# XIV. Mathematics, Grade 8

## Grade 8 Mathematics Test

The spring 2009 grade 8 MCAS Mathematics test was based on learning standards in the Massachusetts *Mathematics Curriculum Framework* (2000). The *Framework* identifies five major content strands, listed below.

- Number Sense and Operations
- Patterns, Relations, and Algebra
- Geometry
- Measurement
- Data Analysis, Statistics, and Probability

The grades 7–8 learning standards for each of these strands appear on pages 62–66 of the *Mathematics Curriculum Framework*, which is available on the Department website at www.doe.mass.edu/frameworks/ current.html.

In test item analysis reports and on the Subject Area Subscore pages of the MCAS *School Reports* and *District Reports*, Mathematics test results are reported under five MCAS reporting categories, which are identical to the five *Framework* content strands listed above.

#### **Test Sessions**

The MCAS grade 8 Mathematics test included two separate test sessions. Each session included multiple-choice and open-response questions. Session 1 also included short-answer 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 8 Mathematics test was provided with a plastic ruler and a grade 8 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 session 2, each student had sole access to a calculator with at least four functions and a square root key. Calculator use was not allowed during session 1.

The use of bilingual word-to-word dictionaries was allowed for current and former limited English proficient students only, during both Mathematics test sessions. No other reference tools or materials were allowed.

#### **Cross-Reference Information**

The table at the conclusion of this chapter indicates each released item's reporting category and the *Framework* learning standard it assesses. The correct answers for released multiple-choice and short-answer questions are also displayed in the table.

## 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 eight 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.



A parallelogram and some of its dimensions are shown below.



What is the area of the parallelogram?

- A. 100 square inches
- B. 200 square inches
- C. 300 square inches
- D. 600 square inches



A square pyramid is shown below.



What is the total number of edges in a square pyramid?

- A. 4
- B. 5
- C. 6
- D. 8

3 Hannah's mean score on four mathematics tests is 92.75. What is the sum of the scores of Hannah's four tests?

- A. 368
- B. 370
- C. 371
- D. 372

4

At a book fair, Scott bought a \$4 tote bag and some books for \$2 each. The total amount Scott spent is represented by the equation below.

y = 2x + 4

What does the variable *x* represent in this equation?

- A. the cost for one book
- B. the total amount spent
- C. the number of books bought
- D. the cost of all the books bought
- 5 A survey showed that  $\frac{3}{5}$  of a newspaper's readers had access to a computer during the day. What is  $\frac{3}{5}$  written as a percent?
  - A. 75%
  - B. 60%
  - C. 35%
  - D. 30%

6

Which of the following is equivalent to the expression below?

$$(-5+6)+2$$

A. 
$$-5(6 + 2)$$
  
B.  $2(-5 + 6)$ 

$$D. 2(-3+0)$$

C. 
$$-5 + (6 + 2)$$

D. 
$$2 + (-6 + 5)$$

7

What is the value of the expression below?

$$4 - 2^3 \cdot 3$$
  
-20  
-14  
18  
24

8 Brian lunch

А. В.

C.

D.

Brian had  $\frac{4}{5}$  of a pizza left over from lunch. He divided his leftover pizza equally among 3 friends. The expression below represents the part of the whole pizza that each friend received.

 $\frac{4}{5} \div 3$ 

Which of the following expressions is equivalent to  $\frac{4}{5} \div 3$ ?

A. 
$$\frac{1}{3} \div \frac{4}{5}$$
  
B.  $\frac{3}{1} \cdot \frac{4}{5}$   
C.  $\frac{4}{5} \div \frac{1}{3}$   
D.  $\frac{4}{5} \cdot \frac{1}{3}$ 

Questions 9 and 10 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.



The figure below shows  $\triangle PQR$  and two of its angle measures.



What is the degree measure of  $\angle P$ ?

**10** James drove 200 miles in 4 hours. At this rate, what is the total number of hours it will take him to drive 150 miles?

Question 11 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 11 in the space provided in your Student Answer Booklet.



Daniel has a spinner divided into two congruent sections, as shown below.



- a. Daniel will spin the arrow on the spinner one time. What is the probability that the arrow will stop in the gray section? Show or explain how you got your answer.
- b. Daniel will spin the arrow two times. What is the probability that the arrow will stop in the gray section both times? Show or explain how you got your answer.
- c. Daniel will spin the arrow three times. In your Student Answer Booklet, construct a tree diagram that shows all the possible outcomes that can occur.
- d. Based on your diagram from part (c), what is the probability that the arrow will stop in the white section **at least** one time when Daniel spins the arrow three times? Show or explain how you got your answer.

## Mathematics Session 2

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

## DIRECTIONS

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



The stem-and-leaf plot below shows the age of each member of a hiking club.

## Hiking Club Members' Ages

Kev								
6	0	2	5	7				
5	3							
4	0	1	1	6	8	8		
3	3	4	6	7	7	7	7	
2	6	8	9					

What is the range of ages of the hiking club members?

2 8 represents 28

- A. 34
- B. 37
- C. 40
- D. 41

13

Callie makes wedding cakes with circular bases. She made a large cake with a radius of 12 inches and a small cake with a radius of 6 inches, as shown below.



Which of the following statements correctly compares the circumferences of the bases of the two cakes?

- A. The circumference of the base of the large cake is 2 times that of the small cake.
- B. The circumference of the base of the large cake is 4 times that of the small cake.
- C. The circumference of the base of the large cake is 6 times that of the small cake.
- D. The circumference of the base of the large cake is 8 times that of the small cake.

Question 14 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 14 in the space provided in your Student Answer Booklet.



Ms. Gleason is opening a new restaurant.

- She has enough booths to seat up to 40 people.
- She is ordering tables to fill the rest of the seating space.
- Each table can seat up to 6 people.
- a. If t represents the number of tables Ms. Gleason orders, write an expression to show the total number of people that can be seated at booths and tables.
- b. Write an inequality that could be used to determine t, the number of tables Ms. Gleason needs to order so that she has enough seating at booths and tables for at least 125 people.
- c. Solve the inequality from part (b) to determine the number of tables Ms. Gleason needs to order. Show or explain how you got your answer.

Mark your answers to multiple-choice questions 15 through 17 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.

15

Jessica has one piece of ribbon that is  $6\frac{2}{3}$  yards long and one piece that is  $5\frac{1}{3}$  yards long. What is the total length, in feet, of the two pieces of ribbon?

- A.  $33\frac{2}{3}$  feet
- B. 34 feet
- C.  $34\frac{1}{2}$  feet
- D. 36 feet

16

At the beginning of the school year, the principal at Adams Middle School equally divided each of the following items among the new teachers:

- 48 red pens
- 40 whiteboard markers
- 16 whiteboard erasers

There were no items remaining.

What was the maximum possible number of new teachers at Adams Middle School at the beginning of the school year?

- A. 2
- B. 4
- C. 8
- D. 16



One of the largest statues of a cow in the United States is 38 feet tall. What is the height of the statue in meters, to the nearest tenth of a meter?  $(1 \text{ meter} \approx 3.28 \text{ feet})$ 

- A. 11.6 meters
- B. 12.5 meters
- C. 115.9 meters
- D. 124.6 meters



## Massachusetts Comprehensive Assessment System Grade 8 Mathematics Reference Sheet

### PERIMETER FORMULAS

square  $\dots P = 4s$ 

rectangle..... P = 2b + 2hOR P = 2l + 2w

triangle  $\dots P = a + b + c$ 

### AREA FORMULAS

square  $\ldots A = s^2$ 

rectangle..... A = bhOR A = lwparallelogram..... A = bh

triangle....  $A = \frac{1}{2}bh$ trapezoid...  $A = \frac{1}{2}h(b_1 + b_2)$ 

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

## TOTAL SURFACE AREA FORMULAS

rectangular prism ... SA = 2(lw) + 2(hw) + 2(lh)cylinder .....  $SA = 2\pi r^2 + 2\pi rh$ 

sphere.....  $SA = 4\pi r^2$ 

## **VOLUME FORMULAS**

rectangular prism ..... V = lwhOR V = Bh(B = area of a base)

cube....  $V = s^3$ (s = length of an edge)

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

sphere .....  $V = \frac{4}{3}\pi r^3$ 

### **CIRCLE FORMULAS**

$$C = 2\pi r$$
  
OR  
$$C = \pi d$$

 $A = \pi r^2$ 

## **PYTHAGOREAN THEOREM**



## Grade 8 Mathematics Spring 2009 Released Items: Reporting Categories, Standards, and Correct Answers\*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC/SA)*
1	206	Measurement	8.M.3	С
2	206	Geometry	8.G.7	D
3	206	Number Sense and Operations	8.N.12	С
4	207	Patterns, Relations, and Algebra	8.P.6	С
5	207	Number Sense and Operations	8.N.1	В
6	207	Number Sense and Operations	8.N.8	С
7	207	Number Sense and Operations	8.N.7	А
8	207	Number Sense and Operations	8.N.9	D
9	208	Geometry	8.G.1	54°
10	208	Number Sense and Operations	8.N.3	3 hours
11	209	Data Analysis, Statistics, and Probability	8.D.4	
12	210	Data Analysis, Statistics, and Probability	8.D.3	D
13	210	Patterns, Relations, and Algebra	8.P.8	А
14	211	Patterns, Relations, and Algebra	8.P.7	
15	212	Measurement	8.M.1	D
16	212	Number Sense and Operations	8.N.5	С
17	212	Measurement	8.M.2	А

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