

2019 STAAR Grade 5 Math Rationales

Item#	Rationale	
1	Option A is correct	To determine each $y$ -value in the table, the student should have multiplied 12 by each corresponding (paired) $x$ -value ( $3 \times 12 = 36$ ; $6 \times 12 = 72$ ; $9 \times 12 = 108$ ; and $15 \times 12 = 180$ ).
	Option B is incorrect	The student likely added 12 to each $x$ -value to determine each corresponding $y$ -value ( $2 + 12 = 14$ ; $6 + 12 = 18$ ; $10 + 12 = 22$ ; and $14 + 12 = 26$ ) instead of multiplying each $x$ -value by 12. The student needs to focus on understanding how to use a multiplication rule in an equation to generate a numerical pattern in a table.
	Option C is incorrect	The student likely added 36 to each $y$ -value to get the next $y$ -value ( $36 + 36 = 72$ ; $72 + 36 = 108$ ; and $108 + 36 = 144$ ) instead of multiplying each $x$ -value by 12. The student needs to focus on understanding how to use a multiplication rule in an equation to generate a numerical pattern in a table.
	Option D is incorrect	The student likely added 12 to each $y$ -value to get the next $y$ -value ( $24 + 12 = 36$ ; $36 + 12 = 48$ ; and $48 + 12 = 60$ ) instead of multiplying each $x$ -value by 12. The student needs to focus on understanding how to use a multiplication rule in an equation to generate a numerical pattern in a table.

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2	Option H is correct	<p>To determine how much Rebecca paid for the 8 air filters, the student should have used the order of operations, or PEMDAS. The student should have completed the operations in this order:</p> <ol style="list-style-type: none"> <li>1. Operations contained in <u>P</u>arentheses or brackets,</li> <li>2. <u>E</u>xponents (numbers raised to a power),</li> <li>3. <u>M</u>ultiplication/<u>D</u>ivision from left to right, and</li> <li>4. <u>A</u>ddition/<u>S</u>ubtraction from left to right.</li> </ol> <p>First the student should have performed the multiplication step within the parentheses (<math>8 \times 16.95</math>), resulting in 135.60. Then the student should have subtracted 7.50 from 135.60, resulting in \$128.10.</p>
	Option F is incorrect	<p>The student likely performed the operations in the correct order but made a computation error when performing the multiplication step by not regrouping in each step, resulting in 88.20. The student likely subtracted 7.50 from 88.20 correctly (<math>88.20 - 7.50 = 80.70</math>). The student needs to focus on understanding how to regroup when completing the steps in the multiplication algorithm (procedure).</p>
	Option G is incorrect	<p>The student likely interpreted the coupon as an increase in price instead of a decrease in price and added 7.50 to 135.60 in the second step instead of subtracting (<math>135.60 + 7.50 = 143.10</math>). The student needs to focus on understanding how to perform the operations that are given in an expression (combination of numbers and operational symbols (<math>+</math>, <math>-</math>, <math>\times</math>, <math>\div</math>) grouped together to show the value) presented in a problem.</p>
	Option J is incorrect	<p>The student likely performed the subtraction step first (<math>16.95 - 7.50 = 9.45</math>) and the multiplication step second (<math>8 \times 9.45 = 75.60</math>). The student needs to focus on understanding how to perform the order of operations.</p>

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Item#	Rationale	
3	Option A is correct	To determine which point is located inside the polygon (closed figure with at least three sides), the student should have first plotted points for the ordered pairs $(1, 3)$ , $(3, 6)$ , $(7, 6)$ , and $(9, 3)$ on the blank coordinate grid. To plot each point, the student should have started at the origin (the point at $(0, 0)$ ) and used the $x$ -coordinate (first number in an ordered pair) to determine how many units to move to the right and then used the $y$ -coordinate (second number in an ordered pair) to determine how many units to move up. Then the student should have plotted the point at the resulting location. Next the student should have drawn line segments to connect the points in the order they were plotted to form the polygon. Finally the student should have plotted a point for each of the ordered pairs given in the answer options and noticed that only the point at $(4, 5)$ is located inside the polygon.
	Option B is incorrect	The student likely plotted the given points correctly but identified a point that was located outside the polygon instead of inside the polygon. The student needs to focus on attending to the details of the question in problems that involve graphing points.
	Option C is incorrect	The student likely plotted the given points correctly but reversed the coordinates of the point at $(5, 7)$ when graphing it on the coordinate grid. The student likely plotted the point at $(7, 5)$ and saw that the point was inside the polygon. The student needs to focus on understanding how to graph a point on a coordinate grid using $x$ - and $y$ -coordinates.
	Option D is incorrect	The student likely plotted the given points correctly but reversed the coordinates of the point at $(3, 1)$ when graphing it on the coordinate grid. The student likely identified a point that was at a vertex (corner) of the polygon instead of inside the polygon. The student needs to focus on understanding how to graph a point on a coordinate grid using the $x$ - and $y$ -coordinates.

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Item#	Rationale	
4	Option J is correct	To determine the number of students who did not pick strawberry as their favorite ice-cream flavor, the student could have added the number of students who picked vanilla to the number of students who picked chocolate. The bar graph shows that there were 50 students who picked vanilla and 65 students who picked chocolate, so the number of students who did not pick strawberry was $50 + 65 = 115$ . 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 how many students did pick strawberry as their favorite ice-cream flavor instead of how many students did not pick strawberry. The student needs to focus on attending to the details of the question when solving problems involving graphs.
	Option G is incorrect	The student likely determined how many students did not pick vanilla as their favorite ice-cream flavor instead of how many students did not pick strawberry ( $65 + 55 = 120$ ). The student needs to focus on attending to the details of the question when solving problems involving graphs.
	Option H is incorrect	The student likely determined the total number of students who picked a favorite ice-cream flavor ( $50 + 65 + 55 = 170$ ) but then did not regroup when subtracting 55 from 170, resulting in 125. The student needs to focus on understanding how to regroup when completing the steps in the subtraction algorithm (procedure).

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5	Option D is correct	To determine the correct expression (combination of numbers and operational symbols (+, -, ×, ÷) grouped together to show the value), the student should have identified that there are 3 identical rectangles representing the weeks in the model and that 3 of the 7 parts $\left(\frac{3}{7}\right)$ of each rectangle are shaded. The student should have recognized that the expression $3 \times \frac{3}{7}$ represents the 3 rectangles in the model, each with $\frac{3}{7}$ shaded.
	Option A is incorrect	The student likely recognized that there were 3 identical rectangles in the model but misinterpreted the fraction represented by each rectangle as $\frac{3}{4}$ , using the number of shaded parts as the numerator (top number) and the number of unshaded parts as the denominator (bottom number). The student then likely identified an expression that uses addition instead of multiplication. The student needs to focus on understanding how to interpret a fraction represented by a model and how to represent multiplication of a whole number and a fraction using a pictorial model.
	Option B is incorrect	The student likely recognized that there were 3 identical rectangles in the model and that $\frac{3}{7}$ of each rectangle was shaded but identified an expression that uses addition instead of multiplication. The student needs to focus on understanding how to represent multiplication of a whole number and a fraction using a pictorial model.
	Option C is incorrect	The student likely recognized that there were 3 identical rectangles in the model and that the model represents a multiplication expression but misinterpreted the fraction represented by each rectangle of the model as $\frac{3}{4}$ , using the number of shaded sections as the numerator (top number) and the number of unshaded sections as the denominator (bottom number). The student needs to focus on understanding how to interpret a fraction represented by a model.

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6	0.6 and any equivalent values are correct	To round to the tenths place, the student should have determined that the digit in the tenths place (first digit to the right of the decimal point) is 6 ( $0.\underline{6}4$ ). The student should have then looked at the digit to the right of the 6 ( $0.6\underline{4}$ ) and compared it to 5. Because 4 is less than 5, the digit 6 is left as is, and the answer is 0.6.

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Item#	Rationale	
7	Option A is correct	To determine the number of ounces of pretzels Ms. Jaffey put into each bowl, the student could have divided the total number of ounces of pretzels by the number of bowls ( $428.5 \div 5$ ), resulting in 85.7 oz. 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 428.5 by 5 but miscalculated the first digit of the quotient (answer) to be 9 instead of 8 and then subtracted 42 from 45, resulting in 3. The student then likely performed the rest of the division algorithm (procedure) correctly, resulting in 97.7 oz. The student needs to focus on understanding how to carry out all the steps in the division algorithm with accuracy.
	Option C is incorrect	The student likely estimated the number of ounces of pretzels Ms. Jaffey put into each bowl by rounding 428.5 to 400 before dividing by 5. The student needs to focus on understanding when a problem situation requires an exact solution instead of an estimated solution.
	Option D is incorrect	The student likely divided 428.5 by 5 correctly to get the first two digits (85) of the quotient (answer). Then the student likely placed the decimal point in the quotient and placed the remainder from the second subtraction step ( $28 - 25 = 3$ ) at the end of 85, resulting in 85.3 oz. The student likely disregarded the last digit (5) in the dividend (number being divided). The student needs to focus on understanding how to carry out all the steps in the division algorithm (procedure) with accuracy.

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Item#	Rationale	
8	Option J is correct	To determine what the parentheses indicate in the given expression (combination of numbers and operational symbols ( + , - , × , ÷ ) grouped together to show the value), 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. The student should have understood that the P in PEMDAS indicates that operations contained in <u>P</u> arentheses or brackets should be performed first, which means that 6 should be subtracted from 72 before the result is multiplied by 4.
	Option F is incorrect	The student identified the part of the expression to the left of the parentheses rather than focusing on the part of the expression within the parentheses. The student needs to focus on recognizing and understanding the meaning of parentheses and brackets in a numeric expression.
	Option G is incorrect	The student likely recognized that the 4 next to the parentheses indicated multiplication but did not understand that the operation inside the parentheses should be performed first. The student needs to focus on understanding the meaning of parentheses and brackets in a numeric expression.
	Option H is incorrect	The student likely understood that addition and subtraction should be performed from left to right and identified a statement that indicates the addition step should be performed before the subtraction step without realizing that the operation inside the parentheses should be performed first. The student needs to focus on understanding the meaning of parentheses and brackets in a numeric expression.



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Item#	Rationale	
9	Option C is correct	<p>To determine how much syrup in gallons was used in each cherry snow cone, the student should have interpreted “the same amount of syrup in each snow cone” to mean division into equal parts. The student could have determined that to divide <math>\frac{1}{4}</math> by 16, the number 16 first has to be considered a fraction with a denominator (bottom number) of 1, represented by <math>\frac{16}{1}</math>. Then the student could have determined that <math>\frac{1}{4}</math> divided by <math>\frac{16}{1}</math> is equal to <math>\frac{1}{4}</math> multiplied by <math>\frac{16}{1}</math> inverted (flipped upside down) <math>\left(\frac{1}{4} \div \frac{16}{1} = \frac{1}{4} \times \frac{1}{16} = \frac{1}{64}\right)</math>. 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 <math>\frac{1}{16}</math> by <math>\frac{1}{4}</math>, resulting in <math>\frac{1}{4}</math> gallon. The student needs to focus on understanding how to interpret a situation that can be represented by dividing a fraction by a whole number.</p>
	Option B is incorrect	<p>The student likely multiplied 16 by <math>\frac{1}{4}</math>, resulting in 4 gallons. The student needs to focus on understanding how to interpret a situation that can be represented by dividing a fraction by a whole number.</p>
	Option D is incorrect	<p>The student likely understood that <math>\frac{1}{4}</math> should be divided by 16 but inverted (flipped upside down) the fraction <math>\frac{1}{4}</math> instead of the fraction <math>\frac{16}{1}</math> and calculated the product (answer) of <math>\frac{4}{1} \times \frac{16}{1}</math>, resulting in 64 gallons. The student needs to focus on understanding how to use the algorithm (procedure) to divide fractions by whole numbers.</p>

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Item#	Rationale	
10	Option H is correct	To determine which statement is true about Cheyenne’s weekly income, the student should have first determined that her weekly gross income (income before paying taxes) is $\$8 \times 15 = \$120$ . Then the student should have realized that her weekly net income (income after paying taxes) would be less than her weekly gross income of \$120.
	Option F is incorrect	The student likely confused the definitions of gross income and net income and did not understand that the given information could be used only to calculate Cheyenne’s weekly gross income. The student needs to focus on understanding the difference between gross income and net income.
	Option G is incorrect	The student likely confused the definitions of gross income and net income. The student needs to focus on understanding the difference between gross income and net income.
	Option J is incorrect	The student likely misunderstood that the given information could be used only to calculate Cheyenne’s weekly gross income and thought the \$120 represented her weekly net income. The student likely determined that her gross income would be greater than her net income. The student needs to focus on understanding that gross income can be calculated by multiplying the number of hours worked by the hourly rate of earnings.

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Item#	Rationale	
11	Option B is correct	To determine the distance in kilometers Nathan rode his bike ( $n$ ), the student should have first determined the distance in kilometers that Philip rode his bike. To do this, the student should have subtracted 12 from the number of kilometers Christine rode (27) because Philip rode 12 kilometers less than Christine. Since Nathan rode his bike 3 times as far as Philip, the student should have multiplied the result of subtracting 12 from 27 by 3. This is represented by the equation $(27 - 12) \times 3 = n$ .
	Option A is incorrect	The student likely did not understand that a multiplication step was needed to represent "3 times as far as" when determining the number of miles that Nathan rode his bike and that a subtraction step was needed to represent "12 kilometers less than" when determining the number of kilometers that Philip rode his bike. The student needs to focus on understanding how a number in a problem situation is related to the other numbers in the problem situation and the mathematical operations (+, -, ×, ÷) that are required to solve the problem.
	Option C is incorrect	The student likely did not understand that a multiplication step was needed to represent "3 times as far as" when determining the number of miles that Nathan rode his bike. The student needs to focus on understanding how a number in a problem situation is related to the other numbers in the problem situation and the mathematical operations (+, -, ×, ÷) that are required to solve the problem.
	Option D is incorrect	The student likely did not understand that a subtraction step was needed to represent "12 kilometers less than" when determining the number of kilometers that Philip rode his bike. The student needs to focus on understanding how a number in a problem situation is related to the other numbers in the problem situation and the mathematical operations (+, -, ×, ÷) that are required to solve the problem.

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Item#	Rationale	
12	Option J is correct	To determine which figures belong in the part of the organizer labeled "Isosceles triangles" (triangles that each have at least two sides of equal length), the student should have used the hash marks on the sides of each triangle. Because sides of a triangle that are marked with the same number of hash marks indicate sides of equal length, the student should have identified that Figure II, Figure IV, and Figure V each have at least two sides that are the same length.
	Option F is incorrect	The student identified Figure II and Figure V as isosceles triangles but did not notice that Figure IV also has two sides that are the same length. The student needs to focus on understanding how to identify isosceles triangles.
	Option G is incorrect	The student identified the figures that represent right triangles (triangles that have one $90^\circ$ angle) instead of isosceles triangles. The student needs to focus on understanding how to identify isosceles triangles.
	Option H is incorrect	The student identified the figures that represent scalene triangles (triangles that have no sides that are the same length) instead of isosceles triangles. The student needs to focus on understanding how to identify isosceles triangles.

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Item#	Rationale	
13	Option B is correct	To determine the number of kilometers that Dion ran during 28 days, the student should have multiplied 3.75 by 28 ( $3.75 \times 28 = 105$ ). The student should have determined that multiplying 375 (3.75 without the decimal point) by 28 results in an answer of 10,500. To determine the placement of the decimal point, the student should have added the numbers of digits to the right of the decimal point in 3.75 (two) and 28 (zero) and then counted that total number of digits (two) from the right of 10,500 to place the decimal point in the answer (105 km).
	Option A is incorrect	The student likely calculated the correct product (answer) of 375 and 28 but miscounted the total number of digits to the right of the decimal points in the two given numbers to be three instead of two and then counted three digits from the right of 10,500 to place the decimal point in the answer. The student needs to focus on understanding where to place the decimal point in the product when multiplying decimal numbers.
	Option C is incorrect	The student likely misunderstood the number of days to be the number of school days in a typical week (5) and then calculated the correct product (answer) of 375 and 5. The student likely did not count the total number of digits to the right of the decimal points in 3.75 and 5 to determine how far to move the decimal point in the answer. The student needs to focus on attending to the details of the question when solving problems involving multiplication of decimal numbers.
	Option D is incorrect	The student likely misunderstood the number of days to be the number of school days in a typical week (5) and then calculated the correct product (answer) of 375 and 5. The student likely counted the total number of digits to the right of the decimal points in 3.75 and 5 to determine how far to move the decimal point in the answer. The student needs to focus on attending to the details of the question and understanding where to place the decimal point in the product when solving problems involving multiplication of decimal numbers.

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Item#	Rationale	
14	Option H is correct	To determine the position Juan’s suitcase would be in if the weights of the suitcases in pounds were ordered from greatest to least, the student should have compared the digits of each place value in each weight. Since all four weights have the digit 2 in the tens place (leftmost digit), the student should have compared the digits in the ones place (digit to the left of the decimal point) of each weight. The weights of Juan’s suitcase and Kimberly’s suitcase have a smaller value in the ones place than the weights of Tiana’s suitcase and Emanuel’s suitcase (2 <u>1</u> is less than 2 <u>4</u> ), so they should be listed after the weights of Tiana’s suitcase and Emanuel’s suitcase. Since the weight of Kimberly’s suitcase has a smaller value in the tenths place (digit to the right of the decimal point) than the weight of Juan’s suitcase (21. <u>4</u> is less than 21. <u>6</u> ), the weight of Kimberly’s suitcase is the least and should be listed last. The weight of Juan’s suitcase is the next least, so it should be listed third. The order from greatest to least should be Tiana’s suitcase (24.8 pounds), Emanuel’s suitcase (24.75 pounds), Juan’s suitcase (21.605 pounds), and Kimberly’s suitcase (21.48 pounds).
	Option F is incorrect	The student likely thought the values in the table were already in order from greatest to least. The student needs to focus on understanding how to compare decimal numbers.
	Option G is incorrect	The student likely listed the weights of the suitcases from least to greatest instead of from greatest to least. The student needs to focus on attending to the details of the question in problems that require ordering decimal numbers.
	Option J is incorrect	The student likely thought that the number with the most digits after the decimal point had the least value. The student needs to focus on understanding how to compare decimal numbers.

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Item#	Rationale	
15	Option B is correct	To determine the difference between $\frac{5}{6}$ and $\frac{1}{4}$ , the student could have used the model to find equivalent fractions with the same denominator (bottom number) and then subtracted the fractions to determine the difference: $\frac{10}{12} - \frac{3}{12} = \frac{7}{12}$ . 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 subtracted the denominator of $\frac{1}{4}$ from the numerator (top number) of $\frac{5}{6}$ and used the result of $5 - 4 = 1$ for the numerator of the answer. Then the student likely subtracted the numerator of $\frac{1}{4}$ from the denominator of $\frac{5}{6}$ and used the result of $6 - 1 = 5$ for the denominator of the answer. The student needs to focus on understanding that, when adding or subtracting fractions, a common denominator must be found/used.
	Option C is incorrect	The student likely subtracted the denominators of the fractions ( $6 - 4 = 2$ ) and identified the answer choice with 2 as a denominator. The student needs to focus on understanding that, when adding or subtracting fractions, a common denominator must be found/used.
	Option D is incorrect	The student likely recognized from the model that $\frac{1}{4}$ is equivalent to $\frac{2}{8}$ . Then the student likely counted the number of additional $\frac{1}{8}$ sections that were needed to get from $\frac{2}{8}$ to a value closest to $\frac{5}{6}$ in the model, resulting in $5 \times \frac{1}{8} = \frac{5}{8}$ . The student needs to focus on understanding that, when adding or subtracting fractions, a common denominator must be found/used.

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Item#	Rationale	
16	Option F is correct	To determine the perimeter (distance around the outside) in inches of the triangle, the student could have first calculated the perimeter in inches of the rectangle by using the rectangle formula from the Perimeter section of the STAAR Grade 5 Mathematics Reference Materials page within the student's test booklet, $P = 2l + 2w$ , where $P$ = perimeter, $l$ = length, and $w$ = width. The perimeter of the rectangle is $P = 2(11) + 2(7) = 36$ . Finally the student could have subtracted the perimeter of the rectangle (36) from the combined perimeter of the rectangle and triangle (63), which results in a perimeter of $63 - 36 = 27$ for the triangle. 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 added the two given side lengths of the rectangle and subtracted the result from 63 inches. The student needs to focus on understanding how to determine the perimeter of a rectangle when the lengths of two adjacent sides are given.
	Option H is incorrect	The student likely calculated the correct perimeter of the triangle but assumed the triangle was equilateral (all sides are the same length) and divided the perimeter by 3 to determine the length of each side. The student needs to focus on understanding problem situations with multiple steps and how to solve them.
	Option J is incorrect	The student likely assumed that each side of the triangle was the same length as the 7-inch side of the rectangle and multiplied 7 inches by 3 to determine the perimeter of the triangle ( $7 \times 3 = 21$ ). The student needs to focus on understanding problem situations with multiple steps and how to solve them.



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Item#	Rationale	
17	Option D is correct	To determine which equation is represented by the model, the student should have interpreted that the 72 shaded squares represent a value of 0.72, that the 9 outlined sections represent dividing the 0.72 into 9 equal groups, and that the 8 shaded squares in each group represent a value of 0.08. Therefore the model represents the equation $0.72 \div 9 = 0.08$ .
	Option A is incorrect	The student likely miscounted the number of squares in each group as 9 instead of 8 and thought the value of the shaded squares in each group was 9 ones instead of 9 hundredths. The student needs to focus on understanding how to represent quotients (answers) of decimals using pictorial models.
	Option B is incorrect	The student likely miscounted the number of squares in each group as 9 instead of 8. The student needs to focus on carefully examining a given pictorial model to determine the quotient (answer) of decimals that the model represents.
	Option C is incorrect	The student likely thought the 8 shaded squares in each group were equal to 8 ones instead of 8 hundredths. The student needs to focus on understanding how to represent quotients (answers) of decimals using pictorial models.

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Item#	Rationale	
18	Option F is correct	To determine which movement Yvonne should do first, the student should have recognized that starting at the origin (point where the horizontal $x$ -axis and the vertical $y$ -axis on a coordinate grid intersect) meant starting at the ordered pair $(0, 0)$ . Then the student should have recognized that the first movement required to find the location of $(3, 7)$ is to find the $x$ -coordinate (first number in an ordered pair). An $x$ -coordinate of 3 indicates moving right along the $x$ -axis 3 units.
	Option G is incorrect	The student likely confused the $y$ -coordinate (second number in an ordered pair) for the $x$ -coordinate and thought Yvonne should move up along the $y$ -axis to 3. The student needs to focus on understanding that the $x$ -coordinate is the first number in an ordered pair and indicates how far to move along the $x$ -axis on a coordinate grid.
	Option H is incorrect	The student likely confused the directions of the $x$ -axis and the $y$ -axis and thought the $y$ -coordinate (second number in an ordered pair) of 7 should be used first when finding the location of the given point. The student needs to focus on understanding that the $x$ -coordinate is the first number in an ordered pair and indicates how far to move along the $x$ -axis on a coordinate grid.
	Option J is incorrect	The student likely confused the $y$ -coordinate (second number in an ordered pair) for the $x$ -coordinate and confused the directions of the $x$ -axis and the $y$ -axis and thought that Yvonne should first move up along the $x$ -axis to 7. The student needs to focus on understanding that the $x$ -coordinate is the first number in an ordered pair and indicates how far to move along the $x$ -axis on a coordinate grid.

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Item#	Rationale	
19	Option C is correct	To determine how many liters of liquid soap remained in the bottle, the student could have first determined how much of the 2 liters of soap was put into the two containers by adding 0.475 liter to 0.35 liter, resulting in 0.825 liter. Then the student could have subtracted this amount from the amount of liquid soap in the full bottle (2 liters), resulting in 1.175 liters. The student also could have subtracted the amount of soap in each container from the amount of soap in the full bottle in two separate steps ( $2 - 0.475 = 1.525$ , $1.525 - 0.35 = 1.175$ ). This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option A is incorrect	The student likely determined the total amount of liquid soap that was put into the two containers ( $0.475 + 0.35 = 0.825$ ) but did not perform any additional steps. The student needs to focus on understanding problem situations and the mathematical operations (+, -, ×, ÷) needed to solve them.
	Option B is incorrect	The student likely determined the total amount of liquid soap that was put into the two containers ( $0.475 + 0.35 = 0.825$ ) but subtracted 0.2 liters from 0.825 liters instead of subtracting 0.825 liters from 2 liters ( $0.825 - 0.2 = 0.625$ ). The student needs to focus on how to rewrite a whole number as a decimal number.
	Option D is incorrect	The student likely aligned the numbers 0.475 and 0.35 on their rightmost digits when adding and got an answer of 0.51. Then the student likely subtracted this amount from 2 liters ( $2 - 0.51 = 1.49$ ). The student needs to focus on understanding how to add decimal numbers using the algorithm (procedure).

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Item#	Rationale	
20	Option G is correct	To determine the difference between the number of students who did more than 36 sit-ups and the number of students who did fewer than 25 sit-ups, the student should have analyzed the stem and leaf plot looking for values greater than 36 and less than 25. Using the key "6 2 means 62" to interpret the meaning of the stems and leaves, the student should have determined that there are 12 values on the stem and leaf plot that are greater than 36 (37, 44, 46, 47, 47, 50, 53, 62, 62, 76, 90, and 92) and six values on the stem and leaf plot that are less than 25 (9, 13, 17, 19, 20, and 23). Then the student should have subtracted 6 from 12, resulting in a difference of 6.
	Option F is incorrect	The student likely subtracted the given numbers of 36 and 25 to determine the answer ( $36 - 25 = 11$ ). The student needs to focus on understanding how to solve a one-step problem using data from a stem and leaf plot.
	Option H is incorrect	The student likely calculated the number of students who did more than 36 sit-ups and the number of students who did fewer than 25 sit-ups but added the results instead of subtracting them to determine the answer ( $12 + 6 = 18$ ). The student needs to focus on understanding the operation needed to solve a one-step problem using data from a stem and leaf plot.
	Option J is incorrect	The student likely calculated the number of students who did more than 36 sit-ups but then calculated the number of students who did fewer than 36 sit-ups instead of the number of students who did fewer than 25 sit-ups. Then the student likely subtracted the results to determine the answer ( $12 - 11 = 1$ ). The student needs to focus on understanding how to solve a one-step problem using data from a stem and leaf plot.

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Item#	Rationale	
21	Option D is correct	To determine how much money Mr. Nolan spent on these shirts, the student should have multiplied \$36.95 by 2 to determine the amount of money Mr. Nolan spent on the adult shirts ( $\$36.95 \times 2 = \$73.90$ ) and should have multiplied \$23.95 by 5 to determine the amount of money Mr. Nolan spent on the youth shirts ( $\$23.95 \times 5 = \$119.75$ ). Then the student should have added the two products (answers) ( $\$73.90 + \$119.75 = \$193.65$ ).
	Option A is incorrect	The student likely multiplied the correct values together but did not regroup when multiplying the digits of 6, 9, and 5 in 36.95 by 2; did not regroup when multiplying the digits of 3, 9, and 5 in 23.95 by 5; and did not regroup when adding the products of \$62.80 and \$105.55. The student needs to focus on understanding how to regroup when carrying out the steps in the multiplication algorithm (procedure) and the addition algorithm.
	Option B is incorrect	The student likely added 2 and 5 to determine the total number of shirts (7) and multiplied this value by the greater of the shirt costs (\$36.95), resulting in \$258.65. The student needs to focus on understanding problem situations and the mathematical operations (+, -, ×, ÷) needed to solve them.
	Option C is incorrect	The student likely reversed the numbers for the two types of shirts Mr. Nolan bought, multiplied \$36.95 by 5 ( $\$36.95 \times 5 = \$184.75$ ), multiplied \$23.95 by 2 ( $\$23.95 \times 2 = \$47.90$ ), and then added the results ( $\$184.75 + \$47.90 = \$232.65$ ). The student needs to focus on attending to the details of problems that involve operations with decimal numbers.
22	27 and any equivalent values are correct	To determine the volume of (amount of three-dimensional space taken up by) the cube in cubic units, the student should have used the formula from the Volume section of the STAAR Grade 5 Mathematics Reference Materials page within the student's test booklet, $V = s \times s \times s$ , where $V$ = volume and $s$ is the length of each edge. The student should have calculated the volume of the cube as 27 cubic units ( $3 \times 3 \times 3 = 27$ ).

2019 STAAR Grade 5 Math Rationales

Item#	Rationale	
23	Option B is correct	To determine how many milliliters of orange juice Kristin drinks during the 15 days, the student could have first multiplied 0.5 liter by 15 to determine that Kristin drinks 7.5 liters of orange juice in 15 days ( $0.5 \times 15 = 7.5$ ). Then the student should have referred to the units shown in the Volume and Capacity section of the STAAR Grade 5 Mathematics Reference Materials page within the student's test booklet, finding that 1 liter (L) = 1,000 milliliters (mL). The student should then have multiplied the number of milliliters of orange juice Kristin drinks in 15 days (7.5) by the conversion factor (1,000), resulting in 7,500 milliliters. The student could also have multiplied 0.5 liter by the conversion factor 1,000 first and then multiplied the result by 15 days ( $0.5 \times 1,000 = 500$ , and $500 \times 15 = 7,500$ ).
	Option A is incorrect	The student likely misunderstood the given information, thinking that 15 was the total number of liters of orange juice Kristin drinks, and multiplied 15 by the conversion factor of 1,000, resulting in 15,000. The student needs to focus on understanding problem situations and the mathematical operations (+, -, ×, ÷) needed to solve them.
	Option C is incorrect	The student likely calculated the number of liters of orange juice Kristin drinks in 15 days but multiplied the number of liters by 100 instead of 1,000, calculating $7.5 \times 100 = 750$ . The student needs to focus on understanding that a volume given in liters should be multiplied by 1,000 to get the equivalent volume in milliliters.
	Option D is incorrect	The student likely calculated the number of liters of juice Kristin drinks in one day by calculating $0.5 \times 1,000 = 500$ . The student needs to focus on understanding problem situations and the mathematical operations (+, -, ×, ÷) needed to solve them.

## 2019 STAAR Grade 5 Math Rationales

Item#	Rationale	
24	Option H is correct	To determine which equation can be used to determine the fraction of the whole cake each friend will receive, the student should have recognized that the model is shaded to show the fraction $\frac{1}{2}$ divided into 3 parts and that each shaded part represents $\frac{1}{6}$ of the entire cake. Therefore the model is shaded to represent the equation $\frac{1}{2} \div 3 = \frac{1}{6}$ .
	Option F is incorrect	The student likely identified that the model showed 3 shaded parts and the total part of the model that is shaded is $\frac{1}{2}$ but confused the operation being represented in the problem as multiplication instead of division. The student needs to focus on understanding how to represent division of a unit fraction by a whole number using a pictorial model.
	Option G is incorrect	The student likely identified that the model showed a total of 6 equal parts and that the total part of the model that is shaded is $\frac{1}{2}$ . Then the student likely confused the operation being represented in the problem as multiplication instead of division. The student needs to focus on understanding how to represent division of a unit fraction by a whole number using a pictorial model.
	Option J is incorrect	The student likely identified that the total part of the model that is shaded is $\frac{1}{2}$ and that division would be used to solve the given problem situation but identified an equation that included the total number of parts in the model (6) instead of the number of parts into which the shaded area was divided (3). The student needs to focus on understanding how to represent division of a unit fraction by a whole number using a pictorial model.

2019 STAAR Grade 5 Math Rationales

Item#	Rationale	
25	Option B is correct	To determine which inequality is NOT true (false), the student should have compared the digits in each place value of the two numbers in each inequality starting with the greatest place value. The two numbers have the same digits in the ones place (digit to the left of the decimal point, $4 = 4$ ) and the tenths place (digit to the right of the decimal point, $0 = 0$ ). When comparing the digits in the hundredths place (second digit to the right of the decimal point), 0 is less than 3; therefore $4.\underline{00}3$ is less than $4.0\underline{3}$ . The symbol $>$ in the given inequality indicates 4.003 is greater than 4.03, which makes the inequality not true.
	Option A is incorrect	The student likely compared the values of the digits in the tenths place without realizing that the digits in the ones place were not the same in both numbers. This inequality is true because the 5 in the ones place of $6\underline{5}.7$ is less than the 7 in the ones place of $6\underline{7}.54$ . The student needs to focus on understanding place values of digits to the left of the decimal point and how to compare them.
	Option C is incorrect	The student chose an inequality that was true instead of an inequality that was not true, as directed. This inequality is true because there is no digit in the hundredths place in 26.4, so a 0 can be used ( $26.\underline{40}$ ) when comparing to $26.4\underline{8}$ , and 0 is less than 8. The student needs to focus on attending to the details of problems that compare decimal numbers.
	Option D is incorrect	The student likely compared the values of 91 and 97 and thought that 0.91 was less than 0.097 since 91 is less than 97. This inequality is true because the 9 in the tenths place of $0.\underline{9}1$ is greater than the 0 in the tenths place of $0.0\underline{9}7$ . The student needs to focus on understanding place values of digits to the right of the decimal point and how to compare them.



2019 STAAR Grade 5 Math Rationales

Item#	Rationale	
26	Option J is correct	To determine which statement is true about the number pattern shown in the table, the student should have analyzed the relationship between each $x$ -value and the corresponding (paired) $y$ -value in the table. The student should have noticed that each $y$ -value is 6 more than the corresponding $x$ -value ( $18 = 12 + 6$ , $30 = 24 + 6$ , $54 = 48 + 6$ , and $66 = 60 + 6$ ). The pattern is "additive" because 6 is "added" to each $x$ -value to get the corresponding $y$ -value.
	Option F is incorrect	The student likely identified a statement that is true about the first $x$ -value and corresponding $y$ -value in the table but did not check whether the statement was true for all values in the table. The student needs to focus on understanding how to recognize the difference between additive and multiplicative patterns given in a table.
	Option G is incorrect	The student likely identified that the description of the relationship between the numbers in the pattern was correct but did not know the pattern was additive instead of multiplicative. The student needs to focus on understanding the meanings of the words "additive" and "multiplicative" and how the words relate to patterns given in a table.
	Option H is incorrect	The student likely recognized that the pattern was additive but identified a statement that described the multiplicative relationship seen between the first $x$ -value and corresponding $y$ -value in the table. The student likely did not check whether the statement was true for all values in the table. The student needs to focus on understanding how to recognize the difference between additive and multiplicative patterns given in a table.

2019 STAAR Grade 5 Math Rationales

Item#	Rationale	
27	Option B is correct	The student should have determined that the graph with points located at $(1, 1\frac{1}{2})$ , $(2, 2\frac{1}{2})$ , $(3, 3\frac{1}{2})$ , $(5, 5\frac{1}{2})$ , and $(6, 6\frac{1}{2})$ best represents the ordered pairs in the table. The student should have determined that the $x$ -value (presented in the top row of the table) represents the horizontal distance to the right from zero, and the $y$ -value (presented in the bottom row of the table) represents the vertical distance up from there.
	Option A is incorrect	The student likely reversed the $x$ -values and $y$ -values and identified the graph with points located at $(1\frac{1}{2}, 1)$ , $(2\frac{1}{2}, 2)$ , $(3\frac{1}{2}, 3)$ , $(5\frac{1}{2}, 5)$ , and $(6\frac{1}{2}, 6)$ . The student needs to focus on understanding how to graph points on the coordinate plane with accuracy.
	Option C is incorrect	The student likely identified a graph with the first three sets of $x$ - and $y$ -values graphed and assumed that the $x$ -values of the points on the graph were 1, 2, 3, 4, and 5 instead of 1, 2, 3, 5, and 6. The student needs to focus on graphing ordered pairs of numbers found in an input-output table.
	Option D is incorrect	The student likely reversed the $x$ -values and $y$ -values in the table and thought that the $y$ -values of the points on the graph were consecutive numbers (1, 2, 3, 4, and 5) instead of 1, 2, 3, 5, and 6. The student needs to focus on graphing ordered pairs of numbers found in an input-output table and understanding how to graph points on the coordinate plane with accuracy.
28	41.5 and any equivalent values are correct	To determine the length of the remaining rope in inches written in decimal form, the student could have found the decimal equivalent of $\frac{1}{2}$ by dividing the numerator (top number) of 1 by the denominator (bottom number) of 2, resulting in 0.5. Then the student could have subtracted 18.5 from 60 to get an answer of 41.5. The student could have also subtracted $18\frac{1}{2}$ from 60, resulting in $41\frac{1}{2}$ , and then found the decimal equivalent to $41\frac{1}{2}$ (41.5). This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

2019 STAAR Grade 5 Math Rationales

Item#	Rationale	
29	Option C is correct	To determine the price of the items Nakita bought, 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 performed the subtraction step within the parentheses ( $3.50 - 0.80$ ), resulting in 2.70. Second the student should have multiplied 2 by 2.70 inside the brackets, resulting in 5.40. Next the student should have added 5.40 to 4.85 and 2.40 inside the brackets, resulting in 12.65. Finally the student should have subtracted 3.00 from 12.65, resulting in 9.65.
	Option A is incorrect	The student likely subtracted the values in the parentheses but did not multiply the resulting value by 2 before adding the other values inside the brackets ( $3.50 - 0.80 = 2.70$ , $2.70 + 4.85 + 2.40 = 9.95$ , and $9.95 - 3.00 = 6.95$ ). The student needs to focus on completing all steps when calculating the value of an expression (combination of numbers and operational symbols $( + , - , \times , \div )$ grouped together to show the value) using the order of operations.
	Option B is incorrect	The student likely performed the operations in order from left to right without regard to the parentheses or brackets ( $2 \times 3.50 = 7.00$ , $7.00 - 0.80 = 6.20$ , $6.20 + 4.85 + 2.40 = 13.45$ , and $13.45 - 3.00 = 10.45$ ). The student needs to focus on understanding how to perform the order of operations.
	Option D is incorrect	The student likely performed all the calculations correctly inside the parentheses and brackets but did not subtract 3.00 from the resulting value. The student needs to focus on completing all steps when calculating the value of an expression (combination of numbers and symbols $( + , - , \times , \div )$ grouped together to show the value) using the order of operations.

2019 STAAR Grade 5 Math Rationales

Item#	Rationale	
30	Option G is correct	To identify the table of values that does NOT represent $y = x + 4.5$ , the student should have identified a table where at least one $y$ -value was not the result of adding 4.5 to the corresponding (paired) $x$ -value. Because the value of $4 + 4.5$ is not 18.0, the value of $5 + 4.5$ is not 22.5, the value of $6 + 4.5$ is not 27.0, and the value of $9 + 4.5$ is not 40.5, this table of values does not represent $y = x + 4.5$ .
	Option F is incorrect	The table represents the equation $y = x + 4.5$ . The student likely made a calculation error when checking whether or not each $y$ -value is the result of adding 4.5 to the corresponding $x$ -value. The student needs to focus on understanding equations and evaluating them accurately to generate corresponding $x$ - and $y$ -values.
	Option H is incorrect	The table represents the equation $y = x + 4.5$ . The student likely made a calculation error when checking whether or not each $y$ -value is the result of adding 4.5 to the corresponding $x$ -value. The student needs to focus on understanding equations and evaluating them accurately to generate corresponding $x$ - and $y$ -values.
	Option J is incorrect	The table represents the equation $y = x + 4.5$ . The student likely made a calculation error when checking whether or not each $y$ -value is the result of adding 4.5 to the corresponding $x$ -value. The student needs to focus on understanding equations and evaluating them accurately to generate corresponding $x$ - and $y$ -values.

2019 STAAR Grade 5 Math Rationales

Item#	Rationale	
31	Option A is correct	To determine the scatterplot that best represents the data in the table, the student should have identified the scatterplot with points located at (15, 5), (12, 2), (20, 3), (16, 5), (14, 2), (18, 3), (15, 3), (16, 4), (12, 1), and (15, 4). The student should have determined for each point on the graph that the $x$ -value (presented in the top row of the table) represents the horizontal distance to the right from zero and the $y$ -value (presented in the bottom row of the table) represents the vertical distance up from the $x$ -value.
	Option B is incorrect	The student likely identified a graph where only one point was graphed for each unique value of $x$ in the table. The student needs to focus on understanding how to graph points on the coordinate plane using $x$ - and $y$ -values from a table.
	Option C is incorrect	The student likely identified a graph with most of the points graphed correctly but misidentified the locations of the three ordered pairs in the table with $x$ -values of 15, which were each graphed with an $x$ -value of 14. The student needs to focus on understanding how to graph points on the coordinate plane using $x$ - and $y$ -values from a table.
	Option D is incorrect	The student likely identified a graph with most of the points graphed correctly but misidentified the locations of the three ordered pairs in the table with $x$ -values of 15, which were each graphed with an $x$ -value of 16. The student needs to focus on understanding how to graph points on the coordinate plane using $x$ - and $y$ -values from a table.

## 2019 STAAR Grade 5 Math Rationales

Item#	Rationale	
32	Option F is correct	To determine how many miles Mr. Adams drove each day, the student should have divided the total number of miles by the number of days ( $151.2 \div 24$ ), resulting in 6.3 miles.
	Option G is incorrect	The student likely divided 151.2 by 24 but made errors in determining the digits of the quotient (answer). The student likely did not regroup when multiplying in the division algorithm (procedure) and identified the answer that appeared to be correct based on the incorrect ones digit (digit to the left of the decimal) of 7 and the incorrect tenths digit (digit to the right of the decimal) of 1. The student needs to focus on understanding how to carry out all the steps in the division algorithm with accuracy.
	Option H is incorrect	The student likely estimated the answer to the question by rounding 151.2 to 150, rounding 24 to 25, and dividing 150 by 25. The student needs to focus on understanding when a problem situation calls for an exact solution instead of an estimated solution.
	Option J is incorrect	The student likely divided 151.2 by 24 but made errors in determining the digits of the quotient (answer). The student likely did not notice that the remainder when the product of 24 and 5 was subtracted from 151 was greater than the divisor and therefore the 5 in the quotient should have been increased to 6. The student needs to focus on understanding how to carry out all the steps in the division algorithm with accuracy.

2019 STAAR Grade 5 Math Rationales

Item#	Rationale	
33	Option B is correct	To determine the volume of the container in cubic feet, the student should have understood that each of the 8 layers contains 36 blocks and multiplied $8 \times 36$ , resulting in 288 cubic feet.
	Option A is incorrect	The student likely only calculated the number of boxes in the base layer shown in the picture. The student needs to focus on understanding how to determine the volume of a rectangular prism by multiplying the number of layers times the number of unit cubes that create the base layer.
	Option C is incorrect	The student likely counted the number of visible square faces in the base layer of boxes shown in the picture and multiplied this value (48) by the number of layers (8), resulting in 384. The student needs to focus on understanding how to determine the number of unit cubes in the base layer of a rectangular prism and multiplying the number of layers times the number of unit cubes that create the base layer.
	Option D is incorrect	The student likely counted the number of boxes in the base layer shown in the picture but multiplied this value (36) by itself instead of the number of layers (8). The student needs to focus on understanding how to determine the volume of a rectangular prism by multiplying the number of layers times the number of unit cubes that create the base layer.

## 2019 STAAR Grade 5 Math Rationales

Item#	Rationale	
34	Option F is correct	<p>To determine how many days Tommy can eat the blueberries before they are all gone, the student should have interpreted "He will eat <math>\frac{1}{2}</math> cup of blueberries each day" to mean division into equal parts.</p> <p>The student could have determined that to divide 3 by <math>\frac{1}{2}</math>, the number 3 first has to be considered a fraction with a denominator (bottom number) of 1, represented by <math>\frac{3}{1}</math>. Then the student could have determined that <math>\frac{3}{1}</math> divided by <math>\frac{1}{2}</math> is equal to <math>\frac{3}{1}</math> multiplied by <math>\frac{1}{2}</math> inverted (flipped upside down) <math>\left(\frac{3}{1} \div \frac{1}{2} = \frac{3}{1} \times \frac{2}{1} = \frac{6}{1} = 6\right)</math>. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.</p>
	Option G is incorrect	<p>The student likely determined the number of days it would take Tommy to eat 1 cup of blueberries by dividing 1 by <math>\frac{1}{2}</math>. The student needs to focus on attending to the details of the question in problems that require the use of mathematical operations (+, -, ×, ÷).</p>
	Option H is incorrect	<p>The student likely determined the number of days it would take Tommy to eat 1 cup of blueberries by dividing 1 by <math>\frac{1}{2}</math> and then added 3 to the result (<math>2 + 3 = 5</math>). The student needs to focus on understanding problem situations and the mathematical operations (+, -, ×, ÷) needed to solve them.</p>
	Option J is incorrect	<p>The student likely added the number of cups of blueberries (3) to the numerator (top number) of <math>\frac{1}{2}</math> (<math>3 + 1 = 4</math>). The student needs to focus on understanding problem situations and the mathematical operations (+, -, ×, ÷) needed to solve them.</p>



2019 STAAR Grade 5 Math Rationales

Item#	Rationale	
35	Option C is correct	To identify the name of the subset (set within the larger set) of quadrilaterals (figures that have four sides) that is missing from the mobile, the student should have determined that Rectangles (parallelograms that have four right angles), Rhombuses (parallelograms that have all sides the same length), and Squares (parallelograms with four right angles and all sides the same length) are subsets of Parallelograms (quadrilaterals with opposite sides parallel) and that Parallelograms are a subset of Quadrilaterals.
	Option A is incorrect	The student likely thought Hexagon (figure that has six sides) was a subset of Quadrilaterals. The student needs to focus on understanding the characteristics of quadrilaterals.
	Option B is incorrect	The student likely misunderstood the diagram and identified Polygon (closed figure that has at least three sides) because quadrilaterals are a subset of polygons. The student needs to focus on understanding the characteristics of quadrilaterals.
	Option D is incorrect	The student likely thought Triangle (figure that has three sides) was a subset of Quadrilaterals. The student needs to focus on understanding the characteristics of quadrilaterals.

2019 STAAR Grade 5 Math Rationales

Item#	Rationale	
36	Option J is correct	<p>To determine the amount of money represented by <math>s</math>, the student should have used the order of operations, or PEMDAS. The student should have completed the operations in this order:</p> <ol style="list-style-type: none"> <li>1. Operations contained in <u>P</u>arentheses or brackets,</li> <li>2. <u>E</u>xponents (numbers raised to a power),</li> <li>3. <u>M</u>ultiplication/<u>D</u>ivision from left to right, and</li> <li>4. <u>A</u>ddition/<u>S</u>ubtraction from left to right.</li> </ol> <p>The student should have first performed the subtraction step within the parentheses (<math>50 - 44 = 6</math>). Then the student should have divided the result of the subtraction by 2 (<math>6 \div 2 = 3</math>).</p>
	Option F is incorrect	<p>The student likely calculated the division step first (<math>44 \div 2 = 22</math>) and then subtracted the result of the division step from 50 (<math>50 - 22 = 28</math>). The student needs to focus on understanding how to perform the order of operations.</p>
	Option G is incorrect	<p>The student likely calculated the subtraction step within the parentheses (<math>50 - 44 = 6</math>) but did not complete the problem by dividing the result of the subtraction step by 2. The student needs to focus on completing all the calculations needed to solve a problem.</p>
	Option H is incorrect	<p>The student likely first divided 50 by 2 and then subtracted the result of the division step (25) from 44 (<math>44 - 25 = 19</math>). The student needs to focus on understanding how to perform the order of operations.</p>