

Math

Module 2

(27 questions)

QUESTION 1

Choice B is correct. 20% of 440 can be calculated as $\left(\frac{20}{100}\right)(440)$, which is equivalent to $\frac{8,800}{100}$, or 88.

Choice A is incorrect. This is 10%, not 20%, of 440. *Choice C* is incorrect. This is 200%, not 20%, of 440. *Choice D* is incorrect. This is 400%, not 20%, of 440.

QUESTION 2

Choice B is correct. For the graph shown, the x -axis represents temperature, in kelvins, and the y -axis represents the estimated pressure, in pounds per square inch (psi). The estimated pressure of the argon when the temperature is 600 kelvins can be found by locating the point on the graph where the value of x is equal to 600. The graph passes through the point (600, 12). This means that when the temperature is 600 kelvins, the estimated pressure is 12 psi.

Choice A is incorrect. This is the estimated pressure, in psi, of the argon when the temperature is 300 kelvins, not 600 kelvins. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect. This is the temperature, in kelvins, of the argon.

QUESTION 3

Choice B is correct. It's given that the function f is defined by $f(x) = 4x - 3$. Substituting 10 for x in the given function yields $f(10) = 4(10) - 3$, which is equivalent to $f(10) = 40 - 3$, or $f(10) = 37$. Therefore, the value of $f(10)$ is 37.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is the value of $f(10)$ for the function $f(x) = 4x$, not $f(x) = 4x - 3$. *Choice D* is incorrect. This is the value of $f(10)$ for the function $f(x) = 4x + 3$, not $f(x) = 4x - 3$.

QUESTION 4

Choice B is correct. Since $2xy$ is a common factor of each term in the given expression, the expression can be rewritten as $2xy(8x^2y + 7)$.

Choice A is incorrect. This expression is equivalent to $16x^2y^2 + 14xy$. *Choice C* is incorrect. This expression is equivalent to $28x^3y^2 + 14xy$. *Choice D* is incorrect. This expression is equivalent to $112x^3y^2 + 14xy$.

QUESTION 5

Choice D is correct. It's given that a veterinarian recommends that each day the rabbit should eat 25 calories per pound of the rabbit's weight, plus an additional 11 calories. If the rabbit's weight is x pounds, then multiplying 25 calories per pound by the rabbit's weight, x pounds, yields $25x$ calories. Adding the additional 11 calories that the rabbit should eat each day yields $25x + 11$ calories. It's given that c is the total number of calories the veterinarian recommends the rabbit should eat each day if the rabbit's weight is x pounds. Therefore, this situation can be represented by the equation $c = 25x + 11$.

Choice A is incorrect. This equation represents a situation where a veterinarian recommends that each day the rabbit should eat 25 calories per pound of the rabbit's weight. *Choice B* is incorrect. This equation represents a situation where a veterinarian recommends that each day the rabbit should eat $25 + 11$, or 36, calories per pound of the rabbit's weight. *Choice C* is incorrect. This equation represents a situation where a veterinarian recommends that each day the rabbit should eat 11 calories per pound of the rabbit's weight, plus an additional 25 calories.

QUESTION 6

The correct answer is 6. Dividing both sides of the equation $6n = 12$ by 6 yields $n = 2$. Substituting 2 for n in the expression $n + 4$ yields $2 + 4$, or 6.

QUESTION 7

The correct answer is either -30 or 30 . Adding 7 to each side of the given equation yields $(d - 30)(d + 30) = 0$. Since a product of two factors is equal to 0 if and only if at least one of the factors is 0, either $d - 30 = 0$ or $d + 30 = 0$. Adding 30 to each side of the equation $d - 30 = 0$ yields $d = 30$. Subtracting 30 from each side of the equation $d + 30 = 0$ yields $d = -30$. Therefore, the solutions to the given equation are -30 and 30 . Note that -30 and 30 are examples of ways to enter a correct answer.

QUESTION 8

Choice D is correct. A line in the xy -plane with a slope of m and a y -intercept of $(0, b)$ can be defined by an equation in the form $y = mx + b$. It's given that line r has a slope of 4 and passes through the point $(0, 6)$. It follows that $m = 4$ and $b = 6$. Substituting 4 for m and 6 for b in the equation $y = mx + b$ yields $y = 4x + 6$. Therefore, the equation $y = 4x + 6$ defines line r .

Choice A is incorrect. This equation defines a line that has a slope of -6 , not 4 , and passes through the point $(0, 4)$, not $(0, 6)$. *Choice B* is incorrect. This equation defines a line that has a slope of 6 , not 4 , and passes through the point $(0, 4)$, not $(0, 6)$. *Choice C* is incorrect. This equation defines a line that passes through the point $(0, -6)$, not $(0, 6)$.

QUESTION 9

Choice B is correct. It's given that the graph shows the height above the water y , in meters, of a diver x seconds after diving from a platform. The x -intercept of a graph is the point at which the graph intersects the x -axis, or when the value of y is 0 . The graph shown intersects the x -axis between $x = 1$ and $x = 2$. In other words, the diver is 0 meters above the water, or hits the water, between 1 and 2 seconds after diving from the platform. Of the given choices, only choice B includes an interpretation where the diver hits the water between 1 and 2 seconds. Therefore, the best interpretation of the x -intercept of the graph is the diver hits the water at 1.6 seconds.

Choice A is incorrect and may result from conceptual errors. *Choice C* is incorrect. This is the best interpretation of the maximum value, not the x -intercept, of the graph. *Choice D* is incorrect and may result from conceptual errors.

QUESTION 10

Choice A is correct. It's given that the kinetic energy, in joules, of an object with a mass of 9 kilograms traveling at a speed of v meters per second is given by the function K , where $K(v) = \frac{9}{2}v^2$. It follows that in the equation $K(34) = 5,202$, 34 is the value of v , or the speed of the object, in meters per second, and $5,202$ is the kinetic energy, in joules, of the object at that speed. Therefore, the best interpretation of $K(34) = 5,202$ in this context is the object traveling at 34 meters per second has a kinetic energy of $5,202$ joules.

Choice B is incorrect. The object traveling at 340 meters per second has a kinetic energy of $520,200$ joules. *Choice C* is incorrect. The object traveling at $5,202$ meters per second has a kinetic energy of $121,773,618$ joules. *Choice D* is incorrect. The object traveling at $23,409$ meters per second has a kinetic energy of $2,465,915,764.5$ joules.

QUESTION 11

Choice C is correct. Any data point that's located above the line of best fit has a y -value that's greater than the y -value predicted by the line of best fit. For the scatterplot shown, 6 of the data points are above the line of best fit. Therefore, 6 of the data points have an actual y -value that's greater than the y -value predicted by the line of best fit.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect. This is the number of data points that have an actual y -value that's less than the y -value predicted by the line of best fit. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 12

Choice D is correct. It's given that at a movie theater, there are a total of 350 customers and that each customer is located in either theater A, theater B, or theater C. If the probability of selecting a customer in theater A is 0.48, then $(0.48)(350)$, or 168, customers are located in theater A. If the probability of selecting a customer in theater B is 0.24, then $(0.24)(350)$, or 84, customers are located in theater B. It follows that there are $168 + 84$, or 252, customers in theater A and theater B. Therefore, there are $350 - 252$, or 98, customers in theater C.

Choice A is incorrect. This is the percent, not the number, of the customers that are located in theater C. **Choice B** is incorrect and may result from conceptual or calculation errors. **Choice C** is incorrect. This is the number of customers that are located in theater B, not theater C.

QUESTION 13

The correct answer is $\frac{44}{3}$. A linear equation can be written in the form $y = mx + b$, where m is the slope of the graph of the equation in the xy -plane and $(0, b)$ is the y -intercept. Distributing the $\frac{1}{3}$ in the equation $y = \frac{1}{3}(29x + 10) + 5x$ yields $y = \frac{29}{3}x + \frac{10}{3} + 5x$. Combining like terms on the right-hand side of this equation yields $y = \frac{44}{3}x + \frac{10}{3}$. This equation is in the form $y = mx + b$, where $m = \frac{44}{3}$ and $b = \frac{10}{3}$. Therefore, the slope of the graph of the given equation in the xy -plane is $\frac{44}{3}$. Note that $44/3$, 14.66, and 14.67 are examples of ways to enter a correct answer.

QUESTION 14

The correct answer is 4,205. The exterior surface area of a figure is the sum of the areas of all its faces. It's given that the box does not have a lid and that each side of the box is in the shape of a square. Therefore, the box consists of 5 congruent square faces. It's also given that the length of each edge is 29 inches. Let s represent the length of an edge of a square. It follows that the area of a square is equal to s^2 . Therefore, the area of each of the 5 square faces is equal to 29^2 , or 841, square inches. Since the box consists of 5 congruent square faces, it follows that the sum of the areas of all its faces, or the exterior surface area of this box without a lid, is $5(841)$, or 4,205, square inches.

QUESTION 15

Choice A is correct. It's given that the table shows an original data set of 5 values. It's also given that a sixth value is added to create a new data set. The new data set consists of the 5 values in the original data set and one additional value, 121. Since the additional value, 121, is less than any value in the original data set, the mean of the original data set is greater than the mean of the new data set.

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 16

Choice A is correct. The sum of the measures of the angles of a triangle is 180° . Therefore, the sum of the measures of $\angle R$, $\angle S$, and $\angle T$ is 180° . It's given that the measure of $\angle R$ is 63° . It follows that the sum of the measures of $\angle S$ and $\angle T$ is $(180 - 63)^\circ$, or 117° . Therefore, the measure of $\angle S$, in degrees, must be less than 117. Of the given choices, only 116 is less than 117. Thus, the measure, in degrees, of $\angle S$ could be 116.

Choice B is incorrect. If the measure of $\angle S$ is 118° , then the sum of the measures of the angles of the triangle is greater than, not equal to, 180° . *Choice C* is incorrect. If the measure of $\angle S$ is 126° , then the sum of the measures of the angles of the triangle is greater than, not equal to, 180° . *Choice D* is incorrect. This is the sum of the measures of the angles of a triangle, in degrees.

QUESTION 17

Choice B is correct. The given expression is equivalent to $8x^3 + 8 - x^3 - (-2)$, or $8x^3 + 8 - x^3 + 2$. Combining like terms in this expression yields $7x^3 + 10$.

Choice A is incorrect. This expression is equivalent to $(8x^3 + 8) - 2$, not $(8x^3 + 8) - (x^3 - 2)$. *Choice C* is incorrect. This expression is equivalent to $(8x^3 + 8) - (-2)$, not $(8x^3 + 8) - (x^3 - 2)$. *Choice D* is incorrect. This expression is equivalent to $(8x^3 + 8) - (x^3 + 2)$, not $(8x^3 + 8) - (x^3 - 2)$.

QUESTION 18

Choice B is correct. Dividing each side of the given equation by 4 yields $\sqrt{2x} = 4$. Squaring both sides of this equation yields $2x = 16$. Multiplying each side of this equation by 3 yields $6x = 48$. Therefore, the value of $6x$ is 48.

Choice A is incorrect. This is the value of $3x$, not $6x$. *Choice C* is incorrect. This is the value of $9x$, not $6x$. *Choice D* is incorrect. This is the value of $12x$, not $6x$.

QUESTION 19

Choice D is correct. All the tables in the choices have the same three values of x , 440, 441, and 442, so each of the three values of x can be substituted in the given inequality to compare the corresponding values of y in each of the tables. Substituting 440 for x in the given inequality yields $2(440) - y > 883$, or $880 - y > 883$. Subtracting 880 from both sides of this inequality yields $-y > 3$. Dividing both sides of this inequality by -1 yields $y < -3$. Therefore, when $x = 440$, the corresponding value of y must be less than -3 . Substituting 441 for x in the given inequality yields $2(441) - y > 883$, or $882 - y > 883$. Subtracting 882 from both sides of this inequality yields $-y > 1$. Dividing both sides of this inequality by -1 yields $y < -1$. Therefore, when $x = 441$, the corresponding value of y must be less than -1 . Substituting 442 for x in the given inequality yields

$2(442) - y > 883$, or $884 - y > 883$. Subtracting 884 from both sides of this inequality yields $-y > -1$. Dividing both sides of this inequality by -1 yields $y < 1$. Therefore, when $x = 442$, the corresponding value of y must be less than 1. For the table in choice D, when $x = 440$, the corresponding value of y is -4 , which is less than -3 ; when $x = 441$, the corresponding value of y is -2 , which is less than -1 ; when $x = 442$, the corresponding value of y is 0 , which is less than 1 . Therefore, the table in choice D gives values of x and their corresponding values of y that are all solutions to the given inequality.

Choice A is incorrect. When $x = 440$, the corresponding value of y in this table is 0 , which isn't less than -3 . *Choice B* is incorrect. When $x = 440$, the corresponding value of y in this table is 0 , which isn't less than -3 . *Choice C* is incorrect. When $x = 440$, the corresponding value of y in this table is -2 , which isn't less than -3 .

QUESTION 20

The correct answer is 20. Adding the first equation to the second equation in the given system yields $5y - 5y = 10x + 5x + 11 - 21$, or $0 = 15x - 10$. Adding 10 to both sides of this equation yields $10 = 15x$. Multiplying both sides of this equation by 2 yields $20 = 30x$. Therefore, the value of $30x$ is 20.

QUESTION 21

The correct answer is 66. It's given that each vertex of the rectangle lies on the circumference of the circle. Therefore, the length of the diameter of the circle is equal to the length of the diagonal of the rectangle. The diagonal of a rectangle forms a right triangle with the shortest and longest sides of the rectangle, where the shortest side and the longest side of the rectangle are the legs of the triangle and the diagonal of the rectangle is the hypotenuse of the triangle. Let s represent the length, in units, of the shortest side of the rectangle. Since it's given that the diagonal is twice the length of the shortest side, $2s$ represents the length, in units, of the diagonal of the rectangle. 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 s for a and $2s$ for c in this equation yields $s^2 + b^2 = (2s)^2$, or $s^2 + b^2 = 4s^2$. Subtracting s^2 from both sides of this equation yields $b^2 = 3s^2$. Taking the positive square root of both sides of this equation yields $b = s\sqrt{3}$. Therefore, the length, in units, of the rectangle's longest side is $s\sqrt{3}$. The area of a rectangle is the product of the length of the shortest side and the length of the longest side. The lengths, in units, of the shortest and longest sides of the rectangle are represented by s and $s\sqrt{3}$, and it's given that the area of the rectangle is $1,089\sqrt{3}$ square units. It follows that $1,089\sqrt{3} = s(s\sqrt{3})$, or $1,089\sqrt{3} = s^2\sqrt{3}$. Dividing both sides of this equation by $\sqrt{3}$ yields $1,089 = s^2$. Taking the positive square root of both sides of this equation yields $33 = s$. Since the length, in units, of the diagonal is represented by $2s$, it follows that the length, in units, of the diagonal is $2(33)$, or 66. Since the length of the diameter of the circle is equal to the length of the diagonal of the rectangle, the length, in units, of the diameter of the circle is 66.

QUESTION 22

Choice D is correct. The area of a rectangle is given by bh , where b is the length of the base of the rectangle and h is its height. Let x represent the length, in units, of the base of rectangle $ABCD$, and let y represent its height, in units. Substituting x for b and y for h in the formula bh yields xy . Therefore, the area, in square units, of $ABCD$ can be represented by the expression xy . It's given that the length of each side of $EFGH$ is 6 times the length of the corresponding side of $ABCD$. Therefore, the length, in units, of the base of $EFGH$ can be represented by the expression $6x$, and its height, in units, can be represented by the expression $6y$. Substituting $6x$ for b and $6y$ for h in the formula bh yields $(6x)(6y)$, which is equivalent to $36xy$. Therefore, the area, in square units, of $EFGH$ can be represented by the expression $36xy$. It's given that the area of $ABCD$ is 54 square units. Since xy represents the area, in square units, of $ABCD$, substituting 54 for xy in the expression $36xy$ yields $36(54)$, or 1,944. Therefore, the area, in square units, of $EFGH$ is 1,944.

Choice A is incorrect. This is the area of a rectangle where the length of each side of the rectangle is $\sqrt{\frac{1}{6}}$, not 6, times the length of the corresponding side of $ABCD$. **Choice B** is incorrect. This is the area of a rectangle where the length of each side of the rectangle is $\sqrt{\frac{2}{3}}$, not 6, times the length of the corresponding side of $ABCD$. **Choice C** is incorrect. This is the area of a rectangle where the length of each side of the rectangle is $\sqrt{6}$, not 6, times the length of the corresponding side of $ABCD$.

QUESTION 23

Choice D is correct. Two fractions can be added together when they have a common denominator. Since $k > 0$, multiplying the second term in the given expression by $\frac{k}{k}$ yields $\frac{(42ak)k}{k}$, which is equivalent to $\frac{42ak^2}{k}$. Therefore, the expression $\frac{42a}{k} + 42ak$ can be written as $\frac{42a}{k} + \frac{42ak^2}{k}$ which is equivalent to $\frac{42a + 42ak^2}{k}$. Since each term in the numerator of this expression has a factor of 42a, the expression $\frac{42a + 42ak^2}{k}$ can be rewritten as $\frac{42a(1) + 42a(k^2)}{k}$, or $\frac{42a(1 + k^2)}{k}$, which is equivalent to $\frac{42a(k^2 + 1)}{k}$.

Choice A is incorrect. This expression is equivalent to $\frac{42a}{k} + \frac{42a}{k}$. **Choice B** is incorrect and may result from conceptual or calculation errors. **Choice C** is incorrect. This expression is equivalent to $\frac{42a}{k} + 42a$.

QUESTION 24

Choice D is correct. The number of solutions to a quadratic equation in the form $ax^2 + bx + c = 0$, where a , b , and c are constants, can be determined by the value of the discriminant, $b^2 - 4ac$. If the value of the discriminant is greater than zero, then the quadratic equation has two distinct real solutions. If the value of the discriminant is equal to zero, then the quadratic equation has exactly one real solution. If the value of the discriminant is less than zero, then the quadratic equation has no real solutions. For the quadratic equation in choice D, $5x^2 - 14x + 49 = 0$, $a = 5$, $b = -14$, and $c = 49$. Substituting 5 for a , -14 for b , and 49 for c in $b^2 - 4ac$ yields $(-14)^2 - 4(5)(49)$, or -784 . Since -784 is less than zero, it follows that the quadratic equation $5x^2 - 14x + 49 = 0$ has no real solutions.

Choice A is incorrect. The value of the discriminant for this quadratic equation is 392. Since 392 is greater than zero, it follows that this quadratic equation has two real solutions. *Choice B* is incorrect. The value of the discriminant for this quadratic equation is 0. Since zero is equal to zero, it follows that this quadratic equation has exactly one real solution. *Choice C* is incorrect. The value of the discriminant for this quadratic equation is 1,176. Since 1,176 is greater than zero, it follows that this quadratic equation has two real solutions.

QUESTION 25

Choice A is correct. It's given that the function P models the population, in thousands, of a certain city t years after 2003. The value of the base of the given exponential function, 1.04, corresponds to an increase of 4% for every increase of 1 in the exponent, $\left(\frac{6}{4}\right)t$. If the exponent is equal to 0, then $\left(\frac{6}{4}\right)t = 0$. Multiplying both sides of this equation by $\left(\frac{4}{6}\right)$ yields $t = 0$. If the exponent is equal to 1, then $\left(\frac{6}{4}\right)t = 1$. Multiplying both sides of this equation by $\left(\frac{4}{6}\right)$ yields $t = \frac{4}{6}$, or $t = \frac{2}{3}$. Therefore, the population is predicted to increase by 4% every $\frac{2}{3}$ of a year. It's given that the population is predicted to increase by 4% every n months. Since there are 12 months in a year, $\frac{2}{3}$ of a year is equivalent to $\left(\frac{2}{3}\right)(12)$, or 8, months. Therefore, the value of n is 8.

Choice B is incorrect. This is the number of months in which the population is predicted to increase by 4% according to the model $P(t) = 260(1.04)^t$, not $P(t) = 260(1.04)^{\left(\frac{6}{4}\right)t}$. *Choice C* is incorrect. This is the number of months in which the population is predicted to increase by 4% according to the model $P(t) = 260(1.04)^{\left(\frac{4}{6}\right)t}$, not $P(t) = 260(1.04)^{\left(\frac{6}{4}\right)t}$. *Choice D* is incorrect. This is the number of months in which the population is predicted to increase by 4% according to the model $P(t) = 260(1.04)^{\left(\frac{1}{6}\right)t}$, not $P(t) = 260(1.04)^{\left(\frac{6}{4}\right)t}$.

QUESTION 26

Choice C is correct. It's given that the circle has its center at $(-1, 1)$ and that line t is tangent to this circle at the point $(5, -4)$. Therefore, the points $(-1, 1)$ and $(5, -4)$ are the endpoints of the radius of the circle at the point of tangency. The slope of a line or line segment that contains the points (a, b) and (c, d) can be calculated as $\frac{d-b}{c-a}$. Substituting $(-1, 1)$ for (a, b) and $(5, -4)$ for (c, d) in the expression $\frac{d-b}{c-a}$ yields $\frac{-4-1}{5-(-1)}$, or $-\frac{5}{6}$. Thus, the slope of this radius is $-\frac{5}{6}$. A line that's tangent to a circle is perpendicular to the radius of the circle at the point of tangency. It follows that line t is perpendicular to the radius at the point $(5, -4)$, so the slope of line t is the negative reciprocal of the slope of this radius. The negative reciprocal of $-\frac{5}{6}$ is $\frac{6}{5}$. Therefore, the slope of line t is $\frac{6}{5}$. Since the slope of line t is the same between any two points on line t , a point lies on line t if the slope of the line segment connecting the point and $(5, -4)$ is $\frac{6}{5}$. Substituting choice C, $(10, 2)$, for (a, b) and $(5, -4)$ for (c, d) in the expression $\frac{d-b}{c-a}$ yields $\frac{-4-2}{5-10}$, or $\frac{6}{5}$. Therefore, the point $(10, 2)$ lies on line t .

Choice A is incorrect. The slope of the line segment connecting $(0, \frac{6}{5})$ and $(5, -4)$ is $\frac{-4 - \frac{6}{5}}{5 - 0}$, or $-\frac{26}{25}$, not $\frac{6}{5}$. *Choice B* is incorrect. The slope of the line segment connecting $(4, 7)$ and $(5, -4)$ is $\frac{-4 - 7}{5 - 4}$, or -11 , not $\frac{6}{5}$. *Choice D* is incorrect. The slope of the line segment connecting $(11, 1)$ and $(5, -4)$ is $\frac{-4 - 1}{5 - 11}$, or $\frac{5}{6}$, not $\frac{6}{5}$.

QUESTION 27

The correct answer is 4,176. It's given that the side length of the larger square is 3 times the side length of the smaller square. This means that the area of the larger square is 3^2 , or 9, times the area of the smaller square. If the area of the smaller square is represented by x , then the area of the larger square can be represented by $9x$. Therefore, the flat surface of the two adjacent squares has a total area of $x + 9x$, or $10x$. It's given that an electric field with strength 29.00 volts per meter passes uniformly through this surface and the total electric flux of the electric field through this surface is 4,640 volts · meters. Since it's given that the electric flux is the product of the electric field's strength and the area of the surface, the equation $29.00(10x) = 4,640$, or $290x = 4,640$, can be used to represent this situation. Dividing each side of this equation by 290 yields $x = 16$. Substituting 16 for x in the expression for the area of the larger square, $9x$, yields $9(16)$, or 144, square meters. Since the area of the larger square is 144 square meters, the electric flux, in volts · meters, of the electric field through the larger square can be determined by multiplying the area of the larger square by the strength of the electric field. Thus, the electric flux is $(144 \text{ square meters})\left(\frac{29.00 \text{ volts}}{\text{meter}}\right)$, or 4,176 volts · meters.