

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
1	Option A is correct	To determine the transformation (change of a shape using a rotation [circular movement], reflection [flip], translation [slide], or dilation [resize]), the student should have recognized that when the value of the x -coordinate is the opposite of the original value, the shape is reflected over the y -axis.
	Option B is incorrect	The student likely interpreted the change in the x -value as a reflection over the x -axis. The student needs to focus on interpreting the rules for transformations.
	Option C is incorrect	The student likely interpreted the change in the x -value as a rotation of 180° . The student needs to focus on interpreting the rules for transformations.
	Option D is incorrect	The student likely interpreted the change in the x -value as indicating that the values of the x -coordinates and y -coordinates would change places. The student needs to focus on interpreting the rules for transformations.

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2	Option H is correct	To determine which measurement is closest to the value of d in inches, the student should have determined that the line segment containing d represents the hypotenuse (longest side) of a right triangle (a closed figure with three sides and one 90-degree angle). The lengths of the two legs of the right triangle can be represented by 11.9 inches and 7.9 inches. Using the Pythagorean theorem (in a right triangle, the square of the hypotenuse [longest side] is equal to the sum [total] of the squares of the other two sides; $a^2 + b^2 = c^2$ or $c = \sqrt{a^2 + b^2}$), the value of d can be represented by the expression $\sqrt{11.9^2 + 7.9^2}$ or $\sqrt{204.02}$, which has a value of approximately 14.3. Therefore, the approximate value of d is 14.3 inches. 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 applied the Pythagorean theorem incorrectly by computing $\sqrt{11.9} + \sqrt{7.9} \approx 3.45 + 2.81 = 6.26 \approx 6.3$. The student needs to focus on how to properly apply the Pythagorean theorem with the given information.
	Option G is incorrect	The student likely identified the lengths of the sides of the right triangle (11.9 inches and 7.9 inches) but subtracted the values instead of applying the Pythagorean theorem. The student needs to focus on recognizing when the Pythagorean theorem should be used and how to properly apply it with the given information.
	Option J is incorrect	The student likely identified the lengths of the sides of the right triangle (11.9 inches and 7.9 inches) but added the values instead of applying the Pythagorean theorem. The student needs to focus on recognizing when the Pythagorean theorem should be used and how to properly apply it with the given information.

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3	Option A is correct	To determine which equation can be used to find the value of x , the student could have used the formula for the perimeter of a triangle, where P represents the perimeter and a , b , and c each represent a side of the triangle. The student could have identified from the problem that $17x$ represents the perimeter of the triangle, a and b could each equal 15, and c could equal $7x$; therefore, $17x = 15 + 15 + 7x$ or $17x = 30 + 7x$. 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 the formula for the perimeter of a triangle but combined 15 and $7x$, resulting in $17x = 15 + 22x$. The student needs to focus on accurately writing algebraic expressions that represent problem situations.
	Option C is incorrect	The student likely used the formula for the perimeter of a triangle by adding 15 and 15 but placed the x on that sum (total) instead of placing the x on the 7, resulting in $17x = 7 + 30x$. The student needs to focus on accurately writing algebraic expressions that represent problem situations.
	Option D is incorrect	The student likely used the formula for the perimeter of a triangle but combined 15 and 7 as 22 and placed the x with 15, resulting in $17x = 22 + 15x$. The student needs to focus on accurately writing algebraic expressions that represent problem situations.

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4	Option G is correct	To determine the best prediction of the weight in pounds of a dog that is 28 weeks old from the scatterplot (a graph of plotted points that shows the relationship between two sets of data), the student could have drawn a line that closely follows the pattern formed by the points on the graph by keeping about half of the points above the line and the other half below the line. A good line for this scatterplot would pass above the points at (5, 16), (10, 25), (13, 30), (22, 46), and (35, 91) and below the points at (12, 36), (15, 43), (18, 52), (34, 88), and (36, 102). The student could then have identified where the grid line marked 28 (representing the age of a dog that is 28 weeks old) intersects (crosses over) the line the student drew and determined that the weight in pounds corresponding to that point is about 75 pounds. 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 corresponding x -value when $y = 28$. The student needs to focus on drawing a line as close as possible to all points with a similar number of points above and below the line.
	Option H is incorrect	The student likely drew a horizontal line passing through (0, 45) and (28, 45), where half of the points are above the line and half of the points are below the line, and used the line to determine the weight of a 28-week-old dog. The student needs to focus on drawing a line as close as possible to all points with a similar number of points above and below the line.
	Option J is incorrect	The student likely focused on the highest labeled value on the x -axis, 38, and estimated the weight of a dog at 38 weeks. The student needs to focus on drawing a line as close as possible to all points with a similar number of points above and below the line and using the correct value for x .

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5	Option C is correct	To determine which graph shows the relationship between y , the cost of the bracelets in dollars, and x , the total number of bracelets bought, the student could have determined that for 5 bracelets bought, the cost is \$12.50, so the unit rate is $\frac{12.50}{5} = 2.50$. The student should have then identified the graph that shows the point (1, 2.5) indicating the cost of 1 bracelet, which is \$2.50, and the point (2, 5) indicating the cost of 2 bracelets, which is $2(2.5) = \$5.00$. If a line was drawn through these points the slope would be 2.5. 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 used 5, the number of bracelets given in the context, as a unit rate (cost of 1 bracelet). The student then chose the graph with the point (1, 5) representing the cost of one bracelet and the point (2, 10) representing the cost of 2 bracelets, which is $2(5) = 10$. The student needs to focus on the unit rate and how it translates to the graph.
	Option B is incorrect	The student likely used 12.50, the cost of 5 bracelets, as a unit rate (cost of 1 bracelet). The student then chose the graph with the point (0, 0) and the point (1, 12.5). The student needs to focus on the unit rate and how it translates to the graph.
	Option D is incorrect	The student likely inverted (flipped) the unit rate to get $\frac{5}{12.50} = 0.4$ instead of $\frac{12.50}{5}$, graphing the ordered pairs (0, 0), (1, 0.4), (2, 0.8), (3, 1.2), (4, 1.6), (5, 2), (6, 2.4), and (7, 2.8). The student needs to focus on determining the unit rate and how it translated to the graph.

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6	Option G is correct	To determine the volume (amount of three-dimensional space taken up) of the cylinder, the student should have used the formula $V = \pi r^2 h$ in which r represents the radius (distance from the center to the circumference of a circle) and h represents the height (vertical distance from top to bottom) of the cylinder. The student should have calculated the length of the radius by dividing the length of the diameter (straight line going through the center of a circle connecting two points on the circumference) by 2, resulting in $r = 1$. Substituting $r = 1$ and $h = 5$ into the formula results in $V = \pi(1^2)(5) \approx 15.7$.
	Option F is incorrect	The student likely used the length of the diameter in place of the length of the radius in the formula. The student needs to focus on understanding the formula for determining the volume of a cylinder.
	Option H is incorrect	The student likely squared the height instead of the radius in the formula. The student needs to focus on understanding the formula for determining the volume of a cylinder.
	Option J is incorrect	The student likely squared the height instead of the radius and used the length of the diameter in place of the length of the radius in the formula. The student needs to focus on understanding the formula for determining the volume of a cylinder.

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7	Option C is correct	To determine the missing number in the list of items ordered from least to greatest, the student could have converted each value to the same form so that a comparison could be made. The student could have converted $\frac{18}{5}$ to 3.6, kept 3.71 as is, and converted $\sqrt{17}$ to approximately 4.12. The student then could have converted the numbers in the answer options. The student could have converted 3.8% to 0.038, $\frac{57}{15}$ to 3.8, and $(3.9)^2$ to 15.21. The number between 3.71 and $\sqrt{17}$ (4.12) is $\frac{57}{15}$ (3.8). 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 divided 17 by 2 when taking the square root of 17 and chose 4.5 to be between 3.71 and 8.5. The student needs to focus on converting square roots to decimals.
	Option B is incorrect	The student likely ignored the percent sign and chose 3.8 as the number between 3.71 and $\sqrt{17}$ (4.12). The student needs to focus on converting percentages to decimals.
	Option D is incorrect	The student likely did not square 3.9 and chose 3.9 as the number between 3.7 and $\sqrt{17}$ (4.12). The student needs to focus on addressing the details of the question in the problem.

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Item #	Rationale	
8	Option F is correct	To determine the transformation applied to a figure on a coordinate grid that does NOT preserve congruence (same size and shape), the student should have recognized that a dilation will enlarge or reduce the size of the figure by a scale factor (relationship between the length of a side of one figure to the length of the corresponding [paired] side of a similar figure). The dilated figure will be similar to the original figure (have corresponding angles equal and corresponding sides proportional) but will NOT be congruent.
	Option G is incorrect	The student likely recalled that a rotation (circular movement) of 180° counterclockwise will change the coordinates for the figure. The student may not have recognized that the congruence of the figure is preserved with a rotation. The student needs to focus on differentiating the characteristics of a rotation from the characteristics of a dilation.
	Option H is incorrect	The student likely recalled that a translation (slide) 90 units to the right will change the coordinates for the figure. The student may not have recognized that the congruence of the figure is preserved with a translation. The student needs to focus on differentiating the characteristics of a translation from the characteristics of a dilation.
	Option J is incorrect	The student likely recalled that a reflection (flip) across the x -axis (horizontal axis) will change the coordinates for the figure. The student may not have recognized that the congruence of the figure is preserved with a reflection. The student needs to focus on differentiating the characteristics of a reflection from the characteristics of a dilation.

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Item #	Rationale	
9	5 and any equivalent values are correct	To determine the value of the exponent when a number is written in scientific notation, the student should have moved the decimal point 5 places to the left to create a number between 1 and 10 and used the number of places moved to the left as the power for 10, resulting in 4.631×10^5 . The value of the exponent is 5.

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Item #	Rationale	
10	Option G is correct	To determine the savings account option that would earn the greater amount of interest, the student could have first calculated the amount of interest for each option using the simple interest formula, $I = Prt$, in which P represents the principal (initial loan amount), r represents the interest rate (in decimal form), and t represents the length of time in years. To determine the amount of interest for 5 years for Account X, a savings account with a 2.1% annual simple interest rate, the student could have calculated $I = (3,000)(0.021)(5) = \315 . To determine the amount of interest for 5 years for Account Y, a savings account with a 2.4% interest rate compounded annually, the student could have calculated $I = (3,000)(1.024)^5 = 3,377.70$ and then subtracted 3,000 from 3,377.70 for a result of \$377.70. The student could then have subtracted $377.70 - 315.00 = 62.70$ to determine that Account Y pays \$62.70 more interest than Account X over 5 years.
	Option F is incorrect	The student likely confused the name of the accounts. The student needs to focus on attending to the details of the question in the problem.
	Option H is incorrect	The student likely used the formula for simple interest for the second savings account, and calculated $I = (3,000)(0.024)(5) = 360$, and then subtracted $360 - 315 = 45$, but confused the names of the accounts. The student needs to focus on attending to the details of the question in the problem.
	Option J is incorrect	The student likely used the formula for simple interest for the second savings account and calculated $I = (3,000)(0.024)(5) = 360$, and then subtracted $360 - 315 = 45$. The student needs to focus on attending to the details of the question in the problem.

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Item #	Rationale	
11	Option D is correct	<p>To determine the y-intercept of the graph of the function, the student could have used the points $(4, 8)$ and $(-5, -7)$ and the slope formula, $\frac{y_2 - y_1}{x_2 - x_1}$, to determine the slope, resulting in $\frac{8 - (-7)}{4 - (-5)} = \frac{15}{9} = \frac{5}{3}$. Then the student could have found the y-intercept by substituting the slope and one of the points into the slope-intercept form of a linear equation, $y = mx + b$, resulting in $8 = \frac{5}{3}(4) + b$. The value of b is $\frac{4}{3}$, which is the y-intercept of the graph. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.</p>
	Option A is incorrect	<p>The student likely incorrectly estimated the point on the graph where the line crosses the y-axis. The student needs to focus on paying attention to details when identifying the y-intercept of a linear function.</p>
	Option B is incorrect	<p>The student likely confused the x-intercept with the y-intercept and estimated the x-intercept, ignoring the sign. The student needs to focus on paying attention to details when identifying the y-intercept of a linear function.</p>
	Option C is incorrect	<p>The student likely confused the y-intercept and the slope and used the formula $\frac{y_2 - y_1}{x_2 - x_1}$ when determining the slope, resulting in $\frac{8 - (-7)}{4 - (-5)} = \frac{5}{3}$. The student needs to focus on paying attention to details when identifying the y-intercept of a linear function.</p>

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Item #	Rationale	
12	Option G is correct	To determine the rule that describes the center of the new circle after the translation, the student could have added p units to the x -coordinate, indicating a translation of p units right, since adding the units to the x -coordinate indicates a translation to the right. The student could have subtracted v units from the y -coordinate, indicating a translation of v units down, since subtracting the units from the y -coordinate indicates a translation down.
	Option F is incorrect	The student likely interpreted the horizontal translation correctly but interpreted a translation down as indicating that the number of units moved should be added to the y -coordinate. The student needs to focus on understanding the rules for translations.
	Option H is incorrect	The student likely interpreted the vertical translation correctly but interpreted a translation to the right as indicating that the units moved should be subtracted from the x -coordinate. The student needs to focus on understanding the rules for translations.
	Option J is incorrect	The student likely interpreted a translation to the right as indicating that the number of units moved should be subtracted from the x -coordinate and a translation down as indicating the number of units moved should be added to the y -coordinate. The student needs to focus on understanding the rules for translations.

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13	Option C is correct	<p>To determine the linear relationship between x and y, the student could have first used the points (640, 3,502) and (820, 3,601) and the slope formula, $\frac{y_2 - y_1}{x_2 - x_1}$, to determine the slope, resulting in $\frac{3,601 - 3,502}{820 - 640} = \frac{99}{180} = 0.55$. Then the student could find the y-intercept by substituting the slope and one of the points into the slope-intercept form of a linear equation, $y = mx + b$, resulting in $3,502 = 0.55(640) + b$. The value of b is 3,150. Substituting the values for m (slope) and b (y-intercept) into the slope-intercept form of a linear equation results in $y = 0.55x + 3,150$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.</p>
	Option A is incorrect	<p>The student likely divided the first two values, $\frac{3,502}{640} \approx 5.47$, and used the value for the slope as if it were a direct variation. The student needs to focus on understanding how to recognize a non-proportional relationship and apply the slope and y-intercept to find the equation of a line in slope-intercept form, which indicates the linear relationship between x and y.</p>
	Option B is incorrect	<p>The student likely divided the last two values, $\frac{3,601}{820} \approx 4.39$, and used the value for the slope as if it were a direct variation. The student needs to focus on understanding how to recognize a non-proportional relationship and apply the slope and y-intercept to find the equation of a line in slope-intercept form, which indicates the linear relationship between x and y.</p>
	Option D is incorrect	<p>The student likely reversed the values for the slope and y-intercept. The student needs to focus on applying the slope and y-intercept to find the equation of a line in slope-intercept form, which indicates the linear relationship between x and y.</p>

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Item #	Rationale	
14	Option J is correct	To determine which statement is true about the possible choices for college, the student could have calculated the amount of money saved by adding $50(60)$ to 1,200 for a sum of \$4,200. The student could have compared the amount of money saved with the costs in the table, seeing that the only choice that costs less than the amount saved is a public 2-year (in-state) college, which costs \$4,000. 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 multiplied \$50 by 60 and by 5 before adding to 1,200 for a result of \$16,200. Then the student misread the table and divided 38,000 by 4 for a quotient of \$9,500. The student then compared \$9,500 with \$16,200. The student needs to focus on addressing the details in the problem and accurately reading a table.
	Option G is incorrect	The student likely divided the cost for out-of-state residents of a public 4-year college, \$28,000, by 4 for a result of \$7,000, and then by 2, resulting in \$3,500. The student then compared \$3,500 with the \$4,200 saved. The student needs to focus on accurately reading a table.
	Option H is incorrect	The student likely multiplied \$50 by 60 and by 5 before adding to 1,200 for a result of \$16,200. The student then compared \$16,500 with the cost for in-state residents for half a year at a public 4-year college, $\frac{11,000}{2} = 5,500$. The student needs to focus on attending to the details of the question in problems.

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15	Option B is correct	To determine the volume of a cylinder in cubic centimeters, the student could have used the formula for the volume of a cylinder, $V = \pi r^2 h$. To determine the radius, r , the student could have divided the diameter, 6 inches, by 2 for a result of 3 inches. The student could then have substituted the radius, r , and the height, h , into the formula for a result of $V = \pi(3)^2(21)$.
	Option A is incorrect	The student likely used the diameter in place of the radius in the volume formula. The student needs to focus on understanding and properly applying the formula for the volume of a cylinder.
	Option C is incorrect	The student likely used the diameter in place of the radius in the volume formula and did not square the radius. The student needs to focus on understanding and properly applying the formula for the volume of a cylinder.
	Option D is incorrect	The student likely did not square the radius. The student needs to focus on understanding and properly applying the formula for the volume of a cylinder.

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Item #	Rationale	
16	Option H is correct	To determine the slope of the graphed line, the student should have noted that the relationship is proportional, since the graph of the line starts at the point (0, 0). Using a point on the line, (10, 24), the student could have found the slope of the line by dividing 24 by 10 for a result of 2.4. 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 a point on the line, (10, 24), but used the reciprocal of the slope, dividing 10 by 24 for a result of approximately 0.42, for the slope. The student needs to focus on the unit rate and how it translates to the graph.
	Option G is incorrect	The student likely did not use the scale for the vertical axis correctly and counted 4 units up and 5 units to the right to go from the point (0, 0) to the point (5, 12). The student needs to focus on reading the scale of a graph.
	Option J is incorrect	The student likely did not use the correct scale for the vertical axis and applied slope as run over rise instead of rise over run. The student counted 5 units across and 4 units up to go from the point (0, 0) to the point (5, 12). The student needs to focus on the unit rate and how it translates to the graph as well as on reading the scale of a graph.

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Item #	Rationale	
17	Option B is correct	<p>To determine the distance between points B and D, the student should have determined that line segment BD is the hypotenuse of right triangle BCD, and line segments BC and CD are the legs of triangle BCD. By counting the units between the endpoints of the legs of the triangle, the student should have determined that the distance between points B and C is 6 units, and the distance between points C and D is 12 units.</p> <p>Using the Pythagorean theorem, $a^2 + b^2 = c^2$ or $c = \sqrt{a^2 + b^2}$, the length of line segment BD can be represented by the expression $\sqrt{6^2 + 12^2}$ or $\sqrt{180}$, which is approximately 13.4 units.</p>
	Option A is incorrect	<p>The student likely knew that the lengths of the triangle's legs could be determined by finding the difference between the values of the coordinates of the points. Rather than (1) finding the difference between the two x-values and the difference between the two y-values and (2) applying the Pythagorean theorem, the student chose a single value from the coordinates $B(5, -9)$ and $D(-1, 3)$ and applied the Pythagorean theorem. Choosing the x-value from $B(5, -9)$ and the y-value from $D(-1, 3)$, the student applied the Pythagorean theorem, $c = \sqrt{a^2 + b^2} = \sqrt{5^2 + 3^2} = \sqrt{34} \approx 5.8$. The student needs to focus on the relationship between coordinates of points and segment lengths.</p>
	Option C is incorrect	<p>The student likely identified line segment BD as a leg of the triangle instead of the hypotenuse and calculated $\sqrt{12^2 - 6^2} = \sqrt{108} \approx 10.4$. The student needs to focus on how to properly apply the Pythagorean theorem with the given information.</p>
	Option D is incorrect	<p>The student likely knew that the lengths of the triangle's legs could be determined by finding the difference between the values of the coordinates of the points. Rather than (1) finding the difference between the two x-values and the difference between the two y-values and (2) applying the Pythagorean theorem, the student chose a single value from the coordinates $B(5, -9)$ and $D(-1, 3)$ and applied the Pythagorean theorem. Choosing the y-value from $B(5, -9)$ and the x-value from $D(-1, 3)$, the student applied the Pythagorean theorem, $c = \sqrt{a^2 + b^2} = \sqrt{(-9)^2 + (-1)^2} = \sqrt{82} \approx 9.1$. The student needs to focus on the relationship between coordinates of points and segment lengths.</p>

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18	Option H is correct	To determine the situation that describes a non-proportional relationship, the student could have determined which relationship does not increase or decrease by an equivalent ratio and does not go through the origin, the point (0, 0). The student could have determined that the equation $y = 2\pi x + 2\pi$ is not a proportional relationship, because the graph of the line does not go through the point (0, 0). 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 determined a non-proportional relationship is represented by an equation with an irrational number for a coefficient and a line that goes through the origin. The student needs to focus on understanding the definition of a proportional relationship.
	Option G is incorrect	The student likely determined a non-proportional relationship is represented by an equation with a whole-number coefficient and a line that goes through the origin. The student needs to focus on understanding the definition of a proportional relationship.
	Option J is incorrect	The student likely determined a non-proportional relationship is represented by an equation with a fraction as a coefficient and a line that goes through the origin. The student needs to focus on understanding the definition of a proportional relationship.

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19	Option D is correct	To determine the statement that is true, the student could have determined that because a rotation (circular movement) preserves congruence (same shape and size), the angle measures of pentagon $P'Q'R'S'T'$ are equal to the angle measures of pentagon $PQRST$. 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 misunderstood the effect a rotation has on the area of a figure and interpreted a rotation as changing the area of the figure. The student needs to focus on the effect a rotation has on a figure and on the fact that a rotation preserves congruence.
	Option B is incorrect	The student likely misunderstood the effect a rotation has on the dimensions of a figure and interpreted a rotation as changing the dimensions of the figure. The student needs to focus on the effect a rotation has on a figure and on the fact that a rotation preserves congruence.
	Option C is incorrect	The student likely misunderstood the effect a rotation has on the perimeter of a figure and interpreted a rotation as increasing the perimeter of the figure. The student needs to focus on the effect a rotation has on a figure and on the fact that a rotation preserves congruence.

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Item #	Rationale	
20	Option F is correct	To determine which conclusion is best supported by the scatterplot, the student could have determined which statement indicates a positive linear association, an increase of both x and y . As the number of nights in a hotel, x , increases, the total cost for the hotel, y , increases, showing an increase for both x and y . 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 interpreted a positive linear association as y decreasing as x increases. The student needs to focus on understanding questions of association.
	Option H is incorrect	The student likely interpreted a positive linear association as y remaining the same as x increases. The student needs to focus on understanding questions of association.
	Option J is incorrect	The student likely did not recognize a positive linear association of the data. The student needs to focus on understanding questions of association.

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Item #	Rationale	
21	Option C is correct	To determine the relationship between Set Q, rational numbers, and Set Z, integers, the student could have used knowledge of visual representations of sets and subsets to determine that the set of integers, Set Z, is a subset of the set of rational numbers, Set Q; thus, the region representing integers, Z, is inside the region representing rational numbers, Q.
	Option A is incorrect	The student likely incorrectly interpreted the diagram in which Sets Q and Z are switched. The student needs to focus on recognizing sets and subsets of numbers and how to use a visual representation indicating the relationship.
	Option B is incorrect	The student likely recognized that the sets have some numbers in common, but did not recognize that the set of integers, Set Z, is a subset of the set of rational numbers, Set Q. The student needs to focus on recognizing sets and subsets of numbers and how to use a visual representation indicating the relationship.
	Option D is incorrect	The student likely interpreted the sets as having no numbers in common. The student needs to focus on recognizing sets and subsets of numbers and how to use a visual representation indicating the relationship.

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Item #	Rationale	
22	Option J is correct	To determine which table represents the relationship between the total cost of books and the number of sets of books the teacher bought, the student could have used the one-time shipping fee, \$22, as the y -intercept and the cost per set of books, \$17.95, as the slope of the line. Substituting 17.95 for m and 22 for b in the slope-intercept form of a linear equation, $y = mx + b$, results in $y = 17.95x + 22$. The student could then have checked the y -values for the corresponding x -values in the tables. Substituting the x -values into the equation results in $y = 17.95(16) + 22 = 309.20$; $y = 17.95(20) + 22 = 381.00$; $y = 17.95(24) + 22 = 452.80$; $y = 17.95(28) + 22 = 524.60$. 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 rate and the y -intercept, using $y = 22x + 17.95$. The student needs to focus on recognizing the slope and y -intercept of a linear equation when given context.
	Option G is incorrect	The student likely multiplied the one-time shipping fee by the sum of the rate and the number of books, using $y = 22(x + 17.95)$. The student needs to focus on identifying the slope and y -intercept and correctly applying the slope-intercept form of a linear equation.
	Option H is incorrect	The student likely multiplied the rate by the sum of the one-time shipping fee and the number of books, using $17.95(x + 22)$. The student needs to focus on correctly applying the slope-intercept form of a linear equation.

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Item #	Rationale	
23	0.60 and any equivalent values are correct	To determine the cost of 1 hot wing, the student could have set up the equation $8x + 4 = 10x + 2.80$, where x is the cost of 1 hot wing. To solve the equation, the student could have first subtracted $8x$ from both sides of the equation, resulting in $4 = 2x + 2.80$. The student then could have subtracted 2.80 from both sides of the equation, resulting in $1.20 = 2x$. Finally, the student could have divided both sides of the equation by 2 , resulting in $x = 0.60$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
24	Option H is correct	To determine from a scatterplot (a graph of plotted points that shows the relationship between two sets of data) the best prediction of the number of games a baseball team won when it practiced 3 hours each week during the season, the student could have drawn a line that closely follows the pattern formed by the points on the graph, by keeping about half of the points above the line and the other half of the points below the line. A good line for this scatterplot would pass slightly below the point at (0.75, 6) but above the point at (1, 4) and through the point at (5, 20). The student could then have identified where the grid line marked 3 (representing 3 hours of practice per week) intersects (crosses over) the line the student drew and determined that the number of games won corresponding to that point of intersection was about 13 games. 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 chose the nearest point to the left of 3 hours, resulting in the number of games won as 10. The student needs to focus on drawing a line as close as possible to all points, with a similar number of points above and below the line.
	Option G is incorrect	The student likely chose the greater (higher) value of the number of games won of the points representing greatest number of hours of practice per week (5 hours), resulting in 20. The student needs to focus on drawing a line as close as possible to all points, with a similar number of points above and below the line.
	Option J is incorrect	The student likely chose the nearest point to the right of 3 hours, resulting in the number of games won as 15. The student needs to focus on drawing a line as close as possible to all points, with a similar number of points above and below the line.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
25	Option A is correct	To determine which measurements could represent the side lengths of a right triangle, the student should have applied the Pythagorean theorem, $a^2 + b^2 = c^2$, using the two smaller measurements as the lengths of the legs, a and b , and the larger measurement as the length of the hypotenuse, c . Substituting 10 and 24 for a and b , and 26 for c , $10^2 + 24^2 = 100 + 576 = 676 = 26^2$.
	Option B is incorrect	The student likely interpreted an equilateral triangle (triangle with three congruent sides) as a right triangle. The student needs to focus on how to properly apply the Pythagorean theorem using the given information.
	Option C is incorrect	The student likely squared only the values for the lengths of the legs and then added those values, resulting in $3^2 + 3^2 = 9 + 9 = 18$. The student needs to focus on how to properly apply the Pythagorean theorem using the given information.
	Option D is incorrect	The student likely added the lengths of the legs, 2 and 3, to equal the length of the hypotenuse, resulting in $2 + 3 = 5$. The student needs to focus on how to properly apply the Pythagorean theorem using the given information.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
26	Option J is correct	To determine the location of a corresponding point on pentagon $A'B'C'D'E'$, the student could have recognized that if (x, y) represents the location of any point on pentagon $ABCDE$ and is dilated with the origin as the center, the coordinates for the corresponding point on pentagon $A'B'C'D'E'$ is multiplied by the scale factor of $\frac{7}{3}$, resulting in $(\frac{7}{3}x, \frac{7}{3}y)$.
	Option F is incorrect	The student likely used the reciprocal of the scale factor. The student needs to focus on recognizing how a dilation with a positive scale factor affects the location of a point.
	Option G is incorrect	The student likely added the scale factor instead of multiplying by it. The student needs to focus on recognizing how a dilation with a positive scale factor affects the location of a point.
	Option H is incorrect	The student likely added the scale factor instead of multiplying by it and used the reciprocal of the scale factor. The student needs to focus on recognizing how a dilation with a positive scale factor affects the location of a point.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
27	Option C is correct	To determine the lateral surface area of the cylinder, the student could have used the formula for the lateral surface area of a cylinder, $S = 2\pi rh$. To determine the radius of the base, the student could have divided the diameter, 5.8 centimeters, by 2, resulting in a radius of 2.9 centimeters. The student then could have evaluated $S = 2\pi(2.9)(7.6)$, which is approximately equal to 138.5 square centimeters.
	Option A is incorrect	The student likely calculated the lateral surface area and added the area of only one base. The student needs to focus on understanding and properly applying the formula for the lateral surface area of a figure.
	Option B is incorrect	The student likely used the diameter instead of the radius in the lateral surface area formula. The student needs to focus on understanding and properly applying the formula for the lateral surface area of a figure.
	Option D is incorrect	The student likely used the formula for total surface area, $S = 2\pi rh + 2\pi r^2$. The student needs to focus on understanding and properly applying the formula for the lateral surface area of a figure and on correctly identifying the parts of the formula and how they are related to the figure.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
28	Option G is correct	To determine the x -coordinate of the ordered pair that best represents a solution to both equations, the student could have estimated the intersection of the two lines, $(0, 0)$, and chosen the first coordinate. 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 slope of one of the lines, $\frac{1}{7}$, as the x -coordinate of the ordered pair that best represents the intersection of the two lines. The student needs to focus on identifying the point of intersection of two intersecting lines.
	Option H is incorrect	The student likely used the slope of one of the lines, 5 , as the x -coordinate of the ordered pair that best represents the intersection of the two lines. The student needs to focus on identifying the point of intersection of two intersecting lines.
	Option J is incorrect	The student likely used the reciprocal of the slope of one of the lines, 7 , as the x -coordinate of the ordered pair that best represents the intersection of the two lines. The student needs to focus on identifying the point of intersection of two intersecting lines.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
29	Option D is correct	To determine which statement is true, the student should have concluded that if a shape is dilated, the length of each side of the shape is dilated by the same scale factor and is proportional to the length of the corresponding side of the original shape.
	Option A is incorrect	The student likely confused the side lengths of the original shape and the new shape. The student needs to focus on understanding the effects of a scale factor applied to a two-dimensional figure on a coordinate plane.
	Option B is incorrect	The student likely confused a dilation with a transformation that preserves congruence, such as a reflection, rotation, or translation. The student needs to focus on understanding the effects of a scale factor applied to a two-dimensional figure on a coordinate plane.
	Option C is incorrect	The student likely multiplied the measure of each angle by the scale factor. The student needs to focus on understanding the effects of a scale factor applied to a two-dimensional figure on a coordinate plane.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
30	Option F is correct	To determine the mean absolute deviation of the numbers, the student should have calculated the mean of the numbers by adding the values representing the puppy weights and then dividing by the number of puppy weights, $\frac{3+1.6+2.8+2.5+1.7+2.8}{6} = 2.4$. Then the student should have found the absolute value of the difference between each number and the mean and added the results together: $ 3 - 2.4 + 1.6 - 2.4 + 2.8 - 2.4 + 2.5 - 2.4 + 1.7 - 2.4 + 2.8 - 2.4 = 0.6 + 0.8 + 0.4 + 0.1 + 0.7 + 0.4 = 3$. The student then should have divided 3 by 6, resulting in the mean absolute deviation of puppy weights of 0.5.
	Option G is incorrect	The student likely used the mean of the numbers representing the puppy weights. The student needs to focus on applying the process for calculating the mean absolute deviation.
	Option H is incorrect	The student likely found the mean absolute deviation, 0.5, but subtracted it from the mean, resulting in $2.4 - 0.5 = 1.9$. The student needs to focus on identifying the mean absolute deviation when applying the algorithm.
	Option J is incorrect	The student likely added the numbers. The student needs to focus on applying the process for calculating the mean absolute deviation.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
31	Option A is correct	To determine which function best represents the relationship between the time spent drilling, x , and the depth of the well, y , the student could have first calculated the slope using the points $(0, 0)$ and $(5, 30)$ and the slope formula, $\frac{y_2 - y_1}{x_2 - x_1}$, resulting in $\frac{30 - 0}{5 - 0} = \frac{30}{5} = 6$. Then the student could have found the y -intercept by substituting the slope and one of the points into the slope-intercept form of a linear equation, $y = mx + b$, resulting in $30 = 6(5) + b$. The value of b is 0. Substituting for m (slope) and b (y -intercept) in the slope-intercept form of a linear equation results in $y = 6x$. 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 the y -value of the point $(5, 30)$ for the slope of the line. The student needs to focus on understanding how to recognize a proportional relationship and apply the slope and y -intercept to find the equation of a line in slope-intercept form, which indicates the linear relationship between x and y .
	Option C is incorrect	The student likely used the point $(5, 30)$, substituting 5 for m and 30 for b in the slope-intercept form of the equation. The student needs to focus on understanding how to recognize a proportional relationship and apply the slope and y -intercept to find the equation of a line in slope-intercept form, which indicates the linear relationship between x and y .
	Option D is incorrect	The student likely calculated the slope correctly but used the y -value of the point $(5, 30)$ for the y -intercept in the slope-intercept form of the equation. The student needs to focus on understanding how to recognize a proportional relationship and apply the slope and y -intercept to find the equation of a line in slope-intercept form, which indicates the linear relationship between x and y .

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
32	Option J is correct	To determine which graph does not represent y as a function of x , the student could have chosen a graph where an x -value, -1 , corresponds to two y -values, -1 and 1 . 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 interpreted a set of non-connected points as not representing a function. The student needs to focus on understanding the definition of a function and being able to identify one on a graph.
	Option G is incorrect	The student likely interpreted a curve as not representing a function. The student needs to focus on understanding the definition of a function and being able to identify one on a graph.
	Option H is incorrect	The student likely interpreted a graph with more than one x -value for each y -value as not representing a function. The student needs to focus on understanding the definition of a function and being able to identify one on a graph.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
33	Option B is correct	To determine the volume of a cone in cubic miles, the student could have used the formula for the volume of a cone, $V = \frac{1}{3}\pi r^2 h$, where r is the radius of the circular base and h is the height of the cone. To determine the value of the radius, r , the student could have divided the diameter, 25 miles, by 2 for a result of 12.5 miles. The student should then have substituted $r = 12.5$ and $h = 2.35$ into the formula for the volume of a cone, resulting in $V = \frac{1}{3}\pi(12.5)^2 2.35 = 385$.
	Option A is incorrect	The student likely used the formula for the volume of a cylinder and not the volume of a cone. The student needs to focus on understanding and properly applying the formula for the volume of a cone.
	Option C is incorrect	The student likely used the diameter instead of the radius in the formula for the volume of a cone. The student needs to focus on understanding and properly applying the formula for the volume of a cone.
	Option D is incorrect	The student likely squared the height instead of the radius in the formula for the volume of a cone. The student needs to focus on understanding and properly applying the formula for the volume of a cone.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
34	6 and any equivalent values are correct	To determine the height of the refrigerator, the student could have used the formula for the surface area of a rectangular prism, $S = Ph + 2B$, with S representing the surface area, P representing the perimeter of the base, h representing the height of the prism, and B representing the area of the base of the prism. The perimeter of the base is $2(4) + 2(5) = 18$. The area of the base is $4(5) = 20$. Substituting into the formula results in $148 = 18h + 2(20)$. Solving for h results in $h = 6$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
35	Option C is correct	To determine the cost of each ticket, the student could have determined that the total amount spent when buying 9 tickets and receiving a \$120 discount is equivalent to the total amount spent when buying 3 tickets and receiving a \$30 discount. Letting t represent the cost of each ticket, the student could have set up the equation $9t - 120 = 3t - 30$. To solve the equation the student first could have subtracted $3t$ from both sides of the equation, resulting in $6t - 120 = -30$. The student then could have added 120 to both sides of the equation, resulting in $6t = 90$. The student then could have divided both sides of the equation by 6, resulting in $t = 15$. 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 ignored the negative sign on the right side of the equation and added 120 to 30, resulting in $6t = 150$. The student needs to focus on using the proper steps to solve an equation.
	Option B is incorrect	The student likely added $9t$ and $3t$, resulting in $12t = 150$. The student needs to focus on using the proper steps to solve an equation.
	Option D is incorrect	The student likely added $9t$ and $3t$ and then subtracted 30 from 120, resulting in $12t = 90$. The student needs to focus on using the proper steps to solve an equation.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
36	Option H is correct	To determine which set of ordered pairs represents y as a function of x , the student could have checked each set of ordered pairs to see whether each value of x is paired with exactly one value of y . In the set $\{(11.1, 7), (5.1, 4), (12.1, 5), (6.1, 7)\}$, each value of x is paired with exactly one value of y .
	Option F is incorrect	The student likely overlooked the duplicated x -value in the set of numbers. The student needs to focus on paying attention to the details in the problem.
	Option G is incorrect	The student likely interpreted different y -values as indicating a function. The student needs to focus on understanding the definition of a function.
	Option J is incorrect	The student likely interpreted different y -values as indicating a function. The student needs to focus on understanding the definition of a function.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
37	Option A is correct	To determine the location of a corresponding point on triangle $X'Y'Z'$, the student could have recognized that, if (x, y) represents the location of any point on triangle XYZ and the point is dilated with the origin as the center, the coordinates of (x, y) are multiplied by the scale factor of $\frac{3}{2}$, resulting in the point $\left(\frac{3}{2}x, \frac{3}{2}y\right)$ on triangle $X'Y'Z'$.
	Option B is incorrect	The student likely added the scale factor instead of multiplying by it. The student needs to focus on recognizing the effect of a dilation with a positive scale factor on the location of a point.
	Option C is incorrect	The student likely used the reciprocal of the scale factor. The student needs to focus on recognizing the effect of a dilation with a positive scale factor on the location of a point.
	Option D is incorrect	The student likely added the scale factor instead of multiplying by it and used the reciprocal of the scale factor. The student needs to focus on recognizing the effect of a dilation with a positive scale factor on the location of a point.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
38	1,698.84 and any equivalent values are correct	To determine the balance in the savings account at the end of 8 years, the student should have used the formula for simple interest, $I = prt$, with p representing the principal (initial amount), r representing the interest rate, and t representing the time in years. The student should have substituted the values $p = 1,287$, $r = 0.04$, and $t = 8$ into the formula, resulting in $I = (1,287)(0.04)(8) = 411.84$. The student then should have added the interest, \$411.84, to the principal, \$1,287, for a result of \$1,698.84.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
39	Option C is correct	To determine which graph has a slope that best represents the rate, $\frac{68}{136}$, or $\frac{1}{2}$, the student could have determined that the equation represents a proportional relationship and therefore has a graph that goes through the origin, (0, 0), and has a slope of $\frac{1}{2}$. The student could have found a point on the line, such as (2, 1), and divided 1 by 2 for a slope of $\frac{1}{2}$. 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 used the reciprocal of the slope, dividing x by y . The student needs to focus on the unit rate and how it is represented on the graph.
	Option B is incorrect	The student likely divided 138 by 68 for an answer of 2 and then used that value for the y -intercept. The student needs to focus on recognizing a proportional relationship and how the unit rate is represented on the graph.
	Option D is incorrect	The student likely used the slope, $\frac{1}{2}$, and chose a horizontal line with this value as the y -intercept. The student needs to focus on recognizing a proportional relationship and how the unit rate is represented on the graph.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
40	Option J is correct	To determine the cost of using 908 kilowatt-hours of electricity, the student could have divided 129.48 by 1,079, resulting in 0.12, which is the value of k . The student could have then used the formula for direct variation, which is $y = kx$, substituting 0.12 for k and 908 for x , resulting in $y = (0.12)(908) = \$108.96$. 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 calculated the difference between 1,079 and 908, resulting in 171, and then subtracted 129.48 from 171, resulting in 41.52. The student needs to focus on understanding the application of direct variation.
	Option G is incorrect	The student likely multiplied 1,079 and 129.48, resulting in 139,708.92. The student then likely divided 139,708.92 by 908, resulting in a value that is approximately \$153.86. The student needs to focus on understanding the application of direct variation.
	Option H is incorrect	The student likely multiplied 1,079 by 908, resulting in 979,732. The student then likely divided 979,732 by 12,948, resulting in a value that is approximately \$75.67. The student needs to focus on understanding the application of direct variation.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
41	Option B is correct	To determine the order of the set of real numbers from least to greatest, the student could have converted all the numbers to an approximate decimal form; $10\sqrt{17}$ is approximately 41.2311, $\frac{675}{16}$ equals 42.1875, $\frac{586}{13}$ is approximately 45.0769, and $\sqrt{2,111}$ is approximately 45.9456. The student could have compared these values with 40, which is already in decimal form. The student then could have ordered the decimal values from least to greatest (40, 41.2311, 42.1875, 45.0769, 45.9456), resulting in the list 40, $10\sqrt{17}$, $\frac{675}{16}$, $\frac{586}{13}$, $\sqrt{2,111}$. 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 compared the numbers under the radical signs, the numerators of the fractions, and 40, resulting in the order 17; 40; 586; 675; 2,111. The student needs to focus on comparing numbers in different forms.
	Option C is incorrect	The student likely ordered the numbers by interpreting fractions as being the last, followed by the square roots and then the whole number. The student needs to focus on comparing numbers in different forms.
	Option D is incorrect	The student likely misunderstood how to simplify $10\sqrt{17}$, ordering the remaining lengths correctly and including $10\sqrt{17}$ at the end of the list. The student needs to focus on simplifying square roots with coefficients and on comparing numbers in different forms.

2022 STAAR Grade 8 Mathematics Rationales

Item #	Rationale	
42	Option J is correct	To determine the situation that can be represented by the equation $18x = 19 + 12x$, the student could have first identified the expression on the left side of the equation as the total amount Krystal earns for tutoring x hours at \$18 per hour. The student could have then identified the expression on the right side of the equation as the total amount of money Jondo has if he starts with \$19 and earns \$12 per hour for tutoring x hours.
	Option F is incorrect	The student likely ignored the 19 in the equation. The student needs to focus on addressing all the details in the problem and reviewing the words associated with writing equations and their meanings.
	Option G is incorrect	The student likely included the \$18 on the incorrect side of the equation. The student needs to focus on reviewing the words associated with writing equations and their meanings.
	Option H is incorrect	The student likely switched the 18 and 12 and multiplied the incorrect value by x . The student needs to focus on reviewing the words associated with writing equations and their meanings.