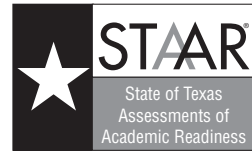


GRADE 7 Mathematics

Administered May 2018

RELEASED

STAAR GRADE 7 MATHEMATICS REFERENCE MATERIALS



LINEAR EQUATIONS

Slope-intercept form

$$y = mx + b$$

Constant of proportionality

$$k = \frac{y}{x}$$

CIRCUMFERENCE

Circle

$$C = 2\pi r$$

or

$$C = \pi d$$

AREA

Triangle

$$A = \frac{1}{2}bh$$

Rectangle or parallelogram

$$A = bh$$

Trapezoid

$$A = \frac{1}{2}(b_1 + b_2)h$$

Circle

$$A = \pi r^2$$

VOLUME

Prism

$$V = Bh$$

Pyramid

$$V = \frac{1}{3}Bh$$

ADDITIONAL INFORMATION

Pi

$$\pi \approx 3.14$$

or

$$\pi \approx \frac{22}{7}$$

Distance

$$d = rt$$

Simple interest

$$I = Prt$$

Compound interest

$$A = P(1 + r)^t$$

Inches

0

1

2

3

4

5

6

7

8

STAAR GRADE 7 MATHEMATICS REFERENCE MATERIALS

LENGTH

Customary

1 mile (mi) = 1,760 yards (yd)

1 yard (yd) = 3 feet (ft)

1 foot (ft) = 12 inches (in.)

Metric

1 kilometer (km) = 1,000 meters (m)

1 meter (m) = 100 centimeters (cm)

1 centimeter (cm) = 10 millimeters (mm)

VOLUME AND CAPACITY

Customary

1 gallon (gal) = 4 quarts (qt)

1 quart (qt) = 2 pints (pt)

1 pint (pt) = 2 cups (c)

1 cup (c) = 8 fluid ounces (fl oz)

Metric

1 liter (L) = 1,000 milliliters (mL)

WEIGHT AND MASS

Customary

1 ton (T) = 2,000 pounds (lb)

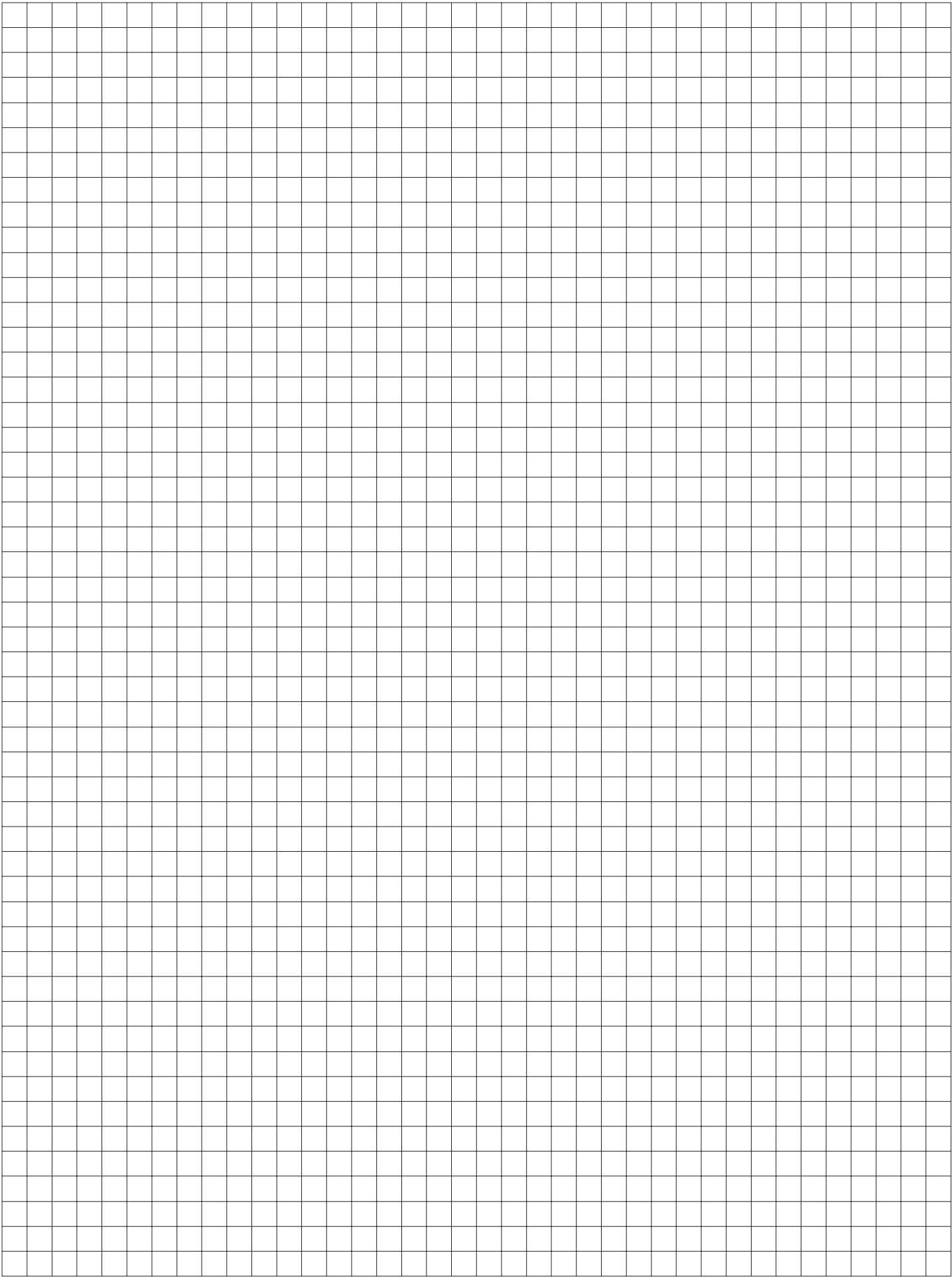
1 pound (lb) = 16 ounces (oz)

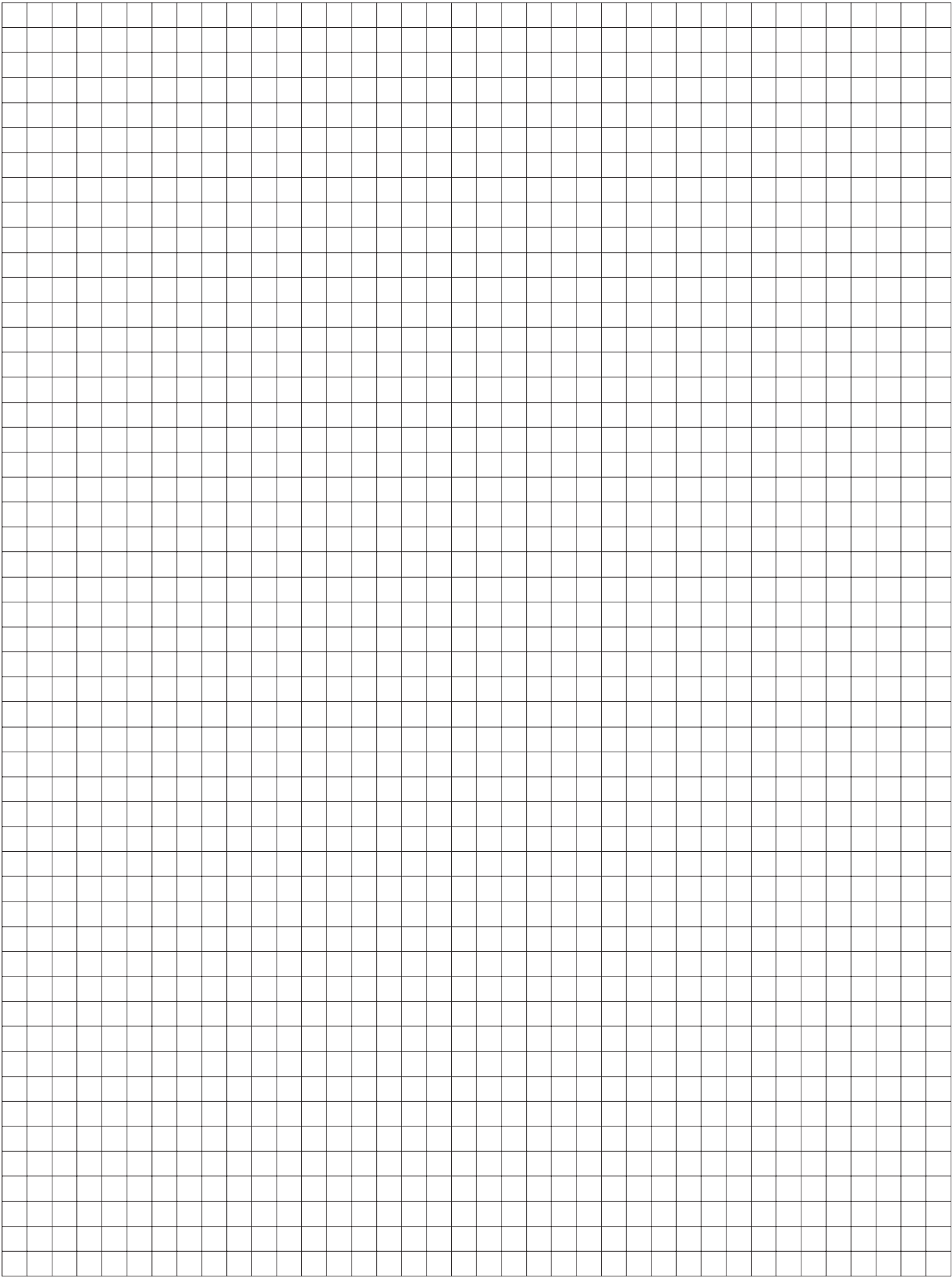
Metric

1 kilogram (kg) = 1,000 grams (g)

1 gram (g) = 1,000 milligrams (mg)

Centimeters



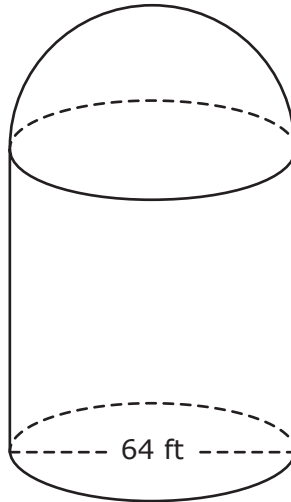


DIRECTIONS

Read each question carefully. For a multiple-choice question, determine the best answer to the question from the four answer choices provided. For a griddable question, determine the best answer to the question. Then fill in the answer on your answer document.

- 1 A recipe says to use 3 cups of flour to make 48 cookies. What is the constant of proportionality that relates the number of cookies made, y , to the number of cups of flour used, x ?
- A 0.6
 - B 48
 - C 3
 - D 16

- 2 An observatory is shaped like a cylinder standing on one of its bases with a dome on top. The diameter of the floor of the observatory is 64 feet, as shown in the diagram.



Which measurement is closest to the circumference of the base of the observatory in feet?

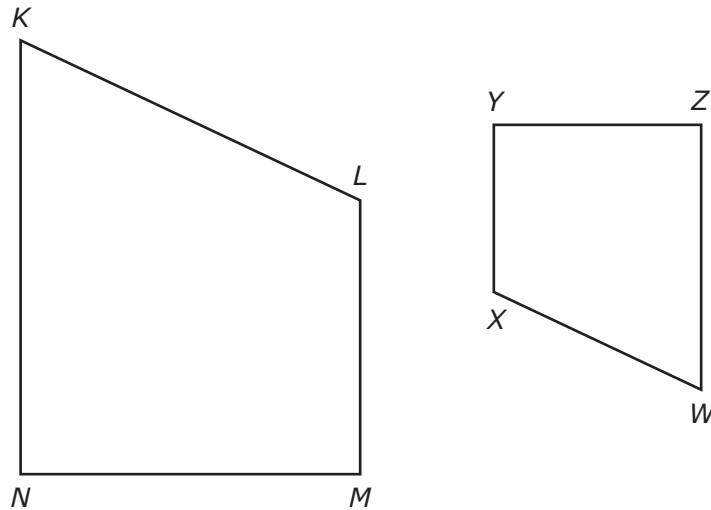
- F 200.96 ft
- G 3,215.36 ft
- H 100.48 ft
- J 401.92 ft

-
- 3 A classroom is arranged with 8 seats in the front row, 10 seats in the middle row, and 12 seats in the back row. The teacher randomly assigns seats to students as they enter the classroom.

What is the probability that the first student who enters the classroom will be assigned a seat in the front row?

- A $\frac{2}{5}$
- B $\frac{2}{3}$
- C $\frac{4}{11}$
- D $\frac{4}{15}$

- 4 Quadrilateral $KLMN$ is similar to quadrilateral $WXYZ$.



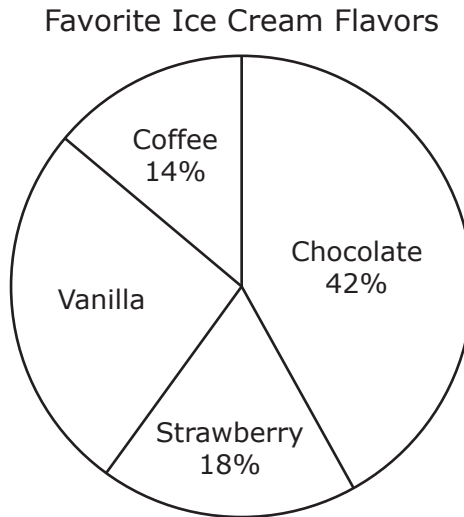
Which statement about these quadrilaterals must be true?

- F** $\frac{KL}{WX} = \frac{WZ}{KN}$
- G** Angle NKL is congruent to angle ZWX .
- H** $\frac{KL}{YZ} = \frac{LM}{ZW}$
- J** Angle NKL is congruent to angle XYZ .
-

- 5 Cheddar cheese costs \$4.25 per pound. Which equation best represents y , the total cost of x pounds of cheddar cheese?

- A** $x = 4.25 + y$
- B** $x = 4.25y$
- C** $y = 4.25 + x$
- D** $y = 4.25x$

- 6 Ursula surveyed 50 classmates about their favorite ice cream flavors. Each classmate chose one flavor. The results are shown in the circle graph.



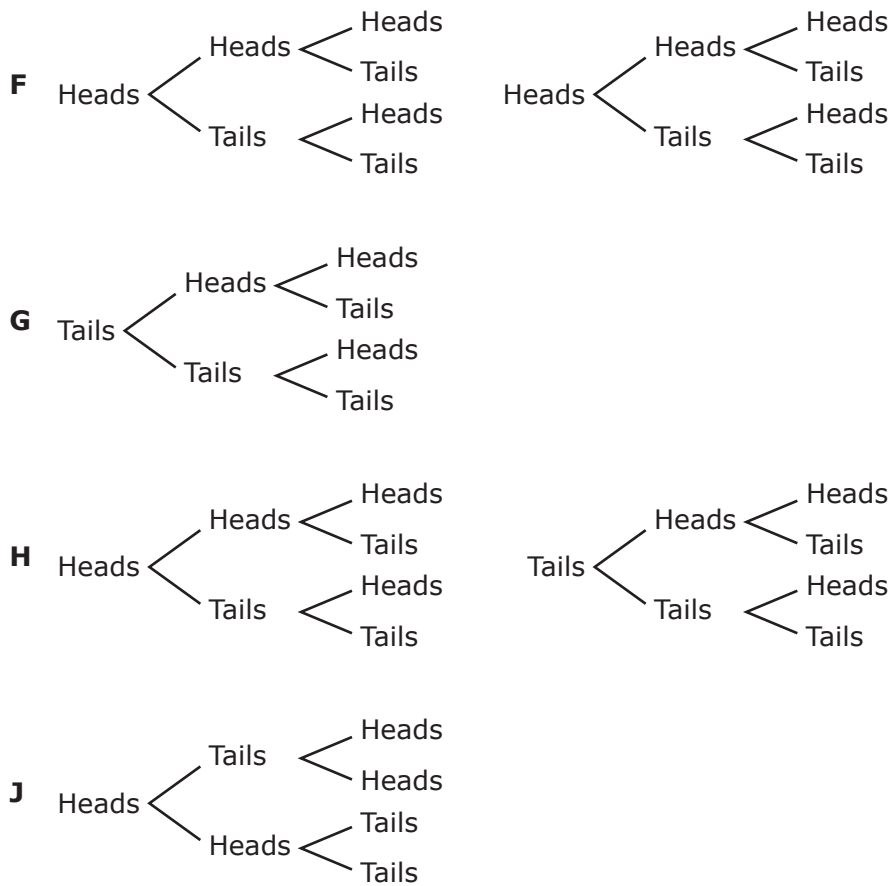
How many more of Ursula's classmates chose chocolate than chose vanilla?

- F 8
- G 6
- H 34
- J 16

-
- 7 What is the solution set for $-4x - 10 \leq 2$?

- A $x \leq -3$
- B $x \geq -3$
- C $x \leq 2$
- D $x \geq 2$

- 8 Jack tossed a coin three times. Which tree diagram shows all the possible outcomes of the coin landing heads up or tails up?

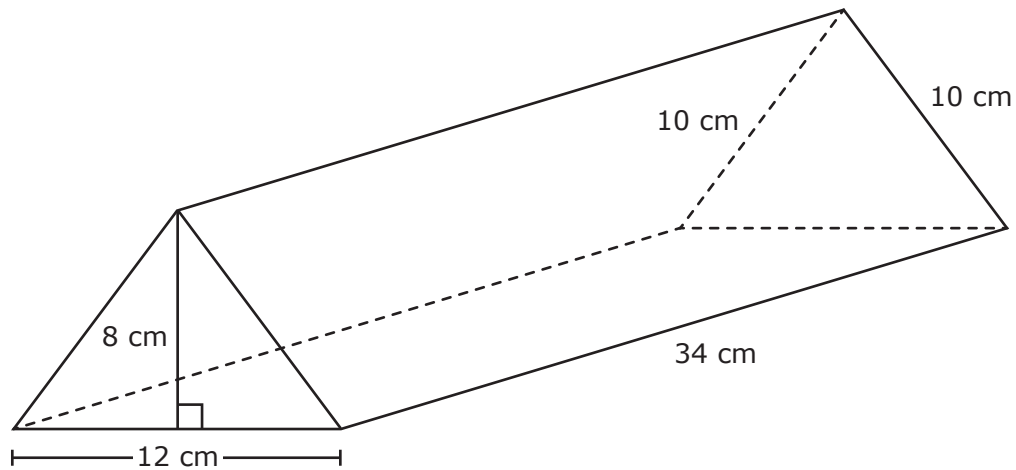


- 9 The ratio of boys to girls in Ms. Cunningham's class is 2 to 3. There are 18 girls in the class.

What is the total number of students in Ms. Cunningham's class?

- A** 12
B 30
C 45
D 27

- 10** The dimensions of a triangular prism are shown in the diagram.



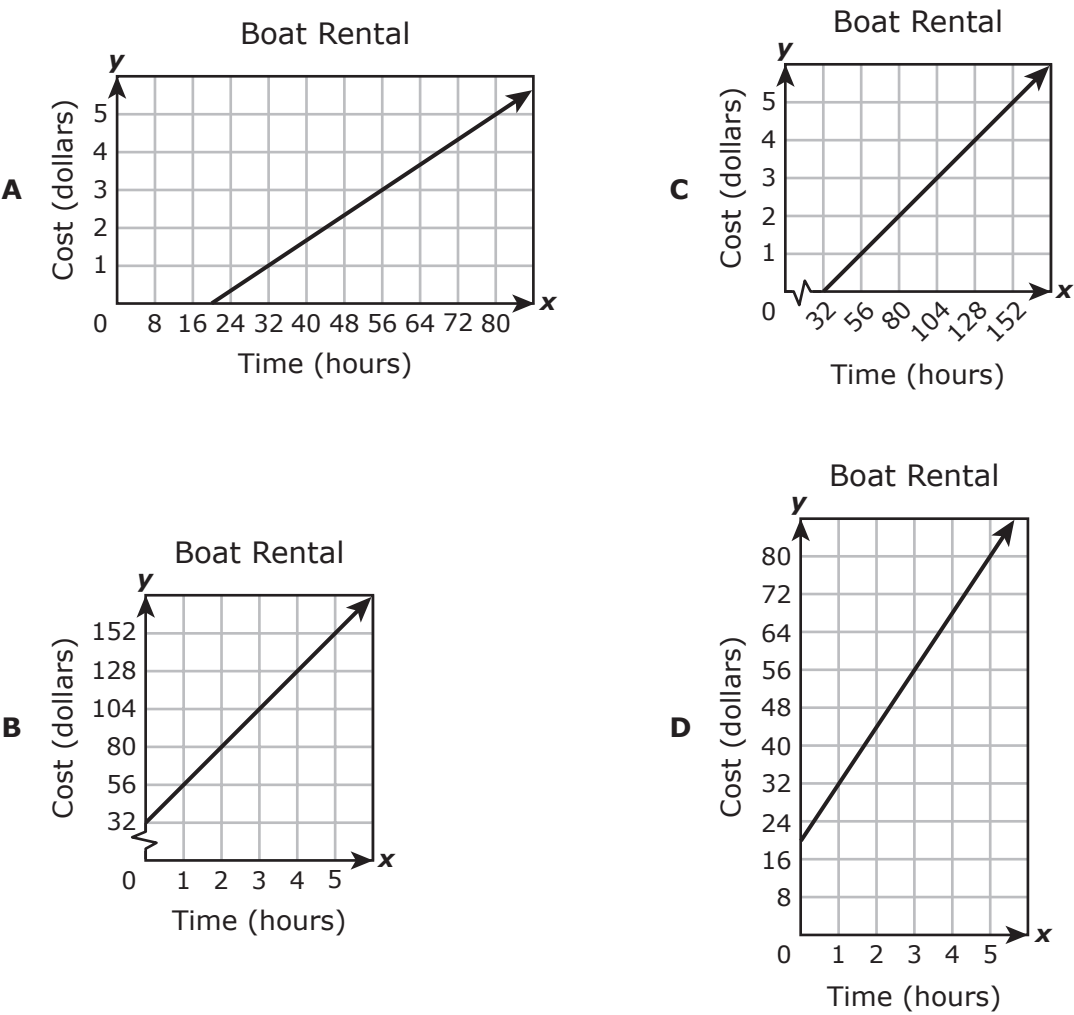
What is the volume of the triangular prism in cubic centimeters?

- F** 1,360 cm^3
- G** 408 cm^3
- H** 1,632 cm^3
- J** 816 cm^3

- 11 The table shows the relationship between y , the cost to rent a boat, and x , the amount of time the boat is rented.

Boat Rental Costs	
Time, x (hours)	Cost, y (dollars)
1	32
3	56
5	80
7	104

Which graph best represents the relationship between x and y shown in the table?



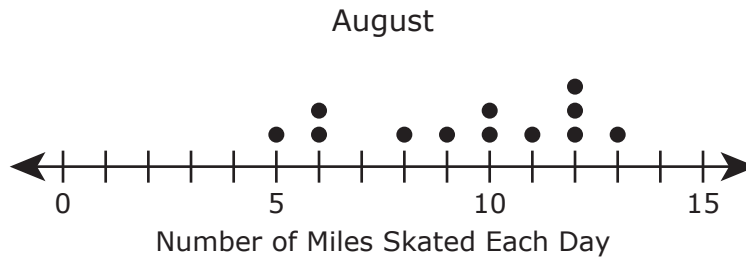
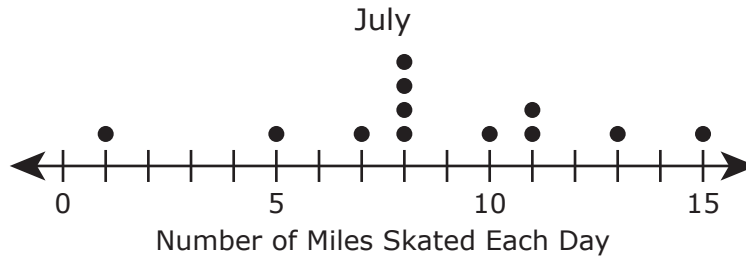
12 The sum of the measures of angle M and angle R is 90° .

- The measure of angle M is $(5x + 10)^\circ$.
- The measure of angle R is 55° .

What is the value of x ?

Record your answer and fill in the bubbles on your answer document. Be sure to use the correct place value.

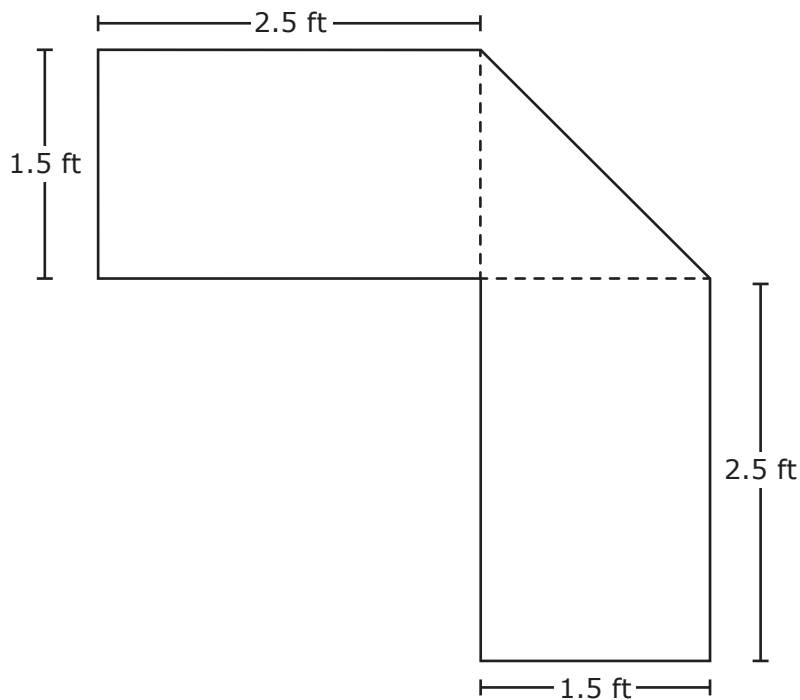
- 13** The dot plots show the numbers of miles Ian skated on several days in two different months.



Which statement is supported by the information in the dot plots?

- A** The least number of miles Ian skated on a day in July is greater than the least number of miles Ian skated on a day in August.
- B** The median number of miles Ian skated each day in July is greater than the median number of miles Ian skated each day in August.
- C** The mode of the number of miles Ian skated each day in July is less than the mode of the number of miles Ian skated each day in August.
- D** The range of the number of miles Ian skated each day in July is less than the range of the number of miles Ian skated each day in August.

- 14** The top surface of a desk is composed of 2 rectangles and a triangle. Some side lengths of the top surface of the desk are shown.



What is the area of the top surface of the desk in square feet?

- F** 9.75 ft^2
- G** 8.625 ft^2
- H** 7.50 ft^2
- J** 9.375 ft^2

- 15** The manager of a movie theater randomly surveyed 50 people who entered the movie theater on Friday. The manager asked about the type of movie each person preferred. The results of the survey are shown in the table.

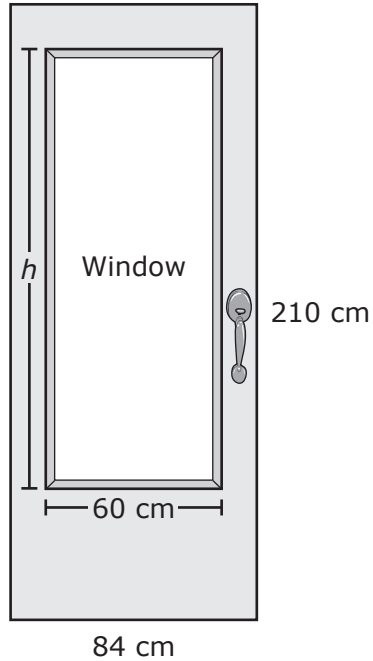
Survey Results

Type of Movie	Number of People
Horror	12
Comedy	15
Action	17
Drama	6

Based on the results in the table, which statement about a person who will go to this theater next Friday is true?

- A** The person is three times as likely to prefer comedy as horror.
- B** The person is twice as likely to prefer drama as horror.
- C** The person is less likely to prefer horror or drama than action.
- D** The person is more likely to prefer horror or comedy than action or drama.

- 16** The diagram shows a door that has a window in it. The front faces of the door and the window are similar rectangles that have the dimensions shown.



What is h , the height of the window in centimeters?

- F** 66 cm
- G** 186 cm
- H** 150 cm
- J** Not here

17 Maya has 120 caramel apples to sell. Each caramel apple is covered with one topping.

- $\frac{1}{5}$ of the caramel apples are covered with peanuts.
- $\frac{1}{3}$ are covered with chocolate chips.
- $\frac{3}{10}$ are covered with coconut.
- The rest are covered with sprinkles.

How many caramel apples are covered with sprinkles?

- A** 100
B 33
C 25
D 20
-

18 The manager of a music store surveyed a random sample of customers who shop in the store about their favorite type of music. The table shows the number of customers who selected each type of music.

Favorite Type of Music

Rock	Country	Jazz	Classical	Rap	Pop
37	27	5	9	12	35

Based on the information in the table, which inference about the favorite type of music of all the customers who shop in the music store appears to be valid?

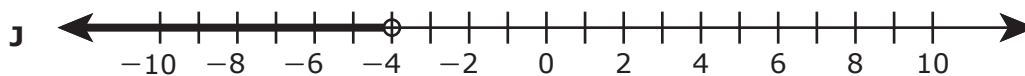
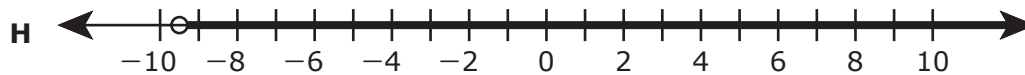
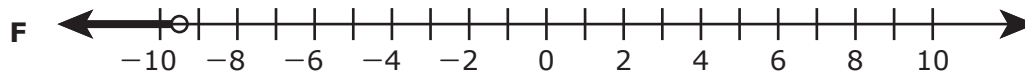
- F** They are certain to select rock or pop music.
G They are less likely to select country or rap music than rock music.
H They are more likely to select country music than jazz, classical, or rap music.
J They are certain to select any type of music other than jazz music.

- 19** The distance between two towns is 120 kilometers. There are approximately 8 kilometers in 5 miles.

Which measurement is closest to the number of miles between these two towns?

- A** 75 mi
 - B** 3 mi
 - C** 192 mi
 - D** 117 mi
-

- 20** Which number line best represents the solution to the inequality $3.3w - 9 > -22.2$?



- 21** The 200 students in a school band will attend an awards dinner. A random survey of 25 of these students was conducted to determine how many of each meal should be prepared for the dinner. The results of the survey are shown.

- 12 students want a beef meal.
- 8 students want a chicken meal.
- 5 students want a pasta meal.

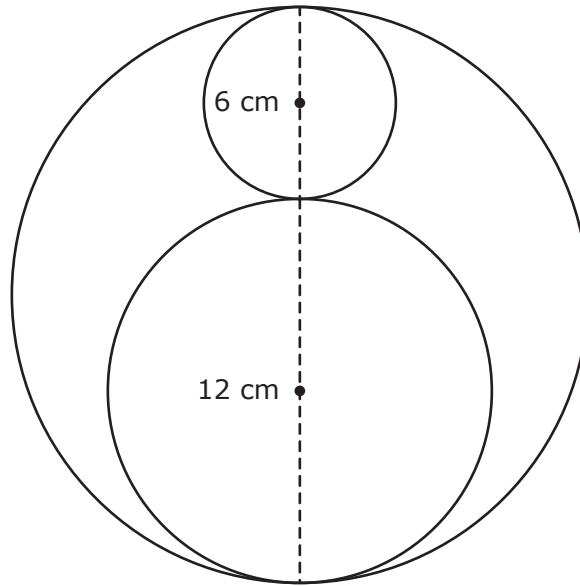
Based on the survey results, which of these is the best prediction of the meals wanted by the 200 students?

- A** There are 16 students who want a beef meal.
 - B** There are 52 students who want either a chicken meal or a pasta meal.
 - C** There are 32 more students who want a beef meal than want a chicken meal.
 - D** There are 24 more students who want a pasta meal than want a chicken meal.
-

- 22** The price of a DVD is \$24.00 plus 8% sales tax. What is the sales tax on this DVD in dollars and cents?

Record your answer and fill in the bubbles on your answer document. Be sure to use the correct place value.

- 23** A company's logo was designed using circles of 3 different sizes. The diameters of two of the circles are shown.



Which measurement is closest to the area of the largest circle in square centimeters?

- A** 56.52 cm^2
- B** 141.30 cm^2
- C** 1,017.36 cm^2
- D** 254.34 cm^2

- 24** A fish is swimming at a constant rate toward the ocean floor. The equation $y = -7x - 3$ can be used to represent this situation, where y is the depth of the fish in meters below sea level and x is the number of seconds the fish has been swimming.

Which statement best describes the depth of the fish, given this equation?

- F** From a starting position of 7 meters below sea level, the fish is descending 3 meters per second.
- G** From a starting position of 7 meters below sea level, the fish is ascending 3 meters per second.
- H** From a starting position of 3 meters below sea level, the fish is descending 7 meters per second.
- J** From a starting position of 3 meters below sea level, the fish is ascending 7 meters per second.

- 25** A number cube with faces labeled from 1 to 6 was rolled 20 times. Each time the number cube was rolled, the number showing on the top face was recorded. The table shows the results.

Results

Number Showing on Top Face	Frequency
1	0
2	3
3	3
4	6
5	3
6	5

Based on these results, what is the experimental probability that the next time the number cube is rolled it will land with 5 or 6 showing on the top face?

- A** $\frac{2}{5}$
- B** $\frac{3}{20}$
- C** $\frac{1}{3}$
- D** $\frac{3}{5}$

-
- 26** Russell has a collection of 1,200 pennies. Of these pennies, 25% are dated before 1980, 35% are dated from 1980 to 2000, and the rest are dated after 2000.

How many pennies in Russell's collection are dated after 2000?

- F** 480
- G** 720
- H** 40
- J** 60

- 27** A group of students formed a circle during a game. The circumference of the circle was about 43.96 feet, and the diameter of the circle was 14 feet.

Which expression best represents the value of π ?

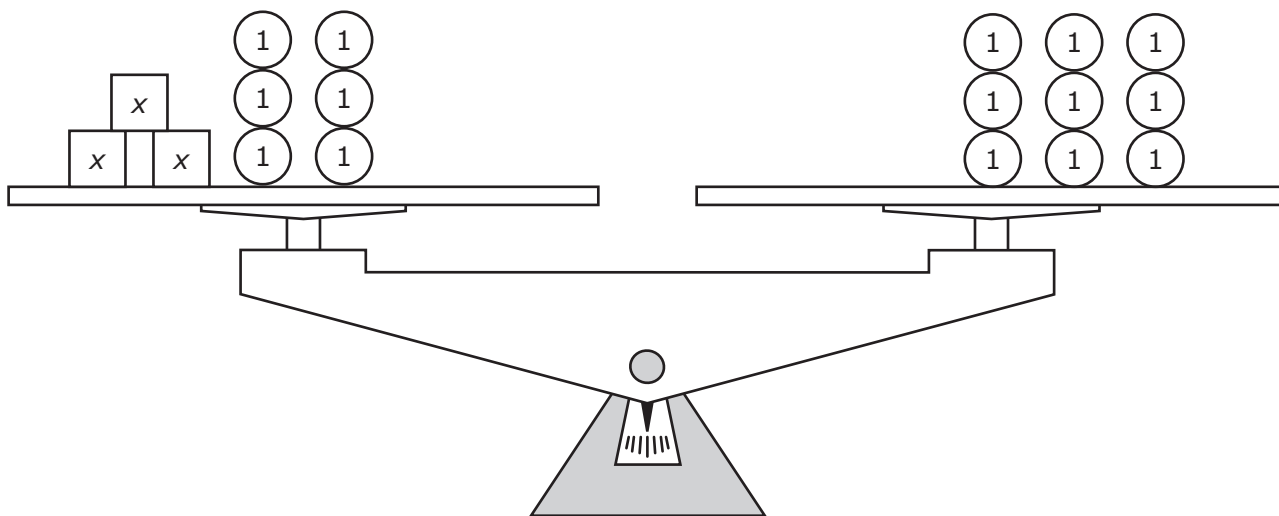
A $\frac{43.96}{7}$

B $\frac{43.96}{14}$

C $\frac{7}{43.96}$

D $\frac{14}{43.96}$

-
- 28** The model represents an equation.



What is the solution for this equation?

- F** $x = 3$
- G** $x = 15$
- H** $x = 5$
- J** $x = 1$

- 29** The table shows Peter’s net worth statement. Assets are shown as positive numbers, and liabilities are shown as negative numbers. The value of Peter’s house is not given.

Net Worth Statement

Item	Value
House (current value)	
Checking account	\$900
Credit-card debt	–\$3,400
Automobile (current value)	\$16,900
Student loans	–\$16,300
Investments	\$4,500
Savings account	\$1,200

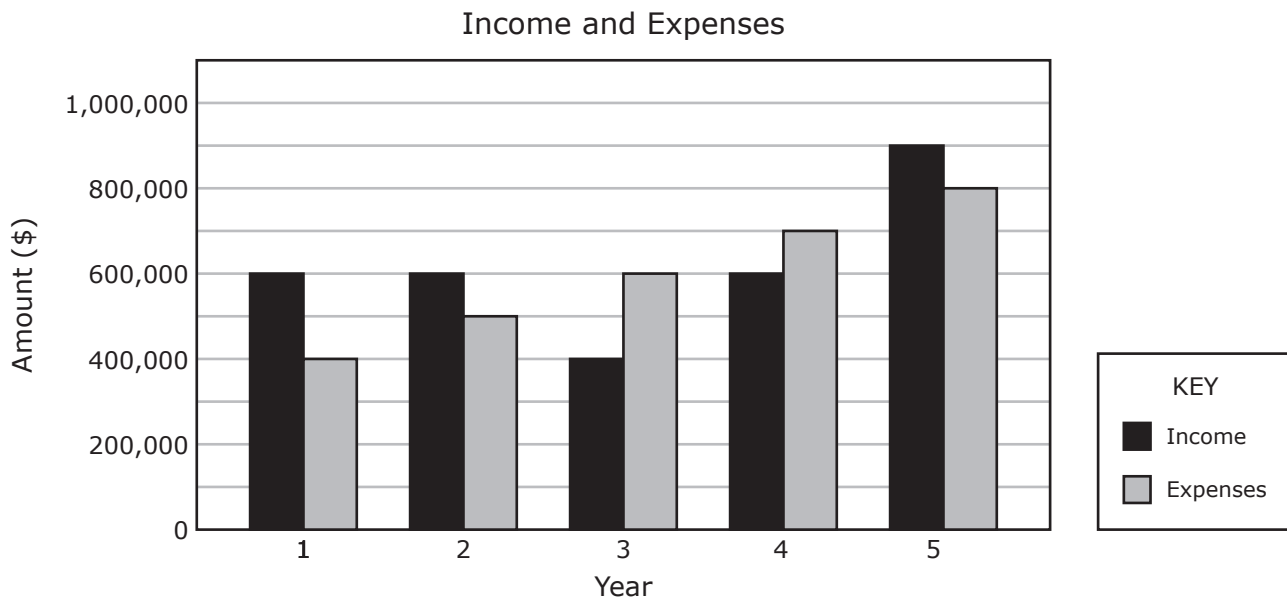
Peter’s net worth is \$101,800. Based on the information in the table, what is the current value of Peter’s house?

- A** \$58,600
- B** \$78,300
- C** \$98,000
- D** \$82,100

-
- 30** What is the value of the expression -9×2.2 ?

Record your answer and fill in the bubbles on your answer document. Be sure to use the correct place value.

- 31** The bar graph shows a company's income and expenses over the last 5 years.



Which statement is supported by the information in the graph?

- A** Expenses have increased \$200,000 each year over the last 5 years.
- B** The income in Year 5 was twice the income in Year 1.
- C** The combined income in Years 1, 2, and 3 was equal to the combined expenses in Years 1, 2, and 3.
- D** The combined expenses in Years 3 and 4 were \$300,000 more than the combined income in Years 3 and 4.

- 32** An architect built a scale model of a sports stadium using a scale in which 2 inches represents 30 feet. The height of the sports stadium is 180 feet.

What is the height of the scale model in inches?

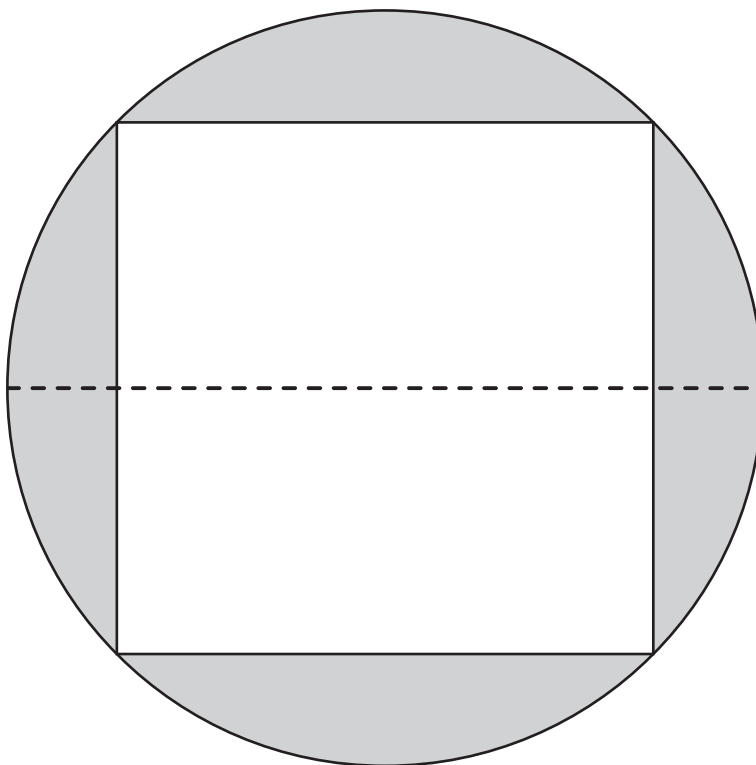
- F** 3 in.
 - G** 105 in.
 - H** 12 in.
 - J** 60 in.
-

- 33** Which situation can be represented by this inequality?

$$120 \leq 12k + 29$$

- A** Felicia has 12 buttons in her collection. She will collect 29 new buttons every year. Felicia collects buttons for k years. For what values of k will Felicia have at least 120 buttons?
- B** Felicia has 29 buttons in her collection. She will collect 12 new buttons every year. Felicia collects buttons for k years. For what values of k will Felicia have at least 120 buttons?
- C** Felicia has 29 buttons in her collection. She will collect 12 new buttons every year. Felicia collects buttons for k years. For what values of k will Felicia have at most 120 buttons?
- D** Felicia has 12 buttons in her collection. She will collect 29 new buttons every year. Felicia collects buttons for k years. For what values of k will Felicia have at most 120 buttons?

- 34** The figure shown was created by placing the vertices of a square on the circle. Use the ruler provided to measure the dimensions of the square and the circle to the nearest centimeter.



Which measurement is closest to the area of the shaded region of the figure in square centimeters?

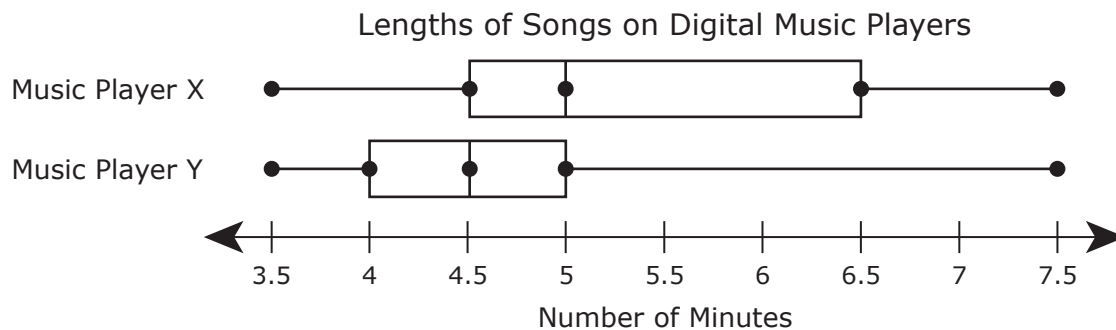
- F** 17.6 cm²
- G** 265.0 cm²
- H** 29.5 cm²
- J** 127.5 cm²

- 35** Marsha gave the cashier \$20 to pay for 3 pairs of socks. The cashier gave her \$5.03 in change. Each pair of socks cost the same amount.

What is the cost in dollars and cents for each pair of socks?

Record your answer and fill in the bubbles on your answer document. Be sure to use the correct place value.

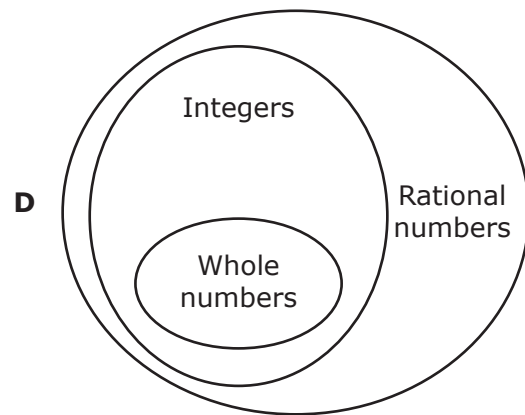
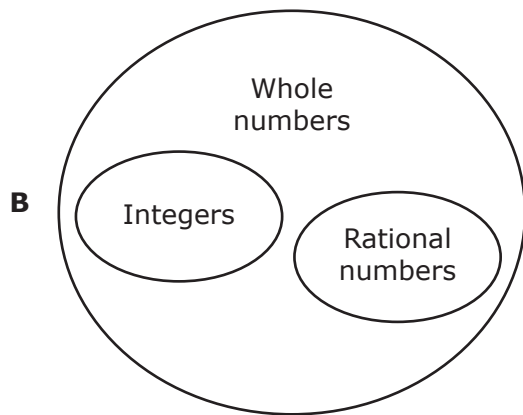
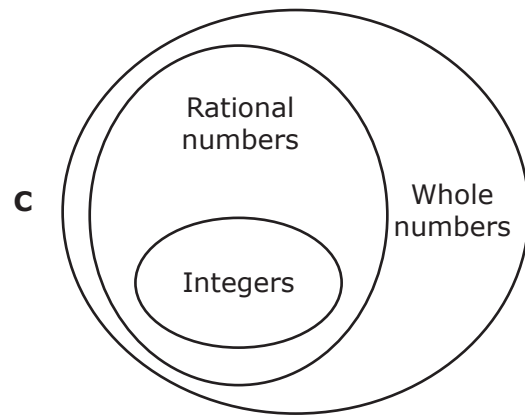
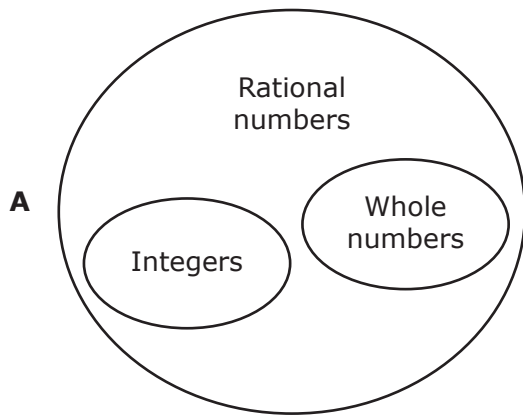
- 36** The box plots show the lengths of the songs on two digital music players in minutes.



Which statement is best supported by the information in the box plots?

- F** The interquartile range of the data for Music Player X is equal to the interquartile range of the data for Music Player Y.
- G** The interquartile range of the data for Music Player X is greater than the interquartile range of the data for Music Player Y.
- H** The median length of the songs on Music Player X is equal to the median length of the songs on Music Player Y.
- J** The median length of the songs on Music Player X is less than the median length of the songs on Music Player Y.

- 37** Which diagram best represents the relationship among integers, rational numbers, and whole numbers?



-
- 38** Which equation is true when $k = -15$?

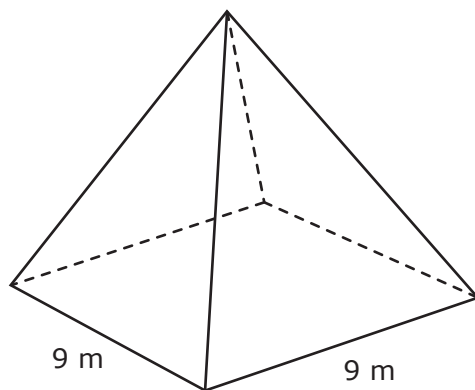
F $3k - 11 = -34$

G $-53 + 4k = 7$

H $\frac{k}{3} + 17 = 12$

J $\frac{k}{5} + 2.5 = 0.5$

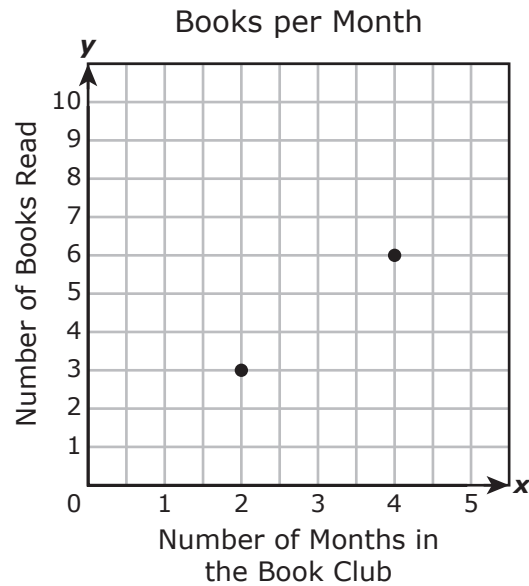
- 39** Some of the dimensions of a square pyramid are shown in the diagram. The height of the square pyramid is 7.5 meters.



What is the volume of the square pyramid in cubic meters?

- A** 202.5 m^3
- B** 303.75 m^3
- C** 270 m^3
- D** 243 m^3

- 40** The graph represents the linear relationship between the number of books Layla has read and the number of months she has been a member of a book club.



Which of these statements is supported by the rate of change in this relationship?

- F** Layla read 2 books in the first 3 months she was a member of the book club.
- G** Layla read 3 books in the first 2 months she was a member of the book club.
- H** Layla read 3 books in the first 4 months she was a member of the book club.
- J** Layla read 4 books in the first 3 months she was a member of the book club.

Item Number	Reporting Category	Readiness or Supporting	Content Student Expectation	Correct Answer
1	2	Supporting	7.4(C)	D
2	3	Readiness	7.9(B)	F
3	1	Readiness	7.6(I)	D
4	3	Supporting	7.5(A)	G
5	2	Readiness	7.4(A)	D
6	4	Readiness	7.6(G)	F
7	2	Readiness	7.11(A)	B
8	1	Supporting	7.6(A)	H
9	2	Readiness	7.4(D)	B
10	3	Readiness	7.9(A)	H
11	2	Readiness	7.7(A)	D
12	3	Supporting	7.11(C)	5
13	4	Readiness	7.12(A)	C
14	3	Readiness	7.9(C)	G
15	1	Readiness	7.6(H)	D
16	3	Readiness	7.5(C)	H
17	2	Readiness	7.3(B)	D
18	4	Supporting	7.12(B)	H
19	3	Supporting	7.4(E)	A
20	2	Supporting	7.10(B)	G
21	1	Readiness	7.6(H)	C
22	4	Supporting	7.13(A)	1.92
23	3	Readiness	7.9(B)	D
24	2	Readiness	7.7(A)	H
25	1	Readiness	7.6(I)	A
26	2	Readiness	7.4(D)	F
27	3	Supporting	7.5(B)	B
28	2	Readiness	7.11(A)	J
29	4	Supporting	7.13(C)	C
30	2	Supporting	7.3(A)	-19.8
31	4	Readiness	7.6(G)	D
32	3	Readiness	7.5(C)	H
33	2	Supporting	7.10(C)	B
34	3	Readiness	7.9(C)	H
35	2	Readiness	7.3(B)	4.99
36	4	Readiness	7.12(A)	G
37	1	Supporting	7.2(A)	D
38	2	Supporting	7.11(B)	H
39	3	Readiness	7.9(A)	A
40	2	Readiness	7.4(A)	G

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
1	Option D is correct	To determine the constant of proportionality that relates the number of cookies made, y , to the number of cups of flour used, x , the student should have used the equation $k = \frac{y}{x}$ provided in the reference materials. After substituting the number of cookies made, or 48, for y , and substituting the number of cups of flour used, or 3, for x , the equation becomes $k = \frac{y}{x} = \frac{48}{3} = 16$.
	Option A is incorrect	The student likely confused which number should be substituted for x and y into the equation $k = \frac{y}{x}$ and substituted 48 for x and 3 for y , and wrote the constant as $\frac{3}{48}$, which is equal to 0.0625, then misplaced the decimal and rounded. The student needs to focus on substituting the correct values in the equation.
	Option B is incorrect	The student likely found only the number of cookies made, which is 48. The student needs to focus on recognizing when additional information is needed to determine the constant of proportionality.
	Option C is incorrect	The student likely found only the number of cups of flour used, which is 3. The student needs to focus on recognizing when additional information is needed to determine the constant of proportionality.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
2	Option F is correct	To determine the circumference (distance around a circle) of the circular base, the student should have used the formula provided in the reference materials, $C = \pi d$, where d is the diameter (straight line going through the center of a circle connecting two points on the circumference). This results in $C = \pi \times 64$ which is approximately 200.96 feet.
	Option G is incorrect	The student likely used the formula for area (amount of space covered by a surface) instead of circumference, resulting in the expression $\pi \times 32^2$. The student needs to focus on understanding which formula to apply in calculations involving circles.
	Option H is incorrect	The student likely determined the radius (distance from the center to the circumference of a circle) of 32 feet, but used the expression $\pi \times 32$. The student needs to focus on applying the correct formula to calculate the circumference of a circle.
	Option J is incorrect	The student likely confused the given diameter of 64 as the radius. The student used the formula $C = 2\pi r$ and substituted 64 for r , resulting in $C = 2 \times \pi \times 64 \approx 401.92$. The student needs to focus on understanding the difference between the radius and the diameter.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
3	Option D is correct	To determine the probability (how likely it is that some event will occur) that the first student who enters the classroom will be assigned a seat in the front row, the student should have written a fraction that has the number of seats in the front row (8) over the total number of seats $(8 + 10 + 12)$. The expression $\frac{8}{8 + 10 + 12}$ is equal to $\frac{8}{30}$ and reduces to $\frac{4}{15}$.
	Option A is incorrect	The student likely wrote a fraction with the number of seats in the front row over the total number of seats in the front and back rows. The expression $\frac{8}{8 + 12}$ is equal to $\frac{8}{20}$ and reduces to $\frac{2}{5}$. The student needs to focus on understanding how to determine theoretical probabilities.
	Option B is incorrect	The student likely wrote a fraction with the total number of seats in the front and back rows over the total number of seats. The expression $\frac{8 + 12}{30}$ is equal to $\frac{20}{30}$ and reduces to $\frac{2}{3}$. The student needs to focus on understanding how to determine theoretical probabilities.
	Option C is incorrect	The student likely wrote a fraction with the number of seats in the front row over the total number of seats in the middle and back rows. The expression $\frac{8}{10 + 12}$ is equal to $\frac{8}{22}$ and reduces to $\frac{4}{11}$. The student needs to focus on understanding how to determine theoretical probabilities.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
4	Option G is correct	To determine that angle NKL is congruent (same measure) to angle ZWX , the student should have established that the two angles are corresponding (in the same position in different figures). Since quadrilateral $KLMN$ is similar to quadrilateral $WXYZ$, the corresponding sides are proportional (equal comparison of two ratios) and the corresponding angles are congruent. Angle NKL in quadrilateral $KLMN$ corresponds to angle ZWX in quadrilateral $WXYZ$ and since the quadrilaterals are similar these corresponding angles are congruent.
	Option F is incorrect	The student likely saw that side KL corresponds to side WX and that side WZ corresponds to side KN but failed to notice that the second ratio in the proportion, $\frac{KL}{WX} = \frac{WZ}{KN}$, was inverted (flipped upside down). The student needs to focus on understanding that the ratios of side lengths between similar figures (two figures with corresponding angles equal and corresponding sides proportional) must be presented in the same order in a proportion.
	Option H is incorrect	The student likely saw that side KL and side YZ are both at the top, and side LM and side ZW are both on the right of the figures, appearing to be in corresponding positions. However, the student likely failed to notice that the orientation (how the figure is positioned) of the quadrilaterals is different and did not correct for this when choosing corresponding sides. The student needs to focus on understanding how to align the orientation of similar figures (two figures with corresponding angles equal and corresponding sides proportional) in order to identify corresponding parts.
	Option J is incorrect	The student likely saw that angle NKL and angle XYZ are at the top left of each quadrilateral, appearing to be in corresponding positions. However, the student likely failed to notice that the orientation (how the figure is positioned) of the quadrilaterals is different and did not account for this when choosing corresponding angles. The student needs to focus on understanding how to align the orientation of similar figures (two figures with corresponding angles equal and corresponding sides proportional) in order to identify corresponding parts.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
5	Option D is correct	The student should have determined that the expression "\$4.25 per pound" is equivalent to 4.25 times the number of pounds of cheddar cheese. The number of pounds of cheddar cheese is represented by x , so the total cost, y , is $4.25x$. Therefore the equation is $y = 4.25x$.
	Option A is incorrect	The student likely attempted to add the cost per pound, 4.25, to the number of pounds of cheddar cheese but reversed x and y . The student needs to focus on understanding how to represent real-world situations with algebraic equations.
	Option B is incorrect	The student likely understood that the number of pounds of cheddar cheese should be multiplied by 4.25 but reversed x and y . The student needs to focus on understanding how to represent real-world situations with algebraic equations.
	Option C is incorrect	The student likely added the cost per pound, 4.25, to the number of pounds of cheddar cheese instead of multiplying. The student needs to focus on understanding how to represent real-world situations with algebraic equations.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
6	Option F is correct	To determine how many more classmates chose chocolate than chose vanilla, the student should have determined the number of classmates who chose each flavor. To determine the number of classmates who chose chocolate, 42% of 50 must be calculated. This is $0.42 \times 50 = 21$. To determine the number of classmates who chose vanilla, it is necessary to calculate the percentage who chose vanilla. The three flavors with percentages chosen shown on the graph are coffee (14%), chocolate (42%), and strawberry (18%). The percentage of classmates who chose vanilla is $100\% - (14\% + 42\% + 18\%) = 26\%$. So the number of classmates who chose vanilla is $0.26 \times 50 = 13$, and the difference between chocolate and vanilla is $21 - 13 = 8$.
	Option G is incorrect	The student likely subtracted the number of students who chose coffee ($0.14 \times 50 = 7$) from the number of students who chose vanilla (13). The student needs to focus on carefully comparing the parts of data represented by circle graphs.
	Option H is incorrect	The student likely determined the correct values for the numbers of classmates who chose chocolate and vanilla but found the sum ($21 + 13 = 34$) instead of the difference. The student needs to focus on understanding which key words indicate subtraction in real-world problems.
	Option J is incorrect	The student likely determined the correct values for the numbers of classmates who chose chocolate and vanilla but found the sum and subtracted that sum from 50. The calculation was $50 - (21 + 13) = 16$. The student needs to focus on carefully comparing the parts of data represented by circle graphs.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
7	Option B is correct	To determine the solution set, the student should have first added 10 to both sides of the inequality, resulting in $-4x \leq 12$. The student then should have divided both sides of the inequality by -4 . Since the student divided by a negative number, the inequality sign was reversed. This step results in the solution to the inequality, which is $x \geq -3$.
	Option A is incorrect	The student likely followed all the correct steps to solve the inequality but failed to reverse the inequality sign. The student needs to focus on using all the proper steps to solve an inequality.
	Option C is incorrect	The student likely subtracted 10 from both sides of the inequality in the first step, resulting in $-4x \leq -8$. The student then likely divided both sides of the inequality by -4 . The student failed to reverse the inequality sign when dividing by a negative. The resulting inequality is $x \leq 2$. The student needs to focus on using all the proper steps to solve an inequality.
	Option D is incorrect	The student likely subtracted 10 from both sides of the inequality in the first step, resulting in $-4x \leq -8$. The student then likely divided both sides of the inequality by -4 . Since the student divided by a negative number, the inequality sign was reversed. The resulting inequality is $x \geq 2$. The student needs to focus on using all the proper steps to solve an inequality.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
8	Option H is correct	The student should have chosen the tree diagram that shows the sample space (set of all possible outcomes) of tossing a coin three times. Each time the coin is tossed, the possible outcomes are heads or tails. So if the first toss is heads, then the second toss will be either heads or tails, and for each of those outcomes, the possible outcomes for the next toss are heads or tails. This scenario repeats when the first toss is tails. This results in eight total possible outcomes for three tosses.
	Option F is incorrect	The student likely noticed that there are eight possible outcomes but failed to notice that the second set of outcomes is a repeat of the first set. The student needs to focus on understanding how to identify the sample space for compound events.
	Option G is incorrect	The student likely noticed that each branch of the tree diagram showed each outcome of heads or tails each time but failed to realize that only half of the outcomes were listed. The set of outcomes in which the first toss is heads is missing. The student needs to focus on understanding how to identify the sample space for compound events.
	Option J is incorrect	The student likely noticed that each branch of the tree diagram showed two outcomes for each toss but failed to realize that the outcomes were repeated and a second set of outcomes is missing. The student needs to focus on understanding how to identify the sample space for compound events.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
9	Option B is correct	The student should have determined the number of boys in the class in order to find the total number of students in the class. To find the number of boys, it is necessary to create a proportion (comparison of two ratios) equating ratios of boys to girls. Since the given ratio of boys to girls is 2 to 3 and the number of girls is 18, a proportion to find b , the number of boys, is $\frac{2}{3} = \frac{b}{18}$. Solving this proportion gives 12 for the number of boys, so the total number of students in the class is $12 + 18$, which equals 30.
	Option A is incorrect	The student likely used a proportion to find the number of boys in the class but failed to do the final step of adding the number of boys to the number of girls to find the total number of students in the class. The student needs to focus on understanding how to solve problems involving proportional relationships.
	Option C is incorrect	The student likely attempted to find the number of boys but inverted (flipped upside down) the ratio in the proportion and solved $\frac{2}{3} = \frac{18}{b}$. Solving this proportion gives 27 for the number of boys. This number of boys, 27, was added to the given number of girls, 18, giving a total of 45. The student needs to focus on understanding how to solve problems involving proportional relationships.
	Option D is incorrect	The student likely attempted to find the number of boys but inverted (flipped upside down) the ratio in the proportion and solved $\frac{2}{3} = \frac{18}{b}$. Solving this proportion gives 27 for the number of boys. The student needs to focus on understanding how to solve problems involving proportional relationships.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
10	Option H is correct	The student should have determined the volume (amount of three-dimensional space taken up) of the triangular prism (three-dimensional figure with triangular bases) in cubic centimeters by using the formula $V = Bh$ provided in the reference materials, where B is the area (amount of space covered by a surface) of the base and h is the height (distance between the two bases, in this case triangles) of the prism. The base is a triangle, so the area of the triangle can be found with the expression $\frac{1}{2} \times 12 \times 8$, which equals 48 square centimeters. The height of the triangular prism is 34 centimeters, so the volume of the triangular prism is determined by multiplying 48 square centimeters by 34 centimeters, which equals 1,632 cubic centimeters.
	Option F is incorrect	The student likely used all the values shown in the figure in an attempt to determine the volume. The labeled dimensions of the triangle are 8 centimeters, 12 centimeters, 10 centimeters, and 10 centimeters. The expression used is $(8 + 12 + 10 + 10) \times 34$, which equals 1,360. The student needs to focus on understanding how to find the volume of triangular prisms.
	Option G is incorrect	The student likely multiplied the length of the base of the triangle and the height of the triangular prism. The expression used is 12×34 , which equals 408. The student needs to focus on understanding how to find the volume of triangular prisms.
	Option J is incorrect	The student likely used the formula for volume of a prism but thought that the result should be divided by 2 since the prism is triangular. The expression used is $\frac{1}{2} \times (48 \times 34)$, which equals 816. The student needs to focus on understanding how to find the volume of triangular prisms.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
11	Option D is correct	The student should have determined that the line shown on the graph contains points representing each pair of x - and y -values in the table. The values for x in the table represent the number of hours a boat is rented, and the x -axis in the graph is labeled Time, in hours. Similarly, the values for y in the table represent the cost, in dollars, to rent a boat, and the y -axis in the graph is labeled Cost, in dollars. The line passes through the points at (1, 32), (3, 56), and (5, 80).
	Option A is incorrect	The student likely noticed that the line seemed to pass through most of the points representing the pairs of x - and y -values in the table but reversed the coordinates (a set of values that shows the position of a point on the coordinate grid in relation to the origin). So the points on the graph that seem to be from the table are at (32, 1), (56, 3), and (80, 5). The student needs to focus on understanding how to represent data from a table in a graph.
	Option B is incorrect	The student likely noticed that the first y -value in the table is 32, assumed that the initial (beginning) value of y on the graph is 32, and disregarded the rest of the line on the graph. The student needs to focus on understanding how to represent data from a table in a graph.
	Option C is incorrect	The student likely noticed that the first y -value in the table is 32 and assumed that the initial value of y on the graph is 32, but started on the x -axis instead of the y -axis. Then the rest of the line on the graph was disregarded. The student needs to focus on understanding how to represent data from a table in a graph.
12	5 and any equivalent values are correct	To determine the value of x , the student should write and solve an equation. It is given that the sum (total) of the measures of angle M and angle R is 90° , so the equation is $m\angle M + m\angle R = 90^\circ$. Substituting the given expressions for the measures of the angles, the equation becomes $(5x + 10) + 55 = 90$. Combining like terms results in $5x + 65 = 90$. Then 65 is subtracted from both sides of the equation, resulting in $5x = 25$. Finally, the terms on both sides of the equation are divided by 5, resulting in $x = 5$.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
13	Option C is correct	To determine which statement is supported by the information in the dot plot (graph that uses dots to display data), the student should have calculated stated measures of center and spread for each plot. The mode of each set of data is the value that occurs most often. The mode for the number of miles Ian skated on a day in July is 8 and the mode for August is 12, and it is true that the mode for July is less than the mode for August.
	Option A is incorrect	The student likely confused the months of July and August when comparing the least number of miles skated on a day in each month. The least number of miles Ian skated on a day in July is 1, and the least number of miles skated on a day in August is 5. The least number for July is less than the least number for August. The student needs to focus on understanding how to compare information presented in two dot plots.
	Option B is incorrect	The student likely calculated the median number (value in a set in which half of the numbers are greater and half of the numbers are less) of miles Ian skated on a day in either July or August incorrectly. The median number of miles Ian skated on a day in July is 8, and the median number of miles skated on a day in August is 10. The median for July is less than the median for August. The student needs to focus on understanding how to compare information presented in two dot plots.
	Option D is incorrect	The student likely calculated the range (difference between the greatest and the least values in a set) of the number of miles Ian skated on a day in either July or August incorrectly. The range of the number of miles Ian skated on a day in July is 14, and the range of the number of miles skated on a day in August is 8. The range for July is greater than the range for August. The student needs to focus on understanding how to compare information presented in two dot plots.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
14	Option G is correct	To determine the area (amount of space covered by a surface) of the top surface of the desk, the student should have calculated the area of each shape. There are two rectangles and one triangle. The two rectangles have the same dimensions, so the areas are equal. To find the area of each rectangle, the length of the base should be multiplied by the height ($1.5 \times 2.5 = 3.75$). To find the area of the triangle, the length of the base should be multiplied by the height and multiplied by one-half ($\frac{1}{2} \times 1.5 \times 1.5 = 1.125$). Combining the areas of the 3 shapes ($3.75 + 1.125 + 3.75$) results in 8.625 square feet.
	Option F is incorrect	The student likely calculated the areas of the rectangles correctly but did not multiply by $\frac{1}{2}$ when calculating the area of the triangle. Instead of $\frac{1}{2} \times 1.5 \times 1.5$, the student used 1.5×1.5 , resulting in $3.75 + 2.25 + 3.75 = 9.75$. The student needs to focus on understanding how to determine the area of a triangle.
	Option H is incorrect	The student likely calculated the area of the rectangles only and failed to add the area of the triangle. The student needs to focus on understanding how to determine the area of composite figures.
	Option J is incorrect	The student likely assumed the area of the triangle was $\frac{1}{2}$ the area of each rectangle and calculated $2.5 \times (1.5 \times 2.5)$, resulting in 9.375. The student needs to focus on understanding how to determine the area of a triangle.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
15	Option D is correct	To determine the true statement based on the table, the student should have compared the number of people who preferred horror or comedy ($12 + 15$) to the number of people who preferred action or drama ($17 + 6$) from the survey results. The number of people who preferred horror or comedy (27) is greater than the number of people who preferred action or drama (23) in the survey, so the statement is true for a person who will go to the theater next Friday, based on the results in the table.
	Option A is incorrect	The student likely interpreted "three times as likely to prefer comedy as horror" as "there were three more people who prefer comedy to horror." There were 15 people who preferred comedy and 12 people who preferred horror from the survey results. The student needs to focus on understanding how to make quantitative predictions and comparisons based on simple experiments.
	Option B is incorrect	The student likely interpreted "twice as likely" as "one-half as likely." There were 6 people who preferred drama and 12 people who preferred horror from the survey results. The student needs to focus on understanding how to make quantitative predictions and comparisons based on simple experiments.
	Option C is incorrect	The student likely interpreted "less likely" as "more likely." There were 18 people who preferred horror or drama and 17 people who preferred action from the survey results. The student needs to focus on understanding how to make quantitative predictions and comparisons based on simple experiments.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
16	Option H is correct	To determine h , the height (vertical distance from top to bottom) of the window in centimeters, the student should have determined that the two rectangles (window and door) are similar figures (two figures with corresponding angles equal and corresponding sides proportional) and then set up and solved the proportion (comparison of two ratios) $\frac{60}{84} = \frac{h}{210}$. To solve for h , the student multiplied 210 by 60, which is 12,600, then divided 12,600 by 84, which results in 150 centimeters.
	Option F is incorrect	The student likely subtracted the other given values from 210. The expression used was likely $210 - 84 - 60$, which results in 66. The student needs to focus on understanding how to solve problems involving similar shapes.
	Option G is incorrect	The student likely calculated the difference between the widths of the two rectangles by subtracting 60 centimeters from 84 centimeters. This difference is 24 centimeters. The student then likely subtracted 24 centimeters from the given length of 210 centimeters, resulting in 186 centimeters. The student needs to focus on understanding how to solve problems involving similar shapes.
	Option J is incorrect	The correct answer (150 centimeters) was presented in one of the other answer options.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
17	Option D is correct	<p>To determine the number of caramel apples with sprinkles, the student should have found the total number of apples with each of the other toppings and subtracted from 120, the total number of caramel apples. According to the given information, $\frac{1}{5}$ of the apples are covered with peanuts, $\frac{1}{3}$ are covered with chocolate chips, $\frac{3}{10}$ are covered with coconut, and the rest are covered with sprinkles. To find the number of apples with each topping, each fraction should be multiplied by 120. So $\frac{1}{5} \times 120 = 24$, $\frac{1}{3} \times 120 = 40$, and $\frac{3}{10} \times 120 = 36$. Adding 24, 40, and 36 results in 100. The rest of the apples are covered with sprinkles, so subtracting 100 from 120 results in 20 apples covered with sprinkles.</p>
	Option A is incorrect	<p>The student likely followed a process to find the total number of apples that are covered with peanuts, chocolate chips, or coconut (100) but failed to subtract that number from 120 to get the number of apples covered with sprinkles. The student needs to focus on understanding how to solve problems involving operations with rational numbers.</p>
	Option B is incorrect	<p>The student likely followed a process to find the correct total number of apples that are covered with peanuts, chocolate chips, or coconut (100) but divided that number by 3 in an attempt to find the number of apples covered with sprinkles. This would result in $100 \div 3 = 33\frac{1}{3}$, and the closest answer is 33. The student needs to focus on understanding how to solve problems involving operations with rational numbers.</p>
	Option C is incorrect	<p>The student likely followed a process to find the total number of apples that are covered with peanuts, chocolate chips, or coconut (100) but divided that number by 4 in an attempt to find the number of apples covered with sprinkles. This would result in $100 \div 4 = 25$. The student needs to focus on understanding how to solve problems involving operations with rational numbers.</p>

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
18	Option H is correct	To determine the valid statement based on the information in the table, the student should have compared the number of customers who selected country music (27) to the total number of customers who selected jazz, classical, or rap music ($5 + 9 + 12$). The number of customers who selected country music (27) is greater than the number of customers who selected jazz, classical, or rap music (26), so the inference is valid.
	Option F is incorrect	The student likely thought that since most of the customers selected rock or pop music, the inference is valid. There were several customers who chose other types of music in the survey, so it is not certain that rock or pop music are the favorite types of music of all customers. The student needs to focus on understanding how to make inferences from a random sample.
	Option G is incorrect	The student likely read "less likely" as "more likely" when comparing the number of customers who selected country or rap music ($27 + 12 = 39$) and the number of customers who selected rock music (37). The student needs to focus on understanding how to make inferences from a random sample.
	Option J is incorrect	The student likely thought that since only 5 of the customers selected jazz music, the inference is valid. Almost all of the customers chose music other than jazz in the survey, but it is not certain that the favorite type of music is any music other than jazz. The student needs to focus on understanding how to make inferences from a random sample.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
19	Option A is correct	To determine the number of miles, m , between the two towns, the student should have set up and solved the proportion (comparison of two ratios) $\frac{8}{5} = \frac{120}{m}$. This proportion consists of ratios of kilometers to miles. The student multiplied 5 by 120 to get 600 and then divided 600 by 8 to get 75 miles.
	Option B is incorrect	The student likely subtracted 5 from 8 to get 3 miles. The student needs to focus on understanding how to use proportions to convert between measurement systems.
	Option C is incorrect	The student likely knew that a proportion needed to be solved and set up the incorrect proportion $\frac{8}{5} = \frac{m}{120}$. The student multiplied 8 by 120 to get 960 and then divided 960 by 5 to get 192 miles. The student needs to focus on understanding how to use proportions to convert between measurement systems.
	Option D is incorrect	The student likely used the incorrect expression $120 - (8 - 5)$ to get 117 miles. The student needs to focus on understanding how to use proportions to convert between measurement systems.

2018 STAAR Grade 7 Mathematics Rationales

Item#	Rationale	
20	Option G is correct	To determine the number line that best represents the solution to the inequality $3.3w - 9 > -22.2$, the student should have followed the steps to solve the inequality. The first step is to add 9 to both sides of the inequality, resulting in $3.3w > -13.2$. The next step is to divide both sides of the inequality by 3.3, resulting in $w > -4$. The correct graph shows the shading pointing to the right since the solution is all the values greater than -4 .
	Option F is incorrect	The student likely subtracted 9 instead of adding 9 in the first step of the solution to the inequality, resulting in $3.3w > -31.2$. The next step is to divide both sides by 3.3, resulting in $w > -9.\overline{45}$ (the bar over the 45 indicates that it repeats indefinitely, $-9.454545\dots$). The student then likely reversed the inequality sign, giving the final inequality of $w < -9.\overline{45}$. The graph for this inequality shows the shading pointing to the left of $-9.\overline{45}$. The student needs to focus on understanding how to solve two-step inequalities and represent the solutions.
	Option H is incorrect	The student likely subtracted 9 instead of adding 9 in the first step of the solution to the inequality, resulting in $3.3w > -31.2$. The next step is to divide both sides by 3.3, resulting in $w > -9.\overline{45}$ (the bar over the 45 indicates that it repeats indefinitely, $-9.454545\dots$). The graph for this inequality shows the shading pointing to the right of $-9.\overline{45}$. The student needs to focus on understanding how to solve two-step inequalities and represent the solutions.
	Option J is incorrect	The student likely followed all the correct steps to solve the inequality $3.3w - 9 > -22.2$, but incorrectly reversed the inequality symbol to end up with the inequality $w < -4$. The graph for this inequality shows the shading pointing to the left of -4 . The student needs to focus on understanding how to solve two-step inequalities and represent the solutions.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
21	Option C is correct	To determine the statement that is the best prediction of the meals wanted by 200 students based on the survey results, the student should have found the number of students out of 200 who probably want each type of meal. Since the survey is of 25 students and 12 students want a beef meal, the proportion (comparison of two ratios) to find the predicted number of students who want beef, x , out of 200 is $\frac{12}{25} = \frac{x}{200}$. This results in 96 students for the beef meal. Similarly, proportions to find the predicted number of students who want chicken, y , and the number of students who want pasta, z , out of 200 are $\frac{8}{25} = \frac{y}{200}$ and $\frac{5}{25} = \frac{z}{200}$. Solving these proportions results in predicted numbers of 96 for beef, 64 for chicken, and 40 for pasta, and $96 - 64 = 32$.
	Option A is incorrect	The student likely divided the total number of students, 200, by the number of students in the survey who wanted a beef meal, 12. This results in $16\frac{2}{3}$, which was rounded down to 16 since incomplete meals would not be used. The student needs to focus on solving problems involving proportional relationships using quantitative predictions from simple experiments.
	Option B is incorrect	The student likely found the total number of students from the survey who wanted chicken or pasta (13), and set up a proportion using 100 total students instead of 200 total students. The proportion used is $\frac{13}{25} = \frac{b}{100}$, where b is the total number of students who want either chicken or pasta, resulting in 52 students. The student needs to focus on solving problems involving proportional relationships using quantitative predictions from simple experiments.
	Option D is incorrect	The student likely found the predicted numbers of students who want pasta (40) and chicken (64) but misread "more" as "fewer" in the statement. The student needs to focus on solving problems involving proportional relationships using quantitative predictions from simple experiments.
22	1.92 and any equivalent values are correct	To determine the sales tax on the DVD in dollars and cents, the student should have converted 8% to a decimal, then multiplied the decimal by 24.00 ($0.08 \times 24.00 = 1.92$).

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
23	Option D is correct	To determine the area (amount of space covered by a surface) of the largest circle in square centimeters, the student should have used the formula for area, A , of a circle, $A = \pi r^2$, provided in the reference materials, where r is the radius (distance from the center to the circumference of a circle) of the circle. The diameters (straight line going through the center of a circle connecting two points on the circumference) of the two smaller circles are 6 centimeters and 12 centimeters respectively, combining to make the diameter of the largest circle 18 centimeters. The radius of the largest circle is 9 centimeters. Applying the formula for area, $A = \pi \times 9^2 \approx 254.34$ square centimeters.
	Option A is incorrect	The student likely found the value of the circumference (distance around a circle) of the largest circle instead of the area. The formula for the circumference, C , is $C = 2\pi r$, where r is the radius of the circle. Using this formula, the circumference is $C = 2 \times \pi \times 9 \approx 56.52$. The student needs to focus on understanding the difference between the circumference and the area of a circle.
	Option B is incorrect	The student likely attempted to find the area of the largest circle by adding the areas of the two smaller circles. Since the diameters of the circles are 6 centimeters and 12 centimeters, the radii of the circles are 3 centimeters and 6 centimeters. Using the formula for the area of a circle, $A = \pi r^2$, the expression $\pi \times 3^2 \approx 28.26$ results in the area of the small circle, and the expression $\pi \times 6^2 \approx 113.04$ results in the area of the larger circle. The last step is to add the areas: $28.26 + 113.04 = 141.30$. The student needs to focus on understanding how find the radius needed to determine the area of a circle.
	Option C is incorrect	The student likely used the diameter instead of the radius in the calculation of the area of the largest circle. The diameter of the largest circle is 18 centimeters. The expression $\pi \times 18^2$ results in the value of about 1,017.36 square centimeters. The student needs to focus on understanding that the radius is needed to determine the area of a circle.

2018 STAAR Grade 7 Mathematics Rationales

Item#	Rationale	
24	Option H is correct	To determine the statement that best describes the depth of the fish given the equation $y = -7x - 3$, the student should have recognized the significance of each value in the equation. The value -7 in the equation is the slope (steepness of a straight line when graphed on a coordinate grid) and represents a rate of change (constant increase or decrease), and the value -3 represents a starting position. So the statement for this choice accurately describes this equation in that the fish starts 3 meters below sea level (-3), and descends 7 meters per second (-7).
	Option F is incorrect	The student likely mismatched both values in the statement. The starting position should be 3 meters below sea level instead of 7, and the fish is descending 7 meters per second instead of 3. The student needs to focus on understanding how to represent linear equations with verbal descriptions.
	Option G is incorrect	The student likely mismatched both values in the statement and confused "ascending" and "descending." The starting position should be 3 meters below sea level instead of 7, and the fish is descending 7 meters per second instead of ascending 3 meters per second. The student needs to focus on understanding how to represent linear equations with verbal descriptions.
	Option J is incorrect	The student likely confused "ascending" and "descending." The fish is descending 7 meters per second instead of ascending 7 meters per second. The student needs to focus on understanding how to represent linear equations with verbal descriptions.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
25	Option A is correct	To determine the experimental probability (how likely it is that some event will occur based on the results of an experiment) that the next time the number cube is rolled it will land with 5 or 6 showing on the top face (side), the student should have combined the number of times 5 or 6 showed on the top face according to the table and divided by the total number of rolls. According to the table, 5 showed on the top face 3 times and 6 showed on the top face 5 times. This is a total of 8 times out of 20. Therefore the probability is $\frac{8}{20}$, which reduces to $\frac{2}{5}$.
	Option B is incorrect	The student likely determined the probability using only the number of times 5 was showing on the top face. This probability is 3 out of 20. The student needs to focus on understanding how to determine experimental probabilities related to simple events.
	Option C is incorrect	The student likely equated the experimental probability that the next roll will land with 5 or 6 showing on the top face as 2 outcomes out of 6, or $\frac{2}{6}$, which reduces to $\frac{1}{3}$. The student needs to focus on understanding how to determine experimental probabilities related to simple events.
	Option D is incorrect	The student likely found the experimental probability that the next time the number cube is rolled, it will not land with 5 or 6 showing on the top face. This would be the experimental probability that the number cube will show 1, 2, 3, or 4. The frequencies, according to the table, are 0, 3, 3, and 6, respectively. Combining these values results in a frequency of 12, so the probability is $\frac{12}{20}$, or $\frac{3}{5}$. The student needs to focus on understanding how to determine experimental probabilities related to simple events.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
26	Option F is correct	To determine the number of pennies in Russell's collection dated after 2000, the student should have first determined the percentage of pennies in the collection dated after 2000. It is given that 25% are dated before 1980, 35% are dated from 1980 to 2000, and the rest are dated after 2000. Adding 25% and 35% results in 60%, so 40% ($100\% - 60\%$) of the pennies are dated after 2000. Multiply 1,200 by 40% ($1,200 \times 0.40$) to get 480 pennies.
	Option G is incorrect	The student likely determined the number of pennies not dated after 2000. Sixty percent of the pennies are dated up to 2000, so 60% of 1,200 ($1,200 \times 0.60$) is 720 pennies. The student needs to focus on understanding how to solve problems involving percents.
	Option H is incorrect	The student likely calculated the percentage of pennies dated after 2000 (40%) correctly but failed to continue to determine the number of pennies. The student needs to focus on understanding how to solve problems involving percents.
	Option J is incorrect	The student likely calculated the percentage of pennies not dated after 2000 (60%) correctly but did not continue to determine the number of pennies dated after 2000. The student needs to focus on understanding how to solve problems involving percents.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
27	Option B is correct	To determine the expression that represents the value of π , the student should have understood that π is the ratio of the circumference (distance around a circle) to the diameter (straight line going through the center of a circle connecting two points on the circumference). The circumference is 43.96 feet and the diameter is 14 feet. Therefore the ratio is $\frac{43.96}{14}$.
	Option A is incorrect	The student likely determined the ratio of the circumference, 43.96 feet, to the radius (distance from the center to the circumference of a circle) of the circle, 7 feet. 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 determined the ratio of the radius, 7 feet, to the circumference, 43.96 feet. 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 determined the ratio of the diameter, 14 feet, to the circumference, 43.96 feet. The student needs to focus on understanding that π is the ratio of circumference of a circle to its diameter.

2018 STAAR Grade 7 Mathematics Rationales

Item#	Rationale	
28	Option J is correct	To determine the solution for the equation, the student should have translated the model into an equation. The model shows 3 x-squares and 6 one-circles on one side of the scale and 9 one-circles on the other side. This can be written as $3x + 6 = 9$. To solve this equation, first subtract 6 from both sides of the equation, resulting in $3x = 3$. The next step is to divide both sides by 3, resulting in $x = 1$.
	Option F is incorrect	The student likely equated the 3 x-squares as $x = 3$ or wrote and solved the equation $3x = 9$. The student needs to focus on understanding how to model and solve one-variable equations.
	Option G is incorrect	The student likely counted all the one-circles on both sides of the scale for a total of 15 and used this as the solution to the equation. The student needs to focus on understanding how to model and solve one-variable equations.
	Option H is incorrect	The student likely wrote a correct equation, $3x + 6 = 9$ from the model but made an error solving the equation. The student likely added 6 to both sides of the equation instead of subtracting, resulting in $3x = 15$. Dividing both sides of the equation results in $x = 5$. The student needs to focus on understanding when to subtract when solving one-variable equations.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
29	Option C is correct	To determine the current value of Peter's house, the student should have added the values of the given items in the table and subtracted from Peter's net worth. The sum (total) of the values in the table is $900 + 16,900 + 4,500 + 1,200 - 3,400 - 16,300 = 3,800$. Subtract this value from Peter's net worth ($101,800 - 3,800$), and the house is worth \$98,000.
	Option A is incorrect	The student likely added all the given values in the table but disregarded the negative signs. This makes the sum $900 + 3,400 + 16,900 + 16,300 + 4,500 + 1,200 = 43,200$. The difference between Peter's net worth and this value is $101,800 - 43,200 = 58,600$. The student needs to focus on understanding financial assets and liabilities in net worth statements.
	Option B is incorrect	The student likely added only the positive values in the table. This makes the sum $900 + 16,900 + 4,500 + 1,200 = 23,500$. The difference between Peter's net worth and this value is $101,800 - 23,500 = 78,300$. The student needs to focus on understanding financial assets and liabilities in net worth statements.
	Option D is incorrect	The student likely subtracted only the values that are negative in the table from the net worth. This makes the value of the house $101,800 - 3,400 - 16,300 = 82,100$. The student needs to focus on understanding financial assets and liabilities in net worth statements.
30	-19.8 and any equivalent values are correct	To determine the value of -9×2.2 , the student should have multiplied the two numbers together to get -19.8.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
31	Option D is correct	To determine that this statement is supported by the information in the graph, the student should have found the combined expenses and combined income in Years 3 and 4 and compared them. The combined expenses for Years 3 and 4 are $\$600,000 + \$700,000 = \$1,300,000$. The combined income in Years 3 and 4 is $\$400,000 + \$600,000 = \$1,000,000$. The difference between the combined expenses and combined income is $\$300,000$, so the statement is supported by the information in the graph.
	Option A is incorrect	The student likely misread $\$100,000$ each year as $\$200,000$ each year in the bar graph. The student needs to focus on understanding how to solve problems using data represented in bar graphs.
	Option B is incorrect	The student likely misinterpreted an increase of 50% as twice as much. The income in Year 1 is $\$600,000$ and the income in Year 5 is $\$900,000$, for an increase of $\$300,000$ instead of $\$600,000$. The student needs to focus on understanding how to solve problems using data represented in bar graphs.
	Option C is incorrect	The student likely miscalculated the combined income in Years 1, 2, and 3 or miscalculated the combined expenses in Years 1, 2, and 3. The combined income in Years 1, 2, and 3 is $\$600,000 + \$600,000 + \$400,000 = \$1,600,000$ and the combined expenses are $\$400,000 + \$500,000 + \$600,000 = \$1,500,000$. The student needs to focus on understanding how to solve problems using data represented in bar graphs.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
32	Option H is correct	To determine the height (vertical distance from top to bottom), h , of the scale model in inches, the student should have set up and solved a proportion (comparison of two ratios) that equates ratios of inches to feet (or feet to inches). The proportion is $\frac{2}{30} = \frac{h}{180}$. Multiply 180 by 2 to get 360. Then divide 360 by 30 to get 12 inches.
	Option F is incorrect	The student likely set up a proportion but divided 180 by 2 to get 90. Then 90 was divided by 30 to get 3. The student needs to focus on understanding how to solve proportions.
	Option G is incorrect	The student likely used the values presented in the problem and simplified the expression $\frac{180 - 30}{2} + 30$ to 105. The student needs to focus on understanding how to solve proportions.
	Option J is incorrect	The student likely multiplied 2 and 30 to get 60. The student needs to focus on understanding how to solve proportions.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
33	Option B is correct	To determine the situation represented by the inequality, the student should have reviewed the inequality for key characteristics. The inequality $120 \leq 12k + 29$ shows that 12 represents a rate and 29 represents a fixed initial amount. Also, "120 is less than or equal to" ($120 \leq$) indicates that a value should be at least 120. This statement shows that Felicia has 29 buttons initially and collects 12 new buttons every year (rate). The question is asking when she will have "at least" 120 buttons. This situation is represented by the inequality.
	Option A is incorrect	The student likely mixed up the interpretations of the values of 12 and the 29. The initial number of buttons should be 29 instead of 12, and the rate should be 12 new buttons per year instead of 29. The student needs to focus on understanding how to write real-world problems based on inequalities.
	Option C is incorrect	The student likely interpreted the initial value and the rate of the inequality correctly but misinterpreted the inequality symbol as "at most" instead of "at least." The student needs to focus on understanding how to write real-world problems based on inequalities.
	Option D is incorrect	The student likely mixed up the interpretations of the values of 12 and the 29 and misinterpreted the inequality symbol as "at most" instead of "at least." The student needs to focus on understanding how to write real-world problems based on inequalities.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
34	Option H is correct	To determine the area (amount of space covered by a surface) of the shaded region in square centimeters, the student should have measured the dimensions of the circle and the square to the nearest centimeter. The diameter (straight line going through the center of a circle connecting two points on the circumference) of the circle is closest to 10 centimeters, and the length of one side of the square is closest to 7 centimeters. The area of the shaded region is the area of the circle minus the area of the square. To put this in a formula, the area of the shaded region is $A = \pi r^2 - bh$, where r is the radius (distance from the center to the circumference of a circle) and b and h are the base and height of the square. So the area of the shaded region is $A = \pi \times 5^2 - 7(7) = \pi \times 25 - 49 \approx 78.5 - 49$, which is about 29.5 square centimeters.
	Option F is incorrect	The student likely subtracted the circumference (distance around a circle) of the circle from the area of the square. The expression $7(7) - 2 \cdot \pi \cdot 5$ was used. This expression is equal to about 17.6. The student needs to focus on understanding how to determine the areas of composite figures.
	Option G is incorrect	The student likely used the value for diameter instead of radius in the calculation. The expression $\pi \times 10^2 - 7(7)$ was used. This expression is equal to about 265. The student needs to focus on understanding how to determine the areas of composite figures.
	Option J is incorrect	The student likely measured the dimensions correctly and applied the formulas correctly for the area of the circle and the square, but added the areas instead of subtracting them. The expression $\pi \times 5^2 + 7(7)$ was used. This expression is equal to about 127.5. The student needs to focus on understanding how to determine the areas of composite figures.
35	4.99 and any equivalent values are correct	To determine the cost in dollars and cents for each pair of socks, the student should have subtracted the change (\$5.03) from \$20, then divided the result by 3. So $20 - 5.03 = 14.97$, and $14.97 \div 3 = 4.99$.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
36	Option G is correct	To determine that this statement is supported by the information in the box plots (data displays that show the minimum, first quartile, median, third quartile, and maximum of sets of data), the student should have calculated the interquartile range (difference between the third quartile and the first quartile of a set of data) for both box plots. The interquartile range of the data for Music Player X is $6.5 - 4.5 = 2$, and the interquartile range of the data for Music Player Y is $5 - 4 = 1$. The interquartile range of the data for Music Player X (2) is greater than the interquartile range of the data for Music Player Y (1).
	Option F is incorrect	The student likely determined the range (difference between the maximum and the minimum of a set of data) of both sets of data instead of the interquartile range of both sets of data. The range of both data sets is $7.5 - 3.5 = 4$. The student needs to focus on understanding how to use measures of spread to compare two groups of numeric data.
	Option H is incorrect	The student likely compared the median (value for which half the numbers are greater and half are less) length of the songs on Music Player X with the third quartile (number for which 75% of the data is less than that number) of the length of the songs on Music Player Y as they are both 5. The student needs to focus on understanding how to use measures of center to compare two groups of numeric data.
	Option J is incorrect	The student likely mixed up the median length of the songs on Music Player X (5) with the median length of the songs on Music Player Y (4.5). The student needs to focus on understanding how to use measures of center to compare two groups of numeric data.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
37	Option D is correct	To determine the diagram that best represents the relationship among integers, rational numbers, and whole numbers, the student should have used the understanding that both integers (all positive and negative whole numbers, including zero) and whole numbers (the numbers 0, 1, 2, 3, 4, etc.) are rational numbers (numbers that can be represented by the division of two integers) and that whole numbers are a subset of integers. This diagram shows these relationships.
	Option A is incorrect	The student likely knew that all integers and whole numbers are rational numbers but did not understand that whole numbers are a subset of integers. The student needs to focus on understanding sets and subsets of rational numbers.
	Option B is incorrect	The student likely assumed that all integers and rational numbers are whole numbers. The student needs to focus on understanding sets and subsets of rational numbers.
	Option C is incorrect	The student likely knew that all integers are rational numbers but did not understand that neither is a subset of whole numbers. The student needs to focus on understanding sets and subsets of rational numbers.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
38	Option H is correct	To determine which equation is true where $k = -15$, the student should have evaluated the equation using -15 for k in the equation to see if it makes a true statement. When -15 is substituted for k , the result is $\frac{-15}{3} + 17 = -5 + 17 = 12$.
	Option F is incorrect	The student likely substituted -15 into the equation $3k + 11 = -34$ instead of $3k - 11 = -34$. When -15 is substituted the result is $3 \times -15 + 11 = -45 + 11 = -34$. The student needs to focus on understanding how to determine if a given value makes an equation true.
	Option G is incorrect	The student likely substituted 15 instead of -15 into the given equation $-53 + 4k = 7$. When 15 is substituted the result is $-53 + 4 \times 15 = -53 + 60 = 7$. The student needs to focus on understanding how to determine if a given value makes an equation true.
	Option J is incorrect	The student likely attempted to evaluate the given equation with $k = -15$ but made a sign error. When -15 is substituted the result is $\frac{-15}{5} + 2.5 = -3 + 2.5 = -0.5$ instead of 0.5 . The student needs to focus on understanding how to determine if a given value makes an equation true.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
39	Option A is correct	To determine the volume (amount of three-dimensional space taken up) of the square pyramid in cubic meters, the student should have used the formula $V = \frac{1}{3} Bh$ provided in the reference materials, where B represents 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. The expression that represents the volume is $\frac{1}{3} \times 9^2 \times 7.5$, which results in 202.5 cubic meters.
	Option B is incorrect	The student likely used $\frac{1}{2}$ instead of $\frac{1}{3}$ when attempting to use the formula for volume. The student needs to focus on understanding how to solve problems involving volumes of pyramids.
	Option C is incorrect	The student likely multiplied the perimeter (distance around the outside) of the square base (36) times the height of the pyramid (7.5) to get 270. The student needs to focus on understanding how to solve problems involving volumes of pyramids.
	Option D is incorrect	The student likely multiplied the area of the square base (81) times 3 to get 243. The student needs to focus on understanding how to solve problems involving volumes of pyramids.

2018 STAAR Grade 7 Math Rationales

Item#	Rationale	
40	Option G is correct	To determine that the statement is supported by the rate of change (constant increase or decrease), the student should have recognized that the rate of change, based on the graph, is $\frac{3}{2}$. The vertical axis shows the number of books and the horizontal axis shows the number of months. The rate of change is the vertical change divided by the horizontal change between two points on the graph. This means that 3 books were read in the first 2 months, according to the graph.
	Option F is incorrect	The student likely inverted (flipped upside down) the rate of change and used $\frac{2}{3}$. The student needs to focus on understanding how to determine the rate of change in a graph.
	Option H is incorrect	The student likely misread the scale on the x-axis and determined that the rate of change is $\frac{3}{4}$. The student needs to focus on understanding how to read the scale on a graph to determine the rate of change.
	Option J is incorrect	The student likely misread the scale on the x-axis and inverted the rate of change, ending up with $\frac{4}{3}$ as the rate of change. The student needs to focus on understanding how to read the scale on a graph to determine the rate of change.