



MASSACHUSETTS DEPARTMENT OF  
ELEMENTARY AND SECONDARY  
**EDUCATION**

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*Release of Spring 2021  
MCAS Test Items*

*from the*

*Grade 5 Mathematics  
Paper-Based Test*

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**June 2021**  
**Massachusetts Department of  
Elementary and Secondary Education**

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This document was prepared by the  
Massachusetts Department of Elementary and Secondary Education  
Jeffrey C. Riley  
Commissioner

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Massachusetts Department of Elementary and Secondary Education  
75 Pleasant Street, Malden, MA 02148-4906  
Phone 781-338-3000 TTY: N.E.T. Relay 800-439-2370  
[www.doe.mass.edu](http://www.doe.mass.edu)



# Overview of Grade 5 Mathematics Test

The spring 2021 grade 5 Mathematics test was a next-generation assessment that was administered in two primary formats: a computer-based version and a paper-based version. The vast majority of students took the computer-based test. The paper-based test was offered as an accommodation for students with disabilities who are unable to use a computer, as well as for English learners who are new to the country and are unfamiliar with technology.

Most of the operational items on the grade 5 Mathematics test were the same, regardless of whether a student took the computer-based version or the paper-based version. In places where a technology-enhanced item was used on the computer-based test, an adapted version of the item was created for use on the paper test. These adapted paper items were multiple-choice, multiple-select, or short-answer items that tested the same Mathematics content and assessed the same standard as the technology-enhanced item.

**This document displays released items from the paper-based test.** Released items from the computer-based test 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 5 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.

In 2021, due to the COVID-19 pandemic, the Department reduced testing time for students in grades 3–8 through a session sampling approach, in which each student took only a portion of each MCAS assessment. Instead of taking two sessions in each subject, individual students took one session each.

## Standards and Reporting Categories

The grade 5 Mathematics test was based on standards in the five major domains for grade 5 in the *Massachusetts Curriculum Framework for Mathematics* (2017). The five major 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](https://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 document 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 5 Mathematics test was provided with a plastic ruler and a grade 5 Mathematics Reference Sheet. A copy of the reference sheet follows the final question in this document. An image of the ruler is not reproduced in the document.

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 5 Mathematics

## SESSION 1

This session contains 8 questions.

*You may use your reference sheet during this session.*  
*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**

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

		<b>.</b>	<b>2</b>	<b>5</b>	
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1	1	1	1	1	1
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4	4	4	4	4	4
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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

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

<b>6</b>	<b>8</b>	<b>1</b>	<b>9</b>		
<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	<input checked="" type="radio"/>	1	1	1
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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 The prices for renting a bicycle from Leo's Bike Shop are shown in this box.

**Bicycle Rental Prices**

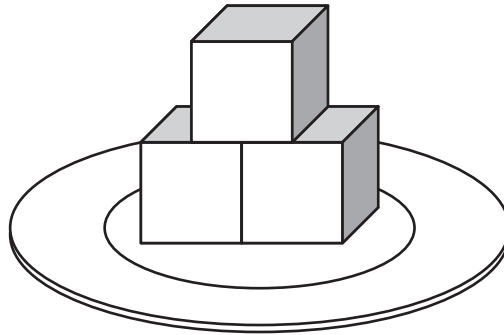
\$6.50 for the first hour

\$1.50 for each additional hour

What is the total price for renting a bicycle from Leo's Bike Shop for 3 hours?

- Ⓐ \$8.00
- Ⓑ \$9.50
- Ⓒ \$12.50
- Ⓓ \$13.00

- 2 A server at a restaurant puts the same number of cubes of butter on each of 10 plates. One of the plates is shown.



All of the cubes of butter on the plate are visible. Each cube of butter has a volume of 1 cubic inch.

What is the total volume, in cubic inches, of butter the server will need for the 10 plates?

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

- 3 In which of the following numbers does the 9 have a value that is  $\frac{1}{10}$  the value of the 9 in the number 871.953?

Select the **two** correct answers.

- Ⓐ 146.792
- Ⓑ 219.73
- Ⓒ 394.821
- Ⓓ 429.13
- Ⓔ 593.427
- Ⓕ 652.49

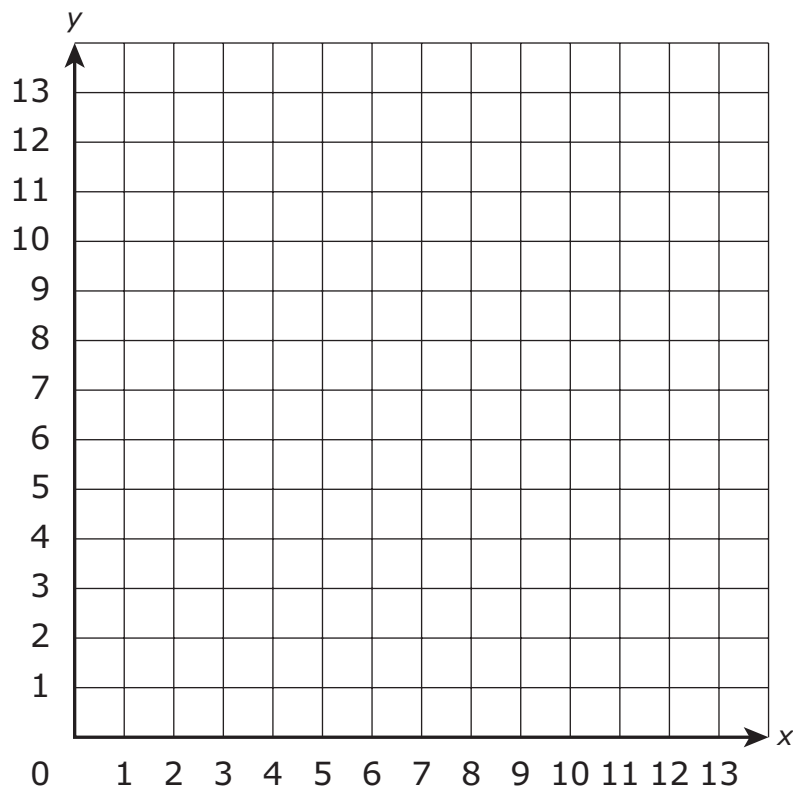


**This question has four parts. Be sure to label each part of your response.**

- 4** A student created two number patterns, Pattern X and Pattern Y.
- A. Pattern X starts with the number 2 and follows the rule "Add 3."  
Starting with 2, write the first four numbers of Pattern X.
- B. Pattern Y starts with the number 13 and follows the rule "Subtract 3."  
Starting with 13, write the first four numbers of Pattern Y.
- C. Write four coordinate pairs in the form  $(X, Y)$  for the first four corresponding terms in Pattern X and Pattern Y.
- D. On the coordinate plane provided in your answer space, plot your four coordinate pairs from Part C.

**Write your answers on the next page.**

4



- 5 Charlotte added 550 milliliters of orange juice to 500 milliliters of pineapple juice to make fruit punch.

What is the total amount of fruit punch, in **liters**, that Charlotte made?

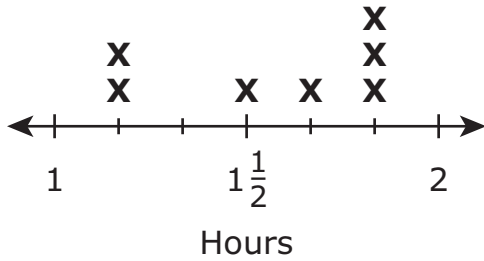
- Ⓐ 1.0
- Ⓑ 1.5
- Ⓒ 1.05
- Ⓓ 1.005

- 6 The numbers of hours that seven students spent reading are listed in this box.

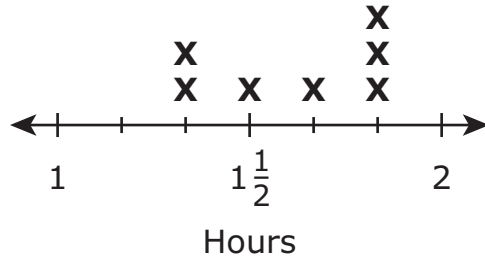
$1\frac{5}{6}, 1\frac{1}{2}, 1\frac{1}{3}, 1\frac{5}{6}, 1\frac{1}{3}, 1\frac{5}{6}, 1\frac{2}{3}$
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Which of the following line plots shows the number of hours each student spent reading?

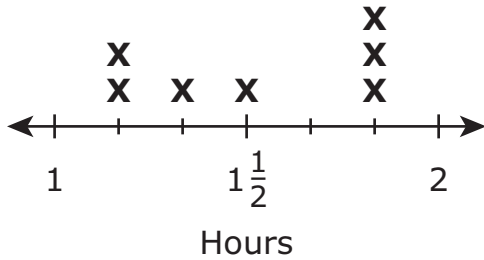
Ⓐ Time Spent Reading



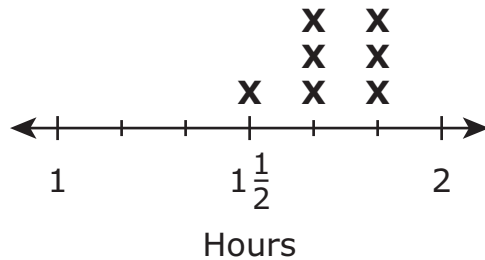
Ⓑ Time Spent Reading



Ⓒ Time Spent Reading



Ⓓ Time Spent Reading



- 7 The length of a pencil is 13.8 centimeters. What is the length of the pencil rounded to the **ones** place?
- Ⓐ 10 centimeters
  - Ⓑ 12 centimeters
  - Ⓒ 13 centimeters
  - Ⓓ 14 centimeters
- 8 Which of the following statements about quadrilaterals is true?
- Ⓐ Every rhombus is also a square.
  - Ⓑ Every trapezoid is also a square.
  - Ⓒ Every rhombus is also a parallelogram.
  - Ⓓ Every trapezoid is also a parallelogram.

# Grade 5 Mathematics

## SESSION 2

This session contains 12 questions.

*You may use your reference sheet during this session.*  
*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.

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**EXAMPLES**

<b>0</b>	<b>.</b>	<b>4</b>	<b>3</b>	<b>2</b>	
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			<b>4</b>	<b>3</b>	<b>8</b>
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<b>6</b>	<b>8</b>	<b>1</b>	<b>9</b>		
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<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- 9 Olga ordered 144 packages of beads from a craft store. Each package contains 25 beads.

What is the total number of beads Olga ordered?

- Ⓐ 1008
- Ⓑ 2500
- Ⓒ 3380
- Ⓓ 3600

- 10 Which of the following expressions is equivalent to 1,000,000,000?

- Ⓐ  $10^{11}$
- Ⓑ  $10^{10}$
- Ⓒ  $10^9$
- Ⓓ  $10^8$



11 What is 375.933 rounded to the nearest tenth?

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.

**12** Two football games were played at a stadium on the same day.

A. At the start of the first game,  $\frac{3}{4}$  of the stadium's seats were filled with people. At the end of the game,  $\frac{2}{3}$  of those seats remained filled.

Write an equation that can be used to determine  $p$ , the fraction of the stadium's seats that remained filled with people at the end of the first game.

B. What fraction of the stadium's seats remained filled with people at the end of the first game?

C. The stadium has 5,000 seats. At the end of the **second** game,  $\frac{2}{5}$  of the seats were filled with people.

What was the total number of seats that were filled with people at the end of the second game? Show or explain how you got your answer.

D. Workers at the stadium gave posters to  $\frac{1}{4}$  of the people who were in their seats when the second game ended.

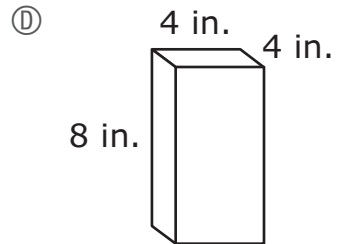
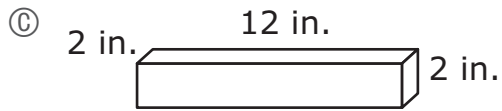
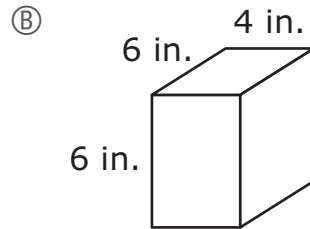
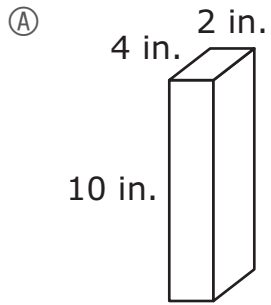
What was the total number of people who received posters? Show or explain how you got your answer.

**Write your answers on the next page.**

12

Lined writing area containing 22 horizontal lines.

13 Which of the following boxes has the **greatest** volume?



- 14 A baker weighed four batches of cookie dough. The weights of the batches are shown.
- 2 pounds
  - 46 ounces
  - 3 pounds
  - 26 ounces

Which of these lists shows the weights in order from **least to greatest** value?

- Ⓐ 26 ounces, 2 pounds, 46 ounces, 3 pounds
- Ⓑ 26 ounces, 46 ounces, 2 pounds, 3 pounds
- Ⓒ 2 pounds, 3 pounds, 26 ounces, 46 ounces
- Ⓓ 2 pounds, 26 ounces, 3 pounds, 46 ounces
- 15 Which of the following expressions are equivalent to this decimal number?

2.097

Select the **two** correct answers.

- Ⓐ  $2 \times 1 + \left(97 \times \frac{1}{100}\right)$
- Ⓑ  $2 \times 1 + \left(97 \times \frac{1}{1000}\right)$
- Ⓒ  $2 \times 1 + \left(9 \times \frac{1}{10}\right) + \left(7 \times \frac{1}{100}\right)$
- Ⓓ  $2 \times 1 + \left(9 \times \frac{1}{10}\right) + \left(7 \times \frac{1}{1000}\right)$
- Ⓔ  $2 \times 1 + \left(9 \times \frac{1}{100}\right) + \left(7 \times \frac{1}{1000}\right)$

This question has two parts.

**16** Part A

Which of these expressions have a product greater than  $\frac{2}{3}$ ?

Select the **three** correct answers.

Ⓐ  $\frac{2}{3} \times \frac{7}{8}$

Ⓑ  $\frac{2}{3} \times \frac{3}{2}$

Ⓒ  $\frac{2}{3} \times \frac{3}{5}$

Ⓓ  $\frac{2}{3} \times \frac{3}{3}$

Ⓔ  $\frac{2}{3} \times 3$

Ⓕ  $\frac{2}{3} \times 1\frac{1}{8}$

**Part B**

Which of the following fractions can be multiplied by 5 to get a product that is less than 5?

Ⓐ  $\frac{1}{3}$

Ⓑ  $\frac{3}{2}$

Ⓒ  $\frac{5}{1}$

Ⓓ  $\frac{1}{1}$

- 17** The location of point  $B$  on a coordinate plane is represented by the ordered pair  $(8, 4)$ .

Which of the following statements describes the location of point  $B$  on the coordinate plane?

- Ⓐ Point  $B$  is 4 units to the right of the origin and 8 units up from the origin.
- Ⓑ Point  $B$  is 8 units to the right of the origin and 4 units up from the origin.
- Ⓒ Point  $B$  is 4 units to the left of the origin and 8 units down from the origin.
- Ⓓ Point  $B$  is 8 units to the left of the origin and 4 units down from the origin.
- 18** Compute:

$$\frac{3}{4} \times 6$$

- Ⓐ  $\frac{18}{24}$
- Ⓑ  $\frac{3}{6}$
- Ⓒ  $\frac{18}{4}$
- Ⓓ  $\frac{9}{4}$

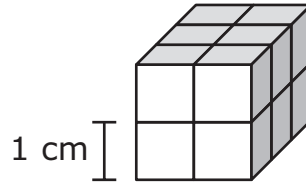
- 19 What is the value of this expression?

$$6 \times 4 - (5 + 3) \div 2$$

- Ⓐ 0
- Ⓑ 8
- Ⓒ 11
- Ⓓ 20



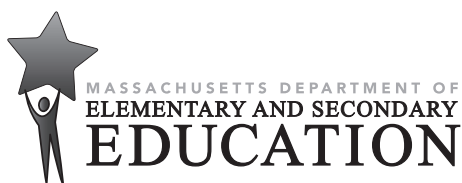
- 20 A right rectangular prism is made of cubes, with no gaps or overlaps. Each cube has a side length of 1 centimeter, as shown.



What is the volume, in cubic centimeters, of the prism?

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



## Massachusetts Comprehensive Assessment System Grade 5 Mathematics Reference Sheet

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### CONVERSIONS

1 cup = 8 fluid ounces

1 pint = 2 cups

1 quart = 2 pints

1 gallon = 4 quarts

1 mile = 5280 feet

1 mile = 1760 yards

1 pound = 16 ounces

1 ton = 2000 pounds

### AREA (A) FORMULAS

square . . . . .  $A = s \times s$

( $s$  = length of a side)

rectangle . . . . .  $A = b \times h$

( $b$  = length of base;  $h$  = height)

OR

$A = l \times w$

( $l$  = length;  $w$  = width)

### VOLUME (V) FORMULAS

right rectangular prism . . . . .  $V = l \times w \times h$

( $l$  = length;  $w$  = width;  $h$  = height)

OR

$V = B \times h$

( $B$  = area of base;  $h$  = height)

**Grade 5 Mathematics**  
**Spring 2021 Released Operational Items**

<b>PBT Item No.</b>	<b>Page No.</b>	<b>Reporting Category</b>	<b>Standard</b>	<b>Item Type*</b>	<b>Item Description</b>	<b>Correct Answer**</b>
1	4	<i>Number and Operations in Base Ten</i>	5.NBT.B.7	SR	Solve a real-world problem involving addition and multiplication of money.	B
2	5	<i>Measurement and Data</i>	5.MD.C.4	SA	Solve a real-world volume problem by counting unit cubes.	30
3	6	<i>Number and Operations in Base Ten</i>	5.NBT.A.1	SR	Demonstrate understanding of place value by selecting multi-digit decimal numbers that have a digit that is one-tenth the value of the same digit in a given number.	A,F
4	7	<i>Operations and Algebraic Thinking</i>	5.OA.B.3	CR	Given the rules for two patterns, determine the first several terms of each pattern and create and graph ordered pairs using corresponding terms of the two patterns.	
5	9	<i>Measurement and Data</i>	5.MD.A.1	SR	Solve a real-world word problem by converting milliliters to liters.	C
6	10	<i>Measurement and Data</i>	5.MD.B.2	SR	Identify which line plot displays a set of data measurements given as mixed numbers with unlike denominators.	B
7	11	<i>Number and Operations in Base Ten</i>	5.NBT.A.4	SR	Round a decimal number to the nearest whole number.	D
8	11	<i>Geometry</i>	5.G.B.4	SR	Identify which statement is true about the properties of special quadrilaterals.	C
9	14	<i>Number and Operations in Base Ten</i>	5.NBT.B.5	SR	Multiply a three-digit whole number by a two-digit whole number.	D
10	14	<i>Number and Operations in Base Ten</i>	5.NBT.A.2	SR	Identify which power of ten is equivalent to a given whole number.	C
11	15	<i>Number and Operations in Base Ten</i>	5.NBT.A.4	SA	Round a decimal to the nearest tenth.	375.9
12	16	<i>Number and Operations-Fractions</i>	5.NF.B.6	CR	Write an equation to represent a given problem and multiply fractions and whole numbers to solve real-world problems.	
13	18	<i>Measurement and Data</i>	5.MD.C.5	SR	Determine which right rectangular prism, shown with side lengths, has the greatest volume.	B
14	19	<i>Measurement and Data</i>	5.MD.A.1	SR	Select the list that orders measures of weight expressed in different units from least to greatest value.	A
15	19	<i>Number and Operations in Base Ten</i>	5.NBT.A.3	SR	Select which expressions correctly show a decimal to the thousandths in expanded form.	B,E
16	20	<i>Number and Operations-Fractions</i>	5.NF.B.5	SR	Identify expressions with a product greater than a given factor and identify the fraction that can be multiplied by a whole number to get a product less than that whole number.	B,E,F;A
17	21	<i>Geometry</i>	5.G.A.1	SR	Given an ordered pair, select the statement that correctly describes the location of the point represented by the ordered pair in relation to the origin on a coordinate plane.	B
18	21	<i>Number and Operations-Fractions</i>	5.NF.B.4	SR	Determine the product of a fraction and a whole number.	C
19	22	<i>Operations and Algebraic Thinking</i>	5.OA.A.1	SR	Determine the value of a given expression with parentheses.	D
20	23	<i>Measurement and Data</i>	5.MD.C.4	SA	Find the volume of a figure by counting cubes with given dimensions.	12

\* 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 5 Mathematics**  
**Spring 2021 Unreleased Operational Items**

<b>PBT Item No.</b>	<b>Reporting Category</b>	<b>Standard</b>	<b>Item Type*</b>	<b>Item Description</b>
21	<i>Geometry</i>	5.G.B.3	SR	Determine which triangle meets specified criteria based on the given side lengths of each triangle.
22	<i>Operations and Algebraic Thinking</i>	5.OA.A.1	SR	Determine which expression with parentheses has an equivalent value if the parentheses are removed.
23	<i>Number and Operations-Fractions</i>	5.NF.A.1	SR	Identify which expression can be used to solve an addition problem by replacing given fractions with equivalent fractions with like denominators.
24	<i>Number and Operations-Fractions</i>	5.NF.B.5	SR	Given several expressions, determine whether the product of each expression is greater than or less than the value of a given factor of the expression.
25	<i>Number and Operations in Base Ten</i>	5.NBT.B.7	SR	Divide a decimal to hundredths by a whole number.
26	<i>Measurement and Data</i>	5.MD.C.5	CR	Write an equation to find the volume of a given prism, find the total volume of two prisms placed together, and determine a set of dimensions that will result in a given volume.
27	<i>Number and Operations-Fractions</i>	5.NF.B.7	SR	Determine which division equation involving a whole number and a unit fraction can be used to solve a word problem.
28	<i>Number and Operations-Fractions</i>	5.NF.A.2	SR	Estimate the sum of two fractions that are less than one to solve a word problem.
29	<i>Number and Operations in Base Ten</i>	5.NBT.A.3	SR	Match decimal numbers in number form with decimals in expanded form and compare two decimal numbers to thousandths.
30	<i>Number and Operations in Base Ten</i>	5.NBT.B.5	SA	Determine the product of two three-digit numbers.
31	<i>Operations and Algebraic Thinking</i>	5.OA.A.2	SR	Identify the word form of a given numerical expression.
32	<i>Number and Operations-Fractions</i>	5.NF.B.7	SA	Determine the quotient of a whole number divided by a fraction in a real-world context.
33	<i>Geometry</i>	5.G.B.4	SR	Classify triangles based on angle and side properties.
34	<i>Geometry</i>	5.G.A.2	SR	Identify which graph shows three points correctly plotted in the first quadrant of the coordinate plane.
35	<i>Number and Operations in Base Ten</i>	5.NBT.B.6	CR	Write an equation to solve a real-world problem, critique another student's reasoning of the problem, and solve a similar problem using division with whole numbers.
36	<i>Number and Operations in Base Ten</i>	5.NBT.A.1	SR	Determine the relationship of the value of a digit in one number compared to the value of that digit in another number.
37	<i>Number and Operations-Fractions</i>	5.NF.B.6	SR	Determine the product of a mixed number and a fraction to solve a real-world problem.
38	<i>Geometry</i>	5.G.B.3	SR	Identify shapes that have two pairs of opposite angles that are congruent.
39	<i>Operations and Algebraic Thinking</i>	5.OA.A.2	SR	Select the numerical expression, with parentheses, that represents a given word expression.
40	<i>Number and Operations-Fractions</i>	5.NF.B.3	SR	Determine the fraction that represents a given word problem.

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