
XII. Mathematics, Grade 6

Grade 6 Mathematics Test

The spring 2009 grade 6 MCAS Mathematics test was based on learning standards in the Massachusetts *Mathematics Curriculum Framework* (2000). The *Framework* identifies five major content strands, listed below. Page numbers for the grades 5–6 learning standards appear in parentheses.

- Number Sense and Operations (*Framework*, pages 25–26)
- Patterns, Relations, and Algebra (*Framework*, page 34)
- Geometry (*Framework*, page 42)
- Measurement (*Framework*, page 50)
- Data Analysis, Statistics, and Probability (*Framework*, page 58)

The *Mathematics Curriculum Framework* 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 *Mathematics Curriculum Framework* content strands listed above.

Test Sessions

The MCAS 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.

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 calculators, 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, one short-answer question, and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

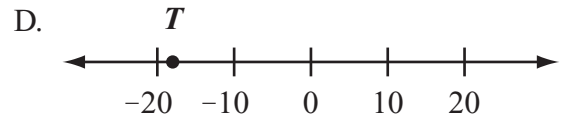
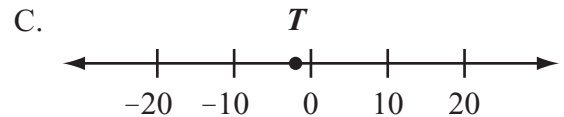
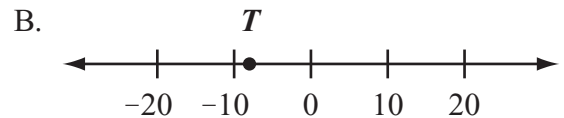
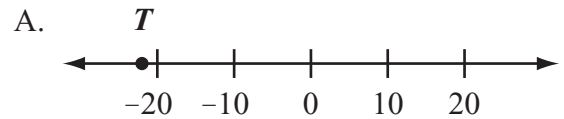
- 1 Maxine's homework assignment is to determine the value of n that makes the equation below true.

$$26 + n = 78$$

Which of the following equations could Maxine use to determine the value of n ?

- A. $78 - 26 = n$
- B. $78 + 26 = n$
- C. $26 - 78 = n$
- D. $26 + 78 = n$

- 2 The low temperature one night was -18°C . On which number line does point T best represent -18 ?



- 3 Craig started the multiplication pattern shown below.

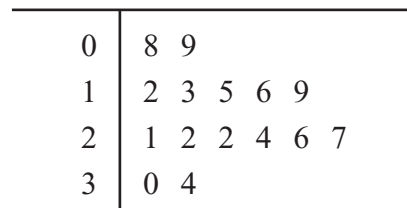
1, 4, 16, 64,

What is the next number in his pattern?

- A. 128
- B. 256
- C. 512
- D. 1024

- 4 The stem-and-leaf plot below shows the lengths of some fish.

Fish Lengths (in inches)



Key	
1 6	represents 16

What is the total number of fish with a length of less than 18 inches?

- A. 4
- B. 5
- C. 6
- D. 7

- 5 Which of the following is 9.423 written in expanded notation?
- A. $(9 \times 1) + (4 \times 10) + (2 \times 100) + (3 \times 1000)$
 - B. $(9 \times 1) + (4 \times 0.1) + (2 \times 0.01) + (3 \times 0.001)$
 - C. $(9 \times 0.1) + (4 \times 10) + (2 \times 100) + (3 \times 1000)$
 - D. $(9 \times 0.1) + (4 \times 0.01) + (2 \times 0.001) + (3 \times 0.0001)$

- 6 Dominique made the input-output table shown below.

Input (x)	Output (y)
1	1
3	9
5	17
7	25

Which of the following expressions is true for all values in Dominique's input-output table?

- A. $3x = y$
- B. $x + 8 = y$
- C. $2x - 1 = y$
- D. $4x - 3 = y$

Question 7 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 7 in the space provided in your Student Answer Booklet.

- 7 The table below shows the distance, in kilometers, Lisa ran each day for 5 days.

Lisa's Running Distances

Day	Distance (in kilometers)
Monday	2.05
Tuesday	4.10
Wednesday	3.80
Thursday	1.95
Friday	4.05

- Write the five distances in order from **greatest to least**.
- Estimate the average distance, in kilometers, Lisa ran each day for the 5 days. Explain your estimation strategy.

To prepare for a race, Lisa plans to run 100 kilometers over a number of days.

- Based on your answer to part (b), estimate the number of days it will take Lisa to run 100 kilometers. Explain your estimation strategy.

Question 8 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.

- 8 Doug put 30 tiles of the same size and shape into a bag. The tiles are numbered 1 through 30 without repeating any numbers. Doug will reach into the bag without looking and take out a tile.

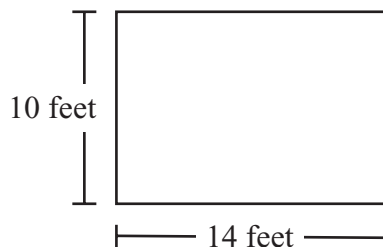
What is the probability that Doug will take out a tile with a number **greater than** 20?

Question 9 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 9 in the space provided in your Student Answer Booklet.

- 9 Carrie's rectangular garden has the dimensions shown below.



- a. What is the area, in square feet, of Carrie's garden? Show or explain how you got your answer.

Carrie wants to put a fence along the perimeter of her garden. She will pay \$15 per foot of fence that she uses.

- b. What is the amount of money, in dollars, that Carrie will pay for the fence? Show or explain how you got your answer.

Roberto has a garden in the shape of a square. The perimeter of his garden is equal to the perimeter of Carrie's garden.

- c. What is the area, in square feet, of Roberto's garden? Show or explain how you got your answer.

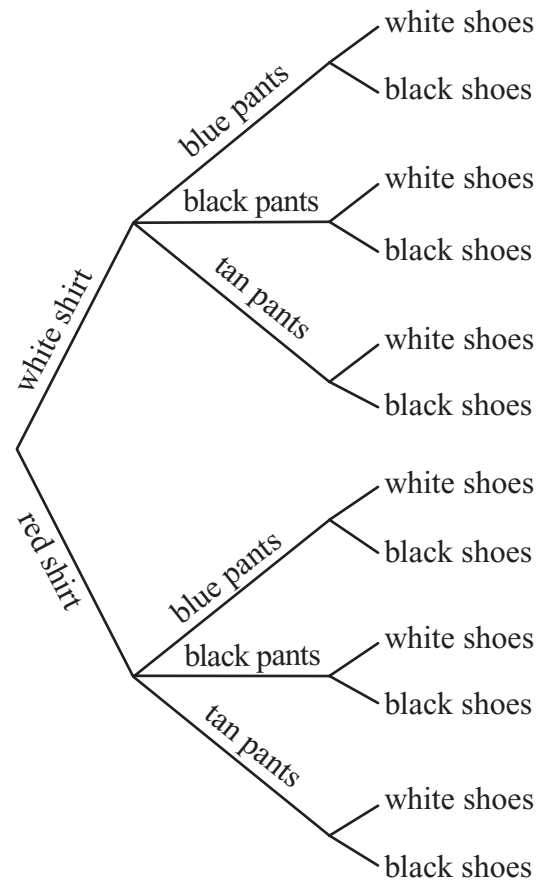
Mark your answers to multiple-choice questions 10 and 11 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

10 What is the value of the expression below?

$$4 + 2 \times (10 - 5)$$

- A. 14
- B. 19
- C. 30
- D. 55

11 The tree diagram below shows all of the outfits Jay can choose to wear today. An outfit has one color of shirt, one color of pants, and one color of shoes.



What is the total number of possible outfits with a white shirt?

- A. 9
- B. 6
- C. 3
- D. 1

Mathematics

SESSION 2

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

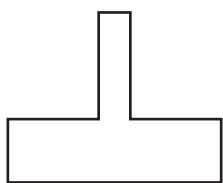


DIRECTIONS

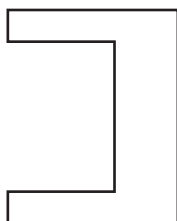
This session contains five multiple-choice questions and one short-answer question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 12 Which of the following shapes appears to have rotational symmetry?

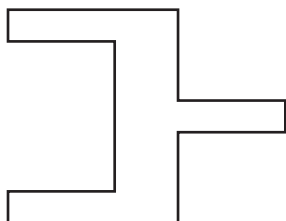
A.



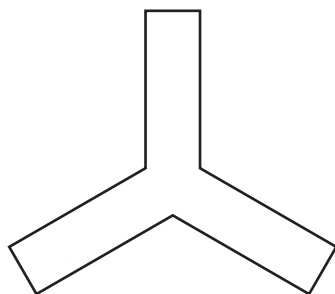
B.



C.



D.



- 13 Phil recorded the number of apples he picked from each apple tree in his yard. The results are listed below.

38, 46, 29, 53, 71, 65

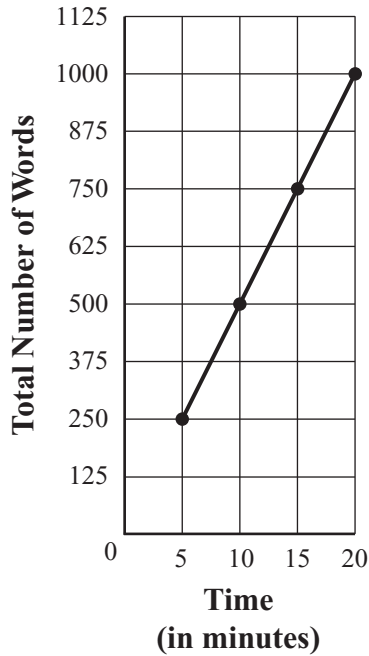
What were the minimum number of apples and the maximum number of apples that Phil picked from the apple trees in his yard?

- A. The minimum was 29 apples and the maximum was 71 apples.
- B. The minimum was 29 apples and the maximum was 65 apples.
- C. The minimum was 38 apples and the maximum was 71 apples.
- D. The minimum was 38 apples and the maximum was 65 apples.

- 14 Samantha types an average of 50 words per minute. Which of the following graphs shows the relationship between the total number of words Samantha types and the time she spends typing?

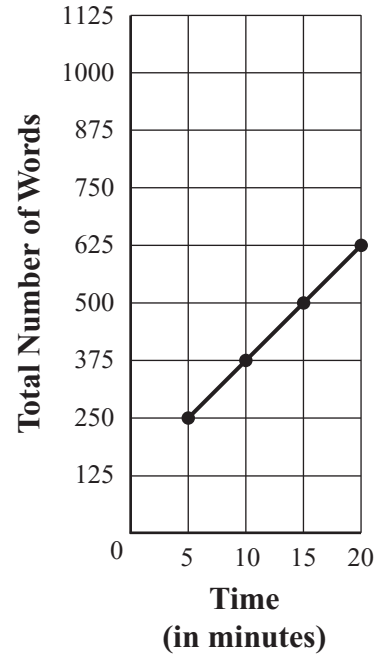
A.

Words Typed over Time



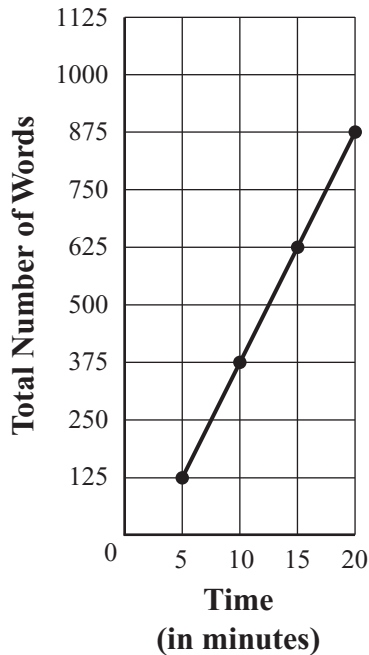
C.

Words Typed over Time



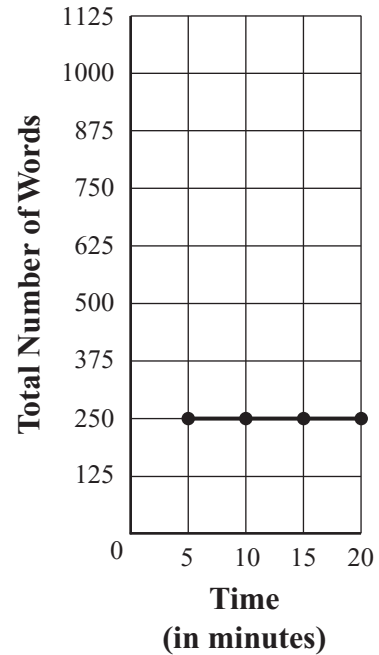
B.

Words Typed over Time

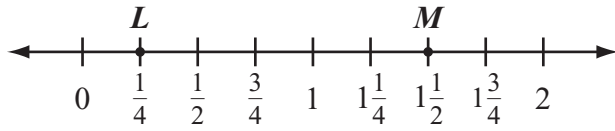


D.

Words Typed over Time



- 15 Which of the following best represents the distance between point L and point M on the number line below?



- A. $\frac{1}{4}$ unit
- B. $\frac{3}{4}$ unit
- C. $1\frac{1}{4}$ units
- D. $1\frac{3}{4}$ units

Question 16 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.

- 16** Gloria mows her lawn every 12 days and washes her windows every 20 days. She mowed her lawn and washed her windows today.
- How many days from now will it be until she next mows her lawn and washes her windows on the same day?

Mark your answer to multiple-choice question 17 in the space provided in your Student Answer Booklet. Do not write your answer in this test booklet. You may do your figuring in the test booklet.

- 17 Hector started the arithmetic pattern shown below.

$$\frac{1}{2}, 1\frac{1}{4}, 2, 2\frac{3}{4}, \dots$$

What is the next number in Hector's pattern?

A. 3

B. $3\frac{1}{2}$

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

D. 4



Massachusetts Comprehensive Assessment System Grade 6 Mathematics Reference Sheet

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 2009 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC/SA)*
1	175	<i>Patterns, Relations, and Algebra</i>	6.P.3	A
2	175	<i>Number Sense and Operations</i>	6.N.6	D
3	176	<i>Patterns, Relations, and Algebra</i>	6.P.1	B
4	176	<i>Data Analysis, Statistics, and Probability</i>	6.D.2	C
5	177	<i>Number Sense and Operations</i>	6.N.3	B
6	177	<i>Patterns, Relations, and Algebra</i>	6.P.4	D
7	178	<i>Number Sense and Operations</i>	6.N.16	
8	179	<i>Data Analysis, Statistics, and Probability</i>	6.D.4	$\frac{1}{3}$ or equivalent
9	180	<i>Measurement</i>	6.M.1	
10	181	<i>Number Sense and Operations</i>	6.N.11	A
11	181	<i>Data Analysis, Statistics, and Probability</i>	6.D.3	B
12	182	<i>Geometry</i>	6.G.7	D
13	182	<i>Data Analysis, Statistics, and Probability</i>	6.D.1	A
14	183	<i>Patterns, Relations, and Algebra</i>	6.P.6	A
15	184	<i>Geometry</i>	6.G.5	C
16	185	<i>Number Sense and Operations</i>	6.N.8	60 days
17	186	<i>Patterns, Relations, and Algebra</i>	6.P.1	B

* 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.