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## XI. Mathematics, Grade 5

# Grade 5 Mathematics Test

The spring 2018 grade 5 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 5 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 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.

## 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/](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 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 chapter. 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 5 Mathematics

## SESSION 1

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 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 What is the value of this expression?

$$4 \times (10 - 2)$$

- A. 32
- B. 38
- C. 40
- D. 48

- 4 Which of the following expressions is equivalent to this number?

$$3,620,075$$

- A.  $(3 \times 100,000) + (6 \times 1,000) + (2 \times 100) + (7 \times 10) + (5 \times 1)$
- B.  $(3 \times 100,000) + (6 \times 10,000) + (2 \times 1,000) + (7 \times 100) + (5 \times 10)$
- C.  $(3 \times 1,000,000) + (6 \times 100,000) + (2 \times 10,000) + (7 \times 10) + (5 \times 1)$
- D.  $(3 \times 1,000,000) + (6 \times 10,000) + (2 \times 1,000) + (7 \times 100) + (5 \times 10)$

- 5 Eberto wrote this expression in his notebook.

$$10 \times 10 \times 10 \times 10$$

Which of the following is equivalent to Eberto's expression?

- A.  $3^{10}$
  - B.  $4^{10}$
  - C.  $10^3$
  - D.  $10^4$
- 6 The owner of a new store is printing 7,520 coupons. The coupons will be sent to 32 locations. Each location will receive the same number of coupons. What is the total number of coupons each location will receive?

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

**This question has three parts.**

- 7** Ben walked a distance of 1.2 kilometers. Alice walked a distance of 0.85 kilometer. Walter walked a distance of 50 **meters**.

**Part A**

What is the distance, in meters, that Ben walked? Show or explain how you got your answer.

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

**Part B**

How many more meters did Ben walk than Alice walked? Show or explain how you got your answer.

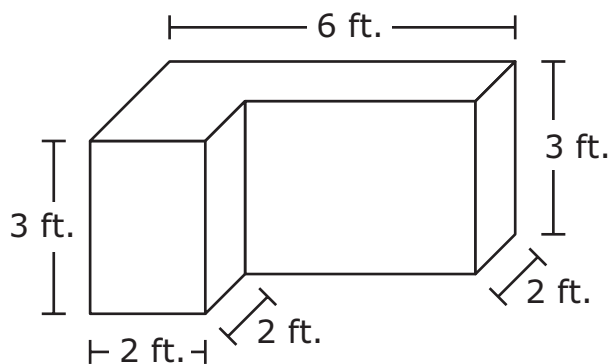
Enter your answer and your work or explanation in the space provided.

**Part C**

What is the total distance, in **kilometers**, that Ben, Alice, and Walter walked? Show or explain how you got your answer.

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

- 9 This figure is made up of two right rectangular prisms.



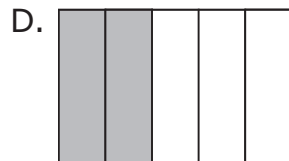
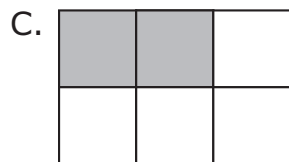
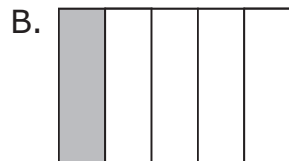
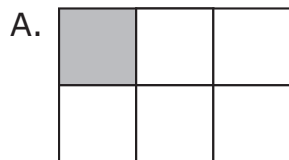
What is the total volume, in cubic feet, of the figure?

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



- 11 Vegetables were planted in  $\frac{1}{2}$  of a garden. The section of the garden where vegetables were planted was divided into 3 equal parts: one for carrots, one for lettuce, and one for tomatoes.

Which of the following models is shaded to represent the fraction of the garden where carrots were planted?



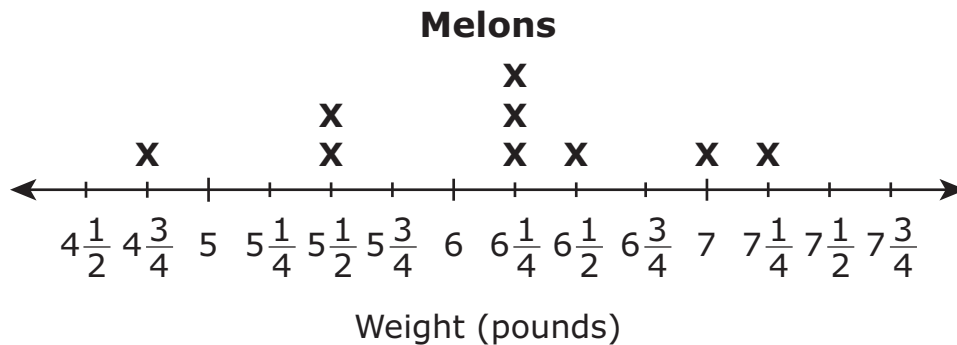
- 13 Victor wants to estimate the sum of this expression.

$$24.8 + 26.82 + 24.3 + 25.7$$

Which of the following is closest in value to the sum?

- A.  $4 \times 20$
- B.  $4 \times 25$
- C.  $4 \times 30$
- D.  $3 \times 25$

- 14 The owners of a melon farm recorded the weights of nine melons in a line plot, as shown.



When the owners record the weight of a tenth melon, the difference in weight between the heaviest and the lightest melons is  $2\frac{3}{4}$  pounds. Which of the following could be the weight of the tenth melon?

- A.  $2\frac{1}{2}$  pounds
- B.  $2\frac{3}{4}$  pounds
- C.  $7\frac{1}{2}$  pounds
- D.  $7\frac{3}{4}$  pounds

- 18** Amanda bought 4 bags of potatoes at a market. Each bag of potatoes weighed 5.75 pounds.

Which of the following expressions can be used to find the total weight, in pounds, of the bags of potatoes Amanda bought?

- A.  $(4 \times 5) + (0.7 + 0.05)$
- B.  $(4 \times 5) + (4 \times 7) + (4 \times 0.5)$
- C.  $(4 \times 50) + (4 \times 7) + (4 \times 0.5)$
- D.  $(4 \times 5) + (4 \times 0.7) + (4 \times 0.05)$
- 19** The 7 children in a family equally shared 4 pizzas. All the pizzas were the same size. Which fraction represents the amount of pizza in each child's share?

- A.  $\frac{4}{7}$
- B.  $\frac{7}{4}$
- C.  $1\frac{3}{7}$
- D.  $1\frac{4}{7}$

- 20 There are 36 boxes of colored pencils in a supply closet. Each box has 144 colored pencils in it.

What is the total number of colored pencils in the supply closet?

- A. 1,296
- B. 5,184
- C. 6,284
- D. 9,072

# Grade 5 Mathematics

## SESSION 2

This session contains 11 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 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.

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7. See below for examples of how to correctly complete an answer grid.

**EXAMPLES**

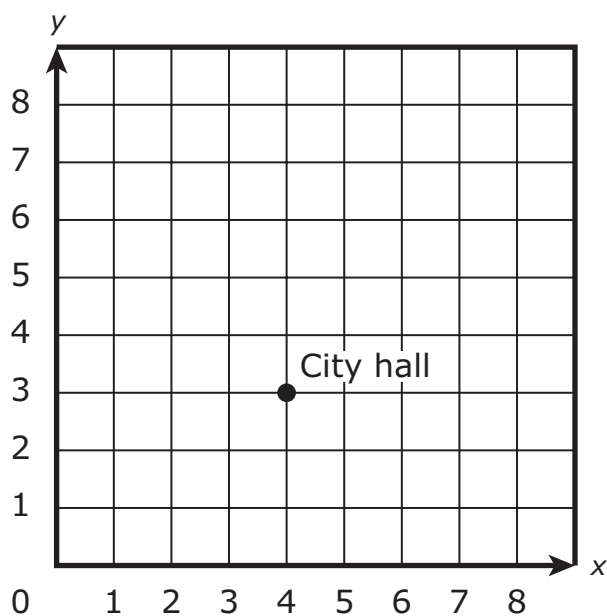
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- 22 This coordinate plane shows the location of the city hall.



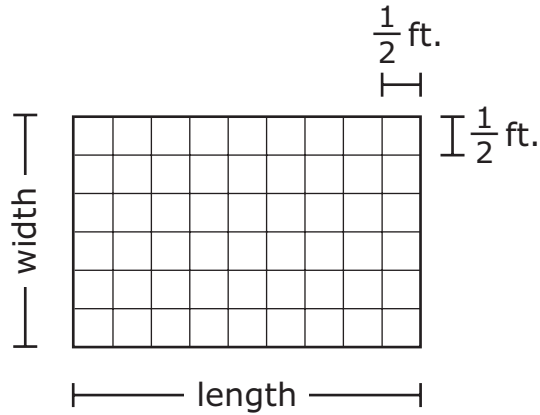
Which ordered pair represents the location on the coordinate plane of the city hall?

- A. (3, 4)
- B. (4, 3)
- C. (4, 0)
- D. (0, 3)



This question has four parts.

- 25 The floor of Sophia’s bathroom is in the shape of a rectangle. She covered the floor with square tiles, as shown.



**Part A**

What is the width, in feet, of the floor?

Enter your answer in the space provided.

**Part B**

Write an equation that can be used to find  $s$ , the area in square feet of the floor.

Enter your equation in the space provided.

**Part C**

Use your equation from Part B to find  $s$ , the area in square feet of the floor. Show or explain how you got your answer.

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

**Part D**

Sophia bought a rug. The rug covers  $\frac{2}{3}$  of the floor. What is the area, in square feet, of the rug? Show or explain how you got your answer.

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

- 26 What is the value of this expression?

$$6 \times (11 - 8) - 3$$

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

- 27 Lina brought \$10.00 to the fair.

- She spent \$2.59 for cotton candy.
- She spent \$3.49 for a toy.

How much money did Lina have left?

- A. \$3.92
- B. \$4.02
- C. \$4.92
- D. \$5.02

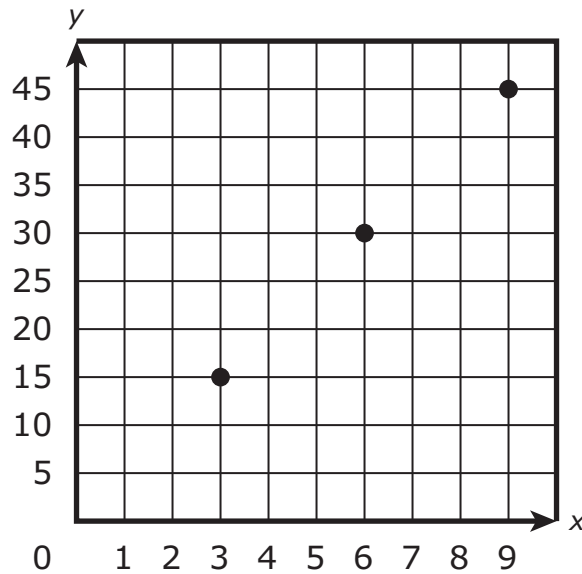
- 31 Which of the following statements is true?
- A.  $(25 \times 10) - 15$  is 15 decreased by the product of 25 and 10.
  - B.  $3 + (19 - 10)$  is 3 more than the sum of 19 and 10.
  - C.  $7 - (18 + 38)$  is 7 less than the sum of 18 and 38.
  - D.  $(24 \div 6) \times 5$  is 5 times the quotient of 24 and 6.
- 33 Which of the following is **always** true about an isosceles triangle?
- A. The sum of its angles is  $100^\circ$ .
  - B. It cannot contain a right angle.
  - C. Two of its sides must be congruent.
  - D. All three of its angles must be congruent.

- 36** A food company packages flavor cubes used for making soup. The flavor cubes are packaged in a box that is in the shape of a rectangular prism.
- Each flavor cube has an edge length of 1 centimeter.
  - Each box holds exactly 2 layers of flavor cubes with no gaps or spaces.
  - Each layer in the box holds 9 flavor cubes.

What is the volume of one box of flavor cubes?

- A. 12 cubic centimeters
- B. 13 cubic centimeters
- C. 18 cubic centimeters
- D. 19 cubic centimeters

- 39 Camila created some ordered pairs from corresponding terms of two different patterns. Then she plotted the ordered pairs on a graph, as shown.



Which of the following describes the relationship between the corresponding terms of the two patterns?

- A. Each  $x$ -value is five times the corresponding  $y$ -value.
- B. Each  $y$ -value is five times the corresponding  $x$ -value.
- C. Each  $x$ -value is twelve more than the corresponding  $y$ -value.
- D. Each  $y$ -value is twelve more than the corresponding  $x$ -value.

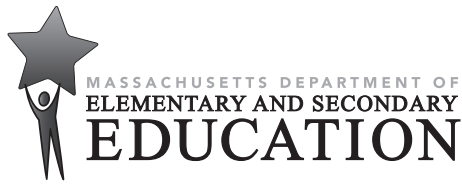
40 Phil spent  $\frac{2}{5}$  of an hour riding his bicycle and  $\frac{1}{3}$  of an hour practicing the piano. What is the total amount of time, in hours, Phil spent riding his bicycle and practicing the piano?

A.  $\frac{3}{8}$

B.  $\frac{3}{15}$

C.  $\frac{8}{15}$

D.  $\frac{11}{15}$



## 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 2018 Released Operational Items:**  
**Reporting Categories, Standards, Item Descriptions, and Correct Answers**

<b>PBT Item No.*</b>	<b>Page No.</b>	<b>Reporting Category</b>	<b>Standard</b>	<b>Item Type**</b>	<b>Description</b>	<b>Correct Answer***</b>
1	218	<i>Operations &amp; Algebraic Thinking</i>	5.OA.A.01	SR	Evaluate a numerical expression that contains parentheses.	A
4	218	<i>Number &amp; Operations in Base Ten</i>	5.NBT.A.03	SR	Determine the expanded form of a number in the millions.	C
5	219	<i>Number &amp; Operations in Base Ten</i>	5.NBT.A.02	SR	Write a given expression as a power of 10.	D
6	219	<i>Number &amp; Operations in Base Ten</i>	5.NBT.B.06	SA	Determine the quotient of a four-digit dividend and a two-digit divisor.	235
7	220	<i>Measurement &amp; Data</i>	5.MD.A.01	CR	Convert distances in the metric system and solve multi-step, real-world problems using the conversions.	
9	221	<i>Measurement &amp; Data</i>	5.MD.C.05	SA	Determine the total volume of two non-overlapping right rectangular prisms.	48
11	222	<i>Number &amp; Operations-Fractions</i>	5.NF.B.07	SR	Interpret the quotient of a fraction divided by a whole number.	A
13	223	<i>Number &amp; Operations in Base Ten</i>	5.NBT.A.04	SR	Estimate a sum by rounding.	B
14	224	<i>Measurement &amp; Data</i>	5.MD.B.02	SR	Add or subtract mixed numbers to solve a problem involving information presented in a line plot.	C
18	225	<i>Number &amp; Operations in Base Ten</i>	5.NBT.B.07	SR	Determine the numerical expression that can be used to solve a decimal multiplication problem.	D
19	225	<i>Number &amp; Operations-Fractions</i>	5.NF.B.03	SR	Determine the solution to a word problem involving division of whole numbers that result in a fractional answer.	A
20	226	<i>Number &amp; Operations in Base Ten</i>	5.NBT.B.05	SR	Determine the product of a two-digit whole number multiplied by a three-digit whole number.	B
22	229	<i>Geometry</i>	5.G.A.02	SR	Determine the coordinate values of a point plotted on a coordinate plane.	B
25	230	<i>Number &amp; Operations-Fractions</i>	5.NF.B.04	CR	Find the product of a mixed number and a fraction, write an equation, and find area using mixed numbers and fractions.	
26	231	<i>Operations &amp; Algebraic Thinking</i>	5.OA.A.01	SA	Evaluate an expression involving parentheses.	15
27	231	<i>Number &amp; Operations in Base Ten</i>	5.NBT.B.07	SR	Solve a word problem by adding and subtracting decimals to hundredths.	A
31	232	<i>Operations &amp; Algebraic Thinking</i>	5.OA.A.02	SR	Identify a verbal statement that is equivalent to a given number expression with parentheses.	D
33	232	<i>Geometry</i>	5.G.B.04	SR	Identify the true statement about properties of a triangle.	C
36	233	<i>Measurement &amp; Data</i>	5.MD.C.03	SR	Given the height and the area of the base, determine the volume of a right rectangular prism to solve a word problem.	C
39	234	<i>Operations &amp; Algebraic Thinking</i>	5.OA.B.03	SR	Given points plotted on a coordinate plane that were created from corresponding terms of two patterns, identify a relationship between the corresponding terms.	B
40	235	<i>Number &amp; Operations-Fractions</i>	5.NF.A.02	SR	Solve a word problem by finding the sum of two fractions with unlike denominators.	D

\* “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 5 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-Fractions</i>	5.NF.A.01	SR	Determine the sum of a fraction and a mixed number with unlike denominators.
3	<i>Measurement &amp; Data</i>	5.MD.C.05	SR	Find the volume of a right rectangular prism given the length, width, and height.
8	<i>Number &amp; Operations-Fractions</i>	5.NF.A.02	SR	Estimate the sum of two fractions less than one to solve a word problem.
10	<i>Geometry</i>	5.G.A.02	SR	Determine the point on a coordinate plane given the coordinate values of the point.
12	<i>Operations &amp; Algebraic Thinking</i>	5.OA.B.03	CR	Extend two different patterns and explain the relationship between corresponding terms in the patterns.
15	<i>Geometry</i>	5.G.B.03	SR	Determine attributes of an equilateral triangle.
16	<i>Measurement &amp; Data</i>	5.MD.C.04	SR	Select the right rectangular prisms packed with unit cubes that are equal to a given volume.
17	<i>Geometry</i>	5.G.A.02	SR	Use a coordinate plane to interpret coordinate values of points in the context of a real-world problem.
21	<i>Number &amp; Operations-Fractions</i>	5.NF.B.03	SR	Interpret a fraction as division of the numerator by the denominator.
23	<i>Measurement &amp; Data</i>	5.MD.A.01	SA	Convert from yards to feet.
24	<i>Number &amp; Operations in Base Ten</i>	5.NBT.A.04	SR	Round a decimal number to the nearest whole number.
28	<i>Measurement &amp; Data</i>	5.MD.C.04	SR	Solve a word problem involving finding the volume of a right rectangular prism by counting unit cubes.
29	<i>Number &amp; Operations in Base Ten</i>	5.NBT.A.02	CR	Write numbers given in exponential form as numbers in standard form and find an unknown exponent in a product.
30	<i>Number &amp; Operations-Fractions</i>	5.NF.A.01	SR	Determine which equivalent fractions with like denominators can be used to add two fractions.
32	<i>Number &amp; Operations-Fractions</i>	5.NF.B.06	SR	Multiply a fraction by a mixed number to solve a word problem.
34	<i>Number &amp; Operations in Base Ten</i>	5.NBT.A.01	SA	Understand place value in a multi-digit whole number.
35	<i>Number &amp; Operations in Base Ten</i>	5.NBT.B.05	SR	Multiply multi-digit whole numbers to solve word problems.
37	<i>Number &amp; Operations-Fractions</i>	5.NF.B.03	SR	Solve a word problem involving division of two whole numbers leading to a mixed number answer.
38	<i>Number &amp; Operations in Base Ten</i>	5.NBT.A.04	SR	Determine which decimal would round to a given amount when rounded to the nearest hundredth.

\* “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).