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Item#		Rationale
1	Option A is correct	To determine the value of the digit 1 in 129,600,000, the student should have recognized that since the digit 1 is the leftmost digit in a nine-digit number, it represents a value of $1 \times 100{,}000{,}000$, resulting in $100{,}000{,}000$.
	Option B is incorrect	The student likely considered only the three digits to the left of the first comma and recognized that the place value for the digit 1 in a three-digit number is the hundreds place ($\underline{1}29$) and $1 \times 100 = 100$. The student needs to focus on understanding the place values of digits in a number.
	Option C is incorrect	The student likely does not understand place value and determined that the value was 1,000. The student needs to focus on understanding the place values of digits in a number.
	Option D is incorrect	The student likely disregarded the digits following the last comma and recognized that the place value for the 1 in a six-digit number is the hundred-thousands place ($\underline{1}29{,}600$) and $1 \times 100{,}000 = 100{,}000$. The student needs to focus on understanding the place values of digits in a number.

Item#	Rationale	
2	Option H is correct	To determine the expression (combination of numbers and operational symbols $(+ , - , \times , \div)$ grouped together to show the value) that can be used to find the difference between the fraction of the book Elaine read and the fraction of the book Ignacio read, the student should have first counted the total number of parts in each model (20). The total number of parts in the model is the denominator (bottom number) of the two fractions. To find the numerator (top number) of the fraction of the book Elaine read, the student should have counted the number of shaded parts in the model representing Elaine (16) and found that the fraction of the book Elaine read is $\frac{16}{20}$. To find the numerator of the fraction of the book Ignacio read, the student should have counted the number of shaded parts in the model representing Ignacio (13) and found that the fraction of the book Ignacio read is $\frac{13}{20}$. The expression that can be used to find the difference between the fraction of the book Elaine read and the fraction of the book Ignacio read is $\frac{16}{20} - \frac{13}{20}$.
	Option F is incorrect	The student likely used the number of shaded parts in Elaine's model (16) as the numerator and the number of unshaded parts in Elaine's model (4) as the denominator for the first fraction and then likely used the number of shaded parts in Ignacio's model (13) as the numerator and the number of unshaded parts in Ignacio's model (7) as the denominator for the second fraction. The student needs to focus on understanding how to determine denominators in problems involving fractions.
	Option G is incorrect	The student likely used the number of unshaded parts in Ignacio's model (7) as the numerator and the number of shaded parts in Ignacio's model (13) as the denominator for the first fraction and then likely used the number of unshaded parts in Elaine's model (4) as the numerator and the number of shaded parts in Elaine's model (16) as the denominator for the second fraction. The student needs to focus on understanding how to determine both numerators and denominators in problems involving fractions.
	Option J is incorrect	The student likely used the total number of parts as the numerator and the number of shaded parts as the denominator in each fraction. The student needs to focus on understanding how to determine both numerators and denominators in problems involving fractions.

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Item#	Rationale	
3	Option B is correct	To determine the decimal equivalent to $\frac{79}{100}$, the student should have placed the 7 and the 9 to the right of the decimal point to represent $\frac{79}{100}$ as 0.79 (seventy-nine hundredths).
	Option A is incorrect	The student likely recognized that the denominator (bottom number) of the fraction $\frac{79}{100}$ had three digits and chose an answer that had three digits to the right of the decimal point representing seventy-nine thousandths instead of seventy-nine hundredths. The student needs to focus on understanding how to relate fractions to decimals that name hundredths.
	Option C is incorrect	The student likely identified that the digits from the numerator (top number) of the fraction $\frac{79}{100}$ should have been used in the decimal number but misplaced the decimal point. The student needs to focus on understanding how to relate fractions to decimals that name hundredths.
	Option D is incorrect	The student likely does not understand how to relate fractions to decimals and replaced the fraction bar with a decimal point. The student needs to focus on understanding how to relate fractions to decimals that name hundredths.

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Item#		Rationale
4	Option F is correct	To determine the statement that best describes a primary service of a bank, the student should have recognized that checking accounts and savings accounts are both services provided by banks to their customers.
	Option G is incorrect	The student likely understood that banks can help customers save for expenses but did not realize that banks would probably not help customers decide which expenses to pay. The student needs to focus on understanding the primary services of a bank.
	Option H is incorrect	The student likely understood that banks are part of a community but did not realize that the primary service of banks is not to help customers meet their neighbors. The student needs to focus on understanding the primary services of a bank.
	Option J is incorrect	The student likely confused the services of a bank with the services of a post office. The student needs to focus on understanding the primary services of a bank.

Item#		Rationale
5	Option C is correct	To determine the strip diagram that shows a way to find the number of water bottles Alexa will drink during each of the next 6 days, the student should have first recognized that the total number of water bottles (36) is represented by the entire length of the strip in the diagram. Next, since 18 is half of 36, the student should have recognized that the number of bottles of water Alexa drank last week is represented by half the length of the strip. Finally, the student should have recognized that the remaining bottles of water should be divided into 6 equal groups which is represented by w in each group.
	Option A is incorrect	The student likely added 36 and 6 to find w, disregarding the details of the rest of the question. The strip diagram represents Alexa drinking a total of w or $36 + 6$ bottles of water. The student needs to focus on understanding how to use a strip diagram to represent a multi-step problem involving the four operations ($+, -, \times, \div$). The student also needs to focus on attending to the details of the question.
	Option B is incorrect	The student likely disregarded the "half" that Alexa already drank and then subtracted 6 from 36 to find w. The strip diagram represents Alexa drinking 6 of 36 bottles last week and drinking the rest of the bottles (w) during the next week. The student needs to focus on understanding how to use a strip diagram to represent a multi-step problem involving the four operations ($+, -, \times, \div$).
	Option D is incorrect	The student likely found half of 36 but did not divide the rest of the water bottles into 6 equal parts. The strip diagram represents Alexa drinking half of the bottles last week (18) and drinking the rest of the bottles during the next week. The student needs to focus on understanding how to use a strip diagram to represent a multi-step problem involving the four operations ($+, -, \times, \div$).

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Item#	Rationale	
6	Option F is correct	To construct an angle (the amount (degree) of turn between two lines around their common point) that has a measure of 85°, the student should have determined that the ray (→, a part of a line with a start point but no end point) shown passes through 90°. Then the student could have subtracted 90 – 85 to determine that the other ray should pass through 5°, represented by point R.
	Option G is incorrect	The student likely recognized that point S represents 85° on the protractor's outer scale but did not consider that the measure of the angle should be 85°. The student needs to focus on understanding that the numbers through which rays pass on a protractor must be subtracted to find the measure of an angle.
	Option H is incorrect	The student likely recognized that point V represents a point that is 5° from the 80° label on the protractor's inner scale and added 5° to 80°, resulting in 85°, but did not consider that the measure of the angle, instead of the location on the protractor's scale, should be 85°. The student needs to focus on understanding how to determine measures of angles in degrees when rays of angles pass through unlabeled tick marks on a protractor. The student also needs to focus on understanding that the numbers through which rays pass on a protractor must be subtracted to find the measure of an angle.
	Option J is incorrect	The student likely recognized that point W represents 0° on the protractor's inner scale and thought one ray of an angle has to pass through 0°. The student needs to focus on understanding that the numbers through which rays pass on a protractor must be subtracted to find the measure of an angle.
7	57 and any equivalent values are correct	To determine the height in inches that is missing a data point on the dot plot, the student should have counted the tally marks in each row under "Number of Students." The student should have determined that 2 students were 53 inches tall, 1 student was 54 inches tall, 5 students were 55 inches tall, 7 students were 56 inches tall, 3 students were 57 inches tall, 1 student was 58 inches tall, and 2 students were 59 inches tall. Then the student should have matched these numbers of students in the table to the numbers of dots above the labeled numbers on the dot plot. The student should have determined that since 57 inches shows only 2 data points, a third dot representing 57 inches is missing.

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Item#	Rationale	
8	Option J is correct	To determine the drawing where line *m* appears to be perpendicular to line *k*, the student should have first understood that perpendicular lines are lines that intersect (cross each other) at a right angle (90° angle). Then the student should have recognized that lines *m* and *k* appear to intersect at a right angle in this drawing.
	Option F is incorrect	The student likely confused the definitions of the terms "parallel" and "perpendicular." Parallel lines are lines that do not cross each other and are always the same distance apart. The student needs to focus on understanding the difference between parallel and perpendicular lines.
	Option G is incorrect	The student likely confused the definitions of the terms "intersecting" and "perpendicular." Intersecting lines are lines that cross each other at any angle. Lines *k* and *m* in this drawing do not intersect at a 90° angle and therefore cannot be called perpendicular. The student needs to focus on understanding the difference between intersecting and perpendicular lines.
	Option H is incorrect	The student likely confused the definitions of the terms "intersecting" and "perpendicular." Intersecting lines are lines that cross each other at any angle. Lines *k* and *m* in this drawing do not intersect at a 90° angle and therefore cannot be called perpendicular. The student needs to focus on understanding the difference between intersecting and perpendicular lines.

Item#	Rationale	
9	Option B is correct	To determine the true comparison, the student could have changed the fraction $\frac{15}{2}$ to a mixed number (number with a whole and fractional part). To do this, the student could have divided 15 by 2, resulting in 7 whole with $\frac{1}{2}$ left over $\left(7\frac{1}{2}\right)$. Then the student should have chosen the comparison $\frac{15}{2} = 7\frac{1}{2}$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option A is incorrect	The student likely compared the fractional parts only $\left(\frac{15}{2}\right.$ is greater than $\left.\frac{1}{2}\right)$. The student needs to focus on understanding how to compare fractions to mixed numbers.
	Option C is incorrect	The student likely thought that $7\frac{1}{2}$ was the same as $\frac{71}{2}$ and compared $\frac{15}{2}$ to $\frac{71}{2}$. The student needs to focus on understanding how to compare fractions to mixed numbers.
	Option D is incorrect	The correct answer $\left(\frac{15}{2} = 7\frac{1}{2}\right)$ was presented in one of the other answer options.

Item#		Rationale
10	Option J is correct	To determine the number of candies that were left over, the student should have multiplied the number of bags by the number of candies in each bag $(4 \times 8 = 32)$ and divided the answer by 9 $(32 \div 9)$. Since 9 can go into 32 only 3 times and $9 \times 3 = 27$, the student should have subtracted $32 - 27$ to find the number of candies left over $(32 - 27 = 5)$.
	Option F is incorrect	The student likely performed the correct calculations but found the number of candies in each gift box instead of the number of candies left over. The student needs to focus on attending to the details of the question being asked in a two-step problem.
	Option G is incorrect	The student likely multiplied 4×8 but miscalculated the product (answer to the multiplication part of the problem) to be 36 instead of 32. The student likely went on to divide 36 by 9 and found the number of candies in each box $(36 \div 9 = 4)$ instead of the number of candies left over. The student needs to focus on understanding how to multiply numbers with accuracy. The student also needs to focus on attending to the details of the question being asked in a two-step problem.
	Option H is incorrect	The student likely multiplied 4×8 but miscalculated the product (answer to the multiplication part of the problem) to be 36 instead of 32. The student likely went on to divide 36 by 9 and found the number of candies in each box $(36 \div 9 = 4)$ with no candies left over (0). The student needs to focus on understanding how to multiply numbers with accuracy.

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Item#		Rationale
11	Option B is correct	To determine the total number of gallons and quarts of ice cream Olivia has left over, the student could have added the numbers of gallons $(2 + 1 = 3)$ and the numbers of quarts $(3 + 2 = 5)$ for a total of 3 gallons and 5 quarts. The student could have used the conversion from gallons to quarts (1 gallon (gal) = 4 quarts (qt)) from the Volume and Capacity section of the STAAR Grade 4 Mathematics Reference Materials page within the student's test booklet to convert 3 gallons and 5 quarts to 4 gallons and 1 quart. 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 numbers of gallons $(2 - 1 = 1)$ and then subtracted the numbers of quarts $(3 - 2 = 1)$ instead of adding the numbers of gallons and adding the numbers of quarts. The student needs to focus on understanding the math operations $(+ , - , \times , \div)$ needed to solve a multi-step problem involving measurements.
	Option C is incorrect	The student likely added the numbers of gallons and added the numbers of quarts correctly but switched the units, resulting in 5 gallons and 3 quarts. The student needs to focus on accurately solving problems involving measurements.
	Option D is incorrect	The student likely found the total number of gallons and the total number of quarts but thought there were only 2 quarts in 1 gallon instead of 4 quarts in 1 gallon. The student likely determined that 3 gallons and 5 quarts was the same as 5 gallons and 1 quart. The student needs to focus on understanding how to use the conversion from one unit to another when solving problems involving measurements.

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Item#		Rationale
12	Option F is correct	To determine the fraction that is equivalent to 1.5, the student should have recognized that the number 1.5 is equal to $1 + 0.5$. The whole number 1 is equal to the fraction $\frac{10}{10}$, and the decimal 0.5 ("five-tenths") is equal to the fraction $\frac{5}{10}$, so $1.5 = 1 + 0.5 = \frac{10}{10} + \frac{5}{10} = \frac{15}{10}$.
	Option G is incorrect	The student likely interpreted 1 and 5 tenths (1.5) as 15 hundredths and chose the fraction with 15 as the numerator (top number) and 100 as the denominator (bottom number). The student needs to focus on understanding the value of each digit in a decimal number and how to convert these values to fractions.
	Option H is incorrect	The student likely interpreted 1 and 5 tenths (1.5) as 15 hundredths and chose the fraction with 100 over 15 $\left(\frac{100}{15}\right)$ instead of 15 over 100 $\left(\frac{15}{100}\right)$. The student needs to focus on understanding the value of each digit in a decimal number and how to convert these values to fractions.
	Option J is incorrect	The student likely interpreted 1 and 5 tenths (1.5) correctly as 15 tenths and chose the fraction with 10 over 15 $\left(\frac{10}{15}\right)$ instead of 15 over 10 $\left(\frac{15}{10}\right)$. The student needs to focus on understanding how to write a fraction equivalent to a given decimal.

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Item#		Rationale
13	Option C is correct	To determine the area of (amount of space covered by) the top of Kathleen's desk, the student should have used the formula for the area of a rectangle from the Area section of the STAAR Grade 4 Mathematics Reference Materials page within the student's test booklet ($A = l \times w$, where A = area, l = length, and w = width). Using the formula, the student should have calculated that the area is 24×17 resulting in 408 square inches.
	Option A is incorrect	The student likely multiplied 24 by 7 correctly but did not use a zero placeholder for the ones place in the second multiplication step when multiplying 24 by 10, resulting in 192 ($24 \times 7 = 168$; $24 \times 1 = 24$; $168 + 24 = 192$). The student needs to focus on understanding how to use placeholders of zero when carrying out the steps in the multiplication algorithm (procedure).
	Option B is incorrect	The student likely added the side lengths ($24 + 17 + 24 + 17 = 82$) to find the perimeter (distance around the outside) of the top of the desk instead of multiplying the length and width to find the area. The student needs to focus on understanding the difference between area and perimeter calculations and when to use each to solve problems.
	Option D is incorrect	The student likely added ($24 + 17 = 41$) instead of multiplying to find the area. The student needs to focus on understanding that the area is determined by multiplying the length and the width of a rectangle.

Item#	Rationale	
14	Option G is correct	To determine the expression (combination of numbers and operational symbols $(+ , - , \times , \div)$ grouped together to show the value) that CANNOT be used to represent the number represented by the shaded parts in Model Y, the student should have calculated that the number represented by the shaded parts in Model Y is $\frac{12}{4}$. Each rectangle has 3 out of 4 parts shaded, and $\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} = \frac{12}{4}$. Since $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{4}{4}$ and $\frac{4}{4}$ is NOT equal to $\frac{12}{4}$, the student should have recognized that this expression CANNOT be used to represent $\frac{12}{4}$.
	Option F is incorrect	The student likely found that Model Y is shaded to represent $\frac{12}{4}$ but added the fractions in the expression $\frac{4}{4} + \frac{4}{4} + \frac{4}{4}$ incorrectly, resulting in $\frac{12}{12}$ which is not equal to $\frac{12}{4}$. The correct sum of $\frac{4}{4} + \frac{4}{4} + \frac{4}{4}$ is $\frac{12}{4}$. The student needs to focus on adding fractions correctly in problems that require finding expressions that are equal to fractions.
	Option H is incorrect	The student likely found that Model Y is shaded to represent $\frac{12}{4}$, but added the fractions in the expression $\frac{4}{4} + \frac{4}{4} + \frac{3}{4} + \frac{1}{4}$ incorrectly, resulting in $\frac{12}{16}$ which is not equal to $\frac{12}{4}$. The correct sum of $\frac{4}{4} + \frac{4}{4} + \frac{3}{4} + \frac{1}{4}$ is $\frac{12}{4}$. The student needs to focus on adding fractions correctly in problems that require finding expressions that are equal to fractions.

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Item#		Rationale
	Option J is incorrect	The student likely found that Model Y is shaded to represent $\frac{12}{4}$, but added the fractions in the expression $\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4}$ incorrectly, resulting in $\frac{12}{16}$ which is not equal to $\frac{12}{4}$. The correct sum of $\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4}$ is $\frac{12}{4}$. The student needs to focus on adding fractions correctly in problems that require finding expressions that are equal to fractions.
15	37 and any equivalent values are correct	To determine the measure of angle *YXZ* in degrees, the student should have subtracted 53° from 90° since 90° is the combined measure of angle *YXZ* and angle *YXW* (90 − 53 = 37).

Item#	Rationale	
16	Option H is correct	To determine the expression (combination of numbers and operational symbols $(+ , - , \times , \div)$ grouped together to show the value) that has a quotient (answer) of about 7, the student could have rounded 36 to the nearest compatible number (35) and recognized that 35 divided by 5 equals 7. 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 most likely confused the word "quotient" with the word "dividend" (the number to divide by). The student needs to focus on understanding the meaning of the word "quotient."
	Option G is incorrect	The student most likely confused the word "quotient" with the word "divisor" (the number dividing into another number). The student needs to focus on understanding the meaning of the word "quotient."
	Option J is incorrect	The student likely subtracted 6 from 13 instead of using estimation and division. The student needs to focus on understanding the meaning of the word "quotient."

Item#		Rationale
17	Option D is correct	To determine the expanded notation (the form of a number shown as a sum of each digit multiplied by its place value) for the number of meters of pipe fixed (37,015.08), the student should have written the sum (total) of the values represented by the digits in 37,015.08. The 3 in the ten-thousands place should be written as $(3 \times 10{,}000)$, the 7 in the thousands place should be written as $(7 \times 1{,}000)$, the zero in the hundreds place has no value, the 1 in the tens place should be written as (1×10), the 5 in the ones place should be written as (5×1), the zero in the tenths place has no value, and the 8 in the hundredths place should be written as (8×0.01).
	Option A is incorrect	The student likely confused the place values for the digits 1, 5, and 8 because of the 0 in the hundreds place (37,015.08) and the 0 in the tenths place (37,015.08), choosing the expanded notation for 37,150.8 instead of 37,015.08. The student needs to focus on identifying the place values for every digit in the number (including the zeros). The student also needs to focus on understanding how to use place values to write decimal numbers in expanded notation.
	Option B is incorrect	The student likely confused the place value for the digit 8, and chose the expanded notation for 37,015.8 instead of 37,015.08. The student needs to focus on identifying the place values for every digit in the number (including the zeros). The student also needs to focus on understanding how to use place values to write decimal numbers in expanded notation.
	Option C is incorrect	The student likely confused the place value for the digits 3 and 7 because of the 0 in the hundreds place (37,015.08), and chose the expanded notation for 3,715.08 instead of 37,015.08. The student needs to focus on identifying the place values for every digit in the number (including the zeros). The student also needs to focus on understanding how to use place values to write decimal numbers in expanded notation.

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Item#	Rationale	
18	Option G is correct	To determine the correct area model (model representing the amount of space covered), the student should have found the model that has 11 units $(10 + 1)$ represented on the left and 13 units $(10 + 3)$ represented on the top, which is equal to a width of 11 units and a length of 13 units. The student should have interpreted each shape in the model to represent a multiplication problem, leading to the total of 143 square units. The area of the large square is 100 square units because the area is found by multiplying the side lengths (10×10). The area of each bar is 10 square units because the area is found by multiplying the side lengths (10×1). The area of each small square is 1 square unit because the area is found by multiplying the side lengths (1×1). The student should have added 100 square units (the large square), 40 square units (4 bars), and 3 square units (3 small squares) to get a total of 143 square units $(100 + 40 + 3)$.
	Option F is incorrect	The student likely chose an area model that represents $11 + 13$ instead of 11×13. The student needs to focus on understanding that the length and width of the rectangle in an area model must each represent one of the numbers being multiplied in a multiplication problem and that the total area of the model must be the same as the answer to the multiplication problem.
	Option H is incorrect	The student likely thought the "10" labeled on top represented 10 on the left side as well and mistakenly chose an area model that represents 11×3 instead of 11×13. The student needs to focus on understanding that the length and width of the rectangle in an area model must each represent one of the numbers being multiplied in a multiplication problem and that the total area of the model must be the same as the answer to the multiplication problem.
	Option J is incorrect	The student likely chose an area model that represents 11×11 instead of 11×13. The student needs to focus on understanding that the length and width of the rectangle in an area model must each represent one of the numbers being multiplied in a multiplication problem and that the total area of the model must be the same as the answer to the multiplication problem. The student also needs to focus on attending to the details of a problem involving area models.

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Item#	Rationale	
19	Option D is correct	To determine the difference between the lengths of the two pencils in centimeters, the student should have first used the centimeter side of the ruler provided on the STAAR Grade 4 Mathematics Reference Materials page within the student's test booklet to measure the length of each pencil. The student should have lined up the end of each line segment with the zero on the centimeter ruler to find the lengths of approximately 10 cm and approximately 13 cm. The student should have found the difference by subtracting $(13 - 10 = 3)$.
	Option A is incorrect	The student likely found the approximate length of each line in inches instead of centimeters and added to find the total length of both pencils $(4 + 5 = 9)$. The student needs to focus on understanding the meaning of the word "difference" and attending to the details of a problem involving measurement.
	Option B is incorrect	The student likely found the approximate length of each line in inches instead of centimeters and subtracted correctly to find the difference $(5 - 4 = 1)$. The student needs to focus on attending to the details of a problem involving measurement.
	Option C is incorrect	The student likely found the correct measurement of each pencil but added instead of subtracted $(10 + 13 = 23)$. The student needs to focus on understanding the meaning of the word "difference" in a problem involving measurement.

Item#	Rationale	
20	Option F is correct	To determine the number of square feet of space that is left, the student should have aligned the numbers using the decimal point and then subtracted the number of square feet the owners plan to use for the kitchen from the total amount of office space rented $(4{,}506.23 - 281.6 = 4{,}224.63)$.
	Option G is incorrect	The student likely aligned the numbers correctly but found the difference by subtracting the smaller digit from the larger digit in each place value instead of regrouping $(4{,}506.23 - 281.6 \rightarrow 4{,}385.43)$. The student needs to focus on understanding how to regroup when subtracting.
	Option H is incorrect	The student likely disregarded the decimal points and right-aligned the numbers when subtracting instead of aligning the numbers by place value, resulting in $450623 - 2816 \rightarrow 447807$. Then the student likely placed the decimal point two places from the right $(4{,}478.07)$. The student needs to focus on understanding how to align decimal numbers when subtracting.
	Option J is incorrect	The student likely represented 281.6 as 281.06 so that both numbers had 2 digits to the right of the decimal point and continued to subtract correctly $(4{,}506.23 - 281.06 = 4{,}225.17)$. The student needs to focus on understanding how to align decimal numbers when subtracting.

Item#	Rationale	
21	Option C is correct	To determine the number of yards of chain Nathan has, the student could have used the relationship shown in the table (Number of Feet ÷ 3 = Number of Yards). The student could have divided 54 by 3, resulting in 18 yards. 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 chose the next consecutive number in the first column (Number of Feet) instead of looking for a relationship between the numbers in the two columns. The student needs to focus on understanding that when equal measurements are given in a table, the relationship is found between the paired values in the table ((12, 4), (15, 5), (18, 6), (21, 7)) and not between the numbers in a single column. The student also needs to focus on understanding that multiplication and division are always used to convert (change) measurements within the same measurement system.
	Option B is incorrect	The student likely reversed the relationship in the table and multiplied 54 by 3 instead of dividing 54 by 3 ($54 \times 3 = 162$). The student needs to focus on understanding that when a measurement is given in a smaller unit (feet), division is needed to get the equal measurement in a larger unit (yards).
	Option D is incorrect	The student likely subtracted 4 from 12 in the first row of data ($12 - 4 = 8$) to find the relationship between the number of feet and the number of yards and then subtracted the difference found (8) from 54 ($54 - 8 = 46$). The student needs to focus on understanding that multiplication and division are always used to convert (change) measurements within the same measurement system.

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Item#		Rationale
22	Option J is correct	To determine the set of equations that can be used to find the amount of money in dollars Mr. Franklin earns from piano lessons each Saturday (m), the student should have identified a set of equations where the amount Mr. Franklin charges for each lesson he teaches at his music school ($15) is multiplied by the number of piano lessons he teaches there (3), the amount Mr. Franklin charges for each lesson he teaches in a student's home ($20) is multiplied by the number of piano lessons he teaches there (4), and the products (answers to the multiplication parts of the problem) are added.
	Option F is incorrect	The student likely confused the number of lessons taught at each location and chose equations showing 15×4 and 20×3 instead of 15×3 and 20×4. The student needs to focus on attending to the details of a multi-step problem that requires representation with an equation.
	Option G is incorrect	The student chose equations showing division instead of multiplication in the first two equations. The student needs to focus on understanding the math operations ($+$, $-$, $\times$, $\div$) needed to represent the solution to a multi-step problem using equations.
	Option H is incorrect	The student chose equations showing subtraction instead of addition in the last equation. The student needs to focus on understanding the math operations ($+$, $-$, $\times$, $\div$) needed to represent the solution to a multi-step problem using equations.

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Item#		Rationale
23	Option B is correct	To determine the frequency table (table that shows how often each value in a set of data occurs) that represents the number of students who chose each color, the student should have first determined the favorite colors of all 22 students (6 red; 2 yellow; 7 blue (5 more than yellow: $5 + 2 = 7$); 3 purple (3 fewer than red: $6 - 3 = 3$); 4 green (the rest: $6 + 2 + 7 + 3 = 18$; $22 - 18 = 4$)). Then the student should have chosen the table with the same number of tally marks for each of the favorite colors in the list (6, 2, 7, 3, 4).
	Option A is incorrect	The student chose a frequency table that represents the given numbers in the list (6, 2, 5, 3) and then incorrectly calculated the number of students who chose green as their favorite color $(22 - 6 - 2 - 5 - 3 = 6)$. The student needs to focus on understanding how to interpret data given in problems involving frequency tables.
	Option C is incorrect	The student likely thought that no students picked green as their favorite color since a number was not shown in the list. The student needs to focus on understanding how to interpret and represent data given in problems involving frequency tables.
	Option D is incorrect	The student likely found the number of students who chose blue as their favorite color by adding 5 to 6 (the number of students who chose red) instead of 2 (the number of students who chose yellow). The student needs to focus on understanding how to interpret data given and attending to the details in problems involving frequency tables.

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Item#		Rationale
24	Option J is correct	To determine the difference between the amount of flour and the combined amount of sugar Zeke used, the student could have first found the combined amount of sugar he used by adding $\frac{3}{4}$ and $\frac{3}{4}$ $\left(\frac{3}{4} + \frac{3}{4} = \frac{6}{4} \text{ or } 1\frac{2}{4}\right)$. Then the student could have subtracted the total amount of sugar used from the total amount of flour used $\left(2\frac{1}{4} - \frac{6}{4} = \frac{9}{4} - \frac{6}{4} = \frac{3}{4}\right)$. 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 added the given amounts $\left(\frac{3}{4} + \frac{3}{4} + 2\frac{1}{4} = 3\frac{3}{4}\right)$ instead of adding the amounts of sugar and then subtracting from the amount of flour. The student needs to focus on understanding the math operations (+ or −) needed to solve a multi-step problem involving fractions.
	Option G is incorrect	The student likely found the combined amount of sugar but did not subtract that amount from the amount of flour. The student needs to focus on carrying out all the steps in a multi-step problem involving fractions.
	Option H is incorrect	The student likely understood that the numerator (top number) in $2\frac{1}{4}$ was not great enough to subtract the numerator in $1\frac{2}{4}$ and attempted to regroup 1 whole in $2\frac{1}{4}$ to become $\frac{4}{4}$. However, instead of finding that $2\frac{1}{4} = 1 + \frac{4}{4} + \frac{1}{4} = 1\frac{5}{4}$, the student did not add the numerators in $\frac{4}{4}$ and $\frac{1}{4}$ and subtracted from $1\frac{4}{4}$ instead of from $1\frac{5}{4}$. The student needs to focus on understanding how to regroup in problems involving the subtraction of fractions.

Item#	Rationale	
25	Option A is correct	To determine the measure of angle *RST* (the amount (degree) of turn between two lines around their common point), the student should have found the two measures on the same scale (inside or outside) through which the rays (→, a part of a line with a start point but no end point) of the angle pass. Then the student should have subtracted the smaller measure from the larger measure. On the inside scale (the measurement values shown on the protractor), one ray of this angle passes through 130° and the other ray passes through 90°, so the measure of angle *RST* is 40° (130° − 90°). On the outside scale, one ray passes through 90° and the other ray passes through 50°, so the measure of the angle is 40° (90° − 50°).
	Option B is incorrect	The student likely recognized that the leftmost ray on the protractor passes through 50° on the outside scale and interpreted 50° to be the measure of the angle. The student needs to focus on understanding that the measures through which rays pass must be subtracted to find the measure of an angle.
	Option C is incorrect	The student likely recognized that the leftmost ray on the protractor passes through 130° on the inside scale and interpreted 130° to be the measure of the angle. The student needs to focus on understanding that the measures through which rays pass must be subtracted to find the measure of an angle.
	Option D is incorrect	The student likely recognized that the leftmost ray on the protractor passes through 130° on the inside scale and 50° on the outside scale and subtracted 50 from 130. The student needs to focus on understanding that there are two scales that can be used on a protractor, but the same scale must be used when determining the measures through which the rays of an angle pass. The student also needs to focus on understanding that the measures through which rays pass must be subtracted to find the measure of an angle.
26	192 and any equivalent values are correct	To determine the total number of cups of flour the baker used in 2 days, the student could have first found the total number of cakes the baker made these two days by multiplying 24 by 2 (24 × 2 = 48). Then the student could have multiplied the total number of cakes by the number of cups of flour in each cake (48 × 4 = 192). This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

Item#	Rationale	
27	Option B is correct	To determine which expenses were fixed expenses for Ms. McCulley, the student should have understood that fixed expenses are expenses that are the same amount each month. The student should have identified Rent and Car payment as the only expenses that were the same amount each month.
	Option A is incorrect	The student likely confused the definitions of variable expenses (changing from month to month) and fixed expenses. The student needs to focus on understanding that fixed expenses are expenses that are the same amount each month.
	Option C is incorrect	The student likely does not know what fixed expenses are. The student needs to focus on understanding that fixed expenses are expenses that are the same amount each month.
	Option D is incorrect	The student likely focused on the word "expenses" and did not distinguish between variable expenses (changing from month to month) and fixed expenses. The student needs to focus on understanding that fixed expenses are expenses that are the same amount each month.

Item#	Rationale	
28	Option H is correct	To determine which is closest to the fraction of the cereal Martha had left, the student should have calculated that since Martha ate $\frac{4}{9}$ of the cereal, she had $\frac{5}{9}$ of the cereal left ($\frac{9}{9} - \frac{4}{9} = \frac{5}{9}$). The student should have then compared $\frac{5}{9}$ to the benchmark (commonly known) fraction $\frac{1}{2}$. Since $\frac{5}{9}$ is just a little greater than $\frac{1}{2}$, about $\frac{1}{2}$ of the cereal was left.
	Option F is incorrect	The student likely determined that $\frac{5}{9}$ of the cereal was left but subtracted $\frac{5}{9} - \frac{4}{9}$ to get $\frac{1}{9}$ and then compared $\frac{1}{9}$ to the benchmark fraction $\frac{1}{4}$ instead of comparing $\frac{5}{9}$ to $\frac{1}{2}$. The student likely thought $\frac{1}{9}$ was a little less than $\frac{1}{4}$. The student needs to focus on attending to the details of problems involving the reasonableness of differences involving benchmark fractions such as $\frac{1}{4}$ or $\frac{1}{2}$.
	Option G is incorrect	The student likely compared $\frac{4}{9}$ (the amount of cereal Martha ate) to $\frac{1}{2}$ instead of comparing $\frac{5}{9}$ (the amount of cereal she had left) to $\frac{1}{2}$. The student needs to focus on attending to the details in problems involving the reasonableness of differences involving benchmark fractions.
	Option J is incorrect	The student likely determined that $\frac{5}{9}$ of the cereal was left but subtracted $\frac{5}{9} - \frac{4}{9}$ to get $\frac{1}{9}$ and then compared $\frac{1}{9}$ to the benchmark fraction $\frac{1}{4}$ instead of comparing $\frac{5}{9}$ to $\frac{1}{2}$. The student likely thought $\frac{1}{9}$ was about $\frac{1}{4}$. The student needs to focus on attending to the details of problems involving the reasonableness of differences involving benchmark fractions such as $\frac{1}{4}$ or $\frac{1}{2}$.

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Item#	Rationale	
29	Option A is correct	To determine the number represented by point *W*, the student should have first counted the number of sections on the number line between 11 and 12. The student should have determined that since there are 10 sections between 11 and 12, each section represents one-tenth. Then the student should have counted the number of sections between 11 and point *W*. The student should have determined that since there are 6 sections between 11 and point *W*, point *W* represents 11.6 (eleven and six-tenths).
	Option B is incorrect	The student likely counted the number of tick marks from 11 to point *W* instead of counting sections. The student also likely confused the tenths and hundredths places, writing eleven and seven-tenths as 11.07 instead of 11.7. The student needs to focus on understanding how to determine the decimal number represented by a point on a number line. The student also needs to focus on understanding the difference between tenths and hundredths when writing decimal numbers.
	Option C is incorrect	The student likely counted the number of tick marks from 11 to point *W* instead of counting sections. The student needs to focus on understanding how to determine the decimal number represented by a point on a number line.
	Option D is incorrect	The student likely confused the tenths and hundredths places, writing eleven and six tenths as 11.06 instead of 11.6. The student needs to focus on understanding the difference between tenths and hundredths when writing decimal numbers.

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Item#		Rationale
30	Option H is correct	To determine the statement that best describes the polygons (closed shapes with at least three sides) in the group, the student should have concluded each polygon has at least one right angle (90° angle).
	Option F is incorrect	The student likely confused the definition of parallel (opposite sides that are always the same distance apart) with the definition of perpendicular (intersect at a right angle). The student needs to focus on recognizing the difference between parallel and perpendicular sides in polygons.
	Option G is incorrect	The student likely confused the definition of obtuse angles (angles that are greater than 90°) with the definition of right angles. The student needs to focus on recognizing the difference between obtuse and right angles in polygons.
	Option J is incorrect	The student likely confused the definition of acute angles (angles that are less than 90°) with the definition of right angles. The student needs to focus on recognizing the difference between acute and right angles in polygons.

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Item#		Rationale
31	Option D is correct	To determine the rule that shows how to find the value when given the position, the student should have considered the relationship in the table. Since each value is 32 more than each paired position, the relationship is $+32$ $(1 + 32 = 33; 2 + 32 = 34; 3 + 32 = 35; 4 + 32 = 36)$.
	Option A is incorrect	The student likely focused only on the first row of numbers in the table $(1 \times 33 = 33)$ and did not test the relationship on any other pairs of numbers in the table. The student needs to focus on understanding that the relationship in a table must be true between the numbers in each set of paired numbers in the table.
	Option B is incorrect	The student likely looked at the paired numbers in the table from right to left instead of from left to right and chose the rule used to determine the position when given the value $(33 - 32 = 1; 34 - 32 = 2; 35 - 32 = 3; 36 - 32 = 4)$. The student needs to focus on attending to the details of the question in problems involving tables.
	Option C is incorrect	The student likely focused only on the paired numbers in the first row of the table from right to left instead of from left to right and chose the rule used to determine the position when given the value $(33 \div 33 = 1)$. The student likely did not test the relationship on any other pairs of numbers in the table. The student needs to focus on understanding that the relationship in a table must be true between the numbers in each set of paired numbers in the table. The student also needs to focus on attending to the details of the question in problems involving tables.

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Item#	Rationale	
32	Option H is correct	To determine the true comparison, the student could have found a common denominator (bottom number that is the same) for $\frac{5}{6}$ and $\frac{4}{8}$. Because 6 and 8 can both be multiplied by a number to get 24, 24 is the lowest common denominator for these fractions $\left(\frac{5}{6} = \frac{20}{24} \text{ and } \frac{4}{8} = \frac{12}{24}\right)$. Using the fractions written with the same denominator of 24, the student should have found that $\frac{20}{24} > \frac{12}{24}$, so $\frac{5}{6} > \frac{4}{8}$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option F is incorrect	The student likely considered the fraction with the smaller denominator to be the larger fraction because fourths of one whole are larger pieces than eighths of the same whole. The student likely did not consider that since the numerators (top numbers) of the fractions are not the same, this thinking is not always true. The student needs to focus on understanding how to compare fractions with different numerators and denominators.
	Option G is incorrect	The student likely thought that the fraction with a larger numerator (top number) and a larger denominator was the larger fraction. The student needs to focus on understanding how to compare fractions with different numerators and denominators.
	Option J is incorrect	The student likely thought that a fraction with a denominator of 10 was larger than a fraction with a denominator of 6. The student needs to focus on understanding how to compare fractions with different denominators.

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Item#		Rationale
33	Option B is correct	To determine which model could represent the bulletin board with a perimeter (distance around the outside of a shape) of 22 feet, the student could have used one of the rectangle formulas from the Perimeter section of the STAAR Grade 4 Mathematics Reference Materials page within the student's test booklet ($P = l + w + l + w$ or $P = 2l + 2w$, where P = perimeter, l = length, and w = width). Because this rectangle has two sides that are 3 feet long and two sides that are 8 feet long, the perimeter is 22 feet ($8 + 3 + 8 + 3 = 22$).
	Option A is incorrect	The student likely confused the formula for perimeter and multiplied 11 feet by 1 foot and then multiplied the result by 2 ($11 \times 1 = 11$; $11 \times 2 = 22$). The student needs to focus on understanding that perimeter is determined by adding all of the side lengths of a shape.
	Option C is incorrect	The student likely added only the given dimensions of 16 feet and 6 feet to get an answer of 22 feet. The two sides of the rectangle that are not labeled also need to be added to find the perimeter. The student needs to focus on understanding that perimeter is determined by adding all of the side lengths of a shape.
	Option D is incorrect	The student likely multiplied the given dimensions of 11 feet and 2 feet. This procedure gives the area of (amount of space covered by) the rectangle (22 square feet) rather than the perimeter. The student needs to focus on understanding the difference between perimeter and area.

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Item#		Rationale
34	Option J is correct	To determine the expression (combination of numbers and operational symbols $(+,-,\times,\div)$ grouped together to show the value) that is equivalent to $\frac{9}{8}$, the student should have found an expression containing fractions that all have the same denominators (bottom numbers) and added the numerators (top numbers). The student should have calculated that $\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}=\frac{9}{8}$.
	Option F is incorrect	The student likely multiplied the numerators instead of adding them. The student needs to focus on understanding how to represent a fraction as a sum of (answer when adding) fractions.
	Option G is incorrect	The student likely added the numerators and added the denominators. The student needs to focus on understanding how to represent a fraction as a sum of (answer when adding) fractions. The student also needs to focus on understanding how to add fractions with different denominators.
	Option H is incorrect	The student calculated correctly to get $\frac{8}{9}$ but chose the expression representing $\frac{8}{9}$ instead of $\frac{9}{8}$. The student needs to focus on attending to the details of problems involving fractions.