

Math

Module 1 (27 questions)

QUESTION 1

Choice B is correct. 10% of a quantity means $\frac{10}{100}$ times the quantity. Therefore, 10% of 470 can be represented as $\frac{10}{100}(470)$, which is equivalent to $0.10(470)$, or 47. Therefore, 10% of 470 is 47.

Choice A is incorrect. This is 10% of 370, not 10% of 470. *Choice C* is incorrect. This is 90% of 470, not 10% of 470. *Choice D* is incorrect. This is $470 - 10$, not 10% of 470.

QUESTION 2

Choice C is correct. Subtracting 6 from both sides of the given equation yields $4x = 12$, which is the equation given in choice C. Since this equation is equivalent to the given equation, it has the same solution as 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 3

Choice D is correct. The cost of the rental fee depends on the number of hours the surfboard is rented. Multiplying t hours by 10 dollars per hour yields a rental fee of $10t$ dollars. The total cost of the rental consists of the rental fee plus the 25 dollar service fee, which yields a total cost of $25 + 10t$ dollars. Since the person intends to spend a maximum of 75 dollars to rent the surfboard, the total cost must be at most 75 dollars. Therefore, the inequality $25 + 10t \leq 75$ represents this situation.

Choice A is incorrect. This represents a situation where the rental fee, not the total cost, is at most 75 dollars. *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 4

Choice A is correct. It's given that $g(x) = x^2 + 9$. Substituting 25 for $g(x)$ in this equation yields $25 = x^2 + 9$. Subtracting 9 from both sides of this equation yields $16 = x^2$. Taking the square root of each side of this equation yields $x = \pm 4$. It follows that $g(x) = 25$ when the value of x is 4 or -4 . Only 4 is listed among the choices.

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 5

Choice A is correct. The total number of possible outcomes for rolling a fair 14-sided die is 14. The number of possible outcomes for rolling a 2 is 1. The probability of rolling a 2 is the number of possible outcomes for rolling a 2 divided by the total number of possible outcomes, or $\frac{1}{14}$.

Choice B is incorrect. This is the probability of rolling a number no greater than 2.

Choice C is incorrect. This is the probability of rolling a number greater than 2.

Choice D is incorrect. This is the probability of rolling a number other than 2.

QUESTION 6

The correct answer is 2,520. There are 60 minutes in one hour. At a rate of 42 posters per minute, the number of posters produced in one hour can be determined by $\left(\frac{42 \text{ posters}}{1 \text{ minute}}\right)\left(\frac{60 \text{ minutes}}{1 \text{ hour}}\right)$, which is 2,520 posters per hour.

QUESTION 7

The correct answer is 30. The value of $f(x)$ when $x = 4$ can be found by substituting 4 for x in the given equation $f(x) = 7x + 2$. This yields $f(4) = 7(4) + 2$, or $f(4) = 30$. Therefore, when $x = 4$, the value of $f(x)$ is 30.

QUESTION 8

Choice D is correct. Since x represents the number of 1-point questions and y represents the number of 3-point questions, the assignment is worth a total of $1 \cdot x + 3 \cdot y$, or $x + 3y$, points. Since the assignment is worth 70 points, the equation $x + 3y = 70$ represents this situation.

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

QUESTION 9

Choice B is correct. It's given that triangle LMN is similar to triangle PQR . Corresponding angles of similar triangles are congruent. Since angle M and angle Q correspond to each other, they must be congruent. Therefore, if the measure of angle M is 53° , then the measure of angle Q is also 53° .

Choice A is incorrect and may result from concluding that angle M and angle Q are complementary rather than congruent. **Choice C** is incorrect and may result from concluding that angle M and angle Q are supplementary rather than congruent. **Choice D** is incorrect and may result from conceptual or calculation errors.

QUESTION 10

Choice C is correct. The given system of linear equations can be solved by the substitution method. Substituting $-3x$ for y from the first equation in the given system into the second equation yields $4x + (-3x) = 15$, or $x = 15$.

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. This is the absolute value of y , not the value of x .

QUESTION 11

Choice B is correct. The equation representing a linear model can be written in the form $y = a + bx$, or $y = bx + a$, where b is the slope of the graph of the model and $(0, a)$ is the y -intercept of the graph of the model. The scatterplot shows that as the x -values of the data points increase, the y -values of the data points decrease, which means the graph of an appropriate linear model has a negative slope. Therefore, $b < 0$. The scatterplot also shows that the data points are close to the y -axis at a positive value of y . Therefore, the y -intercept of the graph of an appropriate linear model has a positive y -coordinate, which means $a > 0$. Of the given choices, only choice B, $y = -1.9x + 10.1$, has a negative value for b , the slope, and a positive value for a , the y -coordinate of the y -intercept.

Choice A is incorrect. The graph of this model has a y -intercept with a negative y -coordinate, not a positive y -coordinate. **Choice C** is incorrect. The graph of this model has a positive slope, not a negative slope, and a y -intercept with a negative y -coordinate, not a positive y -coordinate. **Choice D** is incorrect. The graph of this model has a positive slope, not a negative slope.

QUESTION 12

Choice C is correct. If a value of x satisfies $f(x) = 0$, the graph of $y = f(x)$ will contain a point $(x, 0)$ and thus touch the x -axis. Since there are 3 points at which this graph touches the x -axis, there are 3 values of x for which $f(x) = 0$.

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 13

The correct answer is 41. The number of cupcakes Vivian bought can be found by first finding the amount Vivian spent on cupcakes. The amount Vivian spent on cupcakes can be found by subtracting the amount Vivian spent on party hats from the total amount Vivian spent. The amount Vivian spent on party hats can be found by multiplying the cost per package of party hats by the number of packages of party hats, which yields $\$3 \cdot 10$, or $\$30$. Subtracting the amount Vivian spent on party hats, $\$30$, from the total amount Vivian spent, $\$71$, yields $\$71 - \$30$, or $\$41$. Since the amount Vivian spent on cupcakes was $\$41$ and each cupcake cost $\$1$, it follows that Vivian bought 41 cupcakes.

QUESTION 14

The correct answer is either 2 or -12 . The left-hand side of the given equation can be rewritten by factoring. The two values that multiply to -24 and add to 10 are 12 and -2 . It follows that the given equation can be rewritten as $(z+12)(z-2)=0$. Setting each factor equal to 0 yields two equations: $z+12=0$ and $z-2=0$. Subtracting 12 from both sides of the equation $z+12=0$ results in $z=-12$. Adding 2 to both sides of the equation $z-2=0$ results in $z=2$. Note that 2 and -12 are examples of ways to enter a correct answer.

QUESTION 15

Choice D is correct. Let y represent the number of cells per milliliter x hours after the initial observation. Since the number of cells per milliliter doubles every 3 hours, the relationship between x and y can be represented by an exponential equation of the form $y = a(b)^{\frac{x}{k}}$, where a is the number of cells per milliliter during the initial observation and the number of cells per milliliter increases by a factor of b every k hours. It's given that there were 300,000 cells per milliliter during the initial observation. Therefore, $a = 300,000$. It's also given that the number of cells per milliliter doubles, or increases by a factor of 2, every 3 hours. Therefore, $b = 2$ and $k = 3$. Substituting 300,000 for a , 2 for b , and 3 for k in the equation $y = a(b)^{\frac{x}{k}}$ yields $y = 300,000(2)^{\frac{x}{3}}$. The number of cells per milliliter there will be 15 hours after the initial observation is the value of y in this equation when $x = 15$. Substituting 15 for x in the equation $y = 300,000(2)^{\frac{x}{3}}$ yields $y = 300,000(2)^{\frac{15}{3}}$, or $y = 300,000(2)^5$. This is equivalent to $y = 300,000(32)$, or $y = 9,600,000$. Therefore, 15 hours after the initial observation, there will be 9,600,000 cells per milliliter.

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 16

Choice C is correct. Since each term of the given expression has a common factor of $6x^2y^2$, it may be rewritten as $6x^2y^2(x^6) + 6x^2y^2(2)$, or $6x^2y^2(x^6 + 2)$.

Choice A is incorrect. This expression is equivalent to $12x^8y^2$, not $6x^8y^2 + 12x^2y^2$.

Choice B is incorrect. This expression is equivalent to $6x^6y^2$, not $6x^8y^2 + 12x^2y^2$.

Choice D is incorrect. This expression is equivalent to $6x^6y^2 + 12x^2y^2$, not $6x^8y^2 + 12x^2y^2$.

QUESTION 17

Choice A is correct. It's given that a neighborhood consists of a 2-hectare park and a 35-hectare residential area and that the total number of trees in the neighborhood is 3,934. It's also given that the equation $2x + 35y = 3,934$ represents this situation. Since the total number of trees for a given area can be determined by taking the number of hectares times the average number of trees per hectare, this must mean that the terms $2x$ and $35y$ correspond to the number of trees in the park and in the residential area, respectively. Since $2x$ corresponds to the number of trees in the park, and 2 is the size of the park, in hectares, x must represent the average number of trees per hectare in the park.

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 18

Choice B is correct. The graph shown is a line passing through the points $(0, 40)$ and $(60, 0)$. Since the relationship between x and y is linear, if two points on the graph make a linear equation true, then the equation represents the relationship. Substituting 0 for x and 40 for y in the equation in choice B, $8x + 12y = 480$, yields $8(0) + 12(40) = 480$, or $480 = 480$, which is true. Substituting 60 for x and 0 for y in the equation $8x + 12y = 480$ yields $8(60) + 12(0) = 480$, or $480 = 480$, which is true. Therefore, the equation $8x + 12y = 480$ represents the relationship between x and y .

Choice A is incorrect. The point $(0, 40)$ is not on the graph of this equation, since $40 = 8(0) + 12$, or $40 = 12$, is not true. **Choice C** is incorrect. The point $(0, 40)$ is not on the graph of this equation, since $40 = 12(0) + 8$, or $40 = 8$, is not true.

Choice D is incorrect. The point $(0, 40)$ is not on the graph of this equation, since $12(0) + 8(40) = 480$, or $320 = 480$, is not true.

QUESTION 19

Choice D is correct. The area of a circle can be found by using the formula $A = \pi r^2$, where A is the area and r is the radius of the circle. It's given that the radius of circle A is $3n$. Substituting this value for r into the formula $A = \pi r^2$ gives $A = \pi(3n)^2$, or $9\pi n^2$. It's also given that the radius of circle B is $129n$. Substituting this value for r into the formula $A = \pi r^2$ gives $A = \pi(129n)^2$, or

$16,641\pi n^2$. Dividing the area of circle B by the area of circle A gives $\frac{16,641\pi n^2}{9\pi n^2}$, which simplifies to 1,849. Therefore, the area of circle B is 1,849 times the area of circle A .

Choice A is incorrect. This is how many times greater the radius of circle B is than the radius of circle A . *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is the coefficient on the term that describes the radius of circle B .

QUESTION 20

The correct answer is 14. The maximum value is the largest value in the data set. The frequency refers to the number of times a data value occurs. The given frequency table shows that for this data set, the data value 6 occurs three times, the data value 7 occurs three times, the data value 8 occurs eight times, the data value 9 occurs eight times, the data value 10 occurs nine times, the data value 11 occurs eleven times, the data value 12 occurs nine times, the data value 13 occurs zero times, and the data value 14 occurs six times. Therefore, the maximum data value in the data set is 14.

QUESTION 21

The correct answer is 5. The standard form of an equation of a circle in the xy -plane is $(x-h)^2 + (y-k)^2 = r^2$, where h , k , and r are constants, the coordinates of the center of the circle are (h,k) , and the length of the radius of the circle is r . It's given that an equation of the circle is $(x-2)^2 + (y-9)^2 = r^2$. Therefore, the center of this circle is $(2,9)$. It's given that the endpoints of a diameter of the circle are $(2,4)$ and $(2,14)$. The length of the radius is the distance from the center of the circle to an endpoint of a diameter of the circle, which can be found using the distance formula, $\sqrt{(x_1-x_2)^2 + (y_1-y_2)^2}$. Substituting the center of the circle $(2,9)$ and one endpoint of the diameter $(2,4)$ in this formula gives a distance of $\sqrt{(2-2)^2 + (9-4)^2}$, or $\sqrt{0^2 + 5^2}$, which is equivalent to 5. Since the distance from the center of the circle to an endpoint of a diameter is 5, the value of r is 5.

QUESTION 22

Choice C is correct. It's given that the measure of angle R is $\frac{2\pi}{3}$ radians, and the measure of angle T is $\frac{5\pi}{12}$ radians greater than the measure of angle R . Therefore, the measure of angle T is equal to $\frac{2\pi}{3} + \frac{5\pi}{12}$ radians. Multiplying $\frac{2\pi}{3}$ by $\frac{4}{4}$ to get a common denominator with $\frac{5\pi}{12}$ yields $\frac{8\pi}{12}$. Therefore, $\frac{2\pi}{3} + \frac{5\pi}{12}$ is equivalent to $\frac{8\pi}{12} + \frac{5\pi}{12}$, or $\frac{13\pi}{12}$. Therefore, the measure of angle T is $\frac{13\pi}{12}$ radians. The measure of angle T , in degrees, can be found by multiplying its measure, in

radians, by $\frac{180}{\pi}$. This yields $\frac{13\pi}{12} \times \frac{180}{\pi}$, which is equivalent to 195 degrees.

Therefore, the measure of angle T is 195 degrees.

Choice A is incorrect. This is the number of degrees that the measure of angle T is greater than the measure of angle R . *Choice B* is incorrect. This is the measure of angle R , in degrees. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 23

Choice D is correct. Since the number of yards in 1 mile is 1,760, the number of square yards in 1 square mile is $(1,760)(1,760) = 3,097,600$. Therefore, if the area of the town is 4.36 square miles, it is $4.36(3,097,600) = 13,505,536$, in square yards.

Choice A is incorrect and may result from dividing the number of yards in a mile by the square mileage of the town. *Choice B* is incorrect and may result from multiplying the number of yards in a mile by the square mileage of the town. *Choice C* is incorrect and may result from dividing the number of square yards in a square mile by the square mileage of the town.

QUESTION 24

Choice D is correct. The equation of line h can be written in slope-intercept form $y = mx + b$, where m is the slope of the line and $(0, b)$ is the y -intercept of the line. It's given that line h contains the points $(18, 130)$, $(23, 160)$, and $(26, 178)$.

Therefore, its slope m can be found as $\frac{160-130}{23-18}$, or 6. Substituting 6 for m in the equation $y = mx + b$ yields $y = 6x + b$. Substituting 130 for y and 18 for x in this equation yields $130 = 6(18) + b$, or $130 = 108 + b$. Subtracting 108 from both sides of this equation yields $22 = b$. Substituting 22 for b in $y = 6x + b$ yields $y = 6x + 22$. Since line k is the result of translating line h down 5 units, an equation of line k is $y = 6x + 22 - 5$, or $y = 6x + 17$. Substituting 0 for y in this equation yields $0 = 6x + 17$. Solving this equation for x yields $x = -\frac{17}{6}$. Therefore, the x -intercept of line k is $(-\frac{17}{6}, 0)$.

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 25

Choice C is correct. In the xy -plane, the graph of the line $y = c$ is a horizontal line that crosses the y -axis at $y = c$ and the graph of the quadratic equation $y = -x^2 + 9x - 100$ is a parabola. A parabola can intersect a horizontal line at exactly one point only at its vertex. Therefore, the value of c should be equal to the y -coordinate of the vertex of the graph of the given equation. For a quadratic equation in vertex form, $y = a(x - h)^2 + k$, the vertex of its graph in the xy -plane is (h, k) . The given quadratic equation, $y = -x^2 + 9x - 100$, can be rewritten as

$y = -\left(x^2 - 2\left(\frac{9}{2}\right)x + \left(\frac{9}{2}\right)^2\right) + \left(\frac{9}{2}\right)^2 - 100$, or $y = -\left(x - \frac{9}{2}\right)^2 + \left(-\frac{319}{4}\right)$. Thus, the value of c is equal to $-\frac{319}{4}$.

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. The two given equations are equivalent because the second equation can be obtained from the first equation by multiplying each side of the equation by 5. Thus, the graphs of the equations are coincident, so if a point lies on the graph of one of the equations, it also lies on the graph of the other equation. A point (x, y) lies on the graph of an equation in the xy -plane if and only if this point represents a solution to the equation. It is sufficient, therefore, to find the point that represents a solution to the first given equation. Substituting the x - and y -coordinates of choice B, $-\frac{3r}{2} + \frac{7}{2}$ and r , for x and y , respectively, in the first equation yields $2\left(-\frac{3r}{2} + \frac{7}{2}\right) + 3r = 7$, which is equivalent to $-3r + 7 + 3r = 7$, or $7 = 7$. Therefore, the point $\left(-\frac{3r}{2} + \frac{7}{2}, r\right)$ represents a solution to the first equation and thus lies on the graph of each equation in the xy -plane for the given system.

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 104. An equilateral triangle is a triangle in which all three sides have the same length and all three angles have a measure of 60° . The height of the triangle, $k\sqrt{3}$, is the length of the altitude from one vertex. The altitude divides the equilateral triangle into two congruent 30-60-90 right triangles, where the altitude is the side across from the 60° angle in each 30-60-90 right triangle. Since the altitude has a length of $k\sqrt{3}$, it follows from the properties of 30-60-90 right triangles that the side across from each 30° angle has a length of k and each hypotenuse has a length of $2k$. In this case, the hypotenuse of each 30-60-90 right triangle is a side of the equilateral triangle; therefore, each side length of the equilateral triangle is $2k$. The perimeter of a triangle is the sum of the lengths of each side. It's given that the perimeter of the equilateral triangle is 624; therefore, $2k + 2k + 2k = 624$, or $6k = 624$. Dividing both sides of this equation by 6 yields $k = 104$.