

Computer-Based Released Items

Grade 8 Mathematics

Spring 2021

The spring 2021 grade 8 Mathematics test 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.

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: reporting category, standard(s) covered, item type, item description, and correct answer (for selected-response items only). Information about unreleased operational items is also presented here, and scoring rubrics are provided for released constructed-response items.

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.

2021 Session Sampling

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.

Grade 8 Mathematics
Spring 2021 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.A.2	SR	Determine the cube root of a given number.	A
2	Functions	8.F.A.2	SA	Compare the initial values of two linear functions, one defined in text and the other in a table.	10
3	Geometry	8.G.A.4	SR	Determine which transformations of a figure result in a figure that is either congruent, or similar but not congruent.	<i>see page 6</i>
4	The Number System and Expressions and Equations	8.EE.A.3	SR	Given two numbers, each expressed as a single digit multiplied by an integer power of 10, determine by what value one of the numbers must be multiplied to obtain the other.	C
5	Functions	8.F.A.3	SA	Determine whether given equations are linear or nonlinear functions.	<i>see page 6</i>
6	The Number System and Expressions and Equations	8.EE.C.8	SA	Determine one of the values of the solution to a pair of linear equations.	10
7	The Number System and Expressions and Equations	8.NS.A.1	SR	Determine whether a number is rational or irrational.	C
8	The Number System and Expressions and Equations	8.EE.C.7	CR	Solve linear equations in one variable and create a linear equation, given the number of solutions.	<i>see page 7</i>
9	Functions	8.F.B.4	SA	Find the missing y-value in a table containing (x, y) values that represent the relationship in a linear function.	9
10	The Number System and Expressions and Equations	8.NS.A.2	SR	Determine which list orders rational and irrational numbers from least to greatest.	C
11	Functions	8.F.B.5	SR	Determine which graph represents an increasing linear function.	D
12	Geometry	8.G.B.7	SA	Write an equation showing the relationship between the side lengths of a right triangle in a real-world context.	<i>see page 7</i>
13	Geometry	8.G.A.3	SR	Determine the coordinates of the image of a point on a line segment after the line segment has been reflected over the y-axis.	D

14	The Number System and Expressions and Equations	8.EE.B.6	SA	Determine the equation of a line, given a point on the line and its y-intercept.	<i>see page 7</i>
15	The Number System and Expressions and Equations	8.EE.B.5	SA	Graph a proportional relationship based on a real-world context.	<i>see page 8</i>
16	Geometry	8.G.A.5	SR	Determine the measures of three angles shown in a diagram consisting of parallel lines intersected by a transversal.	<i>see page 8</i>
17	Geometry	8.G.A.2	CR	Describe the transformation on a quadrilateral that produced a given image and demonstrate an understanding of the preservation of congruence.	<i>see page 9</i>
18	Functions	8.F.A.1	SA	Determine which graphs represent functions, and find the missing x-value in a table of (x, y) values that would show that y is not a function of x.	Part A: <i>see page 10</i> Part B: 7 or 12
19	Geometry	8.G.C.9	SR	Determine the volume of a cylinder in a real-world context.	B
20	Statistics and Probability	8.SP.A.1	SR	Determine which statement is true about a scatterplot's pattern of association.	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. Pages 6 through 10 of this document provide correct answers for technology-enhanced (TE) items and scoring rubrics for constructed-response items. Sample responses and scoring guidelines for constructed-response items will be posted to the Department's website later this year.

Grade 8 Mathematics
Spring 2021 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.1	SR	Determine the decimal equivalent of a rational number expressed as a fraction.
22	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.
23	The Number System and Expressions and Equations	8.NS.A.2	SA	Identify a point on a number line that corresponds to the approximate location of an irrational number.
24	Functions	8.F.B.5	SA	Graph a linear function that has the same y-intercept as $y=x$ and passes through a given point.
25	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.
26	The Number System and Expressions and Equations	8.EE.A.4	SA	Solve a real-world problem by performing operations with numbers expressed in both scientific and decimal notation.
27	Geometry	8.G.A.1	SA	Graph the image of a triangle after a reflection and compare the sides, angles, areas, and perimeters of the triangle and its image.
28	The Number System and Expressions and Equations	8.EE.C.8	SR	Determine the number of solutions to a system of equations.
29	The Number System and Expressions and Equations	8.EE.A.1	SR	Apply the properties of integer exponents to identify equivalent expressions.
30	The Number System and Expressions and Equations	8.EE.B.6	SR	Determine the equation of a line graphed on a coordinate plane.
31	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.
32	Geometry	8.G.A.2	SR	Given several transformations on a triangle, determine whether the resulting images are congruent to the original figure.
33	Statistics and Probability	8.SP.A.4	CR	Complete a two-way table, summarize real-world data on two categorical variables, and then compare an additional two-way table to the completed table.
34	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.

35	The Number System and Expressions and Equations	8.EE.B.5	SR	Determine which equation represents a proportional relationship in a real-world context.
36	The Number System and Expressions and Equations	8.EE.C.7	SR	Determine the number of solutions for two different one-variable equations.
37	Geometry	8.G.A.2	SR	Determine which sequence of transformations of a quadrilateral results in a given image.
38	Geometry	8.G.B.7	SR	Use the Pythagorean theorem to find the missing side length of a triangle in a mathematical problem.
39	The Number System and Expressions and Equations	8.EE.B.5	SR	Determine which graph represents a proportional relationship in a real-world context.
40	Geometry	8.G.A.1	SA	Graph the image of a line segment that has been reflected over the x-axis.

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

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

Transformation	Congruent	Similar but Not Congruent
a translation 4 units up and 2 units right	<input checked="" type="radio"/>	<input type="radio"/>
a 90° clockwise rotation, followed by a reflection over the x-axis	<input checked="" type="radio"/>	<input type="radio"/>
a reflection over the y-axis, followed by a dilation by a scale factor of 2 with the center at the origin	<input type="radio"/>	<input checked="" type="radio"/>
a dilation by a scale factor of 1.5 with the center at the origin, followed by a translation 5 units left	<input type="radio"/>	<input checked="" type="radio"/>

Correct Answer for CBT Item #5: Technology-Enhanced Item

Linear Function	Nonlinear Function
<input type="checkbox"/> $y = 2x + 1$	<input type="checkbox"/> $y = x^2 - 1$
<input type="checkbox"/> $y = -x$	<input type="checkbox"/> $y = \frac{1}{3}x^2$
<input type="checkbox"/> $y = \frac{1}{2}x - 5$	

Rubric for CBT Item #8: Constructed Response




Scoring Guide	
Score	Description
4	The student response demonstrates an exemplary understanding of the Expressions and Equations concepts involved in solving linear equations in one variable. The student determines the number of solutions for different equations.
3	The student response demonstrates a good understanding of the Expressions and Equations concepts involved in solving linear equations in one variable. Although there is significant evidence that the student was able to recognize and apply the concepts involved, some aspect of the response is flawed. As a result, the response merits 3 points.
2	The student response demonstrates a fair understanding of the Expressions and Equations concepts involved in solving linear equations in one variable. While some aspects of the task are completed correctly, others are not. The mixed evidence provided by the student merits 2 points.
1	The student response demonstrates a minimal understanding of the Expressions and Equations concepts involved in solving linear equations in one variable.
0	The student response contains insufficient evidence of an understanding of the Expressions and Equations concepts involved in solving linear equations in one variable. As a result, the response does not merit any points.

Correct Answer for CBT Item #12: Technology-Enhanced Item

$$9.6^2 + 7.2^2 = 12^2$$

Correct Answer for CBT Item #14: Technology-Enhanced Item

$y = 3x + 4$

$+$

$-$

\times

\div

$\frac{\square}{\square}$

$\frac{\square}{\square}$

y^x


$\sqrt{\square}$

$\sqrt[3]{\square}$

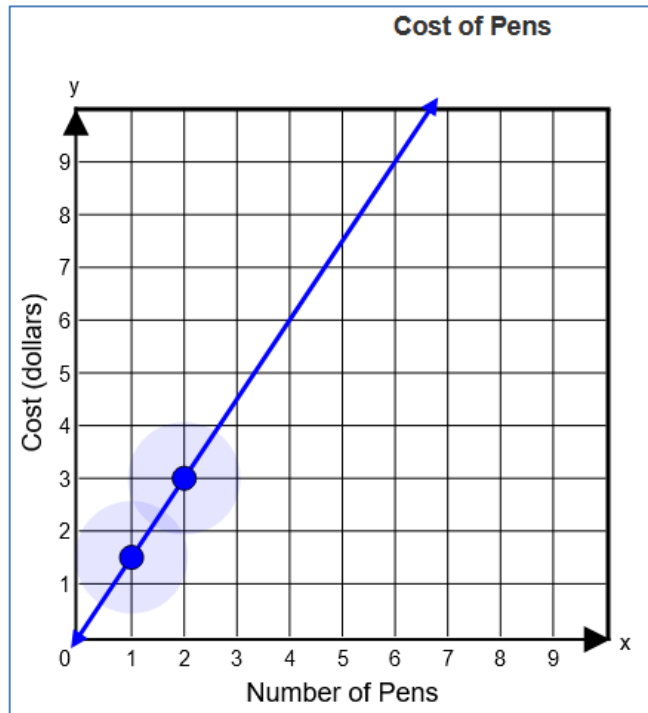
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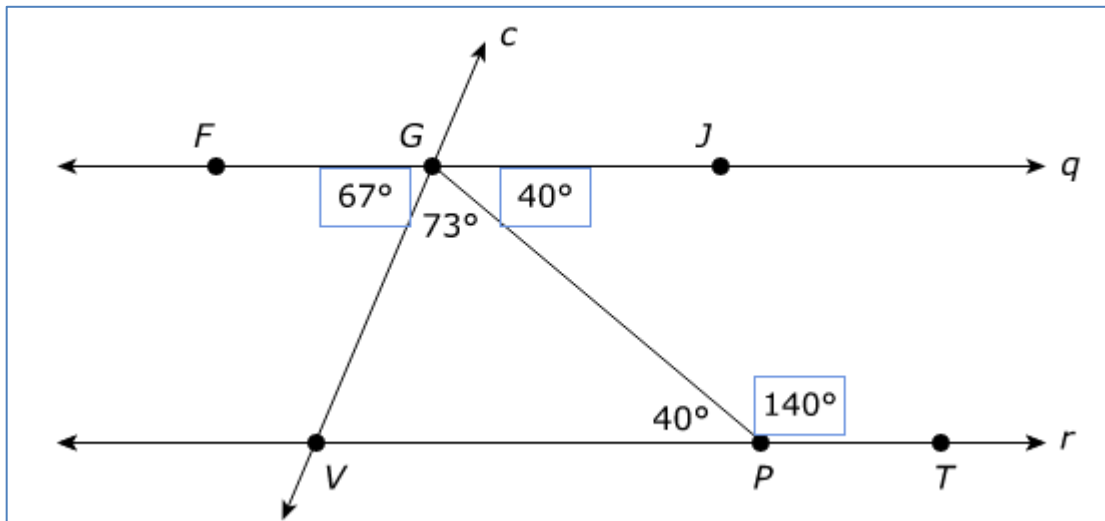
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Correct Answer for CBT Item #15: Technology-Enhanced Item



Correct Answer for CBT Item #16: Technology-Enhanced Item

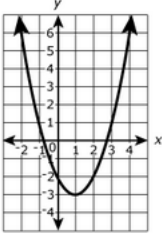
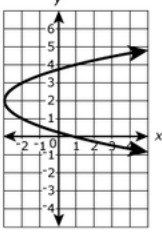
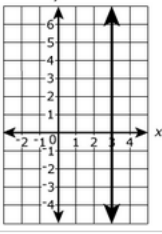
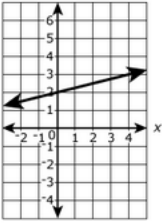


Rubric for CBT Item #17: Constructed Response

Scoring Guide	
Score	Description
4	The student response demonstrates an exemplary understanding of the Geometry concepts involved in understanding that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. Given two congruent figures, the student describes a sequence that exhibits the congruence between them.
3	The student response demonstrates a good understanding of the Geometry concepts involved in understanding that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. Although there is significant evidence that the student was able to recognize and apply the concepts involved, some aspect of the response is flawed. As a result, the response merits 3 points.
2	The student response demonstrates a fair understanding of the Geometry concepts involved in understanding that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. While some aspects of the task are completed correctly, others are not. The mixed evidence provided by the student merits 2 points.
1	The student response demonstrates a minimal understanding of the Geometry concepts involved in understanding that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations.
0	The student response contains insufficient evidence of an understanding of the Geometry concepts involved in understanding that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. As a result, the response does not merit any points.

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

Part A:

Graph	Function	Not a Function
	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input checked="" type="radio"/>
	<input type="radio"/>	<input checked="" type="radio"/>
	<input checked="" type="radio"/>	<input type="radio"/>