

Math

Module 2

(27 questions)

QUESTION 1

Choice B is correct. Subtracting 7 from each side of the given equation yields $w = 350$. Therefore, the value of w that is the solution to the given equation is 350.

Choice A is incorrect. This is the value of w that is the solution to the equation $7w = 357$, not $w + 7 = 357$. *Choice C* is incorrect. This is the value of w that is the solution to the equation $w - 7 = 357$, not $w + 7 = 357$. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 2

Choice B is correct. The expression $16(x + 15)$ can be rewritten as $16(x) + 16(15)$, which is equivalent to $16x + 240$.

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 3

Choice D is correct. If a member of the organization is selected at random, the probability that the selected member is at least 40 years old is equal to the number of members who are at least 40 years old divided by the total number of members. According to the table, there are a total of 135 members of the organization, and 107 of these members are at least 40 years old. Therefore, the probability that the selected member is at least 40 years old is $\frac{107}{135}$.

Choice A is incorrect. This is the probability that the selected member is less than 40 years old. *Choice B* is incorrect. This is the probability that the selected member lives east of the river. *Choice C* is incorrect. This is the probability that the selected member lives west of the river.

QUESTION 4

Choice B is correct. Adding the second equation in the given system to the first equation in the given system yields $3x + (-3x + y) = 12 + (-6)$, which is equivalent to $y = 6$.

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 5

Choice D is correct. The equation of a line in the xy -plane can be written as $y = mx + b$, where m represents the slope of the line and $(0, b)$ represents the y -intercept of the line. It's given that the slope of the line is $\frac{1}{9}$. It follows that $m = \frac{1}{9}$. It's also given that the line passes through the point $(0, 14)$. It follows that $b = 14$. Substituting $\frac{1}{9}$ for m and 14 for b in $y = mx + b$ yields $y = \frac{1}{9}x + 14$. Thus, the equation $y = \frac{1}{9}x + 14$ represents this line.

Choice A is incorrect. This equation represents a line with a slope of $-\frac{1}{9}$ and a y -intercept of $(0, -14)$. *Choice B* is incorrect. This equation represents a line with a slope of $-\frac{1}{9}$ and a y -intercept of $(0, 14)$. *Choice C* is incorrect. This equation represents a line with a slope of $\frac{1}{9}$ and a y -intercept of $(0, -14)$.

QUESTION 6

The correct answer is 70. Based on the figure, the angle with measure 110° and the angle vertical to the angle with measure x° are same side interior angles. Since vertical angles are congruent, the angle vertical to the angle with measure x° also has measure x° . It's given that lines s and t are parallel. Therefore, same side interior angles between lines s and t are supplementary. It follows that $x + 110 = 180$. Subtracting 110 from both sides of this equation yields $x = 70$.

QUESTION 7

The correct answer is 1. It's given that the function f is defined by $f(x) = x + \frac{8}{11}$.

Substituting $\frac{3}{11}$ for x in the given function yields $f\left(\frac{3}{11}\right) = \frac{3}{11} + \frac{8}{11}$, which gives

$f\left(\frac{3}{11}\right) = \frac{11}{11}$, or $f\left(\frac{3}{11}\right) = 1$. Therefore, when $x = \frac{3}{11}$, the value of $f(x)$ is 1.

QUESTION 8

Choice D is correct. A linear relationship can be represented by an equation of the form $y = mx + b$, where m and b are constants. It's given in the table that when $x = 0$, $y = 18$. Substituting 0 for x and 18 for y in $y = mx + b$ yields $18 = m(0) + b$, or $18 = b$. Substituting 18 for b in the equation $y = mx + b$ yields $y = mx + 18$. It's also given in the table that when $x = 1$, $y = 13$. Substituting 1 for x and 13 for y in the equation $y = mx + 18$ yields $13 = m(1) + 18$, or $13 = m + 18$. Subtracting 18 from both sides of this equation yields $-5 = m$. Therefore, the equation $y = -5x + 18$ represents the relationship between x and y .

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. The solution to a system of equations is the ordered pair (x, y) that satisfies all equations in the system. It's given by the first equation in the system that $x + 7 = 10$. Substituting 10 for $x + 7$ into the second equation yields $10^2 = y$, or $y = 100$. The x -coordinate of the solution to the system of equations can be found by subtracting 7 from both sides of the equation $x + 7 = 10$, which yields $x = 3$. Therefore, the ordered pair $(3, 100)$ is a solution to the given system of equations.

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 10

Choice D is correct. The given function f is a linear function. Therefore, the graph of $y = f(x)$ in the xy -plane has one x -intercept at the point $(k, 0)$, where k is a constant. Substituting 0 for $f(x)$ and k for x in the given function yields $0 = 7k - 84$. Adding 84 to both sides of this equation yields $84 = 7k$. Dividing both sides of this equation by 7 yields $12 = k$. Therefore, the x -intercept of the graph of $y = f(x)$ in the xy -plane is $(12, 0)$.

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 11

Choice C is correct. It's given that the relationship between t and n is exponential. The table shows that the value of n increases as the value of t increases. Therefore, the relationship between t and n can be represented by an increasing exponential equation of the form $n = a(1 + b)^t$, where a and b are positive constants. The table shows that when $t = 0$, $n = 604$. Substituting 0 for t and 604 for n in the equation $n = a(1 + b)^t$ yields $604 = a(1 + b)^0$, which is equivalent to $604 = a(1)$, or $604 = a$. Substituting 604 for a in the equation $n = a(1 + b)^t$ yields $n = 604(1 + b)^t$. The table also shows that when $t = 1$, $n = 606.42$. Substituting 1 for t and 606.42 for n in the equation $n = 604(1 + b)^t$ yields $606.42 = 604(1 + b)^1$, or $606.42 = 604(1 + b)$. Dividing both sides of this equation by 604 yields approximately $1.004 = 1 + b$. Subtracting 1 from both sides of this equation yields that the value of b is approximately 0.004. Substituting 0.004 for b in the equation $n = 604(1 + b)^t$ yields $n = 604(1 + 0.004)^t$. Therefore, of the choices, choice C best represents the relationship between t and n .

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 12

Choice D is correct. It's given that the function w models the volume of liquid, in milliliters, in a container t seconds after it begins draining from a hole at the bottom. The given function $w(t) = 300 - 4t$ can be rewritten as $w(t) = -4t + 300$. Thus, for each increase of t by 1, the value of $w(t)$ decreases by $4(1)$, or 4. Therefore, the predicted volume, in milliliters, draining from the container each second is 4 milliliters.

Choice A is incorrect. This is the amount of liquid, in milliliters, in the container before the liquid begins draining. *Choice B* is incorrect and may result from conceptual errors. *Choice C* is incorrect and may result from conceptual errors.

QUESTION 13

The correct answer is 45. It's given that $h(0) = 45$. Therefore, for the given function h , when $x = 0$, $h(x) = 45$. Substituting 0 for x and 45 for $h(x)$ in the given function, $h(x) = x + b$, yields $45 = 0 + b$, or $45 = b$. Therefore, the value of b is 45.

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 B is correct. If two triangles are similar, then their corresponding angles are congruent. It's given that right triangle FGH is similar to right triangle JKL and angle F corresponds to angle J . It follows that angle F is congruent to angle J and, therefore, the measure of angle F is equal to the measure of angle J . The sine ratios of angles of equal measure are equal. Since the measure of angle F is equal to the measure of angle J , $\sin(F) = \sin(J)$. It's given that $\sin(F) = \frac{308}{317}$. Therefore, $\sin(J)$ is $\frac{308}{317}$.

Choice A is incorrect. This is the value of $\cos(J)$, not the value of $\sin(J)$. *Choice C* is incorrect. This is the reciprocal of the value of $\sin(J)$, not the value of $\sin(J)$. *Choice D* is incorrect. This is the reciprocal of the value of $\cos(J)$, not the value of $\sin(J)$.

QUESTION 16

Choice C is correct. Let x be the 2015 population of Greenville. It's given that the population increased by 7% from 2015 to 2016. The increase in population can be written as $(0.07)x$. The 2016 population of Greenville is given as the sum of the 2015 population of Greenville and the increase in population from 2015 to 2016. This can be rewritten as $x + (0.07)x$, or $1.07x$. Therefore, the value of k is 1.07.

Choice A is incorrect. This is the percent, represented as a decimal, that the population increased from 2015 to 2016, not the value of k . **Choice B** is incorrect and may result from conceptual or calculation errors. **Choice D** is incorrect. This is the value of k if the population increased by 70%, not 7%, from 2015 to 2016.

QUESTION 17

Choice B is correct. Standard deviation is a measure of the spread of a data set from its mean. The dot plot for class A and the dot plot for class B have the same shape. Thus, the frequency distributions for both class A and class B are the same. Since both class A and class B have the same frequency distribution of glue sticks brought in by each student, it follows that both class A and class B have the same spread of the number of glue sticks brought in by each student from their respective means. Therefore, the standard deviation of the number of glue sticks brought in by each student for class A is equal to the standard deviation of the number of glue sticks brought in by each student for class B.

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 18

Choice B is correct. In the statement " $m(330)$ is approximately equal to 362," the input of the function, 330, is the value of t , the elapsed time, in days, since the animal was born. The approximate value of the function, 362, is the predicted body mass, in kilograms, of the animal after that time has elapsed. Therefore, the predicted body mass of the animal was approximately 362 kg 330 days after it was born.

Choice A is incorrect. This would be the best interpretation of the statement " $m(362)$ is approximately equal to 330." **Choice C** is incorrect. The number $\frac{330}{7}$ is the number of weeks, not the number of days, after the animal was born. **Choice D** is incorrect. This would be the best interpretation of the statement " $m(362)$ is approximately equal to $\frac{330}{7}$."

QUESTION 19

Choice C is correct. It's given that triangle XYZ is similar to triangle RST , such that X , Y , and Z correspond to R , S , and T , respectively. Since corresponding angles of similar triangles are congruent, it follows that the measure of $\angle Z$ is congruent to the measure of $\angle T$. It's given that the measure of $\angle Z$ is 20° . Therefore, the measure of $\angle T$ is 20° .

Choice A is incorrect and may result from a conceptual error. *Choice B* is incorrect. This is half the measure of $\angle Z$. *Choice D* is incorrect. This is twice the measure of $\angle Z$.

QUESTION 20

The correct answer is 410. It's given that t minutes after an initial observation, the number of bacteria in a population is $60,000(2)^{\frac{t}{410}}$. This expression consists of the initial number of bacteria, 60,000, multiplied by the expression $2^{\frac{t}{410}}$. The time it takes for the number of bacteria to double is the increase in the value of t that causes the expression $2^{\frac{t}{410}}$ to double. Since the base of the expression $2^{\frac{t}{410}}$ is 2, the expression $2^{\frac{t}{410}}$ will double when the exponent increases by 1. Since the exponent of the expression $2^{\frac{t}{410}}$ is $\frac{t}{410}$, the exponent will increase by 1 when t increases by 410. Therefore the time, in minutes, it takes for the number of bacteria in the population to double is 410.

QUESTION 21

The correct answer is -19 . It's given that function f is defined by $f(x) = a^x + b$, where a and b are constants and $a > 0$. It's also given that the graph of $y = f(x)$ in the xy -plane has a y -intercept at $(0, -25)$ and passes through the point $(2, 23)$. Since the graph has a y -intercept at $(0, -25)$, $f(0) = -25$. Substituting 0 for x in the given equation yields $f(0) = a^0 + b$, or $f(0) = 1 + b$, and substituting -25 for $f(0)$ in this equation yields $-25 = 1 + b$. Subtracting 1 from each side of this equation yields $-26 = b$. Substituting -26 for b in the equation $f(x) = a^x + b$ yields $f(x) = a^x - 26$. Since the graph also passes through the point $(2, 23)$, $f(2) = 23$. Substituting 2 for x in the equation $f(x) = a^x - 26$ yields $f(2) = a^2 - 26$, and substituting 23 for $f(2)$ yields $23 = a^2 - 26$. Adding 26 to each side of this equation yields $49 = a^2$. Taking the square root of both sides of this equation yields $\pm 7 = a$. Since it's given that $a > 0$, the value of a is 7. It follows that the value of $a + b$ is $7 - 26$, or -19 .

QUESTION 22

Choice D is correct. All the tables in the choices have the same three values of x , 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 3 for x in the given inequality yields $y > 13(3) - 18$, or $y > 21$. Therefore, when $x = 3$, the corresponding value of y is greater than 21. Substituting 5 for x in the given inequality yields $y > 13(5) - 18$, or $y > 47$. Therefore, when $x = 5$, the corresponding value of y is greater than 47. Substituting 8 for x in the given inequality yields $y > 13(8) - 18$, or $y > 86$. Therefore, when $x = 8$, the corresponding value of y is greater than 86. For the table in choice D, when $x = 3$, the corresponding value of y is 26, which is greater than 21; when $x = 5$, the corresponding value of y is 52, which is greater than 47; when $x = 8$, the corresponding value of y is 91, which is greater than 86. 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. In the table for choice A, when $x = 3$, the corresponding value of y is 21, which is not greater than 21; when $x = 5$, the corresponding value of y is 47, which is not greater than 47; when $x = 8$, the corresponding value of y is 86, which is not greater than 86. *Choice B* is incorrect. In the table for choice B, when $x = 5$, the corresponding value of y is 42, which is not greater than 47; when $x = 8$, the corresponding value of y is 86, which is not greater than 86. *Choice C* is incorrect. In the table for choice C, when $x = 3$, the corresponding value of y is 16, which is not greater than 21; when $x = 5$, the corresponding value of y is 42, which is not greater than 47; when $x = 8$, the corresponding value of y is 81, which is not greater than 86.

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 A is correct. When a square is inscribed in a circle, a diagonal of the square is a diameter of the circle. It's given that a square is inscribed in a circle and the length of a radius of the circle is $\frac{20\sqrt{2}}{2}$ inches. Therefore, the length of a diameter of the circle is $2\left(\frac{20\sqrt{2}}{2}\right)$ inches, or $20\sqrt{2}$ inches. It follows that the length of a diagonal of the square is $20\sqrt{2}$ inches. A diagonal of a square separates the square into two right triangles in which the legs are the sides of the square and the hypotenuse is a diagonal. Since a square has 4 congruent sides, each of these two right triangles has congruent legs and a hypotenuse of length $20\sqrt{2}$ inches. Since each of these two right triangles has congruent legs, they are both 45-45-90 triangles. In a 45-45-90 triangle, the length of the hypotenuse is $\sqrt{2}$ times the length of a leg. Let s represent the length of a leg of one of these 45-45-90 triangles. It follows that $20\sqrt{2} = \sqrt{2}(s)$. Dividing both sides of this equation by $\sqrt{2}$ yields $20 = s$. Therefore, the length of a leg of one of these 45-45-90 triangles is 20 inches. Since the legs of these two 45-45-90 triangles are the sides of the square, it follows that the side length of the square is 20 inches.

Choice B is incorrect. This is the length of a radius, in inches, of the circle. *Choice C* is incorrect. This is the length of a diameter, in inches, of the circle. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 25

Choice C is correct. Factoring the denominator in the second term of the given expression gives $\frac{y+12}{x-8} + \frac{y(x-8)}{xy(x-8)}$. This expression can be rewritten with common denominators by multiplying the first term by $\frac{xy}{xy}$, giving $\frac{xy(y+12)}{xy(x-8)} + \frac{y(x-8)}{xy(x-8)}$. Adding these two terms yields $\frac{xy(y+12)+y(x-8)}{xy(x-8)}$. Using the distributive property to rewrite this expression gives $\frac{xy^2+12xy+xy-8y}{x^2y-8xy}$. Combining the like terms in the numerator of this expression gives $\frac{xy^2+13xy-8y}{x^2y-8xy}$.

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 D is correct. A y -intercept of a graph in the xy -plane is a point where the graph intersects the y -axis, or a point where $x = 0$. Substituting 0 for x in the equation defining function f yields $f(0) = a(2.2^0 + 2.2^b)$, or $f(0) = a(1 + 2.2^b)$. So, the y -coordinate of the y -intercept of the graph is $a(1 + 2.2^b)$, or equivalently, $a + a(2.2)^b$. It's given that function g is equivalent to function f , where $0 < a < b$. It follows that $k = 2.2^b$. Since $a(2.2)^b$ can't be equal to 0, the coefficient a can't be equal to $a + a(2.2)^b$. Since $0 < a$, the constant k , which is equal to 2.2^b , can't be equal to $a + a(2.2)^b$. Therefore, function g doesn't display the y -coordinate of the y -intercept of the graph of $y = f(x)$ in the xy -plane as a constant or coefficient. It's also given that function h is equivalent to function f , where $0 < a < b$. The equation defining f can be rewritten as $f(x) = a(2.2)^x + a(2.2)^b$. It follows that $m = a(2.2)^b$. Since $a(2.2)^b$ can't be equal to 0, the coefficient a can't be equal to $a + a(2.2)^b$. Since $0 < a$, the constant m , which is equal to $a(2.2)^b$, can't be equal to $a + a(2.2)^b$. Therefore, function h doesn't display the y -coordinate of the y -intercept of the graph of $y = f(x)$ in the xy -plane as a constant or coefficient. Thus, neither function g nor function h displays the y -coordinate of the y -intercept of the graph of $y = f(x)$ in the xy -plane as a constant or coefficient.

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 50. An equation of the form $ax^2 + bx + c = 0$, where a , b , and c are constants, has no real solutions if and only if its discriminant, $b^2 - 4ac$, is negative. Applying the distributive property to the left-hand side of the equation $x(kx - 56) = -16$ yields $kx^2 - 56x = -16$. Adding 16 to each side of this equation yields $kx^2 - 56x + 16 = 0$. Substituting k for a , -56 for b , and 16 for c in $b^2 - 4ac$ yields a discriminant of $(-56)^2 - 4(k)(16)$, or $3,136 - 64k$. If the given equation has no real solution, it follows that the value of $3,136 - 64k$ must be negative. Therefore, $3,136 - 64k < 0$. Adding $64k$ to both sides of this inequality yields $3,136 < 64k$. Dividing both sides of this inequality by 64 yields $49 < k$, or $k > 49$. Since it's given that k is an integer, the least possible value of k is 50.