

Math

Module 2

(27 questions)

QUESTION 1

Choice A is correct. It's given that a total of 165 people contributed to a charity event as either a donor or a volunteer. It's also given that 130 people contributed as a donor. It follows that $165 - 130$, or 35, people contributed as a volunteer.

Choice B is incorrect. This is the number of people who contributed as a donor, not a volunteer. **Choice C** is incorrect. This is the total number of people who contributed as either a donor or a volunteer, not the number of people who contributed as a volunteer. **Choice D** is incorrect and may result from conceptual or calculation errors.

QUESTION 2

Choice B is correct. It's given that there are 250 trees in a park and of these trees, 6% are birch trees. The number of birch trees in the park can be calculated by multiplying the number of trees in the park by $\frac{6}{100}$. Therefore, the number of birch trees in the park is $250\left(\frac{6}{100}\right)$, or 15.

Choice A is incorrect. This is the percentage of trees in the park that are birch trees, not the number of birch trees in the park. **Choice C** is incorrect. This is 30%, not 6%, of 250. **Choice D** is incorrect and may result from conceptual or calculation errors.

QUESTION 3

Choice C is correct. The vertex of the graph of a quadratic function in the xy -plane is the point at which the graph is either at its minimum or maximum y -value. In the graph shown, the minimum y -value occurs at the point $(0, 2)$.

Choice A is incorrect. The graph shown doesn't pass through the point $(0, -2)$.

Choice B is incorrect. The graph shown doesn't pass through the point $(0, -3)$.

Choice D is incorrect. The graph shown doesn't pass through the point $(0, 3)$.

QUESTION 4

Choice A is correct. It's given that there are 2,358 raccoons in a 131-square-mile area. The estimated population density, in raccoons per square mile, is the estimated number of raccoons divided by the number of square miles. Therefore, the estimated population density of this area is $\frac{2,358 \text{ raccoons}}{131 \text{ square miles}}$, or 18 raccoons per square mile.

Choice B is incorrect. This is the number of square miles in the area, not the estimated number of raccoons per square mile in this area. **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 5

Choice B is correct. The probability of selecting a positive number is the number of positive numbers in the data set divided by the total number of numbers in the data set. There is 1 positive number in this data set. There are 3 total numbers in this data set. Thus, if a number from this data set is selected at random, the probability of selecting a positive number is $\frac{1}{3}$.

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

Choice C is incorrect. This is the probability of selecting a negative number from this data set. **Choice D** is incorrect and may result from conceptual or calculation errors.

QUESTION 6

The correct answer is 2,850. It's given that the function $f(x) = 45x + 600$ gives the monthly fee, in dollars, a facility charges to keep x crates in storage. Substituting 50 for x in this function yields $f(50) = 45(50) + 600$, or $f(50) = 2,850$. Therefore, the monthly fee, in dollars, the facility charges to keep 50 crates in storage is 2,850.

QUESTION 7

The correct answer is $\frac{11}{4}$. It's given that the function f is defined by

$f(x) = 5\left(\frac{1}{4} - x\right)^2 + \frac{11}{4}$. Substituting $\frac{1}{4}$ for x in this equation yields

$f\left(\frac{1}{4}\right) = 5\left(\frac{1}{4} - \frac{1}{4}\right)^2 + \frac{11}{4}$, which is equivalent $f\left(\frac{1}{4}\right) = 5(0)^2 + \frac{11}{4}$, or $f\left(\frac{1}{4}\right) = \frac{11}{4}$. Therefore,

the value of $f\left(\frac{1}{4}\right)$ is $\frac{11}{4}$. Note that $11/4$ or 2.75 are examples of ways to enter a correct answer.

QUESTION 8

Choice C is correct. It's given that $8x = 6$. Multiplying each side of this equation by 9 yields $72x = 54$. Therefore, the value of $72x$ is 54.

Choice A is incorrect. This is the value of $4x$, not $72x$. **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 9

Choice C is correct. Since x is a common factor of each term in the given expression, the given expression can be rewritten as $x(23x^2 + 2x + 9)$.

Choice A is incorrect. This expression is equivalent to $23x^3 + 46x^2 + 207x$.

Choice B is incorrect. This expression is equivalent to $207x^4 + 18x^3 + 9x$.

Choice D is incorrect. This expression is equivalent to $34x^3 + 34x^2 + 34x$.

QUESTION 10

Choice D is correct. The given expression can be rewritten as $(9x^3 + 6x^3) + 5x^2 + 5x + (7 - 5)$. Combining like terms in this expression yields $15x^3 + 5x^2 + 5x + 2$.

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

QUESTION 11

Choice D is correct. It's given that the equation $80S + 90C = 1,120$ represents this situation, where S is the number of square tokens won, C is the number of circle tokens won, and 1,120 is the total number of points the tokens are worth. It follows that $80S$ represents the total number of points the square tokens are worth. Therefore, each square token is worth 80 points. It also follows that $90C$ represents the total number of points the circle tokens are worth. Therefore, each circle token is worth 90 points. Since a circle token is worth 90 points and a square token is worth 80 points, then a circle token is worth $90 - 80$, or 10, more points than a square token.

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

Choice B is incorrect. This is the number of points a circle token is worth.

Choice C is incorrect. This is the number of points a square token is worth.

QUESTION 12

Choice D is correct. A line in the xy -plane that passes through the points (x_1, y_1) and (x_2, y_2) has a slope of $\frac{y_2 - y_1}{x_2 - x_1}$. The line of best fit shown passes approximately through the points $(1, 3.3)$ and $(7, 14.5)$. It follows that the slope of this best fit line is approximately $\frac{14.5 - 3.3}{7 - 1}$, which is equivalent to $\frac{11.2}{6}$, or approximately 1.87. Therefore, of the given choices, 2 is closest to the slope of the line of best fit shown.

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

QUESTION 13

The correct answer is 4.41. The area, A , of a circle is given by the formula $A = \pi r^2$, where r is the radius of the circle. It's given that the area of the circle is $b\pi$ square inches, where b is a constant, and the radius of the circle is 2.1 inches.

Substituting $b\pi$ for A and 2.1 for r in the formula $A = \pi r^2$ yields $b\pi = \pi(2.1^2)$.

Dividing both sides of this equation by π yields $b = 4.41$. Therefore, the value of b is 4.41.

QUESTION 14

The correct answer is 153. Since it's given that $\overline{PQ}$ is parallel to $\overline{XY}$ and angle Y is a right angle, angle ZQP is also a right angle. Angle ZPQ is complementary to angle XZY , which means its measure, in degrees, is $90 - 63$, or 27. Since angle XPQ is supplementary to angle ZPQ , its measure, in degrees, is $180 - 27$, or 153.

QUESTION 15

Choice C is correct. It's given that t represents the number of years since the account was opened. Therefore, $\frac{t}{10}$ represents the number of 10-year periods since the account was opened. Since the value of the account doubles during each of these 10-year periods, the value of the account can be found by multiplying the initial value by $\frac{t}{10}$ factors of 2. This is equivalent to $2^{\frac{t}{10}}$. It's given that the initial value of the account is \$890. Therefore, the value of the account $M(t)$, in dollars, t years after the account was opened can be represented by $M(t) = 890(2)^{\frac{t}{10}}$.

Choice A is incorrect. This equation represents the value of an account if the value of the account halves, not doubles, every 10 years. **Choice B** is incorrect. This equation represents the value of an account if the value of the account decreases by 90%, not doubles, every 2, not 10, years. **Choice D** is incorrect. This equation represents the value of an account if the value of the account increases by a factor of 10, not doubles, every 2, not 10, years.

QUESTION 16

Choice A is correct. The inequality $y < x$ indicates that for any solution to the given system of inequalities, the value of x must be greater than the corresponding value of y . The inequality $x < 22$ indicates that for any solution to the given system of inequalities, the value of x must be less than 22. Of the given choices, only choice A contains values of x that are each greater than the corresponding value of y and less than 22. Therefore, for choice A, all the values of x and their corresponding values of y are solutions to the given system of inequalities.

Choice B is incorrect. The values in this table aren't solutions to the inequality $y < x$. **Choice C** is incorrect. The values in this table aren't solutions to the inequality $x < 22$. **Choice D** is incorrect. The values in this table aren't solutions to the inequality $y < x$ or the inequality $x < 22$.

QUESTION 17

Choice A is correct. For positive values of a , $\frac{a^m}{a^n} = a^{(m-n)}$, where m and n are integers. Since it's given that $h > 0$ and $q > 0$, this property can be applied to rewrite the given expression as $(h^{(15-5)})(q^{(7-21)})$, which is equivalent to $h^{10}q^{-14}$. For positive values of a , $a^{-n} = \frac{1}{a^n}$. This property can be applied to rewrite the expression $h^{10}q^{-14}$ as $(h^{10})\left(\frac{1}{q^{14}}\right)$, which is equivalent to $\frac{h^{10}}{q^{14}}$.

Choice B 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 D is correct. Adding the second equation to the first equation in the given system of equations yields $3y - 3y = 4x + 9x + 17 - 23$, or $0 = 13x - 6$. Adding 6 to each side of this equation yields $6 = 13x$. Multiplying each side of this equation by 3 yields $18 = 39x$. Therefore, the value of $39x$ is 18.

Choice A is incorrect. This is the value of $-39x$, not $39x$. *Choice B* is incorrect.

This is the value of $-13x$, not $39x$. *Choice C* is incorrect. This is the value of $13x$, not $39x$.

QUESTION 19

Choice B is correct. It's given that the function h estimates that the object is 3,364 feet above the ground when it's dropped at $t = 0$. Substituting 3,364 for $h(t)$ and 0 for t in the function h yields $3,364 = -16(0)^2 + b$, or $3,364 = b$. Substituting 3,364 for b in the function h yields $h(t) = -16t^2 + 3,364$. When the object hits the ground, its height will be 0 feet above the ground. Substituting 0 for $h(t)$ in $h(t) = -16t^2 + 3,364$ yields $0 = -16t^2 + 3,364$. Adding $16t^2$ to each side of this equation yields $16t^2 = 3,364$. Dividing each side of this equation by 16 yields $t^2 = 210.25$. Since the object will hit the ground at a positive number of seconds after it's dropped, the value of t can be found by taking the positive square root of each side of this equation, which yields $t = 14.50$. It follows that the function estimates the object will hit the ground approximately 14.50 seconds after being dropped.

Choice A is incorrect. The function estimates that 7.25 seconds after being dropped, the object's height will be $-16(7.25)^2 + 3,364$ feet, or 2,523 feet, above the ground. *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 20

The correct answer is 120. The solutions to a quadratic equation of the form $ax^2 + bx + c = 0$ can be calculated using the quadratic formula and are given by $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. The given equation is in the form $ax^2 + bx + c = 0$, where $a = 2$, $b = -8$, and $c = -7$. It follows that the solutions to the given equation are $x = \frac{8 \pm \sqrt{(-8)^2 - 4(2)(-7)}}{2(2)}$, which is equivalent to $x = \frac{8 \pm \sqrt{64 + 56}}{4}$, or $x = \frac{8 \pm \sqrt{120}}{4}$. It's given that one solution to the equation $2x^2 - 8x - 7 = 0$ can be written as $\frac{8 - \sqrt{k}}{4}$. The solution $\frac{8 - \sqrt{120}}{4}$ is in this form. Therefore, the value of k is 120.

QUESTION 21

The correct answer is 1,660. It's given that a line intersects two parallel lines, forming four acute angles and four obtuse angles. When two parallel lines are intersected by a transversal line, the angles formed have the following properties: two adjacent angles are supplementary, and alternate interior angles are congruent. Therefore, each of the four acute angles have the same measure, and each of the four obtuse angles have the same measure. It's also given that the measure of one of the acute angles is $(9x - 560)^\circ$. If two angles are supplementary, then the sum of their measures is 180° . Therefore, the measure of the obtuse angle adjacent to any of the acute angles is $(180 - (9x - 560))^\circ$, or $(180 - 9x + 560)^\circ$, which is equivalent to $(-9x + 740)^\circ$. It's given that the sum of the measures of one of the acute angles and three of the obtuse angles is $(-18x + w)^\circ$. It follows that $(9x - 560) + 3(-9x + 740) = (-18x + w)$, which is equivalent to $9x - 560 - 27x + 2,220 = -18x + w$, or $-18x + 1,660 = -18x + w$. Adding $18x$ to both sides of this equation yields $1,660 = w$.

QUESTION 22

Choice B is correct. An equation that defines a linear function f can be written in the form $f(x) = mx + b$, where m and b are constants. It's given in the table that when $x = -4$, $f(x) = 0$. Substituting -4 for x and 0 for $f(x)$ in the equation $f(x) = mx + b$ yields $0 = m(-4) + b$, or $0 = -4m + b$. Adding $4m$ to both sides of this equation yields $4m = b$. Substituting $4m$ for b in the equation $f(x) = mx + b$ yields $f(x) = mx + 4m$. It's also given in the table that when $x = -\frac{19}{5}$, $f(x) = 1$.

Substituting $-\frac{19}{5}$ for x and 1 for $f(x)$ in the equation $f(x) = mx + 4m$ yields $1 = m\left(-\frac{19}{5}\right) + 4m$, or $1 = \frac{1}{5}m$. Multiplying both sides of this equation by 5 yields $m = 5$. Substituting 5 for m in the equation $f(x) = mx + 4m$ yields $f(x) = 5x + 4(5)$, or $f(x) = 5x + 20$. If $h(x) = f(x) - 13$, substituting $5x + 20$ for $f(x)$ in this equation yields $h(x) = (5x + 20) - 13$, or $h(x) = 5x + 7$.

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 an equation that defines the linear function f , not h .

QUESTION 23

Choice C is correct. It's given that $g(c+7) = \frac{c}{4}$. Therefore, for the given linear function g , when $x = c+7$, $g(x) = \frac{c}{4}$. Substituting $c+7$ for x and $\frac{c}{4}$ for $g(x)$ in $g(x) = b - 15x$ yields $\frac{c}{4} = b - 15(c+7)$. Applying the distributive property to the right-hand side of this equation yields $\frac{c}{4} = b - 15c - 105$. Adding $15c$ to both sides of this equation yields $\frac{c}{4} + 15c = b - 105$. Adding 105 to both sides of this equation yields $\frac{c}{4} + 15c + 105 = b$, or $\frac{61c}{4} + 105 = b$. Therefore, the expression that represents the value of b is $\frac{61c}{4} + 105$.

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 24

Choice B is correct. It's given that angle Z in triangle XYZ is a right angle. Thus, side YZ is the leg opposite angle X and side XZ is the leg adjacent to angle X . The tangent of an acute angle in a right triangle is the ratio of the length of the leg opposite the angle to the length of the leg adjacent to the angle. It follows that $\tan X = \frac{YZ}{XZ}$. It's given that $\tan X = \frac{12}{35}$ and the length of side YZ is 24 units.

Substituting $\frac{12}{35}$ for $\tan X$ and 24 for YZ in the equation $\tan X = \frac{YZ}{XZ}$ yields $\frac{12}{35} = \frac{24}{XZ}$.

Multiplying both sides of this equation by $35(XZ)$ yields $12(XZ) = 24(35)$, or $12(XZ) = 840$. Dividing both sides of this equation by 12 yields $XZ = 70$. The length XY can be calculated using the Pythagorean theorem, which states that if a right triangle has legs with lengths of a and b and a hypotenuse with length c , then $a^2 + b^2 = c^2$. Substituting 70 for a and 24 for b in this equation yields $70^2 + 24^2 = c^2$, or $5,476 = c^2$. Taking the square root of both sides of this equation yields $\pm 74 = c$. Since the length of the hypotenuse must be positive, $74 = c$. Therefore, the length of XY is 74 units. The perimeter of a triangle is the sum of the lengths of all sides. Thus, $(74 + 70 + 24)$ units, or 168 units, is the perimeter of triangle XYZ .

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

Choice C is incorrect. This would be the perimeter, in units, for a right triangle where the length of side YZ is 12 units, not 24 units. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 25

Choice C is correct. It's given that in the xy -plane, the graph of the given equation is a circle. The equation of a circle in the xy -plane can be written in the form $(x-h)^2 + (y-k)^2 = r^2$, where (h, k) is the center of the circle and r is the length of the circle's radius. Subtracting $6y$ from both sides of the equation $x^2 + 14x + y^2 = 6y + 109$ yields $x^2 + 14x + y^2 - 6y = 109$. By completing the square, this equation can be rewritten as $(x^2 + 14x + (\frac{14}{2})^2) + (y^2 - 6y + (\frac{-6}{2})^2) = 109 + (\frac{14}{2})^2 + (\frac{-6}{2})^2$. This equation

can be rewritten as $(x^2 + 14x + 49) + (y^2 - 6y + 9) = 109 + 49 + 9$, or $(x + 7)^2 + (y - 3)^2 = 167$. Therefore, $r^2 = 167$. Taking the square root of both sides of this equation yields $r = \sqrt{167}$ and $r = -\sqrt{167}$. Since r is the length of the circle's radius, r must be positive. Therefore, the length of the circle's radius is $\sqrt{167}$.

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 26

Choice B is correct. It's given that the speed of a vehicle is increasing at a rate of 7.3 meters per second squared. It's given to use 1 mile = 1,609 meters. There are 60 seconds in 1 minute; therefore, 60^2 or 3,600 seconds squared is equal to 1 minute squared. It follows that the rate of 7.3 meters per second squared is equivalent to $\left(\frac{7.3 \text{ meters}}{1 \text{ second squared}}\right)\left(\frac{1 \text{ mile}}{1,609 \text{ meters}}\right)\left(\frac{3,600 \text{ seconds squared}}{1 \text{ minute squared}}\right)$, or approximately 16.33 miles per minute squared. The rate, in miles per minute squared, rounded to the nearest tenth is 16.3.

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 27

The correct answer is 14. It's given by the first equation of the system of equations that $y = -2.5$. Substituting -2.5 for y in the second given equation, $y = x^2 + 8x + k$, yields $-2.5 = x^2 + 8x + k$. Adding 2.5 to both sides of this equation yields $0 = x^2 + 8x + k + 2.5$. A quadratic equation of the form $0 = ax^2 + bx + c$, where a , b , and c are constants, has no real solutions if and only if its discriminant, $b^2 - 4ac$, is negative. In the equation $0 = x^2 + 8x + k + 2.5$, where k is a positive integer constant, $a = 1$, $b = 8$, and $c = k + 2.5$. Substituting 1 for a , 8 for b , and $k + 2.5$ for c in $b^2 - 4ac$ yields $8^2 - 4(1)(k + 2.5)$, or $64 - 4(k + 2.5)$. Since this value must be negative, $64 - 4(k + 2.5) < 0$. Adding $4(k + 2.5)$ to both sides of this inequality yields $64 < 4(k + 2.5)$. Dividing both sides of this inequality by 4 yields $16 < k + 2.5$. Subtracting 2.5 from both sides of this inequality yields $13.5 < k$. Since k is a positive integer constant, the least possible value of k is 14.