Texas Education Agency
Student Assessment Division
May 2022

Item #	Rationale	
	Option C is incorrect	The student likely used the reciprocal of the slope formula, $m = \frac{x_2 - x_1}{y_2 - y_1}$, to calculate the slopes as $m = \frac{-5 - 0}{-5 - (-3)} = \frac{-5}{-2} = \frac{5}{2}$ for the line that is increasing and $m = \frac{-5 - 0}{-5 - (-8)} = \frac{-5}{3} = -\frac{5}{3}$ for the line that is decreasing. In addition, the student likely switched the values of the y- L Q W H U F H S W V X V L Q J í I R U value of b L Q W K H O L Q H W K D W L V L Q F U H D V L Q J in the line that is decreasing. The student needs to focus on correctly applying the slope formula and correctly identifying the y- intercept of a linear equation when given a graph.
	Option D is incorrect	The student likely used the reciprocal of the slope formula, $m = \frac{x_2 - x_1}{y_2 - y_1}$, to calculate the slopes as $m = \frac{-5 - 0}{-5 - (-3)} = \frac{-5}{-2} = \frac{5}{2}$ for the line that is increasing and $m = \frac{-5 - 0}{-5 - (-8)} = \frac{-5}{3} = -\frac{5}{3}$ for the line that is decreasing. The student correctly identified the values of the y- intercep13.004 t(ect]TJ09.98 0 Td [(y)-1.816 (-)]TJ /12

Item #	Rationale	
5	Option A is correct	To determine the solution to the system of linear equations, the student could have used the elimination method. Multiplying the first equation by 2 results in the equation $4x + 2y$

Texas Education Agency
Student Assessment Division
May 2022

Texas Education Agency
Student Assessment Division
May 2022

Item #	Rationale		
8	Option G is correct	To determine which graph best represents the solution set for the inequality 8	x + 5 y ” L Q W K H J L Y H Q F R Q W H [W W K H V W X G H Q W F R X O G K D Y H U H F R J Q L] H L€ ð

Item #

Item #	Rationale	
9	Option A is correct	To determine which function best represents the graph of an exponential function, the student could have recognized that an exponential function is in the form $p(x) = ab^x$, where a is the y-intercept (value where the graph crosses the y-axis), b is the decay factor (constant rate by which successive values decrease), and x is the variable (symbol used to represent an unknown number). From the graph, the student could have interpreted that the y-intercept at (0, 1) means that the value of a is 1.

Item #	Rationale	
11	Option B is correct	To determine the situation that best shows causation (in which an event is the result of the

Item #	Rationale
	Option F is incorrect The student likely determined the correct y-

Item #	Rationale	
	Option H is incorrect	The student likely determined the correct y- intercepts for both line h and line j but incorrectly applied the slope formula, using $m = \frac{x_2 - x_1}{y_2 - y_1}$ instead of $m = \frac{y_2 - y_1}{x_2 - x_1}$. For line h, the student likely calculated the slope using the first two ordered pairs represented in the table, resulting in _____ _____ ___ _ Next, the student likely substituted $m = -\frac{4}{3}$ and b = í L Q W R $y = mx + b$, resulting in $y = -\frac{4}{3}x - 5$. For line j, the student likely calculated the slope using the ordered pairs (4, í D Q G í6), resulting in $m = \frac{x_2 - x_1}{y_2 - y_1} = \frac{-4 - 4}{6 - (-4)} = \frac{-8}{10} = -\frac{4}{5}$. Next, the student likely substituted $m = -\frac{4}{5}$ and b = 1 into $y = mx + b$, obtaining $y = -\frac{4}{5}x + 1$. The student needs to focus on understanding how to identify the slope and y- intercept of a line when given a table of values or a graph.

2022 STAAR Algebra I Math Rationales

Texas Education Agency
Student Assessment Division
May 2022

Item #	Rationale	
	Option D is incorrect	The student likely recognized from the graph that the line intersects the y-axis at (0, 7) and correctly concluded that the value of b is 7. Next, the student likely applied the slope formula incorrectly, using $m = \frac{x_2 - x_1}{y_2 - y_1}$ instead of $m = \frac{y_2 - y_1}{x_2 - x_1}$. The student likely substituted the ordered pairs (4, 0) and (8, í from the graph into $m = \frac{x_2 - x_1}{y_2 - y_1}$, resulting in $m = \frac{x_2 - x_1}{y_2 - y_1} = \frac{8 - 4}{-7 - 0} = \frac{4}{-7} = -\frac{4}{7}$. Finally, the student likely substituted $b = 7$ and $m = -\frac{4}{7}$ into $y = mx + b$, resulting in $y = -\frac{4}{7}x + 7$. The student needs to focus on understanding how to find the slope of a linear function when given a graph.

Item #	Rationale
16	Option J is correct To determine the expression equivalent to $\frac{c^8\left(d^6\right)^3}{c^2}$, the student could have applied the power of a power property, $(a^m)^n = a^{mn}$, to the factor $(d^6)^3$, obtaining $\left[\frac{c^8 d^{(6)(3)}}{c^2}\right] = \frac{c^8 d^{18}}{c^2}$. Next, the student could have applied the quotient of powers property, $\frac{a^m}{a^n} = a^{m-n}$, to the factors containing c, obtaining $\frac{c^8 d^{18}}{c^2} = c^{8-2} d^{18} = c^6 d^{18}$. This is an efficient way to solve the problem; however, other methods could be ,l -11

Item #	Rationale	
17	Option A is correct	To determine which value of x is a solution to the equation, the student could have first recognized that one side of the equation must be set equal to 0. The student could have subtracted 30 x and added 45 to both sides of the equation, resulting in $5x^2 \pm 30x + 45 = 0$. Next, the student could have found the factors (numbers or expressions that can be multiplied to get another number or expression) of $5 x^2 \pm 30x + 45 = 0$ and solved for the value of x. The student could have factored out a 5 from the equation, resulting in $5(x^2 \pm 6x + 9) = 0$. The student could have then found the factors of $x^2 \pm 6x + 9$. The student could have recognized that x^2 and 9 represent perfect squares (numbers ma de by squaring whole numbers). Using this, the student could have noticed that $x^2 \pm 6x + 9$ has the form of a perfect square trinomial, $a^2 \pm 2ab + b^2$, which factors as $(a \pm b)^2$. In this case, $a^2 \pm 2ab + b^2 = x^2 \pm 2(3)x + 3^2$, which makes $a = x$ and $b = 3$, so the factors can be written as $(x \pm 3)^2$. Finally, the student could have set the factor (x ±3) equal to 0 and solved for x, obtaining x = 3. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option B is incorrect	The student likely used $x^2 \pm 6x + 9$ and identified the equation as a perfect square trinomial bse, e, pro=ectly.36 4.002 (u

Item #	Rationale	
18	Option G is correct	To determine the domain (all possible x-values) of the part of the discrete linear function shown, the student could have identified all the x-values for which the graph has a corresponding y-value. The x-values for the ordered pairs represented on the graph are {0, 1, 2, 3, 4, 5, 6, 7, 8}. Therefore, the domain is the set of these numbers, which is {0, 1, 2, 3, 4, 5, 6, 7, 8}. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option F is incorrect	The student likely used the values on the scale of the x-axis as the values of the domain. The student needs to focus on understanding how to identify the domain of a discrete function from its graph and express the domain using set notation.

Item #	Rationale	
19	Option D is correct	To determine the rate of change (constant increase or decrease) of y with respect to x, the student could have chosen two points from the graph and calculated the amount of change. The student could have used the slope formula, $m = \frac{y_2 - y_1}{x_2 - x_1}$, resulting in $-\frac{5}{6}$. Therefore, the rate of change is $-\frac{5}{6}$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option A is incorrect	The student likely identified the y-intercept of the line as the rate of change. The student needs to focus on understanding the meaning of the rate of change and how to find it when given a graph.
	Option B is incorrect	The student likely calculated the rate of change as the change in x divided by the change in y, using $m = \frac{x_2 - x_1}{y_2 - y_1}$ instead of $m = \frac{y_2 - y_1}{x_2 - x_1}$. The student likely used values from the points $(9, -3)$ and $(5, 5)$ and calculated $m = \frac{9 - (-3)}{-5 - 5} = \frac{12}{-10} = -\frac{6}{5}$. The student needs to focus on correctly applying the slope formula to find the rate of change when given a graph.
	Option C is incorrect	The student likely used the x-intercept of the line, 3, and then likely estimated the y-intercept to be 2. The student likely understood that rate of change is the change in y divided by the change in x, interpreted these two values as changes from the origin, and found the rate of change to be $\frac{2}{3}$. The student needs to focus on correctly applying the slope formula to find the rate of change when given a graph.

Item #	Rationale

/A/Aa values ar

Texas Education Agency
Student Assessment Division
May 2022

Item #	Rationale	
22	Option H is correct	To determine which function (relationship where each input has a single output) best models the data, the student could have used a graphing calculator to generate the function using quadratic regression (a method of determining the quadratic function of best fit). The function that best models the data is $d(x) = 0.26x^2 \pm 3.11x$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option F is incorrect	The student likely reversed the values of time, x, and depth, $d(x)$, when entering the data into a graphing calculator and disregarded the value of the constant term, c, that was generated. The student needs to focus on understanding how to use technology to determine a quadratic function that best fits a table of data.
	Option G is incorrect	The student likely reversed the values of time, x, and depth, $d(x)$, when entering the data into a graphing calculator. The student needs to focus on understanding how to use technology to determine a quadratic function that best fits a table of data.
	Option J is incorrect	The student likely used the quadratic regression feature on a graphing calculator correctly but used the value of the coefficient of determination, $r^2 = 1$, as the value of the constant term, c. The student needs to focus on understanding how to use technology to determine a quadratic function that best fits a table of data.

Item #	Rationale
23	

Item #	Rationale	
24	Option F is correct	To determine which function could be represented by the quadratic function $p(x)$ with the given solutions (x-values when $p(x)$ is equal to 0), the student could have used the solutions to construct and simplify the equation of a quadratic function using $p(x) = (x \pm u)(x \pm v)$, where u and v represent solutions to the equation $p(x) = 0$. The student could have used the values of the given solutions, $x = -7$ or $x = 7$, letting $u = -7$ or $u = 7$, and substituted those values into $p(x) = (x \pm u)(x \pm v)$ to obtain $p(x) = [x \pm (-7)](x \pm 7)$. Then the student could have found the product of $[x \pm (-7)]$ $(x \pm 7)$ to equal $(x + 7)(x \pm 7) = x^2 \pm 49$, so $p(x) = x^2 \pm 49$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option G is incorrect	The student likely substituted the correct solutions into $p(x) = (x \pm u)(x \pm v)$ to obtain $p(x) = [x \pm (-7)](x \pm 7)$ but made a sign error when multiplying (-7) and (-7) to obtain -49 instead of 49. The student needs to focus on understanding how to multiply binomial expressions.
	Option H is incorrect	The student likely substituted the correct solutions into $p(x) = (x \pm u)(x \pm v)$ to obtain $p(x) = [x \pm (-7)](x \pm 7)$ but made a sign error when multiplying (-7) and 7 to obtain 7 instead of -7. The student needs to focus on understanding how to multiply binomial expressions.
	Option J is incorrect	The student likely substituted the correct solutions into $p(x) = (x \pm u)(x \pm v)$ to obtain $p(x) = [x \pm (-7)](x \pm 7)$ but made a sign error when multiplying (-7) and 7 to obtain 7 instead of -7. The student needs to focus on understanding how to multiply binomial expressions.

Item #	Rationale	
	Option B is incorrect	The student likely correctly determined the value of the y-intercept, $-\frac{2}{3}$. The student then likely correctly calculated the change in x, 3, but when determining the change in y, counted the horizontal grid lines, including the grid lines at $y = 6$ and $y = -1$, and the vertical grid lines, including the grid lines at $x = -1$ and $x = 2$, instead of the spaces between the grid lines, $\frac{11}{3}$. The student needs to focus on understanding how to write a linear function in slope-intercept form when given a graph.
	Option C is incorrect	The student likely identified the correct values for the slope, m, and the y-intercept, b, but reversed those values when substituting them into the slope-intercept form of a linear equation, $y = mx + b$. The student needs to focus on understanding how to write a linear function in slope-intercept form when given a graph.

Item #	Rationale
26	Option G is correct To determine which exponential function models the values given in the table, the student could have recognized that an exponential function is of the form $v(x) = ab^x$, where a is the y-intercept (value where the graph crosses the y-axis), b is the common factor (constant rate by which successive values decrease), and x is the variable (symbol used to represent an unknown number). From the table, the student could have determined that the y-intercept at (0, 9,000) means that the value of a is 9,000. Next, the student could have determined the common factor, b, by dividing each $v(x)$ value by the previous $v(x)$ value, calculating ——— ——— ———. Substituting $a = 9{,}000$ and $b = 0.9$ into the exponential equation $v(x) = ab^x$, the student could have obtained $v(x) = (9{,}000)(0.9)$) = rm 70 Td [() *98 (,2 (75 -1Td [())n4.63998 -.84]TJ.88 0 Td922bcT equat)6..vi.6TThis is)4.003874 Td (6360.6ff6 (r, 40.0c4.56 0 Ti004 (h)3.)3.633 ( )- /TT0 10.v v v

Item #	Rationale	
27	2 and any equivalent values are correct	To determine the positive solution to $x^2 + 9x \pm 22 = 0$, the student could have recognized the need to find the factors (numbers or expressions that can be multiplied to get another number or expression) of $x^2 + 9x \pm 22$. The student could have determined that x^2 is equal to $x \cdot x$ and written x as the first term in each factor. The student then could have determined that the second terms in the two factors are ± 11 and ∓ 2 (opposite of the number given) and their sum is 9 (coefficient of middle term in the expression given). The student could have then written the factors as $(x + 11)(x \pm 2)$. Next, the student could have set each factor equal to zero ($x + 11 = 0$ and $x \pm 2 = 0$) and solved each equation for x, resulting in $x = \pm 11$ and $x = 2$. Finally, the student could have recognized that $x = 2$ is the positive solution to $x^2 + 9x \pm 22 = 0$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

Texas Education Agency
Student Assessment Division
May 2022

Item #	Rationale	
29	Option A is correct	To determine which function (relationship where each input has a single output) best models the data

Item #	Rationale	
30	Option H is correct	To determine which statement is true, the student could have first found the factors (numbers or expressions that can be multiplied to get another number or expression) of $x^2 \pm 36$. The student could have recognized that $x^2 \pm 36$ can be rewritten as $(x\ )^2 \pm (6)^2$, which represents the difference of squares pattern, where $a^2 \pm b^2$ can be written as the product of the binomial factors $(a + b)$ and $(a \pm b)$. Applying this pattern, the student could have rewritten the expression $x^2 \pm 36 = (x)^2 \pm (6)^2$ as the product $(x + 6)(x \pm 6)$. Finally, the student could have solved for the zeros (input value, x, that produces an output value, y, of zero) by setting each factor (expression within the parentheses) equal to zero ($x + 6 = 0$ and $x \pm 6 = 0$) and solving for x, resulting in $x = \pm 6$ and $x = 6$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option F is incorrect	The student likely incorrectly identified the difference of squares pattern as $a^2 \pm b^2 = (a \pm b)(a \pm b)$, obtaining $(x \pm 6)(x \pm 6)$ instead of $(x + 6)(x \pm 6)$. The student needs to focus on understanding how to factor an expression representing the difference of squares.
	Option G is incorrect	The student likely incorrectly identified the difference of squares pattern as $a^2 \pm b^2 = (a \pm b)(a \pm b)$, and then likely divided 36 by 2 instead of taking the square root of 36, resulting in $(x \pm 18)(x \pm 18)$. The student needs to focus on understanding how to factor an expression representing the difference of squares.
	Option J is incorrect	x

Item #	Rationale
31	Option A is correct To determine the value of f í W K H V W X G H Q W V K R X O G K D Y H V X E V W L W X W H G í I R U

Item #	Rationale	
32	Option H is correct	To determine which graph best represents the linear function $y =$ í $x + 3)$ ±2, the student could have appl ied the point-slope equation, $y \pm y_1 = m(x \pm x_1)$, where m re presents the slope of the line and (x_1, y_1) repres ents a point on the line. Solving for y, the student could have obtained $y = m(x \pm x_1) + y_1$ DQG WKHQ GHWHUPLQHG WKDW WKH JUDSK RI WKH JLYHQ OL FRQWDLQV WKH SRLQW í í 7R JUDSK WKH OLQH WKH VWXGHQW FRXO DQG XVHG WKH VORSH WR ILQG WKDW WKH SRLQWV íne. Therefore, this í DQG í DOVR graph could represent $y =$ í $x + 3)$ ± EHFDXVH LW KDV D VORSH HTXDO WR í DQG F í í 7KLV LV DQ HIILFLHQW ZD\ WR VROYH WKH SUREOHP KRZHYHU RW solve the problem correctly.
	Option F is incorrect	The student likely solved the point-slope equation, $y \pm y_1 = m(x \pm x_1)$, for y, resulting in $y = m(x \pm x_1) + y_1$. The student then likely interpreted the slope of the line $y =$ í $x + 3)$ ±2 as 4 instead of ±4 and identified a point oQ WKH OLQH DV í LQVWHDG RI í í 7KH V focus on understanding how to identify the key features of a linear graph when given an equation in point-slope form.
	Option G is incorrect	The student likely solved the point-slope equation, $y \pm y_1 = m(x \pm x_1)$, for y, resulting in $y = m(x \pm x_1) + y_1$. The student then likely interpreted the slope of the line $y =$ í $x + 3)$ ±2 as LQVWHDG RI í EXW FRUUHFWO\ LGHQWLILHG WKH SRLQW WKH OLQH 7KH VWXGHQW focus on understanding how to identify the key features of a linear graph when given an equation in point-slope form.
	Option J is incorrect	The student likely solved the point-slope equation, $y \pm y_1 = m(x \pm x_1)$, for y, resulting in $y = m(x \pm x_1) + y_1$ 7KH VWXGHQW WKHQ OLNHO\ LGHQWLILHG D SRLQW RQ WKH í í EXW FRUUHFWO\ LGHQWLILHG WKH VORSH RI WKH OLQH DV í 7KH V understanding how to identify the key features of a linear graph when given an equation in point-slope form.

Item #	Rationale	
33	Option D is correct	To determine a factor of the given expression, $10x^2 \pm 19x + 6$, the student could have found the factors (numbers or expressions that can be multiplied to get another number or expression) of the expression. The student could have first multiplied $10x^2$ by 6, resulting in $60x^2$. The student then could have identified two terms that have a product of $60x^2$ DQG D VXP Rí x ZKLFK DUH xand í x. Then the student could have rewritten the expression in expanded form using these two terms, resulting in $10x^2 \pm 15x \pm 4x + 6$. The student could have grouped the first two terms and last two terms of the expression and factored out the greatest (largest) common factor from each group of terms, resulting in $5x(2x \pm 3) \pm 2(2x \pm 3)$. Next, the student could have factored out the binomial $(2x \pm 3)$ from the expression, resulting in the factored form $(5x \pm 2)(2x$ í)LQDOO\ WKH VWXGH could have recognized that $(5x \pm 2)$ is one of the factors of the given expression. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option A is incorrect	The student likely determined that two factors of $60x^2$ are $10x$ and $6x$, and that two factors of 6 are í DQG EXW GLVUHJDUGHG WKH YDOXH RI WKH OLQHDU The student needs WKH TXDG to focus on understanding how to factor an expression of the form $ax^2 + bx + c$.
	Option B is incorrect	The student likely determined that two factors of $60x^2$ are $10x$ and $6x$, and that two factors of 6 are í DQG EXW GLVUHJDUGHG WKH YDOXH RI WKH OLQHDU The student needs WKH TXDG to focus on understanding how to factor an expression of the form $ax^2 + bx + c$.
	Option C is incorrect	The student likely determined the correct expanded form of the expression, $10x^2 \pm 15x \pm 4x + 6$, but likely switched the constant terms when factoring out the common factor from each group. The student needs to focus on understanding how to factor an expression of the form $ax^2 + bx + c$.

Item #		Rationale
34	8 and any equivalent values are correct	To determine the rate of change (constant rate of increase or decrease) of the distance in feet below sea level with respect to time in seconds the submarine traveled, the student could have chosen two points from the table and calculated the amount of change. The student could have used the first two sets of values in the table and applied the slope formula, $m = \frac{y_2 - y_1}{x_2 - x_1}$, resulting in $m = \frac{604 - 460}{18 - 0} = \frac{144}{18} = 8$. Therefore, the student could have concluded that the rate of change is 8 feet per second. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

Item #	Rationale	
35	Option B is correct	To determine which equation best represents the line shown on the grid, the student could have recognized that because the line is horizontal, the equation of the line can be written as y = c, where c is the value through which the line intersects (crosses) the y -axis, resulting in y = í 7 K L V L V an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option A is incorrect	The student likely recognized that because the line is horizontal, the equation of the line can be written as y = c, and that the slope of a horizontal line is 0. The student then likely used the value of the slope, 0, as the constant in the equation, obtaining y = 0. The student needs to focus on understanding how to write the equation of a horizontal line.
	Option C is incorrect	The student likely recognized that the line is horizontal and that the slope of a horizontal line is 0. Then the student likely used the value of the slope, 0, and used x = 0 since a horizontal line is parallel to the x- axis. The student needs to focus on understanding how to write the equation of a horizontal line.
	Option D is incorrect	The student likely recognized that the line is horizontal and has a y- L Q W H U F H S W R I í 7 K H Q W K H likely used x = í V L Q F H D K R U L] R Q W D O O L Q H x-axis. The student needs to focus on W K H understanding how to write the equation of a horizontal line.

2022 STAAR Algebra I Math Rationales

Texas Education Agency
Student Assessment Division
May 2022

Item #	Rationale	
37	Option A is correct	To determine which ordered pair is in the solution set of $y > -\frac{1}{6}x - 4$, the student should have recognized that the graph of the solution set of the inequality would have a boundary line that is GDVKHG EHFDXVH WKH ³!´ V\PERO LQGLFDWHV WKDW WKH VROXWLRQ VHW points that lie on the boundary line. Next, the student could have used the test point (0, 0) to determine which half-plane is included in the solution set. Substituting (0, 0) into $y \quad \frac{1}{6}x \quad 4$, the student could have obtained $0 > -\frac{1}{6}(0) - 4$ and then 0 ! í 6since that is a true statement, the student could have then concluded that the solution set of the inequality is the half-plane that contains (0, 0), not including the points on the boundary line. Finally, the student could have realized WKDW WKH SRLQW that half-plane. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option B is incorrect	The student likely GHWHUPLQHG WKDW WKH SRLQW $y = -\frac{1}{6}x - 4$, but understanding OLQH that the points on the boundary line are not included in the solution set of the inequality $y \quad \frac{1}{6}x \quad 4$. The student needs to focus on understanding how to determine whether an ordered pair is in the solution set of an inequality.
	Option C is incorrect	The student likely used (4, í 6) as the test point and substituted it into $y \quad \frac{1}{6}x \quad 4$ to obtain $-6 > -\frac{1}{6}(4) - 4$ and then $-6 > -\frac{14}{3}$. Next, the student likely incorrectly concluded that the inequality is true and that the solution set of the inequality is the half-plane that contains (4, í 6). The student needs to focus on understanding how to determine whether an ordered pair is in the solution set of an inequality.

Item #	Rationale	
	Option D is incorrect	7 K H V W X G H Q W O L N H O \ U H Y H U V H G W K H F R Rstudent tested point and substituting Z K H Q X into $y > -\frac{1}{6}x - 4$, obtaining $-2 > -\frac{1}{6}(-7) - 4$ and then $-2 > -\frac{17}{6}$. Next, the student likely concluded that the solution set of the inequality is the half-plane that contains that point. The student needs to focus on understanding how to determine whether an ordered pair is in the solution set of an inequality.

Item #	Rationale
39	2 S W L R Q ´ & L V ´ F R U U H F W Determine which graph best represents the solution set of se re f* EMC 02 Tf 91.88 0 5 [( )4.691 (s)5297 (+e s633

$y = -\frac{1}{2}x - 1$

Item #	Rationale	
40	2SWLRQ´)´LV´FRUUHFW	To determine which graph best represents the function $h(x) = (x + 1)(x \pm 3)$, the student could have identified that the zeros of $h(x)$ could be obtained by setting each factor equal to 0 and solving for x. Setting $x + 1 = 0$, the student could have solved for x by subtracting 1 from both sides of the equation to obtain $x = -1$. Setting $x \pm 3 = 0$, the student could have solved for x by adding 3 to both sides of the equation to obtain $x = 3$. Next, the student could have recognized that the zeros of a function are the x-intercepts (values where the graph of a function crosses the x-axis) of the graph of the function. The student then could have identified that the graph has x-intercepts of -1 and 3. Finally, the student could have determined the value of the y-intercept by substituting $x = 0$ into the function and solving for y, resulting in $h(0) = (0 + 1)(0 \pm 3) = -3$. The student could have chosen the graph with x-intercepts of -1 and 3 and a y-intercept of -3. This is an efficient way to solve the problem. However, other methods could be used to solve the problem correctly.
	2SWLRQ´*´LV´LQFRUUHFW´	The student likely used the values of the constants in the binomial factors $(x + 1)$ and $(x \pm 3)$ and interpreted that the x-intercepts would occur at $x = 1$ and $x = -3$. Also, the student did not find the correct y-intercept. The student needs to focus on identifying the correct graph of a quadratic function in the form $h(x) = (x \pm u)(x \pm v)$.
	2SWLRQ´+´LV´LQFRUUHFW´	The student likely correctly found the correct zeros of the function and interpreted those values to be the x-intercepts but did not find the correct y-intercept. The student needs to focus on identifying the correct graph of a quadratic function in the form $h(x) = (x \pm u)(x \pm v)$.
	2SWLRQ´-´LV´LQFRUUHFW´	The student likely found the correct y-intercept but used the values of the constants in the binomial factors $(x + 1)$ and $(x \pm 3)$ and concluded that the x-intercepts would occur at $x = 1$ and $x = -3$. The student needs to identify the correct graph of a quadratic function in the form $h(x) = (x \pm u)(x \pm v)$.

Item #	Rationale

2022 STAAR Algebra I Math Rationales

Item #

Item #	Rationale	
43	2 S W L R Q ´ % L V ´ F R U U H F W	To determine the expression equivalent to $36m^2 \pm 100$, the student could have first recognized that 36 and 100 have a greatest (largest) common factor of 4 and factored that out, resulting in $36m^2 \pm 100 = 4(9m^2 \pm 25)$. Next, the student could have recognized that the expression inside the parentheses, $9m^2 \pm 25$, can be rewritten as $(3m)^2 \pm (5)^2$, which represents the difference-of-squares pattern, where $a^2 \pm b^2$ can be written as the product of the binomial factors $(a \pm b)$ and $(a + b)$. Applying this pattern, the student could have rewritten the expression $4(9m^2 \pm 25) = 4[(3m)^2 \pm (5)^2]$ as the product $4(3m \pm 5)(3m + 5)$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	2 S W L R Q ´ $ L V ´ L Q F R U U H F W	The student likely determined that two factors of $36m^2$ are $9m$ and $4m$ DQG WKDW WZR IDFWRUV DUH í DQG EXW GLVUHJDUGHG WKH YDOXH RI WKH OLQHDU WHUP RI WKH The student needs to focus on understanding how to factor quadratic expressions.
	2 S W L R Q ´ & L V ´ L Q F R U U H F W	The student likely recognized that DQG KDYH D FRPPRQ IDFWRU RI obtaining $2(18m^2 \pm 50)$. Then the student likely recognized that $2m$ and $9m$ are factors of $18m^2$ and WKDW í DQG DUH IDFWRUV RI í EXW GLVUHJDUGHG WKH YDOXH RI WKH terms of the quadratic equation. The student needs to focus on understanding how to factor quadratic expressions.
	2 S W L R Q ´ ' L V ´ L Q F R U U H F W	The student likely recognized that DQG KDYH D JUHDWHVW O\´UHFRJQL]HG WKDW DQG KDYH D FRPPRQ IDFWRU RI factored that out, resulting in $36m^2 \pm 100 = 4(9m^2 \pm 25)$. Next, the student likely recognized that 9 and 25 are perfect squares and applied the perfect-square trinomial pattern for factoring $(a^2 \pm 2ab + b^2 = (a \pm b)^2)$ instead of the difference-of-squares factoring pattern, obtaining $4(3m \pm 5)^2$. The student needs to focus on understanding how to factor quadratic expressions.

Item #	Rationale
44	2 S W L R Q ´) L V ´ F R U U H F W. To determine which function (relationship where each input has a single output) best models the data, the student could have used a graphing calculator to generate the function using exponential regression (method of determining the exponential function, $r(x) = ab^x$, where a is the initial [beginning] value, b is the common factor [constant rate by which successive values increase or decrease], and x is the variable [symbol used to represent an unknown number]). The function that best models the data is $r(x) = 223.06(1.09)^x$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

Item #	Rationale
45	2 S W L R Q ´ % L V ´ F R U To determine which graph best represents the system of equations (two or more equations containing the same set of variables [symbols used to represent unknown numbers]) and its solution, the student can first rewrite each equation into slope-intercept form. Slope-intercept form of a linear equation is $y = mx + b$, where m represents the slope (steepness of a straight line graphed on a coordinate grid; $m = \frac{y_2 - y_1}{x_2 - x_1}$) of each line and b represents the y-intercept (value where a line crosses the y-axis) of each line. To rewrite the first equation, $2x = 6 \pm y$, the student could have first added y to both sides of the equation, obtaining $2x + y = 6$. Next, the student could have subtracted $2x$ from both sides, resulting in the equation $y = -x + 6$. Next, the student could have subtracted $2x$ from both sides, resulting in the equation $y = -x + 6$.

Item #	Rationale	
	2 S W L R Q ´ ' L V ´ L Q F R U U H F W	The student likely made sign errors when converting each equation to slope-intercept form, resulting in identifying the slopes as being the opposite signs of the correct values. The student needs to focus on understanding how to rewrite linear equations from standard form or other forms into slope-intercept form.

Item #		Rationale
47	2SWLRQ´&LV´FRUUHFW	The student correctly determined which graph best represents part of a quadratic function with a domain (all possible x-values) and a range (all real numbers less than or equal to −1, the y-value of the vertex (highest or lowest point of the curve) containing an x-coordinate of −1, the x-value) and a partial parabola that continues up forever (as represented by the arrow) to the left. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	2SWLRQ´$LV´LQFRUUHFW	The student likely identified a graph with a domain of all real numbers less than 0, using the y-value of the y-intercept of −1 instead of the x-value. The student needs to focus on understanding how to identify the domain of a quadratic function from a graph.
	2SWLRQ´%LV´LQFRUUHFW	The student likely identified a graph with a domain of all real numbers greater than or equal to −1, using ³JUHDWHU WKDQ´ instead of ³JUHDWHU WKDQ RU HTXDO WR´. The student needs to focus on understanding how to identify the domain of a quadratic function from a graph.
	2SWLRQ´'LV´LQFRUUHFW	The student likely identified a graph with a domain of all real numbers greater than 0, using the y-value of the y-intercept of −1 instead of the x-value, and using ³JUHDWHU WKDQ´ instead of ³JUHDWHU WKDQ RU HTXDO WR´. The student needs to focus on understanding how to identify the domain of a quadratic function from a graph.

Item #	Rationale
48	2SWLRQ´*LV´FRUUHFW´ The student could have used the given ordered pairs and applied the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ to determine the slope (steepness of a straight line when graphed on a coordinate grid) when given two points, the student could have used the given ordered pairs and applied the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ 6XEVWLWXWLQJ WKH YDOXHV RI í and í, the student could have calculated $m = \frac{8 - 1}{5 - (-3)} = \frac{7}{8}$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	2SWLRQ´)LV´LQFRUUHFW´ The student could have used the given ordered pairs and applied the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ to determine the slope (steepness of a straight line when graphed on a coordinate grid) when given two points, but reversed the x-values and the y-values, obtaining $m = \frac{8 + 1}{5 + (-3)} = \frac{9}{2}$. The student needs to focus on understanding how to use the formula for the slope of a line when given two ordered pairs.
	2SWLRQ´+LV´LQFRUUHFW´ The student could have used the given ordered pairs and applied the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ to determine the slope (steepness of a straight line when graphed on a coordinate grid) when given two points, but reversed the x-values and the y-values and made a sign error when calculating, obtaining $m = \frac{8 + 1}{5 + (-3)} = \frac{9}{-2} = -\frac{9}{2}$. The student needs to focus on understanding how to use the formula for the slope of a line when given two ordered pairs.
	2SWLRQ´-LV´LQFRUUHFW´ The student made a sign error when calculating $\frac{8 - 1}{5 - (-3)} = \frac{7}{-8} = -\frac{7}{8}$ instead of The st

$$m = \frac{8+1}{5+(-3)} = \frac{9}{-2} = -\frac{9}{2}$$

Item #	Rationale	
49	2SWLRQ´$ LV´FRUUHFW To determine the distance the mail carrier traveled on the morning route, the student could set up and solve a system of equations [two or more equations containing the same set of variables (symbols used to represent unknown numbers)]. If x represents the number of miles the mail carrier traveled on the morning route and y represents the number of miles the mail carrier traveled on the afternoon route, the student could have set up the two equations; 16x + 12y = 141 (16 times the number of miles in the morning route + 12 times the number of miles in the afternoon route = 141 miles) and 10x + 15y = 123.75 (10 times the number of miles in the morning route + 15 times the number of miles in the afternoon route = 123.75 miles). Next, the student could have solved the system of equations using the elimination method, multiplying the first equation by 5 and the second equation by í UHVXOWLQJ LQ WKH HTXDWLRQV íx ± 60y = í495. Next, the student could have added the two equations together to eliminate the terms containing y, resulting in 40x = 210. Dividing by 40, the student obtained the result x = 5.25. Since x represents the number of miles the mail carrier traveled on the morning route, the student could have concluded that the distance of the morning route in miles is 5.25 miles. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	2SWLRQ´% LV´LQFRUUHFW The student subtracted the number of times the mail carried delivered mail on the morning route this month, 10, from the number of times the mail carried delivered mail on the morning route last month, 16, and concluded that the difference represents the distance of the morning route in miles. The student needs to focus on understanding how to write a system of equations from a verbal description.	
	2SWLRQ´& LV´LQFRUUHFW The student set up and solved the system of equations x and y, concluding that the distance of the morning route was 4.75 miles instead of 5.25. The student needs to focus on understanding what value each variable represents in terms of the situation when solving a system of equations.	

Item #	Rationale

Item #	Rationale	
50	2SWLRQ´-´LV´FRUUHFW	To determine which function best represents the graph of q, the student could have first identified p(x) = x^2 as the quadratic parent function and used the function q(x) = af(x) + d to analyze the transformation. Next, the student could have recognized that the graph of p was reflected over the x-axis and translated up 2 units to create the graph of q. The student could then have determined that a reflection over the x-axis indicates that the coefficient of the quadratic term, a, is −1 and that a vertical translation up 2 units indicates that the value of d is 2. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	2SWLRQ´)´LV´LQFRUUHFW	The student likely correctly identified the reflection of the graph over the x-axis but did not recognize that replacing x with x − 2 in a quadratic function would indicate that the graph was translated 2 units right instead of up 2 units. The student needs to focus on how the direction of the transformation affects the function.
	2SWLRQ´*´LV´LQFRUUHFW	The student likely correctly identified the reflection of the graph over the x-axis but did not recognize that replacing x with x + 2 in a quadratic function would indicate that the graph was translated 2 units left instead of up 2 units. The student needs to focus on how the direction of the transformation affects the function.
	2SWLRQ´+´LV´LQFRUUHFW	The student correctly identified the reflection over the x-axis but interpreted a vertical translation 2 units up as 2 being subtracted from the quadratic term instead of added. The student needs to focus on how the direction of the transformation affects the function.

Item #	Rationale	
51	2 S W L R Q ´ & L V ´ F R U U H F W	To determine the solution to the equation 2(40 ±5y) = 10y + 5(1 ±y), the student could first have distributed (multiplied) the number in front of the parentheses by the terms inside of the parentheses, resulting in 80 ±10y = 10y + 5 ±5y. Next, the student could have combined like terms (terms that contain the same variables raised to the same powers) on the right side of the equation, obtaining 80 ±10y = 5 y + 5. The student could then have added 10 y to both sides of the equation, resulting in the equation 80 = 15y + 5, and then subtracted 5 from both sides with the result 75 = 15y. Finally, the student could have divided both sides of the equation by 15, with the result that 5 = y, or y = 5. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	2 S W L R Q ´ $ L V ´ L Q F R U U H F W	The student likely distributed 2 to only the first term in the parentheses, resulting in 80 ±5y = 10y + 5 ±5y. After combining like terms, the student likely obtained 80 ±5y = 5 y + 5 . Then, adding 5y and subtracting 5 from both sides, the student likely obtained the result 75 = 10y. Finally, dividing both sides by 10, the student found that y = 7.5. The student needs to focus on understanding how to apply the distributive property when solving equations.
	2 S W L R Q ´ % L V ´ L Q F R U U H F W	The student likely made a sign error when applying the distributive property and i7 Tc 15.6004 (but)38-2.994df* 2216>3.00l <</l

Item #	Rationale	
52	2 S W L R Q ´) L V ´ F R U U H F W	To determine which graph best represents the situation in which the initial value of a home is $200,000 and the value of the home increases at the rate of 6% per year, the student first could have recognized that the graph will represent an exponential function in the form $y = ab^x$, where a is the y-intercept (value where the graph crosses the y-axis), b is the common factor (constant rate by which successive values increase or decrease), and x is the variable (symbol used to represent an unknown number). Since it is given that the initial value of the house is $200,000, the student could have recognized that the value of a is 200,000. Since the value of the home increases at a rate of 6% per year, the student could have understood that the common factor, b, will be 1 + 0.06, or $b = 1.06$. Substitu ting these values into the exponential function $y = ab^x$, the student could have obtained the result $y = 200{,}000(1.06)^x$, where x represents the time in years. The student then could have calculated the value of the function when $x = 5$, resulting in $y = 200{,}000(1.06)^5$. Finally, the student could have concluded that the point located at approximately (5, 267,645) lies on the graph of the exponential function. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	2 S W L R Q * L V ´ L Q F R U U H F W	The student likely miscalculated the value of the base, b, as $b = 1.6$ instead of 1.06, and used an init ial value of $a = 100{,}000$. The student needs to focus on understanding how to identify the graph of an exponential function.
	2 S W L R Q ´ + L V ´ L Q F R U U H F W	The student likely miscalculated the value of the base, b, as $b = 1.6$ instead of 1.06, but used the correct initial value of

Item #	Rationale	
53	2 S W L R Q ´ & L V ´ F R U U H F W	To determine the range (all possible y-values) of the part of the discrete linear function shown, the student could have identified all the y-values of the points that are plotted. The ordered pairs on the graph are (0, 96), (1, 88), (2, 80), (3, 72), (4, 64), (5, 56), and (6, 48). The student could have realized that the set of y-values {96, 88, 80, 72, 64, 56, 48} represents the range of the function for this situation. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	2 S W L R Q ´ $ L V ´ L Q F R U U H F W	The student likely identified the set of seven y-values on the scale of the y-axis, beginning with 96 and decreasing in increments of 12, {96, 84, 72, 60, 48, 36, 24}, as representing the range of the function. The student needs to focus on understanding how to identify and express the domain and range of a function from a graph.
	2 S W L R Q ´ % L V ´ L Q F R U U H F W	The student likely identified the set of sums of the values in the domain and the number of balls given to each player, {8, 9, 10, 11, 12, 13, 14}, as the range. The student needs to focus on understanding how to identify and express the domain and range of a function from a graph.
	2 S W L R Q ´ ' L V ´ L Q F R U U H F W	The student likely identified the set of values of the domain, {0, 1, 2, 3, 4, 5, 6}, as the range. The student needs to focus on understanding how to identify and express the domain and range of a function from a graph.

Item #	Rationale	
54	2SWLRQ´*LV´FRUUHFW	To determine which graph best represents linear function (a relationship where each input has a single output) k, the student could have recognized that the zero of a linear function is located at the x-intercept of the graph. The student could then have identified the graph of a line that appears to have an x-LQWHUFHSW RI í and a y-intercept of 6. The student could have determined that the line intersects (crosses) the x-D[LV DW0) á and the y-axis at (0, 6), representing an x-LQWHUFHSW RI í and a y-intercept of 6. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	2SWLRQ´)LV´LQFRUUHFW	The student likely correctly identified the y-intercept of 6 to be located at the point (0, 6), but likely confused the slope (steepness of a straight line graphed on a coordinate grid; $m = \frac{y_2 - y_1}{x_2 - x_1}$) of the line with the x-intercept of the line, choosing a line with a slope of í 2. The student needs to focus on understanding how to identify the zero and the y-intercept of a linear function.