Computer-Based Released Items
Grade 10 Mathematics
Spring 2024

The spring 2024 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.onlinehelp.cognia.org/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/release.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 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 2024 Computer-Based Released Operational Items

CBT Item No.	Reporting Category	Standard	Item Type*	Item Description	Correct Answer**
1	Algebra and Functions	F-IF.A.3	SR	Given a function that represents an arithmetic sequence, identify the first four numbers in the sequence.	B
2	Number and Quantity	N-RN.B.3	SR	Given variables that represent a rational and an irrational number, identify variable expressions as rational or irrational.	*see page 4*
3	Algebra and Functions	A-SSE.B.3	SR	Identify the equation of a line that meets given slope and intercept criteria.	C
4	Geometry	G-CO.C.9	SR	Determine an unknown angle measure in a diagram with parallel lines crossed by a transversal.	B
5	Algebra and Functions	A-REI.C.5	SR	Identify a system of linear equations that has the same solution as a given system of linear equations.	A
6	Statistics and Probability	S-ID.A.2	CR	Calculate the range and the median of a set of real-world data and determine the values of additional data based on changes in measures of center.	
7	Algebra and Functions	F-IF.C.9	SR	Compare properties of two linear functions, one represented by an equation and the other represented by a graph.	*see page 4*
8	Geometry	G-GPE.A.1	SR	Determine the coordinates of the center of a circle given its equation.	C
9	Algebra and Functions	F-LE.A.2	SR	Identify the equation of a linear function based on values in a table.	C
10	Algebra and Functions	A-APR.A.1	SR	Identify an equivalent expression by finding the difference of two trinomials.	D
11	Geometry	G-CO.A.5	SA	Identify a transformation rule used to map one triangle onto another, and graph the triangle over a rotation.	Part A: D Part B: *see page 4*
12	Algebra and Functions	A-REI.B.4	SR	Identify the solutions of a factored quadratic equation in one variable.	C
13	Number and Quantity	N-RN.A.2	CR	Equate various radical expressions to exponential expressions and evaluate a claim based on the properties of exponents.	
14	Statistics and Probability	S-CP.A.4	SA	Calculate a marginal probability and a conditional probability based on survey data displayed in a table.	Part A: C Part B: *see page 4*
15	Geometry	G-CO.B.6	SR	Identify a transformation which, if performed on a triangle, would not produce a congruent image.	B
16	Algebra and Functions	F-IF.A.2	SR	Analyze a quadratic function that models a relationship based on a real-world situation.	*see page 4*
17	Number and Quantity	N-Q.A.2	SR	Use estimation to determine a unit rate in a real-world situation involving quantities with different units.	B
18	Algebra and Functions	A-REI.D.12	SR	Identify the graph of the solution set of a linear inequality, and identify a different inequality based on the graph of its solution set.	C;A
19	Algebra and Functions	A-SSE.A.2	SR	Relate the products of binomials to their expanded forms.	*see page 5*
20	Geometry	G-GPE.B.5	SR	Identify an equation of a line parallel to a line graphed on a coordinate plane, which passes through a given point.	A

21	*Algebra and Functions*	A-REI.A.1	SR	Identify which step in the solution of an equation contains an error.	D
22	*Geometry*	G-CO.A.2	SR	Identify a transformation rule that represents the translation of a polygon on a coordinate plane.	A
23	*Geometry*	G-GMD.A.1	SR	Determine the area of a semicircle given the length of its diameter.	A
24	*Algebra and Functions*	F-BF.A.1	SR	Create an exponential function that models a relationship based on a real-world situation.	*see page 5*
25	*Number and Quantity*	N-RN.A.1	SR	Identify an exponential expression equivalent to a given radical expression.	B
26	*Geometry*	G-SRT.A.1	SA	Graph the image of a quadrilateral, over a dilation, on a coordinate plane.	*see page 5*
27	*Geometry*	G-C.A.2	CR	Determine minor arc measures, a major arc measure, and an angle measure given a figure inscribed in a circle.	
28	*Algebra and Functions*	A-CED.A.1	SR	Create and solve a one-variable exponential equation based on a real-world context.	B
29	*Geometry*	G-GMD.A.3	SR	Calculate the volume of a right circular cylinder given its dimensions.	B
30	*Geometry*	G-SRT.C.8	SR	Use a trigonometric relationship to calculate an unknown measurement in a trapezoid.	A
31	*Algebra and Functions*	F-LE.B.5	SR	Interpret an exponential function based on the context it represents.	C
32	*Geometry*	G-CO.B.7	SA	Relate the side lengths and angle measures in pairs of congruent triangles.	28;D
33	*Geometry*	G-CO.D.12	SR	Analyze the construction of an angle bisector.	*see page 5*
34	*Algebra and Functions*	A-CED.A.3	CR	Create and solve a system of linear equations in two variables using given constraints, and create and analyze a related inequality.	
35	*Number and Quantity*	N-Q.A.1	SA	Use dimensional analysis to solve real-world problems involving distance and time.	A;24
36	*Statistics and Probability*	S-ID.B.5	SR	Calculate a relative frequency based on real-world data displayed in a two-way table.	C
37	*Geometry*	G-C.A.1	SR	Identify a sequence of transformations that can be used to prove two circles are similar.	*see page 5*
38	*Statistics and Probability*	S-CP.B.6	SR	Identify an expression that can be used to calculate the probability of two dependent events occurring.	D
39	*Algebra and Functions*	F-IF.B.4	SR	Given the graph of a quadratic function, interpret the value of the vertex and analyze other aspects of the function, based on the context it represents.	Part A: B Part B: *see page 6*
40	*Geometry*	G-SRT.B.4	SR	Use a proportion to calculate an unknown length in a diagram of a triangle and a line parallel to one of its sides.	C
41	*Statistics and Probability*	S-ID.C.7	SR	Interpret the rate of change in a linear equation that models data in a real-world situation.	*see page 6*
42	*Geometry*	G-C.B.5	SR	Calculate the measure of the central angle of a circle given the radius of the circle and the length of the arc intercepted by the angle.	B

* 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 4 through 6 of 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/.

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

Expression	Rational	Irrational
x^2	●	○
xy	○	●
$2x+y$	○	●

Correct Answer for CBT Item #7: Technology-Enhanced Item

The slope of $f(x)$ is [positive,] and the slope of $g(x)$ is [negative.]
The y-intercept of $f(x)$ is [less than] the y-intercept of $g(x)$.

Correct Answer for CBT Item #11 Part B: Technology-Enhanced Item
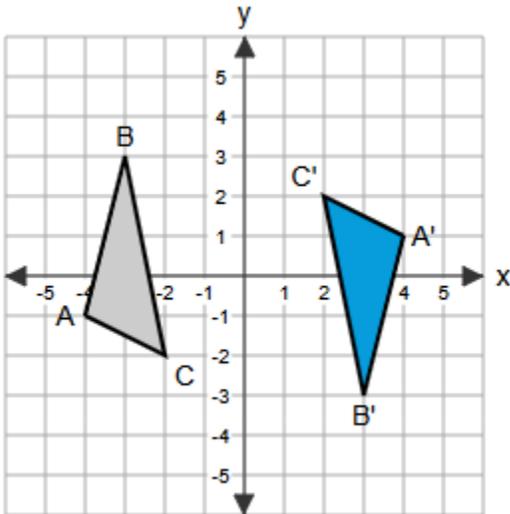
Correct Answer for CBT Item #14 Part B: Technology-Enhanced Item

Student response is any of the following: $\frac{17}{37}$, .45, .459, .459459, .46 or equivalent

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

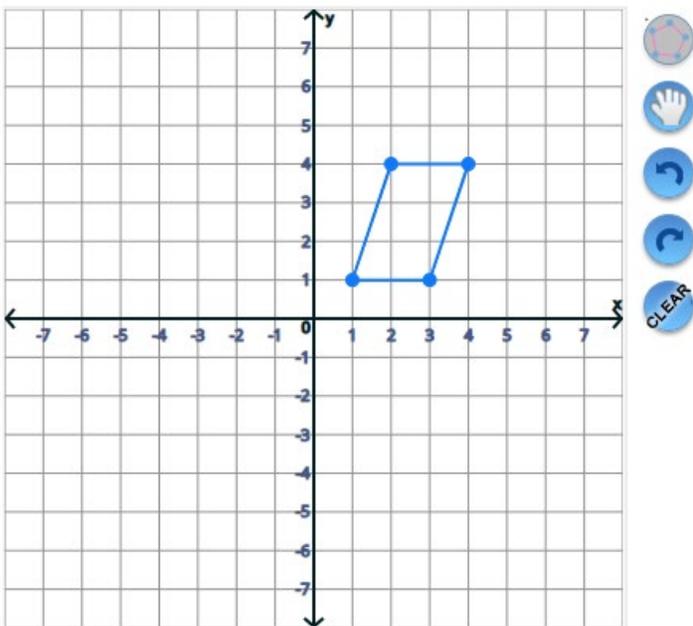The value of $f(0)$ is [0.25] , which represents the maximum [height,] in feet, of the speed bump.

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

Polynomial Expression	$(x+y)(x+y)$	$(x+y)(x-y)$	$(x-y)(x-y)$
$x^2 - y^2$	○	●	○
$x^2 - 2xy + y^2$	○	○	●
$x^2 + 2xy + y^2$	●	○	○

Correct Answer for CBT Item #24: Technology-Enhanced Item

$$B(t) = \boxed{1,800} \, (\, \boxed{0.95} \,)^t$$

Correct Answer for CBT Item #26: Technology-Enhanced Item

Correct Answer for CBT Item #33: Technology-Enhanced Item

The steps illustrate how to [bisect ▾] angle S so that [angle RSP is congruent to angle TSP. ▾]

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

To prove that the circles are similar, translate circle F such that its center is the point ($\boxed{1}$, $\boxed{0}$), and then dilate it by a scale factor of $\boxed{3}$ with respect to its center.

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Correct Answer for CBT Item #39 Part B: Technology-Enhanced Item

Statement	True	False
The ball was in the air for a total of 6 seconds.	○	◉
The ball was thrown from an initial height of 80 feet.	◉	○
The height of the ball was increasing for a greater interval of time than it was decreasing.	○	◉

Correct Answer for CBT Item #41: Technology-Enhanced Item

Based on the model, the number of residents of an apartment building [decreases ▾] by [17 ▾] for every 1-mile increase in the building's distance from the city center.