**Computer-Based Released Items**
**Grade 8 Mathematics**
**Spring 2023**

The spring 2023 grade 8 Mathematics test was administered in two formats: a computer-based version and a paper-based version. Most students took the computer-based test. The paper-based test was offered as an accommodation for eligible students who were unable to use a computer.

The Department of Elementary and Secondary Education is releasing items from both versions of the test to provide information about the knowledge and skills that students are expected to demonstrate.

- Released items from the **computer-based test** are available online at mcas.pearsonsupport.com/released-items. The computer-based released items are collected in a mini test called an ePAT (electronic practice assessment tool). Items in the ePAT are displayed in TestNav 8, the testing platform for the computer-based tests.

- Released items from the **paper-based test** are available in PDF format on the Department's website at www.doe.mass.edu/mcas/testitems.html.

This document provides information about each released item from the *computer-based test*, including the following: reporting category, standard(s) covered, item type, item description, and correct answer (for released selected-response short-answer items only). Information about unreleased operational items is also presented here. Sample student responses and scoring rubrics for released constructed-response items will be posted at www.doe.mass.edu/mcas/student/.

**A Note about Testing Mode**

Most of the operational items on the grade 8 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.

# Grade 8 Mathematics
# Spring 2023 Computer-Based Released Operational Items

| CBT Item No. | Reporting Category | Standard | Item Type* | Item Description | Correct Answer** |
|---|---|---|---|---|---|
| 1 | The Number System and Expressions and Equations | 8.EE.C.7 | SR | Solve a linear equation by collecting like terms. | C |
| 2 | Geometry | 8.G.C.9 | SR | Find the volume of a cylinder given its diameter and height. | C |
| 3 | Geometry | 8.G.A.2 | SR | Given several transformations on a triangle, determine whether the resulting images are congruent to the original figure. | *see page 5* |
| 4 | The Number System and Expressions and Equations | 8.NS.A.2 | SR | Approximate the value of a square root by showing how to find its location on a number line. | *see page 5* |
| 5 | Functions | 8.F.B.4 | CR | Use the linear relationship represented in a table to determine the y-intercept and slope; to write the equation of the line; and to determine whether a given point falls on the line. | |
| 6 | The Number System and Expressions and Equations | 8.EE.A.4 | SR | Solve a real-world problem that involves performing operations on two numbers expressed in scientific notation. | B |
| 7 | The Number System and Expressions and Equations | 8.EE.C.8 | SR | Determine the number of solutions to a system of equations. | A |
| 8 | The Number System and Expressions and Equations | 8.EE.A.1 | SR | Apply the properties of negative integer bases and exponents to identify the signed values of expressions. | C |
| 9 | The Number System and Expressions and Equations | 8.NS.A.1 | SR | Match decimal expansions with their fraction equivalents. | *see page 5* |
| 10 | The Number System and Expressions and Equations | 8.EE.A.2 | SR | Evaluate the cube root of a small perfect cube. | A |
| 11 | The Number System and Expressions and Equations | 8.EE.B.5 | SR | Determine which graph represents a proportional relationship in a real-world context. | A |
| 12 | Geometry | 8.G.B.7 | SR | Use the Pythagorean theorem to find the missing side length of a right triangle in a real-world problem. | B |
| 13 | Statistics and Probability | 8.SP.A.1 | CR | Given a scatter plot, determine if there are outliers in the data, describe the association represented by the data, and make a prediction based on the data. | |
| 14 | Geometry | 8.G.B.6 | SR | Given the lengths of two sides of a right triangle, determine the possible length of the third side by using the Pythagorean Theorem. | B,C |
| 15 | The Number System and Expressions and Equations | 8.EE.C.8 | SA | Create two linear equations, each involving the same two variables, to solve a real-world problem. | 270 |
| 16 | Geometry | 8.G.A.1 | SA | Determine the length of a line segment after a series of transformations. | 8 |
| 17 | Geometry | 8.G.B.8 | SA | Use the Pythagorean Theorem to create an equation to represent the length of a line segment that is graphed on a coordinate plane. | *see page 5* |
| 18 | Geometry | 8.G.A.5 | SR | Determine the angle measures of a triangle that is congruent to a given triangle. | *see page 5* |
| 19 | Functions | 8.F.A.3 | SR | Interpret the equation y=mx+b, and decide whether given functions are linear or not linear. | Part A: C<br>Part B: B,D |

| | | | | | |
|---|---|---|---|---|---|
| 20 | Geometry | 8.G.A.3 | SR | Determine the coordinates of the image of a vertex of a quadrilateral after it has been rotated about the origin. | A |

* 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. Page 5 of this document provides correct answers for technology-enhanced (TE) items. Sample responses and scoring guidelines for constructed-response items will be posted at www.doe.mass.edu/mcas/student/default.html.

## Grade 8 Mathematics
## Spring 2023 Computer-Based Unreleased Operational Items

| CBT Item No. | Reporting Category | Standard | Item Type* | Item Description |
|---|---|---|---|---|
| 21 | The Number System and Expressions and Equations | 8.NS.A.2 | SR | Determine between which pair of integers the square root of a given number lies. |
| 22 | Statistics and Probability | 8.SP.A.3 | SA | Use the equation of a linear model derived from data to solve a real-world problem. |
| 23 | The Number System and Expressions and Equations | 8.EE.A.1 | CR | Use the properties of exponents to find equivalent expressions. |
| 24 | The Number System and Expressions and Equations | 8.NS.A.1 | SR | Identify an irrational number from a list of numbers. |
| 25 | The Number System and Expressions and Equations | 8.EE.C.8 | SR | Determine the coordinates of the solution of a system of equations. |
| 26 | The Number System and Expressions and Equations | 8.EE.A.1 | SR | Use the properties of exponents to identify equivalent expressions. |
| 27 | The Number System and Expressions and Equations | 8.EE.B.5 | SR | Interpret a proportional relationship on a graph, and identify and interpret the slope of the graph. |
| 28 | The Number System and Expressions and Equations | 8.EE.A.2 | SR | Classify radical expressions as rational or irrational numbers. |
| 29 | Geometry | 8.G.A.1 | SA | Determine the effects of a translation and a rotation on the angles and sides of a quadrilateral. |
| 30 | The Number System and Expressions and Equations | 8.NS.A.1 | SR | Identify rational numbers from a list of radical expressions. |
| 31 | Functions | 8.F.B.4 | SR | Use the linear relationship represented in a table of values to solve a real-world problem that involves determining the y-value for a given x-value. |
| 32 | Statistics and Probability | 8.SP.A.3 | SR | Use the equation of a linear model derived from data to solve a real-world problem. |
| 33 | Statistics and Probability | 8.SP.A.2 | SR | Justify why a line drawn through data on a scatter plot is suitable as a line of best fit. |
| 34 | Functions | 8.F.B.4 | SR | Given a real-world context, interpret the rate of change from an equation. |
| 35 | Geometry | 8.G.A.1 | CR | Given a polygon and its image after a transformation, verify congruence by analyzing properties of both polygons; describe a series of transformations that would result in the same image of the polygon. |
| 36 | Functions | 8.F.A.1 | SA | Given a set of points on a coordinate plane, determine which point should be removed in order to create a function. |
| 37 | Functions | 8.F.A.1 | SR | Determine which set of coordinate pairs represents a function. |
| 38 | Functions | 8.F.A.2 | SR | Compare properties of two functions represented algebraically and in a table, and interpret each function's rate of change and initial value. |
| 39 | Geometry | 8.G.C.9 | SA | Find the volume of a sphere given its radius. |
| 40 | Geometry | 8.G.A.4 | SR | Given several transformations of a figure, determine whether the image created by each transformation is congruent or similar but not congruent to the original figure. |

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

**Correct Answer for CBT Item #3: Technology-Enhanced Item**

| Sequence of Transformations on Triangle $ABC$ | Congruent to Triangle $ABC$ | Not Congruent to Triangle $ABC$ |
|---|---|---|
| translate $4$ units to the right, and then reflect over the *y*-axis | ◉ | ○ |
| rotate $180°$ clockwise about the origin, and then dilate by a scale factor of $3$ with the center at the origin | ○ | ◉ |
| rotate $90°$ counterclockwise about the origin, and then reflect over the line $y = x$ | ◉ | ○ |

**Correct Answer for CBT Item #4: Technology-Enhanced Item**

On a number line, the expression is located between [7 and 8] . The approximate value of the expression is **closest** to [8] .

**Correct Answer for CBT Item #9: Technology-Enhanced Item**

| $\frac{11}{15}$ | $\frac{8}{11}$ | $\frac{26}{33}$ |
|---|---|---|
| $0.7\overline{3}$ | $0.\overline{72}$ | $0.\overline{78}$ |

**Correct Answer for CBT Item #17: Technology-Enhanced Item**

$4^2 + 5^2 = k^2$

**Correct Answer for CBT Item #18: Technology-Enhanced Item**

$m\angle R =$ 42 °

$m\angle S =$ 96 °

$m\angle T =$ 42 °