $-2\frac{1}{3}$
  - D.  $-2\frac{2}{3}$
- 14 Sean's height is 1.8 meters. What is Sean's height in centimeters?
- A. 0.018 centimeter
  - B. 0.18 centimeter
  - C. 18 centimeters
  - D. 180 centimeters

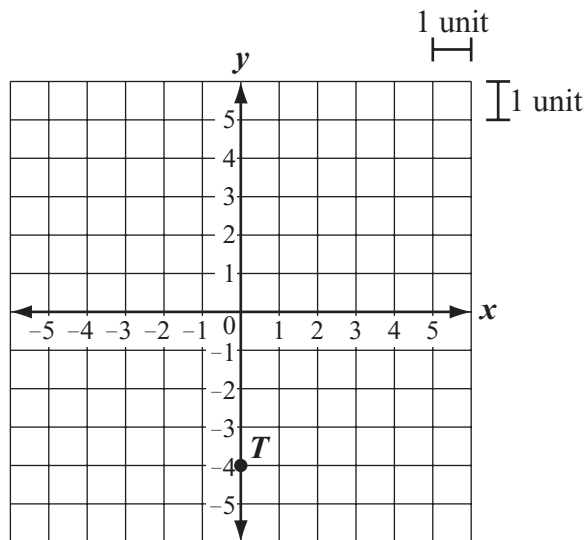
Questions 15 and 16 are short-answer questions. Write your answers to these questions in the boxes provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 15 Mason wrote the expression shown below.

$$5(y + 2)$$

Write an expression that is equivalent to Mason's expression.

- 16 The location of point  $T$  is shown on the coordinate grid below.



Point  $S$  is located 5 units to the right of point  $T$ . What are the coordinates of point  $S$ ?

Question 17 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 17 in the space provided in your Student Answer Booklet.

- 17 Zoe recorded the number of hours she worked each day for 5 days. Her data set is shown in the box below.

4, 8, 2, 3, 8
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- a. What is the median number of hours Zoe worked for the 5 days? Show or explain how you got your answer.
- b. What is the mean number of hours Zoe worked for the 5 days? Show or explain how you got your answer.

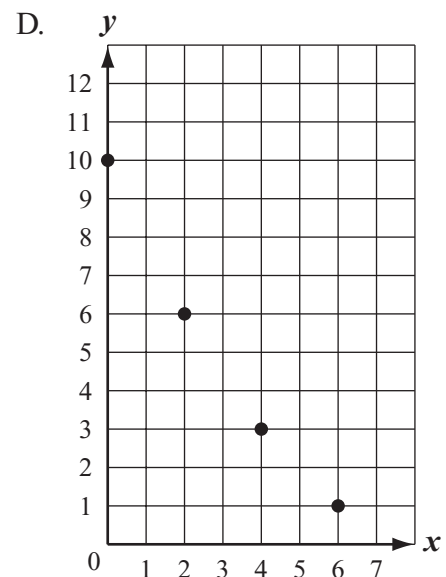
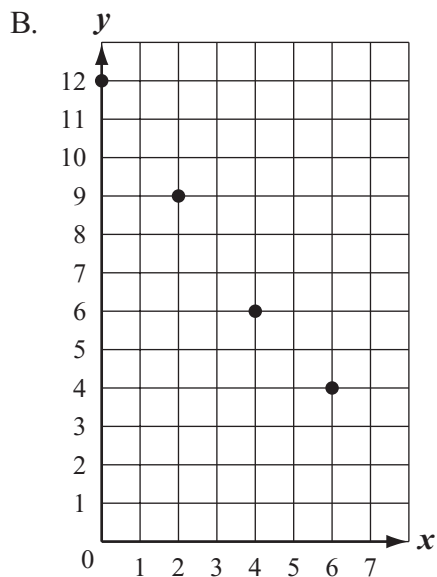
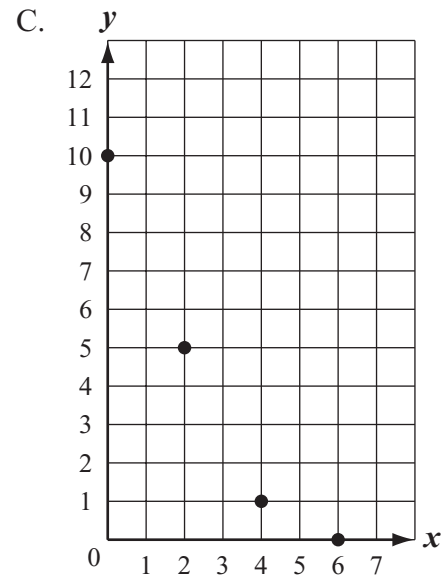
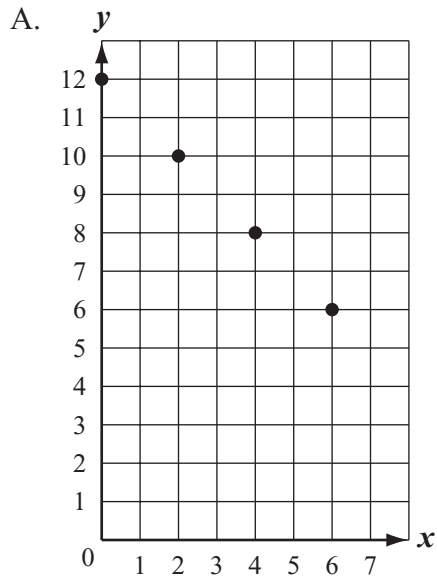
Lance also recorded the number of hours he worked each day for 5 days. His data set is shown in the box below.

2, 2, 3, 5, 8
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- c. Which measure is the same for both Zoe's and Lance's data sets: median, mean, or range? Show or explain how you got your answer.

Mark your answers to multiple-choice questions 18 through 21 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

18 Which of the following graphs shows a constant rate of change between the variables  $x$  and  $y$ ?



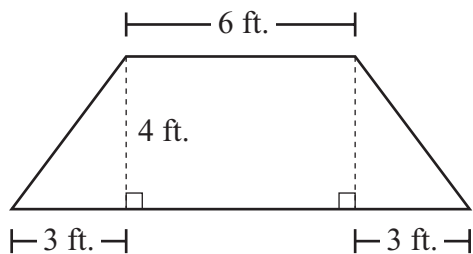
19 Two bands are marching in a parade.

- There are 32 people marching in the first band.
- There are 40 people marching in the second band.
- The same number of people are marching in each row in both bands.

What is the **greatest** number of people that could be marching in each row?

- A. 2
- B. 4
- C. 8
- D. 10

20 Mr. Walsh has a sign that is in the shape of a trapezoid. Some of the dimensions of Mr. Walsh’s sign are shown below.



What is the area of Mr. Walsh’s sign?

- A. 24 sq. ft.
- B. 36 sq. ft.
- C. 42 sq. ft.
- D. 48 sq. ft.

21 Which of the following is closest to the circumference, in inches, of a circle with a diameter of 5 inches? (Use 3.14 for  $\pi$ .)

- A. 15.7 inches
- B. 19.6 inches
- C. 31.4 inches
- D. 78.5 inches

**PERIMETER FORMULAS**

perimeter = distance around

square . . . . .  $P = 4s$

rectangle . . . . .  $P = 2b + 2h$

OR

$P = 2l + 2w$

triangle . . . . .  $P = a + b + c$

**AREA FORMULAS**

square . . . . .  $A = s \times s$

rectangle . . . . .  $A = bh$

OR

$A = lw$

parallelogram . . . . .  $A = bh$

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

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

**VOLUME FORMULAS**

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

cube . . . . .  $V = s \times s \times s$

( $s$  = length of an edge)

**CIRCLE FORMULAS**

$C = 2\pi r$

OR

$C = \pi d$

$A = \pi r^2$

**Grade 6 Mathematics**  
**Spring 2015 Released Items:**  
**Reporting Categories, Standards, and Correct Answers\***

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC/SA)*
1	188	<i>The Number System</i>	NS.2	C
2	188	<i>Ratios and Proportional Relationships</i>	RP.3	A
3	189	<i>Expressions and Equations</i>	EE.4	D
4	189	<i>Expressions and Equations</i>	EE.1	B
5	190	<i>Geometry</i>	G.1	120 square meters
6	191	<i>Expressions and Equations</i>	EE.2	
7	192	<i>Ratios and Proportional Relationships</i>	RP.1	A
8	192	<i>Ratios and Proportional Relationships</i>	RP.3	B
9	193	<i>Ratios and Proportional Relationships</i>	RP.1	C
10	193	<i>Statistics and Probability</i>	SP.4	A
11	194	<i>The Number System</i>	NS.1	A
12	194	<i>Geometry</i>	G.4	C
13	194	<i>The Number System</i>	NS.6	B
14	194	<i>Ratios and Proportional Relationships</i>	RP.3	D
15	195	<i>Expressions and Equations</i>	EE.3	$5y + 10$ or equivalent
16	195	<i>The Number System</i>	NS.8	$(5, -4)$
17	196	<i>Statistics and Probability</i>	SP.5	
18	197	<i>Expressions and Equations</i>	EE.9	A
19	198	<i>The Number System</i>	NS.4	C
20	198	<i>Geometry</i>	G.1	B
21	198	<i>Geometry</i>	G.1	A

\* Answers are provided here for multiple-choice and short-answer items only. Sample responses and scoring guidelines for open-response items, which are indicated by the shaded cells, will be posted to the Department's website later this year.

**Grade 6 Mathematics**  
**Spring 2015 Unreleased Common Items:**  
**Reporting Categories and Standards**

<b>Item No.</b>	<b>Reporting Category</b>	<b>Standard</b>
22	<i>Geometry</i>	G.1
23	<i>Statistics and Probability</i>	SP.4
24	<i>Expressions and Equations</i>	EE.9
25	<i>Statistics and Probability</i>	SP.5
26	<i>Statistics and Probability</i>	SP.5
27	<i>Ratios and Proportional Relationships</i>	RP.2
28	<i>Geometry</i>	G.2
29	<i>Expressions and Equations</i>	EE.8
30	<i>Statistics and Probability</i>	SP.5
31	<i>Expressions and Equations</i>	EE.5
32	<i>Expressions and Equations</i>	EE.6
33	<i>Expressions and Equations</i>	EE.9
34	<i>The Number System</i>	NS.7
35	<i>Expressions and Equations</i>	EE.7
36	<i>Geometry</i>	G.3
37	<i>The Number System</i>	NS.3
38	<i>Statistics and Probability</i>	SP.5
39	<i>Geometry</i>	G.2
40	<i>Expressions and Equations</i>	EE.6
41	<i>Expressions and Equations</i>	EE.1
42	<i>Ratios and Proportional Relationships</i>	RP.3