

Math

Module 2

(27 questions)

QUESTION 1

Choice B is correct. The y -intercept of a graph is the point where the graph intersects the y -axis, and the y -intercept always has an x -coordinate of 0. In the graph in choice B, the curve intersects the y -axis at the point where the y -coordinate is 5, so the y -intercept of this graph is $(0, 5)$.

Choice A is incorrect. This graph has a y -intercept of $(0, 4)$, not $(0, 5)$. *Choice C* is incorrect. This graph has a y -intercept of $(0, 6)$, not $(0, 5)$. *Choice D* is incorrect. This graph has a y -intercept of $(0, 7)$, not $(0, 5)$.

QUESTION 2

Choice D is correct. The graph gives the area y , in square inches, for each triangular piece of plywood with base length x , in inches, and $x > 0$. The point (x, y) on the graph where $x = 4$ has a corresponding y -value of approximately 30. Therefore, the best estimate of the area, in square inches, of a triangular piece of plywood with a base length of 4 inches is 30.

Choice A is incorrect. This is the base length, in inches, of the triangular piece of plywood. *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 3

Choice B is correct. It's given that an object's average acceleration, in meters per second squared, is the change in the object's speed, in meters per second, divided by the time during which the change occurred, in seconds. It's also given that the car's speed changes by 58 meters per second in 8 seconds. It follows that the car's average acceleration, in meters per second squared, during this time period is $\frac{58}{8}$, or 7.25.

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 4

Choice C is correct. It's given that the length of each side of triangle A is 280 millimeters and that the length of each side of triangle B is double the length of each side of triangle A. Therefore, the length of each side of triangle B is 2 times the length of each side of triangle A, which can be represented by the expression $2(280)$, or 560. Therefore, the length, in millimeters, of each side of triangle B is 560.

Choice A is incorrect. This is the length of each side of triangle A, not triangle B.

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 5

Choice A is correct. It's given that when $x = 0$, the value of y is 60, and for every increase in the value of x by 1, the corresponding value of y increases by 10% of its previous value. This relationship can be represented by an exponential equation of the form $y = a\left(1 + \frac{p}{100}\right)^x$, where the value of y is a when $x = 0$ and for every increase in the value of x by 1, the corresponding value of y increases by $p\%$ of its previous value. For this relationship, $a = 60$ and $p = 10$. Substituting 60 for a and 10 for p in the equation $y = a\left(1 + \frac{p}{100}\right)^x$ yields $y = 60\left(1 + \frac{10}{100}\right)^x$, or $y = 60(1.10)^x$.

Choice B is incorrect. This equation represents a relationship where for every increase in the value of x by 1, the corresponding value of y increases by 1%, not 10%, of its previous value. *Choice C* is incorrect. This equation represents a relationship where when $x = 0$, the value of y is 10, not 60, and for every increase in the value of x by 1, the corresponding value of y increases by 60%, not 10%, of its previous value. *Choice D* is incorrect. This equation represents a relationship where when $x = 0$, the value of y is 10, not 60, and for every increase in the value of x by 1, the corresponding value of y increases by 6%, not 10%, of its previous value.

QUESTION 6

The correct answer is 80. It's given that a recreational speedboat can travel at a maximum speed of 20 meters per second. At this speed, the boat would travel $\left(\frac{20 \text{ meters}}{1 \text{ second}}\right)(4 \text{ seconds})$, or 80 meters in 4 seconds.

Alternate approach: It's given that a recreational speedboat can travel at a maximum speed of 20 meters per second. This speed can be written as $\frac{20 \text{ meters}}{1 \text{ second}}$.

Let x represent the distance, in meters, the speedboat would travel in 4 seconds at this maximum speed. It follows that $\frac{20 \text{ meters}}{1 \text{ second}} = \frac{x \text{ meters}}{4 \text{ seconds}}$, which can be written as $\frac{20}{1} = \frac{x}{4}$, or $20 = \frac{x}{4}$. Multiplying each side of this equation by 4 yields $x = 80$.

Therefore, at this maximum speed, the speedboat would travel 80 meters in 4 seconds.

QUESTION 7

The correct answer is 64. 10% of a quantity means $\frac{10}{100}$ times the quantity.

Therefore, 10% of 640 can be represented as $(\frac{10}{100})(640)$, which is equivalent to $0.10(640)$, or 64. Therefore, 10% of 640 is 64.

QUESTION 8

Choice D is correct. The expression $4xy(2x^2 + 6y)$ can be rewritten as $4xy(2x^2) + 4xy(6y)$, which is equivalent to $8x^3y + 24xy^2$.

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 9

Choice A is correct. It's given that h represents the number of hours Sophia worked at her full-time job and c represents the number of hours she worked at her part-time job. Therefore, in the equation $23h + 10c = 1,007$, the coefficients 23 and 10 represent the hourly earnings in dollars at the full-time and part-time jobs, respectively. Thus, the best interpretation of 23 in this context is the amount, in dollars, Sophia earned for each hour she worked at her full-time job.

Choice B is incorrect. This is the best interpretation of 10, not 23. *Choice C* is incorrect. This is the best interpretation of h , not 23. *Choice D* is incorrect. This is the best interpretation of c , not 23.

QUESTION 10

Choice B is correct. It's given that function f is defined by $f(x) = \frac{5}{11}x$. Therefore, the equation representing the graph of $y = f(x)$ in the xy -plane is $y = \frac{5}{11}x$. For a linear equation in the form $y = mx + b$, m represents the slope of the graph and $(0, b)$ is the y -intercept of the graph of $y = f(x)$ in the xy -plane. Since the value of m in the equation $y = \frac{5}{11}x$ is $\frac{5}{11}$, the slope of the graph of $y = f(x)$ in the xy -plane is $\frac{5}{11}$.

Choice A is incorrect. This is the value of b , not m . *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. It's given that the average weight w , in pounds, per bag is estimated to be 1.03, with a margin of error of 0.05 pounds. This means that plausible values of w are between $1.03 - 0.05$, or 0.98, and $1.03 + 0.05$, or 1.08. Therefore, the most appropriate conclusion is $0.98 \leq w \leq 1.08$.

Choice A is incorrect because it doesn't account for the margin of error, which gives more than one plausible value of w . *Choice B* is incorrect because it doesn't include values of w between 1.03 and 1.08, which are also plausible. *Choice D* is incorrect because it doesn't include values of w between 0.98 and 1.03, which are also plausible.

QUESTION 12

Choice C is correct. The base of a cylinder is a circle with a diameter equal to the diameter of the cylinder. The volume, V , of a cylinder can be found by multiplying the area of the circular base, A , by the height of the cylinder, h , or $V = Ah$. The area of a circle can be found using the formula $A = \pi r^2$, where r is the radius of the circle. It's given that the diameter of the cylinder is 12 inches. Thus, the radius of the circular base of the cylinder is 6 inches. Substituting 6 for r in the formula $A = \pi r^2$ gives $A = \pi(6)^2$, or $A = 36\pi$. It's given that the height h of the cylinder is 21 inches. Substituting 36π for A and 21 for h in the formula $V = Ah$ gives $V = 36\pi(21)$, or $V = 756\pi$. Thus, the volume of the cylinder is 756π cubic inches.

Choice A is incorrect. This is the area, in square inches, of the circular base of the cylinder. *Choice B* is incorrect and may result from calculating the area of the circular base as $2\pi r$ rather than πr^2 . *Choice D* is incorrect. This is the volume, in cubic inches, of a cylinder with a radius, not a diameter, of 12 inches and a height of 21 inches.

QUESTION 13

The correct answer is 20. The area of a rectangle is equal to its length times its width. It's given that the length of the rectangle is 20 inches and the width is 1 inch, so the area, in square inches, is $(20)(1)$, or 20.

QUESTION 14

The correct answer is 30. It's given that function f is defined by $f(x) = 9x + 21$. Substituting 1 for x in the given function yields $f(1) = 9(1) + 21$, or $f(1) = 30$. Therefore, when $x = 1$, the value of $f(x)$ is 30.

QUESTION 15

Choice D is correct. It's given that Luca plants 205 seedlings per hour. It's also given that Luca planted seedlings for 1 hour on Monday. It follows that he planted $205(1)$, or 205, seedlings on Monday. It's given that Luca planted seedlings for t hours on Tuesday. It follows that he planted $205(t)$, or $205t$, seedlings on Tuesday. The total number of seedlings planted on Monday and Tuesday can therefore be written as $205 + 205t$, or $205t + 205$. Factoring out the common factor of 205 from this expression yields $205(t + 1)$. Therefore, $s(t) = 205(t + 1)$ gives the total number of seedlings Luca planted on Monday and Tuesday.

Choice A is incorrect. This gives the total number of seedlings Luca planted on Tuesday, not the total number of seedlings he planted on Monday and Tuesday. *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 D is correct. It's given that, each year, the silver maple tree's height increase was 2.3 feet. It's also given that, each year, the red maple tree's height increase was 32% less than the silver maple tree's height increase in the same year. Therefore, each year, the red maple tree's height increase was $2.3 - 0.32(2.3)$, or 1.564, feet. Thus, during these 5 years, the red maple tree's height increased at a constant rate. Therefore, an increasing linear function best models how the height of the red maple tree changed over time during these 5 years.

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 17

Choice D is correct. Multiplying both sides of the given equation by 24 yields $(x - 19) = 3(x - 19)$. Subtracting $(x - 19)$ from both sides of this equation yields $0 = 2(x - 19)$. Dividing both sides of this equation by 2 yields $0 = x - 19$, or $x - 19 = 0$. Adding 38 to both sides of this equation yields $x + 19 = 38$. Therefore, the value of $x + 19$ is 38.

Choice A is incorrect. This is the value of $x - 19$, not $x + 19$. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is the value of x , not $x + 19$.

QUESTION 18

Choice A is correct. The solutions to a system of three equations are the points where all three of the graphs of the equations intersect. In the graph of the system of three equations shown, all three of the graphs of the equations intersect at a single point. Therefore, this system has 1 solution.

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 19

Choice D is correct. If the ordered pairs (x, y) are solutions to the given system, then they must satisfy both inequalities $y < 48 - 8x$ and $\frac{y}{8} > 10$. Multiplying both sides of the inequality $\frac{y}{8} > 10$ by 8 yields $y > 80$. Combining $y > 80$ with $y < 48 - 8x$ gives $80 < y < 48 - 8x$. It follows that $80 < 48 - 8x$, and that this inequality can be used to find the values of x that satisfy the given system. Adding $8x$ to both sides of this inequality yields $80 + 8x < 48$. Subtracting 80 from both sides of this inequality yields $8x < -32$. Dividing both sides of this inequality by 8 yields $x < -4$. Therefore, the inequality $x < -4$ represents the x values for all solutions that satisfy the given system of inequalities.

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 20

The correct answer is 72. Based on the figure, the angle with measure x° and the angle with measure 108° together form a straight line. Therefore, these two angles are supplementary, so the sum of their measures is 180° . It follows that $x + 108 = 180$. Subtracting 108 from both sides of this equation yields $x = 72$.

QUESTION 21

The correct answer is 4. It's given that $4x^3 + 32$ is equivalent to $k(x^3 + 8)$, where k is a constant. Since the expression $4x^3 + 32$ has a common factor of 4, it can be rewritten as $4(x^3 + 8)$. Therefore, $4(x^3 + 8)$ is equivalent to $k(x^3 + 8)$. It follows that the value of k is 4.

QUESTION 22

Choice C is correct. The solutions to a quadratic equation of the form $ax^2 + bx + c = 0$, where a , b , and c are constants, can be calculated using the quadratic formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. The given equation is of this form, where $a = 3$, $b = -3$, and $c = -1$. Substituting these values into the quadratic formula yields $x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(3)(-1)}}{(2)(3)}$, or $x = \frac{3 \pm \sqrt{21}}{6}$. These solutions can be rewritten as $x = \frac{3}{6} \pm \frac{\sqrt{21}}{6}$, or $x = \frac{1}{2} \pm \frac{\sqrt{21}}{6}$.

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. These are the solutions to $3x^2 + 3x - 1 = 0$, not $3x^2 - 3x - 1 = 0$.

QUESTION 23

Choice B is correct. It's given that 7 resistors connected in series have a total resistance of 110 ohms and that the total resistance of 3 resistors in the circuit is 90 ohms. This means the total resistance of the other 4 resistors is $110 - 90$, or 20, ohms. Since the resistance of each resistor is positive, the resistance, x , in ohms, of one of these 4 resistors is greater than 0 and less than 20. Therefore, $0 < x < 20$.

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 24

Choice B is correct. It's given that x represents the pressure, in atmospheres (atm), mixture A contributes to the tank and y represents the pressure, in atm, mixture B contributes to the tank. It's also given that the total pressure of the combined gas mixtures is 80 atm, so $x + y = 80$ represents the sum of the partial pressures contributed by mixtures A and B. Mixture A contributes x atm of pressure, 27% of which is contributed by oxygen, so the

oxygen contribution from mixture A is $0.27x$ atm. Mixture B contributes y atm of pressure, 45% of which is contributed by oxygen, so the oxygen contribution from mixture B is $0.45y$ atm. Since 36% of the total pressure of 80 atm is contributed by oxygen, the total pressure contributed by oxygen is $0.36(80)$. Therefore, the equation $0.27x + 0.45y = 0.36(80)$ represents the contributions by oxygen to the total pressure of the combined mixture. Therefore, the system of equations that represents this situation is $x + y = 80$ and $0.27x + 0.45y = 0.36(80)$.

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 25

Choice A is correct. It's given that line k is defined by $y = mx + b$. For a graph of a line in the xy -plane with an equation $y = mx + b$, m is the slope of the line and $(0, b)$ is its y -intercept. Since lines k and ℓ are perpendicular, the slope of line ℓ is the negative reciprocal of the slope of line k . Thus, line ℓ can be defined by the equation $y = -\frac{1}{m}x + c$, where $(0, c)$ is the y -intercept of line ℓ . It's also given that lines k and ℓ intersect at the point $(2, 8)$. Therefore, the point $(2, 8)$ lies on line ℓ .

Substituting 2 for x and 8 for y into the equation $y = -\frac{1}{m}x + c$ yields

$8 = -\frac{1}{m}(2) + c$, or $8 = -\frac{2}{m} + c$. Adding $\frac{2}{m}$ to both sides of this equation yields

$8 + \frac{2}{m} = c$, or $c = 8 + \frac{2}{m}$. Substituting $8 + \frac{2}{m}$ for c in the line ℓ equation yields

$y = -\frac{1}{m}x + 8 + \frac{2}{m}$. Substituting 3 for x in $y = -\frac{1}{m}x + 8 + \frac{2}{m}$ yields $y = -\frac{3}{m} + 8 + \frac{2}{m}$,

or $y = 8 - \frac{1}{m}$. Therefore, the point $(3, 8 - \frac{1}{m})$ lies on line ℓ .

Choice B is incorrect. This may result from using $\frac{1}{m}$, rather than $-\frac{1}{m}$, as the slope of line ℓ . *Choice C* is incorrect. This may result from using $-m$, rather than $-\frac{1}{m}$, as the slope of line ℓ . *Choice D* is incorrect. This point lies on line k , not line ℓ .

QUESTION 26

Choice B is correct. It's given that the histogram summarizes a data set of the weights, in pounds, of 14 young female jaguars. The median of a data set with an even number of elements is between the two middle elements when the elements are in numerical order. For 14 elements in numerical order, the median is between the 7th and 8th elements. For the original data set represented in the histogram, the 7th and 8th elements in the ordered set have values that are between 85 and 90. Therefore, the median of the data set will also have a value that is between 85 and 90. If an additional weight of 32 pounds is added to the original data set to create a new data set of 15 weights, the median of the new data set will be the 8th element. Since 32 is less than the value of all of the elements in the original data set, the 8th element in the ordered new data set is the 7th element of the original data set, which has a value that is between 85 and 90. Therefore, the medians of the original and new data sets are between 85 and 90. It follows that

the median of the new data set is not necessarily less than the median of the original data set. The mean of a data set is the sum of the values of the elements divided by the number of elements of the data set. For the original data set represented by the histogram, the sum of the values of the elements can be represented by the variable T , and the mean of the original data set is equal to $\frac{T}{14}$ pounds. Since it's given that all of the jaguars in the original data set have a weight of at least 70 pounds, the value of T is at least $(70)(14)$, or 980. If an additional weight of 32 pounds is added to create a new data set of 15 weights, the mean of the new data set can be represented by $\frac{T+32}{15}$. The mean of the new data set is less than the mean of the original data set if and only if $\frac{T+32}{15}$ is less than $\frac{T}{14}$, or $\frac{T+32}{15} < \frac{T}{14}$. Multiplying both sides of this inequality by 14 yields $\frac{14(T+32)}{15} < T$. Multiplying both sides of this inequality by 15 yields $14(T+32) < 15T$, or $14T + 448 < 15T$. Subtracting $14T$ from both sides of this inequality yields $448 < T$. Since T is at least 980, 448 must be less than T . Thus, it follows that $\frac{T+32}{15} < \frac{T}{14}$. Therefore, the mean of the new data set must be less than the mean of the original data set.

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 either 245 or -246 . It's given that $(x - 245)(x + 246) = 0$. By the zero-product property, if the product of two factors is zero, then at least one of the factors must be zero. Setting each factor equal to zero yields $x - 245 = 0$ or $x + 246 = 0$. Adding 245 to both sides of the equation $x - 245 = 0$ yields $x = 245$. Subtracting 246 from both sides of the equation $x + 246 = 0$ yields $x = -246$. Therefore, the solutions to the given equation are 245 and -246 . Note that 245 and -246 are examples of ways to enter a correct answer.