Item Position	Rationale	
1	Option A is correct	To determine which dot plot correctly represents the data, the student could have put the values in the list in order and then counted the number of times each value occurs in the list. Then the student should have matched the counts of the values in the list to the numbers of dots shown above the labeled values in the dot plot (a graphical way of showing the frequency of an event by placing a dot or dots above a value on a number line). The list contains two $52\frac{1}{2}$s, two $53\frac{1}{2}$s, one 54, one $54\frac{1}{2}$, and two 55s. 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 chose a dot plot with only one dot for each unique value, excluding additional occurrences of values in the list. The student needs to focus on understanding that each element in a set of data should be represented by one dot on a dot plot.
	Option C is incorrect	The student likely did not put the values in the list in order and incorrectly counted the number of times each value occurred, counting 54 and $54\frac{1}{2}$ one time too many and leaving out one occurrence of $53\frac{1}{2}$ and 55. The student needs to focus on organizing the data given in data analysis problems.
	Option D is incorrect	The student likely chose a dot plot that excluded one height of $52\frac{1}{2}$ because the two identical heights were positioned next to each other (rather than scattered, as other duplicate heights were) in the list of values. The student needs to focus on organizing the data given in data analysis problems.

Item Position	Rationale	
2	26,630; 41,996; 9,633	To determine the numbers in which the value of the circled digit is 10 times the value of the underlined digit, the student could have written the value of each identified digit in expanded notation and identified the circled digits that have a value that is 10 times the value of the underlined digits: $6 \times 1{,}000$ is 10 times 6×100; 9×100 is 10 times 9×10; and 3×10 is 10 times 3×1. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

Item Position	Rationale	
3	Option A is correct	To determine the total amount of money in Kiara's jar, the student could have first identified the value of each coin pictured and then added the values to find the total value of the coins shown. The student then should have added the value of the coins shown to the value of the coins in Kiara's jar. There are 3 quarters ($0.75), 8 dimes ($0.80), and 2 nickels ($0.10): 0.75 + 0.80 + 0.10 = 1.65. Kiara started with $0.15 in her jar and added $1.65: 1.65 + 0.15 = 1.80. 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 confused the values of the dimes and the nickels and multiplied the number of dimes (8) by $0.05 and the number of nickels (2) by $0.10. The student needs to focus on identifying the values of different types of U.S. currency.
	Option C is incorrect	The student likely incorrectly identified the nickels as pennies and multiplied the number of nickels (2) by $0.01. The student needs to focus on identifying the values of different types of U.S. currency.
	Option D is incorrect	The student likely confused the values of the quarters and the nickels and multiplied the number of quarters (3) by $0.05 and the number of nickels (2) by $0.25. The student needs to focus on identifying the values of different types of U.S. currency.

Item Position	Rationale	
4	Option D is correct	To determine the number of boxes Xenia filled with hair bows, the student could have first found the total number of hair bows made, by dividing the total number of ribbons used (483) by the number of ribbons used to make each hair bow (7): 483 ÷ 7 = 69. Then the student could have divided the total number of hair bows made (69) by the number of hair bows placed in each box (3): 69 ÷ 3 = 23. 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 calculated the number of boxes that would be needed if 3 ribbons were placed in each box, and divided 483 ribbons by 3. The student needs to focus on attending to the details of the question.
	Option B is incorrect	The student likely calculated the total number of ribbons needed for the 3 hair bows in each box, and multiplied 7 ribbons by 3 hair bows. The student needs to focus on attending to the details of the question.
	Option C is incorrect	The student likely calculated the total number of hair bows Xenia made, by dividing the total number of ribbons used, 483, by the number of ribbons used in each hair bow, 7. The student needs to focus on identifying and completing all the steps in a multistep problem.

Item Position	Rationale	
5	Option B is correct	To determine the equivalent decimal form of $\frac{29}{10}$, the student could have first divided 29 by 10 to get 2 with a remainder of 9. Therefore, $\frac{29}{10}$ can be rewritten as the mixed number $2\frac{9}{10}$, which represents 2 wholes and 9 tenths, or 2.9. 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 confused 29 tenths with 20 and 9 tenths (0.9). The student needs to focus on understanding how to relate fractions to decimals that name tenths.
	Option C is incorrect	The student likely used 29 as the whole number and the denominator (bottom number of the fraction), 10, as the digits to the right of the decimal point. The student needs to focus on understanding how to relate fractions to decimals that name tenths.
	Option D is incorrect	The student likely recognized that the denominator (bottom number) of the fraction $\frac{29}{10}$ has two digits and chose an answer that has two digits to the right of the decimal point, which represents 9 hundredths instead of 9 tenths. The student needs to focus on understanding how to relate fractions to decimals that name tenths.

Item Position	Rationale	
6	Ray: Figure with a dot on the left end and an arrow on the right end. Line: Figure with an arrow on each end.	To determine which image represents a ray and which image represents a line, the student could recall the definition of each term. A ray is a part of a line that has only one endpoint, and a line is a straight, one-dimensional figure that does not have endpoints. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

Item Position	Rationale	
7	Option D is correct	To determine which strip diagram represents the number of apples, *a*, that Duncan and Priscilla each have, the student should have first recognized that the total number of apples, 68, is represented by the entire length of the strip in the diagram. Next, since Duncan and Priscilla used 46 apples to make pies for the bake sale, the student should have realized that approximately two-thirds of the longer bar should represent the 46 apples used. Finally, the student should have understood that Duncan and Priscilla split the remaining number of apples equally; therefore, dividing that remaining number of apples in half results in the number of apples that Duncan and Priscilla each have.
	Option A is incorrect	The student likely mistook the situation as representing addition, adding the 46 apples used for making pies to the 68 apples that Duncan and Priscilla started with. Additionally, since the diagram does not show any apples remaining after the two values are added, the student did not represent the division of the remaining apples. The student needs to focus on understanding how to use a strip diagram to represent a multistep problem involving the four operations (+, −, ×, ÷). The student also needs to focus on attending to the details of the question.
	Option B is incorrect	The student likely did not understand how to use a strip diagram to represent the details of the problem, and thus misinterpreted the number of apples being shared and divided the total amount incorrectly instead of dividing the remaining amount. Additionally, the student likely did not understand that the 46 apples used to bake pies came from the 68 apples that Duncan and Priscilla started with, so the student added the two values instead of subtracting 46 from 68. The student needs to focus on understanding how to use a strip diagram to represent a multistep problem involving the four operations (+, −, ×, ÷). The student also needs to focus on attending to the details of the question.
	Option C is incorrect	The student likely recognized that the total number of apples, 68, is represented by the entire length of the strip in the diagram and that Duncan and Priscilla used 46 apples to make pies for the bake sale (approximately two-thirds of the longer bar).

		The student likely did not realize that the remaining number of apples, represented by *a* in the diagram, should be divided in half to show that the apples were split evenly between Duncan and Priscilla. The student needs to focus on understanding how to use a strip diagram to represent a multistep problem involving the four operations (+, −, ×, ÷). The student also needs to focus on attending to the details of the question.

Item Position	Rationale	
8	Option A is correct	To determine which of the four fractions is greater than $\frac{6}{8}$, the student could have created equivalent fractions by finding a common denominator (a multiple of both bottom numbers) for $\frac{6}{8}$ and each of the fractions in the answer choices. Since the fractions $\frac{6}{8}$ and $\frac{4}{5}$ have denominators of 8 and 5, the student could have recognized that a common denominator for the fractions could be 40, since $8 \times 5 = 40$ and $5 \times 8 = 40$. The student then could have written the two fractions in their equivalent forms based on the common denominator: $\frac{6}{8} \times \frac{5}{5} = \frac{30}{40}$ and $\frac{4}{5} \times \frac{8}{8} = \frac{32}{40}$. The student then could have compared the numerators (top numbers) of the two fractions. Since 30 is less than 32, $\frac{30}{40} < \frac{32}{40}$, which is equivalent to $\frac{6}{8} < \frac{4}{5}$. 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 compared the two numerators of $\frac{6}{8}$ and $\frac{7}{10}$ and did not consider that the two fractions have different denominators. The student needs to focus on understanding how to compare fractions with different numerators and denominators.
	Option C is incorrect	The student likely misunderstood the inequality sign and selected a fraction that is less, instead of greater, than $\frac{6}{8}$, after finding equivalent fractions with common denominators $\left(\frac{6}{8} = \frac{18}{24} > \frac{1}{3} = \frac{8}{24}\right)$. The student needs to focus on attending to the meaning of math symbols used when comparing fractions with different numerators and denominators.
	Option D is incorrect	The student likely compared the difference between the numerator (top number) and the denominator (bottom number) in $\frac{3}{4}$ and in $\frac{6}{8}$, noticing that the difference between 3 and 4 is 1 and the difference between 6 and 8 is 2. The student likely did not realize that a smaller difference between a numerator and a denominator indicates a greater fraction only when comparing fractions whose denominators are the same. The student needs to focus on understanding how to compare fractions with different numerators and denominators.

Item Position	Rationale	
9	Option C is correct	To determine the area (amount of space covered by a two-dimensional figure) of the square, the student first should have used the formula for the perimeter (distance around the outside of a figure) of a square from the "Perimeter" section of the STAAR Grade 4 Mathematics Reference Materials ($P = 4s$, where P = perimeter and s = side length). The student should have solved $40 = 4 \times$ a side length to determine the length of one side ($40 \div 4 = 10$ centimeters). Next, the student should have used the formula for the area of a square ($A = s \times s$, where A = area and s = side length). Since all sides of the square have a length of 10 centimeters, the student should have calculated the area as 10×10, resulting in 100 square centimeters.
	Option A is incorrect	The student likely divided 40 by 4 then multiplied the result by 2, resulting in 20. The student needs to focus on understanding that the area of a square is determined by multiplying the side length of the square by itself.
	Option B is incorrect	The student likely confused area and perimeter, first dividing 40 by 2 and then multiplying the result by 4, which represents the number of sides needed to find the perimeter ($40 \div 2 = 20$; $20 \times 4 = 80$). 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 confused area and perimeter. The student likely found the correct side length ($40 \div 4 = 10$ centimeters) and then, unsure of the next step, multiplied the side length by the perimeter ($10 \times 40 = 400$). The student needs to focus on understanding the difference between area and perimeter calculations and when to use each to solve problems.

Item Position	Rationale	
10	Option D is correct	To determine which table shows the rule (relationship) – 4 when given the position (input value) and the value (output value), the student should have subtracted 4 from each input value and identified the table that correctly lists the paired output values (10 – 4 = 6; 11 – 4 = 7; 12 – 4 = 8; 13 – 4 = 9).
	Option A is incorrect	The student likely confused the rule – 4 with the output value. Rather than subtracting 4 from each position, the student identified values that could be subtracted to give an output value of 4. The student needs to focus on understanding that the relationship between the position of a number in a pattern and its value must apply to all the numbers in the pattern.
	Option B is incorrect	The student likely misunderstood the position column and what it represents (the input or the number impacted by the applied rule). Given the numbers in the position column, each number in the value column should be the result of 4 – 4. Instead, the student likely selected the position number as the opposite (+ 4) of the rule, choosing a completely different number with which to apply the rule. The student needs to focus on understanding that the relationship between the position of a number in a pattern and its value must apply to all the numbers in the pattern.
	Option C is incorrect	The student likely confused the rule – 4 with the output value and chose a table that has only input values that are multiples of 4. The student needs to focus on understanding that the relationship between the position of a number in a pattern and its value must apply to all the numbers in the pattern.

Item Position	Rationale	
11	1,000; 1; 0.1	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 4,002.7, the student should have written the sum (total) of the values represented by the digits. The 4 in the thousands place should be written as (4 × 1,000), the zero in the hundreds place has no value, the zero in the tens place has no value, the 2 in the ones place should be written as (2 × 1), and the 7 in the tenths place should be written as (7 × 0.1).

Item Position	Rationale	
12	Option A is correct	To determine the product when multiplying a number by a power of 10, the student could have recalled that for each power of 10, (10, 100, 1,000, 10,000, ...), an additional zero can be added to the multiplicand (the number being multiplied) to find the product (the result of a multiplication expression). Therefore, the student could have added two zeros to the right side of 476,500: 476,500 × 1 0 0 = 47,650,0 0 0. 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 added three zeros, one for each digit in the number 1 0 0 (3 digits), to 476,500 to get the result 476,500,0 0 0. The student needs to focus on understanding how to use placeholders of zero when multiplying.
	Option C is incorrect	The student was likely confused about the method of multiplying by powers of 10 and removed two zeros from the multiplicand rather than adding two zeros to the end of the number. The student needs to focus on understanding how to use placeholders of zero when carrying out the steps in the multiplication algorithm.
	Option D is incorrect	The student was likely confused about the method of multiplying by powers of 10 and thought multiplying a number by 100 the digits in the hundreds period should be zeros so moved the digits one place value to the left. The student needs to focus on understanding how to use placeholders of zero when carrying out the steps in the multiplication algorithm.

Item Position	Rationale	
13	Option D is correct	To determine which angle appears to have a measure (amount of turn between two rays around their common point) of 95°, the student could have found the two measures from the same scale (one sequence of measurement values on the protractor) through which the angle's two rays (shown by arrows; a part of a line with only one endpoint) pass. The student then could have subtracted the smaller measure from the larger measure. On the outside scale, the left ray passes through 10°, and the right ray passes through 105°, so the measure of the angle is 95° (105° − 10° = 95°). 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 was unsure of how to read the numbers on the protractor, because there are numbers listed in two scales. The student likely identified the ray passing through 90°, believing this to be a close enough approximation of 95°. The student needs to focus on using a protractor to find measures of angles.
	Option B is incorrect	The student likely identified that both rays making up the given angle pass through 95°, with the left ray passing through 95° on the inner scale and the right ray passing through 95° on the outer scale. The student needs to focus on using a protractor to find measures of angles.
	Option C is incorrect	The student likely used different scales for the two rays when reading the protractor before subtracting to find the measure of the given angle, creating a subtraction problem using the left ray passing through 95° on the outer scale and the right ray passing through 0° on the inner scale (95° − 0° = 95°). The student needs to focus on using a protractor to find measures of angles.

Item Position	Rationale	
14	$\frac{8}{9}$ and any equivalent values are correct	To determine what fraction of the shirts are either solid or striped, the student should have first found the total number of shirts in the pictorial model (5 + 3 + 1 = 9) and identified 9 as the denominator (bottom number) of the fraction, because the denominator represents the total number of parts that make up the whole. The student then should have found the sum of the number of solid shirts and the number of striped shirts (5 + 3 = 8) and identified 8 as the numerator (top number) of the fraction.

Item Position	Rationale	
15	Option B is correct	To determine the difference between the highest and lowest scores represented on the stem and leaf plot (a plot that displays data with each number split into a stem [the first digit or digits of the number, in this case the ones place] and a leaf [the last digit of the number, in this case the tenths place]), the student should have read the key and recognized that 6|2 represents 6.2, the least value, and 9|6 represents 9.6, the greatest value. Then the student should have subtracted 6.2 from 9.6 (9.6 – 6.2 = 3.4) to find the difference between the highest and lowest scores.
	Option A is incorrect	The student likely identified the greatest and least digits on the right side of the stem and leaf plot and subtracted 8 – 0 = 8. The student needs to focus on reading data represented in stem and leaf plots.
	Option C is incorrect	The student likely identified the highest and lowest scores from the stem and leaf plot but added the values instead of determining the difference between them. The student needs to focus on attending to the details of the question.
	Option D is incorrect	The student likely did not read the key and incorrectly identified 9.6 as 96 and 6.2 as 62, finding a difference of 34 (96 – 62 = 34). The student needs to focus on attending to the details of the question.

Item Position	Rationale	
16	4.05 and any equivalent values are correct	To determine the amount of money Amar spends on his snack in dollars and cents, the student could have first identified the total value of the money shown in the picture and then added to find the value of the money left over. There are 4 ten-dollar bills, 1 five-dollar bill, three quarters (0.25) and two dimes (0.10). Next, adding the values shown, the student could have concluded that Amar was given $45.95 back, $(4 \times 10.00) + (1 \times 5.00) + (3 \times 0.25) + (2 \times 0.10) = 45.95$. Finally, the student could have subtracted the amount of money left over from the $50 bill that Amar used to buy his snack, $50.00 - 45.95 = 4.05$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

Item Position	Rationale	
17	Option B is correct	To determine the two fractions represented by point *F*, the student should have first counted the number of sections between 0 and 1 on the number line. The student should have determined that, since there are 3 sections between 0 and 1, each section represents $\frac{1}{3}$ (one-third). Then the student should have counted the number of sections between 0 and point *F*. The student should have determined that since there are 2 sections between 0 and point *F*, that point represents $\frac{2}{3}$ (two-thirds). Finally, the student could have identified the equivalent fraction, $\frac{4}{6}$, by multiplying the numerator (top number) and the denominator (bottom number) of $\frac{2}{3}$ by $\frac{2}{2}$: $\frac{2}{3} \times \frac{2}{2} = \frac{4}{6}$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option A is incorrect	The student likely found that there are 4 tick marks (vertical lines) from 0 to 1 and 3 tick marks from 0 to point *F* and therefore determined that point *F* represents the fraction $\frac{3}{4}$. Finally, the student likely multiplied the numerator and the denominator of $\frac{3}{4}$ by $\frac{2}{2}$, resulting in the equivalent fraction $\frac{6}{8}$. The student needs to focus on understanding how to determine a fraction represented by a point on a number line.
	Option C is incorrect	The student likely found the fractional amount to the left of point *F* (2 out of 3 sections) and the fractional amount to the right of point *F* (1 out of 3 sections). The student needs to focus on understanding how to determine a fraction represented by a point on a number line.
	Option D is incorrect	The student likely found the fractional amount to the left of point *F* by counting the tick marks instead of the sections (3 out of 4 lines) and found the fractional amount to the right of point *F* by counting the lines (2 out of 4 lines). The student needs to focus on understanding how to determine a fraction represented by a point on a number line.

Item Position	Rationale	
18	*P*, *S*	To construct an angle that has a measure (the amount of turn between two rays around their common point) of 85°, the student should have determined that the ray (arrow; →) a part of a line with only one endpoint) shown passes through 0° on the protractor's inner scale. Then the student should have determined that Clayton should draw the second ray from point *P* through point *S* (85° on the inner scale).

Item Position	Rationale	
19	Option B is correct	To determine Colleen's total cost after she applies the $0.75 coupon, the student could have added the costs of the craft paper ($7.99) and the glue ($3.69), making sure to line up the place value of each digit in the two numbers (3.69 + 7.99 = 11.68). Then the student should have subtracted the value of the coupon ($0.75) from the sum (11.68 – 0.75 = 10.93). 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 added the three numbers given, mistaking the coupon for another purchase made by Colleen (3.69 + 7.99 + 0.75 = 12.43). The student needs to focus on attending to the details of the question.
	Option C is incorrect	The student likely did not regroup a 1 from the ones place in 11.68 (when subtracting 0.**7**5 from 11.**6**8) to make 16 tenths, which would allow the student to subtract 7 from 16, but instead subtracted 6 from 7. The student needs to focus on understanding how to regroup when adding and subtracting decimals.
	Option D is incorrect	The student likely did not regroup when finding the sum of the values in the hundredths place (7.9**9** + 3.6**9**) and thus determined the total cost before the coupon is applied to be $11.58 instead of $11.68. The student needs to focus on attending to the details of a multistep problem.

Item Position	Rationale	
20	Option C is correct	To determine which comparison of the three numbers shown is true, the student could have first looked at the digits that share each place value in the numbers, starting with the greatest place value. All three numbers have a 3 in the hundred-millions place; therefore, the student should have looked at the ten-millions place, identifying 3**4**5,897,187 as being less than 354,835,256 or 3**5**4,855,675, because 40 million is less than 50 million. Next, the student should have looked at the millions place and the hundred-thousands place in the two remaining numbers, noticing that they share the same digits in both positions; however, by looking at the ten-thousands place, the student should have identified 354,8**3**5,256 as being less than 354,8**5**5,675, because 30 thousand is less than 50 thousand. Finally, the student should have placed the three numbers in order from least to greatest: 3**4**5,897,187 < 3**5**4,8**3**5,256 < 3**5**4,8**5**5,675. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option A is incorrect	The student likely misunderstood the less-than symbol (<) to mean "greater than" and therefore listed the numbers from greatest to least. The student needs to focus on representing comparisons using the symbols >, <, or =.
	Option B is incorrect	The student likely missed the differing digits in the ten-millions place and instead compared the digits in the ten-thousands place (the next place value filled by differing digits in the three numbers). Additionally, the student likely ordered the numbers from the greatest to the least ten-thousands digit (345,8**9**7,187 < 354,8**5**5,675 < 354,8**3**5,256). The student needs to focus on representing comparisons using the symbols >, <, or = and attending to the details of a problem.
	Option D is incorrect	The student likely missed the differing digits in the ten-millions place and instead compared the digits in the ten-thousands place (the next place value filled by differing digits in the three numbers). Then the student likely ordered the numbers from least to greatest based on that digit (354,8**3**5,256 < 354,8**5**5,675 < 345,8**9**7,187). The student needs to focus on attending to the details of a problem.

Item Position	Rationale	
21	Option C is correct	To determine Addison's profit (the amount of money made after subtracting expenses from the total amount collected) from selling the chair, the student could have added the price in dollars she paid for the chair and the cost of the paint used to repaint the chair (15 + 9 = 24). Then the student could have subtracted the sum of her expenses from the amount for which she sold the chair (42 – 24 = 18). 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 confused the terms "profit" and "expenses" and selected the amount in dollars that Addison spent buying and repainting the chair (15 + 9 = 24). The student needs to focus on understanding how to calculate profit in given situations.
	Option B is incorrect	The student likely thought "profit" meant the total amount for which Addison sold the chair (42). The student needs to focus on understanding how to calculate profit in given situations.
	Option D is incorrect	The student likely misunderstood the term "profit" and added all the dollar amounts in the problem (15 + 9 + 42 = 66). The student needs to focus on attending to the details of a multistep problem involving calculating profit.

Item Position	Rationale	
22	Option A is correct	To determine the true comparison, the student could have changed the fractions in the table, $\frac{17}{2}$, $\frac{126}{12}$, $\frac{60}{6}$, and $\frac{90}{12}$, into mixed numbers (numbers with a whole and a fractional part). To do this, the student could have divided the numerator (top number) of each fraction by its denominator (bottom number), writing any remainder as the numerator over the original denominator: Red: $\frac{17}{2} = 17 \div 2 = 8\frac{1}{2}$ Green: $\frac{126}{12} = 126 \div 12 = 10\frac{6}{12}$ Black: $\frac{60}{6} = 60 \div 6 = 10$ Purple: $\frac{90}{12} = 90 \div 12 = 7\frac{6}{12}$ Finally, the student could have used the mixed numbers to identify that the width of the purple tablecloth $\left(7\frac{6}{12}\text{ feet}\right)$ is less than the width of the red tablecloth $\left(8\frac{1}{2}\text{ feet}\right)$. 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 considered only the numerators (top numbers) when comparing the fractions in the table, identifying the width of the black tablecloth $\left(\frac{60}{6}\text{ feet}\right)$ as being less than the width of the purple tablecloth $\left(\frac{90}{12}\text{ feet}\right)$ because 60 is less than 90. The student needs to focus on understanding how to compare fractions using both numerators and denominators.
	Option C is incorrect	The student likely rounded the numerator to the nearest ten, making the rounded width in feet of the red tablecloth $\frac{20}{2}$, which is equivalent to the width in feet of the black tablecloth, $\frac{60}{6}$, when simplified: $\frac{20}{2} = 20 \div 2 = 10$; $\frac{60}{6} = 60 \div 6 = 10$. The student needs to focus on understanding how to compare fractions using both numerators and denominators.
	Option D is incorrect	The student likely considered only the denominators (bottom numbers) when comparing the fractions in the table, identifying the width of the green tablecloth $\left(\frac{126}{12}\text{ feet}\right)$ as equal to the width of the purple tablecloth $\left(\frac{90}{12}\text{ feet}\right)$ because 12 = 12. The student needs to focus on understanding how to

		compare fractions using both numerators and denominators.

Item Position	Rationale	
23	+,–	To determine an equation that can be used to find the number of tulips, t, David has in his shop, the student should have concluded that the numbers of red and yellow tulips in Carolyn's shop must be added and then 39 must be subtracted, resulting in $t = 156 + 142 - 39$.

Item Position	Rationale	
24	Option D is correct	To determine the area (amount of space covered by a shape) of the floor in square feet, the student could have extended the vertical line segment that measures 12 feet until it met (at a 90° angle) the horizontal line segment that measures 24 feet, creating two rectangles. The first rectangle, on the left, has dimensions of 10 feet × 20 feet. The second rectangle, on the right, has dimensions of 14 feet × 8 feet. Next, the student should have found the formula for the area of a rectangle in the "Area" section of the STAAR Grade 4 Mathematics Reference Materials ($A = l \times w$, where A = area, l = length, and w = width) and used this formula to find the area of each rectangle: $A = 10 \times 20 = 200$ ft^2, and $A = 14 \times 8 = 112$ ft^2. Finally, the student should have added the areas of the two rectangles to find the total area of the floor: 200 + 112 = 312 square feet. 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 multiplied the length given at the bottom of the figure (24 ft) by the length given at the top of the figure (10 ft). The student needs to focus on identifying the dimensions needed to calculate the area of a composite figure.
	Option B is incorrect	The student likely multiplied the length given at the bottom of the figure (24 ft) by the width given on the left side of the figure (20 ft), finding the area of one large rectangle, rather than recognizing that the figure shown is composed of two rectangles. The student needs to focus on identifying the dimensions needed to calculate the area of a composite figure.
	Option C is incorrect	The student likely added all the dimensions shown on the figure (20 + 10 + 12 + 14 + 8 + 24 = 88 ft), finding the perimeter instead of the area. The student needs to focus on solving problems related to the perimeter and the area of a composite figure.

Item Position	Rationale	
25	84, 12, 7 or 84, 7, 12	To determine the equation represented by the array, the student could have counted the number of unit squares in the first row (horizontal, 12) and the number of unit squares in the first column (vertical, 7) and multiplied the number of squares in each row by the number of squares in each column ($12 \times 7 = 84$). Then the student could have recognized that the equation $84 \div 7 = 12$ or $84 \div 12 = 7$ can be used to find the number of unit squares in each row of the array. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

Item Position	Rationale	
26	Option B 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 miles Nancy's mom drove to her friend's house, the student could have translated the given number from word form to numeric form (one hundred six and thirty-five hundredths = 106.35) and then written the sum (total) of the values represented by the digits in 106.35. The 1 in the hundreds place should be written as (1 × 100), the zero in the tens place has no value, the 6 in the ones place should be written as (6 × 1), the 3 in the tenths place should be written as (3 × 0.1), and the 5 in the hundredths place should be written as (5 × 0.01). 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 was likely confused about the place value for the digit 1, because of the zero in the tens place (10<u>0</u>6.35) and chose the expanded notation for 16.35 instead of 106.35. The student needs to focus on identifying the place value for every digit in the number (including the zeros).
	Option C is incorrect	The student was likely confused about representing the place value of decimals that are given in word form and chose the expression where the hundr**<u>edths</u>** place was written as hundr**<u>eds</u>**. Additionally, the student was likely confused about the place values for the 3 and the 5, identifying both digits as being in the hundreds place. The student needs to focus on understanding how to use place values to write decimal numbers in expanded notation.
	Option D is incorrect	The student was likely confused about the place values to the right of the decimal point (tenths and hundredths) and instead used the five positions to the left of the decimal point (10,635), one for each digit in the number 106.35. The student needs to focus on understanding how to use place values to write decimal numbers in expanded notation.

Item Position	Rationale	
27	Option C is correct	To determine how many miles Calvin drove each day, the student could have used the long-division algorithm (procedure) to divide 1,924 miles by 4 days, resulting in 1,924 ÷ 4 = 481 miles. 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 multiplied instead of dividing (1,924 × 4 = 7,696). The student needs to focus on understanding the mathematical operations (+, −, ×, ÷) needed to represent the solution to a real-life problem.
	Option B is incorrect	The student likely divided 1,924 by 4 but made an error when using the standard algorithm. The student correctly divided 19 by 4 to get 4 with a remainder of 3, brought down the 2, and divided 32 by 4 to get 8. However, because 32 is divided by 4 without any remainder, the student likely placed a 0 in the ones place instead of bringing down the 4 to finish the division problem. The student needs to focus on understanding how to carry out all the steps in the division algorithm with accuracy.
	Option D is incorrect	The student likely subtracted instead of dividing (1,924 – 4 = 1,920). The student needs to focus on understanding the mathematical operations (+, −, ×, ÷) needed to represent the solution to a real-life problem.

Item Position	Rationale	
28	Option A is correct	To determine which figures appear to have at least one pair of perpendicular sides (lines that intersect at a 90° angle), the student should have identified the characteristics of each shape given. Figure R, a right trapezoid, has two sets of perpendicular sides (the left side is perpendicular to the bottom side, and the left side is also perpendicular to the top side).
	Option C is correct	To determine which figures appear to have at least one pair of perpendicular sides, the student should have identified the characteristics of each shape given. Figure T, a composite figure created with a rectangle and a triangle, has multiple pairs of perpendicular sides (e.g., the left side of the rectangle is perpendicular to the base of the rectangle).
	Option B is incorrect	The student likely confused perpendicular sides with parallel sides and identified Figure S, a hexagon, as having the greatest number of pairs of parallel sides (3). The student needs to focus on attending to the details of the question being asked and on understanding the terms used to classify two-dimensional figures based on the presence or absence of specific types of angles.
	Option D is incorrect	The student likely confused perpendicular sides with congruent sides and incorrectly identified Figure U as the only shape appearing to have four congruent sides.
	Option E is incorrect	The student likely confused perpendicular sides with parallel sides and identified the isosceles trapezoid as having one pair of parallel sides. The student needs to focus on attending to the details of the question being asked and on understanding the terms used to classify two-dimensional figures based on the presence or absence of specific types of angles.

Item Position	Rationale	
29	Option D is correct	To determine which equation shows a decimal and fraction that are equivalent, the student could have determined that the number 8.5 is equal to 8 + 0.5. The decimal 0.5 (5 tenths) is equal to the fraction $\frac{5}{10}$. Then the student could have realized that 8 is equal to $\frac{8}{1}$ and that $\frac{8}{1} \times \frac{10}{10} = \frac{80}{10}$. Finally, the student could have added $\frac{5}{10} + \frac{80}{10}$ to find $\frac{85}{10}$, the fraction equivalent to 8.5. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option A is incorrect	The student likely determined that the number 8.05 is equal to 8 + 0.05. The decimal 0.05 (5 hundredths) is equal to the fraction $\frac{5}{100}$. The student was likely confused about the process of converting a whole number to a fraction and, instead, just included the numeral 8 when writing the numerator: $\frac{85}{100}$. The student needs to focus on understanding the value of each digit in a decimal number and how to convert decimal numbers to fractions.
	Option B is incorrect	The student likely knew that the denominator would be a power of ten (1, 10, 100, or 1,000) but was confused about how to determine the denominator, identifying the zero in 8.<u>0</u>5 as being in the tenths place and. The student then wrote the remaining digits, 8 and 5, as the numerator: $\frac{85}{10}$. The student needs to focus on understanding the value of each digit in a decimal number and how to convert decimal numbers to fractions.
	Option C is incorrect	The student likely knew that the denominator would be a power of ten (1, 10, 100, or 1,000) but was confused about how to determine the denominator and decided to count the number of digits in the number 8.5 (two digits). The student then used that number of zeros when writing the denominator and used the digits of the given decimal number as the numerator, $\frac{85}{100}$. The student needs to focus on understanding the value of each digit in a decimal number and how to convert decimal numbers to fractions.

Item Position	Rationale	
30	Option C is correct	To determine which stem and leaf plot (a display of data with each number split into a stem [the first digit or digits of the number, in this case the tens place] and a leaf [the last digit of the number, in this case the ones place]) correctly represents the data in the list, the student could have written the data in order from least to greatest and systematically checked each data point against the stem and leaf plot. The student should have recognized that the given stem and leaf plot has each number from the list accounted for.
	Option D is correct	To determine which frequency table (a table that shows how often each value in a set of data occurs) represents the data in the list, the student should have determined the number of times values within each defined interval occurred. Then the student should have matched that frequency to the number of tally marks shown in each row in the table. The list has 7 values from 20 and 29, 5 values from30 and 39, and 2 values from 40 and 49.
	Option A is incorrect	The student likely ignored repeated values and numbers with a zero in the ones place when determining which stem and leaf plot represents the data in the list. The student needs to focus on representing data in stem and leaf plots.
	Option B is incorrect	The student likely confused stem and leaf plots with frequency tables, listing the frequency values (7, 5, 2) for numbers within the range defined by each digit in the stem of the plot (2, 3, or 4 in the tens place). The student needs to focus on representing data in stem and leaf plots and frequency tables.
	Option E is incorrect	The student likely did not account for the duplicate number (28, 28) in the list of data. The student needs to focus on representing data in frequency tables.

Item Position	Rationale	
31	Option A is correct	To determine the type of triangle Patricia draws, the student should have understood that if a triangle has one angle measure greater than 90°, then it must be classified as an obtuse triangle. The student should also have realized that a triangle can never have more than one obtuse angle; therefore, only one obtuse angle is necessary for a triangle to be classified by its angles as obtuse.
	Option B is incorrect	The student was likely confused about the definition of acute angles and identified all three angles as acute. The student needs to focus on applying knowledge of angles to identify acute, right, and obtuse triangles.
	Option C is incorrect	The student was likely confused about the definition of obtuse angles and identified all three angles as obtuse. The student needs to focus on applying knowledge of angles to identify acute, right, and obtuse triangles.
	Option D is incorrect	The student was likely confused about the definitions of acute and obtuse triangles and assumed that since there was at least one acute angle, the triangle must be classified by its angles as acute. The student needs to focus on applying knowledge of angles to identify acute, right, and obtuse triangles.

Item Position	Rationale	
32	Option C is correct	To determine which table correctly represents the rule + 7, the student should have considered the relationship between each input value and the corresponding output value listed in each table. Since each output value in this table is 7 greater than its input value, the rule involves adding 7 to the input value (1 + 7 = 8; 2 + 7 = 9; 3 + 7 = 10; 4 + 7 = 11). The student should have chosen the set of outputs that shows "input + 7."
	Option A is incorrect	The student likely confused addition and multiplication and selected the table in which the input values are multiplied by 7 to give the output values of 7, 14, 21, and 28. The student needs to focus on attending to the details of the question in problems involving tables.
	Option B is incorrect	The student likely confused the rule and the output value, using the 7 given in the rule + 7 as the first output number. The student likely added 1 to each output value to determine the next output value. The student needs to focus on describing a rule that can be used to find the output value when an input value is given.
	Option D is incorrect	The student was likely confused about how to apply the rule to each value in the Input column. The student applied the rule + 7 to the first input value (1) but then used the first output value (8) to find the remaining output values, adding 8 to each output value to find the next output value (8 + 8 = 16; 16 + 8 = 24; 24 + 8 = 32). The student needs to focus on understanding that the relationship in a table must apply to each set of paired numbers in the table.