

Math

Module 1 (27 questions)

QUESTION 1

Choice C is correct. It's given that 3 teaspoons is equivalent to 1 tablespoon.

Therefore, 44 tablespoons is equivalent to $(44 \text{ tablespoons})\left(\frac{3 \text{ teaspoons}}{1 \text{ tablespoon}}\right)$, or 132 teaspoons.

Choice A is incorrect. This is equivalent to approximately 15.66 tablespoons, not 44 tablespoons. *Choice B* is incorrect. This is equivalent to approximately 29.33 tablespoons, not 44 tablespoons. *Choice D* is incorrect. This is equivalent to approximately 58.66 tablespoons, not 44 tablespoons.

QUESTION 2

Choice D is correct. It's given that $f(x) = \frac{1}{6x}$. Substituting 3 for x in this equation yields $f(3) = \frac{1}{6(3)}$, or $f(3) = \frac{1}{18}$. Therefore, when $x = 3$, the value of $f(x)$ is $\frac{1}{18}$.

Choice A is incorrect. This is the value of $f(x)$ when $x = 0.5$. *Choice B* is incorrect. This is the value of $f(x)$ when $x = 1$. *Choice C* is incorrect. This is the value of $f(x)$ when $x = 1.5$.

QUESTION 3

Choice C is correct. It's given that $x = 40$. Adding 6 to both sides of this equation yields $x + 6 = 40 + 6$, or $x + 6 = 46$. Therefore, the value of $x + 6$ is 46.

Choice A is incorrect. This is the value of $x - 6$, not $x + 6$. *Choice B* is incorrect. This is the value of x , not $x + 6$. *Choice D* is incorrect. This is the value of $x + 24$, not $x + 6$.

QUESTION 4

Choice A is correct. 23% of 100 can be calculated by multiplying $\frac{23}{100}$ by 100, which yields $\left(\frac{23}{100}\right)100$, or 23.

Choice B is incorrect. This is 46%, not 23%, of 100. *Choice C* is incorrect. This is 23% less than 100, not 23% of 100. *Choice D* is incorrect. This is 23% greater than 100, not 23% of 100.

QUESTION 5

Choice D is correct. The given expression shows addition of two like terms. Therefore, the given expression is equivalent to $(50+5)x^2$, or $55x^2$.

Choice A is incorrect. This expression is equivalent to $(50)(5)x^2$, not $(50+5)x^2$.

Choice B is incorrect. This expression is equivalent to $\left(\frac{50}{5}\right)x^2$, not $(50+5)x^2$.

Choice C is incorrect. This expression is equivalent to $(50-5)x^2$, not $(50+5)x^2$.

QUESTION 6

The correct answer is 370. It's given that the population density of Cedar County is 230 people per square mile and the county has a population of 85,100 people. Based on the population density, it follows that the area of Cedar County is

$(85,100 \text{ people})\left(\frac{1 \text{ square mile}}{230 \text{ people}}\right)$, or 370 square miles.

QUESTION 7

The correct answer is -9 . Since w is in the denominator of a fraction in the given equation, w can't be equal to 0. Since w isn't equal to 0, multiplying both sides of the given equation by w yields an equivalent equation, $-54 = 6w$. Dividing both sides of this equation by 6 yields $-9 = w$. Therefore, -9 is the solution to the given equation.

QUESTION 8

Choice B is correct. An equation defining a linear function can be written in the form $f(x) = mx + b$, where m and b are constants, m is the slope of the graph of $y = f(x)$ in the xy -plane, and $(0, b)$ is the y -intercept of the graph. It's given that for the function f , the graph of $y = f(x)$ in the xy -plane has a slope of 3. Therefore, $m = 3$. It's also given that this graph passes through the point $(0, -8)$. Therefore, the y -intercept of the graph is $(0, -8)$, and it follows that $b = -8$. Substituting 3 for m and -8 for b in the equation $f(x) = mx + b$ yields $f(x) = 3x - 8$. Thus, the equation that defines f is $f(x) = 3x - 8$.

Choice A is incorrect. For this function, the graph of $y = f(x)$ in the xy -plane passes through the point $(0, 0)$, not $(0, -8)$. *Choice C* is incorrect. For this function, the graph of $y = f(x)$ in the xy -plane passes through the point $(0, 5)$, not $(0, -8)$. *Choice D* is incorrect. For this function, the graph of $y = f(x)$ in the xy -plane passes through the point $(0, 11)$, not $(0, -8)$.

QUESTION 9

Choice A is correct. The perimeter of a triangle is the sum of the lengths of its three sides. The triangle shown has side lengths x , y , and z . It's given that the triangle has a perimeter of 22 units. Therefore, $x + y + z = 22$. If $x = 9$ units and $y = 7$ units, the value of z , in units, can be found by substituting 9 for x and 7 for y in the equation $x + y + z = 22$, which yields $9 + 7 + z = 22$, or $16 + z = 22$. Subtracting 16 from both sides of this equation yields $z = 6$. Therefore, if $x = 9$ units and $y = 7$ units, the value of z , in units, is 6.

Choice B is incorrect. This is the value of y , in units, not the value of z , in units.

Choice C is incorrect. This is the value of x , in units, not the value of z , in units.

Choice D is incorrect. This is the value of $x + y$, in units, not the value of z , in units.

QUESTION 10

Choice A is correct. The value of $h(-2)$ can be found by substituting -2 for x in the equation defining h . Substituting -2 for x in $h(x) = 3x - 7$ yields $h(-2) = 3(-2) - 7$, or $h(-2) = -13$. Therefore, the value of $h(-2)$ is -13 .

Choice B is incorrect. This is the value of $h(-1)$, not $h(-2)$. **Choice C** is incorrect and may result from conceptual or calculation errors. **Choice D** is incorrect and may result from conceptual or calculation errors.

QUESTION 11

Choice C is correct. The tangent of an acute angle in a right triangle is defined as the ratio of the length of the side opposite the angle to the length of the shorter side adjacent to the angle. In the triangle shown, the length of the side opposite the angle with measure x° is 26 units and the length of the side adjacent to the angle with measure x° is 7 units. Therefore, the value of $\tan x^\circ$ is $\frac{26}{7}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 12

Choice C is correct. It's given that the scatterplot shows the relationship between two variables, x and y , and a line of best fit is shown. For the line of best fit shown, for each increase in the value of x by 1, the corresponding value of y increases by a constant rate. It follows that the relationship between the variables x and y has a positive linear trend. A line in the xy -plane that passes through the points (a, b) and (c, d) has a slope of $\frac{d-b}{c-a}$. The line of best fit shown passes approximately through the points $(0, 0.25)$ and $(4, 2)$. It follows that the slope of this line is approximately $\frac{2-0.25}{4-0}$, which is equivalent to 0.4375. Therefore, of the given choices, 0.44 is closest to the slope of the line of best fit shown.

Choice A is incorrect. This is the slope of a line of best fit for a relationship between x and y that has a negative, rather than a positive, linear trend. **Choice B**

is incorrect. This is the slope of a line of best fit for a relationship between x and y that has a negative, rather than a positive, linear trend. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 13

The correct answer is 9. It's given that the y -intercept of the graph of $12x + 2y = 18$ in the xy -plane is $(0, y)$. Substituting 0 for x in the equation $12x + 2y = 18$ yields $12(0) + 2y = 18$, or $2y = 18$. Dividing both sides of this equation by 2 yields $y = 9$. Therefore, the value of y is 9.

QUESTION 14

The correct answer is 241. For a certain animal, it's given that a model predicts the animal weighed 241 pounds when it was born and gained 3 pounds per day in its first year of life. It's also given that this model is defined by an equation in the form $f(x) = a + bx$, where $f(x)$ is the predicted weight, in pounds, of the animal x days after it was born, and a and b are constants. It follows that a represents the predicted weight, in pounds, of the animal when it was born and b represents the predicted rate of weight gain, in pounds per day, in its first year of life. Thus, the value of a is 241.

QUESTION 15

Choice A is correct. It's given that the graph shows the height above ground, in meters, of a ball x seconds after the ball was launched upward from a platform. In the graph shown, the x -axis represents time, in seconds, and the y -axis represents the height of the ball above ground, in meters. It follows that for the marked point $(1.0, 4.8)$, 1.00 represents the time, in seconds, after the ball was launched upward from a platform and 4.80 represents the height of the ball above ground, in meters. Therefore, the best interpretation of the marked point $(1.0, 4.8)$ is 1.00 second after being launched, the ball's height above ground is 4.80 meters.

Choice B is incorrect and may result from conceptual errors. *Choice C* is incorrect and may result from conceptual errors. *Choice D* is incorrect and may result from conceptual errors.

QUESTION 16

Choice A is correct. It's given that based on a random sample from a population, the estimated mean value for a certain variable for the population is 20.5, with an associated margin of error of 1. This means that it is plausible that the actual mean value of the variable for the population is between $20.5 - 1$ and $20.5 + 1$. Therefore, the most appropriate conclusion is that it is plausible that the actual mean value of the variable for the population is between 19.5 and 21.5.

Choice B is incorrect. The estimated mean value and associated margin of error describe only plausible values, not all the possible values, for the actual mean value of the variable, so this is not an appropriate conclusion. *Choice C* is

incorrect. The estimated mean value and associated margin of error describe only plausible values for the actual mean value of the variable, not all the possible values of the variable, so this is not an appropriate conclusion. *Choice D* is incorrect. Since 20.5 is the estimated mean value of the variable based on a random sample, the actual mean value of the variable may not be exactly 20.5. Therefore, this is not an appropriate conclusion.

QUESTION 17

Choice B is correct. It's given that the equation $7m = 5(n + p)$ relates the positive numbers m , n , and p . Dividing both sides of the given equation by 5 yields

$\frac{7m}{5} = n + p$. Subtracting p from both sides of this equation yields $\frac{7m}{5} - p = n$, or $n = \frac{7m}{5} - p$. It follows that the equation $n = \frac{7m}{5} - p$ correctly gives n in terms of m and p .

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 18

Choice A is correct. It's given that a rectangle has a length that is 15 times its width. It's also given that the function $y = (15w)(w)$ represents this situation, where y is the area, in square feet, of the rectangle and $y > 0$. The area of a rectangle can be calculated by multiplying the rectangle's length by its width. Since the rectangle has a length that is 15 times its width, it follows that w represents the width of the rectangle, in feet, and $15w$ represents the length of the rectangle, in feet. Therefore, the best interpretation of $15w$ in this context is that it's the length of the rectangle, in feet.

Choice B is incorrect. This is the best interpretation of y , not $15w$, in the given function. *Choice C* is incorrect and may result from conceptual errors. *Choice D* is incorrect. This is the best interpretation of w , not $15w$, in the given function.

QUESTION 19

Choice B is correct. Adding the first equation to the second equation in the given system yields $(x + 2y) + (x - 2y) = 6 + 4$, or $(x + x) + (2y - 2y) = 10$. Combining like terms in this equation yields $2x = 10$. Dividing both sides of this equation by 2 yields $x = 5$. Thus, the value of x is 5.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the value of $2x$, not x .

QUESTION 20

The correct answer is 19. The minimum value of a data set is the least value in the data set. The frequency refers to the number of times a value occurs. The given table shows that for this data set, the value 19 occurs 7 times, the value 21 occurs 1 time, the value 23 occurs 7 times, and the value 25 occurs 4 times. Therefore, of the values 19, 21, 23, and 25 given in the data set, the minimum value of the data set is 19.

QUESTION 21

The correct answer is -2 . It's given that a number x is at most 17 less than 5 times the value of y , or $x \leq 5y - 17$. Substituting 3 for y in this inequality yields $x \leq 5(3) - 17$, or $x \leq -2$. Thus, if the value of y is 3, the greatest possible value of x is -2 .

QUESTION 22

Choice C is correct. The left-hand side of the given equation can be factored as $(5x + 3)(x - 8)$. Therefore, the given equation, $5x^2 - 37x - 24 = 0$, can be written as $(5x + 3)(x - 8) = 0$. Applying the zero product property to this equation yields $5x + 3 = 0$ and $x - 8 = 0$. Subtracting 3 from both sides of the equation $5x + 3 = 0$ yields $5x = -3$. Dividing both sides of this equation by 5 yields $x = -\frac{3}{5}$. Adding 8 to both sides of the equation $x - 8 = 0$ yields $x = 8$. Therefore, the two solutions to the given equation, $5x^2 - 37x - 24 = 0$, are $-\frac{3}{5}$ and 8. It follows that 8 is the positive solution to the given equation.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 23

Choice B is correct. In the figure shown, the angle measuring y° is congruent to its vertical angle formed by lines s and m , so the measure of the vertical angle is also y° . The vertical angle forms a same-side interior angle pair with the angle measuring x° . It's given that lines r and s are parallel. Therefore, same-side interior angles in the figure are supplementary, which means the sum of the measure of the vertical angle and the measure of the angle measuring x° is 180° , or $x + y = 180$. Subtracting x from both sides of this equation yields $y = 180 - x$. Substituting $180 - x$ for y in the inequality $y < 65$ yields $180 - x < 65$. Adding x to both sides of this inequality yields $180 < 65 + x$. Subtracting 65 from both sides of this inequality yields $115 < x$, or $x > 115$. Thus, if $y < 65$, it must be true that $x > 115$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. $x + y$ must be equal to, not less than, 180. *Choice D* is incorrect. $x + y$ must be equal to, not greater than, 180.

QUESTION 24

Choice B is correct. It's given that the graph of $y = g(x)$ is produced by translating the graph of $y = f(x)$ 3 units down and 4 units to the right in the xy -plane. Therefore, function g can be defined by an equation in the form

$g(x) = f(x - 4) - 3$. Function f is defined by the equation $f(x) = \frac{a-19}{x} + 5$, where a is a constant. Substituting $x - 4$ for x in the equation $f(x) = \frac{a-19}{x} + 5$ yields $f(x - 4) = \frac{a-19}{x-4} + 5$. Substituting $\frac{a-19}{x-4} + 5$ for $f(x - 4)$ in the equation $g(x) = f(x - 4) - 3$ yields $g(x) = \frac{a-19}{x-4} + 5 - 3$, or $g(x) = \frac{a-19}{x-4} + 2$. Therefore, the equation that defines function g is $g(x) = \frac{a-19}{x-4} + 2$.

Choice A is incorrect. This equation defines a function whose graph is produced by translating the graph of $y = f(x)$ 3 units down and 4 units to the left, not 3 units down and 4 units to the right. **Choice C** is incorrect. This equation defines a function whose graph is produced by translating the graph of $y = f(x)$ 4 units to the left, not 3 units down and 4 units to the right. **Choice D** is incorrect. This equation defines a function whose graph is produced by translating the graph of $y = f(x)$ 4 units to the right, not 3 units down and 4 units to the right.

QUESTION 25

Choice D is correct. An equation representing the height above ground h , in meters, of a softball t seconds after it is launched by a machine from ground level can be written in the form $h = -a(t - b)^2 + c$, where a , b , and c are positive constants. In this equation, b represents the time, in seconds, at which the softball reaches its maximum height of c meters above the ground. It's given that this softball reaches a maximum height of 51.84 meters above the ground at 1.8 seconds; therefore, $b = 1.8$ and $c = 51.84$. Substituting 1.8 for b and 51.84 for c in the equation $h = -a(t - b)^2 + c$ yields $h = -a(t - 1.8)^2 + 51.84$. It's also given that this softball hits the ground at 3.6 seconds; therefore, $h = 0$ when $t = 3.6$. Substituting 0 for h and 3.6 for t in the equation $h = -a(t - 1.8)^2 + 51.84$ yields $0 = -a(3.6 - 1.8)^2 + 51.84$, which is equivalent to $0 = -a(1.8)^2 + 51.84$, or $0 = -3.24a + 51.84$. Adding $3.24a$ to both sides of this equation yields $3.24a = 51.84$. Dividing both sides of this equation by 3.24 yields $a = 16$. Substituting 16 for a in the equation $h = -a(t - 1.8)^2 + 51.84$ yields $h = -16(t - 1.8)^2 + 51.84$. Therefore, $h = -16(t - 1.8)^2 + 51.84$ represents the height above ground h , in meters, of this softball t seconds after it is launched.

Choice A is incorrect. This equation represents a situation where the maximum height is 3.6 meters above the ground at 0 seconds, not 51.84 meters above the ground at 1.8 seconds. **Choice B** is incorrect. This equation represents a situation where the maximum height is 51.84 meters above the ground at 0 seconds, not 1.8 seconds. **Choice C** is incorrect and may result from conceptual or calculation errors.

QUESTION 26

Choice D is correct. It's given that in triangle ABC , the measure of angle B is 90° and BD is an altitude of the triangle. Therefore, the measure of angle BDC is 90° . It follows that angle B is congruent to angle D and angle C is congruent to angle C . By the angle-angle similarity postulate, triangle ABC is similar to triangle BDC . Since triangles ABC and BDC are similar, it follows that $\frac{AC}{AB} = \frac{BC}{BD}$. It's also given that the length of $\overline{AB}$ is 15 and the length of $\overline{AC}$ is 23 greater than the length of $\overline{AB}$. Therefore, the length of $\overline{AC}$ is $15 + 23$, or 38. Substituting 15 for AB and 38 for AC in the equation $\frac{AC}{AB} = \frac{BC}{BD}$ yields $\frac{38}{15} = \frac{BC}{BD}$. Therefore, the value of $\frac{BC}{BD}$ is $\frac{38}{15}$.

Choice A is incorrect. This is the value of $\frac{BD}{BC}$. **Choice B** is incorrect and may result from conceptual or calculation errors. **Choice C** is incorrect and may result from conceptual or calculation errors.

QUESTION 27

The correct answer is -7 . For a quadratic function defined by an equation of the form $f(x) = a(x - h)^2 + k$, where a , h , and k are constants and $a > 0$, the function reaches its minimum when $x = h$. In the given function, $a = 1$, $h = -7$, and $k = 4$. Therefore, the value of x for which $f(x)$ reaches its minimum is -7 .