
X. Mathematics, Grade 4

Grade 4 Mathematics Test

Test Sessions and Content Overview

The spring 2016 grade 4 Mathematics test was made up of two separate test sessions. Each session included:

- Twenty-one common items, including multiple-choice, short-answer, and open-response questions. These common items are the items on which each student’s 2016 MCAS Mathematics score will be based.
- Three items developed by the Partnership for Assessment of Readiness for College and Careers (PARCC), including multiple-choice, multiple-select, and open-response questions. Students’ performance on these PARCC items will **not** be factored into their MCAS scores.

Approximately half of the common test items are shown on the following pages as they appeared in test booklets.

The PARCC items are not being released in this document. The Department will post information about these items to the Student Assessment webpage in a separate document. See page 4 of the Introduction to this document for more information about the inclusion of PARCC items in the 2016 MCAS tests.

Standards and Reporting Categories

The common items in the spring 2016 grade 4 Mathematics test assessed standards in the five domains for grade 4 in the *Massachusetts Curriculum Framework for Mathematics* (March 2011). The grade 4 standards can be found on pages 43–47 in the *Framework*, and the five domains are listed below.

- Operations and Algebraic Thinking
- Number and Operations in Base Ten
- Number and Operations—Fractions
- Measurement and Data
- Geometry

The *Massachusetts Curriculum Framework for Mathematics* is 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 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.

Standards and reporting categories for the PARCC items in the grade 4 Mathematics test will be listed in a separate document, which will be posted to the Student Assessment webpage.

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. The tool kit pieces and an image of the ruler are 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 4 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 six multiple-choice questions, two short-answer questions, and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 1 Jane, Frank, and Denise each cut a length of ribbon.
- Jane's ribbon is 0.5 meter long.
 - Frank's ribbon is 0.39 meter long.
 - Denise's ribbon is 0.4 meter long.

Which statement about the lengths of the ribbons is true?

- A. Jane's ribbon is longer than Frank's ribbon.
- B. Denise's ribbon is longer than Jane's ribbon.
- C. Frank's ribbon is longest.
- D. Denise's ribbon is shortest.

- 2 Jessica is thinking of a number. She listed some of the factors of her number in the box shown below.

2, 3, 4, 6

Which of the following could be Jessica's number?

- A. 12
- B. 14
- C. 16
- D. 18

Questions 3 and 4 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 3.

- 3 In your Student Answer Booklet, draw two lines that are perpendicular.

- 4 Devin wrote a number in expanded form, as shown below.

$$500,000 + 90,000 + 3,000 + 20 + 8$$

Write Devin's number in standard form.

Question 5 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 5 in the space provided in your Student Answer Booklet.

5 Carl sold cookies and pies at a bake sale to earn money.

- A bag of cookies sells for \$3.
 - A pie sells for \$8.
- a. Carl sold 4 bags of cookies and 2 pies during the first hour of the bake sale. What is the total amount of money, in dollars, Carl earned during the first hour of the bake sale? Show or explain how you got your answer.
- b. Ms. O'Hara bought 2 bags of cookies and 1 pie from Carl. She paid with a \$20 bill. What is the total amount of change, in dollars, Ms. O'Hara should receive? Show or explain how you got your answer.

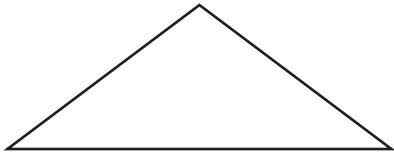
Vanessa sold cakes at the same bake sale.

- c. Mr. Stanley bought 1 bag of cookies and 2 pies from Carl. Mr. Stanley also spent \$11 to buy a cake from Vanessa at the bake sale. Write an equation to show m , the total amount of money, in dollars, Mr. Stanley spent at the bake sale.
- d. Solve the equation you wrote in part (c) to find the total amount of money, in dollars, Mr. Stanley spent at the bake sale. Show your work.

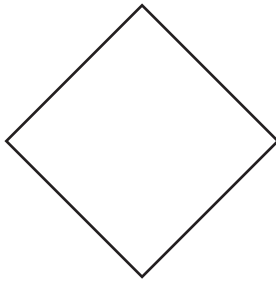
Mark your answers to multiple-choice questions 6 through 9 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

6 Which of the following shapes has **exactly** two lines of symmetry?

A.



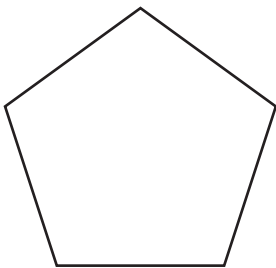
B.



C.



D.



7 When rounded to the nearest **thousand**, the number of people who attended a concert is 18,000.

Which of the following could be the number of people who attended the concert?

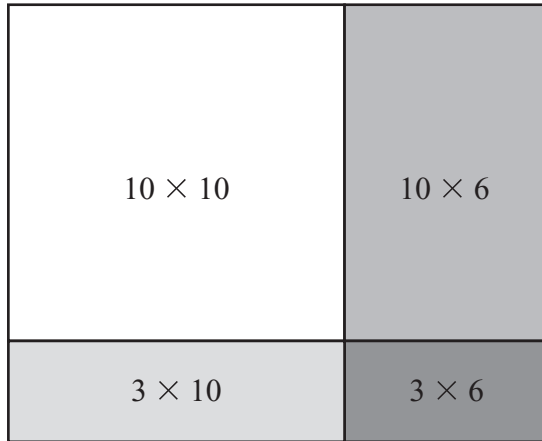
A. 17,264

B. 17,428

C. 18,135

D. 18,526

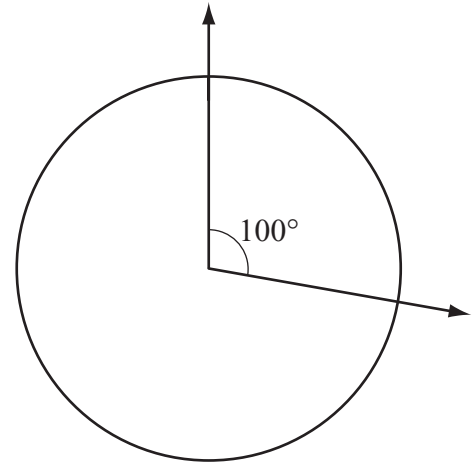
- 8 Nathan is using the area model below to solve a problem.



Which problem is represented by the whole area model?

- A. $12 \times 6 = \square$
- B. $16 \times 13 = \square$
- C. $20 \times 9 = \square$
- D. $60 \times 30 = \square$

- 9 Kendall drew a 100° angle from the center of a circle, as shown below.



What fraction of the circle does Kendall's angle turn through?

- A. $\frac{100}{360}$
- B. $\frac{100}{260}$
- C. $\frac{100}{180}$
- D. $\frac{100}{90}$

Question 10 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 10 in the space provided in your Student Answer Booklet.

10 Erin uses $\frac{2}{8}$ yard of string to make 1 bracelet. Erin will make 6 bracelets.

- a. How many yards of string will Erin use to make 6 bracelets? Show or explain how you got your answer.

Erin uses $\frac{3}{8}$ yard of string to make 1 necklace. Erin will make 5 necklaces.

- b. How many yards of string will Erin use to make 5 necklaces? Show or explain how you got your answer.
- c. The total number of yards of string Erin will use for 6 bracelets and 5 necklaces is between what two whole numbers? Show or explain how you got your answer.

Grade 4 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 ten multiple-choice questions and one short-answer question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 11 Which of these numbers has a 5 whose value is ten times the value of the 5 in 7359?

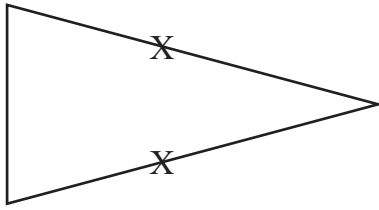
A. 5268
B. 4652
C. 3005
D. 2511

- 12 Darlene has 16 toy spiders. She has one-half as many toy beetles as she has toy spiders.

Which of the following equations can be used to find b , the total number of toy beetles Darlene has?

A. $16 - 2 = b$
B. $16 \div 2 = b$
C. $16 - \frac{1}{2} = b$
D. $16 \div \frac{1}{2} = b$

- 13 Gianna drew an X on two sides of a triangle, as shown below.



Which statement is true about the sides that Gianna drew an X on?

- A. The sides are parallel.
- B. The sides are perpendicular.
- C. The sides form an acute angle.
- D. The sides form an obtuse angle.

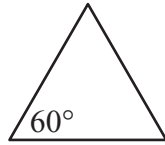
- 14 A class of 29 students is taking a field trip to the zoo. Each ticket to the zoo costs \$15.

Which of these expressions can be used to find the total cost, in dollars, of the tickets to the zoo?

- A. $(29 + 10) + (29 + 5)$
- B. $(29 \times 10) + (29 \times 5)$
- C. $(29 + 10) \times (29 + 5)$
- D. $(29 \times 10) \times (29 \times 5)$

15 Which of these is a right triangle?

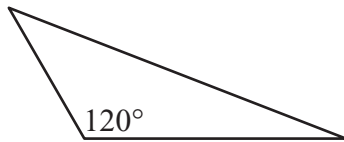
A.



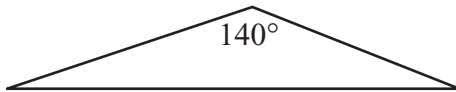
B.



C.



D.



16 The recipe on a box of pancake mix tells how many cups of pancake mix are needed to make different numbers of pancakes, as shown in the table below.

Pancake Recipe

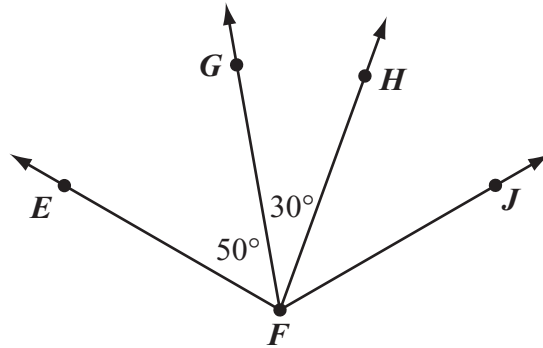
Cups of Pancake Mix	Number of Pancakes
1	8
2	16
3	24
4	32
5	
6	?

Based on the information in the table, how many pancakes can be made with 6 cups of pancake mix?

- A. 39
- B. 40
- C. 46
- D. 48

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 Some angles are shown in the diagram below.

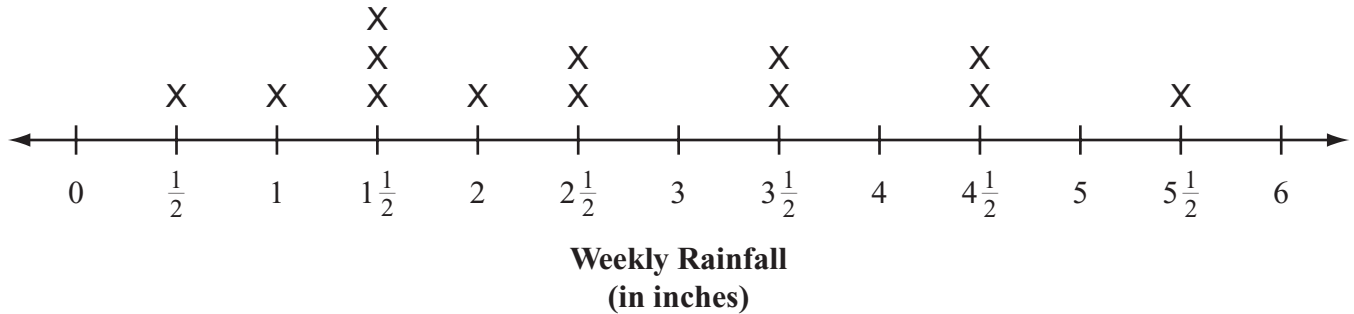


Angle EFG has a measure of 50° , and angle GFH has a measure of 30° . The sum of the measures of angles EFG , GFH , and HFJ is 120° .

What is the measure, in degrees, of angle HFJ ?

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 Brendan made a line plot showing the weekly rainfall, in inches, for his town one summer. His line plot is shown below.



Which of these expressions can Brendan use to find the difference, in inches, between the greatest weekly rainfall and the least weekly rainfall that he recorded for his town?

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

- 19 Jacob wrote the expression shown below.

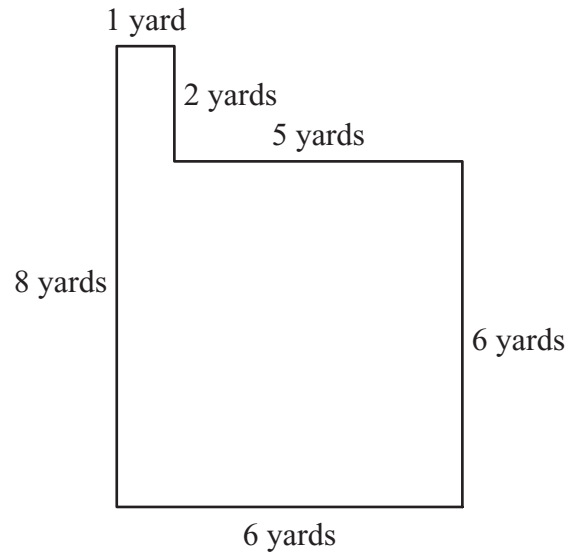
$$\frac{6}{10} + \frac{7}{100}$$

Which of these is equivalent to the expression Jacob wrote?

- A. $\frac{6}{10} + \frac{7}{10}$
- B. $\frac{60}{10} + \frac{7}{100}$
- C. $\frac{60}{100} + \frac{7}{100}$
- D. $\frac{60}{100} + \frac{70}{100}$

- 20 A diagram of Parvati’s garden and the lengths of all its sides are shown below.

Parvati’s Garden



Parvati wants to put a fence around her whole garden. What is the least number of yards of fence she will need?

- A. 24 yards
- B. 28 yards
- C. 36 yards
- D. 48 yards

- 21 Olivia's height is 1.34 meters. What is Olivia's height in **centimeters**?
- A. 0.0134 centimeter
 - B. 0.134 centimeter
 - C. 13.4 centimeters
 - D. 134.0 centimeters



Massachusetts Comprehensive Assessment System Grade 4 Mathematics Tool Kit

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

Grade 4 Mathematics
Spring 2016 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC/SA)*
1	156	<i>Number and Operations-Fractions</i>	NF.7	A
2	156	<i>Operations and Algebraic Thinking</i>	OA.4	A
3	157	<i>Geometry</i>	G.1	Two lines or line segments that are perpendicular
4	157	<i>Number and Operations In Base Ten</i>	NBT.2	593,028
5	158	<i>Operations and Algebraic Thinking</i>	OA.3	
6	159	<i>Geometry</i>	G.3	C
7	159	<i>Number and Operations In Base Ten</i>	NBT.3	C
8	160	<i>Number and Operations In Base Ten</i>	NBT.5	B
9	160	<i>Measurement and Data</i>	MD.5	A
10	161	<i>Number and Operations-Fractions</i>	NF.4	
11	162	<i>Number and Operations In Base Ten</i>	NBT.1	D
12	162	<i>Operations and Algebraic Thinking</i>	OA.2	B
13	163	<i>Geometry</i>	G.1	C
14	163	<i>Number and Operations In Base Ten</i>	NBT.5	B
15	164	<i>Geometry</i>	G.2	B
16	164	<i>Operations and Algebraic Thinking</i>	OA.5	D
17	165	<i>Measurement and Data</i>	MD.7	40 degrees
18	166	<i>Measurement and Data</i>	MD.4	B
19	167	<i>Number and Operations-Fractions</i>	NF.5	C
20	167	<i>Measurement and Data</i>	MD.3	B
21	168	<i>Measurement and Data</i>	MD.1	D

* 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 4 Mathematics
Spring 2016 Unreleased Common Items:
Reporting Categories and Standards

Item No.	Reporting Category	Standard
22	<i>Operations and Algebraic Thinking</i>	OA.1
23	<i>Number and Operations In Base Ten</i>	NBT.4
24	<i>Number and Operations-Fractions</i>	NF.1
25	<i>Measurement and Data</i>	MD.6
26	<i>Number and Operations In Base Ten</i>	NBT.2
27	<i>Geometry</i>	G.1
28	<i>Geometry</i>	G.2
29	<i>Operations and Algebraic Thinking</i>	OA.2
30	<i>Operations and Algebraic Thinking</i>	OA.3
31	<i>Number and Operations-Fractions</i>	NF.3
32	<i>Operations and Algebraic Thinking</i>	OA.5
33	<i>Operations and Algebraic Thinking</i>	OA.4
34	<i>Number and Operations-Fractions</i>	NF.3
35	<i>Number and Operations-Fractions</i>	NF.6
36	<i>Measurement and Data</i>	MD.2
37	<i>Number and Operations-Fractions</i>	NF.4
38	<i>Operations and Algebraic Thinking</i>	OA.2
39	<i>Measurement and Data</i>	MD.2
40	<i>Geometry</i>	G.3
41	<i>Geometry</i>	G.2
42	<i>Number and Operations In Base Ten</i>	NBT.6