Item #	Rationale	
1	Option D is correct	To determine the number of raisins in the bag of trail mix, the student could have set up and solved a proportion (comparison of two ratios) comparing the number of almonds to the number of raisins in the bag. The ratio of almonds to raisins in the bag is 4:3. The student could have used the proportion $\frac{4}{3} = \frac{600}{x}$ to find the value of *x*, the number of raisins in the bag. To solve the proportion, the student could have multiplied the number of raisins (600) by 3, resulting in 1,800. The student then could have divided 1,800 by the number of almonds (4), resulting in 450. Therefore, there are 450 raisins in the bag of trail mix 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 divided the number of almonds (600) by 2 (representing the two elements of the trail mix, almonds and raisins) instead of using the given ratio, 4 almonds to 3 raisins. The student needs to focus on understanding how to use part-to-part proportional relationships to solve real-world problems.
	Option B is incorrect	The student likely divided the number of almonds (600) by 4, resulting in 150, but did not multiply the result by 3 to determine the number of raisins in the bag. The student needs to focus on understanding how to use part-to-part proportional relationships to solve real-world problems.
	Option C is incorrect	The student likely set up the proportion 4 almonds to 3 raisins is equal to the number of raisins in the bag (*x*) to the number of almonds in the bag (600), $\frac{4}{3} = \frac{x}{600}$, instead of 4 almonds to 3 raisins is equal to the number of almonds in the bag (600) to the number of raisins in the bag (*x*), $\frac{4}{3} = \frac{600}{x}$. The student needs to focus on understanding how to use part-to-part proportional relationships to solve real-world problems.

Item #	Rationale	
2	Pepperoni, Sausage, Thick, Sausage	To determine how to complete the table to show all the possible one-topping pizzas Jana can order, the student should have chosen the toppings and crusts that complete the sample space (set of all possible outcomes) described by the scenario. Each pizza has two possible toppings (pepperoni or sausage) and three possible crusts (thin, thick, or stuffed). Each possible pizza order should contain one topping choice and one crust choice, and each possible order should have a different combination of topping and crust, resulting in six possible pizza orders: {(Pepperoni, Thin), (Sausage, Thin), (Pepperoni, Stuffed), (Sausage, Stuffed), (Pepperoni, Thick), (Sausage, Thick)}.

Item #	Rationale	
3	Option A is correct	To determine the inequality that represents all possible values of *m*, the number of miles ridden each day from Tuesday through Friday, the student should have recognized that 8 miles is a fixed amount and will represent a constant term in the inequality. Next, the student should have recognized that the number of days from Tuesday through Friday, 4 days, would represent the coefficient (number in front of the variable) of the variable *m* and that the expression $4m$ will be added to 8 to represent the total number of miles ridden. The student then should have recognized that fewer than (less than the number) 30 miles were ridden during the 5-day period. Finally, the student should have used all this information to create the inequality $8 + 4m < 30$.
	Option B is incorrect	The student likely determined the correct expression, $8 + 4m$, to represent the total number of miles ridden but interpreted “fewer than” as greater than instead of less than. The student needs to focus on understanding the meaning of an inequality symbol.
	Option C is incorrect	The student likely wrote an incorrect expression, $8 – 4m$, to represent the total number of miles ridden and interpreted “fewer than” as greater than instead of less than. The student needs to focus on understanding how to write inequalities based on real-world problems. The student also needs to focus on understanding the meaning of an inequality symbol.
	Option D is incorrect	The student likely wrote an incorrect expression, $8 – 4m$, to represent the total number of miles ridden. The student needs to focus on understanding how to write inequalities based on real-world problems.

Item #	Rationale	
4	Option A is correct	To determine the measurement closest to the height of the model in inches, the student could have set up and solved the proportion (comparison of two ratios) $\frac{1}{15} = \frac{x}{555}$, comparing the ratio of the scale where 1 inch represents 15 feet and the ratio of height of the monument in the model (*x* inches) to the height of the actual monument (555 feet). To solve the proportion, the student could have multiplied by each denominator (the number on the bottom of a fraction) on both sides of the equation, resulting in $1(555) = 15x$ or $15x = 555$. Last, the student could have divided both sides of the equation by 15, resulting in $x = 37$. The student could have concluded that the height of the monument in the model was 37 inches. 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 multiplied 15 by 5, a common factor of 555 and 15, to determine the measurement closest to the height of the model, resulting in 75 inches. The student needs to focus on understanding how to solve problems involving scale models.
	Option C is incorrect	The student likely divided 555 feet by 12 inches, the number of inches in 1 foot, to determine the measurement closest to the height of the model, resulting in approximately 46 inches. The student needs to focus on understanding how to solve problems involving scale models.
	Option D is incorrect	The student likely multiplied 15 feet by 12 inches, the number of inches in 1 foot, to determine the measurement closest to the height of the model, resulting in 180 inches. The student needs to focus on understanding how to solve problems involving scale models.

Item #	Rationale	
5	Groceries, Rent, Entertainment	To determine which categories represent more than 10% of the total budget, the student could have calculated the percentage for each category in the budget by dividing the monthly amount for each category by the total amount in the budget. The total monthly amount for all categories in the budget (250 + 90 + 100 + 440 + 110 + 75) is \$1,065. To determine the percentage for each category, the student could have calculated 250 ÷ 1,065 ≈ 0.23 = 23% for groceries, 90 ÷ 1,065 ≈ 0.08 = 8% for gasoline, 100 ÷ 1,065 ≈ 0.09 = 9% for cell phone, 440 ÷ 1,065 ≈ 0.41 = 41% for rent, 110 ÷ 1,065 ≈ 0.103 = 10.3% for entertainment, and 75 ÷ 1,065 ≈ 0.07 = 7% for utilities. The three categories that represent more than 10% of the total budget are groceries, rent, and entertainment. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

Item #	Rationale	
6	Option C is correct	To determine a reasonable prediction for the number of times a card with a letter should be chosen, the student could have calculated the total number of cards in the deck as the number of cards with letters plus the number of cards with numbers, resulting in 12 + 16 = 28. The student then could have determined the probability (how likely it is that an event will occur) of drawing a card with a letter as the ratio of the number of cards with letters to the total number of cards, resulting in $\frac{12}{28}$. Finally, the student could have multiplied this probability by 14, the number of times the card-pulling process is carried out, resulting in $\frac{12}{28}(14) = 6$. 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 determined the probability of drawing a card with a letter as the ratio of the number of cards with letters to the number of cards with numbers, resulting in $\frac{12}{16}$. The student then likely multiplied this probability by 14, the number of times the card-pulling process is carried out, resulting in $\frac{12}{16}(14) = 10.5$, and truncated (shortened the number after the decimal point) the value to 10. The student needs to focus on attending to the details of the question in problems that require students to make predictions using probability.
	Option B is incorrect	The student likely subtracted the number of cards with letters, 12, from the number of times the card-pulling process was carried out, 14, resulting in 2. The student needs to focus on attending to the details of the question in problems that require students to make predictions using probability.
	Option D is incorrect	The student likely chose the number of letter cards given, 12. The student needs to focus on attending to the details of the question in problems that require students to make predictions using probability.

Item #	Rationale	
7	Option B is correct	To determine the table that shows the cost, *c*, of renting shoes and playing *g* games of bowling, the student could have first understood that the statement “charges \$6.50 per game played” means that the rate of change (ratio of the change in *y*-values to the change in *x*-values) for this situation is 6.5, since the cost increases by \$6.50 for each game played. The student could have then understood that the statement “\$4.00 for shoe rental” means that the cost of renting shoes, \$4.00, represents the *y*-value when no games have been played, or the fixed cost. The number of games is represented by *g*, so the total cost for playing *g* games is $c = 6.50g + 4.00$. The student then could have identified the table that follows this rule by substituting the values 1, 3, and 5 for *g*, resulting in $6.50(1) + 4.00 = 10.50$, $6.50(3) + 4.00 = 23.50$, and $6.50(5) + 4.00 = 36.50$. 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 interpreted \$6.50 as the initial value and \$4.00 as the rate of change, resulting in the rule $c = 4.00g + 6.50$. The student likely substituted the values 1, 3, and 5 for *g*, resulting in $4.00(1) + 6.50 = 10.50$, $4.00(3) + 6.50 = 18.50$, $4.00(5) + 6.50 = 26.50$. The student needs to focus on understanding how to represent real-world linear relationships using tables.
	Option C is incorrect	The student likely interpreted \$6.50 as the cost for one game and then added \$4.00 for each subsequent cost value listed in the table. The student needs to focus on understanding how to represent real-world linear relationships using tables.
	Option D is incorrect	The student likely did not include the shoe charge when calculating the table values. This results in the rule $c = 6.50g$. The student likely substituted the values 1, 3, and 5 for *g*, resulting in $6.50(1) = 6.50$, $6.50(3) = 19.50$, and $6.50(5) = 32.50$. The student needs to focus on understanding how to represent real-world linear relationships using tables.

Item #	Rationale	
8	Option D is correct	To determine which measurement is closest to the area (amount of space covered by a surface) of the circular base of the sundial in square feet, the student should have used the formula for the area of a circle ($A = \pi r^2$, where A is the area of the circle and r is the radius [distance from the center of the circle to a point on the circle]). The student should have recognized that the radius of the sundial is half the labeled diameter (length of the line segment going through the center of the circle connecting two points on the circle) of 90 feet, resulting in $90 \div 2 = 45$ feet. The student should then have substituted $r = 45$ and $\pi \approx 3.14$ into the formula for the area of a circle, resulting in $A \approx 3.14 \bullet 45^2 \approx 3.14 \bullet 2{,}025 \approx 6{,}358.5$ square feet.
	Option A is incorrect	The student likely did not properly regroup when calculating $45^2 = 45 \bullet 45$, resulting in 1,805 and again did not properly regroup when multiplying 1,805 by 3.14, resulting in 3,627.5 square feet. The student needs to focus on understanding how to accurately perform calculations when applying the formula for the area of a circle.
	Option B is incorrect	The student likely used the formula for the circumference (distance around the circle) of a circle ($C = \pi d$, where C is the circumference and d is the diameter), resulting in $3.14 \bullet 90 = 282.6$. The student needs to focus on understanding which formula to apply in calculations involving circles.
	Option C is incorrect	The student likely did not square the radius but rather multiplied the radius by 3.14, resulting in $3.14 \bullet 45 = 141.3$. The student needs to focus on understanding how to correctly apply the formula for the area of a circle.

Item #	Rationale	
9	Selected 2 points on the line $y = 40x$, such as (0, 0) and (1, 40). Any other points on the line $y = 40x$ are correct.	To determine two points on the graph to represent y, the number of inches the snail traveled in x hours, the student should have recognized that the rate of change (ratio of the change in y-values to the change in x-values) for this situation is 40 inches per hour, since the snail traveled 20 inches in $\frac{1}{2}$ hour and the ratio 20 to $\frac{1}{2}$ is equivalent to the unit rate of change 40 to 1. The student should have recognized that the total distance traveled in inches is represented by y and the amount of time in hours is represented by x. The student then should have checked x- and y-values to create the graph in which each y-value is the result of multiplying the corresponding x-value by 40, satisfying the equation $y = 40x$. The line contains the points (0, 0), (1, 40), (2, 80) and (3, 120).

Item #	Rationale	
10	Option D is correct	To determine which statement is best supported by the information in the box plots, the student should have calculated the interquartile range (difference between the third quartile and the first quartile). The student should have identified the first quartile (the value represented by the left side of the rectangle in a box plot) and the third quartile (the value represented by the right side of the rectangle in a box plot) for each set of data. The interquartile range for Monday is 80 – 55 = 25, and the interquartile range for Tuesday is 75 – 50 = 25. The student then should have recognized that 25 = 25 and concluded that the interquartile range of the typing speeds on Monday was equal to the interquartile range of the typing speeds on Tuesday.
	Option A is incorrect	The student likely confused the median (represented by the vertical line within the rectangle in a box plot) with the range (difference between the maximum and minimum values in a data set). The student needs to focus on understanding how to find the medians of data presented in comparative box plots.
	Option B is incorrect	The student likely confused the maximum (greatest value in a data set) with the third quartile. The student needs to focus on understanding how to find the maxima of data presented in comparative box plots.
	Option C is incorrect	The student likely confused the range with the interquartile range. The student needs to focus on understanding how to find the ranges of data presented in comparative box plots.

Item #	Rationale	
11	Option A is correct	To determine which definition describes π, the student should have understood that π is the ratio of the circumference (distance around a circle) to the diameter (length of a line segment going through the center of the circle connecting two points on the circle).
	Option B is incorrect	The student likely confused the radius (distance from the center to a point on the circle) with the diameter when determining the ratio. The student needs to focus on understanding that π is the ratio of the circumference of a circle to its diameter.
	Option C is incorrect	The student likely confused π with the circumference of a circle. The approximate circumference of a circle can be found by multiplying the radius times 2 times 3.14 (an approximation for π). The student needs to focus on understanding that π is the ratio of the circumference of a circle to its diameter.
	Option D is incorrect	The student likely confused π with the circumference of a circle and confused radius with diameter. The student needs to focus on understanding that π is the ratio of the circumference of a circle to its diameter.

Item #	Rationale	
12	Option C is correct	To determine which car brands represented 60% of the sales, the student could have first determined the total number of cars sold in a month, which is 18 + 15 + 21 + 6 = 60. The student then could have determined 60% of 60, resulting in $\frac{60}{100} \times 60 = 36$ cars. Finally, the student could have determined which combination of brands represents a total of 36 cars. The salesperson sold 15 Brand B cars and 21 Brand C cars, resulting in 15 + 21 = 36. Therefore, Brand B and Brand C represent 60% of the total of 60 cars sold. 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 recognized that the total for Brand A and Brand B, 18 + 15 = 33, represents over 50% of the total number of cars sold and estimated the brands as representing 60% of the total. The student needs to focus on understanding the part-to-whole relationship when calculating a percentage.
	Option B is incorrect	The student likely calculated the total for Brand A and Brand C, 18 + 21 = 39, but made a division error when solving the proportion (comparison of two ratios) $\frac{39}{60} = \frac{x}{100}$. The student likely multiplied 39 by 100, resulting in 3,900 and then made a division error when dividing 3,900 by 60. The student needs to focus on understanding the part-to-whole relationship when calculating a percentage.
	Option D is incorrect	The student likely interpreted Brand C as representing 50% of data since it is the tallest bar and Brand D as representing 10% of the data since it is the shortest bar. The student needs to focus on understanding the part-to-whole relationship when calculating a percentage.

Item #	Rationale	
13	15 and any equivalent values are correct.	To determine the area (amount of space covered by a surface) of the figure in square feet, the student should have calculated the sum of the areas of the shapes that make up the figure. The student could have calculated the area of the top trapezoid by substituting $b_1 = 4$, $b_2 = 3$, and $h = 2$ into the formula for the area of a trapezoid ($A = \frac{1}{2}(b_1 + b_2)h$, where b_1 and b_2 represent the lengths of the parallel sides of the trapezoid and h represents the height), resulting in $A = \frac{1}{2}(4 + 3)2 = \frac{1}{2}(7)2 = 7$ square feet. Next, the student could have calculated the area of the bottom trapezoid by substituting $b_1 = 3$, $b_2 = 5$, and $h = 2$ into the formula for the area of a trapezoid, resulting in $A = \frac{1}{2}(3 + 5)2 = \frac{1}{2}(8)2 = 8$ square feet. The student should then have found the sum of the areas to find the total area of the figure, resulting in $A = 7 + 8 = 15$ square feet. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

Item #	Rationale	
14	Option B is correct	To determine how many yards of cloth the fabric store has left, the student could have subtracted the total length of cloth the store sold from the total length of cloth the store originally had. The student could have found the total length of cloth the store originally had by adding the lengths of the two rolls, resulting in $10\frac{7}{8} + 12\frac{1}{4} = 23\frac{1}{8}$ yards. The student then could have found the total length of cloth the store sold by multiplying the length of each piece sold by 4, resulting in $4 \times 4\frac{3}{8} = 17\frac{1}{2}$ yards. Last, the student could have subtracted the total length of cloth the store sold from the total length of cloth the store originally had, resulting in $23\frac{1}{8} - 17\frac{1}{2} = 5\frac{5}{8}$ yards. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option A is incorrect	The student likely made an error when calculating the total length of cloth the store originally had. The student likely did not multiply the numerator (number on the top of a fraction) by 2 when getting a common denominator (number on the bottom of a fraction) to add $10\frac{7}{8}$ and $12\frac{1}{4}$, resulting in $10\frac{7}{8} + 12\frac{1}{8} = 23$ yards. Subtracting the total amount sold from this total results in $23 - 17\frac{1}{2} = 5\frac{1}{2}$ yards. The student needs to focus on performing the mathematical operations (+, −, ×, ÷) that are required to solve a problem.
	Option C is incorrect	The student likely made an error when calculating the total length of fabric sold by the store. The student likely incorrectly multiplied 4 times $4\frac{3}{8}$ by adding 4 to the numerator instead of multiplying, resulting in $16\frac{7}{8}$ yards. Subtracting this amount from the total amount the store originally had results in $23\frac{1}{8} - 16\frac{7}{8} = 6\frac{1}{4}$ yards. The student needs to focus on performing the mathematical operations (+, −, ×, ÷) that are required to solve a problem.
	Option D is incorrect	The student likely made an error when calculating the total length of fabric sold by the store. The student likely multiplied only the whole numbers when multiplying 4 and $4\frac{3}{8}$, resulting in $16\frac{3}{8}$ yards. Subtracting this amount from the total amount the store originally had results in $23\frac{1}{8} - 16\frac{3}{8} = 6\frac{3}{4}$ yards. The student needs to focus on performing the mathematical operations (+, −, ×, ÷) that are required to solve a problem.

Item #	Rationale	
15	Option A is correct	To determine which statement is true about the result of spinning the arrow, the student should have compared the numbers of triangles, diamonds, and stars on the spinner. The student should have determined that there are 4 diamonds and 3 stars on the spinner. Since the fair spinner is divided into sections of equal size and 4 > 3, the student should have concluded that the spinner is more likely to land on a diamond than on a star.
	Option B is incorrect	The student likely did not consider the number of sections for each shape but rather interpreted each of the three shapes as equally likely. The student needs to focus on understanding how to solve problems using qualitative predictions from simple experiments.
	Option C is incorrect	The student likely did not compare the numbers of sections with diamonds and with stars but rather interpreted the 4 diamonds on the spinner as indicating that the arrow is 4 times as likely to land on a diamond as it is to land on a star. The student needs to focus on understanding how to solve problems using qualitative predictions from simple experiments.
	Option D is incorrect	The student likely misinterpreted the meaning of the phrase “less likely,” resulting in a reversal of the comparison between diamonds and stars. The student needs to focus on understanding how to solve problems using qualitative comparisons from simple experiments.

Item #	Rationale	
16	Option D is correct	To determine the experimental probability (how likely it is that an event will occur based on the results of an experiment) that the next time the geometric solid is rolled, it will land with a 7 showing on the top face (side), the student should have recognized that the number 7 appears twice in the table. The student then should have divided the number of times that 7 showed on the top face by the total number of rolls, resulting in $\frac{2}{30} = \frac{1}{15}$.
	Option A is incorrect	The student likely wrote the probability as a ratio of the number of faces on the geometric solid, 8, to the number of times the solid was rolled, 30, resulting in $\frac{8}{30} = \frac{4}{15}$. The student needs to focus on understanding how to determine the probability of a simple event from an experiment.
	Option B is incorrect	The student likely determined that the probability is $\frac{1}{8}$ since the geometric solid used in the game has 8 faces. The student needs to focus on understanding how to determine the probability of a simple event from an experiment.
	Option C is incorrect	The student likely wrote the probability as a ratio of the number of times the 7 showed on the top face, 2, to the number of sides on the geometric solid, 8, resulting in $\frac{2}{8} = \frac{1}{4}$. The student needs to focus on understanding how to determine the probability of a simple event from an experiment.

Item #	Rationale	
17	Option A is correct	To determine the volume (amount of three-dimensional space) of the tent in cubic feet, the student should have used the formula for the volume of a pyramid ($V = \frac{1}{3}Bh$, where *V* is the volume, *B* is the area [amount of space covered by a surface] of the base, and *h* is the height [vertical distance from top to bottom] of the pyramid). To determine *B*, the student should have found the area of the square base by multiplying 7 feet by 7 feet, resulting in 49 square feet. Then the student should have substituted the values *B* = 49 and *h* = 6.6 into the volume formula, resulting in $V = \frac{1}{3}(49)(6.6) = 107.8$ cubic feet.
	Option B is incorrect	The student likely used 6.6 for the side length of the square base and 7 for the height of the pyramid. This results in *B* = (6.6)(6.6) = 43.56, *h* = 7, and $V = \frac{1}{3}(43.56)(7) = 101.64$ cubic feet. The student needs to focus on understanding how to solve problems involving volumes of pyramids.
	Option C is incorrect	The student likely used $\frac{1}{2}$ instead of $\frac{1}{3}$ in the formula for volume $\frac{1}{2}(49)(6.6) = 161.7$ cubic feet. The student needs to focus on understanding how to solve problems involving volumes of pyramids.
	Option D is incorrect	The student likely calculated the perimeter (distance around the outside) of the square base, (7)(4) = 28, rather than the area and multiplied the perimeter by the height, resulting in 28 × 6.6 = 184.8 cubic feet. The student needs to focus on understanding how to solve problems involving volumes of pyramids.

Item #	Rationale	
18	Option B is correct	To determine which value of x is NOT in the solution set of the inequality $-5x + 4x + 4 \le 12$, the student could have solved the inequality. First, the student could have simplified the left side of the inequality by combining $-5x$ and $4x$, resulting in $-x + 4 \le 12$. The student then could have subtracted 4 from both sides of the inequality, resulting in $-x \le 8$. Next, the student could have divided both sides of the inequality by –1. Since the student divided by a negative number, the inequality sign should have been reversed, resulting in the solution to the inequality, which is $x \ge -8$. Finally, the student could have determined that $-9 \le -8$ and that –9 is therefore not in the solution set of the inequality. 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 solved the inequality correctly, resulting in $x \ge -8$, but interpreted the "≥" symbol in the inequality to mean "greater than" instead of "greater than or equal to." The student needs to focus on the meaning of the inequality symbol when determining values in a solution set.
	Option C is incorrect	The student likely did not recognize that –6 is greater than or equal to –8, because 6 is less than 8. The student needs to focus on the meaning of the inequality symbol when determining values in a solution set.
	Option D is incorrect	The student likely did not recognize that when an inequality is divided by a negative number, the inequality sign is reversed, and therefore found the solution $x \le -8$. The student needs to focus on understanding how to represent the inequality symbol when solving an inequality.

Item #	Rationale	
19	Option C is correct	To determine the true statement about the similar (two figures with corresponding angle measures that are equal and corresponding side lengths that are proportional) quadrilaterals (four-sided shapes), the student should have recognized that the corresponding (paired) angles of the quadrilaterals must be congruent (equal in measure).
	Option E is correct	To determine the true statement about the similar quadrilaterals, the student should have recognized that the corresponding side lengths of the quadrilaterals must be proportional (equal in ratio).
	Option A is incorrect	The student likely confused similarity with congruence (having same shape and same size) and inferred that the corresponding sides of the quadrilaterals must be congruent. The student needs to focus on understanding that the corresponding side lengths of similar figures are proportional and the corresponding angle measures are equal.
	Option B is incorrect	The student likely determined that all quadrilaterals are parallelograms and inferred that the opposite sides of the quadrilaterals must be congruent. The student needs to focus on understanding that the corresponding side lengths of similar figures are proportional and the corresponding angle measures are equal.
	Option D is incorrect	The student likely determined that all quadrilaterals are rectangles and inferred that the corresponding angles of the quadrilaterals must each be right angles. The student needs to focus on understanding that the corresponding side lengths of similar figures are proportional and the corresponding angle measures are equal.

Item #	Rationale	
20	Option B is correct	To determine which inference (a conclusion based on evidence) about the preferred study times of all students who attend the two colleges is best supported by the information in the comparative bar graph, the student should have compared the numbers of students from College X and College Y for each of the study times. For College X, the student should have recognized that 8 students chose morning, 3 students chose afternoon, and 2 students chose evening. The student then should have determined that the number of students who chose morning is greater than the numbers of students who chose afternoon and evening. Therefore, the mode (most frequent response in a set of data) time preference for studying among students who attend College X is the morning.
	Option A is incorrect	The student likely interpreted the number of students who responded that morning was their preferred study time as the total number of students for each college. The student needs to focus on attending to the details of comparative bar graphs in problems that require the student to make an inference from a data set.
	Option C is incorrect	The student likely did not combine the total numbers of students from College Y who responded with morning and afternoon and determined that more College Y students responded that evening was their preferred study time than morning or afternoon. The student needs to focus on attending to the details of the answer options in problems that require the student to make an inference from a data set.
	Option D is incorrect	The student likely did not calculate the percentages of students who prefer studying in the morning or afternoon for students attending College X and College Y, but rather compared the total numbers of responses. The student needs to focus on attending to the details of comparative bar graphs in problems that require the student to make an inference from a data set.

Item #	Rationale	
21	Option C is correct	To determine the percent increase from the original amount of money to the amount the musician will have at the end of 12 months, the student could have calculated the amount the savings will increase over the 12-month period and then divided by the original amount that was saved. To calculate the increase in savings, the student could have multiplied \$130 by 12 months, resulting in 130(12) = \$1,560. Next, the student could have divided the \$1,560 increase in savings by \$750, the original amount that had been saved. This results in 1,560 ÷ 750 = 2.08. Finally, the student could have converted 2.08 to a percentage (a number expressed as a part of 100) by moving the decimal point two places to the right, resulting in 208%. 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 divided the original amount saved by the increase in the amount saved after 12 months (750 ÷ 1,560 ≈ 0.48) and incorrectly placed the decimal point when converting to a percentage, resulting in 480%. The student needs to focus on understanding how to solve problems involving percent increase.
	Option B is incorrect	The student likely divided the original amount saved by the total amount after 12 months, resulting in 750 ÷ 2,310 ≈ 0.32 = 32%. The student needs to focus on understanding how to solve problems involving percent increase.
	Option D is incorrect	The student likely divided the increase in the amount saved after 12 months by the total amount saved after 12 months, resulting in 1,560 ÷ 2,310 ≈ 0.675 ≈ 68%. The student needs to focus on understanding how to solve problems involving percent increase.

Item #	Rationale	
22	Option B is correct	To determine the equation that can be used to find the value of x, the student should have recognized that the perimeter (distance around the outside) of a rectangle is the sum (total) of 2 times the width and 2 times the length. The student should have written an equation showing that the sum of 2 times the width, $2(4) = 8$, and 2 times the length, $2(2.5x) = 5x$, is equal to 32 inches, resulting in $8 + 5x = 32$.
	Option A is incorrect	The student likely did not multiply the width and length by 2, resulting in $4 + 2.5x = 32$. The student needs to focus on understanding how to write equations using geometric concepts, including perimeter.
	Option C is incorrect	The student likely wrote an equation to represent the area (amount of space covered by a surface) of the rectangle, which is the length times the width, resulting in $4(2.5x) = 32$. The student needs to focus on understanding how to write equations using geometric concepts, including perimeter.
	Option D is incorrect	The student likely doubled the side lengths of the rectangle but found the product (result of multiplication) instead of the sum, resulting in $8(5x) = 32$. The student needs to focus on understanding how to write equations using geometric concepts, including perimeter.

Item #	Rationale	
23	Option A is correct	To determine the answer choices that best represent packing *y* pickles in *x* jars at the given rate, the student could have determined that 80 pickles per 5 jars is equivalent to 16 pickles per 1 jar. The student could have then recognized that the total number of pickles, *y*, is equal to 16 times the number of jars, *x*. Therefore, the equation is $y = 16x$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option E is correct	To determine the answer choices that best represent packing *y* pickles in *x* jars at the given rate, the student could have determined that 80 pickles per 5 jars is equivalent to 16 pickles per 1 jar. The student could have recognized that the total number of pickles, *y*, is equal to 16 times the number of jars, *x*. The student then could have checked *x*- and *y*-values to find the graph in which each *y*-value is the result of multiplying the corresponding *x*-value by 16. The line contains the points (1, 16) and (2, 32). 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 reversed the definitions of the variables, resulting in *y* representing the number of jars and *x* representing the number of pickles. The student then likely represented the rate of change as 5 pickles per 80 jars, or 1 pickle per 16 jars, resulting in the equation $y = \frac{1}{16}x$. The student needs to focus on understanding how to represent real-world situations with algebraic equations.
	Option C is incorrect	The student likely selected the table where 80 was the change in *y* but did not consider that the change in *x* should be 5 to represent 80 pickles per 5 jars. The student needs to focus on understanding how to represent real-world situations with a table.
	Option D is incorrect	The student likely recognized that the ordered pair (5, 80) is equivalent to 16 pickles per 1 jar but did not check any other ordered pairs from the graph. The student needs to focus on understanding how to represent real-world situations with a graph.

Item #	Rationale	
24	Option A is correct	To determine which measurement is closest to the lateral surface area (total amount of space covered by the surfaces, not including the bases) of the triangular prism in square centimeters, the student could have found the area of the rectangle ($A = bh$, where A represents the area, b represents the length of the base, and h represents the height) for each rectangular face. Since the bases of the prism are equilateral triangles, the student should have recognized that the height of each rectangular face is 6 centimeters. Substituting $h = 6$ and $b = 9$ into the formula, the student could have determined that the area of one rectangular face is $A = 6(9) = 54$ square centimeters. Since the equilateral triangular prism has 3 rectangular faces, the student could have multiplied the area of one rectangular face by 3 to determine the lateral surface area, S, resulting in $S = 3(54) = 162$ square centimeters. 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 multiplied the given numbers as if finding the volume of a rectangular prism, resulting in 6(9)(5.2) = 280.8, and concluded that the lateral surface area of the prism was 280.8 square centimeters. The student needs to focus on understanding the steps and formulas needed to determine the lateral surface area of a prism from a net (two-dimensional view of a three-dimensional figure).
	Option C is incorrect	The student likely found the total surface area of the triangular prism. The student likely found the area for one equilateral triangular face ($A = \frac{1}{2}bh$, where A represents the area of the triangle, b represents the length of the base of the triangle, and h represents the height). Substituting $b = 6$ and $h = 5.2$ into the formula, the student likely obtained $A = \frac{1}{2}(6)(5.2) = 15.6$ square centimeters. Since the prism has 2 equilateral triangular faces, the student likely multiplied the area of one triangular face by 2 to determine the total area of the bases, resulting in $A = 15.6(2) = 31.2$ square centimeters. The student then likely added the total area of the bases and the total area of the rectangular faces, resulting in $S = 31.2 + 162 = 193.2$ square centimeters. The student needs to focus on understanding the steps and formulas needed to determine the lateral surface area of a prism from a net.
	Option D is incorrect	The student likely found the area of one rectangular face of the prism. The student needs to focus on understanding the steps and formulas needed to determine the lateral surface area of a prism from a net.

Item #	Rationale	
25	$-\frac{1}{3}$, −3	To create the equation that describes the relationship between *x* and *y* in the table, the student could have identified *m*, the rate of change (ratio of the change in *y*-values to the change in *x*-values) of the values, and *b*, the *y*-value when *x* = 0, and written the equation in the form *y* = *mx* + *b*. To find the rate of change, the student could have used the ordered pairs (–6, –1) and (0, –3) from the table and calculated the change in *y* as –3 – (–1) = –2 and the change in *x* as 0 – (–6) = 6, resulting in the ratio $-\frac{2}{6} = -\frac{1}{3}$. The student then could have recognized that *y* = –3 when *x* = 0 in the table. Therefore, *b* = –3. Substituting $m = -\frac{1}{3}$ and *b* = –3 into the equation *y* = *mx* + *b* results in the equation $y = -\frac{1}{3}x - 3$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

Item #	Rationale	
26	Option D is correct	To determine the combined area (amount of space covered) of the dark pieces of wood in square inches, the student could have subtracted the area of the unshaded rectangles from the total area of the figure. To find the total area of the figure, the student could have used the formula for the area of a rectangle ($A = bh$, where b represents the length of the base of the rectangle and h represents the height). The student could have substituted $b = 29$ and $h = 39$ into the formula, resulting in $A = 29(39) = 1{,}131$ square inches. The student could have converted the length of the base of the unshaded rectangle, $3\frac{3}{4}$, to its equivalent decimal, which is 3.75. To find the area of one unshaded rectangle, the student could have substituted $b = 3.75$ and $h = 39$, resulting in $A = 3.75(39) = 146.25$ square inches. Since there are 6 unshaded rectangles, the student could have multiplied the area of one unshaded rectangle by 6, resulting in the total area of the unshaded rectangles: $A = 146.25(6) = 877.5$ square inches. Last, the student could have subtracted the area of the unshaded rectangles from the total area of the figure to determine the total area of the shaded rectangles: $A = 1{,}131 – 877.5 = 253.5$ square inches. 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 the area of 5 unshaded rectangles instead of 6, obtaining the total area of the unshaded rectangles as $A = 146.25(5) = 731.25$ square inches. The student then likely subtracted the area of the unshaded rectangles from the total area of the figure to determine the total area of the shaded rectangles: $A = 1{,}131 – 731.25 = 399.75$ square inches. The student needs to focus on understanding how to determine the area of a composite figure.
	Option B is incorrect	The student likely found the total area of the unshaded rectangles, resulting in $A = 6(3.75)(39) = 877.5$ square inches. The student needs to focus on understanding how to determine the area of a composite figure.
	Option C is incorrect	The student likely substituted $h = 29$ instead of $h = 39$ as the height of the unshaded rectangles, resulting in $A = 6(3.75)(29) = 652.5$ square inches. The student likely then subtracted the area of the unshaded rectangles from the total area of the figure to determine the total area of the shaded rectangles: $A = 1{,}131 – 652.5 = 478.5$ square inches. The student needs to focus on understanding how to determine the area of a composite figure.

Item #	Rationale	
27	Option C is correct	To determine which number line represents the solution to the inequality $-4x + 29 > 19$, the student could have first subtracted 29 from both sides of the inequality, resulting in $-4x + 29 - 29 > 19 - 29$, or $-4x > -10$. The student then could have divided both sides of the inequality by –4. Since the student divided by a negative number, the inequality sign should have been reversed, resulting in the solution to the inequality, which is $x < 2.5$. The correct number line shows an open point at the value 2.5 with the shaded arrow pointing to the left since the solution is all values less than 2.5. 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 subtracted 19 from 29 instead of subtracting 29 from 19, resulting in $-4x > 10$. The student likely then divided both sides of the inequality by –4 but did not reverse the direction of the inequality sign, resulting in $x > -2.5$. The student then likely chose the graph with an open point at the value –2.5 and the shading pointing to the right. The student needs to focus on understanding how to solve two-step inequalities and represent the solutions on a number line.
	Option B is incorrect	The student likely subtracted 19 from 29 instead of subtracting 29 from 19, resulting in $-4x > 10$. The student likely then divided both sides by –4 and reversed the direction of the inequality sign, resulting in $x < -2.5$. The student then likely chose the graph with an open point at the value –2.5 and the shading pointing to the left. The student needs to focus on understanding how to solve two-step inequalities and represent the solutions on a number line.
	Option D is incorrect	The student likely followed the correct steps to solve the inequality but did not reverse the inequality sign, resulting in $x > 2.5$. The student then likely chose the graph with an open point at the value 2.5 with the shading pointing to the right. The student needs to focus on understanding how to solve two-step inequalities and represent the solutions on a number line.

Item #	Rationale	
28	The number of tomato plants is 16. The total number of cucumber and bell pepper plants is 18. Watermelon and cucumber plants combined are 40% of the plants.	To determine which statements are true, the student could have determined the number of plants of each type in the garden. Since the number of tomato plants is twice the number of bell pepper plants, the student could have determined that 32% of the plants in the garden are tomato plants. To determine the number of tomato plants in the garden, the student could have calculated 32% of 50, resulting in (0.32)(50) = 16. Since 60% of the plants in the garden are squash, bell pepper, and tomato plants, the student could have determined that the remaining 40% of the garden contains watermelon and cucumber plants. Since the number of cucumber plants is the same as the number of watermelon plants, the student could have determined that 20% of the plants in the garden are cucumber plants. To determine the number of cucumber plants in the garden, the student could have calculated 20% of 50, resulting in (0.2)(50) = 10. To determine the number of bell pepper plants in the garden, the student could have calculated 16% of 50, resulting in (0.16)(50) = 8. Next, the student could have added the numbers of cucumber and bell pepper plants and concluded that the garden has a total of 18 cucumber and bell pepper plants. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

Item #	Rationale	
29	Option D is correct	To determine which equation is true when $x = -3$, the student could have evaluated the equation using -3 for x to determine whether it makes a true statement. When -3 is substituted for x in $3x - 6 = -15$, the result is $3(-3) - 6 = -9 - 6 = -15$, which is a true statement. 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 substituted $x = 3$ instead of $x = -3$ into the equation, resulting in $5(3) + 1 = 15 + 1 = 16$. The student needs to focus on understanding how to determine whether a given value makes an equation true.
	Option B is incorrect	The student likely combined $4x$ and -8 before substituting $x = -3$ into the equation, obtaining the equation $-4x = 12$. The student then likely substituted $x = -3$ into the equation, resulting in $-4(-3) = 12$. The student needs to focus on understanding how to determine whether a given value makes an equation true and following the order of operations.
	Option C is incorrect	The student likely substituted $x = -3$ into the equation but added -3 and 9 before multiplying by -2, resulting in $-2(-3 + 9) = -2(6) = -12$. The student needs to focus on understanding how to determine whether a given value makes an equation true and following the order of operations.

Item #	Rationale	
30	Option D is correct	To determine the probability (how likely it is that an event will occur) that a customer will randomly choose a sandwich that is made using white bread, ham, and cheddar cheese, the student could have first found the probability for each event. The probability of choosing white bread is $\frac{1}{2}$ since 1 of the 2 types of bread is white. The probability of choosing ham is $\frac{1}{3}$ since 1 of the 3 types of meat is ham. The probability of choosing cheddar is $\frac{1}{2}$ since 1 of the 2 types of cheese is cheddar. Next, the student could have recognized that because three events are being chosen, the probability that all three events occur at the same time is $\left(\frac{1}{2}\right)\left(\frac{1}{3}\right)\left(\frac{1}{2}\right) = \frac{1}{12}$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option A is incorrect	The student likely determined only the probability for white bread. The student needs to focus on understanding how to determine the probability of a compound event.
	Option B is incorrect	The student likely determined only the probability for ham. The student needs to focus on understanding how to determine the probability of a compound event.
	Option C is incorrect	The student likely determined only the probability for white bread and ham, resulting in $\left(\frac{1}{2}\right)\left(\frac{1}{3}\right) = \frac{1}{6}$. The student needs to focus on understanding how to determine the probability of a compound event.

Item #	Rationale	
31	Option C is correct	To determine the temperature at 10:00 p.m., the student could have first found the total number of degrees Celsius that the outside temperature decreased since 4:00 p.m. According to the given information, the temperature decreased 2.5 °C each hour for a total of 6 hours, the elapsed time between 4:00 p.m. and 10:00 p.m. To find the total decrease in temperature, the student could have multiplied 2.5 by 6, resulting in (2.5)(6) = 15. Next, the student could have subtracted the product (the result of a multiplication expression) from 8, resulting in 8 – 15 = –7. The temperature at 10:00 p.m. was –7 °C. 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 2.5 by 6 to find the total decrease in temperature, resulting in (2.5)(6) = 15, but did not subtract the product from 8. The student needs to focus on attending to the details of a multi-step problem.
	Option B is incorrect	The student likely subtracted 10 from 8 degrees, resulting in 8 – 10 = –2. The student needs to focus on understanding what the values given in a problem represent and how to multiply rational numbers.
	Option D is incorrect	The student likely multiplied 6 by 2 instead of multiplying 6 by 2.5 when finding the total decrease in temperature, resulting in (2)(6) = 12. The student then likely subtracted the product from 8, resulting in 8 – 12 = – 4. The student needs to focus on attending to the details of a multi-step problem.

Item #	Rationale	
32	asymmetrical, range	To determine whether the distribution of the data for both groups is symmetrical (data to the right of the middle are approximately the same shape as the data to the left of the middle) or asymmetrical (data to the right of the middle are shaped differently from the data to the left of the middle), the student should have looked at the shape of both dot plots (graphs that use dots to display data). For both graphs, the left and right sides are not reflections of each other. Therefore, the distribution of the data for both groups is asymmetrical. To determine whether both groups have the same median (middle number in a set of data when the set is ordered by value), mode (most frequent value in a set of data), or range (difference between the greatest and least values in a set of data), the student should have calculated the stated measures of center and spread for each dot plot. The range for both dot plots is 13.5 – 10.5 = 3. Therefore, the range of the data is the same for both data sets.

Item #	Rationale	
33	Option B is correct	To determine the constant of proportionality that relates *y* to *x*, the student should have used the formula for the constant of proportionality ($k = \frac{y}{x}$, where *k* represents the constant of proportionality, *x* represents the values of the independent variable, and *y* represents the corresponding [paired] values of the dependent variable). The student could have used the pair of corresponding values (3, 12) from the table and substituted *x* = 3 and *y* = 12 into the formula for the constant of proportionality, resulting in $k = \frac{12}{3}$ or *k* = 4. 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 selected a pair of corresponding values from the table but switched the values of *x* and *y* when substituting into the formula for the constant of proportionality, resulting in $k = \frac{3}{12} = \frac{1}{4}$. The student needs to focus on substituting the correct values in the equation to determine the constant of proportionality.
	Option C is incorrect	The student likely used the reciprocal of the changes in *y*-values in the table, resulting in $\frac{1}{20-12} = \frac{1}{8}$. The student needs to focus on understanding how to use the equation $k = \frac{y}{x}$ to determine the constant of proportionality.
	Option D is incorrect	The student likely used the changes in *y*-values in the table, resulting in 20 – 12 = 8 and 28 – 20 = 8. The student needs to focus on understanding how to use the equation $k = \frac{y}{x}$ to determine the constant of proportionality.

Item #	Rationale	
34	Option A is correct	To determine the height (vertical distance from top to bottom) of the gift box in inches, the student could have used the formula for the volume of a prism (*V* = *Bh*, where *V* represents the volume, *B* represents the area [amount of space covered by a surface] of the base, and *h* represents the height of the prism) and solved for *h*. The student could have recognized that *V* = 384 and *B* = 64 since the volume of the gift box is 384 cubic inches and the area of the base is 64 square inches. Next, the student could have substituted *V* = 384 and *B* = 64 into the volume formula, resulting in 384 = 64*h*. The student then could have divided both sides of the equation by 64 to solve for *h*, resulting in $\frac{384}{64} = \frac{64h}{64}$ or 6 = *h*. Last, the student could have concluded that the height of the gift box is 6 inches. 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 multiplied the area of the base by 2, resulting in 384 = 2(64)*h* = 128*h*. The student then divided both sides of the equation by 128 to solve for *h*, resulting in a height of $\frac{384}{128} = 3$ inches. The student needs to focus on understanding how to apply the formula for the volume of a rectangular prism when given the dimensions.
	Option C is incorrect	The student likely multiplied the area of the base by 0.5, resulting in 384 = 0.5(64)*h* = 32*h*. The student then divided both sides of the equation by 32 to solve for *h*, resulting in a height of $\frac{384}{32} = 12$ inches. The student needs to focus on understanding how to apply the formula for the volume of a rectangular prism when given the dimensions.
	Option D is incorrect	The student likely used the side length of the base as the height, resulting in 8. The student needs to focus on understanding how to apply the formula for the volume of a rectangular prism when given the dimensions.

Item #	Rationale	
35	more likely than, less likely than	To complete the predictions about the number of points the team will score in its next game, the student should have compared the numbers of games for the five ranges of points. The student should have recognized that 19 games had a total score range of 96–105 and 3 games had a total score range of 136–145. Since 19 > 3, the student should have concluded that scoring 96–105 points in the next game is more likely than scoring 136–145 points in the next game. The student should have recognized that 17 games had a total score range of 116–125 and 21 games had a total score range of 106–115. Since 17 < 21, the student should have concluded that scoring 116–125 points in the next game is less likely than scoring 106–115 points in the next game. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.

Item #	Rationale	
36	Option B is correct	To determine the price per pound for potatoes, the student should have divided the price the shopper paid by the number of pounds of potatoes, resulting in 3.95 ÷ 5 = 0.79. The student should have concluded that the price per pound for potatoes is $0.79.
	Option A is incorrect	The student likely divided the price the shopper paid by 10, resulting in 3.95 ÷ 10 = 0.395. The student then likely rounded 0.395 to 0.40 and concluded that the price per pound for potatoes is $0.40. The student needs to focus on understanding how to calculate a unit rate given a problem situation.
	Option C is incorrect	The student likely subtracted 3.95 from 5, resulting in 5 – 3.95 = 1.05. The student then likely concluded that the price per pound for potatoes is $1.05. The student needs to focus on understanding how to calculate a unit rate given a problem situation.
	Option D is incorrect	The student likely divided the number of pounds of potatoes by the price the shopper paid, resulting in 5 ÷ 3.95 ≈ 1.266. The student then likely rounded 1.266 to 1.27 and concluded that the price per pound for potatoes is $1.27. The student needs to focus on understanding how to calculate a unit rate given a problem situation.

Item #	Rationale	
37	Option B is correct	To determine which measurement is closest to the circumference (distance around the circle) in centimeters, the student could have used the formula for the circumference of a circle ($C = 2\pi r$, where C represents the circumference, r represents the radius, and π is approximately 3.14). Substituting 4.5 for the value of the radius and 3.14 for π into the formula for circumference results in $C \approx 2(3.14)(4.5) \approx 28.26$ centimeters. 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 used the formula $C = \pi d$, where d represents the diameter, for the circumference and substituted 4.5 for the value of the diameter, resulting in $C \approx 3.14(4.5) \approx 14.13$. The student needs to focus on understanding how to correctly apply the formula for the circumference of a circle.
	Option C is incorrect	The student likely used the formula for the area of a circle ($A = \pi r^2$, where A represents the area, r represents the radius, and π is approximately 3.14), resulting in $A \approx 3.14(4.5)^2 \approx 3.14(20.25) \approx 63.59$ square centimeters. The student needs to focus on understanding which formula to apply in calculations involving circles.
	Option D is incorrect	The student likely used the diameter, 9 centimeters, as the radius in the formula for the circumference of a circle, resulting in $C \approx 2(3.14)(9) \approx 56.52$ centimeters. The student needs to focus on understanding how to correctly apply the formula for the circumference of a circle.

Item #	Rationale	
38	Option C is correct	To determine the value of x that makes the equation represented by the model true, the student could have translated the model into an equation and solved for x. The student could have recognized that the left side of the model contains 3 rectangles, each representing x, and 1 square, representing 1, which results in the expression $3x + 1$. The student could have recognized that the right side of the model contains 7 squares, each representing 1, which results in the expression 7. The student could have set up the equation by setting the expression on the left equal to the expression on the right, obtaining the equation $3x + 1 = 7$. The student then could have solved the equation by first subtracting 1 from both sides of the equation, resulting in $3x + 1 - 1 = 7 - 1$ or $3x = 6$. Last, the student could have divided both sides of the equation by 3, resulting in $\frac{3x}{3} = \frac{6}{3}$ or $x = 2$. This is an efficient way to solve the problem; however, other methods could be used to solve the problem correctly.
	Option A is incorrect	The student likely set up the equation as $3x + 1 = 7$ based on the model but then added 1 to the right side of the equation instead of subtracting 1, resulting in $3x = 7 + 1$ or $3x = 8$. The student then likely divided both sides of the equation by 3, resulting in $\frac{3x}{3} = \frac{8}{3}$ or $x = \frac{8}{3}$. The student needs to focus on understanding how to solve a two-step linear equation.
	Option B is incorrect	The student likely used the total number of rectangles and squares on the left side of the model as the coefficient (number in front of a variable [symbol used to represent an unknown number]) of x, which results in the expression $4x$. The student likely set up the equation by setting the expression on the left equal to the expression on the right, obtaining the equation $4x = 7$. The student then likely divided both sides of the equation by 4, resulting in $\frac{4x}{4} = \frac{7}{4}$ or $x = \frac{7}{4}$. The student needs to focus on understanding how to write an equation when given a model.
	Option D is incorrect	The student likely used the total number of squares in the model to represent the value of x, resulting in 8. The student needs to focus on understanding how to write an equation when given a model.