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## X. Mathematics, Grade 4

# Grade 4 Mathematics Test

The spring 2018 grade 4 Mathematics test was a next-generation assessment that was administered in two formats: a computer-based version and a paper-based version. The test included both operational items, which count toward a student's score, and matrix items. The matrix portion of the test consisted of field-test and equating questions that do not count toward a student's score.

Most of the operational items on the grade 4 Mathematics test were the same, regardless of whether a student took the computer-based version or the paper-based version. In some instances, the wording of a paper item differed slightly from the computer-based version. In places where a technology-enhanced item was used on the computer-based test, that item was typically replaced with one or more alternative items on the paper test. These alternative items sometimes assessed the same standard as the technology-enhanced item, or other standards from the same reporting category.

This document displays the **paper-based versions** of the 2018 operational items that have been released. The **computer-based versions** of the released items are available on the MCAS Resource Center website at [mcas.pearsonsupport.com/released-items](https://mcas.pearsonsupport.com/released-items).

## Test Sessions and Content Overview

The grade 4 Mathematics test was made up of two separate test sessions. Each session included selected-response, short-answer, and constructed-response questions. On the paper-based test, the selected-response questions were multiple-choice items and multiple-select items, in which students select the correct answer(s) from among several answer options.

## Standards and Reporting Categories

The grade 4 Mathematics test was based on standards in the five domains for grade 4 in the *Massachusetts Curriculum Framework for Mathematics* (2017). 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/](http://www.doe.mass.edu/frameworks/).

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 provide the following information about each released and unreleased operational item: reporting category, standard(s) covered, item type, and item description. The correct answers for released selected-response and short-answer questions are also displayed in the released item table.

## Reference Materials and Tools

Each student taking the paper-based version of the grade 4 Mathematics test was provided with a plastic ruler. An image of the ruler is 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 learner students only. No calculators, other reference tools, or materials were allowed.

# Grade 4 Mathematics

## SESSION 1

This session contains 7 questions.

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



### Directions

Read each question carefully and then answer it as well as you can. You must record all answers in your Student Answer Booklet.

For some questions, you will mark your answers by filling in the circles in your Student Answer Booklet. Make sure you darken the circles completely. Do not make any marks outside of the circles. If you need to change an answer, be sure to erase your first answer completely.

For other questions, you will need to fill in an answer grid. Directions for completing questions with answer grids are provided on the next page.

If a question asks you to show or explain your work, you must do so to receive full credit. Write your response in the space provided in your Student Answer Booklet. Only responses written within the provided space will be scored.

**Directions for Completing Questions with Answer Grids**

1. Work the question and find an answer.
2. Enter your answer in the answer boxes at the top of the answer grid.
3. Print only one number or symbol in each box. Do not leave a blank box in the middle of an answer.
4. Under each answer box, fill in the circle that matches the number or symbol you wrote above. Make a solid mark that completely fills the circle.
5. Do not fill in a circle under an unused answer box.
6. If you need to change an answer, be sure to erase your first answer completely.
7. See below for examples of how to correctly complete an answer grid.

**EXAMPLES**

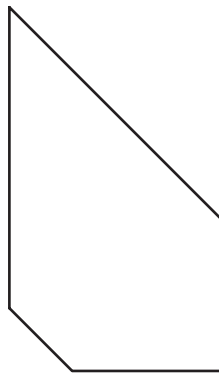
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- 1 Anjali has the shape shown.



What is the total number of right angles Anjali's shape appears to have?

- A. 0  
B. 1  
C. 2  
D. 3
- 4 Which fraction is less than  $\frac{1}{2}$ ?
- A.  $\frac{6}{12}$   
B.  $\frac{5}{8}$   
C.  $\frac{4}{6}$   
D.  $\frac{2}{5}$

- 5 A student mixes  $\frac{7}{100}$  liter of red food dye with  $\frac{4}{10}$  liter of water. How many liters in all are in the student's mixture?
- A.  $\frac{11}{100}$  liter
- B.  $\frac{28}{100}$  liter
- C.  $\frac{47}{100}$  liter
- D.  $\frac{74}{100}$  liter

**This question has three parts.**

- 7** A group of friends played a computer game.
- Jordan scored two hundred sixteen thousand, forty-five points.
  - Madison scored 210,634 points.

**Part A**

Write the number of points Jordan scored in standard form.  
Enter your answer in the space provided.

**Part B**

Write the number of points Madison scored in expanded form.  
Enter your answer in the space provided.

**Part C**

Hannah also played the computer game.

- She scored more than 215,000 points.
- She scored fewer points than Jordan.
- Her score has the same six digits as Madison's score, but she did not have the same score as Madison.

Write a number sentence using  $<$ ,  $>$ , or  $=$  to compare the number of points Madison scored to the number of points Hannah could have scored. Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

- 14 Nick ran a race in 14.56 seconds. Casey ran the race in 14.58 seconds.

At which place value are Nick's and Casey's race times different?

- A. tens
- B. ones
- C. tenths
- D. hundredths

- 16 What value of  $p$  makes this equation true?

$$3,032 \div p = 8$$

- A. 354
- B. 375
- C. 379
- D. 382



20 Which expression is equal to  $\frac{8}{2}$ ?

A.  $2 + \frac{1}{8}$

B.  $2 \times \frac{1}{8}$

C.  $8 + \frac{1}{2}$

D.  $8 \times \frac{1}{2}$

# Grade 4 Mathematics

## SESSION 2

This session contains 14 questions.

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



### Directions

Read each question carefully and then answer it as well as you can. You must record all answers in your Student Answer Booklet.

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**EXAMPLES**

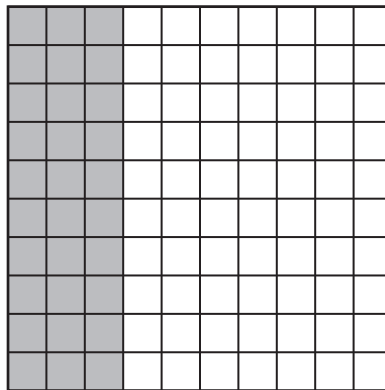
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- 21 The decimal 0.30 is represented by the shaded part of this grid.



Which of these is equivalent to the decimal 0.30?

- A. 0.003
- B. 0.03
- C. 0.3
- D. 3.0

22 Which of these shows only multiples of the number 7?

A. 1, 7, 14, 21

B. 7, 17, 27, 37

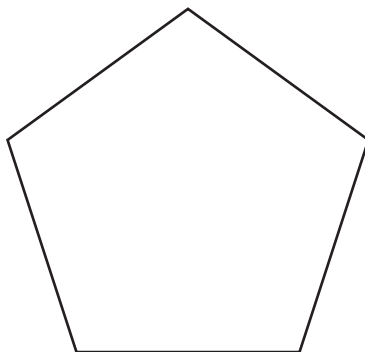
C. 7, 14, 21, 28

D. 14, 21, 28, 36

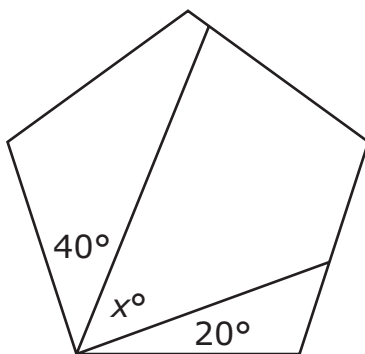
26 Ryan put 3 liters of water in a bucket. How much water, in **milliliters**, did Ryan put in the bucket?

Enter your answer in the answer boxes at the top of the answer grid **and** completely fill the matching circles.

- 28 The measure of each angle in this shape is  $108^\circ$ .



Olivia drew two lines inside the shape and found the measures of two angles, as shown.



What is the value of  $x$ ?

- A. 30
- B. 48
- C. 60
- D. 68

**This question has four parts.**

**29** Juan and Lily each wrote a pattern.

Lily wrote a pattern using a rule with two operations. The rule is “subtract 2, add 8.” The first five numbers in her pattern are shown.

114, 112, 120, 118, 126, ...

**Part A**

Continue Lily’s pattern to show the next four numbers in her pattern.

Enter your answer in the space provided.

**Part B**

Explain why the numbers in Lily’s pattern increased overall, although part of her rule is “subtract 2.”

Enter your explanation in the space provided.

**Part C**

Juan also wrote a pattern using a rule with two operations. The first two numbers in his pattern are shown.

150, 160, ...

The seventh number in Juan’s pattern is less than the first number in his pattern. Write a rule with two operations that could be Juan’s rule.

Enter your answer in the space provided.

**Part D**

Continue Juan’s pattern to show the next five numbers in his pattern using the rule you wrote in Part C.

Enter your answer in the space provided.

30 Which of these is true?

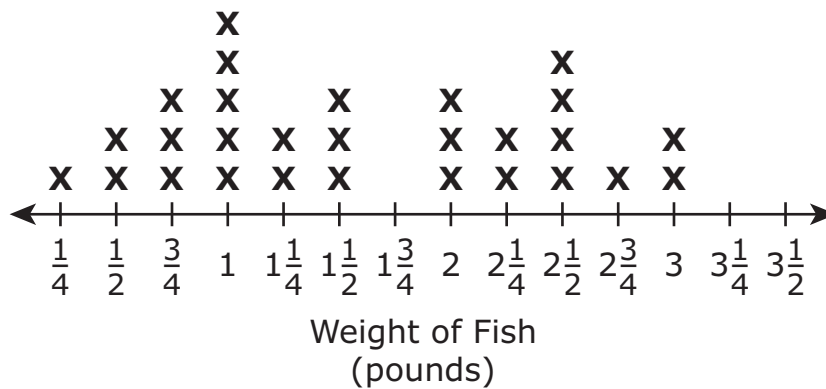
A.  $\frac{1}{12} \times 7 = \frac{7}{12}$

B.  $\frac{1}{12} \times 7 = \frac{12}{7}$

C.  $\frac{1}{12} \times 7 = \frac{7}{84}$

D.  $\frac{1}{12} \times 7 = \frac{84}{7}$

31 The shopkeeper at a seafood store measured the weight, in pounds, of each fish sold to each customer. The shopkeeper recorded the data on this line plot.



Based on the line plot, what was the difference between the weight of the heaviest fish sold and the weight of the lightest fish sold?

A.  $\frac{3}{4}$  pound

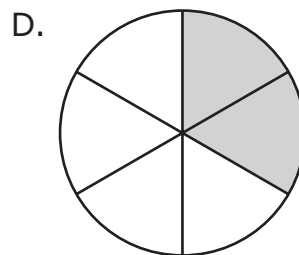
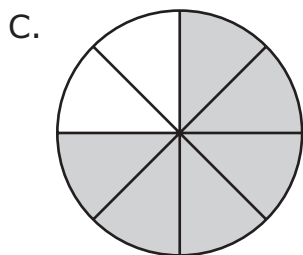
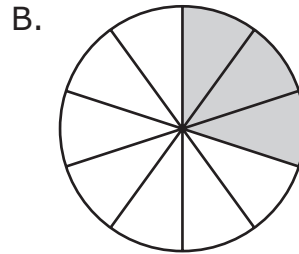
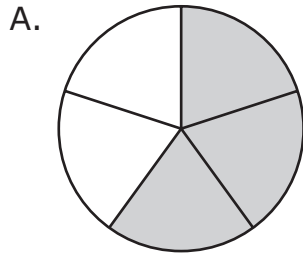
B.  $2\frac{1}{4}$  pounds

C.  $2\frac{3}{4}$  pounds

D.  $3\frac{1}{4}$  pounds

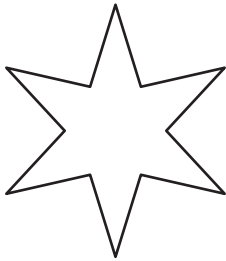


- 32 Paloma shaded a circle to model a fraction that is equivalent to  $\frac{6}{10}$ . Which of these could be the circle Paloma shaded?

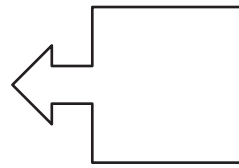


33 Which of these shapes has **exactly** one line of symmetry?

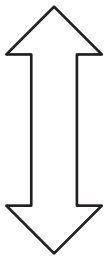
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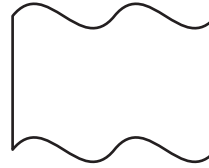
B.



C.



D.



34 Which of these is equivalent to  $\frac{38}{100}$ ?

A. 0.038

B. 0.38

C. 38.0

D. 380

- 37** The value of the 6 in 56,273 is how many times the value of the 6 in 48,624?

Enter your answer in the answer boxes at the top of the answer grid **and** completely fill the matching circles.

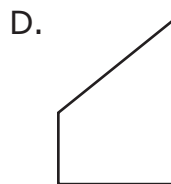
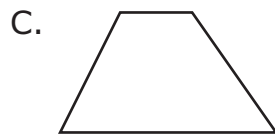
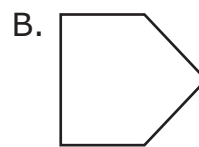
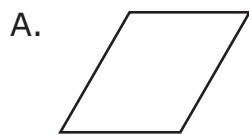
- 38** An angle turns through  $\frac{1}{4}$  of a circle. What is the measure, in degrees, of the angle?

Enter your answer in the answer boxes at the top of the answer grid **and** completely fill the matching circles.

- 39 Ms. Curran wrote three clues about a shape, as shown in this box.

<p><b>Clues</b></p> <ul style="list-style-type: none"><li>• It is a quadrilateral.</li><li>• It has two right angles.</li><li>• Two of its sides are parallel.</li></ul>
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Which of the following shapes matches all three clues?



- 40 Kenji has 7 times as many baseball cards as Logan. Logan has 360 baseball cards.

Which equation can be used to find  $n$ , the number of baseball cards Kenji has?

- A.  $7 \times n = 360$   
B.  $7 + n = 360$   
C.  $360 \times 7 = n$   
D.  $360 + 7 = n$

**Grade 4 Mathematics**  
**Spring 2018 Released Operational Items:**  
**Reporting Categories, Standards, Item Descriptions, and Correct Answers**

PBT Item No.*	Page No.	Reporting Category	Standard	Item Type**	Description	Correct Answer***
1	196	<i>Geometry</i>	4.G.A.01	SR	Determine the number of right angles in a given polygon.	B
4	196	<i>Number &amp; Operations-Fractions</i>	4.NF.A.02	SR	Determine which fraction is less than a given benchmark fraction.	D
5	197	<i>Number &amp; Operations-Fractions</i>	4.NF.C.05	SR	Add two fractions with denominators 10 and 100 by writing equivalent fractions with like denominators.	C
7	198	<i>Number &amp; Operations in Base Ten</i>	4.NBT.A.02	CR	Write numbers in expanded notation and standard form, determine a number that meets given criteria, and write a number sentence using $<$ , $>$ , or $=$ to compare numbers.	
14	199	<i>Number &amp; Operations-Fractions</i>	4.NF.C.07	SR	Identify the place value of a digit in a given decimal number.	D
16	199	<i>Number &amp; Operations in Base Ten</i>	4.NBT.B.06	SR	Give the value of a variable that makes a division equation true.	C
20	200	<i>Number &amp; Operations-Fractions</i>	4.NF.B.04	SR	Determine which expression is equivalent to a given fraction.	D
21	203	<i>Number &amp; Operations-Fractions</i>	4.NF.C.07	SR	Use a visual model to identify a decimal that is equivalent to a given decimal.	C
22	204	<i>Operations &amp; Algebraic Thinking</i>	4.OA.B.04	SR	Choose the set of numbers that shows only multiples of a given single-digit number.	C
26	204	<i>Measurement &amp; Data</i>	4.MD.A.01	SA	Express an amount given in liters in milliliters.	3000
28	205	<i>Measurement &amp; Data</i>	4.MD.C.07	SR	Determine an angle measure given the measures of two adjacent angles and the sum of all three angle measures.	B
29	206	<i>Operations &amp; Algebraic Thinking</i>	4.OA.C.05	CR	Determine additional terms of a pattern given the rule, explain how the rule affects the pattern, and then analyze a similar pattern to find additional terms.	
30	207	<i>Number &amp; Operations-Fractions</i>	4.NF.B.04	SR	Determine the product of a whole number and a unit fraction.	A
31	207	<i>Measurement &amp; Data</i>	4.MD.B.04	SR	Find the difference between two values from a line plot with fraction, mixed number, and whole number values.	C
32	208	<i>Number &amp; Operations-Fractions</i>	4.NF.A.01	SR	Choose the fraction model that represents an equivalent fraction of a given fraction.	A
33	209	<i>Geometry</i>	4.G.A.03	SR	Determine which figure has exactly one line of symmetry.	B
34	209	<i>Number &amp; Operations-Fractions</i>	4.NF.C.06	SR	Determine which decimal is equivalent to a given fraction with a denominator of 100.	B
37	210	<i>Number &amp; Operations in Base Ten</i>	4.NBT.A.01	SA	Determine how many times the value of a digit in one number is compared to the value of the digit in another number.	10
38	210	<i>Measurement &amp; Data</i>	4.MD.C.05	SA	Determine the measure of an angle that turns through a given fraction of a circle.	90
39	211	<i>Geometry</i>	4.G.A.02	SR	Identify the shape that matches a given list of features describing the sides and angles of the shape.	D
40	211	<i>Operations &amp; Algebraic Thinking</i>	4.OA.A.02	SR	Choose a multiplication equation that can be used to solve a word problem with a multiplicative comparison.	C

\* “PBT Item Number” refers to the position of the item on the operational paper-based test. This is the item number that DESE refers to when reporting student results for a PBT item.

\*\* Mathematics item types are: selected-response (SR), short-answer (SA), and constructed-response (CR).

\*\*\* Answers are provided here for selected-response and short-answer items only. Sample responses and scoring guidelines for any constructed-response items will be posted to the Department’s website later this year.

**Grade 4 Mathematics**  
**Spring 2018 Unreleased Operational Items:**  
**Reporting Categories, Standards, and Item Descriptions**

<b>PBT Item No.*</b>	<b>Reporting Category</b>	<b>Standard</b>	<b>Item Type**</b>	<b>Description</b>
2	<i>Number &amp; Operations in Base Ten</i>	4.NBT.B.04	SA	Given one three-digit addend and the four-digit sum, determine the missing addend.
3	<i>Number &amp; Operations in Base Ten</i>	4.NBT.A.01	SR	Determine the relationship between digits in multi-digit whole numbers.
6	<i>Measurement &amp; Data</i>	4.MD.A.02	SR	Solve a word problem involving amounts of money written in dollars and cents.
8	<i>Number &amp; Operations-Fractions</i>	4.NF.C.06	SR	Identify the equivalent fraction to a given decimal.
9	<i>Number &amp; Operations in Base Ten</i>	4.NBT.B.05	SA	Multiply a four-digit whole number and a one-digit whole number.
10	<i>Measurement &amp; Data</i>	4.MD.C.06	SR	Identify three angles, displayed with protractors, that have a measure greater than a given angle measure.
11	<i>Measurement &amp; Data</i>	4.MD.A.02	SR	Given a starting time on an analog clock and the amount of time a task will take, determine what the time will be when the task is finished.
12	<i>Number &amp; Operations-Fractions</i>	4.NF.B.03	CR	Solve word problems by adding fractions with like denominators and comparing fractions with like numerators.
13	<i>Operations &amp; Algebraic Thinking</i>	4.OA.B.04	SR	Solve a word problem by identifying a multiple of a given whole number.
15	<i>Geometry</i>	4.G.A.03	SR	Identify a shape that has more than one line of symmetry.
17	<i>Operations &amp; Algebraic Thinking</i>	4.OA.A.03	SA	Solve multi-step word problems by adding 3 four-digit whole numbers and by adding and subtracting four-digit whole numbers.
18	<i>Number &amp; Operations-Fractions</i>	4.NF.A.02	SR	Order fractions from least to greatest.
19	<i>Number &amp; Operations in Base Ten</i>	4.NBT.B.04	SA	Subtract a four-digit whole number from another four-digit whole number.
23	<i>Operations &amp; Algebraic Thinking</i>	4.OA.A.02	SR	Divide to solve a word problem involving a multiplicative comparison.
24	<i>Geometry</i>	4.G.A.01	SR	Identify the mathematical term that describes a given angle.
25	<i>Measurement &amp; Data</i>	4.MD.A.03	CR	Use a ruler to measure the sides of a rectangle and then find the area of the rectangle.
27	<i>Number &amp; Operations-Fractions</i>	4.NF.C.05	SR	Choose which fraction is equivalent to a given fraction with a denominator of 100.
35	<i>Number &amp; Operations-Fractions</i>	4.NF.A.02	SR	Compare fractions with different denominators to determine which fraction is the greatest and then identify fractions that are equivalent to a given fraction.
36	<i>Operations &amp; Algebraic Thinking</i>	4.OA.A.01	SR	Identify an equation that represents a multiplicative comparison in a word problem.

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