

2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
1	Option C is correct	To determine which histogram displays all the data in the table correctly, the student should have identified that the numbers in the table are ordered by value and categorized these values by the ranges shown in the histogram. The student should have noted that there were three values from the table in the 800–899 category, five values in the 900–999 category, eight values in the 1,000–1,099 category, six values in the 1,100–1,199 category, and three values in the 1,200–1,299 category. The student then should have determined that the histogram has bars that represent the number of values in each of the categories.
	Option A is incorrect	The student likely noted that there are five values in each row and five values in each column of the table and determined that the histogram has bars that represent five values in each category. The student needs to focus on understanding how to display data from a table in a histogram.
	Option B is incorrect	The student likely categorized 1,098 from the table in the 1,100–1,199 category instead of the 1,000–1,099 category and determined that the histogram has bars that represent the number of values in each of the categories. The student needs to focus on attending to details in a set of data when displaying data in a histogram.
	Option D is incorrect	The student likely counted the values that repeated in the table (805 and 1,150) only once within each category and determined that the histogram has bars that represent the number of values in each of the categories. The student needs to focus on understanding that repeated values in a table should be accounted for when the data is displayed in a histogram.

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2	Option F is correct	<p>To determine which Venn diagram shows the correct relationship among the different sets of numbers (rational numbers, integers, and whole numbers) and the correct placement of <math>-648</math>, the student should have first considered the classification system for the sets of numbers. The largest classification in the Venn diagram is Rational numbers. Rational numbers are all numbers that can be represented as the division of two integers. There are many special types of rational numbers, such as fractions, decimals, integers, and whole numbers. Two of the special types of rational numbers are shown in the Venn diagram (Integers and Whole numbers). Integers make up the second largest classification in the Venn diagram. Integers are all of the positive and negative numbers, with no decimal or fraction parts, and zero. Whole numbers make up the smallest classification in the Venn diagram. Whole numbers are all of the positive integers and zero. The student should have determined that this Venn diagram has the classifications in the right order. Then the student should have determined that since <math>-648</math> can be written as <math>\frac{-648}{1}</math>, it is a rational number, and that since <math>-648</math> is negative and has no decimal or fractional part, it is also an integer. Finally the student should have determined that <math>-648</math> cannot be a whole number (because whole numbers must be positive) and belongs inside the Integers circle but not inside the Whole Numbers circle.</p>
	Option G is incorrect	<p>The student likely determined the correct relationship between rational numbers, integers, and whole numbers but determined that <math>-648</math> is a whole number, an integer, and a rational number instead of just an integer and a rational number. The student needs to focus on understanding the difference between integers and whole numbers.</p>
	Option H is incorrect	<p>The student likely reversed the relationship between whole numbers and integers and determined that <math>-648</math> is a whole number instead of an integer and a rational number. The student needs to focus on understanding the relationships between sets of numbers in the classification system and understanding the difference between integers and whole numbers.</p>

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	Option J is incorrect	The student likely reversed the relationship between whole numbers and integers and determined that $-648$ is a whole number, an integer, and a rational number instead of just an integer and a rational number. The student needs to focus on understanding the relationships between sets of numbers in the classification system and understanding the difference between integers and whole numbers.

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3	Option D is correct	To determine the amount of change in dollars the customer should receive, the student should have first multiplied the two groupings of numbers in the innermost parentheses, 2 times 5, resulting in 10, and 2 times 2, resulting in 4. The student then should have added the numbers in the outer pair of parentheses ( $14 + 12 + 10 + 4 + 3 = 43$ ). Finally, the student should have subtracted 43 from 50, resulting in a final answer of \$7.
	Option A is incorrect	The student likely calculated $2(2 + 3)$ instead of $2(2) + 3$ , resulting in 10. The student then likely added the numbers in the outer pair of parentheses ( $14 + 12 + 10 + 10 = 46$ ) and subtracted 46 from 50, resulting in a final answer of \$4. The student needs to focus on understanding how to group numbers correctly when multiplying.
	Option B is incorrect	The student likely determined the value of $2(5)$ as 25 and the value of $2(2)$ as 22. The student then likely added the numbers in the outer pair of parentheses ( $14 + 12 + 25 + 22 + 3 = 76$ ) and subtracted 50 from 76, resulting in a final answer of \$26. The student needs to focus on understanding how to use parentheses as indicators of multiplication.
	Option C is incorrect	The student likely determined the value of $2(5)$ correctly as 10 but calculated $(14 + 12 + 10 + 2)(2) + 3$ , which equals $(38)(2) + 3$ , resulting in 79. Then the student likely subtracted 50 from 79, resulting in a final answer of \$29. The student needs to focus on understanding how to group numbers correctly when multiplying.

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Item#	Rationale	
4	Option G is correct	To determine which expression is equivalent to $(6 \cdot p) + 3$ , the student should have applied the commutative property. The commutative property is a property of addition ( + ) and multiplication ( $\cdot$ ) that allows for the order of terms in expressions to change without affecting the result. In the question, 3 is the rightmost term and $(6 \cdot p)$ is the leftmost term in the expression, but in the answer choice, the terms have switched positions. Because the operation (addition) is the same in both expressions, $(6 \cdot p) + 3$ and $3 + (6 \cdot p)$ , the order of the terms does not matter. Similarly, within the parentheses in the question, 6 is the leftmost term and p is the rightmost term, but in the answer choice, the terms have switched positions. Because the operation (multiplication) is the same in both expressions, $(6 \cdot p)$ and $(p \cdot 6)$ , the order of the terms does not matter. The student should have determined that $(6 \cdot p) + 3$ is equivalent to $3 + (p \cdot 6)$ .
	Option F is incorrect	The student used the opposite operation of addition (subtraction) after changing the positions of 3 and $(6 \cdot p)$ in the expression. The student needs to focus on understanding how to apply the commutative property to find equivalent expressions.
	Option H is incorrect	The student likely determined that the commutative property only applied to moving the numbers that have operators ( $\cdot$ and + ) immediately before them and switched the positions of + 3 and $\cdot p$ . The student likely did not realize that the terms within the parentheses had to stay together to be equivalent to the terms in the parentheses in the question. The student needs to focus on understanding how to apply the commutative property to find equivalent expressions.
	Option J is incorrect	The student likely applied ideas from the associative property to this expression and moved the parentheses from around the multiplication part of the expression to around the addition part of the expression. Though the student likely understood that the associative property allows for the regrouping of terms without affecting the result, the student disregarded the fact that the operations must be the same between the regrouped terms. The student needs to focus on understanding how to apply the commutative and associative properties to find equivalent expressions.

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Item#	Rationale	
5	Option C is correct	To determine the number of liters equivalent to 786 milliliters, the student should have converted 786 milliliters to liters by dividing 786 by 1,000 (1 liter = 1,000 milliliters), resulting in 0.786 liter.
	Option A is incorrect	The student likely multiplied the number of milliliters (786) by the number of milliliters in a liter (1,000). The student needs to focus on understanding how to convert between units within a measurement system.
	Option B is incorrect	The student likely divided the number of milliliters (786) by 100 instead of 1,000. The student needs to focus on understanding how to convert between units within a measurement system.
	Option D is incorrect	The student likely divided the number of milliliters (786) by 10,000 instead of 1,000. The student needs to focus on understanding how to convert between units within a measurement system.

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Item#	Rationale	
6	Option J is correct	To determine which inequality is true when $p = 3.4$ , the student should have substituted the value of 3.4 for $p$ in the inequality $8.5 \geq 2.5p$ and determined that $8.5 \geq 2.5(3.4)$ because $8.5 \geq 8.5$ (8.5 is greater than or equal to 8.5).
	Option F is incorrect	The student likely substituted the value of 3.4 for $p$ in the inequality $3p < 10.2$ , mistook the less than symbol ( $<$ ) for an equal sign ( $=$ ), and determined that $3(3.4) = 10.2$ , resulting in $10.2 = 10.2$ . The student needs to focus on understanding the difference between comparison symbols ( $<$ , $>$ , $=$ , $\leq$ , $\geq$ ) in inequalities and equations.
	Option G is incorrect	The student likely substituted the value of 3.4 for $p$ in the inequality $13.6 \leq 3.9p$ , determined that $13.6 \leq 3.9(3.4)$ , resulting in $13.6 \leq 13.26$ , and confused $\leq$ (less than or equal to) for $\geq$ (greater than or equal to). The student needs to focus on understanding the difference between comparison symbols ( $<$ , $>$ , $=$ , $\leq$ , $\geq$ ) in inequalities and equations.
	Option H is incorrect	The student likely substituted the value of 3.4 for $p$ in the inequality $5p > 17.1$ , determined that $5(3.4) > 17.1$ , resulting in $17 > 17.1$ , and confused $>$ (greater than) for $<$ (less than). The student needs to focus on understanding the difference between comparison symbols ( $<$ , $>$ , $=$ , $\leq$ , $\geq$ ) in inequalities and equations.

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Item#	Rationale	
7	Option A is correct	To determine the value that is equivalent to the fraction of the days in February that Carlos walked to school, the student could have divided 14 by 20, resulting in 0.70 or 70%. 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 divided 14 by 20 but made an error in placing the decimal point when determining the decimal. The student needs to focus on understanding how to represent the given part of a whole as a decimal.
	Option C is incorrect	The student likely used the digits in 14 and 20 to create a decimal. The student needs to focus on understanding how to represent the given part of a whole as a decimal.
	Option D is incorrect	The student likely made an error when creating an equivalent fraction with a denominator (bottom number) of 100; $\frac{14}{20} = \frac{?}{100} \rightarrow \frac{14 \cdot 4}{20 \cdot 5} = \frac{56}{100}$ , resulting in 0.56 or 56% instead of $\frac{14}{20} = \frac{?}{100} \rightarrow \frac{14 \cdot 5}{20 \cdot 5} = \frac{70}{100}$ . The student needs to focus on understanding how to find a fraction equivalent to another fraction.



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Item#	Rationale	
8	Option F is correct	To determine which statement about the dot plot is true, the student should have identified that the dot plot has one dot above the value 46, one dot above the value 47, three dots above the value 48, and one dot above the value 49 for a total of 6 of the 10 dots on the dot plot. Because $\frac{6}{10} > \frac{5}{10}$ , more than half of the 10 birds represented in the dot plot have wing lengths of less than 50 millimeters.
	Option G is incorrect	The student likely thought that “more birds” meant “greater wing length” ( $54 > 46$ ). The student needs to focus on understanding how to interpret data summarized in a dot plot.
	Option H is incorrect	The student likely thought that the total of five dots above the values 49, 51, 53, and 54 meant fewer than half of the birds have wing lengths greater than 50 millimeters, instead of exactly half. The student needs to focus on understanding how to interpret data summarized in a dot plot.
	Option J is incorrect	The student likely confused the placement of the dot above the value 51, thinking that it was instead above the value 52. The student needs to focus on understanding how to interpret data summarized in a dot plot.

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Item#	Rationale	
9	Option D is correct	To determine which equation can be used to find $n$ , the number of students in the class before the 4 new students joined, the student should have determined that "new" and "joined" mean students were added to the original number of students and that the total of the original ( $n$ ) and the new students (4) is 32, resulting in $n + 4 = 32$ .
	Option A is incorrect	The student divided the original number of students by the 4 new students instead of adding 4. The student needs to focus on understanding how to write one-step equations to represent conditions in problems.
	Option B is incorrect	The student subtracted the 4 new students from the original number of students instead of adding 4. The student needs to focus on understanding how to write one-step equations to represent conditions in problems.
	Option C is incorrect	The student multiplied the original number of students by the 4 new students instead of adding 4. The student needs to focus on understanding how to write one-step equations to represent conditions in problems.
10	-1 and any equivalent values are correct	To determine the value of the expression, the student should have used the order of operations, or PEMDAS. The student should have completed the operations in this order: 1. Operations contained in <u>P</u> arentheses or brackets, 2. <u>E</u> xponents (numbers raised to a power), 3. <u>M</u> ultiplication/ <u>D</u> ivision from left to right, and 4. <u>A</u> ddition/ <u>S</u> ubtraction from left to right. First, the student should have determined that $5^2 = 25$ . Then the student should have subtracted ( $24 - 25 = -1$ ).

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Item#	Rationale	
11	Option C is correct	To determine which situation can be represented by the equation $y = 12x$ , the student should have first recognized that the variables (symbols or letters used to represent unknown numbers) represent the amounts of money each person in the situation has. The variable $y$ represents the amount of money Victoria has, and the variable $x$ represents the amount of money Victoria's brother has. The student should have determined that "12 times $x$ " means that Victoria's amount of money ( $y$ ) is equal to 12 times the amount of money her brother has ( $x$ ) and can be represented as $12x$ . As a result, the student should have determined that the equation representing this situation is $y = 12x$ .
	Option A is incorrect	The student chose a situation represented by the equation $x = 12y$ instead of $y = 12x$ . The student needs to focus on understanding how to identify situations that can be represented by equations in the form $y = kx$ .
	Option B is incorrect	The student chose a situation represented by the equation $x = y - 12$ instead of $y = 12x$ . The student needs to focus on understanding how to identify situations that can be represented by equations in the form $y = kx$ .
	Option D is incorrect	The student chose a situation represented by the equation $y = 12 + x$ instead of $y = 12x$ . The student needs to focus on understanding how to identify situations that can be represented by equations in the form $y = kx$ .

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Item#	Rationale	
12	Option F is correct	<p>To determine the list that shows the weights in order from greatest (largest) to least (smallest), the student should have changed the values in the list to the same form of number, resulting in a list of either all fractions or all decimals. The value of <math>9\frac{3}{8}</math> expressed as a decimal is <math>(9 + 3 \div 8)</math>, or 9.375, and the value of <math>9\frac{3}{4}</math> expressed as a decimal is <math>(9 + 3 \div 4)</math>, or 9.75. The numbers written in decimal form are listed in order from greatest to least as 9.75, 9.5, 9.375, and 9.125. To convert all the decimals in the list to fractions for comparison, the student should have written 9.5 as <math>9\frac{1}{2}</math>, and the student should have written 9.125 as <math>9\frac{1}{8}</math>. The student then should have found the common denominator (bottom number) of 8 for all of the fractions <math>(9\frac{1}{2} = 9\frac{4}{8}</math> and <math>9\frac{3}{4} = 9\frac{6}{8})</math>. The numbers written in fraction form are listed in order from greatest to least as <math>9\frac{6}{8}</math>, <math>9\frac{4}{8}</math>, <math>9\frac{3}{8}</math> and <math>9\frac{1}{8}</math>. The original numbers listed in order from greatest to least are <math>9\frac{3}{4}</math>, 9.5, <math>9\frac{3}{8}</math>, and 9.125.</p>
	Option G is incorrect	<p>The student likely converted the fractions to decimals but converted <math>9\frac{3}{8}</math> to 9.38 and converted <math>9\frac{3}{4}</math> to 9.34. The student needs to focus on understanding how to convert numbers from fractions to decimals.</p>
	Option H is incorrect	<p>The student likely placed the values in order from least to greatest. The student needs to focus on attending to the details of the question in problems that order numbers.</p>
	Option J is incorrect	<p>The student likely placed the values of the fractions in order from greatest to least, followed by the values of the decimals in order from greatest to least. The student needs to focus on understanding how to convert numbers in a list to the same form (decimal or fraction) so the numbers can be compared and ordered.</p>

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Item#	Rationale	
13	Option A is correct	<p>To determine the number of boys in the choir, the student should have interpreted the ratio of the number of boys to the number of girls to mean that for every 5 boys in the choir, there were also 4 girls in the choir. The student could have set up the ratio as a fraction <math>\left(\frac{5}{4}\right)</math>. Then the student could have found an equivalent fraction based on the total number of girls being 60. To get from 4 to 60, a student could have determined that multiplying 4 by 15 was necessary. Then the student could have multiplied 5 by 15 as well <math>\left(\frac{5 \text{ boys} \times 15}{4 \text{ girls} \times 15} = \frac{75 \text{ boys}}{60 \text{ girls}}\right)</math>. The student then should have understood that for every 60 girls in the choir, there are 75 boys in the choir. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.</p>
	Option B is incorrect	<p>The student likely calculated the difference between 60 and 4 and then added this difference to 5, resulting in 61 (<math>60 - 4 = 56</math>; <math>56 + 5 = 61</math>). The student needs to focus on understanding how to determine equivalent ratios.</p>
	Option C is incorrect	<p>The student likely made an error in setting up the ratio, reversing the numbers for boys and girls, before finding the equivalent fraction <math>\left(\frac{4 \text{ boys}}{5 \text{ girls}} = \frac{48 \text{ boys}}{60 \text{ girls}}\right)</math>. The student needs to focus on understanding how to determine equivalent ratios.</p>
	Option D is incorrect	<p>The student likely made an error when multiplying to find the equivalent ratio of the number of boys to the number of girls in the choir, thinking that 4 times 16 is 60 instead of 4 times 15 <math>\left(\frac{5 \text{ boys}}{4 \text{ girls}} \rightarrow \frac{80 \text{ boys}}{60 \text{ girls}}\right)</math>. The student needs to focus on understanding how to determine equivalent ratios.</p>

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Item#	Rationale	
14	Option G is correct	To determine the area of (amount of space covered by) the lawn in square meters, the student should have substituted the values into the formula for the area of a trapezoid from the Area section of the STAAR Grade 6 Mathematics Reference Materials within the student’s test booklet ( $A = \frac{1}{2}(b_1 + b_2)h$ , where $A$ represents the area, $b_1$ represents the length of one base, $b_2$ represents the length of the second base, and $h$ represents the height (vertical distance from top to bottom)). Substituting $b_1 = 12$ , $b_2 = 18$ , and $h = 4$ , the student should have determined that $A = \frac{1}{2}(12 + 18)(4) = 60$ .
	Option F is incorrect	The student likely multiplied the bases (12 and 18) and then multiplied the result by $\frac{1}{2}$ , resulting in 108. The student needs to focus on understanding how to calculate the area of a trapezoid.
	Option H is incorrect	The student likely multiplied the base (18) by the height (4), resulting in 72. The student needs to focus on understanding how to calculate the area of a trapezoid.
	Option J is incorrect	The student likely substituted the values into the formula correctly but did not complete all of the steps, omitting the multiplication by $\frac{1}{2}$ , resulting in 120. The student needs to focus on understanding how to calculate the area of a trapezoid.

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Item#	Rationale	
15	Option C is correct	To determine the statements that describe the relationship between $x$ and $y$ in Data Set I and Data Set II, the student should have determined that in the table for Data Set I, each $y$ -value is 5.5 times the corresponding (paired) $x$ -value, and in the table for Data Set II, each $y$ -value is 5 times the corresponding $x$ -value. The student should have understood that each of the data sets represents a multiplicative relationship because of the operation ( $\times$ ).
	Option A is incorrect	The student likely reversed the meaning of additive ( $+$ ) and multiplicative ( $\times$ ) relationships. The student needs to focus on understanding the difference between “additive” and “multiplicative” relationships.
	Option B is incorrect	The student likely determined the multiplicative relationship in Data Set I correctly but used only the last row of values in the table for Data Set II (5 and 25) to determine the $y$ -value is 20 more than the corresponding $x$ -value and incorrectly identified the relationship as additive ( $+$ ). The student needs to focus on understanding how to determine the relationships of corresponding values in a table in order to differentiate between additive and multiplicative relationships.
	Option D is incorrect	The student likely determined the multiplicative relationship in Data Set II correctly but used only the first row of values in the table for Data Set I (1 and 5.5) to determine the $y$ -value is 4.5 more than the $x$ -value and incorrectly identified the relationship as additive. The student needs to focus on understanding how to determine the relationships of corresponding values in a table in order to differentiate between additive and multiplicative relationships.

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Item#	Rationale	
16	Option H is correct	To determine the point on the number line that best represents $\frac{1}{3}$ , the student should have determined the least (smallest) and greatest (largest) labels on the number line and then used the tick marks on the number line to determine the intervals (distance between the tick marks) used for the number line. The student should have determined that the least value shown is 0 and the greatest value shown is 0.5. The student should also have determined that there are 10 tick marks following 0, and so the interval for the number line is $(0.5 \div 10)$ or 0.05. The student then could have converted $\frac{1}{3}$ to a decimal, which is approximately equal to 0.33. The student could have used the number line to count 0.05 for each tick mark to find that point <i>M</i> falls between 0.3 (6 tick marks past 0) and 0.35 (7 tick marks past 0), meaning that point <i>M</i> best represents $\frac{1}{3}$ .
	Option F is incorrect	The student likely determined that $\frac{1}{3}$ is equivalent to 0.13 instead of approximately 0.33 and chose point <i>K</i> . The student needs to focus on understanding how to convert fractions to decimals.
	Option G is incorrect	The student likely determined that the point just past the third tick mark from 0 (point <i>L</i> ) best represented $\frac{1}{3}$ but did not interpret the interval used for the number line correctly. The student needs to focus on understanding how to determine the intervals of a number line.
	Option J is incorrect	The student likely determined that the point just past the eighth tick mark from 0 (point <i>N</i> ) best represented $\frac{1}{3}$ but did not interpret the interval used for the number line correctly. The student needs to focus on understanding how to determine the intervals of a number line.



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Item#	Rationale	
17	Option A is correct	To determine which inequality represents all possible values for $t$ , the number of hours Ms. Gallegos must ride her bike to burn more than 590 calories, the student should have created an inequality from the given information ( $236t > 590$ ). The student should have understood that to find the total number of calories Ms. Gallegos burns, multiplying 236 by $t$ is necessary, represented by $236t$ . The student also should have understood that, because Ms. Gallegos wants to burn more than 590 calories, the number of hours she rides her bike must lead to a number of calories burned that is greater than ( $>$ ) 590. To solve the inequality and find all the possible values, the student then should have divided both sides of the inequality by 236, resulting in $t > 2.5$ . The number of hours Ms. Gallegos must ride her bike is greater than 2.5 hours.
	Option B is incorrect	The student likely divided both sides of the inequality by 236 but reversed the direction of the inequality symbol, using $<$ instead of $>$ . The student needs to focus on understanding how to model and solve a one-step inequality.
	Option C is incorrect	The student likely divided 236 by 590, instead of 590 by 236, when solving for $t$ . The student needs to focus on understanding how to model and solve a one-step inequality.
	Option D is incorrect	The student likely divided 236 by 590, instead of 590 by 236, when solving for $t$ and reversed the direction of the inequality symbol, using $<$ instead of $>$ . The student needs to focus on understanding how to model and solve a one-step inequality.

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Item#	Rationale	
18	Option J is correct	<p>To determine which percentage bar graph best represents the data, the student should have considered the amount of each type of food out of the total amount of food the guinea pig was given (80 grams). The student could have calculated the fraction of the total amount of food that came from each type and then converted each fraction to a percentage (Hay = <math>\frac{40}{80} = 0.50 = 50\%</math>, Alfalfa pellets = <math>\frac{20}{80} = 0.25 = 25\%</math>, Tomatoes = <math>\frac{10}{80} = 0.125 = 12.5\%</math>, and Lettuce = <math>\frac{10}{80} = 0.125 = 12.5\%</math>). The student then should have used the key for the bar graph and used the percentage of each type of food to determine the bar lengths. The hay bar should end at 50%, because <math>0\% + 50\% = 50\%</math>, the alfalfa pellets bar should end at 75%, because <math>50\% + 25\% = 75\%</math>, the tomatoes bar should end at 87.5%, because <math>75\% + 12.5\% = 87.5\%</math>, and the lettuce bar should end at 100%, because <math>87.5\% + 12.5\% = 100\%</math>.</p>
	Option F is incorrect	<p>The student likely determined the lengths of the bars by using the amounts of food to create the percentages, without dividing by the total (Hay = 40%, Alfalfa pellets = 20%, Tomatoes = 10%, and Lettuce = 10%). The student likely then used these percentages to determine the bar lengths and placements of the bars, not realizing that the bars do not reach 100%. The student needs to focus on understanding how to convert values to percentages and understanding that percentage bar graphs should always go from 0% to 100%.</p>
	Option G is incorrect	<p>The student likely determined the lengths of the bars by using the amounts of food to create the percentages, without dividing by the total (Hay = 40%, Alfalfa pellets = 20%, Tomatoes = 10%, and Lettuce = 10%). The student likely determined the hay bar should end at the 40% label on the graph and then chose the lengths of the other bars by relative length (20% should be a shorter bar than 40% and each 10% should be a shorter bar than 20%). The student likely did not consider the actual lengths of the bars and did not match them to the values in the table. The student needs to focus on understanding how to convert values to percentages and how to display the percentages correctly on percentage bar graphs.</p>

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Item#	Rationale	
	Option H is incorrect	The student likely determined the percentages correctly using the values given in the table (50%, 25%, 12.5%, and 12.5%). The student then likely chose the length of the bar correctly as ending at the 50% label but did not know how to choose the lengths for the values that did not end at labeled values (25%, 12.5%, and 12.5%). The student needs to focus on understanding how to display percentages correctly on percentage bar graphs.

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Item#	Rationale	
19	Option C is correct	To determine the point on the number line that represents the value of $\left -\frac{1}{2}\right $ , or the absolute value (positive distance from zero on the number line) of $-\frac{1}{2}$ , the student should have understood that the tick marks on the number line represent intervals (distance between the tick marks) of 0.5. The student then should have determined $\left -\frac{1}{2}\right  = \frac{1}{2}$ because $-\frac{1}{2}$ is $\frac{1}{2}$ or 0.5 unit from 0. Point <i>R</i> represents a distance of $\frac{1}{2}$ or 0.5 unit from 0.
	Option A is incorrect	The student likely determined that $\left -\frac{1}{2}\right  = -\frac{2}{1} = -2$ and chose point <i>P</i> . The student needs to focus on understanding the concept of absolute value.
	Option B is incorrect	The student likely determined that $\left -\frac{1}{2}\right  = -\frac{1}{2}$ and chose point <i>Q</i> . The student needs to focus on understanding the concept of absolute value.
	Option D is incorrect	The student likely determined that $\left -\frac{1}{2}\right  = \frac{2}{1} = 2$ and chose point <i>S</i> . The student needs to focus on understanding the concept of absolute value.

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Item#	Rationale	
20	Option J is correct	<p>To determine which equation represents the relationship between <math>r</math> and <math>s</math>, the student should have used the given information that <math>s</math> is the independent variable (symbol used to represent an unknown number) and recognized that when each value of <math>s</math> is multiplied by a common factor (number that can be multiplied to get another number) of <math>\frac{1}{6}</math>, the result is the corresponding (paired) value of <math>r</math>.</p> <p>The student then should have determined the equation <math>r = \frac{1}{6}s</math> represents this relationship and can be used to find all of the values in the table</p> $\left(\frac{1}{6} = \frac{1}{6} \times 1, \frac{1}{3} = \frac{1}{6} \times 2, \frac{1}{2} = \frac{1}{6} \times 3, \frac{2}{3} = \frac{1}{6} \times 4, \frac{5}{6} = \frac{1}{6} \times 5, 1 = \frac{1}{6} \times 6\right).$
	Option F is incorrect	<p>The student likely reversed <math>r</math> and <math>s</math> in the relationship and determined the equation as <math>s = \frac{1}{6}r</math>. The student needs to focus on understanding which variable is the independent variable when writing an equation from given values in a table.</p>
	Option G is incorrect	<p>The student likely used the first column of values in the table and determined that the equation <math>r = s - \frac{5}{6}</math> is true for that column. The student needs to focus on understanding how to determine an equation that is true for all values in a given table.</p>
	Option H is incorrect	<p>The student likely reversed <math>r</math> and <math>s</math> in the relationship and used the first column of values in the table and determined that the equation <math>s = r - \frac{5}{6}</math> is true for that column. The student needs to focus on understanding which variable is the independent variable when writing an equation from given values in a table and on understanding how to determine an equation that is true for all values in a given table.</p>

2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
21	16.8 and any equivalent values are correct	<p>To determine the volume of (amount of three-dimensional space taken up by) the rectangular prism in cubic centimeters, the student should have substituted the given values into the formula for the volume of a rectangular prism from the Volume section of the STAAR Grade 6 Mathematics Reference Materials within the student's test booklet (<math>V = Bh</math>, where <math>V</math> represents the volume, <math>B</math> represents the area of (amount of space covered by) the base, and <math>h</math> represents the height (vertical distance from top to bottom)). To determine <math>B</math>, the area of the base, the student should have multiplied 1.4 cm by 4 cm, resulting in <math>5.6 \text{ cm}^2</math>. Then the student should have substituted the values of <math>B = 5.6</math> and <math>h = 3</math> into the volume formula (<math>V = 5.6 \times 3</math>), resulting in a volume of <math>16.8 \text{ cm}^3</math>.</p>

## 2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
22	Option J is correct	To determine how many servings there are in 22.5 ounces of trail mix, the student could have divided 22.5 by 2.5, which results in a quotient (answer to a division problem) of 9.0. 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 divided 22 by 2 and added 0.5 to the quotient ( $11 + 0.5$ ), resulting in 11.5. The student needs to focus on understanding how to divide decimal numbers.
	Option G is incorrect	The student likely added 2.5 to 22.5, resulting in 25.0. The student needs to focus on recognizing when a situation requires division to solve a problem.
	Option H is incorrect	The student likely multiplied 22.5 by 2.5, resulting in 56.25. The student needs to focus on recognizing when a situation requires division to solve a problem.

## 2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
23	Option A is correct	To determine which expression is equivalent to $y + 9 \cdot \frac{3}{4}$ , the student should have grouped $9 \cdot \frac{3}{4}$ by using parentheses, converted $\frac{3}{4}$ to $3 \div 4$ , and applied the commutative property. The commutative property is a property of addition (+) and multiplication (•) that allows for the order of terms in expressions to change without affecting the result. In the original expression, $9 \cdot \frac{3}{4}$ is the rightmost term in the expression and $y$ is the leftmost term, but in the answer choice, the terms have switched positions. Because the operation (addition) is the same in both expressions, $y + 9 \cdot \frac{3}{4}$ and $(9 \cdot 3 \div 4) + y$ , the order of the terms does not matter and the expressions are equivalent.
	Option B is incorrect	The student likely applied ideas from the commutative property by moving the first two values, 9 and $y$ , but did not understand that the operations (+, -, •, ÷) must be the same for the commutative property to be applied. The student needs to focus on understanding how to apply the commutative property to find equivalent expressions.
	Option C is incorrect	The student likely applied ideas from the associative property to this expression and placed parentheses around $y + 9$ and parentheses around $3 \div 4$ . Though the student likely understood that the associative property allows for regrouping of terms without affecting the result, the student disregarded the fact that the operations must be the same between the regrouped terms. The student needs to focus on understanding how to apply the commutative and associative properties to find equivalent expressions.
	Option D is incorrect	The correct answer $((9 \cdot 3 \div 4) + y)$ was presented in one of the other answer options.



2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
24	Option H is correct	To determine that this situation could be represented by the equation $10.75 = 5.5n$ , the student should have determined that $5.5n$ represents the number of miles Ricardo ran each hour for $n$ hours, so the equation $10.75 = 5.5n$ represents $n$ , the number of hours Ricardo would need to run in order to run a total of 10.75 miles.
	Option F is incorrect	The student likely understood that the situation could be represented by an equation that uses multiplication but did not realize that the terms are in the incorrect order. The student chose a situation represented by $n = 5.5(10.75)$ instead of $10.75 = 5.5n$ . The student needs to focus on understanding how to write an equation for a real-world problem.
	Option G is incorrect	The student likely thought that the situation could be represented by an equation that uses addition instead of multiplication. The student chose a situation that can be represented by $10.75 = n + 5.5$ . The student needs to focus on understanding the operations ( $+$ , $-$ , $\cdot$ , $\div$ ) needed in an equation to represent a real-world problem.
	Option J is incorrect	The student likely thought that the situation could be represented by an equation that uses subtraction instead of multiplication. The student chose a situation that can be represented by $10.75 = n - 5.5$ . The student needs to focus on understanding the operations ( $+$ , $-$ , $\cdot$ , $\div$ ) needed in an equation to represent a real-world problem.

2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
25	Option B is correct	To determine the range of the numbers of employees in these departments, the student should have compared the numbers in the given list to identify the least (smallest) and greatest (largest) values. The student then should have subtracted the number with the least value (3) from the number with the greatest value (54), resulting in a range of 51.
	Option A is incorrect	The student likely put the list of numbers in order from least to greatest value and determined the value of the median (middle number in a set of numbers that is ordered by value) instead of the range (3, 6, 14, 17, <u>23</u> , 26, 26, 30, 54). The student needs to focus on understanding the difference between range and median when summarizing data sets.
	Option C is incorrect	The student likely determined the value of the mode (number in a set of numbers that repeats most often) instead of the range. The student needs to focus on understanding the difference between range and mode when summarizing data sets.
	Option D is incorrect	The student likely put the list of numbers in order from least to greatest value and determined the quartiles (values dividing a data set into quarters: first quartile (Q1), second quartile (Q2), and third quartile (Q3)) of the data set (3, 6, <u>Q1</u> , 14, 17, <u>23</u> or <u>Q2</u> , 26, 26, <u>Q3</u> , 30, 54). Because the list has an odd number of values (9), the median (middle number in a set of numbers that is ordered by value) of 23 is also the second quartile (Q2). The values of Q1 and Q3 are calculated by adding the two values on either side of a quartile and dividing by 2 ( $(6 + 14) \div 2 = 10$ and $(26 + 30) \div 2 = 28$ ). The student then likely found the interquartile range (difference between Q3 and Q1 of the data set) by subtracting 10 from 28, resulting in 18. The student needs to focus on understanding the difference between range and interquartile range.

## 2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
26	Option J is correct	To determine the true statement about the three line segments, the student should have first measured the length of the third line segment to the nearest $\frac{1}{2}$ inch and determined the length of the segment was approximately $4\frac{1}{2}$ inches. The student then should have determined that the line segments cannot form a triangle because the longest side of the triangle has to be shorter than 4 inches, since the combined length of the two shortest line segments $\left(1\frac{1}{2} + 2\frac{1}{2}\right)$ is 4 inches.
	Option F is incorrect	The student likely understood that a triangle can have three different side lengths but did not understand that the combined length of the two shortest sides must be greater than the length of the longest side of a triangle. The student needs to focus on understanding how to determine when three line segments form a triangle.
	Option G is incorrect	The student likely made an error in measuring the third line segment. The student needs to focus on understanding how to measure to the nearest $\frac{1}{2}$ inch using a ruler.
	Option H is incorrect	The student likely did not understand that scalene triangles (triangles with no two sides of the same length) exist. The student needs to focus on understanding how to determine when three line segments form a triangle.

2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
27	Option B is correct	To determine the graph that shows the relationship between the number of days and the number of frozen treats sold ( $y = 120x$ ), the student should have first determined that 120 frozen treats sold per day means that in 1 day 120 frozen treats are sold, in 2 days 240 frozen treats are sold, in 3 days 360 frozen treats are sold, in 4 days 480 frozen treats are sold, in 5 days 600 frozen treats are sold, in 6 days 720 frozen treats are sold, in 7 days 840 frozen treats are sold, and in 8 days 960 frozen treats are sold. The student then should have determined that based on the labels and the locations of the points, this graph best shows the relationship.
	Option A is incorrect	The student likely did not recognize that the labels on the graph are reversed, showing the relationship of 1 frozen treat being sold every 120 days instead of 120 frozen treats being sold each day. The student needs to focus on understanding how to use a verbal description to show a relationship in the form $y = kx$ on a graph.
	Option C is incorrect	The student likely determined the relationship to mean 120 frozen treats per 2 days (60 frozen treats per day) and did not recognize that the labels in the graph are reversed, showing the relationship of 1 frozen treat being sold every 60 days. The student needs to focus on understanding how to use a verbal description to show a relationship in the form $y = kx$ on a graph.
	Option D is incorrect	The student likely determined the relationship to mean 120 frozen treats per 2 days (60 frozen treats per day). The student needs to focus on understanding how to use a verbal description to show a relationship in the form $y = kx$ on a graph.

2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
28	Option G is correct	To determine the statement that is NOT supported by the data in the table, the student should have determined that the number of children who chose oatmeal is 15 and that the total number of children in the group is 50 ( $15 + 10 + 2 + 20 + 3 = 50$ ). The value of 15 does not represent 15% (15 out of 100) of the children in the group, since $15 \div 50$ equals 0.30 or 30%.
	Option F is incorrect	The student likely determined the percentage of "other" as 3% (3 out of 100) based on the 3 from the table and compared 3% to 5% ( $3\% < 5\%$ ). The student needs to focus on understanding how to convert values to percentages.
	Option H is incorrect	The student likely determined there was no mode (number in a data set that repeats most often) in this situation since none of the types of cereal or numbers of children were repeated in the table. The student likely did not understand that the mode of a categorical data set (data set with categories like types of cereal) is the category with the greatest number. The student needs to focus on understanding how to determine the mode of a categorical data set.
	Option J is incorrect	The student likely determined that 10 children is not equal to 20% (10 out of 50 or 20 out of 100). The student needs to focus on understanding how to convert values to percentages.
29	180 and any equivalent values are correct	To determine the number of customers who made additional purchases, the student could have multiplied 72% (0.72) by 250, resulting in 180. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
30	Option H is correct	To determine the temperature in degrees Celsius that is less than both of the temperatures Mari recorded, the student should have determined that $-3.4^{\circ}$ is less than $1.6^{\circ}$ . The student should have compared $-3.4^{\circ}$ to $-5.4^{\circ}$ , determining that $-5.4^{\circ}$ is less than $-3.4^{\circ}$ .
	Option F is incorrect	The student likely compared $-3.4^{\circ}$ to $-2.6^{\circ}$ and determined that since $2.6^{\circ}$ is less than $3.4^{\circ}$ , the same is true for $-2.6^{\circ}$ and $-3.4^{\circ}$ . The student needs to focus on understanding how to order negative numbers.
	Option G is incorrect	The student likely determined a temperature that is greater than instead of less than both $-3.4^{\circ}$ and $1.6^{\circ}$ . The student needs to focus on understanding how to order numbers.
	Option J is incorrect	The student likely compared $0^{\circ}$ with $-3.4^{\circ}$ and $1.6^{\circ}$ but ignored the negative sign in $-3.4^{\circ}$ and determined that $0^{\circ}$ is less than both temperatures. The student needs to focus on understanding how to order negative numbers.

2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
31	Option B is correct	To determine the height (vertical distance from top to bottom) of the rectangle, the student could have used the given information and the formula for the area of (amount of space covered by) a rectangle, $A = bh$ , in which $b$ represents the base and $h$ represents the height. The student could have substituted 45.5 for $A$ and 7 for $b$ and solved the equation $45.5 = 7h$ by dividing both sides of the equation by 7, resulting in $h = 6.5$ .
	Option A is incorrect	The student likely multiplied 45.5 by 7 instead of dividing 45.5 by 7 when solving for $h$ . The student needs to focus on understanding how to write and solve a one-step equation that represents a geometric concept.
	Option C is incorrect	The student likely used the formula for the perimeter (distance around the outside) of a rectangle, $P = 2l + 2w$ , and solving for $w$ , substituted 45.5 for $P$ and 7 for $l$ . The student likely solved the equation $(45.5) = 2(7) + 2(w)$ by subtracting 14 from both sides of the equation and then dividing both sides of the equation by 2, resulting in $w = 15.75$ . The student needs to focus on understanding how to write and solve a one-step equation that represents a geometric concept.
	Option D is incorrect	The student likely subtracted 7 from 45.5 instead of dividing 45.5 by 7 when solving for $h$ . The student needs to focus on understanding how to solve a one-step equation.

2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
32	Option F is correct	To determine the point that is best represented by the ordered pair $(2, -5.5)$ , the student should have determined the point with an ordered pair that is 2 units right of the origin (point where the $x$ -axis (horizontal) and the $y$ -axis (vertical) on a coordinate grid intersect; also the point represented by the ordered pair $(0, 0)$ ) and $-5.5$ units below the origin. Because point $W$ is located 2 units to the right of the origin, the value of the $x$ -coordinate (horizontal position from 0) of point $W$ is 2, and the value of the $y$ -coordinate (vertical position from 0) of point $W$ is $-5.5$ .
	Option G is incorrect	The student likely chose a point (point $V$ ) represented by an ordered pair with the opposite sign for the value of the $x$ -coordinate ( $-2$ instead of 2). The student needs to focus on understanding how to graph ordered pairs on a coordinate grid.
	Option H is incorrect	The student likely chose a point (point $S$ ) represented by an ordered pair with reversed values for the $x$ -coordinate and the $y$ -coordinate and with the opposite signs for the values of the $x$ -coordinate and the $y$ -coordinate ( $-2$ instead of 2, $5.5$ instead of $-5.5$ ), resulting in the point located at $(5.5, -2)$ instead of $(2, -5.5)$ . The student needs to focus on understanding how to graph ordered pairs on a coordinate grid.
	Option J is incorrect	The student likely chose a point (point $R$ ) represented by an ordered pair with reversed values for the $x$ -coordinate and the $y$ -coordinate, resulting in the point located at $(-5.5, 2)$ instead of $(2, -5.5)$ . The student needs to focus on understanding how to graph ordered pairs on a coordinate grid.
33	535.25 and any equivalent values are correct	To determine the balance of Raúl's checking account after the transaction on April 13 in dollars and cents, the student should have used the starting balance ( $\$539.50$ ), subtracted the amount of each withdrawal from the balance, and added the amount of the deposit to the balance ( $\$539.50 - \$35.50 - \$23.75 + \$55.00 = \$535.25$ ), resulting in a balance of $\$535.25$ after the transaction on April 13. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.



2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
34	Option G is correct	<p>To determine the number of packages of flour tortillas the clerk could have put on the shelf, the student could have first determined the number of packages of flour tortillas out of every 16 packages of tortillas the clerk put on the shelf. Using the ratio of the number of packages of corn tortillas to the total number of packages of tortillas <math>\left(\frac{7}{16}\right)</math>, the student should have determined that the remaining 9 packages of tortillas out of every 16 packages must be packages of flour tortillas (<math>16 - 7 = 9</math>). Based on this information, the student should have determined that the numbers of packages of flour tortillas should always be multiples of 9 (numbers that can be divided by 9 evenly). The student should have determined that 18 is the only multiple of 9 in the answer choices. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.</p>
	Option F is incorrect	<p>The student likely added the values in the ratio of the number of packages of corn tortillas (7) to the total number of packages of tortillas (16) on the shelf, resulting in 23. The student needs to focus on understanding how to determine equivalent ratios to solve real-world problems.</p>
	Option H is incorrect	<p>The student likely found the number of packages of corn tortillas the clerk could have put on the shelf instead of the number of packages of flour tortillas. The student needs to focus on understanding how to determine equivalent ratios to solve real-world problems.</p>
	Option J is incorrect	<p>The student likely used 16 as the number of packages of flour tortillas instead of the total number of packages, resulting in 32, since 32 is a multiple of 16 (<math>16 \times 2 = 32</math>). The student needs to focus on understanding how to use equivalent ratios to solve real-world problems.</p>

2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
35	Option D is correct	To determine which expression is equivalent to $4(3 + 5) - 3 \cdot 9^2$ , the student should have used the order of operations, or PEMDAS. The student should have completed the operations in this order: 1. Operations contained in <u>P</u> arentheses or brackets, 2. <u>E</u> xponents (numbers raised to a power), 3. <u>M</u> ultiplication/ <u>D</u> ivision from left to right, and 4. <u>A</u> ddition/ <u>S</u> ubtraction from left to right. First the student should have determined that $9^2 = 81$ . Then the student should have determined that $(3 + 5) = 8$ , resulting in the expression $4(8) - 3 \cdot 81$ .
	Option A is incorrect	The student likely evaluated the expression from left to right without paying attention to the parentheses and without using the correct order of operations $(4(3) + 5 - 3 \cdot 9^2 = 12 + 5 - 3 \cdot 9^2 = 17 - 3 \cdot 9^2 = 14 \cdot 9^2$ , resulting in $14 \cdot 81$ ). The student needs to focus on using the correct order of operations to determine equivalent expressions.
	Option B is incorrect	The student likely evaluated the expression without paying attention to the parentheses and without using the correct order of operations $(4(3) + 5 - (3 \cdot 9^2) = 12 + 5 - (3 \cdot 9^2) = 17 - (3 \cdot 9)^2$ , resulting in $17 - (27)^2$ ). The student needs to focus on using the correct order of operations to determine equivalent expressions.
	Option C is incorrect	The student likely evaluated the expression without using the correct order of operations and multiplied 9 by 2 instead of squaring 9 $(4(3 + 5) - (3 \cdot 9)^2 = 4(3 + 5) - (27)^2 = 4(3 + 5) - (27) \cdot 2 = 4(3 + 5) - 54 = 4(3) + 4(5) - 54$ , resulting in $12 + 20 - 54$ ). The student needs to focus on using the correct order of operations to determine equivalent expressions.

## 2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
36	Option J is correct	To determine the value of $\frac{4}{15} \div \frac{2}{3}$ , the student should have inverted (flipped upside down) the second fraction and multiplied $\left(\frac{4}{15} \cdot \frac{3}{2} = \frac{12}{30}\right)$ and then simplified $\left(\frac{12 \div 6}{30 \div 6} = \frac{2}{5}\right)$ .
	Option F is incorrect	The student likely multiplied the fractions without inverting the second fraction $\left(\frac{4}{15} \cdot \frac{2}{3}\right)$ , resulting in $\frac{8}{45}$ . The student needs to focus on understanding how to divide fractions.
	Option G is incorrect	The student likely added the fractions $\left(\frac{4}{15} + \frac{2}{3} = \frac{4}{15} + \frac{10}{15}\right)$ , resulting in $\frac{14}{15}$ . The student needs to focus on understanding how to divide fractions.
	Option H is incorrect	The student likely inverted the first fraction and multiplied $\left(\frac{15}{4} \cdot \frac{2}{3} = \frac{30}{12}\right)$ and then simplified $\left(\frac{30 \div 6}{12 \div 6} = \frac{5}{2}\right)$ . The student needs to focus on understanding how to divide fractions.

2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
37	Option B is correct	To determine the equation that can be used to represent the relationship between $A$ , the area of (amount of space covered by) the squares, and $s$ , the side length of the squares, the student should have looked at the corresponding (paired) numbers in each column. The student should have determined that each value of $A$ is equivalent to each corresponding value of $s$ multiplied by itself ( $1 = 1 \cdot 1$ , $4 = 2 \cdot 2$ , $49 = 7 \cdot 7$ , and $64 = 8 \cdot 8$ ), so $A = s \cdot s$ .
	Option A is incorrect	The student likely used the first column of values in the table and determined that the equation $A = s$ is true for that column ( $1 = 1$ ). The student needs to focus on understanding how to determine an equation that is true for all corresponding values in a table.
	Option C is incorrect	The student likely used the second column of values in the table and determined that the equation $A = 2 + s$ is true for that column ( $4 = 2 + 2$ ). The student needs to focus on understanding how to determine an equation that is true for all corresponding values in a table.
	Option D is incorrect	The student likely used the second column of values in the table and determined that the equation $A = s + s$ is true for that column ( $4 = 2 + 2$ ). The student needs to focus on understanding how to determine an equation that is true for all corresponding values in a table.

2019 STAAR Grade 6 Math Rationales

Item#	Rationale	
38	Option F is correct	To determine the kind of financial assistance Riley received, the student should have recognized that a student loan has to be paid back along with any interest that may accrue after graduation.
	Option G is incorrect	The student likely misinterpreted the meaning of a scholarship, not understanding that it is a way to pay for college that does not need to be paid back after graduation. The student needs to focus on understanding the different ways to pay for college.
	Option H is incorrect	The student likely misinterpreted the meaning of a work-study, not understanding that it is a way to pay for college that does not need to be paid back after graduation. The student needs to focus on understanding the different ways to pay for college.
	Option J is incorrect	The student likely misinterpreted the meaning of a savings plan, not understanding that it is a way to pay for college that does not need to be paid back after graduation. The student needs to focus on understanding the different ways to pay for college.