Item #	Rationale	
1	Option D is correct	To determine which dot plot displays the same data as the list, the student should have put the numbers in the list in order by value and then counted the number of times each number occurs in the list. Then, the student should have matched the counts of the numbers in the list to the numbers of dots shown above the labeled numbers on the dot plot. The list has 1 zero, 1 one, 4 twos, 2 fours, 2 fives, 4 sixes, and 1 eight.
	Option A is incorrect	The student likely did not recognize that the dot above the 9 should be above the 8 to match the data in the list. The student needs to focus on understanding how to accurately represent data in a dot plot.
	Option B is incorrect	The student likely did not plot the dot representing zero because zero has no value. The student needs to focus on understanding that sets of data sometimes contain zeros and the zeros should be plotted on dot plots.
	Option C is incorrect	The student likely chose a dot plot with one dot for each unique value once instead of plotting a dot for each occurrence of a value in the list. The student needs to focus on understanding that each number in a set of data should be represented with one dot on a dot plot.

Item #	Rationale	
2	Option F 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 pounds of bananas Rita bought (three and forty-eight hundredths, or 3.48), the student should have written the sum (total) of the values represented by the digits in 3.48. The 3 in the ones place should have been written as (3×1), the 4 in the tenths place should have been written as (4×0.1), and the 8 in the hundredths place should have been written as (8×0.01).
	Option G is incorrect	The student likely did not correctly use a decimal point in writing the number of pounds and then chose the expanded notation for the number (348). The student needs to focus on understanding how decimal numbers given in words are represented in number form and expanded notation.
	Option H is incorrect	The student likely reversed the place values of the digits on the right side of the decimal point, using 0.01 (instead of 0.1) for the tenths digit (4) and 0.1 (instead of 0.01) for the hundredths digit (8). The student needs to focus on understanding the order of the decimal digits in numbers.
	Option J is incorrect	The student likely interpreted the number of pounds as 300.48 and chose the expanded notation for this number. The student needs to focus on understanding how decimal numbers given in words are represented in number form and expanded notation.

Item #	Rationale	
3	Option B is correct	To determine the difference in meters between the lengths of Line S and Line P, the student should have subtracted the length of Line P from the length of Line S ($7.75 - 1.8 = 5.95$).
	Option A is incorrect	The student likely right-aligned 7.75 and 1.8 when subtracting instead of aligning the numbers by place value, resulting in $7.75 - 0.18 = 7.57$. The student needs to focus on understanding how to align decimal numbers by place value when subtracting.
	Option C is incorrect	The student likely subtracted the length of Line Q (4.05 meters) instead of the length of Line P (1.8 meters) from the length of Line S (7.75 meters). The student needs to focus on eliminating unnecessary information in a problem and attending to the details of the question being asked in a problem.
	Option D is incorrect	The student likely did not regroup (carry) to subtract in the tenths place (the first digit to the right of the decimal point). Instead of regrouping, the student likely subtracted the smaller digit (7) from the larger digit (8). The student needs to focus on understanding how to regroup when subtracting.

Item#	Rationale	
4	Option F is correct	To determine the figures with 2 or more lines of symmetry (imaginary lines dividing a figure into halves that are reflections of each other), the student should have visualized the different ways to draw a line through each figure to create two shapes that are mirror images of each other. Figure K and Figure L each have 2 lines of symmetry while Figure M and Figure N each have only 1 line of symmetry.
	Option G is incorrect	The student likely identified the figures that have fewer than 2 lines of symmetry instead of 2 or more lines of symmetry. The student needs to focus on attending to the details of the question being asked in a problem.
	Option H is incorrect	The student likely considered Figure N to have more than one line of symmetry because of the leftmost section that is rectangular. The student needs to focus on understanding that, when identifying lines of symmetry, the entire figure must be considered.
	Option J is incorrect	The student likely chose all the figures because they all have at least one line of symmetry. The student needs to focus on attending to the details of the question being asked in a problem.

Item#	Rationale	
5	Option D is correct	To determine the model that represents 0.53, the student should have first used the information given in the first sentences of the problem along with the shaded large square to understand the representation for 1 whole. The student then should have understood that the 100 small squares within the shaded large square each represent 1 hundredth of a whole. Therefore, 0.53 (53 hundredths) would be represented by 53 shaded small squares.
	Option A is incorrect	The student likely interpreted 0.53 to mean 5 shaded whole large squares and 3 shaded columns. This model represents 5.3 instead of 0.53. The student needs to focus on understanding how to represent decimal numbers based on a given model of 1 whole.
	Option B is incorrect	The student likely interpreted 0.53 to mean 5 shaded columns in one whole and 3 shaded columns in another whole. This model represents 0.80 instead of 0.53. The student needs to focus on understanding how to represent decimal numbers based on a given model of 1 whole.
	Option C is incorrect	The student likely interpreted 0.53 to mean 5 shaded whole large squares and 3 shaded small squares from another whole. This model represents 5.03 instead of 0.53. The student needs to focus on understanding how to represent decimal numbers based on a given model of 1 whole.

Item #	Rationale	
6	Option G is correct	To determine the total amount Fran paid, the student should have added the cost of 4 shirts ($4 \times \$13$) and the cost of the pair of socks (\$4.29), resulting in $4 \times \$13 + \$4.29 = \$56.29$.
	Option F is incorrect	The student likely added the three numbers that were given in the problem ($4 + 13 + 4.29$). The student needs to focus on understanding how to interpret and solve two-step problems involving multiplication.
	Option H is incorrect	The student likely added the cost of the 4 shirts ($4 \times \$13$) to the cost of 4 pairs of socks ($4 \times \$4.29$) instead of just 1 pair of socks, resulting in $4 \times \$13 + 4 \times \$4.29 = \$69.16$. The student needs to focus on attending to the details of the question being asked in a problem.
	Option J is incorrect	The correct answer (\$56.29) was presented in one of the other answer options.
7	152 and any equivalent values are correct	To determine the measure of angle *XYW* in degrees, the student should have subtracted 28° from 180° since the combined measure of angle *XYW* and angle *XYZ* equals 180°.

Item #	Rationale	
8	Option J is correct	To determine the table that correctly represents the relationship between the position of a number in the pattern and the value of that number, the student should have first looked at the positions and values of the numbers in the list. The positions and values of the numbers are: (Position 1, 6), (Position 2, 12), (Position 3, 18), (Position 4, 24). Then the student should have determined the relationship between the positions and the values of the numbers. In the case of this pattern, each position multiplied by 6 is the value. The student should have chosen this table because the paired position, numerical expression, and value matched the information for the numbers in the list.
	Option F is incorrect	The student likely focused only on the values and not the positions of the numbers. This likely led to a relationship that each position should be multiplied by 1 to get to each value in the table. The student needs to focus on understanding the term “position” as it relates to number patterns.
	Option G is incorrect	The student likely considered “counting by sixes” in the list to be adding 6 rather than multiplying by 6 because each value in the list is 6 more than the value before it. The student needs to focus on understanding how to represent relationships between positions and values of numbers in a pattern.
	Option H is incorrect	The student likely confused “values” with “positions” and chose a relationship that involved division rather than multiplication. The student needs to focus on understanding the terms “position” and “value” as they relate to number patterns.

Item #	Rationale	
9	Option C is correct	To determine which thickness is less than $\frac{3}{8}$ inch, the student should have found a common denominator (bottom number that is the same) for the fraction in the problem and the fraction in the answer choice. The lowest common denominator for $\frac{3}{8}$ and $\frac{1}{3}$ is 24 $\left(\frac{3}{8} \times \frac{3}{3} = \frac{9}{24}, \frac{1}{3} \times \frac{8}{8} = \frac{8}{24}\right)$. Using the fractions written with the same denominator of 24, the student should have found that the numerator (top number) 8 is less than the numerator 9 $\left(\frac{8}{24} < \frac{9}{24}\right)$, therefore $\frac{1}{3}$ is less than $\frac{3}{8}$, and the thickness of Crosby's phone could be $\frac{1}{3}$ inch.
	Option A is incorrect	The student likely considered that because $\frac{2}{5}$ has both a smaller numerator and a smaller denominator than $\frac{3}{8}$, $\frac{2}{5}$ inch is less than $\frac{3}{8}$ inch. The student needs to focus on understanding how to compare fractions with different numerators and denominators.

Item#	Rationale	
	Option B is incorrect	The student likely considered that the smaller denominator of $\frac{4}{7}$ compared to the denominator of $\frac{3}{8}$ meant that $\frac{4}{7}$ must be smaller than $\frac{3}{8}$. The student needs to focus on understanding how to compare fractions with different numerators and denominators.
	Option D is incorrect	The student likely confused the relationship between the thicknesses of Crosby's cell phone and Jacob's cell phone and looked for the greatest (largest) fraction in the answer options instead of the least (smallest). The student likely knew that $\frac{5}{6}$ is close to $\frac{6}{6}$ or 1 whole, making it the thickest measurement given. The student needs to focus on attending to the details of a problem involving the comparison of fractions.

Item #	Rationale	
10	Option G is correct	To determine which model could represent the sign with a perimeter (distance around the outside of a shape) of 48 inches, the student should have found the rectangle that has four side lengths that add up to 48 inches. This rectangle is a square with 4 side lengths that are each 12 inches $(12 + 12 + 12 + 12 = 48)$.
	Option F is incorrect	The student likely added only the given dimensions of 16 inches and 32 inches to get an answer of 48 inches. 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 H is incorrect	The student likely multiplied the given dimensions of 4 inches and 12 inches. This procedure gives the area of (amount of space covered by) the rectangle (48 square inches) rather than the perimeter. The student needs to focus on understanding the difference between perimeter and area and how to solve problems involving perimeter.
	Option J is incorrect	The student likely misunderstood the concept of perimeter and thought only one of the dimensions of a shape needed to be 48 inches. The student needs to focus on understanding that perimeter is determined by adding all of the side lengths of a shape.

Item#	Rationale	
11	Option C is correct	To determine the equation that represents the total amount of water that Darren drank, the student should have multiplied the number of glasses of water he drank per day (3) by the number of days (6) by the number of ounces in each glass (12).
	Option A is incorrect	The student likely thought the values should be added instead of multiplied. The student needs to focus on understanding the math operations ($+$, $-$, $\times$, $\div$) needed to represent the solution to a multi-step problem using an equation.
	Option B is incorrect	The student likely found only the total number of ounces in 1 glass of water every day for 6 days, instead of 3 glasses of water every day. The student needs to focus on attending to all the steps needed to solve a multi-step problem.
	Option D is incorrect	The student likely interpreted the meaning of “every day for 6 days” as division by 6 instead of multiplication. The student needs to focus on understanding the math operations ($+$, $-$, $\times$, $\div$) needed to represent the solution to a multi-step problem using an equation.

Item#	Rationale	
12	Option F is correct	To determine the amount of time Randy spent doing chores, the student should have added the number of minutes (40, 55, 35, 45, and 30) to get a total of 205 minutes. Then the student should have recognized that there are 60 minutes in each hour, and that 205 minutes is the same as 3 hours and 25 minutes.
	Option G is incorrect	The student likely rounded each number of minutes to the nearest 15-minute interval before adding (45, 60, 30, 45, 30). Adding these numbers results in 210 minutes, or 3 hours and 30 minutes. The student needs to focus on accurately solving problems that deal with measurements of time.
	Option H is incorrect	The student likely added the numbers of minutes correctly to find 205 minutes, but incorrectly interpreted this number of minutes to mean 2 hours and 5 minutes. The student needs to focus on understanding how to convert (change) an amount of time given in minutes to hours and minutes.
	Option J is incorrect	The student likely added only 55, 35, 45, and 30 from the table to get 165 minutes, or 2 hours and 45 minutes. The student needs to focus on accurately solving problems that deal with measurements of time.

Item #	Rationale	
13	Option B is correct	To determine whether a statement is true, the student should have compared the values of the digits described. The student should have found that the digit in the thousands place ($3\underline{3},300$) is one tenth of the value of the digit in the ten-thousands place ($\underline{3}3,300$). The digit in the thousands place represents 3,000, and the digit in the ten-thousands place represents 30,000, and 3,000 is $\frac{1}{10}$ as much as 30,000.
	Option A is incorrect	The student likely understood the relationship between tens and hundreds ($10 \times 10 = 100$), but reversed the relationship and did not notice that the digits in those two places ($33,\underline{30}0$) are different. The student needs to focus on the understanding that the value of each place-value position is 10 times as great as the value of the position to the right and $\frac{1}{10}$ the value of the position to the left.
	Option C is incorrect	The student likely understood the relationship between hundreds and thousands ($100 \times 10 = 1{,}000$), but reversed the relationship. The student needs to focus on the understanding that the value of each place-value position is 10 times as great as the value of the position to the right and $\frac{1}{10}$ the value of the position to the left.
	Option D is incorrect	The student likely misunderstood the relationship between ten thousands and hundreds $\left(10{,}000 \times \frac{1}{100} = 100\right)$. The student needs to focus on the understanding that the value of each place-value position is 10 times as great as the value of the position to the right and $\frac{1}{10}$ the value of the position to the left.

Item #	Rationale	
14	Option H is correct	To determine the number of yards, the student should have used the relationship shown in the table (Number of Yards $\times$ 3 $=$ Number of Feet). Then the student should have done the opposite operation (division) and divided 333 by 3 to get 111 yards.
	Option F is incorrect	The student likely reversed the relationship in the table and multiplied 333 by 3, instead of dividing 333 by 3. The student needs to focus on understanding when a measurement is given in a smaller unit (feet), division is needed to get the equal measurement in a larger unit (yards).
	Option G is incorrect	The student likely interpreted the relationship in the table to be that each foot is equal to 30 yards because of the pattern in the second column of the table. The pattern from the top to bottom of the second column shows numbers increasing by 30. The student then likely added 30 to 333 to get a total of 363. 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 ((5, 15), (15, 45), (25, 75), (35, 105)) 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 J is incorrect	The student likely added all the numbers of feet in the table to get a total of 240, and then subtracted 240 from 333, making an error in regrouping in the hundreds place when borrowing to subtract in the tens place. The student needs to focus on understanding that when equivalent measurements are given in a table, the relationship is found between the paired values in the table ((5, 15), (15, 45), (25, 75), (35, 105)) 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.

Item #	Rationale	
15	8.09 and any equivalent values are correct	To determine the decimal equivalent to $8\frac{9}{100}$, the student should have placed the 8 on the left side of the decimal point to represent the whole number 8 and represented $\frac{9}{100}$ as 0.09 (nine-hundredths). $\left(8\frac{9}{100} = 8 + 0.09 = 8.09\right)$
16	Option H is correct	To determine the correct area model (model representing the amount of space covered), the student should have found the model that has 14 units $(10 + 4)$ represented on the top and 14 units $(10 + 4)$ represented on the left, or a length of 14 units and a width of 14 units. The student should have interpreted each smaller shape in the model to represent a multiplication problem, leading to the total of 196 square units. The large square has a side length of 10 units, and when the side lengths are multiplied (10×10), the large square represents an area of 100 square units. Each bar has a length of 10 units and a width of 1 unit, and when the side lengths are multiplied (10×1), each bar represents an area of 10 square units. Each small square has a side length of 1 unit, and when the side lengths are multiplied (1×1), each small square represents an area of 1 square unit. The student should have added 100 square units (the large square), 80 square units (8 bars), and 16 square units (16 small squares) to get a total of 196 square units.
	Option F is incorrect	The student likely chose an area model with a length of 14 units and ignored the width. The student needs to focus on understanding that each side of the rectangle in an area model must 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.

Item#	Rationale	
	Option G is incorrect	The student likely chose an area model that would result in 14 square units when the length and width are multiplied ($7 \times 2 = 14$). The student needs to focus on understanding that each side of the rectangle in an area model must 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 a model that represents a value of 14 square units ($14 \times 1 = 14$). The student needs to focus on understanding that each side of the rectangle in an area model must 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.

Item #	Rationale	
17	Option A is correct	To determine the true statement, the student should have first decided whether each person's expense was a fixed expense (the same amount each month) or a variable expense (changing from month to month). The student should have determined that Sheldon's electricity expense was fixed because he paid the same amount each month and that Jenna's electricity expense was variable because she paid a different amount each month.
	Option B is incorrect	The student likely either confused the definitions of fixed expense and variable expense or misread which person had each type of expense. The student needs to focus on analyzing information presented in a problem to distinguish between fixed and variable expenses.
	Option C is incorrect	The student likely considered that because Sheldon's expense was different from Jenna's expense in each row, the term to describe the expenses was "variable." The student needs to focus on understanding that variable expenses are expenses that are different for one person from month to month.
	Option D is incorrect	The student likely focused on Sheldon's expenses and thought both electricity expenses were fixed. The student needs to focus on analyzing information presented in a problem to distinguish between fixed and variable expenses.

Item #	Rationale	
18	Option J is correct	To determine the expression that can be used to find the fraction of flowers in the vase that are daisies or tulips, the student should have first counted the total number of flowers in the vase (15). The total number of flowers in the vase is the denominator (bottom number) of the two fractions. For the fraction of flowers in the vase that are daisies, the student should have counted the number of daisies (4) and found that the fraction of flowers in the vase that are daisies is $\frac{4}{15}$. The student should have counted the number of tulips (5) and found that the fraction of flowers in the vase that are tulips is $\frac{5}{15}$. The expression that can be used to find the fraction of flowers in the vase that are daisies or tulips is $\frac{4}{15} + \frac{5}{15}$.
	Option F is incorrect	The student likely used the numbers of roses (6) and tulips (5) as both the numerators (top numbers) and denominators of the fractions instead of using the total number of flowers (15) as the denominator and the number of daisies (4) and the number of tulips (5) as the numerators. The student needs to focus on understanding how to determine denominators in problems involving fractions. The student also needs to focus on attending to the details of a problem involving fractions.

Item#	Rationale	
	Option G is incorrect	The student likely used the numbers of daisies (4) and tulips (5) as both the numerators (top numbers) and denominators of the fractions instead of using the total number of flowers (15) as the denominator. The student needs to focus on understanding how to determine denominators in a problem involving fractions.
	Option H is incorrect	The student likely used the fraction of the flowers that are roses $\left(\frac{6}{15}\right)$ instead of using the fraction of the flowers that are daisies $\left(\frac{4}{15}\right)$. The student needs to focus on attending to the details of a problem involving fractions.

Item#	Rationale	
19	Option B is correct	To determine which polygon (closed shape with at least 3 sides) has exactly 2 right (90°) angles, the student should have concluded that a right triangle has three sides with only 1 right angle, a rectangle has two pairs of parallel sides (opposite sides that are always the same distance apart) with 4 right angles, and a rhombus has four sides of equal lengths with either 0 or 4 right angles. The student should have concluded that Hayden drew a right trapezoid, a four-sided polygon with only 1 pair of parallel sides. The word “right” in the term “right trapezoid” indicates that the pair of parallel sides is connected by a third side at 90° angles. The fourth side of a right trapezoid is not connected at right angles.
	Option A is incorrect	The student likely considered the right triangle to have 2 right angles because of the presence of “right” in the polygon name. The student needs to focus on understanding the characteristics of right triangles and right trapezoids.
	Option C is incorrect	The student likely associated right angles with a familiar polygon (rectangle) but disregarded the number of right angles in a rectangle. The student needs to focus on understanding the characteristics of rectangles and right trapezoids.
	Option D is incorrect	The student likely confused a rhombus with a right trapezoid. The student needs to focus on understanding the characteristics of rhombuses and right trapezoids.

Item #	Rationale	
20	Option J is correct	The student should have determined that, since the digit 4 is one place to the left of the rightmost comma, it represents a value of $4 \times 1{,}000$. The value 4,000 is not presented in any of the other answer options, so the student should have determined that the answer was "Not here."
	Option F is incorrect	The student likely misidentified the digit of 4 as being in the hundreds place because the hundreds place is also next to the comma, but on the opposite side. The student needs to focus on understanding the place values of digits in a number.
	Option G is incorrect	The student likely does not understand place value and determined that the value was 40. The student needs to focus on understanding the place values of digits in a number.
	Option H is incorrect	The student likely does not understand that the value of the digit 4 is different depending on where it is placed in a number. The student needs to focus on understanding the place values of digits in a number.

Item #	Rationale	
21	Option C is correct	To determine which answer is true, the student should have used the benchmark (commonly known) fraction of $\frac{1}{2}$. The student should have determined that both $\frac{1}{5}$ and $\frac{4}{10}$ are less than $\frac{1}{2}$. Then, the student should have determined that $\frac{1}{5} = \frac{2}{10}$ so $\frac{2}{10} + \frac{4}{10} = \frac{6}{10}$, which is more than $\frac{1}{2}$. Therefore, if Greg will give away and sell more than half his collection, Greg will have less than half his collection left.
	Option A is incorrect	The student likely added the numerators (top numbers) of $\frac{1}{5}$ and $\frac{4}{10}$, but used the denominator (bottom number) of 10 instead of finding a common denominator and changing $\frac{1}{5}$ to $\frac{2}{10}$. Since $\frac{5}{10} = \frac{1}{2}$, the student likely thought that Greg will have exactly half of his collection left. The student needs to focus on understanding how to generate equivalent fractions to find sums ($+$) and differences ($-$) and compare those sums and differences to benchmark fractions.
	Option B is incorrect	The student likely compared the numerator (top number) of $\frac{1}{2}$ to the numerator of $\frac{4}{10}$ and considered $\frac{4}{10}$ to be greater (larger) than $\frac{1}{2}$. The student needs to focus on understanding how to generate equivalent fractions to compare fractions.
	Option D is incorrect	The student likely compared the denominator (bottom number) in $\frac{1}{5}$ to the denominator in $\frac{1}{2}$ and considered $\frac{1}{5}$ to be greater (larger) than $\frac{1}{2}$ because 5 is greater than 2. The student needs to focus on understanding how to generate equivalent fractions to compare fractions.

Item#	Rationale	
22	Option J is correct	To determine the data set that the frequency table (table that shows how often each value in a set of data occurs) could represent, the student should have divided each list into the intervals (span of numbers) given in the frequency table under “Number of Visits” (1–5, 6–10, 11–15, and 16–20). Then the student should have chosen the list with the number of occurrences in each interval that matched the numbers of tally marks in the second column of the frequency table (4, 5, 5, and 3).
	Option F is incorrect	The student likely did not count the diagonal tally marks in the “6–10” row and the “11–15” row. The student needs to focus on understanding how to represent data using tally marks in a frequency table.
	Option G is incorrect	The student likely considered “0” to be included in the allowable data for the “1–5” row of the frequency table. The student needs to focus on understanding how to represent data using ranges (groups of numbers) in a frequency table.
	Option H is incorrect	The student likely chose data that represented all of the numbers shown in the first column of the frequency table (1, 5, 6, 10, 11, 15, 16, 20) and all the numbers represented by tally marks in the second column of the frequency table (4, 5, 5, 3). The student needs to focus on understanding how to represent data using frequency tables.

Item#	Rationale	
23	Option A is correct	The student should have determined that both sides of the equation show a different way to represent $\frac{7}{4}$. Because the denominators (bottom numbers) of the fractions are all 4, the student should have added the numerators (top numbers) to find the total of $\frac{7}{4}$ on each side of the equation. The student should have calculated that $\frac{2}{4} + \frac{2}{4} + \frac{3}{4} = \frac{7}{4}$ and $\frac{5}{4} + \frac{2}{4} = \frac{7}{4}$.
	Option B is incorrect	Because the denominators of the fractions are all 4, the student likely added the numerators on the left side of the equation, resulting in the total of $\frac{7}{4}$, but then made an error when adding the numerators on the right side of the equation $\left(\frac{1}{4} + \frac{4}{4} + \frac{1}{4} \Rightarrow \frac{7}{4}\right)$. The student needs to focus on understanding how to decompose (break down) a fraction in different ways.

Item #	Rationale	
	Option C is incorrect	Because the denominators of the fractions are all 4, the student likely added the numerators on the right side of the equation, resulting in the total of $\frac{7}{4}$, but then did not do any calculations on the left side of the equation to make sure the left side also resulted in $\frac{7}{4}$. The student needs to focus on understanding how to decompose (break down) a fraction in different ways.
	Option D is incorrect	The student likely saw that the left side of the equation showed one way to represent $\frac{7}{4}$ and that $\frac{7}{4}$ was also included on the right side of the equation. The student likely ignored the "$+\frac{1}{4}$" on the right side of the equation. The student needs to focus on understanding how to decompose (break down) a fraction in different ways.
24	Option J is correct	To determine the total cost, the student should have added the costs of two chairs and one table ($\$57.65 + \$57.65 + \$146.22 = \$261.52$).
	Option F is incorrect	The student likely added only the costs of one chair and one table. The student needs to focus on attending to the details of a problem involving the addition of decimals.
	Option G is incorrect	The student likely added the costs of one chair and two tables instead of two chairs and one table. The student needs to focus on attending to the details of a problem involving the addition of decimals.
	Option H is incorrect	The student likely did not regroup (carry) to any place when adding. The student needs to focus on understanding how to regroup when adding decimals.

Item #	Rationale	
25	Option C is correct	To determine the measure of the angle, the student should have found the two measures on the same scale (inside or outside) through which the rays (→) of the angle pass. Then the student should have subtracted the smaller measure from the larger measure. On the inside scale, one ray of this angle passes through 95° and the other ray passes through 0°, so the measure of the angle is $95° - 0°$, or 95°. On the outside scale, one ray passes through 180° and the other ray passes through 85°, so the measure of the angle is $180° - 85°$, or 95°.
	Option A is incorrect	The student likely interpreted the rightmost ray on the protractor as passing through 40° on the inside scale and found the difference between 135° and 40°. The student needs to focus on understanding how to determine measures of angles in degrees when rays of angles pass through unlabeled measures on a protractor.
	Option B is incorrect	The student likely read the protractor incorrectly and used 95° from the inside scale for the ray pointing upward, but used the 0° from the outside scale for the ray pointing to the left. Then the student correctly found the difference between 95° and 0°. 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.
	Option D is incorrect	The student likely read the protractor incorrectly and focused on the rays passing through both 95° on both the inside scale and the outside scale. 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	42 and any equivalent values are correct	To determine the number of marbles the teacher put into each container, the student should have divided 378 by 9 ($378 \div 9 = 42$).

Item#	Rationale	
27	Option C is correct	The student should have determined that the number 13.7 is equal to $13 + 0.7$. The decimal 0.7 ("seven tenths") is equal to the fraction $\frac{7}{10}$, so $13.7 = 13\frac{7}{10}$.
	Option A is incorrect	The student likely chose $13\frac{1}{7}$ because the fraction has a denominator (bottom number) of 7. The student needs to focus on understanding how to relate decimals to fractions that name tenths and hundredths.
	Option B is incorrect	The student likely considered that since 0.7 is "seven tenths," the denominator (bottom number) of the fraction would be 7×10, or 70. The student needs to focus on understanding how to relate decimals to fractions that name tenths and hundredths.
	Option D is incorrect	The student likely interpreted 7 tenths in the decimal (0.7) as 7 hundredths and chose the fraction with 7 hundredths. The student needs to focus on understanding that the first digit to the right of the decimal point is in the tenths place and the second digit to the right of the decimal point is in the hundredths place.

Item #	Rationale	
28	Option F is correct	To determine the strip diagram that represents the amount of money each partner received, the student should have added the amounts earned for the two jobs ($96 and $78) and then divided the sum into 3 equal parts, each represented by *m*.
	Option G is incorrect	The student likely determined that the amounts earned should be multiplied by 3 instead of divided by 3. This strip diagram represents a situation in which one person earned ($78 + $96) three times. The student needs to focus on understanding how to use a strip diagram to represent a multi-step problem involving the four operations (+, −, ×, ÷).
	Option H is incorrect	The student likely considered only the amount earned for the first job. This strip diagram represents a situation in which $96 was divided equally among the 3 partners. The student needs to focus on understanding how to use a strip diagram to represent a multi-step problem involving the four operations (+, −, ×, ÷).
	Option J is incorrect	The student likely added the amounts earned, but did not divide among the 3 partners. This strip diagram represents a situation in which one person earned ($78 + $96). The student needs to focus on understanding how to use a strip diagram to represent a multi-step problem involving the four operations (+, −, ×, ÷).

Item #	Rationale	
29	Option B is correct	To determine the true comparison, the student should have found a common denominator (bottom number that is the same) for $\frac{2}{10}$, $\frac{3}{6}$, and $\frac{1}{5}$. Because 10, 6, and 5 can all be multiplied by a number to get to 30, 30 is the lowest common denominator for these fractions $\left(\frac{2}{10} = \frac{6}{30}, \frac{3}{6} = \frac{15}{30}, \text{ and } \frac{1}{5} = \frac{6}{30}\right)$. Using the fractions written with the same denominator of 30, the student should have found that $\frac{2}{10}$ and $\frac{1}{5}$ are both equal to $\frac{6}{30}$, so $\frac{2}{10} = \frac{1}{5}$.
	Option A is incorrect	The student likely considered the fraction with the smaller denominator to be the larger fraction because fifths of one whole are larger pieces than sixths 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 C 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 numerators (top numbers) and denominators.
	Option D is incorrect	The student likely considered the fraction with the smaller denominator to be the larger fraction because fifths of one whole are larger pieces than tenths 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.

Item#	Rationale	
30	Option J is correct	To determine the area of (amount of space covered by) the section where Norman will plant carrots, the student should have first determined the length and width of the section labeled "Carrots" in the model. Since the garden is a rectangle, the right side of the carrots section has a length of 14 feet because it is the same length as the opposite side of the garden. The width of the carrots section is $30 - 24$ feet, or 6 feet, because the width of the carrots section plus the width of the rest of the garden should add up to 30 feet, the same width as the entire garden. The student should have calculated that the area of the carrots section is 14×6 or 84 square feet because the area of a rectangle is found by multiplying the length and width of the rectangle.
	Option F is incorrect	The student likely subtracted 24 feet from 30 to get a length of 6 feet for the section of the garden where Norman will plant carrots. Then the student likely added the side lengths of the section ($6 + 14 + 6 + 14 = 40$) to find the perimeter (distance around the outside) of the section instead of multiplying the length and width to find the area of the section. The student needs to focus on understanding the difference between area and perimeter calculations and how to solve problems involving each calculation.
	Option G is incorrect	The student likely made a subtraction error when subtracting 24 feet from 30 feet to get a length of 16 feet for the section of the garden where Norman will plant carrots. Then, the student likely multiplied 16 by 14 to get an area of 224 square feet. The student needs to focus on understanding how to determine lengths not given, based on those lengths provided in problems involving area calculations.
	Option H is incorrect	The student likely multiplied 14 feet by 24 feet to get an area of 336 square feet, which is the area of the section of the garden where Norman will NOT plant carrots. The student needs to focus on attending to the details of the question in problems involving area calculations.

Item#	Rationale	
31	Option A is correct	To determine the total number of tickets that Stephen won at the carnival, the student should have added all the numbers of tickets he won. The stem and leaf plot displays the data with each number split into a stem (the first digit or digits of a number) and a leaf (the last digit of a number). Since 9|6 means 96 tickets, the student should have added 84, 88, 90, 96, 98, 105, 105, and 117 to get a total of 783 tickets.
	Option B is incorrect	The student likely added the leaf numbers as though they were the numbers of tickets (48, 68, 55, and 7) instead of using the key to find the actual numbers of tickets. The student needs to focus on understanding how data is presented in stem and leaf plots.
	Option C is incorrect	The student likely added the numbers in the stem and leaf plot independently of one another, ignoring the key (8, 4, 8, 9, 0, 6, 8, 10, 5, 5, 11, and 7). The student needs to focus on understanding how data is presented in stem and leaf plots.
	Option D is incorrect	The student likely omitted one of the values of 105 when adding, but added the rest of the values correctly. The student needs to focus on understanding how duplicate values are presented in stem and leaf plots.

Item#	Rationale	
32	Option G is correct	To determine the term for what Oscar drew, the student should have identified the components of what was drawn. Since the two lines do not intersect, they are not intersecting lines, nor are they perpendicular lines since perpendicular lines intersect at a right angle (90° angle). The term “line segments” names another type of figure rather than the “lines” indicated in the first sentence of the problem. Since the two lines are one inch apart and never intersect, they must be parallel because parallel lines are two lines that do not intersect and are always the same distance apart.
	Option F is incorrect	The student likely confused the definitions of the terms “perpendicular” and “parallel.” The student needs to focus on understanding the difference between parallel and perpendicular lines.
	Option H is incorrect	The student likely confused the definitions of the terms “intersecting” and “parallel.” The description stated that the lines did not intersect; therefore Oscar could not have drawn intersecting lines. The student needs to focus on understanding the difference between parallel and intersecting lines.
	Option J is incorrect	The student likely chose a term that names figures that can be parallel, but that are not the figures that Oscar drew. The student needs to focus on understanding the difference between lines and line segments.

Item#	Rationale	
33	Option A is correct	To determine which number machine shows the same relationship as the one in the table, the student should have considered the relationship in the table. Since each output value is 14 more than each paired input value, the relationship is $+14$. The student should have chosen the number machine showing a relationship of $+14$ between the input and output values.
	Option B is incorrect	The student likely focused only on the first row of values in the table and did not test the relationship on any other pairs of values in the table. The student needs to focus on understanding that the relationship in an input-output table must be true between the numbers in each set of paired values in the table.
	Option C is incorrect	The student likely focused only on the second row of values and did not test the relationship on any other pairs of values in the table. The student needs to focus on understanding that the relationship in an input-output table must be true between the numbers in each set of paired values in the table.
	Option D is incorrect	The student likely focused only on the relationship between the output values from the top to the bottom of the table rather than on the relationship between the pairs of input values and output values. The student needs to focus on understanding that the relationship in an input-output table must be true between the numbers in each set of paired values in the table.

Item #	Rationale	
34	Option H is correct	To determine how much money Melanie had after she bought the fruit cup, the student should have first found the amount of money Melanie had before she bought the fruit cup. She had two \$10 bills (\$20), one \$5 bill (\$5), four dimes (\$0.40), and six pennies (\$0.06) for a total of \$25.46. Then the student should have found the difference between \$25.46 and \$2.19 (\$25.46 – \$2.19 = \$23.27).
	Option F is incorrect	The student likely added the amount Melanie paid for the fruit cup to the amount of money Melanie had rather than subtracting it. The student needs to focus on understanding the operations needed to solve a multi-step problem involving money.
	Option G is incorrect	The student likely found the amount of money Melanie had before she bought the fruit cup and did not subtract the amount Melanie paid for the fruit cup. The student needs to focus on carrying out all the steps in a multi-step problem involving money.
	Option J is incorrect	The student likely confused the value of dimes (\$0.10) with the value of nickels (\$0.05) when finding the amount of money Melanie had before she bought the fruit cup, adding \$0.20 instead of \$0.40 to get a total of \$25.26. Then the student likely subtracted the amount Melanie paid for the fruit cup from \$25.26. The student needs to focus on understanding the values of dimes and nickels.