

Computer-Based Released Items **Grade 10 Mathematics** **Spring 2023**

The spring 2023 grade 10 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 selected-response and short-answer items only). Sample student responses and scoring rubrics for 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 10 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 10 Mathematics
Spring 2023 Computer-Based Released Operational Items

CBT Item No.	Reporting Category	Standard	Item Type*	Item Description	Correct Answer**
1	Algebra and Functions	A-SSE.B.3	SR	Factor a quadratic expression to solve a problem in a real-world context.	A
2	Geometry	G-GPE.A.1	SR	Create the equation of a circle given its center and radius.	<i>see page 4</i>
3	Number and Quantity	N-RN.A.2	SR	Evaluate a radical expression that has an exponent using laws of exponents.	A
4	Statistics and Probability	S-ID.A.1	SR	Determine the median value of real-world data displayed in a line plot.	B
5	Algebra and Functions	A-APR.A.1	SR	Given a polynomial expression, identify an equivalent expression.	D
6	Geometry	G-GPE.B.5	CR	Given a line graphed on a coordinate plane, determine its slope, create an equation of a parallel line, determine whether another line is parallel, and create an equation of a perpendicular line passing through a given point.	
7	Algebra and Functions	A-REI.B.3	SR	Solve a linear inequality based on a real-world context.	B
8	Geometry	G-GPE.B.6	SA	Identify the point on a line segment that partitions the segment into a given ratio.	<i>see page 4</i>
9	Algebra and Functions	A-REI.B.4	SR	Identify the solutions of a quadratic equation in factored form.	C
10	Geometry	G-SRT.C.6	SR	Determine the length of a leg of a right triangle based on angle measures.	A
11	Number and Quantity	N-RN.B.3	SR	Identify a statement about rational and irrational numbers that is not true and determine whether a given expression is rational.	Part A: C Part B: <i>see page 4</i>
12	Algebra and Functions	A-CED.A.2	SR	Identify the equation of a line graphed on a coordinate plane.	A
13	Algebra and Functions	F-IF.B.4	CR	Given a quadratic function that represents a context, evaluate the function for a specific input value, analyze how the function changes over different input values, and determine the maximum value of the function.	
14	Algebra and Functions	F-IF.C.9	SR	Compare properties of a quadratic function shown on a graph and another represented by values in a table.	Part A: C Part B: <i>see page 5</i>
15	Algebra and Functions	F-LE.A.2	SR	Construct an exponential function based on information in a table.	D
16	Number and Quantity	N-Q.A.2	SR	Use estimation skills to approximate the solution of a real-world problem.	C
17	Algebra and Functions	A-REI.D.10	SR	Identify the coordinates of points that lie on the graph of a linear equation.	D,E
18	Geometry	G-SRT.C.8	SA	Use trigonometric ratios to determine side lengths in different right triangles based on a real-world context.	12;C
19	Algebra and Functions	A-REI.A.1	SR	Justify each step in the solution of a linear equation.	<i>see page 5</i>
20	Geometry	G-CO.C.10	SA	Use the Triangle Sum Theorem to determine an angle measure.	70
21	Algebra and Functions	A-REI.C.7	SR	Identify the solution of a system of a linear equation and a quadratic equation.	C

22	Geometry	G-GPE.B.7	SR	Calculate the area of a trapezoid graphed on a coordinate plane.	B
23	Algebra and Functions	F-BF.A.2	SR	Identify a function that represents a geometric sequence partially displayed in a table.	C
24	Algebra and Functions	A-CED.A.1	SR	Create two one-variable equations and use them to solve a real-world problem.	B
25	Algebra and Functions	F-IF.A.1	SR	Identify the domain and range of a linear function from its graph.	<i>see page 5</i>
26	Geometry	G-SRT.B.5	SR	Identify a proportion that can be used to find an unknown side length in a pair of similar triangles.	D
27	Statistics and Probability	S-CP.A.4	CR	Complete a two-way frequency table of data, use the data in the table to compute conditional probabilities, and determine whether the variables of interest are independent.	
28	Geometry	G-CO.A.5	SR	Identify the graph of a triangle on a coordinate plane after a transformation.	A
29	Algebra and Functions	F-LE.B.5	SR	Compare the parameters of three linear functions that represent a real-world context.	C,D
30	Geometry	G-CO.D.13	SR	Analyze the construction of a square inscribed in a circle.	A
31	Algebra and Functions	F-LE.A.3	SR	Compare the values of a linear function and an exponential function, graphed on a coordinate plane, as the value of the independent variable increases.	<i>see page 6</i>
32	Statistics and Probability	S-ID.B.5	SA	Calculate relative frequencies from a two-way table based on a real-world context.	A;47
33	Geometry	G-C.A.2	SR	Determine an unknown arc measure in a diagram of a triangle inscribed in a circle.	C
34	Number and Quantity	N-Q.A.1	CR	Use dimensional analysis and translate between units to solve real-world problems, and then apply the solutions to a related problem.	
35	Geometry	G-CO.B.7	SR	Relate the side lengths and angle measures in pairs of congruent triangles.	Part A: D Part B: <i>see page 6</i>
36	Number and Quantity	N-Q.A.3	SR	Use estimation and dimensional analysis to solve a real-world problem involving mass and money.	D
37	Statistics and Probability	S-ID.A.2	SR	Compare measures of center and spreads of two real-world data sets displayed in line plots.	<i>see page 6</i>
38	Geometry	G-CO.A.2	SR	Determine the coordinates of a vertex of a pentagon, graphed on a coordinate plane, after a sequence of transformations.	D
39	Geometry	G-C.B.5	SA	Calculate the area of a sector of a circle and the length of an arc on the circle.	A;7.3
40	Algebra and Functions	A-SSE.A.1	SR	Interpret the parts of an exponential expression based on a real-world context.	<i>see page 6</i>
41	Geometry	G-GMD.A.3	SR	Calculate the radius of a cone given its height and its volume.	C
42	Statistics and Probability	S-ID.C.8	SR	Identify the correlation coefficient that best represents a description of the results of a survey.	A

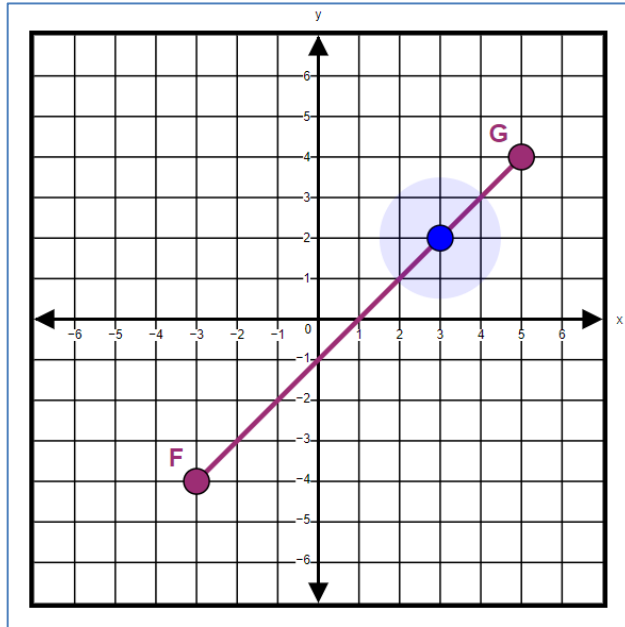
* Mathematics item types are selected-response (SR), short-answer (SA), and constructed-response (CR).

** Answers are provided here for selected-response and short-answer items only. Pages 5 through 7 on this document provide 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.

Correct Answer for CBT Item #2: Technology-Enhanced Item

$$(x - 2)^2 + (y - -4)^2 = (4)^2$$

Correct Answer for CBT Item #8: Technology-Enhanced Item



Correct Answer for CBT Item #11: Technology-Enhanced Item

Part B:

The value of the expression is because

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

Part B:

Statement	True	False
The graphs of the functions open in opposite directions.	<input checked="" type="radio"/>	<input type="radio"/>
The functions have the same domain.	<input checked="" type="radio"/>	<input type="radio"/>
The functions have the same range.	<input type="radio"/>	<input checked="" type="radio"/>

Correct Answer for CBT Item #19: Technology-Enhanced Item

Step	Justification
$3(1 + 2x) = 4$	Given
$3(2x + 1) = 4$	<input type="text" value="commutative property"/>
$6x + 3 = 4$	<input type="text" value="distributive property"/>
$6x = 1$	<input type="text" value="subtraction property of equality"/>
$x = \frac{1}{6}$	<input type="text" value="division property of equality"/>

Correct Answer for CBT Item #25: Technology-Enhanced Item

Domain: $\leq x \leq$


Range: $\leq y \leq$

Correct Answer for CBT Item #31: Technology-Enhanced Item

Statement	True	False
For $x < 2$, the value of $f(x)$ is greater than the value of $g(x)$.	<input type="radio"/>	<input checked="" type="radio"/>
For $x > 2$, the value of $f(x)$ is less than the value of $g(x)$.	<input type="radio"/>	<input checked="" type="radio"/>
For $x > 2$, the value of $f(x)$ is greater than the value of $g(x)$.	<input checked="" type="radio"/>	<input type="radio"/>

Correct Answer for CBT Item #35: Technology-Enhanced Item

Part B:



$\triangle H K J \cong \triangle E F G$

Correct Answer for CBT Item #37: Technology-Enhanced Item

Based on the line plots, the median is greater for hours, the mean is greater for hours, and the spread is greater for hours.

Correct Answer for CBT Item #40: Technology-Enhanced Item

In the expression, 18,000 represents the and 0.86 represents the