
X. Mathematics, Grade 4

Grade 4 Mathematics Test

The spring 2010 grade 4 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 3–4 learning standards appear in parentheses.

- Number Sense and Operations (*Framework*, pages 22–23)
- Patterns, Relations, and Algebra (*Framework*, page 32)
- Geometry (*Framework*, page 40)
- Measurement (*Framework*, page 48)
- Data Analysis, Statistics, and Probability (*Framework*, page 56)

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 4 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 4 Mathematics test was provided with a plastic ruler and a grade 4 Mathematics Tool Kit. A copy of the tool kit pieces used by students to answer question 9 immediately follows the last 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 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 tool kit and MCAS ruler during this session.
You may *not* use a calculator during this session.



DIRECTIONS

This session contains nine 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.

- 1 The table below shows the populations of three cities.

Populations of Three Cities

City	Population
Jackson	63,203
Middleville	?
Carson	89,468

The population of Middleville is **greater** than the population of Jackson and is **less** than the population of Carson.

Which of the following could be the population of Middleville?

- A. 62,785
- B. 89,524
- C. 60,300
- D. 84,680

- 2 There are 6 stickers on each page of Miguel's sticker book.

Which expression represents the number of stickers on \square pages of Miguel's sticker book?

- A. $6 \times \square$
- B. $6 + \square$
- C. $6 \div \square$
- D. $6 - \square$

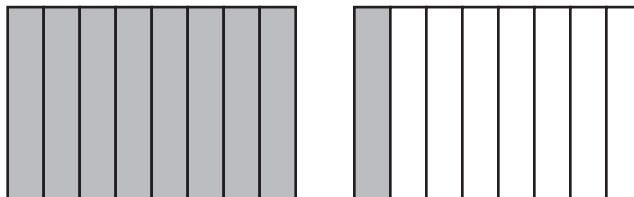
- 3 Fredric wants to measure how much water the pitcher shown below can hold.



Which of the following units of measurement should he use?

- A. liter
- B. meter
- C. kilogram
- D. centimeter

- 4 Each rectangle below is divided into 8 equal parts. Altogether the shaded parts of the rectangles represent $1\frac{1}{8}$.



Which of the following is another way to write $1\frac{1}{8}$?

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

- 5 Todd is exactly 6 years older than Rita. If t represents Todd's age and r represents Rita's age, which of the following is **always** a true statement?

- A. $t < 6$
- B. $r < 6$
- C. $t > r$
- D. $r > t$

- 6 Angelina made the input-output table below.

Input	6	18	24	30	36
Output	2	6	?	10	12

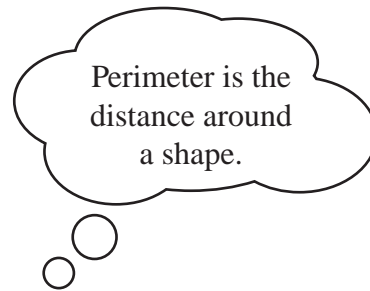
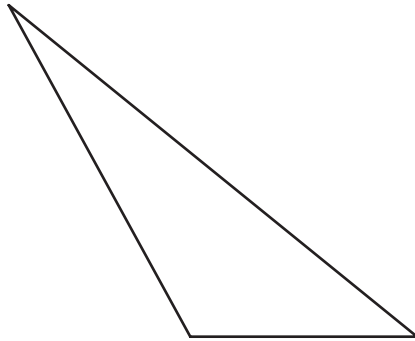
What is the output when the input is 24?

- A. 3
- B. 7
- C. 8
- D. 9

Questions 7 and 8 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.

Use your MCAS ruler to answer question 7.

- 7 What is the perimeter, to the nearest **centimeter**, of the triangle below?



- 8 What is 98,257 rounded to the nearest 1,000?

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.

Use the pieces labeled 1, 2, 3, 4, and 5 from your tool kit to answer question 9.

- 9 For all parts of this question, the tool kit pieces should be lying flat on your desk with the labeled sides facing up.
- Put pieces 1 and 3 together so that a side labeled x matches up to a side labeled o . The pieces should touch but not overlap. What polygon did you make? Explain how you know.
 - Put pieces 2 and 4 together so that they make the same polygon you made in part (a). In your Student Answer Booklet, trace or draw each piece to show how the pieces go together to make the polygon. Label each piece in your drawing with the correct number.
 - Explain how you know the polygon you made in part (a) is congruent to the polygon you made in part (b).
 - Which **two** pieces can be put together without overlapping to make a rectangle? In your Student Answer Booklet, trace or draw each piece to show how the pieces go together to make a rectangle. Label each piece in your drawing with the correct number.

Mark your answers to multiple-choice questions 10 through 12 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 The chart below shows the numbers of markers in the desks of some students.

Markers in Desks

Student	Number of Markers
Sanjay	12
Hana	19
Lynn	13
Tommy	9

Which two students have a number of markers that could be shared equally among three students?

- A. Lynn and Hana
- B. Lynn and Tommy
- C. Sanjay and Lynn
- D. Sanjay and Tommy

- 11 Janica uses 1 ink cartridge to print 75 pictures.

How many ink cartridges will Janica use to print 750 pictures?

- A. 7
- B. 10
- C. 75
- D. 100

- 12 Hoshi is 139 centimeters tall. Her father is 171 centimeters tall.

Which of the following has a value that is closest to the difference between Hoshi’s height and her father’s height?

- A. $170 - 130$
- B. $170 - 140$
- C. $180 - 130$
- D. $180 - 140$

Mathematics

SESSION 2

You may use your tool kit and MCAS ruler during this session.

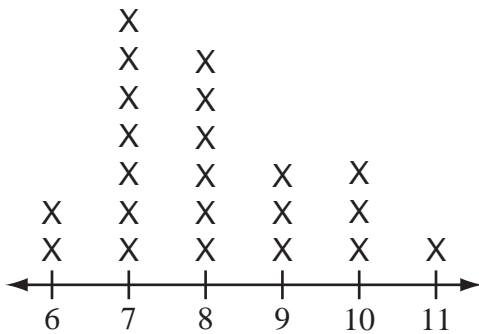
You may **not** use a calculator during this session.



DIRECTIONS

This session contains seven 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.

- 13** The line plot below shows the numbers of books Marla's classmates read over the summer.



Number of Books Read over the Summer

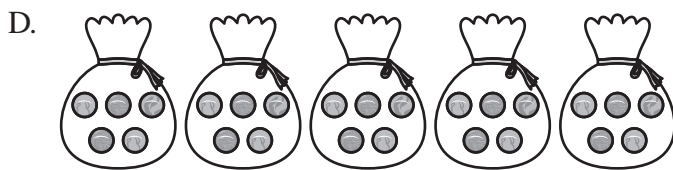
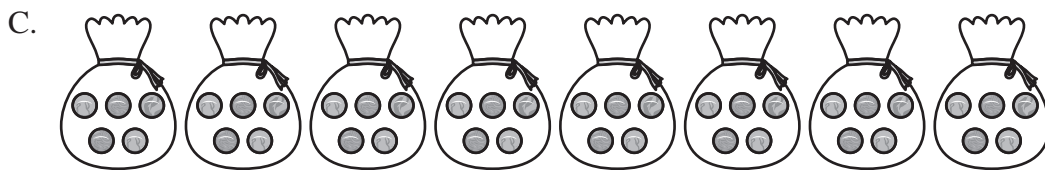
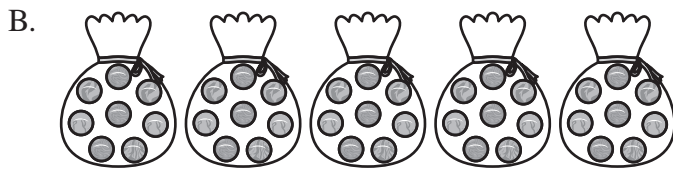
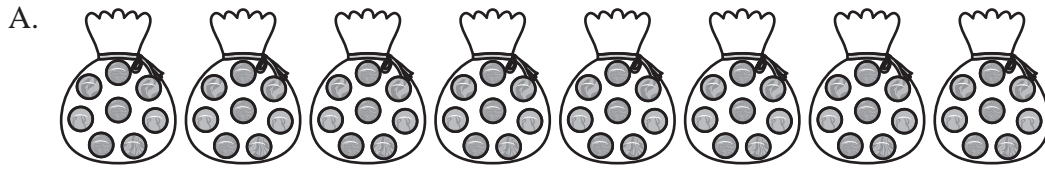
Marla read 8 books.

Based on the line plot, how many of her classmates read **fewer** books than Marla read?

- A. 6
- B. 7
- C. 8
- D. 9

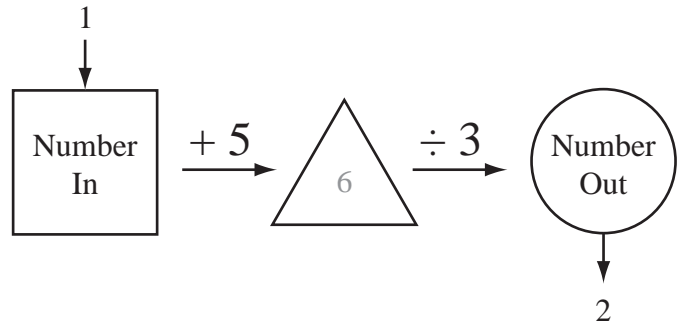
- 14 Mr. Garcia had 40 marbles. He divided the marbles equally among 8 students by putting the marbles in bags.

Which model shows how the 40 marbles were divided?



- 15 Which of the following shows sixty-two thousand, nine hundred thirteen written in standard form?
- A. 62,000,913
 - B. 6,200,913
 - C. 620,913
 - D. 62,913

- 16 Leon’s number machine follows the same rule each time he puts in a number. When Leon put in the number 1, the number 2 came out, as shown below.



Leon puts the number 10 into his machine.

What number will come out?

- A. 20
- B. 15
- C. 5
- D. 2

Question 17 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.

- 17 What is the value of \square that makes the number sentence below true?

$$\square \div 6 = 6$$

Question 18 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 18 in the space provided in your Student Answer Booklet.

- 18** Four children each have a bag of grapes. The table below shows the number of grapes in each child's bag.

Grapes in Bags

Child	Number of Grapes
Greta	30
Karen	27
Nate	24
Dave	33

- Use the information in the table to make a bar graph.
 - Be sure to label your graph and include a title.
 - Your scale must be greater than 1.
- Use the data from your graph to write a question that compares the numbers of grapes in the children's bags.
- Answer the question you wrote in part (b).

Mark your answers to multiple-choice questions 19 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.

- 19 At a local fair in Massachusetts, Jan had \$10.00 to spend. She spent \$4.75 on video games, \$1.25 on a large popcorn, and \$0.75 on a small lemonade. How much money did Jan have left?

A. \$3.25
B. \$4.75
C. \$6.75
D. \$16.75

- 20 There are 29 students in a class. No more than 6 students can sit at a lunch table.

What is the least number of tables needed to seat the 29 students?

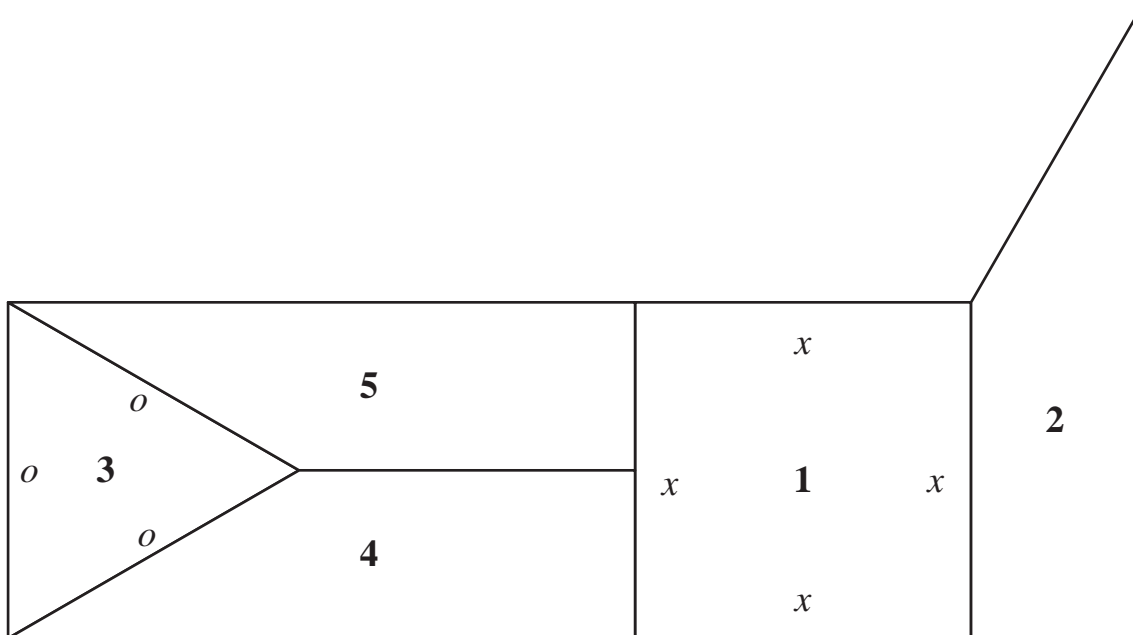
A. 4
B. 5
C. 6
D. 7

- 21 Fatima is making a poster. The list below shows the numbers of different pencils, markers, and crayons she can use.

- 2 pencils
- 4 markers
- 4 crayons

How many different combinations of 1 pencil, 1 marker, and 1 crayon can Fatima use to make her poster?

A. 8
B. 10
C. 24
D. 32



During testing, students were provided additional tool kit pieces to answer test items that are not released.

Grade 4 Mathematics
Spring 2010 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC/SA)*
1	149	<i>Number Sense and Operations</i>	4.N.2	D
2	149	<i>Patterns, Relations, and Algebra</i>	4.P.2	A
3	150	<i>Measurement</i>	4.M.1	A
4	150	<i>Number Sense and Operations</i>	4.N.4	B
5	151	<i>Patterns, Relations, and Algebra</i>	4.P.2	C
6	151	<i>Patterns, Relations, and Algebra</i>	4.P.6	C
7	152	<i>Measurement</i>	4.M.4	15 centimeters
8	152	<i>Number Sense and Operations</i>	4.N.16	98,000
9	153	<i>Geometry</i>	4.G.9	
10	154	<i>Number Sense and Operations</i>	4.N.7	D
11	154	<i>Patterns, Relations, and Algebra</i>	4.P.5	B
12	154	<i>Number Sense and Operations</i>	4.N.17	B
13	155	<i>Data Analysis, Statistics, and Probability</i>	4.D.3	D
14	156	<i>Number Sense and Operations</i>	4.N.8	C
15	157	<i>Number Sense and Operations</i>	4.N.2	D
16	157	<i>Patterns, Relations, and Algebra</i>	4.P.4	C
17	158	<i>Patterns, Relations, and Algebra</i>	4.P.3	36
18	159	<i>Data Analysis, Statistics, and Probability</i>	4.D.3	
19	160	<i>Number Sense and Operations</i>	4.N.10	A
20	160	<i>Number Sense and Operations</i>	4.N.13	B
21	160	<i>Data Analysis, Statistics, and Probability</i>	4.D.5	D

* 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 4 Mathematics
Spring 2010 Unreleased Common Items:
Reporting Categories and Standards

Item No.	Reporting Category	Standard
22	<i>Data Analysis, Statistics, and Probability</i>	4.D.2
23	<i>Geometry</i>	4.G.5
24	<i>Patterns, Relations, and Algebra</i>	4.P.3
25	<i>Number Sense and Operations</i>	4.N.18
26	<i>Data Analysis, Statistics, and Probability</i>	4.D.6
27	<i>Number Sense and Operations</i>	4.N.9
28	<i>Number Sense and Operations</i>	4.N.6
29	<i>Patterns, Relations, and Algebra</i>	4.P.1
30	<i>Number Sense and Operations</i>	4.N.10
31	<i>Geometry</i>	4.G.8
32	<i>Number Sense and Operations</i>	4.N.5
33	<i>Data Analysis, Statistics, and Probability</i>	4.D.1
34	<i>Number Sense and Operations</i>	4.N.11
35	<i>Patterns, Relations, and Algebra</i>	4.P.1
36	<i>Data Analysis, Statistics, and Probability</i>	4.D.3
37	<i>Data Analysis, Statistics, and Probability</i>	4.D.4
38	<i>Number Sense and Operations</i>	4.N.3
39	<i>Geometry</i>	4.G.6
40	<i>Patterns, Relations, and Algebra</i>	4.P.3
41	<i>Patterns, Relations, and Algebra</i>	4.P.4
42	<i>Measurement</i>	4.M.3