

Math

Module 1

(27 questions)

QUESTION 1

Choice B is correct. Subtracting 12 from both sides of the given equation yields $k = 324$. Therefore, the solution to the given equation is 324.

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 2

Choice C is correct. The value of $f(2)$ is the value of $f(x)$ when $x = 2$.

Substituting 2 for x in the given function yields $f(2) = (2)^3 + 15$, or $f(2) = 8 + 15$, which is equivalent to $f(2) = 23$. Therefore, the value of $f(2)$ is 23.

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

Choice B is incorrect. This is the value of $f(2)$ when $f(x) = x(3) + 15$, rather than $f(x) = x^3 + 15$. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 3

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 4

Choice D is correct. The sum of consecutive interior angles between two parallel lines and on the same side of the transversal is 180 degrees. Since it's given that line m is parallel to line n , it follows that $x + 26 = 180$. Subtracting 26 from both sides of this equation yields 154. Therefore, the value of x is 154.

Choice A is incorrect. This is half of the given angle measure. *Choice B* is incorrect. This is the value of the given angle measure. *Choice C* is incorrect. This is twice the value of the given angle measure.

QUESTION 5

Choice C is correct. It's given that John made a \$16 payment each month for p months. The total amount of these payments can be represented by the expression $16p$. The down payment can be added to that amount to find the total amount John paid, yielding the expression $16p + 37$. It's given that John paid a total of \$165. Therefore, the expression for the total amount John paid can be set equal to that amount, yielding the equation $16p + 37 = 165$.

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 6

The correct answer is 50. Substituting 8 for x in the given equation yields $y = 5(8) + 10$, or $y = 50$. Therefore, the value of y is 50 when $x = 8$.

QUESTION 7

The correct answer is 40. The height of each bar in the bar graph shown represents the number of cans collected by the group specified at the bottom of the bar. The bar for group 6 reaches a height of 40. Therefore, group 6 collected 40 cans.

QUESTION 8

Choice C is correct. If one of these students is selected at random, the probability of selecting a student whose vote for the new mascot was for a lion is given by the number of votes for a lion divided by the total number of votes. The given table indicates that the number of votes for a lion is 20 votes, and the total number of votes is 80 votes. The table gives the distribution of votes for 80 students, and the table shows a total of 80 votes were counted. It follows that each of the 80 students voted exactly once. Thus, the probability of selecting a student whose vote for the new mascot was for a lion is $\frac{20}{80}$, or $\frac{1}{4}$.

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

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

Choice D is incorrect and may result from conceptual or computational errors.

QUESTION 9

Choice A is correct. It's given that the electrician charges a onetime fee plus an hourly rate. It's also given that the graph represents the total charge, in dollars, for x hours of work. This graph shows a linear relationship in the xy -plane. Thus, the total charge y , in dollars, for x hours of work can be represented as $y = mx + b$, where m is the slope and $(0, b)$ is the y -intercept of the graph of the equation in the xy -plane. Since the given graph represents the total charge, in dollars, by an electrician for x hours of work, it follows that its slope is m , or the electrician's hourly rate.

Choice B is incorrect. The electrician's onetime fee is represented by the y -coordinate of the y -intercept, not the slope, of the graph. **Choice C** is incorrect and may result from conceptual errors. **Choice D** is incorrect and may result from conceptual errors.

QUESTION 10

Choice D is correct. The perimeter, P , of a square can be found using the formula $P = 4s$, where s is the length of each side of the square. It's given that square X has a side length of 12 centimeters. Substituting 12 for s in the formula for the perimeter of a square yields $P = 4(12)$, or $P = 48$. Therefore, the perimeter of square X is 48 centimeters. It's also given that the perimeter of square Y is 2 times the perimeter of square X. Therefore, the perimeter of square Y is $2(48)$, or 96, centimeters. Substituting 96 for P in the formula $P = 4s$ gives $96 = 4s$. Dividing both sides of this equation by 4 gives $24 = s$. Therefore, the length of one side of square Y is 24 centimeters.

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 B is correct. The equation of a line in the xy -plane can be written in slope-intercept form $y = mx + b$, where m is the slope of the line and $(0, b)$ is its y -intercept. It's given that the line passes through the point $(0, 5)$. Therefore, $b = 5$. It's also given that the line is parallel to the graph of $y = 7x + 4$, which means the line has the same slope as the graph of $y = 7x + 4$. The slope of the graph of $y = 7x + 4$ is 7. Therefore, $m = 7$. Substituting 7 for m and 5 for b in the equation $y = mx + b$ yields $y = 7x + 5$.

Choice A is incorrect. The graph of this equation passes through the point $(0, 0)$, not $(0, 5)$, and has a slope of 5, not 7. **Choice C** is incorrect. The graph of this equation passes through the point $(0, 0)$, not $(0, 5)$. **Choice D** is incorrect. The graph of this equation passes through the point $(0, 7)$, not $(0, 5)$, and has a slope of 5, not 7.

QUESTION 12

Choice A is correct. An equation defining a linear function can be written in the form $h(x) = ax + b$, where a and b are constants. It's given that $h(0) = 41$. Substituting 0 for x and 41 for $h(x)$ in the equation $h(x) = ax + b$ yields $41 = a(0) + b$, or $b = 41$. Substituting 41 for b in the equation $h(x) = ax + b$ yields $h(x) = ax + 41$. It's also given that $h(1) = 40$. Substituting 1 for x and 40 for $h(x)$ in the equation $h(x) = ax + 41$ yields $40 = a(1) + 41$, or $40 = a + 41$. Subtracting 41 from the left- and right-hand sides of this equation yields $-1 = a$. Substituting -1 for a in the equation $h(x) = ax + 41$ yields $h(x) = -1x + 41$, or $h(x) = -x + 41$.

Choice B is incorrect. Substituting 0 for x and 41 for $h(x)$ in this equation yields $41 = -0$, which isn't a true statement. **Choice C** is incorrect. Substituting 0 for x and 41 for $h(x)$ in this equation yields $41 = -41(0)$, or $41 = 0$, which isn't a true statement. **Choice D** is incorrect. Substituting 41 for $h(x)$ in this equation yields $41 = -41$, which isn't a true statement.

QUESTION 13

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 14

The correct answer is 76. It's given that the graph of $y = g(x)$ is the result of translating the graph of $y = f(x)$ up 4 units in the xy -plane. It follows that the graph of $y = g(x)$ is the same as the graph of $y = f(x) + 4$. Substituting $g(x)$ for y in the equation $y = f(x) + 4$ yields $g(x) = f(x) + 4$. It's given that $f(x) = (x - 6)(x - 2)(x + 6)$. Substituting $(x - 6)(x - 2)(x + 6)$ for $f(x)$ in the equation $g(x) = f(x) + 4$ yields $g(x) = (x - 6)(x - 2)(x + 6) + 4$. Substituting 0 for x in this equation yields $g(0) = (0 - 6)(0 - 2)(0 + 6) + 4$, or $g(0) = 76$. Thus, the value of $g(0)$ is 76.

QUESTION 15

Choice D is correct. It's given that the candle starts with 17 ounces of wax and has 6 ounces of wax remaining after a period of time has passed. The amount of wax the candle has lost during the time period can be found by subtracting the

remaining amount of wax from the amount of wax the candle was made of, which yields $17 - 6$ ounces, or 11 ounces. This means the candle loses 11 ounces of wax during that period of time. It's given that the amount of wax decreases by 1 ounce every 4 hours. If h represents the number of hours the candle has been burning, it follows that $\frac{1}{4} = \frac{11}{h}$. Multiplying both sides of this equation by $4h$ yields $h = 44$. Therefore, the candle has been burning for 44 hours.

Choice A is incorrect and may result from using the equation $\frac{1}{4} = \frac{h}{11}$ rather than $\frac{1}{4} = \frac{11}{h}$ to represent the situation, and then rounding to the nearest whole number. *Choice B* is incorrect. This is the amount of wax, in ounces, remaining in the candle, not the number of hours it has been burning. *Choice C* is incorrect and may result from using the equation $\frac{1}{4} = \frac{6}{h}$ rather than $\frac{1}{4} = \frac{11}{h}$ to represent the situation.

QUESTION 16

Choice A is correct. Subtracting $14j$ from each side of the given equation results in $5k = m - 14j$. Dividing each side of this equation by 5 results in $k = \frac{m-14j}{5}$.

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 17

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 18

Choice B is correct. Let x be the first integer and let y be the second integer. If the first integer is 11 greater than twice the second integer, then $x = 2y + 11$. If the product of the two integers is 546, then $xy = 546$. Substituting $2y + 11$ for x in this equation results in $(2y + 11)y = 546$. Distributing the y to both terms in the parentheses results in $2y^2 + 11y = 546$. Subtracting 546 from both sides of this equation results in $2y^2 + 11y - 546 = 0$. The left-hand side of this equation can be factored by finding two values whose product is $2(-546)$, or $-1,092$, and whose sum is 11. The two values whose product is $-1,092$ and whose sum is 11 are 39 and -28 . Thus, the equation $2y^2 + 11y - 546 = 0$ can be rewritten as

$2y^2 + 28y - 39y - 546 = 0$, which is equivalent to $2y(y - 14) + 39(y - 14) = 0$, or $(2y + 39)(y - 14) = 0$. By the zero product property, it follows that $2y + 39 = 0$ and $y - 14 = 0$. Subtracting 39 from both sides of the equation $2y + 39 = 0$ yields $2y = -39$. Dividing both sides of this equation by 2 yields $y = -\frac{39}{2}$. Since y is a positive integer, the value of y is not $-\frac{39}{2}$. Adding 14 to both sides of the equation $y - 14 = 0$ yields $y = 14$. Substituting 14 for y in the equation $xy = 546$ yields $x(14) = 546$. Dividing both sides of this equation by 14 results in $x = 39$. Therefore, the two integers are 14 and 39, so the smaller of the two integers is 14.

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

Choice C is incorrect. This is the larger of the two integers. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 19

Choice D is correct. A point (x, y) is a solution to a system of inequalities in the xy -plane if substituting the x -coordinate and the y -coordinate of the point for x and y , respectively, in each inequality makes both of the inequalities true. Substituting the x -coordinate and the y -coordinate of choice D, 14 and 0, for x and y , respectively, in the first inequality in the given system, $y \leq x + 7$, yields $0 \leq 14 + 7$, or $0 \leq 21$, which is true. Substituting 14 for x and 0 for y in the second inequality in the given system, $y \geq -2x - 1$, yields $0 \geq -2(14) - 1$, or $0 \geq -29$, which is true. Therefore, the point $(14, 0)$ is a solution to the given system of inequalities in the xy -plane.

Choice A is incorrect. Substituting -14 for x and 0 for y in the inequality $y \leq x + 7$ yields $0 \leq -14 + 7$, or $0 \leq -7$, which is not true. *Choice B* is incorrect. Substituting 0 for x and -14 for y in the inequality $y \geq -2x - 1$ yields $-14 \geq -2(0) - 1$, or $-14 \geq -1$, which is not true. *Choice C* is incorrect. Substituting 0 for x and 14 for y in the inequality $y \leq x + 7$ yields $14 \leq 0 + 7$, or $14 \leq 7$, which is not true.

QUESTION 20

The correct answer is -3 . Squaring both sides of the given equation yields $(x - 2)^2 = 3x + 34$, which can be rewritten as $x^2 - 4x + 4 = 3x + 34$. Subtracting $3x$ and 34 from both sides of this equation yields $x^2 - 7x - 30 = 0$. This quadratic equation can be rewritten as $(x - 10)(x + 3) = 0$. According to the zero product property, $(x - 10)(x + 3)$ equals zero when either $x - 10 = 0$ or $x + 3 = 0$. Solving each of these equations for x yields $x = 10$ or $x = -3$. Therefore, the given equation has two solutions, 10 and -3 . Of these two solutions, -3 is the smallest solution to the given equation.

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 $\frac{9}{5}$ are examples of ways to enter a correct answer.

QUESTION 22

Choice A is correct. It's given that the sample is in the shape of a cube with edge lengths of 0.9 meters. Therefore, the volume of the sample is 0.90^3 , or 0.729, cubic meters. It's also given that the sample has a density of 807 kilograms per 1 cubic meter. Therefore, the mass of this sample is 0.729 cubic meters $\left(\frac{807 \text{ kilograms}}{1 \text{ cubic meter}}\right)$, or 588.303 kilograms. Rounding this mass to the nearest whole number gives 588 kilograms. Therefore, to the nearest whole number, the mass, in kilograms, of this sample is 588.

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 D is correct. It's given that for $x > 0$, $f(x)$ is equal to 201% of x . This is equivalent to $f(x) = \frac{201}{100}x$, or $f(x) = 2.01x$, for $x > 0$. This function indicates that as x increases, $f(x)$ also increases, which means f is an increasing function. Furthermore, $f(x)$ increases at a constant rate of 2.01 for each increase of x by 1. A function with a constant rate of change is linear. Thus, the function f can be described as an increasing linear function.

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 could describe the function $f(x) = (2.01)^x$, where $f(x)$ is equal to 201% of $f(x-1)$, not x , for $x > 0$.

QUESTION 24

Choice C is correct. It's given that $f(x) = \frac{a}{x+b}$ and that the graph shown is a partial graph of $y = f(x)$. Substituting y for $f(x)$ in the equation $f(x) = \frac{a}{x+b}$ yields $y = \frac{a}{x+b}$. The graph passes through the point $(-7, -2)$. Substituting -7 for x and -2 for y in the equation $y = \frac{a}{x+b}$ yields $-2 = \frac{a}{-7+b}$. Multiplying each side of this equation by $-7+b$ yields $-2(-7+b) = a$, or $14 - 2b = a$. The graph also passes through the point $(-5, -6)$. Substituting -5 for x and -6 for y in the equation $y = \frac{a}{x+b}$ yields $-6 = \frac{a}{-5+b}$. Multiplying each side of this equation by

$-5 + b$ yields $-6(-5 + b) = a$, or $30 - 6b = a$. Substituting $14 - 2b$ for a in this equation yields $30 - 6b = 14 - 2b$. Adding $6b$ to each side of this equation yields $30 = 14 + 4b$. Subtracting 14 from each side of this equation yields $16 = 4b$.

Dividing each side of this equation by 4 yields $4 = b$. Substituting 4 for b in the equation $14 - 2b = a$ yields $14 - 2(4) = a$, or $6 = a$. Substituting 6 for a and 4

for b in the equation $f(x) = \frac{a}{x+b}$ yields $f(x) = \frac{6}{x+4}$. It's given that $g(x) = f(x+4)$.

Substituting $x+4$ for x in the equation $f(x) = \frac{6}{x+4}$ yields $f(x+4) = \frac{6}{x+4+4}$,

which is equivalent to $f(x+4) = \frac{6}{x+8}$. It follows that $g(x) = \frac{6}{x+8}$.

Choice A is incorrect. This could define function g if $g(x) = f(x-4)$. *Choice B* is incorrect. This could define function g if $g(x) = f(x)$. *Choice D* is incorrect. This could define function g if $g(x) = f(x) \cdot (x+4)$.

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 B is correct. It's given that 483 out of 803 voters responded that they would vote for Angel Cruz. Therefore, the proportion of voters from the poll who responded they would vote for Angel Cruz is $\frac{483}{803}$. It's also given that there are a total of 6,424 voters in the election. Therefore, the total number of people who would be expected to vote for Angel Cruz is $6,424\left(\frac{483}{803}\right)$, or 3,864. Since 3,864 of the 6,424 total voters would be expected to vote for Angel Cruz, it follows that $6,424 - 3,864$, or 2,560 voters would be expected not to vote for Angel Cruz. The difference in the number of votes for and against Angel Cruz is $3,864 - 2,560$, or 1,304 votes. Therefore, if 6,424 people vote in the election, Angel Cruz would be expected to win by 1,304 votes.

Choice A is incorrect. This is the difference in the number of voters from the poll who responded that they would vote for and against Angel Cruz. *Choice C* is incorrect. This is the total number of people who would be expected to vote for Angel Cruz. *Choice D* is incorrect. This is the difference between the total number of people who vote in the election and the number of voters from the poll.

QUESTION 27

The correct answer is 10. It's given that the graph of $x^2 + x + y^2 + y = \frac{199}{2}$ in the xy -plane is a circle. The equation of a circle in the xy -plane can be written in the form $(x - h)^2 + (y - k)^2 = r^2$, where the coordinates of the center of the circle are (h, k) and the length of the radius of the circle is r . The term $(x - h)^2$ in this equation can be obtained by adding the square of half the coefficient of x to both sides of the given equation to complete the square. The coefficient of x is 1. Half the coefficient of x is $\frac{1}{2}$. The square of half the coefficient of x is $\frac{1}{4}$.

Adding $\frac{1}{4}$ to each side of $(x^2 + x) + (y^2 + y) = \frac{199}{2}$ yields

$(x^2 + x + \frac{1}{4}) + (y^2 + y) = \frac{199}{2} + \frac{1}{4}$, or $(x + \frac{1}{2})^2 + (y^2 + y) = \frac{199}{2} + \frac{1}{4}$. Similarly, the term $(y - k)^2$ can be obtained by adding the square of half the coefficient of y to both

sides of this equation, which yields $(x + \frac{1}{2})^2 + (y^2 + y + \frac{1}{4}) = \frac{199}{2} + \frac{1}{4} + \frac{1}{4}$, or

$(x + \frac{1}{2})^2 + (y + \frac{1}{2})^2 = \frac{199}{2} + \frac{1}{4} + \frac{1}{4}$. This equation is equivalent to

$(x + \frac{1}{2})^2 + (y + \frac{1}{2})^2 = 100$, or $(x + \frac{1}{2})^2 + (y + \frac{1}{2})^2 = 10^2$. Therefore, the length of the circle's radius is 10.