
XIII. Mathematics, Grade 7

Grade 7 Mathematics Test

The spring 2012 grade 7 Mathematics test was based on learning standards in the five major content strands in the Massachusetts *Mathematics Curriculum Framework* (2000) listed below. Specific learning standards for grade 7 are found in the *Supplement to the Massachusetts Mathematics Curriculum Framework* (2004). Page numbers for the grades 7–8 *Framework* learning standards and for the grade 7 *Supplement* standards appear in parentheses.

- Number Sense and Operations (*Framework*, page 62; *Supplement*, page 11)
- Patterns, Relations, and Algebra (*Framework*, page 63; *Supplement*, page 12)
- Geometry (*Framework*, page 64; *Supplement*, pages 12–13)
- Measurement (*Framework*, page 65; *Supplement*, page 13)
- Data Analysis, Statistics, and Probability (*Framework*, page 66; *Supplement*, page 14)

The *Mathematics Curriculum Framework* and *Supplement* are available on the Department website at www.doe.mass.edu/frameworks/current.html.

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

Test Sessions

The grade 7 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 7 Mathematics test was provided with a plastic ruler and a grade 7 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 English language learner students only, during both Mathematics test sessions. No other reference tools or materials were allowed.

Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common 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 released item 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 Sarah recorded the lengths of time, in seconds, of the first five commercials that aired during a television program. The times she recorded are shown in the table below.

**Television
Commercials**

Commercial	Length of Time (in seconds)
first	15
second	60
third	40
fourth	20
fifth	15

What is the mean of the lengths of time that Sarah recorded?

- A. 15 seconds
- B. 20 seconds
- C. 30 seconds
- D. 45 seconds

- 2 The ratio of the number of girls to the number of boys in a chess club is 3 to 2. There are 14 boys in the chess club.

What is the number of girls in the chess club?

- A. 7
- B. 9
- C. 21
- D. 23

- 3 The weights, in ounces, of three different packages of cookies are listed below.

7.7 , $7\frac{1}{7}$, 7.25

Which list shows these weights in order from least to greatest?

- A. 7.25 , $7\frac{1}{7}$, 7.7
- B. $7\frac{1}{7}$, 7.25 , 7.7
- C. 7.25 , 7.7 , $7\frac{1}{7}$
- D. $7\frac{1}{7}$, 7.7 , 7.25

Mark your answers to multiple-choice questions 4 through 6 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.

- 4 What is the value of the expression below?

$$|3| + |-3| + |-1|$$

- A. -7
- B. -1
- C. 1
- D. 7

- 5 A park has a grassy section that covers $2\frac{1}{3}$ acres. Denny mowed half the grassy section.

What is the number of acres that Denny mowed?

- A. $1\frac{1}{6}$
- B. $1\frac{1}{3}$
- C. $1\frac{2}{3}$
- D. $1\frac{5}{6}$

- 6 Lara has \$12 in quarters. The equation below can be used to solve for q , the number of quarters Lara has.

$$0.25q = 12$$

Which of the following describes a way to solve for q in one step?

- A. add 0.25 to both sides
- B. subtract 0.25 from both sides
- C. multiply both sides by 0.25
- D. divide both sides by 0.25

Question 7 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.

7 Compute:

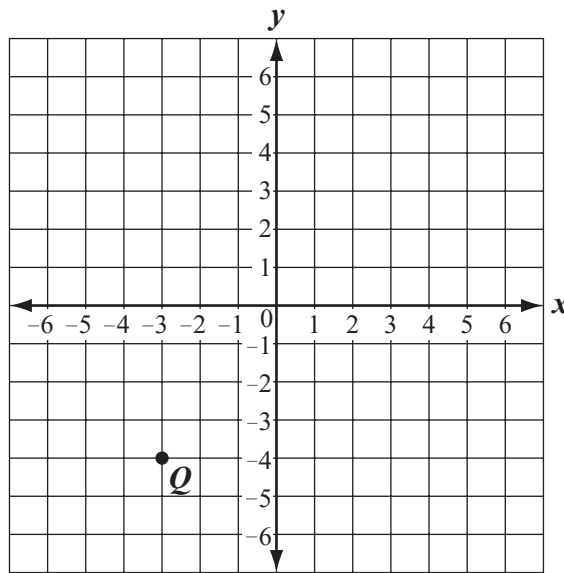
$$\frac{3}{8} \cdot \frac{2}{3} \cdot \frac{3}{4}$$

Question 8 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 8 in the space provided in your Student Answer Booklet.

- 8 On the grid in your Student Answer Booklet, copy the x -axis, the y -axis, and point Q , as shown below.



- a. What are the coordinates of point Q ?
- b. On your grid, plot and label points $S(-5, 0)$ and $R(-3, 0)$.
- c. On your grid, plot and label a point T so that quadrilateral $QRST$ is a rectangle. What are the coordinates of point T ?
- d. On your grid, draw a second rectangle that meets the following requirements:
 - It is congruent to rectangle $QRST$.
 - The coordinates of each vertex are positive numbers.
 - The vertices are labeled $U, V, W,$ and X .
- e. What are the coordinates of each vertex of rectangle $UVWX$?

Mark your answers to multiple-choice questions 9 and 10 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.

- 9 Brad has a blue highlighter, a yellow highlighter, a purple highlighter, and a green highlighter in his desk. All four highlighters are the same size and shape. He will randomly select one, use it to highlight a word, and put it back in his desk. Then Brad will randomly select a second highlighter.

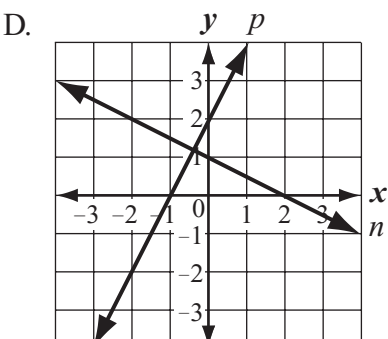
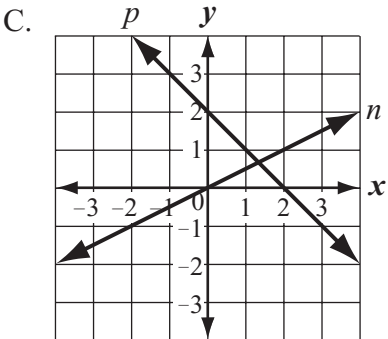
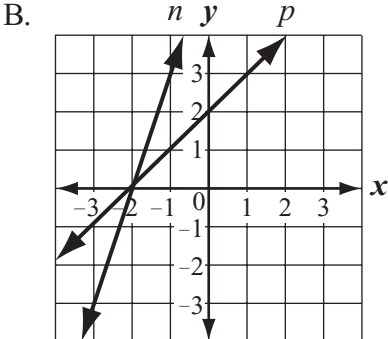
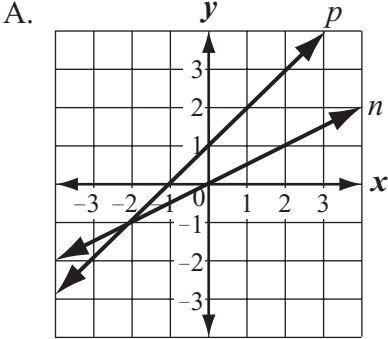
The organized list below shows all the possible combinations of colors of highlighters Brad can select when he randomly selects a highlighter two times.

blue – blue	yellow – blue	purple – blue	green – blue
blue – yellow	yellow – yellow	purple – yellow	green – yellow
blue – purple	yellow – purple	purple – purple	green – purple
blue – green	yellow – green	purple – green	green – green

What is the probability that Brad will select, in any order, a blue highlighter and a green highlighter?

- A. $\frac{1}{16}$
B. $\frac{1}{8}$
C. $\frac{1}{4}$
D. $\frac{1}{2}$

10 In which of the following graphs does line p have a positive rate of change and line n have a negative rate of change?



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.

- 11** The first five terms in a number pattern are shown below.

7, 10, 13, 16, 19

The pattern continues using the same rule.

- a. What is the next term in the pattern? Show or explain how you got your answer.
- b. What is the 20th term in the pattern? Show or explain how you got your answer.
- c. Write an expression that can be used to find the value of the n th term in the pattern.

Mathematics

SESSION 2

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

You may use a calculator during this session.



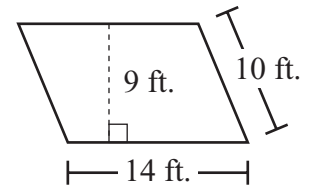
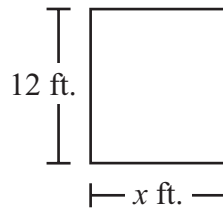
DIRECTIONS

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

- 12 The price of each ticket to the spring choral concert is \$3. Which of the following expressions represents the price of t tickets to the concert?

- A. $3 + t$
- B. $3 - t$
- C. $3 \cdot t$
- D. $3 \div t$

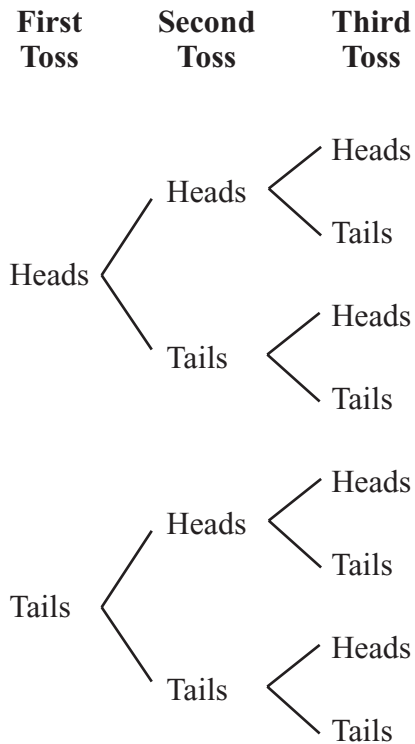
- 13 A rectangle and a parallelogram have the same area. The rectangle, the parallelogram, and some of their dimensions are shown below.



Based on the dimensions shown, what is the value of x ?

- A. 7.5
- B. 10.5
- C. 11.7
- D. 16.8

- 14 The tree diagram below shows all of the possible combinations that can occur when a fair coin is tossed three times.



What is the probability that a person who tosses a fair coin three times will get heads twice and tails once in any order?

- A. $\frac{1}{8}$
- B. $\frac{3}{14}$
- C. $\frac{3}{8}$
- D. $\frac{3}{5}$

- 15 Burke wrote the equation shown below.

$$4x + 8 = 16$$

Which of the following equations is equivalent to Burke's equation?

- A. $x + 8 = 4$
- B. $x + 8 = 12$
- C. $4x = 8$
- D. $4x = 24$

- 16 Justine paid \$1.16 for 2 pounds of bananas. Dave bought 2.5 pounds of bananas at the same price per pound that Justine paid.

What was the total amount that Dave paid for his bananas?

- A. \$1.45
- B. \$1.74
- C. \$2.50
- D. \$2.90

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 Juanita started a small business.

- In the first year, she spent \$12,000 for advertising.
- In the second year, she spent 40% more for advertising than she spent in the first year.

What was the total amount of money that Juanita spent for advertising in the **second** year?

- A. \$4,800
- B. \$12,480
- C. \$15,000
- D. \$16,800

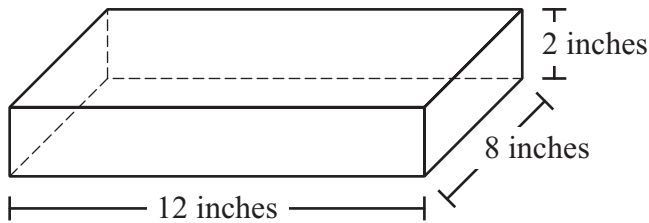
Questions 18 and 19 are short-answer questions. Write your answers to these questions in the boxes provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 18 The list below shows the number of bottles of juice sold from a vending machine each day for 8 days.

25, 58, 40, 45, 65, 61, 48, 58

What is the median number of bottles of juice sold for the 8 days?

- 19 A rectangular prism and its dimensions are shown below.



What is the volume, in cubic inches, of the rectangular prism?

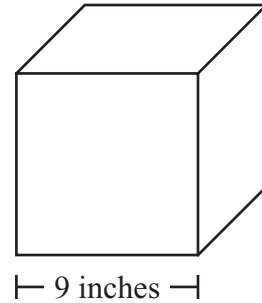
Mark your answers to multiple-choice questions 20 and 21 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 20 A baseball used by a professional baseball team must have a diameter that is between 2.86 inches and 2.94 inches.

Which of the following could be the diameter of a baseball used by a professional baseball team?

- A. $2\frac{7}{8}$ inches
- B. $2\frac{7}{9}$ inches
- C. $2\frac{8}{10}$ inches
- D. $2\frac{9}{11}$ inches

- 21 Matthew made a wooden cube that has an edge length of 9 inches, as shown below.



He painted half the faces of the cube red and the remaining faces yellow.

What is the surface area of the faces Matthew painted red?

- A. 162 square inches
- B. 243 square inches
- C. 365 square inches
- D. 486 square inches



PERIMETER FORMULAS

square $P = 4s$

rectangle $P = 2b + 2h$

OR

$$P = 2l + 2w$$

triangle $P = a + b + c$

AREA FORMULAS

square $A = s^2$

rectangle $A = bh$

OR

$$A = lw$$

parallelogram $A = bh$

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 $SA = 2\pi r^2 + 2\pi rh$

VOLUME FORMULAS

rectangular prism $V = lwh$

OR

$$V = Bh$$

(B = area of a base)

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

cylinder $V = \pi r^2 h$

CIRCLE FORMULAS

$$C = 2\pi r$$

OR

$$C = \pi d$$

$$A = \pi r^2$$

Grade 7 Mathematics
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC/SA)*
1	215	<i>Data Analysis, Statistics, and Probability</i>	7.D.2	C
2	215	<i>Number Sense and Operations</i>	7.N.2	C
3	215	<i>Number Sense and Operations</i>	7.N.1	B
4	216	<i>Number Sense and Operations</i>	7.N.4	D
5	216	<i>Number Sense and Operations</i>	7.N.9	A
6	216	<i>Patterns, Relations, and Algebra</i>	7.P.4	D
7	217	<i>Number Sense and Operations</i>	7.N.7	$\frac{3}{16}$
8	218	<i>Geometry</i>	7.G.4	
9	219	<i>Data Analysis, Statistics, and Probability</i>	7.D.3	B
10	220	<i>Patterns, Relations, and Algebra</i>	7.P.5	D
11	221	<i>Patterns, Relations, and Algebra</i>	7.P.1	
12	222	<i>Patterns, Relations, and Algebra</i>	7.P.3	C
13	222	<i>Measurement</i>	7.M.3	B
14	223	<i>Data Analysis, Statistics, and Probability</i>	7.D.3	C
15	223	<i>Patterns, Relations, and Algebra</i>	7.P.4	C
16	223	<i>Number Sense and Operations</i>	7.N.2	A
17	224	<i>Number Sense and Operations</i>	7.N.9	D
18	225	<i>Data Analysis, Statistics, and Probability</i>	7.D.2	53
19	225	<i>Measurement</i>	7.M.3	192 cubic inches
20	226	<i>Number Sense and Operations</i>	7.N.1	A
21	226	<i>Measurement</i>	7.M.3	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.

Grade 7 Mathematics
Spring 2012 Unreleased Common Items:
Reporting Categories and Standards

Item No.	Reporting Category	Standard
22	<i>Number Sense and Operations</i>	7.N.6
23	<i>Patterns, Relations, and Algebra</i>	7.P.1
24	<i>Number Sense and Operations</i>	7.N.7
25	<i>Patterns, Relations, and Algebra</i>	7.P.2
26	<i>Patterns, Relations, and Algebra</i>	7.P.2
27	<i>Number Sense and Operations</i>	7.N.1
28	<i>Patterns, Relations, and Algebra</i>	7.P.3
29	<i>Patterns, Relations, and Algebra</i>	7.P.2
30	<i>Measurement</i>	7.M.3
31	<i>Number Sense and Operations</i>	7.N.4
32	<i>Patterns, Relations, and Algebra</i>	7.P.1
33	<i>Measurement</i>	7.M.3
34	<i>Measurement</i>	7.M.3
35	<i>Patterns, Relations, and Algebra</i>	7.P.5
36	<i>Geometry</i>	7.G.2
37	<i>Geometry</i>	7.G.4
38	<i>Geometry</i>	7.G.2
39	<i>Number Sense and Operations</i>	7.N.2
40	<i>Geometry</i>	7.G.3
41	<i>Patterns, Relations, and Algebra</i>	7.P.6
42	<i>Data Analysis, Statistics, and Probability</i>	7.D.3