

Math

Module 2

(27 questions)

QUESTION 1

Choice C is correct. The y -intercept of a graph is the point where the graph intersects the y -axis. The line graphed intersects the y -axis at the point $(0, 5)$. Therefore, the y -intercept of the line graphed is $(0, 5)$.

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

QUESTION 2

Choice C is correct. The table shows that for a certain region in 2016, the average number of store employees in warehouse stores was 365 and the average number of store employees in supermarkets was 130. Subtracting 130 from 365 yields $365 - 130$, or 235. Therefore, the average number of store employees was 235 greater in warehouse stores than in supermarkets.

Choice A is incorrect. For this region in 2016, this is how much greater the average number of store employees was in department stores than in supermarkets. *Choice B* is incorrect. For this region in 2016, this is how much greater the average number of store employees was in warehouse stores than in department stores. *Choice D* is incorrect. For this region in 2016, this is the sum of the average number of store employees in warehouse stores and in supermarkets.

QUESTION 3

Choice D is correct. It's given that line m is parallel to line n , and line t intersects both lines. It follows that line t is a transversal. When two lines are parallel and intersected by a transversal, exterior angles on the same side of the transversal are supplementary. Thus, $x + 33 = 180$. Subtracting 33 from both sides of this equation yields $x = 147$. Therefore, the value of x is 147.

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 4

Choice C is correct. It's given that the cost of renting a tent is \$11 per day for d days. Multiplying the rental cost by the number of days yields $\$11d$, which represents the cost of renting the tent for d days before the insurance is added. Adding the onetime insurance fee of \$10 to the rental cost of $\$11d$ gives the total cost c , in dollars, which can be represented by the equation $c = 11d + 10$.

Choice A is incorrect. This equation represents the total cost to rent the tent if the insurance fee was charged every day. *Choice B* is incorrect. This equation represents the total cost to rent the tent if the daily fee was $\$(d + 11)$ for 10 days. *Choice D* is incorrect. This equation represents the total cost to rent the tent if the daily fee was \$10 and the onetime fee was \$11.

QUESTION 5

Choice D is correct. By the Pythagorean theorem, if a right triangle has a hypotenuse with length c and legs with lengths a and b , then $c^2 = a^2 + b^2$. In the right triangle shown, the hypotenuse has length c and the legs have lengths a and b . It's given that $a = 4$ and $b = 5$. Substituting 4 for a and 5 for b in the Pythagorean theorem yields $c^2 = 4^2 + 5^2$. Taking the square root of both sides of this equation yields $c = \pm \sqrt{4^2 + 5^2}$. Since the length of a side of a triangle must be positive, the value of c is $\sqrt{4^2 + 5^2}$.

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 6

The correct answer is 9. It's given that $g(x) = 6x$. Substituting 54 for $g(x)$ in the given function yields $54 = 6x$. Dividing both sides of this equation by 6 yields $x = 9$. Therefore, the value of x when $g(x) = 54$ is 9.

QUESTION 7

The correct answer is 68. It's given that the function f is defined by $f(x) = 8x^3 + 4$. Substituting 2 for x in this equation yields $f(2) = 8(2)^3 + 4$, or $f(2) = 8(8) + 4$, which is equivalent to $f(2) = 68$. Therefore, the value of $f(2)$ is 68.

QUESTION 8

Choice B is correct. The y -intercept of the graph of a function in the xy -plane is the point on the graph where $x = 0$. It's given that $f(x) = \frac{1}{10}x - 2$. Substituting 0 for x in this equation yields $f(0) = \frac{1}{10}(0) - 2$, or $f(0) = -2$. Since it's given that $y = f(x)$, it follows that $y = -2$ when $x = 0$. Therefore, the y -intercept of the graph of $y = f(x)$ in the xy -plane is $(0, -2)$.

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 9

Choice D is correct. Since x represents the number of 1-minute segments and y represents the number of 3-minute segments, the total length of the video is $1 \cdot x + 3 \cdot y$, or $x + 3y$, minutes. Since the video is 70 minutes long, 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 10

Choice D is correct. If the graph of $y = g(x)$ is the result of shifting the graph of $y = f(x)$ down k units in the xy -plane, the function g can be defined by an equation of the form $g(x) = f(x) - k$. It's given that $f(x) = 7x^3$ and the graph of $y = g(x)$ is the result of shifting the graph of $y = f(x)$ down 2 units. Substituting $7x^3$ for $f(x)$ and 2 for k in the equation $g(x) = f(x) - k$ yields $g(x) = 7x^3 - 2$.

Choice A is incorrect and may result from conceptual errors. *Choice B* is incorrect and may result from conceptual errors. *Choice C* is incorrect. This equation defines a function g for which the graph of $y = g(x)$ is the result of shifting the graph of $y = f(x)$ up, not down, 2 units.

QUESTION 11

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 12

Choice B is correct. The sine of an acute angle in a right triangle is the ratio of the length of the side opposite that angle to the length of the hypotenuse. The hypotenuse of a right triangle is the side opposite the right angle. In right triangle ABC , side BC is the side opposite angle A and side AB is the hypotenuse. It's given that the length of side BC is 35 units and the length of side AB is 171 units. Therefore, the value of $\sin A$ is $\frac{35}{171}$.

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

Choice C is incorrect. This is the ratio of the length of the hypotenuse to the length of the side opposite angle A rather than the ratio of the length of the side opposite angle A to the length of the hypotenuse. *Choice D* is incorrect. This is the length of the hypotenuse rather than $\sin A$.

QUESTION 13

The correct answer is 986. The area, A , of a rectangle is given by $A = \ell w$, where ℓ is the length of the rectangle and w is its width. It's given that the length of the rectangle is 34 centimeters (cm) and the width is 29 cm. Substituting 34 for ℓ and 29 for w in the equation $A = \ell w$ yields $A = (34)(29)$, or $A = 986$. Therefore, the area, in square centimeters, of this rectangle is 986.

QUESTION 14

The correct answer is 24. The equation $\frac{24x}{ny} = 4$ can be rewritten as $\left(\frac{24}{n}\right)\left(\frac{x}{y}\right) = 4$. It's given that $\frac{x}{y} = 4$. Substituting 4 for $\frac{x}{y}$ in the equation $\left(\frac{24}{n}\right)\left(\frac{x}{y}\right) = 4$ yields $\left(\frac{24}{n}\right)(4) = 4$. Multiplying both sides of this equation by n yields $(24)(4) = 4n$. Dividing both sides of this equation by 4 yields $24 = n$. Therefore, the value of n is 24.

QUESTION 15

Choice D is correct. It's given that the bowl starts with 20 ounces of water and has 9 ounces of water remaining after a period of time has passed. The amount of water the bowl has lost during the time period can be found by subtracting the remaining amount of water from the amount of water the bowl starts with, which yields $20 - 9$ ounces, or 11 ounces. This means the bowl loses 11 ounces of water during that period of time. It's given that the amount of water decreases by 1 ounce every 4 days. Letting t represent the number of days the bowl has been uncovered, it follows that $\frac{1}{4} = \frac{11}{t}$. Multiplying both sides of this equation by $4t$ yields $t = 44$. Therefore, the bowl has been uncovered for 44 days.

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. This is the value of t for the equation $\frac{1}{4} = \frac{9}{t}$, not $\frac{1}{4} = \frac{11}{t}$.

QUESTION 16

Choice D is correct. The value of $4 - 3x$ can be found by isolating this expression in the given equation. Subtracting 2 from both sides of the given equation yields $9(4 - 3x) = 8(4 - 3x) + 16$. Subtracting $8(4 - 3x)$ from both sides of this equation yields $9(4 - 3x) - 8(4 - 3x) = 16$, which gives $1(4 - 3x) = 16$, or $4 - 3x = 16$. Therefore, the value of $4 - 3x$ is 16.

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

Choice B is incorrect. This is the value of x , not $4 - 3x$. *Choice C* is incorrect and may result from conceptual or calculation errors.

QUESTION 17

Choice A is correct. It's given that a certain township consists of a 5-hectare industrial park and a 24-hectare neighborhood and that the total number of trees in the township is 4,529. It's also given that the equation $5x + 24y = 4,529$ represents this situation. Since the total number of trees for a given area can be

determined by taking the size of the area, in hectares, times the average number of trees per hectare, the best interpretation of $5x$ is the number of trees in the industrial park and the best interpretation of $24y$ is the number of trees in the neighborhood. Since 5 is the size of the industrial park, in hectares, the best interpretation of x is the average number of trees per hectare in the industrial 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. Since $\frac{12}{12} = 1$, multiplying the exponent of the given expression by $\frac{12}{12}$ yields an equivalent expression: $a^{\left(\frac{11}{12} \cdot \frac{12}{12}\right)} = a^{\left(\frac{132}{144}\right)}$. Since $\frac{132}{144} = 132\left(\frac{1}{144}\right)$, the expression $a^{\frac{132}{144}}$ can be rewritten as $a^{\left(132\left(\frac{1}{144}\right)\right)}$. Applying properties of exponents, this expression can be rewritten as $\left(a^{132}\right)^{\frac{1}{144}}$. An expression of the form $(m)^{\frac{1}{k}}$, where $m > 0$ and $k > 0$, is equivalent to $\sqrt[k]{m}$. Therefore, $\left(a^{132}\right)^{\frac{1}{144}}$ is equivalent to $\sqrt[144]{a^{132}}$.

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 19

Choice A is correct. The median of a data set with an odd number of values that are in ascending or descending order is the middle value of the data set. Since the distribution of the values of both data set A and data set B form symmetric dot plots, and each data set has an odd number of values, it follows that the median is given by the middle value in each of the dot plots. Thus, the median of data set A is 13, and the median of data set B is 13. Therefore, statement I is true. Data set A and data set B have the same frequency for each of the values 11, 12, 14, and 15. Data set A has a frequency of 1 for values 10 and 16, whereas data set B has a frequency of 2 for values 10 and 16. Standard deviation is a measure of the spread of a data set; it is larger when there are more values farther from the mean, and smaller when there are more values closer to the mean. Since both distributions are symmetric with an odd number of values, the mean of each data set is equal to its median. Thus, each data set has a mean of 13. Since more of the values in data set A are closer to 13 than in data set B, it follows that data set A has a smaller standard deviation than data set B. Thus, statement II is false. Therefore, only statement I must be true.

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 20

The correct answer is 46. It's given that O is the center of a circle and that points R and S lie on the circle. Therefore, $\overline{OR}$ and $\overline{OS}$ are radii of the circle. It follows that $OR = OS$. If two sides of a triangle are congruent, then the angles opposite them are congruent. It follows that the angles $\angle RSO$ and $\angle ORS$, which are across from the sides of equal length, are congruent. Let x° represent the measure of $\angle RSO$. It follows that the measure of $\angle ORS$ is also x° . It's given that the measure of $\angle ROS$ is 88° . Because the sum of the measures of the interior angles of a triangle is 180° , the equation $x^\circ + x^\circ + 88^\circ = 180^\circ$, or $2x + 88 = 180$, can be used to find the measure of $\angle RSO$. Subtracting 88 from both sides of this equation yields $2x = 92$. Dividing both sides of this equation by 2 yields $x = 46$. Therefore, the measure of $\angle RSO$, in degrees, is 46.

QUESTION 21

The correct answer is 1.8. It's given that the regular price of a shirt at a store is \$11.70, and the sale price of the shirt is 80% less than the regular price. It follows that the sale price of the shirt is $\$11.70\left(1 - \frac{80}{100}\right)$, or $\$11.70(1 - 0.8)$, which is equivalent to \$2.34. It's also given that the sale price of the shirt is 30% greater than the store's cost for the shirt. Let x represent the store's cost for the shirt. It follows that $2.34 = \left(1 + \frac{30}{100}\right)x$, or $2.34 = 1.3x$. Dividing both sides of this equation by 1.3 yields $x = 1.80$. Therefore, the store's cost, in dollars, for the shirt is 1.80. Note that 1.8 and $9/5$ are examples of ways to enter a correct answer.

QUESTION 22

Choice A is correct. The volume of a cube can be found by using the formula $V = s^3$, where V is the volume and s is the edge length of the cube. Therefore, the volume of the given cube is $V = 68^3$, or 314,432 cubic inches. The volume of a sphere can be found by using the formula $V = \frac{4}{3}\pi r^3$, where V is the volume and r is the radius of the sphere. Therefore, the volume of the given sphere is $V = \frac{4}{3}\pi(34)^3$, or approximately 164,636 cubic inches. The volume of the space in the cube not taken up by the sphere is the difference between the volume of the cube and volume of the sphere. Subtracting the approximate volume of the sphere from the volume of the cube gives $314,432 - 164,636 = 149,796$ cubic inches.

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 23

Choice B is correct. A system of two linear equations in two variables, x and y , has no solution if the lines represented by the equations in the xy -plane are parallel and distinct. Lines represented by equations in standard form, $Ax + By = C$ and $Dx + Ey = F$, are parallel if the coefficients for x and y in one equation are proportional to the corresponding coefficients in the other equation, meaning

$\frac{D}{A} = \frac{E}{B}$; and the lines are distinct if the constants are not proportional, meaning $\frac{E}{C}$ is not equal to $\frac{D}{A}$ or $\frac{E}{B}$. The given equation, $y = 6x + 18$, can be written in standard form by subtracting $6x$ from both sides of the equation to yield $-6x + y = 18$.

Therefore, the given equation can be written in the form $Ax + By = C$, where $A = -6$, $B = 1$, and $C = 18$. The equation in choice B, $-6x + y = 22$, is written in the form $Dx + Ey = F$, where $D = -6$, $E = 1$, and $F = 22$. Therefore, $\frac{D}{A} = \frac{-6}{-6}$, which can be rewritten as $\frac{D}{A} = 1$; $\frac{E}{B} = \frac{1}{1}$, which can be rewritten as $\frac{E}{B} = 1$; and $\frac{F}{C} = \frac{22}{18}$, which can be rewritten as $\frac{F}{C} = \frac{11}{9}$. Since $\frac{D}{A} = 1$, $\frac{E}{B} = 1$, and $\frac{F}{C}$ is not equal to 1, it follows that the given equation and the equation $-6x + y = 22$ are parallel and distinct. Therefore, a system of two linear equations consisting of the given equation and the equation $-6x + y = 22$ has no solution. Thus, the equation in choice B could be the second equation in the system.

Choice A is incorrect. The equation $-6x + y = 18$ and the given equation represent the same line in the xy -plane. Therefore, a system of these linear equations would have infinitely many solutions, rather than no solution. *Choice C* is incorrect. The equation $-12x + y = 36$ and the given equation represent lines in the xy -plane that are distinct and not parallel. Therefore, a system of these linear equations would have exactly one solution, rather than no solution. *Choice D* is incorrect. The equation $-12x + y = 18$ and the given equation represent lines in the xy -plane that are distinct and not parallel. Therefore, a system of these linear equations would have exactly one solution, rather than no solution.

QUESTION 24

Choice C is correct. Since $P = (4, 5)$ and $Q = (4, 7)$, side PQ is parallel to the y -axis and has a length of 2. Since $P = (4, 5)$ and $R = (6, 5)$, side PR is parallel to the x -axis and has a length of 2. Therefore, triangle PQR is a right isosceles triangle, where $\angle P$ has measure 90° and $\angle Q$ and $\angle R$ each have measure 45° . It follows that if the measure of $\angle Q$ is t° , then $t = 45$. Since $L = (4, 5)$ and $M = (4, 7 + k)$, side LM is parallel to the y -axis and has a length of $k + 2$. Since $L = (4, 5)$ and $N = (6 + k, 5)$, side LN is parallel to the x -axis and has a length of $k + 2$. Therefore, triangle LMN is a right isosceles triangle, where $\angle L$ has measure 90° and $\angle M$ and $\angle N$ each have measure 45° . Of the given choices, only $(90 - t)^\circ$ is equal to 45° , so the measure of $\angle N$ is $(90 - t)^\circ$.

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 25

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 26

Choice D is correct. If $x^2 - c^2 \leq 0$, then neither side of the given equation is defined and there can be no solution. Therefore, $x^2 - c^2 > 0$. Subtracting $\frac{c^2}{\sqrt{x^2 - c^2}}$

from both sides of the given equation yields $\frac{x^2}{\sqrt{x^2 - c^2}} - \frac{c^2}{\sqrt{x^2 - c^2}} = 39$, or $\frac{x^2 - c^2}{\sqrt{x^2 - c^2}} = 39$.

Squaring both sides of this equation yields $\left(\frac{x^2 - c^2}{\sqrt{x^2 - c^2}}\right)^2 = 39^2$, or $\frac{(x^2 - c^2)(x^2 - c^2)}{x^2 - c^2} = 39^2$.

Since $x^2 - c^2$ is positive and, therefore, nonzero, the expression $\frac{x^2 - c^2}{x^2 - c^2}$ is defined

and equivalent to 1. It follows that the equation $\frac{(x^2 - c^2)(x^2 - c^2)}{x^2 - c^2} = 39^2$ can be rewritten

as $\left(\frac{x^2 - c^2}{x^2 - c^2}\right)(x^2 - c^2) = 39^2$, or $(1)(x^2 - c^2) = 39^2$, which is equivalent to $x^2 - c^2 = 39^2$.

Adding c^2 to both sides of this equation yields $x^2 = c^2 + 39^2$. Taking the square root of both sides of this equation yields two solutions: $x = \sqrt{c^2 + 39^2}$ and $x = -\sqrt{c^2 + 39^2}$. Therefore, of the given choices, $-\sqrt{c^2 + 39^2}$ is one of the solutions 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 C is incorrect and may result from conceptual or calculation errors.

QUESTION 27

The correct answer is 168. The quadratic function g gives the estimated depth of the seal, $g(t)$, in meters, t minutes after the seal enters the water. It's given that function g estimates that the seal reached its maximum depth of 302.4 meters 6 minutes after it entered the water. Therefore, function g can be expressed in vertex form as $g(t) = a(t - 6)^2 + 302.4$, where a is a constant. Since it's also given that the seal reached the surface of the water after 12 minutes, $g(12) = 0$.

Substituting 12 for t and 0 for $g(t)$ in $g(t) = a(t - 6)^2 + 302.4$ yields $0 = a(12 - 6)^2 + 302.4$, or $36a = -302.4$. Dividing both sides of this equation by 36 gives $a = -8.4$. Substituting -8.4 for a in $g(t) = a(t - 6)^2 + 302.4$ gives

$g(t) = -8.4(t - 6)^2 + 302.4$. Substituting 10 for t in $g(t)$ gives

$g(10) = -8.4(10 - 6)^2 + 302.4$, which is equivalent to $g(10) = -8.4(4)^2 + 302.4$, or

$g(10) = 168$. Therefore, the estimated depth, to the nearest meter, of the seal 10 minutes after it entered the water was 168 meters.