Grade 7 Mathematics Test

The spring 2019 grade 7 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 7 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 RICAS Resource Center website at ricas.pearsonsupport.com/released-items.

The Scoring Guides can be found at www.doe.mass.edu/mcas/student/. They provide the released constructed-response questions, a unique scoring guide for each question, and samples of student work at each score point.

Test Sessions and Content Overview

The grade 7 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 7 Mathematics test was based on standards in the five domains for grade 7 in the *Massachusetts Curriculum Framework for Mathematics* (2017). The five domains are listed below.

- Ratios and Proportional Relationships

- The Number System

- Expressions and Equations

- Geometry

- Statistics and Probability

The *Massachusetts Curriculum Framework* is strongly aligned with Rhode Island's Mathematics standards: the Common Core State Standards (CCSS). The RICAS Mathematics assessment tables articulate this alignment and are available on the RIDE website at www.ride.ri.gov/ricas. 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 RICAS 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 7 Mathematics test was provided with a plastic ruler and a grade 7 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 Session 2, each student had sole access to a calculator. Calculator use was not allowed during Session 1.

During both Mathematics test sessions, the use of bilingual word-to-word dictionaries was allowed for current and former English learner students only. No other reference tools or materials were allowed.

Grade 7 Mathematics

SESSION 1

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 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 in this Test & 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. Fractions cannot be entered into an answer grid and will not be scored. Enter fractions as decimals.

7. If you need to change an answer, be sure to erase your first answer completely.

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

EXAMPLES

Rhode Island Comprehensive Assessment System
Grade 7 Mathematics Reference Sheet

CONVERSIONS

1 cup = 8 fluid ounces

1 pint = 2 cups

1 quart = 2 pints

1 gallon = 4 quarts

1 gallon ≈ 3.785 liters

1 liter ≈ 0.264 gallon

1 liter = 1000 cubic centimeters

1 inch = 2.54 centimeters

1 meter ≈ 39.37 inches

1 mile = 5280 feet

1 mile = 1760 yards

1 mile ≈ 1.609 kilometers

1 kilometer ≈ 0.62 mile

1 pound = 16 ounces

1 pound ≈ 0.454 kilogram

1 kilogram ≈ 2.2 pounds

1 ton = 2000 pounds

AREA (*A*) FORMULAS

square . . . . $A = s^2$

rectangle . . . . . $A = bh$

OR

$A = lw$

parallelogram . . $A = bh$

triangle . . . . . . $A = \frac{1}{2}bh$

trapezoid . . . . . $A = \frac{1}{2}h(b_1 + b_2)$

circle . . . . $A = \pi r^2$

VOLUME (*V*) FORMULAS

cube . . . . $V = s^3$

(s = length of an edge)

right prism . . . . $V = Bh$

TOTAL SURFACE AREA (*SA*) FORMULAS

right rectangular prism . . $SA = 2(lw) + 2(hw) + 2(lh)$

CIRCLE FORMULAS

area . . . . $A = \pi r^2$

circumference . . $C = 2\pi r$

OR

$C = \pi d$

1   A student can run 6 miles in $\frac{3}{4}$ hour. At this rate, what is the total number of miles the student can run in 1 hour?

   Ⓐ $\frac{1}{8}$

   Ⓑ $\frac{2}{9}$

   Ⓒ   8

   Ⓓ   9

2   What is the value of this expression?

$$(2 - 3)(4 - 5)$$

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

3 A principal surveyed 200 seventh-grade students to find out whether they prefer to participate in fall sports or spring sports. This table shows the results.

Sports Survey

| Season	Boys	Girls
fall	63	45
spring	37	55

Based on the table, what is the probability that a seventh-grade student chosen at random would prefer to participate in spring sports rather than fall sports?

Ⓐ 37%

Ⓑ 46%

Ⓒ 54%

Ⓓ 92%

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

4 This graph shows the relationship between x, the number of hours Mr. David works, and y, the number of dollars he earns.

Mr. David's Earnings
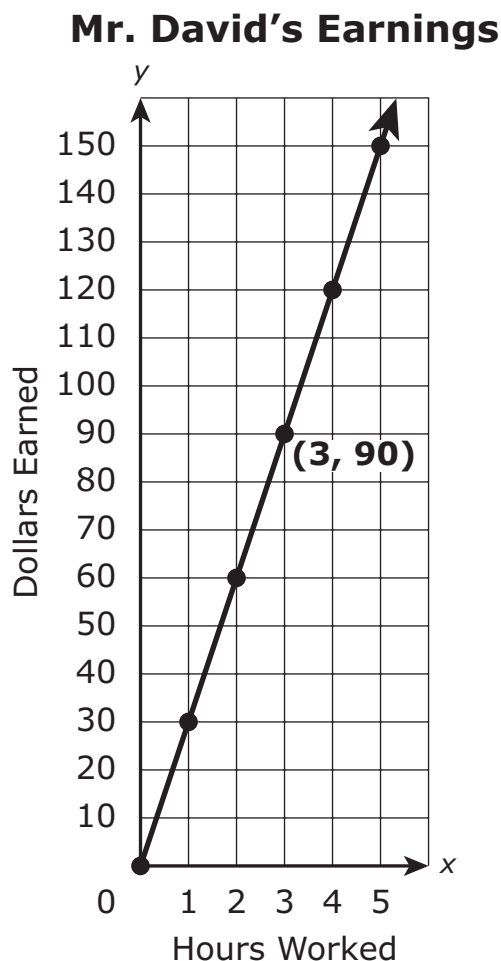
A. Based on the graph, is the relationship between x and y proportional? Explain your reasoning.

B. What does the point (3, 90) represent in the context of this situation?

C. Based on the graph, how many dollars will Mr. David earn if he works 10 hours? Show or explain how you got your answer.

D. Write an equation that could be used to find y, the number of dollars Mr. David earns for working x hours.

4

5   What is the value of this expression?

$$2.4 \div 0.12$$

Ⓐ   0.05

Ⓑ   0.2

Ⓒ   5

Ⓓ   20

6   Consider this expression.

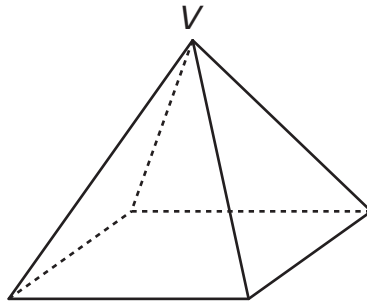$$\left[-\tfrac{1}{5} - \left(-\tfrac{2}{3}\right)\right] \cdot \left(-\tfrac{5}{6}\right)$$

What is the value of the expression?

Ⓐ $-\dfrac{7}{18}$

Ⓑ $-\dfrac{34}{45}$

Ⓒ $\dfrac{13}{18}$

Ⓓ $\dfrac{34}{45}$

7 One evening, the temperature decreased by 5°F during the first hour after sunset, and then decreased by 2°F **each** hour for the next 7 hours. The temperature increased by 14.5°F the next morning and then increased by 11°F that afternoon.

What was the total change in temperature?

Ⓐ The temperature decreased by a total of 15.5°F.

Ⓑ The temperature decreased by a total of 16.5°F.

Ⓒ The temperature increased by a total of 6.5°F.

Ⓓ The temperature increased by a total of 32.5°F.

8 One of the vertices of a square pyramid is labeled *V* in this diagram.

What two-dimensional figure will result from slicing the pyramid perpendicular to its base through vertex *V*?

Ⓐ square

Ⓑ triangle

Ⓒ pentagon

Ⓓ trapezoid

9 A student had 500 milliliters of water in a water bottle. She drank 25% of the water before soccer practice. After practice, she drank $\frac{1}{3}$ of the remaining water.

How much water, in milliliters, does the student have left in the bottle?

Ⓐ 250

Ⓑ 290

Ⓒ 330

Ⓓ 375

10 Consider this expression.

$$|4| + |-7|$$

What is the value of the expression?

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

11   The manager of a company wants to survey a representative sample of the company's employees to choose a company logo. Which of the following is a representative sample of the company's employees?

Ⓐ   every third employee from the largest department in the company

Ⓑ   every employee who enters the employee cafeteria

Ⓒ   every third employee on the company's payroll

Ⓓ   every employee who is under the age of 35

Grade 7 Mathematics
SESSION 2

This session contains 9 questions.

You may use your reference sheet during this session.
You may 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 in this Test & Answer Booklet. Only responses written within the provided space will be scored.

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

12   Mia, Colton, and Ian use the same taxi company to travel.

- The initial fee for a taxi ride is $2.60.

- Each mile traveled in a taxi costs an additional $2.50.

A. One day, Mia rode 2 miles in a taxi. What was the total cost, in dollars, of her taxi ride?

B. Colton rode in a taxi to get to work. The total cost of his taxi ride was $9.60.

Let x represent the number of miles Colton rode in the taxi.

Which of the following equations represents this situation?

    Ⓐ $2.5x + 2.6 = 9.6$

    Ⓑ $2.5x + 9.6 = 2.6$

    Ⓒ $2.6x + 2.5 = 9.6$

    Ⓓ $2.6x + 9.6 = 2.5$

C. Based on your answer to Part B, what is the total distance, in miles, that Colton rode in the taxi? Show or explain how you got your answer.

D. Ian rode in a taxi to get to an airport. The total cost of his taxi ride was more than $12.

Write and solve an inequality to find the possible distances, in miles, Ian could have traveled in the taxi. Show or explain how you got your answer.

12

13 What is the total number of unique triangles that can be formed with side lengths of 6.5 centimeters, 6 centimeters, and 2.5 centimeters?

Enter your answer in the answer boxes at the top of the answer grid **and** completely fill the matching circles.
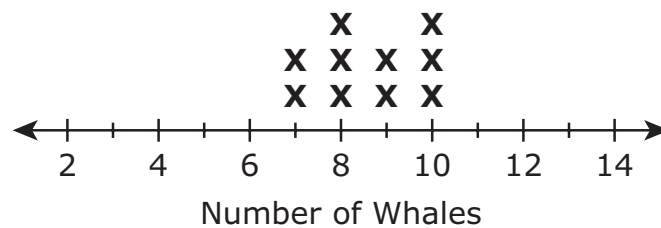
14   A ship's captain uses line plots to record the numbers of whales seen on morning and afternoon whale-watch trips, as shown.

Whales Seen on Morning Trips
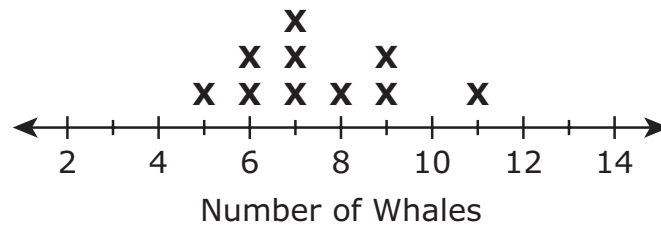

Whales Seen on Afternoon Trips

Based on the line plots, which of the following comparisons are true?

Select the **two** correct answers.

  Ⓐ   The mean number of whales seen on morning trips is equal to the mean number of whales seen on afternoon trips.

  Ⓑ   The mean number of whales seen on morning trips is greater than the mean number of whales seen on afternoon trips.

  Ⓒ   The mean number of whales seen on morning trips is less than the mean number of whales seen on afternoon trips.

  Ⓓ   The mean absolute deviation in the number of whales seen on morning trips is equal to the mean absolute deviation in the number of whales seen on afternoon trips.

  Ⓔ   The mean absolute deviation in the number of whales seen on morning trips is greater than the mean absolute deviation in the number of whales seen on afternoon trips.

  Ⓕ   The mean absolute deviation in the number of whales seen on morning trips is less than the mean absolute deviation in the number of whales seen on afternoon trips.

15 A teacher has a number cube with faces numbered 1 through 6. He will roll the number cube two times.

This tree diagram shows all the possible outcomes that can result when the teacher rolls the number cube two times.
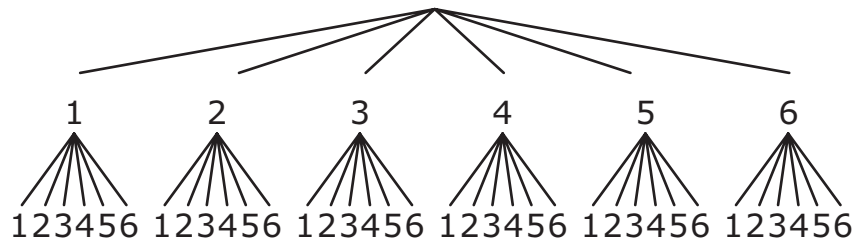
Each time the teacher rolls the number cube, he will record the number shown on the top face. Then he will find the sum of the two numbers he records.

What is the probability that the sum of the numbers he records will be 8?

Ⓐ $\dfrac{5}{36}$

Ⓑ $\dfrac{0}{36}$

Ⓒ $\dfrac{1}{11}$

Ⓓ $\dfrac{5}{6}$

16   This expression can be used to find the price of a television that is on sale for 20% off the regular price of p dollars.

$$p - \frac{1}{5}p$$

Which of the following is another expression that can be used to find the sale price of the television?

Ⓐ $0.20p$

Ⓑ $0.20p - p$

Ⓒ $0.80p$

Ⓓ $0.80p - p$

This question has two parts.

17 A circle has a radius of 6 meters, as shown.

6 m
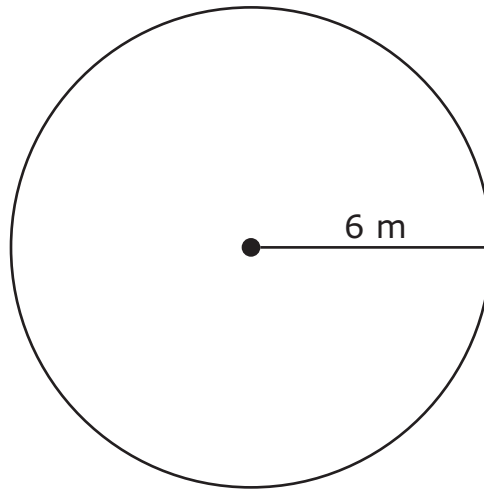
Part A

Which of the following is **closest** to the circumference, in meters, of the circle? (Use 3.14 for π.)

Ⓐ 18.8

Ⓑ 37.7

Ⓒ 59.2

Ⓓ 113.0

Part B

What is the area, in square meters, of the circle?

Ⓐ 6π

Ⓑ 12π

Ⓒ 36π

Ⓓ 144π

18 Consider this expression.

$$-4(x - 1) + 2$$

Which of the following is equivalent to the expression?

Ⓐ $-4x - 8$

Ⓑ $-4x - 2$

Ⓒ $-4x + 1$

Ⓓ $-4x + 6$

19   There are 1,000 balls in a container. All of the balls are the same size and shape. In the container, there are

- 400 red balls;

- 250 orange balls;

- 100 green balls; and

- 250 yellow balls.

A student will pick **one** ball at random from the container. What are the probabilities that the student will pick a ball that is either red, orange, or green?

Select the **three** correct probabilities.

Ⓐ $P(\text{red}) = \frac{1}{4}$

Ⓑ $P(\text{red}) = 0.4$

Ⓒ $P(\text{orange}) = \frac{1}{4}$

Ⓓ $P(\text{orange}) = 0.4$

Ⓔ $P(\text{green}) = 0.1\%$

Ⓕ $P(\text{green}) = 10\%$

20 A customer wants to purchase a sweater from a store.

- The original price of the sweater is $40.

- The sweater is on sale for 10% off the original price.

- The customer has a coupon for 25% off the sale price.

The customer claims that she can determine the final price of the sweater by taking 35% off the original price since 10% + 25% = 35%.

Which of the following statements is true?

Ⓐ The customer's claim is correct. The final price of the sweater will be $5.

Ⓑ The customer's claim is correct. The final price of the sweater will be $26.

Ⓒ The customer's claim is incorrect. The final price of the sweater will be $27.

Ⓓ The customer's claim is incorrect. The final price of the sweater will be $30.

Grade 7 Mathematics
Spring 2019 Released Operational Items

PBT Item No.	Page No.	Reporting Category	Standard	Item Type*	Item Description	Correct Answer**
1	244	*Ratios and Proportional Relationships*	7.RP.A.1	SR	Determine the unit rate using fractions and whole numbers to solve a real-world problem.	C
2	244	*The Number System*	7.NS.A.2	SA	Determine the product of an expression using order of operations.	1
3	245	*Statistics and Probability*	7.SP.A.2	SR	Use a given two-way table containing data from two populations to determine the probability of an event.	B
4	246	*Ratios and Proportional Relationships*	7.RP.A.2	CR	Determine whether the graphed relationship is proportional; use rate and ratio language to analyze the relationship; and write an equation to describe a proportional relationship.	
5	248	*The Number System*	7.NS.A.2	SR	Determine the quotient when dividing a decimal number by a decimal number that has a value less than one.	D
6	248	*The Number System*	7.NS.A.3	SR	Use the four operations to determine the value of a given multi-step expression containing fractions.	A
7	249	*The Number System*	7.NS.A.3	SR	Compute with rational numbers representing temperature changes in a real-world context.	C
8	249	*Geometry*	7.G.A.3	SR	Determine which two-dimensional figure results from slicing a three-dimensional figure in a given way.	B
9	250	*Expressions and Equations*	7.EE.B.3	SR	Solve a multi-step real-life problem posed with a positive whole number, percent, and a fraction.	A
10	250	*The Number System*	7.NS.A.1	SA	Determine the sum of two numbers expressed as absolute values.	11
11	251	*Statistics and Probability*	7.SP.A.1	SR	Determine which sampling strategy will result in a representative sample of a population.	C
12	254	*Expressions and Equations*	7.EE.B.4	CR	Given a real-world context, create an equation and an inequality with variables, and use them to solve problems.	
13	256	*Geometry*	7.G.A.2	SA	Determine if a unique triangle can be formed using a given set of conditions.	1
14	257	*Statistics and Probability*	7.SP.B.3	SR	Choose correct comparison statements about mean and mean absolute deviation based on line plots.	C,E
15	258	*Statistics and Probability*	7.SP.C.8	SR	Determine the probability of a given compound event by using a tree diagram.	A
16	259	*Expressions and Equations*	7.EE.A.2	SR	Determine an equivalent expression to a given expression representing a real-world context.	C
17	260	*Geometry*	7.G.B.4	SR	Determine the circumference and the area of a given circle.	B;C
18	261	*Expressions and Equations*	7.EE.A.1	SR	Using the distributive property, choose which expression represents the simplified form of a linear expression.	D
19	262	*Statistics and Probability*	7.SP.C.7	SR	Using a uniform probability model, determine the probabilities of events expressed as decimals, fractions, or percents.	B,C,F
20	263	*Ratios and Proportional Relationships*	7.RP.A.3	SR	Solve a multi-step percent problem using proportional relationships involving markdowns.	C

* 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 7 Mathematics
Spring 2019 Unreleased Operational Items

PBT Item No.	Reporting Category	Standard	Item Type*	Item Description
21	*The Number System*	7.NS.A.1	SR	Determine which addition expression is equivalent to a given subtraction expression.
22	*Expressions and Equations*	7.EE.A.2	SR	Determine which expression is equivalent to a given expression.
23	*Expressions and Equations*	7.EE.B.4	SR	Determine which graph is the solution set of an inequality that represents a real-world problem.
24	*Ratios and Proportional Relationships*	7.RP.A.1	SR	Choose an equation that shows how to compute a unit rate associated with ratios of fractions in a real-world problem.
25	*The Number System*	7.NS.A.3	SR	Solve a real-world problem that involves fractions and mixed numbers using operations.
26	*Statistics and Probability*	7.SP.C.5	CR	Determine the likelihood of an event and calculate the probability of other events in a real-world context.
27	*The Number System*	7.NS.A.2	SA	Determine the product of a negative fraction multiplied by a negative fraction, and then express the product as a rational decimal number.
28	*Statistics and Probability*	7.SP.B.3	SR	Express the difference between two means in terms of the mean absolute deviation.
29	*Expressions and Equations*	7.EE.A.1	SR	Determine which expression represents an expansion of a linear expression with a rational coefficient.
30	*Expressions and Equations*	7.EE.B.4	SA	Solve a two-step equation.
31	*The Number System*	7.NS.A.3	SR	Convert a value from one system of measurement to another using operations.
32	*Expressions and Equations*	7.EE.B.4	SR	Determine which equation models a given written scenario based on a real-world context.
33	*Ratios and Proportional Relationships*	7.RP.A.2	SR	Determine which proportion represents a given real-world relationship.
34	*Ratios and Proportional Relationships*	7.RP.A.3	SR	Determine the solution of a percent increase problem with real-world context.
35	*Expressions and Equations*	7.EE.B.3	SR	Solve a real-world, multi-step problem involving mixed numbers, percents, and whole numbers.
36	*Ratios and Proportional Relationships*	7.RP.A.1	SA	Determine the unit rate in a multi-step problem, given a real-world scenario.
37	*Geometry*	7.G.B.5	CR	Use facts about angles to write and solve equations that can be used to find the measures of unknown angles in a diagram.
38	*Ratios and Proportional Relationships*	7.RP.A.2	SR	Determine the unit rate in a real-world problem.
39	*Statistics and Probability*	7.SP.B.3	SA	Determine the number of data that lie between the means of two data sets.
40	*Expressions and Equations*	7.EE.B.4	SR	Choose an expression that can be used to solve a real-world problem.

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