

Massachusetts MCAS 2022
Grade 4 Math

Exam Materials
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MASSACHUSETTS DEPARTMENT OF
ELEMENTARY AND SECONDARY
EDUCATION

*Release of Spring 2022
MCAS Test Items*
from the

*Grade 4 Mathematics
Paper-Based Test*

June 2022
**Massachusetts Department of
Elementary and Secondary Education**

Grade 4 Mathematics

SESSION 1

This session contains 13 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 this Test & Answer Booklet.

For some questions, you will mark your answers by filling in the circles in your Test & 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. 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

0	.	4	3	2	
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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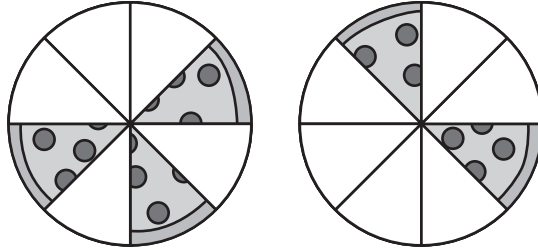
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9	9	9	9	9	9

			4	3	8
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2	2	2	2	2	2
3	3	3	3	<input checked="" type="radio"/>	3
4	4	4	<input checked="" type="radio"/>	4	4
5	5	5	5	5	5
6	6	6	6	6	6
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9	9	9	9	9	9

6	8	1	9		
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0	0	0	0	0	0
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3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
<input checked="" type="radio"/>	6	6	6	6	6
7	7	7	7	7	7
8	<input checked="" type="radio"/>	8	8	8	8
9	9	9	<input checked="" type="radio"/>	9	9

- 1 A family ordered two pizzas for dinner. Both pizzas were the same size. Each slice of pizza was the same size.

This diagram shows the amount of pizza remaining after dinner.



Which of these equations shows how to find the fraction of a whole pizza that was **remaining** after dinner?

- Ⓐ $\frac{3}{5} + \frac{2}{6} = \frac{5}{11}$
- Ⓑ $\frac{3}{8} + \frac{2}{8} = \frac{5}{8}$
- Ⓒ $\frac{5}{8} + \frac{6}{8} = \frac{11}{8}$
- Ⓓ $\frac{3}{8} + \frac{2}{8} = \frac{5}{16}$

- 2 Claire correctly worked out the answer to a subtraction problem. Which of these could be Claire's problem and work?

(A)

$$\begin{array}{r} 3012 \\ - 176 \\ \hline 3164 \end{array}$$

(B)

$$\begin{array}{r} 2910 \\ 3012 \\ - 176 \\ \hline 2836 \end{array}$$

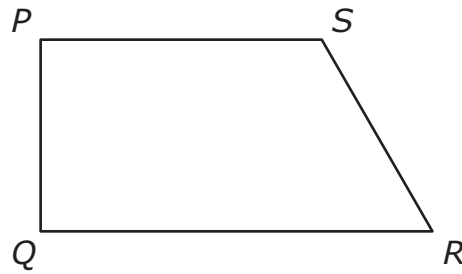
(C)

$$\begin{array}{r} 910 \\ 3012 \\ - 176 \\ \hline 3836 \end{array}$$

(D)

$$\begin{array}{r} 299 \\ 3012 \\ - 176 \\ \hline 2826 \end{array}$$

- 3 A student created this figure by drawing line segments and angles.



Which line segments and angles did the student use to create the figure?

Select the **two** correct answers.

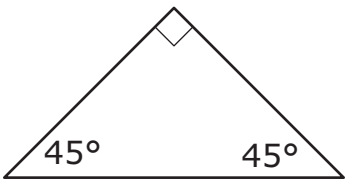
- Ⓐ line segment PR
 - Ⓑ line segment PQ
 - Ⓒ line segment QS
 - Ⓓ angle SPQ
 - Ⓔ angle SQR
 - Ⓕ angle QSR
- 4 In which of these numbers does the 7 have a value that is **ten** times the value of the 7 in 9,176?
- Ⓐ 2,473
 - Ⓑ 3,724
 - Ⓒ 4,327
 - Ⓓ 7,432

- 5 Which of these comparisons are correct?

Select the **two** correct answers.

- Ⓐ $0.29 < 0.8$
- Ⓑ $0.29 > 0.8$
- Ⓒ $0.29 = 0.8$
- Ⓓ $0.8 < 0.29$
- Ⓔ $0.8 > 0.29$

6 A triangle is shown.



How many lines of symmetry does the triangle have?

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

•	•	•	•	•	•
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

7 Which of these statements are correct?

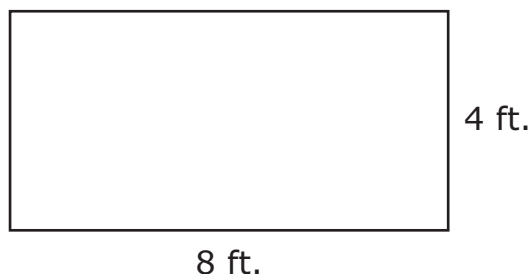
Select the **three** correct answers.

- Ⓐ $36 \div p = 4$ has a related multiplication fact of $p \times 4 = 36$.
- Ⓑ $36 \div p = 4$ has a related multiplication fact of $36 \times p = 4$.
- Ⓒ $s \div 7 = 5$ has a related multiplication fact of $s \times 5 = 7$.
- Ⓓ $s \div 7 = 5$ has a related multiplication fact of $7 \times 5 = s$.
- Ⓔ $72 \div 12 = a$ has a related multiplication fact of $a \times 12 = 72$.
- Ⓕ $72 \div 12 = a$ has a related multiplication fact of $a \times 72 = 12$.

This question has four parts. Be sure to label each part of your response.

- 8 There is a garden, a patio, and a flower bed in the backyard of a house. The garden, the patio, and the flower bed are each in the shape of a rectangle.

- A. The garden has a length of 4 feet and a width of 8 feet, as shown in this diagram.



What is the area, in square feet, of the garden?

- B. The patio has a length of 5 feet and an area of 35 square feet.

What is the width, in feet, of the patio? Show or explain how you got your answer.

- C. The owner of the house thinks the garden and the patio have the same perimeter.

Is the owner correct? Explain your reasoning.

- D. The area of the flower bed is **less than** the area of the garden. The perimeter of the flower bed is **equal** to the perimeter of the patio.

What could be the length **and** the width of the flower bed? Explain how you know your answer is correct.

Write your answers on the next page.

8

- 9 A student drinks $\frac{2}{5}$ liter of water each morning.

Which of these is the total amount of water, in liters, the student drinks over 4 mornings?

- Ⓐ $\frac{6}{5}$ liters
- Ⓑ $\frac{8}{5}$ liters
- Ⓒ $\frac{8}{10}$ liter
- Ⓓ $\frac{8}{20}$ liter

10 A teacher has 8 sheets of stickers for decorating posters.

- Each sheet has 10 stickers.
- Each poster will have exactly 3 stickers.

What is the **greatest** number of posters the teacher can decorate?

- Ⓐ 25 posters
- Ⓑ 26 posters
- Ⓒ 27 posters
- Ⓓ 28 posters

This question has two parts.

- 11 On field day, a student recorded his finish times for three different races. He also recorded the distances of four of his softball throws.

Part A

The student’s finish times for the three races are shown.

- 3 minutes
- 4 minutes, 39 seconds
- 10 minutes, 17 seconds

Which table shows the student’s finish times, in **seconds**, for the three races?

Ⓐ

Finish Times

Time	Time in Seconds
3 minutes	180
4 minutes, 39 seconds	179
10 minutes, 17 seconds	617

Ⓑ

Finish Times

Time	Time in Seconds
3 minutes	180
4 minutes, 39 seconds	279
10 minutes, 17 seconds	617

Ⓒ

Finish Times

Time	Time in Seconds
3 minutes	180
4 minutes, 39 seconds	279
10 minutes, 17 seconds	6,017

Ⓓ

Finish Times

Time	Time in Seconds
3 minutes	300
4 minutes, 39 seconds	439
10 minutes, 17 seconds	1,017

Part B

The distances of the student's four softball throws were recorded using different units of measurement, as shown.

120 inches

3 yards

8 feet

100 inches

Which of these shows the distances of the softball throws in the correct order from **least to greatest**?

Ⓐ

8 feet

100 inches

3 yards

120 inches

Ⓑ

8 feet

3 yards

100 inches

120 inches

Ⓒ

100 inches

120 inches

8 feet

3 yards

Ⓓ

3 yards

8 feet

100 inches

120 inches

- 12 Lashawn knows this number sentence is true.

$$4 \times 7 = 28$$

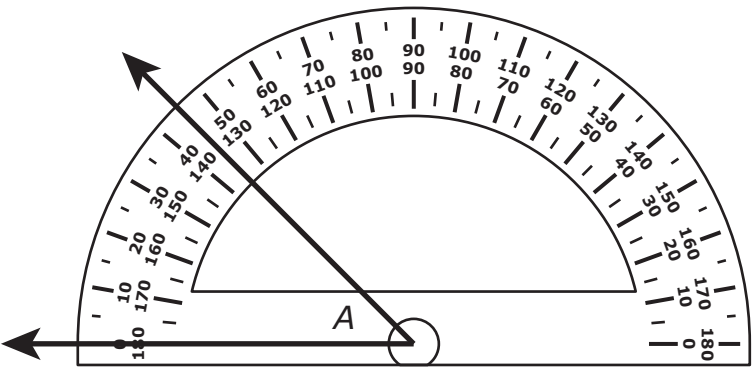
What is the value of that makes this number sentence true?

$$4 \times 700 = \text{?}$$

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

•	•	•	•	•	•
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

- 13 A protractor is used to measure angle A, as shown.



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

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

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
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6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

Grade 4 Mathematics

SESSION 2

This session contains 7 questions.

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Directions

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EXAMPLES

0	.	4	3	2	
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input checked="" type="radio"/>	0	0	0	0	0
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7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

		.	2	5	
<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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4	4	4	4	4	4
5	5	5	5	<input checked="" type="radio"/>	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

			4	3	8
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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2	2	2	2	2	2
3	3	3	3	<input checked="" type="radio"/>	3
4	4	4	<input checked="" type="radio"/>	4	4
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6	6	6	6	6	6
7	7	7	7	7	7
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9	9	9	9	9	9

6	8	1	9		
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8	<input checked="" type="radio"/>	8	8	8	8
9	9	9	<input checked="" type="radio"/>	9	9

14 What value of c makes this equation true?

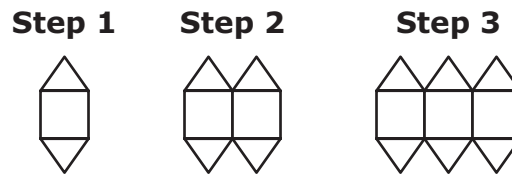
$$\frac{4}{6} = \frac{8}{c}$$

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

•	•	•	•	•	•
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

This question has four parts. Be sure to label each part of your response.

- 15** A student uses squares and triangles to make a pattern. In each step of the pattern, the student adds 1 square and 2 triangles, as shown.



The student continues the pattern.

- A. What is the total number of triangles in Step 4 of the pattern?
- B. What is the total number of **squares** in Step 6 of the pattern? Explain how you know your answer is correct.
- C. What is the total number of **triangles** in Step 9 of the pattern? Explain how you can get your answer by using multiplication.
- D. One step in the pattern will have a total of 64 triangles.

What is the total number of **squares** in that step? Show or explain how you got your answer.

Write your answers on the next page.

15

- 16** Which of these sentences are correct?

Select the **three** correct answers.

- Ⓐ The number 142,839 rounded to the nearest **thousand** is 142,000.
- Ⓑ The number 142,839 rounded to the nearest **thousand** is 143,000.
- Ⓒ The number 142,839 rounded to the nearest **ten thousand** is 140,000.
- Ⓓ The number 142,839 rounded to the nearest **ten thousand** is 150,000.
- Ⓔ The number 142,839 rounded to the nearest **hundred thousand** is 100,000.
- Ⓕ The number 142,839 rounded to the nearest **hundred thousand** is 200,000.

- 17** Which two fractions are equivalent?

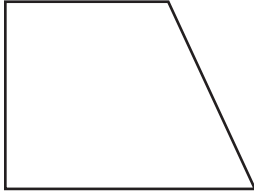
Select the **two** correct answers.

- Ⓐ $\frac{4}{1}$
- Ⓑ $\frac{40}{1}$
- Ⓒ $\frac{4}{10}$
- Ⓓ $\frac{4}{100}$
- Ⓔ $\frac{40}{100}$

- 18** Which of these shapes appear to have at least one pair of parallel sides **and** at least one pair of perpendicular sides?

Select the **three** correct shapes.

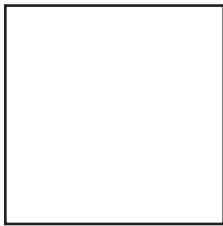
Ⓐ



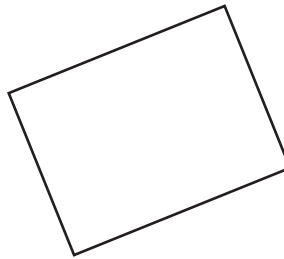
Ⓑ



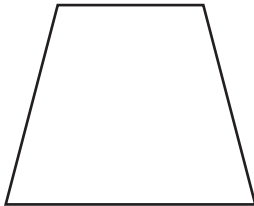
Ⓒ



Ⓓ



Ⓔ



- 19** Which of these fractions is equivalent to 0.3?

Ⓐ $\frac{1}{3}$

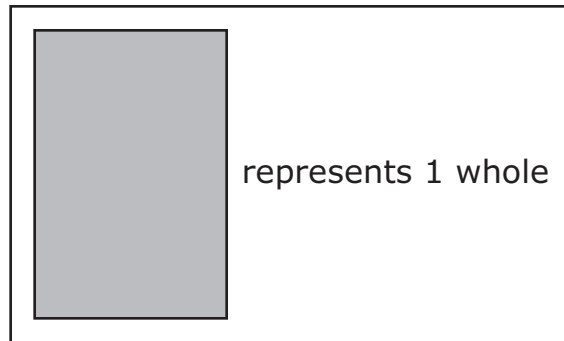
Ⓑ $\frac{1}{30}$

Ⓒ $\frac{3}{10}$

Ⓓ $\frac{3}{100}$

- 20 Which fraction model is shaded to show the product of this expression?

$$4 \times \frac{1}{3}$$



- (A)
- (B)
- (C)
- (D)

Grade 4 Mathematics
Spring 2022 Released Operational Items

PBT Item No.	Page No.	Reporting Category	Standard	Item Type*	Item Description	Correct Answer**
1	4	<i>Number and Operations-Fractions</i>	4.NF.B.3	SR	Determine which addition equation involving fractions represents a given real-world context.	B
2	5	<i>Number and Operations in Base Ten</i>	4.NBT.B.4	SR	Determine which set of student work given for a subtraction problem of a four-digit number minus a three-digit number is correct.	B
3	6	<i>Geometry</i>	4.G.A.1	SR	Identify whether specified line segments and angles can be found in a given figure.	B,D
4	6	<i>Number and Operations in Base Ten</i>	4.NBT.A.1	SR	Determine which number has a digit with a value that is 10 times the value of a digit in a given number.	B
5	7	<i>Number and Operations-Fractions</i>	4.NF.C.7	SR	Determine which comparisons of two decimals to hundredths using the symbols $>$, $<$, or $=$ are correct.	A,E
6	8	<i>Geometry</i>	4.G.A.3	SA	Identify the number of lines of symmetry in a given figure.	1
7	9	<i>Number and Operations in Base Ten</i>	4.NBT.B.6	SR	Determine which statements showing related multiplication equations and division equations including a variable are correct.	A,D,E
8	10–11	<i>Measurement and Data</i>	4.MD.A.3	CR	Determine the area of a rectangle given the length and width, determine the width of a rectangle given the area and length, explain how it is possible for two rectangles with different areas to have the same perimeter, and solve a real-world problem involving rectangles with the same perimeter but with different areas.	
9	12	<i>Number and Operations-Fractions</i>	4.NF.B.4	SR	Solve a word problem by multiplying a fraction by a whole number.	B
10	13	<i>Operations and Algebraic Thinking</i>	4.OA.A.3	SR	Solve a multi-step real-world problem using multiplication and division, and by interpreting a remainder.	B
11	14–15	<i>Measurement and Data</i>	4.MD.A.1	SR	Convert from a larger unit of measure to a smaller unit of measure using minutes and seconds and order measurements given in yards, feet, and inches.	B;A
12	16	<i>Number and Operations in Base Ten</i>	4.NBT.B.5	SA	Determine the product of a three-digit number and a one-digit number.	2800
13	17	<i>Measurement and Data</i>	4.MD.C.6	SA	Determine the measure of an angle shown with a drawing of a protractor.	45
14	20	<i>Number and Operations-Fractions</i>	4.NF.A.1	SA	Determine the denominator that will make a fraction equivalent to a given fraction.	12
15	21–22	<i>Operations and Algebraic Thinking</i>	4.OA.C.5	CR	Determine the next step in a shape pattern, identify how many shapes will be in future steps, and demonstrate understanding of the relationships between different features of the pattern.	
16	23	<i>Number and Operations in Base Ten</i>	4.NBT.A.3	SR	Round a multi-digit whole number to the nearest thousand, ten thousand, and hundred thousand.	B,C,E
17	23	<i>Number and Operations-Fractions</i>	4.NF.C.5	SR	Identify two fractions with denominators of 10 and 100 that are equivalent.	C,E
18	24	<i>Geometry</i>	4.G.A.2	SR	Identify shapes that have at least one pair of parallel sides and at least one pair of perpendicular sides.	A,C,D
19	24	<i>Number and Operations-Fractions</i>	4.NF.C.6	SR	Identify the fraction that is equivalent to a given decimal.	C
20	25	<i>Number and Operations-Fractions</i>	4.NF.B.4	SR	Determine the fraction model that represents the product of a whole number and a unit fraction.	D

* 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 2022 Unreleased Operational Items

PBT Item No.	Reporting Category	Standard	Item Type*	Item Description
21	<i>Geometry</i>	4.G.A.1	SR	Identify all obtuse angles in a given two-dimensional figure.
22	<i>Number and Operations in Base Ten</i>	4.NBT.A.2	CR	Convert between numbers written in word form, expanded form, and number form; compare numbers in the different forms using $<$, $>$, or $=$; and critique the reasoning of a given estimate based on place value.
23	<i>Number and Operations-Fractions</i>	4.NF.B.3	SR	Determine the sum of two mixed numbers with like denominators.
24	<i>Operations and Algebraic Thinking</i>	4.OA.A.1	SR	Determine which written statements of multiplicative comparison represent a given multiplication equation.
25	<i>Number and Operations-Fractions</i>	4.NF.C.6	SR	Determine which point on a number line labeled in decimals represents a given fraction.
26	<i>Number and Operations-Fractions</i>	4.NF.C.5	SR	Add fractions with denominators of 10 and 100.
27	<i>Number and Operations-Fractions</i>	4.NF.A.2	SR	Determine if given comparisons between two fractions with unlike denominators are true.
28	<i>Measurement and Data</i>	4.MD.C.5	SR	Identify which figure has a given angle measure.
29	<i>Operations and Algebraic Thinking</i>	4.OA.A.3	SR	Solve a real-world problem using division and interpreting a remainder.
30	<i>Operations and Algebraic Thinking</i>	4.OA.A.1	SR	Determine which equation with a variable for the unknown can be used to solve a given word problem involving multiplicative comparison.
31	<i>Number and Operations in Base Ten</i>	4.NBT.B.4	SA	Determine the sum of a five-digit number and a four-digit number.
32	<i>Number and Operations-Fractions</i>	4.NF.C.7	CR	Identify the greatest decimal in a given group; compare decimals to hundredths using $<$, $>$, or $=$; write a decimal that is between two given decimals; and determine which decimal is closest to a given decimal.
33	<i>Geometry</i>	4.G.A.3	SR	Determine the figure that has three or more lines of symmetry.
34	<i>Measurement and Data</i>	4.MD.C.7	SA	Determine the measure of an unknown angle when given the measurements of two angles and the sum of all three angles.
35	<i>Number and Operations-Fractions</i>	4.NF.A.2	SR	Identify a fraction that will make a comparison statement with another fraction true.
36	<i>Operations and Algebraic Thinking</i>	4.OA.B.4	SR	Identify composite numbers.
37	<i>Operations and Algebraic Thinking</i>	4.OA.A.2	SA	Solve a word problem involving multiplicative comparison and determine which equation represents a given multiplicative-comparison word problem.
38	<i>Measurement and Data</i>	4.MD.B.4	SR	Determine which line plot represents a set of data given as fractions with different denominators.
39	<i>Measurement and Data</i>	4.MD.A.2	SA	Solve a word problem that involves expressing a larger metric unit of measure as a smaller metric unit of measure.
40	<i>Geometry</i>	4.G.A.1	SR	Identify the mathematical term that describes a given angle.

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