

Math

Module 2

(27 questions)

QUESTION 1

Choice B is correct. Substituting 72 for $f(x)$ in the given function yields $72 = 8x$. Dividing each side of this equation by 8 yields $9 = x$. Therefore, $f(x) = 72$ when the value of x is 9.

Choice A is incorrect. This is the value of x for which $f(x) = 64$, not $f(x) = 72$.

Choice C is incorrect. This is the value of x for which $f(x) = 512$, not $f(x) = 72$.

Choice D is incorrect. This is the value of x for which $f(x) = 640$, not $f(x) = 72$.

QUESTION 2

Choice A is correct. It's given that angle 1 and angle 2 are vertical angles, and the measure of angle 1 is 72° . Vertical angles have equal measures. Therefore, the measure of angle 2 is 72° .

Choice B is incorrect. This is the measure of an angle that is supplementary, not congruent, to angle 1. *Choice C* is incorrect. This is the sum of the measures of angle 1 and angle 2. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 3

Choice B is correct. If a house from the street is selected at random, the probability of selecting a house that is blue is equal to the number of houses on the street that are blue divided by the total number of houses on the street. Since there are 2 blue houses on a street with 7 total houses, the probability of selecting a house that is blue from this street is $\frac{2}{7}$.

Choice A is incorrect. This is the probability of selecting a house that is blue from a street on which 1 of the 7 houses is blue. *Choice C* is incorrect. This is the probability of selecting a house that is not blue from this street. *Choice D* is incorrect. This is the probability of selecting a house that is blue from a street on which all the houses are blue.

QUESTION 4

Choice A is correct. The graph of function f shows that as x increases, $f(x)$ also increases, which means $f(x)$ is an increasing function. The graph of f is a line, which indicates a constant rate of change. A function that has a constant rate of change is a linear function. Therefore, function f can be described as increasing linear.

Choice B is incorrect. For a decreasing function, as x increases, $f(x)$ decreases, rather than increases. **Choice C** is incorrect. For a decreasing function, as x increases, $f(x)$ decreases, rather than increases, and the graph of an exponential function isn't a line. **Choice D** is incorrect. The graph of an exponential function isn't a line.

QUESTION 5

Choice B is correct. The y -intercept of a graph is the point where the graph intersects the y -axis. The graph of function f shown intersects the y -axis at the point $(0, -4)$. Therefore, the y -intercept of the graph is $(0, -4)$.

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 6

The correct answer is 6. The first equation in the given system is $x = 8$. Substituting 8 for x in the second equation in the given system yields $8 + 3y = 26$. Subtracting 8 from both sides of this equation yields $3y = 18$. Dividing both sides of this equation by 3 yields $y = 6$. Therefore, the value of y is 6.

QUESTION 7

The correct answer is 10. It's given that the amount of Hanna's food order was \$50 and that Hanna gave a tip of 20% of the amount of the bill. 20% of 50 can be calculated as $\left(\frac{20}{100}\right)(50)$, which yields $\frac{1000}{100}$, or 10. Therefore, the amount, in dollars, of the tip Hanna gave is 10.

QUESTION 8

Choice B is correct. Since x^3 is a common factor of each term in the given expression, the expression can be rewritten as $x^3(5x^2 - 6x + 8)$.

Choice A is incorrect. This expression is equivalent to $5x^5 - 6x^4$. **Choice C** is incorrect. This expression is equivalent to $40x^5 - 48x^4 + 8x^3$. **Choice D** is incorrect. This expression is equivalent to $-36x^9 + 48x^8 + 6x^5$.

QUESTION 9

Choice A is correct. It's given that the ratio of the length of line segment XY to the length of line segment ZV is 6 to 1, which means $\frac{XY}{ZV} = \frac{6}{1}$. It's given that the length of line segment XY is 102 inches. If the length, in inches, of line segment ZV is represented by ℓ , the value of ℓ can be calculated by solving the equation $\frac{102}{\ell} = \frac{6}{1}$, or $\frac{102}{\ell} = 6$. Multiplying each side of this equation by ℓ yields $102 = 6\ell$. Dividing each side of this equation by 6 yields $17 = \ell$. Therefore, the length of line segment ZV is 17 inches.

Choice B is incorrect. This is the length, in inches, of line segment ZV if the length of line segment XY is 576, not 102, inches. **Choice C** is incorrect. This is the length, in inches, of line segment XY , not line segment ZV . **Choice D** is incorrect. This is the length, in inches, of line segment ZV if the ratio of the length of line segment XY to the length of line segment ZV is 1 to 6, not 6 to 1.

QUESTION 10

Choice A is correct. Dividing each side of the given equation by 7 yields $\frac{7(2x-3)}{7} = \frac{63}{7}$, or $2x - 3 = 9$. Therefore, the equation $2x - 3 = 9$ is equivalent to the given equation and has the same solution.

Choice B is incorrect. This equation is equivalent to $7(2x - 3) = 392$, not $7(2x - 3) = 63$. **Choice C** is incorrect. Distributing 7 on the left-hand side of the given equation yields $14x - 21 = 63$, not $2x - 21 = 63$. **Choice D** is incorrect. Distributing 7 on the left-hand side of the given equation yields $14x - 21 = 63$, not $2x - 21 = 70$.

QUESTION 11

Choice D is correct. It's given that the function f defined by $f(t) = 14t + 9$ gives the estimated length, in inches, of a vine plant t months after Tavon purchased it. For a function defined by an equation of the form $f(t) = mt + b$, where m and b are constants, b represents the value of $f(0)$, or the value of $f(t)$ when the value of t is 0. Therefore, for the function defined by $f(t) = 14t + 9$, 9 represents the value of $f(t)$ when the value of t is 0. This means that 0 months after the vine plant was purchased, the estimated length of the vine plant was 9 inches. Therefore, the best interpretation of 9 in this context is the estimated length of the vine plant was 9 inches when Tavon purchased it.

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

Choice B is incorrect. The vine plant is expected to grow 14 inches, not 9 inches, each month. **Choice C** is incorrect and may result from conceptual or calculation errors.

QUESTION 12

Choice C is correct. Applying the zero product property to the given equation yields three equations: $x + 2 = 0$, $x - 5 = 0$, and $x + 9 = 0$. Subtracting 2 from both sides of the equation $x + 2 = 0$ yields $x = -2$. Adding 5 to both sides of the equation $x - 5 = 0$ yields $x = 5$. Subtracting 9 from both sides of the equation $x + 9 = 0$ yields $x = -9$. Therefore, the solutions to the given equation are -2 , 5 , and -9 . It follows that a positive solution to the given equation is 5 .

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 774 . It's given that Brian saves $\frac{2}{5}$ of the $\$215$ he earns each week from his job. Therefore, Brian saves $\left(\frac{2}{5}\right)(\$215)$, or $\$86$, per week. If Brian continues to save at this rate of $\$86$ per week for 9 weeks, then he will save a total of $(9)(86)$, or 774 , dollars.

QUESTION 14

The correct answer is 5 . Let x represent the width, in inches, of the rectangle. It's given that the length of the rectangle is 4 inches less than 7 times its width, or $7x - 4$ inches. The area of a rectangle is equal to its width multiplied by its length. Multiplying the width, x inches, by the length, $7x - 4$ inches, yields $x(7x - 4)$ square inches. It's given that the rectangle has an area of 155 square inches, so it follows that $x(7x - 4) = 155$, or $7x^2 - 4x = 155$. Subtracting 155 from both sides of this equation yields $7x^2 - 4x - 155 = 0$. Factoring the left-hand side of this equation yields $(7x + 31)(x - 5) = 0$. Applying the zero product property to this equation yields two solutions: $x = -\frac{31}{7}$ and $x = 5$. Since x is the rectangle's width, in inches, which must be positive, the value of x is 5 . Therefore, the width of the rectangle, in inches, is 5 .

QUESTION 15

Choice B is correct. If a data set contains an even number of data values, when the data values are listed in ascending or descending order, the median is between the two middle values. The given data set contains 8 values. When listed in ascending order, the data set is $4, 4, 4, 5, 6, 10, 18$ and the two middle values are 5 and 5 . Since the two middle values are the same, the median must be 5 .

Choice A is incorrect. This value is between the two middle values in the list shown, not the two middle values when the data values are listed in ascending or descending order. *Choice C* is incorrect. This is the mean, not the median, of the data set. *Choice D* is incorrect. This is the range, not the median, of the data set.

QUESTION 16

Choice A is correct. The volume, V , of a right circular cylinder is given by the formula $V = \pi r^2 h$, where πr^2 is the area of the base of the cylinder and h is the height. It's given that a right circular cylinder has a volume of 432 cubic centimeters and the area of the base is 24 square centimeters. Substituting 432 for V and 24 for πr^2 in the formula $V = \pi r^2 h$ yields $432 = 24h$. Dividing both sides of this equation by 24 yields $18 = h$. Therefore, the height of the cylinder, in centimeters, is 18.

Choice B is incorrect. This is the area of the base, in square centimeters, not the height, in centimeters, of the cylinder. **Choice C** is incorrect. This is the height, in centimeters, of a cylinder if its volume is 432 cubic centimeters and the area of its base is 2, not 24, cubic centimeters. **Choice D** is incorrect. This is the height, in centimeters, of a cylinder if its volume is 432 cubic centimeters and the area of its base is $\frac{1}{24}$, not 24, cubic centimeters.

QUESTION 17

Choice D is correct. Since the square of a real number is never negative, the given equation isn't true for any real value of x . Therefore, the given equation has zero distinct real solutions.

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 18

Choice B is correct. It's given that line k is defined by $y = 7x + \frac{1}{8}$. For an equation in slope-intercept form $y = mx + b$, m represents the slope of the line defined by this equation in the xy -plane and b represents the y -coordinate of the y -intercept of this line. Therefore, the slope of line k is 7. It's also given that line j is perpendicular to line k in the xy -plane. Therefore, the slope of line j is the opposite reciprocal of the slope of line k . The opposite reciprocal of 7 is $-\frac{1}{7}$. Therefore, the slope of line j is $-\frac{1}{7}$.

Choice A is incorrect. This is the opposite reciprocal of the y -coordinate of the y -intercept, not the slope, of line k . **Choice C** is incorrect. This is the y -coordinate of the y -intercept of line k , not the slope of line j . **Choice D** is incorrect. This is the slope of a line that is parallel, not perpendicular, to line k .

QUESTION 19

Choice A is correct. It's given that there is a linear relationship between the number of cars, c , on a commuter train and the maximum number of passengers and crew, p , that the train can carry. It follows that this relationship can be represented by an equation of the form $p = mc + b$, where m is the rate of change of p in this relationship and b is a constant. The rate of change of p in this relationship can be calculated by dividing the difference in any two values of p by the difference in the corresponding values of c . Using two pairs of values given in the table, the rate of change of p in this relationship is $\frac{284-174}{5-3}$, or 55.

Substituting 55 for m in the equation $p = mc + b$ yields $p = 55c + b$. The value of b can be found by substituting any value of c and its corresponding value of p for c and p , respectively, in this equation. Substituting 10 for c and 559 for p yields $559 = 55(10) + b$, or $559 = 550 + b$. Subtracting 550 from both sides of this equation yields $9 = b$. Substituting 9 for b in the equation $p = 55c + b$ yields $p = 55c + 9$. Subtracting 9 from both sides of this equation yields $p - 9 = 55c$. Subtracting p from both sides of this equation yields $-9 = 55c - p$, or $55c - p = -9$.

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 $\frac{7}{24}$. An expression of the form $\sqrt[n]{a^m}$, where m and n are integers greater than 1 and $a \geq 0$, is equivalent to $a^{\frac{m}{n}}$. Therefore, the expression on the right-hand side of the given equation, $\sqrt[3]{4^7}$, is equivalent to $4^{\frac{7}{3}}$. Thus, $4^{8c} = 4^{\frac{7}{3}}$. It follows that $8c = \frac{7}{3}$. Dividing both sides of this equation by 8 yields $c = \frac{7}{24}$. Note that $7/24$, .2916, .2917, 0.219, and 0.292 are examples of ways to enter a correct answer.

QUESTION 21

The correct answer is 1,677. Adding the first equation to the second equation in the given system yields $(x-2) + (x-2) + (-4)(y+7) + 4(y+7) = 117 + 442$, or $2(x-2) = 559$. Multiplying both sides of this equation by 3 yields $6(x-2) = 1,677$. Therefore, the value of $6(x-2)$ is 1,677.

QUESTION 22

Choice B is correct. The Pythagorean theorem states that for a right triangle, $c^2 = a^2 + b^2$, where c represents the length of the hypotenuse and a and b represent the lengths of the legs. It's given that in triangle ABC , angle B is a right angle. Therefore, triangle ABC is a right triangle, where the hypotenuse is side AC and the legs are sides AB and BC . It's given that the lengths of sides AB and BC are $10\sqrt{37}$ and $24\sqrt{37}$, respectively. Substituting these values for a and b in the formula $c^2 = a^2 + b^2$ yields $c^2 = (10\sqrt{37})^2 + (24\sqrt{37})^2$, which is equivalent

to $c^2 = 100(37) + 576(37)$, or $c^2 = 676(37)$. Taking the square root of both sides of this equation yields $c = \pm 26\sqrt{37}$. Since c represents the length of the hypotenuse, side AC , c must be positive. Therefore, the length of side AC is $26\sqrt{37}$.

Choice A is incorrect. This is the result of solving the equation

$c = 24\sqrt{37} - 10\sqrt{37}$, not $c^2 = (10\sqrt{37})^2 + (24\sqrt{37})^2$. *Choice C* is incorrect.

This is the result of solving the equation $c = 10\sqrt{37} + 24\sqrt{37}$, not

$c^2 = (10\sqrt{37})^2 + (24\sqrt{37})^2$. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 23

Choice A is correct. The equation $f(x) = (1.84)^{\frac{x}{4}}$ can be rewritten as

$f(x) = (1.84)^{\left(\frac{1}{4}\right)x}$, which is equivalent to $f(x) = (1.84^{\frac{1}{4}})^x$, or approximately

$f(x) = (1.16467)^x$. Since it's given that $f(x) = (1.84)^{\frac{x}{4}}$ can be rewritten as

$f(x) = \left(1 + \frac{p}{100}\right)^x$, where p is a constant, it follows that $1 + \frac{p}{100}$ is approximately

equal to 1.16467. Therefore, $\frac{p}{100}$ is approximately equal to 0.16467. It follows that

the value of p is approximately equal to 16.467. Of the given choices, 16 is

closest to the value of p .

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 24

Choice D is correct. It's given that $f(24) < 0$. Substituting 24 for $f(x)$ in the

equation $f(x) = a\sqrt{x+b}$ yields $f(24) = a\sqrt{24+b}$. Therefore, $a\sqrt{24+b} < 0$. Since

$\sqrt{24+b}$ can't be negative, it follows that $a < 0$. It's also given that the graph of

$y = f(x)$ passes through the point $(-24, 0)$. It follows that when $x = -24$, $f(x) = 0$.

Substituting -24 for x and 0 for $f(x)$ in the equation $f(x) = a\sqrt{x+b}$ yields

$0 = a\sqrt{-24+b}$. By the zero product property, either $a = 0$ or $\sqrt{-24+b} = 0$.

Since $a < 0$, it follows that $\sqrt{-24+b} = 0$. Squaring both sides of this equation yields

$-24 + b = 0$. Adding 24 to both sides of this equation yields $b = 24$. Since

$a < 0$ and b is 24, it follows that $a < b$ must be true.

Choice A is incorrect. The value of $f(0)$ is $a\sqrt{b}$, which must be negative. *Choice B*

is incorrect. The value of $f(0)$ is $a\sqrt{b}$, which could be -24 , but doesn't have to be.

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

QUESTION 25

Choice A is correct. It's given that points A and B lie on the circle with center C . Therefore, $\overline{AC}$ and $\overline{BC}$ are both radii of the circle. Since all radii of a circle are congruent, $\overline{AC}$ is congruent to $\overline{BC}$. The length of $\overline{AC}$, or the distance from point A to point C , can be found using the distance formula, which gives the distance between two points, (x_1, y_1) and (x_2, y_2) , as $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$. Substituting the given coordinates of point A , $(h + 1, k + \sqrt{102})$, for (x_1, y_1) and the given coordinates of point C , (h, k) , for (x_2, y_2) in the distance formula yields $\sqrt{(h + 1 - h)^2 + (k + \sqrt{102} - k)^2}$, or $\sqrt{1^2 + (\sqrt{102})^2}$, which is equivalent to $\sqrt{1 + 102}$, or $\sqrt{103}$. Therefore, the length of $\overline{AC}$ is $\sqrt{103}$ and the length of $\overline{BC}$ is $\sqrt{103}$. It's given that angle ACB is a right angle. Therefore, triangle ACB is a right triangle with legs $\overline{AC}$ and $\overline{BC}$ and hypotenuse $\overline{AB}$. By the Pythagorean theorem, if a right triangle has a hypotenuse with length c and legs with lengths a and b , then $a^2 + b^2 = c^2$. Substituting $\sqrt{103}$ for a and b in this equation yields $(\sqrt{103})^2 + (\sqrt{103})^2 = c^2$, or $103 + 103 = c^2$, which is equivalent to $206 = c^2$. Taking the positive square root of both sides of this equation yields $\sqrt{206} = c$. Therefore, the length of $\overline{AB}$ is $\sqrt{206}$.

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

Choice C is incorrect. This would be the length of $\overline{AB}$ if the length of $\overline{AC}$ were 103, not $\sqrt{103}$. **Choice D** is incorrect and may result from conceptual or calculation errors.

QUESTION 26

Choice A is correct. An equation of a line of best fit for data set F can be written in the form $y = a + bx$, where a is the y -coordinate of the y -intercept of the line of best fit and b is the slope. The line of best fit shown for data set E has a y -intercept at approximately $(0, 12)$. It's given that data set F is created by multiplying the y -coordinate of each data point from data set E by 3.9. It follows that a line of best fit for data set F has a y -intercept at approximately $(0, 12(3.9))$, or $(0, 46.8)$. Therefore, the value of a is approximately 46.8. The slope of a line that passes through points (x_1, y_1) and (x_2, y_2) can be calculated as $\frac{y_2 - y_1}{x_2 - x_1}$. Since the line of best fit shown for data set E passes approximately through the point $(12, 30)$, it follows that a line of best fit for data set F passes approximately through the point $(12, 30(3.9))$, or $(12, 117)$. Substituting $(0, 46.8)$ and $(12, 117)$ for (x_1, y_1) and (x_2, y_2) , respectively, in $\frac{y_2 - y_1}{x_2 - x_1}$ yields $\frac{117 - 46.8}{12 - 0}$, which is equivalent to $\frac{70.2}{12}$, or 5.85. Therefore, the value of b is approximately 5.85, or approximately 5.9. Thus, $y = 46.8 + 5.9x$ could be an equation of a line of best fit for data set F .

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. This could be an equation of a line of best fit for data set E , not data set F .

QUESTION 27

The correct answer is -28 . 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 distinct and parallel. The graphs of two lines in the xy -plane represented by equations in the form $Ax + By = C$, where A , B , and C are constants, are parallel if the coefficients for x and y in one equation are proportional to the corresponding coefficients for x and y in the other equation. The first equation in the given system, $48x - 64y = 48y + 24$, can be written in the form $Ax + By = C$ by subtracting $48y$ from both sides of the equation to yield $48x - 112y = 24$. The second equation in the given system, $ry = \frac{1}{8} - 12x$, can be written in the form $Ax + By = C$ by adding $12x$ to both sides of the equation to yield $12x + ry = \frac{1}{8}$. The coefficient of x in the second equation is $\frac{1}{4}$ times the coefficient of x in the first equation. That is, $48\left(\frac{1}{4}\right) = 12$. For the lines to be parallel, the coefficient of y in the second equation must also be $\frac{1}{4}$ times the coefficient of y in the first equation. Therefore, $-112\left(\frac{1}{4}\right) = r$, or $-28 = r$. Thus, if the given system has no solution, the value of r is -28 .