

Computer-Based Released Items

Grade 10 Mathematics

Spring 2019

The spring 2019 grade 10 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). Scoring rubrics are also provided for released constructed-response items.

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 2019 Computer-Based Released Operational Items

CBT Item No.	Reporting Category	Standard	Item Type*	Item Description	Correct Answer**
1	Algebra and Functions	A-APR.A.1	SR	Multiply two polynomial expressions.	B
2	Algebra and Functions	F-IF.A.2	SR	Evaluate a quadratic function for different input values.	<i>see page 5</i>
3	Geometry	G-C.A.2	SR	Use an inscribed right triangle to determine the circumference of a circle.	B
4	Geometry	G-CO.B.6	SR	Identify transformations that would produce a congruent figure.	A,B,C
5	Algebra and Functions	A-REI.C.6	SA	Solve for one variable in a system of linear equations algebraically.	2
6	Algebra and Functions	A-SSE.A.2	SR	Factor a trinomial expression.	B
7	Algebra and Functions	A-REI.D.12	SA	Graph the solution set of a linear inequality in two variables.	<i>see page 5</i>
8	Geometry	G-GPE.B.5	SR	Identify an equation of a line perpendicular to a given line.	A
9	Number and Quantity	N-RN.A.2	CR	Evaluate expressions involving radicals and rational exponents.	<i>see page 6</i>
10	Statistics and Probability	S-ID.A.2	SR	Compare measures of center and spread of two data sets.	C
11	Geometry	G-GPE.B.6	SR	Find the midpoint of a line segment graphed on a coordinate plane.	B
12	Statistics and Probability	S-CP.B.6	SA	Calculate conditional probabilities of real-world events from a description.	<i>Part A: A</i> <i>Part B: see page 7</i>
13	Algebra and Functions	A-REI.B.4	SR	Find the solutions of a quadratic equation in one variable.	A

14	Statistics and Probability	S-ID.A.2	CR	Interpret data in a data display and compare the measures of center of the data sets.	<i>see page 8</i>
15	Number and Quantity	N-Q.A.2	SR	Estimate the solution of a real-world problem using units.	D
16	Geometry	G-SRT.A.3	SR	Use similarity criteria to identify and name similar triangles.	<i>see page 9</i>
17	Algebra and Functions	A-SSE.B.3	SR	Factor a quadratic trinomial expression.	D
18	Geometry	G-SRT.A.1	SA	Graph a figure on a coordinate plane after a dilation.	<i>see page 10</i>
19	Number and Quantity	N-RN.B.3	SR	Consider and complete statements about operations with rational and irrational numbers.	<i>see page 11</i>
20	Algebra and Functions	A-REI.B.3	SR	Determine the solution set of a linear inequality in one variable.	B
21	Geometry	G-SRT.C.6	SR	Use a trigonometric ratio to determine a missing side length in a right triangle.	C
22	Geometry	G-GMD.A.3	SR	Calculate the volume of a right square pyramid.	A
23	Statistics and Probability	S-ID.B.5	SR	Complete a two-way table that represents a real-world situation.	<i>see page 11</i>
24	Algebra and Functions	F-IF.A.1	SR	Identify a graph that does not represent a functional relationship.	D
25	Geometry	G-CO.A.5	SA	Graph a figure on a coordinate plane after a reflection.	<i>see page 12</i>
26	Geometry	G-GPE.B.7	SR	Calculate the perimeter of a parallelogram shown on a coordinate plane.	B
27	Geometry	G-GMD.A.3	SR	Calculate the volume of a sphere.	B
28	Algebra and Functions	F-IF.C.9	SR	Compare the properties of linear functions represented in different ways.	<i>see page 12</i>

29	Algebra and Functions	A-SSE.A.1	SA	Interpret part of an expression that represents a real-world situation.	25
30	Geometry	G-CO.A.2	CR	Describe transformations that create congruent and non-congruent images and determine the coordinates of the vertices of transformed figures.	<i>see page 13</i>
31	Algebra and Functions	A-REI.A.1	SR	Justify each step in the solution of a linear equation.	<i>see page 14</i>
32	Geometry	G-CO.C.11	SR	Determine the number of sides of a regular polygon based on the measures of its exterior angles.	C
33	Number and Quantity	N-Q.A.1	SA	Use dimensional analysis to equate actual distances and those on a map.	1.5; 4
34	Geometry	G-SRT.B.5	SR	Use similar triangles to determine a missing side length.	C
35	Algebra and Functions	A-CED.A.1	CR	Create exponential equations from a formula and use them to solve real-world problems.	<i>see page 15</i>
36	Geometry	G-SRT.C.8	SR	Use the Pythagorean theorem to solve a real-world problem.	C
37	Algebra and Functions	F-LE.A.2	SA	Identify the features of a linear function from values in a table and write an equation for another linear function shown on a graph.	<i>see page 16</i>
38	Algebra and Functions	A-CED.A.2	SR	Determine a system of two-variable equations based on a real-world situation.	D
39	Geometry	G-CO.A.3	SR	Identify a transformation that would carry a figure onto itself.	D
40	Algebra and Functions	F-LE.B.5	SR	Interpret parameters of linear functions based on a real-world situation.	<i>see page 16</i>
41	Geometry	G-C.B.5	SR	Determine the area of a sector of a circle.	A
42	Statistics and Probability	S-ID.B.6	SR	Identify the method for drawing the line of best fit for data displayed in a scatter plot.	C

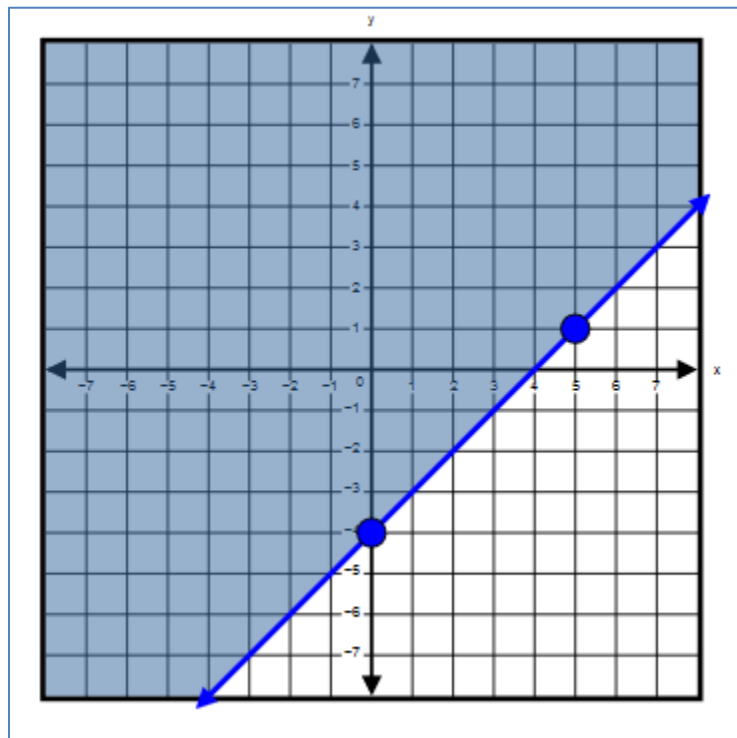
* Mathematics item types are: selected-response (SR), short-answer (SA), and constructed-response (CR).

** Answers are provided here for selected-response and short-answer items only. Correct answers for technology-enhanced (TE) items can be found beginning on page 5 of this document. Scoring rubrics for constructed-response items are also provided in this document. Sample responses and scoring guidelines for constructed-response items will be posted to the Department's website later this year.

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

$f(0) =$	<input type="text" value="0"/>
$f(5) =$	<input type="text" value="65"/>
$f(18) =$	<input type="text" value="0"/>

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



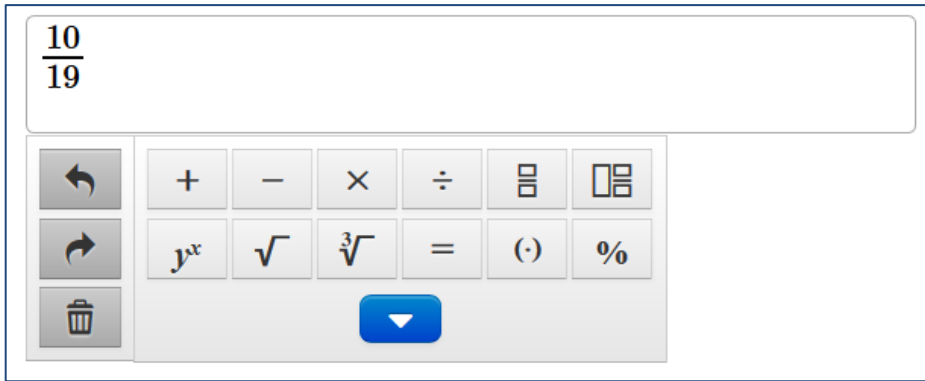
Rubric for CBT Item #9: Constructed Response

Scoring Guide	
Score	Description
4	The student response demonstrates an exemplary understanding of the Number and Quantity concepts involved in rewriting expressions involving radicals and rational exponents. The student evaluates expressions for specific values of a variable and simplifies expressions representing distance and area.
3	The student response demonstrates a good understanding of the Number and Quantity concepts involved in rewriting expressions involving radicals and rational exponents. 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 Number and Quantity concepts involved in rewriting expressions involving radicals and rational exponents. 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 Number and Quantity concepts involved in rewriting expressions involving radicals and rational exponents.
0	The student response contains insufficient evidence of an understanding of the Number and Quantity concepts involved in rewriting expressions involving radicals and rational exponents to merit any points.

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

Part B:

$\frac{10}{19}$



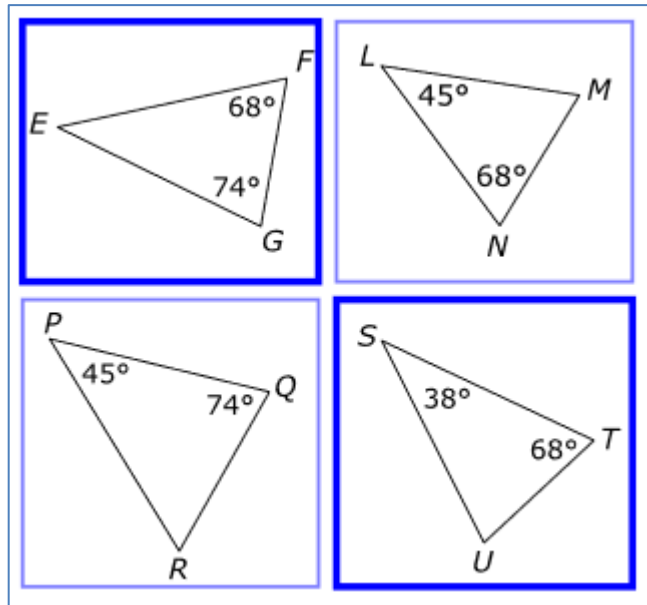
The image shows a digital calculator interface. At the top, a white input field contains the fraction $\frac{10}{19}$. Below the input field is a keypad with several buttons. The first row contains a left arrow, a plus sign (+), a minus sign (-), a multiplication sign (×), a division sign (÷), a fraction template button (two horizontal lines), and a square root button (√). The second row contains a right arrow, a power button (y^x), a square root button (√), a cube root button (∛), an equals sign (=), a negative sign button (⋅), and a percent sign (%). The third row contains a trash can icon and a blue button with a white downward-pointing triangle.

Rubric for CBT Item #14: Constructed Response

Scoring Guide	
Score	Description
4	The student response demonstrates an exemplary understanding of the Statistics and Probability concepts involved in using statistics appropriate to the shape of the data distribution to compare center and spread of two or more different data sets. The student analyzes a double bar graph and compares measures of center of the data.
3	The student response demonstrates a good understanding of the Statistics and Probability concepts involved in using statistics appropriate to the shape of the data distribution to compare center and spread of two or more different data sets. 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 Statistics and Probability concepts involved in using statistics appropriate to the shape of the data distribution to compare center and spread of two or more different data sets. 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 Statistics and Probability concepts involved in using statistics appropriate to the shape of the data distribution to compare center and spread of two or more different data sets.
0	The student response contains insufficient evidence of an understanding of the Statistics and Probability concepts involved in using statistics appropriate to the shape of the data distribution to compare center and spread of two or more different data sets to merit any points.

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

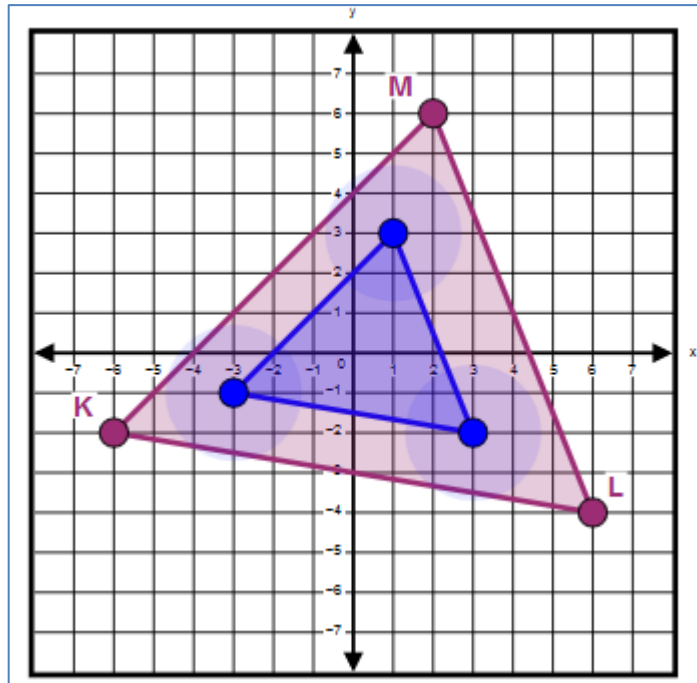
Part A:



Part B:

$$\triangle EFG \sim \triangle \begin{array}{|c|} \hline Z \\ \hline \end{array} \begin{array}{|c|} \hline X \\ \hline \end{array} \begin{array}{|c|} \hline Y \\ \hline \end{array}$$

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



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

Part A:

Statement	True	False
The sum of two rational numbers is rational.	<input checked="" type="radio"/>	<input type="radio"/>
The product of two rational numbers is irrational.	<input type="radio"/>	<input checked="" type="radio"/>
The sum of a rational number and an irrational number is rational.	<input type="radio"/>	<input checked="" type="radio"/>

Part B:

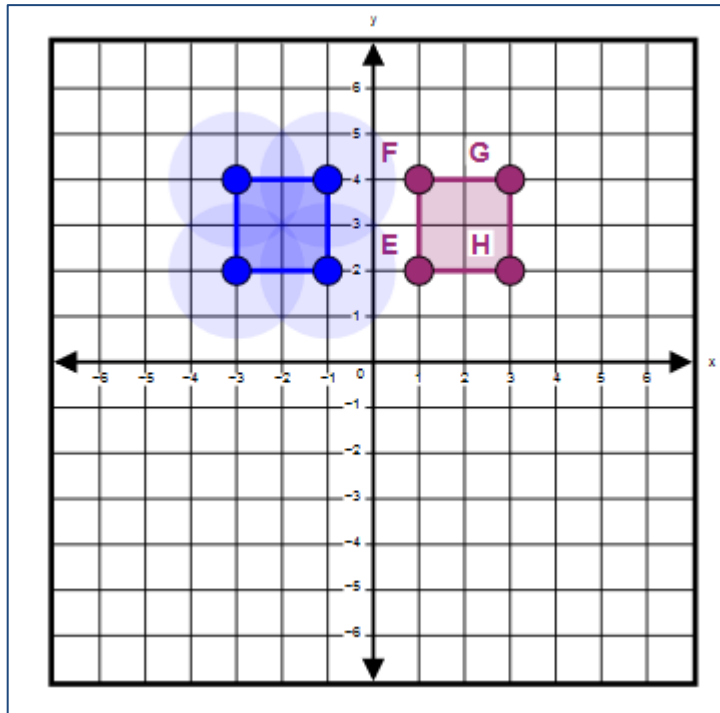
The sum of $\frac{\pi}{2}$ and $\frac{\pi}{2}$ is .

The product of $\frac{1}{2}$ and π is .

Correct Answer for CBT Item #23: Technology-Enhanced Item

	Likes Traveling	Dislikes Traveling	Totals
Ages 18–30	<input type="text" value="40"/>	10	50
Ages 31–60	<input type="text" value="20"/>	<input type="text" value="30"/>	50
Totals	60	40	100

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



Correct Answer for CBT Item #28: Technology-Enhanced Item

Description	$f(x)$	$g(x)$
has the greater rate of change	<input type="radio"/>	<input checked="" type="radio"/>
has the greater y-intercept	<input checked="" type="radio"/>	<input type="radio"/>

Rubric for CBT Item #30: Constructed Response

Scoring Guide	
Score	Description
4	The student response demonstrates an exemplary understanding of the Geometry concepts involved in representing transformations in the plane, describing transformations as functions that take points in the plane as inputs and give other points as outputs, and comparing transformations that preserve distance and angle to those that do not. The student explains the effect of transformations on the coordinates of the vertices of a triangle graphed on a coordinate plane.
3	The student response demonstrates a good understanding of the Geometry concepts involved in representing transformations in the plane, describing transformations as functions that take points in the plane as inputs and give other points as outputs, and comparing transformations that preserve distance and angle to those that do not. 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 representing transformations in the plane, describing transformations as functions that take points in the plane as inputs and give other points as outputs, and comparing transformations that preserve distance and angle to those that do not. 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 representing transformations in the plane, describing transformations as functions that take points in the plane as inputs and give other points as outputs, and comparing transformations that preserve distance and angle to those that do not.
0	The student response contains insufficient evidence of an understanding of the Geometry concepts involved in representing transformations in the plane, describing transformations as functions that take points in the plane as inputs and give other points as outputs, and comparing transformations that preserve distance and angle to those that do not to merit any points.

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

Step	Explanation
$4(x + 5) = 88$	Given
$4x + 20 = 88$	He used the distributive property.
$4x = 68$	He subtracted 20 from both sides.
$x = 17$	He divided both sides by 4.

Rubric for CBT Item #35: Constructed Response

Scoring Guide	
Score	Description
4	The student response demonstrates an exemplary understanding of the Algebra concepts involved in creating equations in one variable and using them to solve problems. The student creates exponential equations, based on a formula, and uses them to solve real-world problems.
3	The student response demonstrates a good understanding of the Algebra concepts involved in creating equations in one variable and using them to solve problems. 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 Algebra concepts involved in creating equations in one variable and using them to solve problems. 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 Algebra concepts involved in creating equations in one variable and using them to solve problems.
0	The student response contains insufficient evidence of an understanding of the Algebra concepts involved in creating equations in one variable and using them to solve problems to merit any points.

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

Part A:

Statement	True	False
The slope of the line is positive.	<input type="radio"/>	<input checked="" type="radio"/>
The y-intercept of the line is positive.	<input checked="" type="radio"/>	<input type="radio"/>

Part B:

$$g(x) = \boxed{-6} x + \boxed{228}$$

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

Part A:

Increasing		Decreasing	
<input type="button" value="Rye"/>	<input type="button" value="Smithfield"/>	<input type="button" value="Pinehill"/>	<input type="button" value="Troy"/>

Part B:

<input type="button" value="Least"/>			<input type="button" value="Greatest"/>
<input type="button" value="Rye"/>	<input type="button" value="Troy"/>	<input type="button" value="Pinehill"/>	<input type="button" value="Smithfield"/>