

Math

Module 1 (27 questions)

QUESTION 1

Choice B is correct. If a point (x, y) lies on both lines in the graph of a system of two linear equations, the ordered pair (x, y) is a solution to the system. The graph shown is the graph of a system of two linear equations, where the two lines in the graph intersect at the point $(3, 4)$. Therefore, the point $(3, 4)$ lies on both lines, so the ordered pair $(3, 4)$ is the solution to the system.

Choice A is incorrect. The point $(2, 3)$ lies on one, not both, of the lines in the graph shown. *Choice C* is incorrect. The point $(4, 5)$ lies on one, not both, of the lines in the graph shown. *Choice D* is incorrect. The point $(5, 6)$ lies on one, not both, of the lines in the graph shown.

QUESTION 2

Choice C is correct. It's given that x represents years after 2010. Therefore, 2010 is represented by $x = 0$. On the model shown, the point with an x -coordinate of 0 has a y -coordinate of 20,000. Thus, the model estimates that in 2010, the city had 20,000 residents.

Choice A is incorrect. This is the value of x that represents the year 2010.

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

Choice D is incorrect. This is approximately the number of residents the model estimates the city had in 2014, not 2010.

QUESTION 3

Choice B is correct. It's given that the bar graph shows the number of each type of monkey in a sanctuary. The bar representing the number of mandrills has a height of 5; therefore, there are 5 mandrills in the sanctuary. The bar representing vervets has a height of 11; therefore, there are 11 vervets in the sanctuary. Therefore, there are $11 - 5$, or 6, more vervets in this sanctuary than mandrills.

Choice A is incorrect. This is the number of vervets in the sanctuary. *Choice C* is incorrect. This is the number of mandrills in the sanctuary. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 4

Choice A is correct. Applying the distributive property on the left-hand side of the given equation yields $3x + 5x + 20 = 76$, or $8x + 20 = 76$. Subtracting 20 from each side of this equation yields $8x = 56$. Dividing each side of this equation by 8 yields $x = 7$.

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

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

Choice D is incorrect. This is the solution to the equation $x + 4 = 76$, not $3x + 5(x + 4) = 76$.

QUESTION 5

Choice A is correct. It's given that $f(x) = \frac{16}{x}$. Substituting 17 for x in this function yields $f(17) = \frac{16}{17}$. Therefore, when $x = 17$, the value of $f(x)$ is $\frac{16}{17}$.

Choice B is incorrect. This is the value of the reciprocal of $f(x)$ when $x = 17$.

Choice C is incorrect. This is the value of $f(x)$ when $x = 1$. *Choice D* is incorrect. This is the value of x when $x = 17$.

QUESTION 6

The correct answer is 3. It's given that the y -intercept of the graph shown is $(0, y)$. The graph passes through the point $(0, 3)$. Therefore, the value of y is 3.

QUESTION 7

The correct answer is 5. Let p represent the number of packages of dinner rolls that should be bought for the party. It's given that dinner rolls are sold in packages of 12. Therefore, $12p$ represents the number of dinner rolls that should be bought for the party. It's also given that 50 dinner rolls are needed; therefore, $12p \geq 50$.

Dividing both sides of this inequality by 12 yields $p \geq \frac{50}{12}$, or approximately $p \geq 4.17$. Since the number of packages of dinner rolls must be a whole number, the minimum number of packages that should be bought for the party is 5.

QUESTION 8

Choice D is correct. Let x represent the number that 21 is 21% of. It follows that

$\frac{21}{x} = \frac{21}{100}$. Multiplying each side of this equation by x yields $21 = \frac{21x}{100}$. Multiplying each side of this equation by 100 yields $2,100 = 21x$. Dividing each side of this equation by 21 yields $100 = x$. Therefore, 21 is 21% of 100.

Choice A is incorrect. 21% of 0 is 0, not 21. *Choice B* is incorrect. 21% of 1 is 0.21, not 21. *Choice C* is incorrect. 21% of 42 is 8.82, not 21.

QUESTION 9

Choice C is correct. It's given that the technician charges \$60 per hour for labor. Therefore, if the job takes x hours, the technician will charge $\left(\frac{\$60}{1 \text{ hour}}\right)(x \text{ hours})$, or $\$60x$, for labor. It's also given that the technician charges \$120 for parts. Therefore, $f(x) = 60x + 120$ represents the total amount, in dollars, the technician will charge for this job if it takes x hours.

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

Choice B is incorrect. This function represents the total amount, in dollars, the technician charges for labor only, not the total amount charged for labor and parts. *Choice D* is incorrect. This function represents the total amount, in dollars, the technician would charge if the charge for parts were subtracted from, rather than added to, the charge for labor.

QUESTION 10

Choice B is correct. It's given that function f is defined by $f(x) = 80 - 6x$. The value of $f(7)$ can be found by substituting 7 for x in the given function, which yields $f(7) = 80 - 6(7)$, or $f(7) = 80 - 42$, which is equivalent to $f(7) = 38$. Therefore, the value of $f(7)$ is 38.

Choice A is incorrect. This is the value of $80 - 67$, not $80 - 6(7)$. *Choice C* is incorrect. This is the value of $80 - 6(1)$, not $80 - 6(7)$. *Choice D* is incorrect. This is the value of $80 - 6 + 7$, not $80 - 6(7)$.

QUESTION 11

Choice A is correct. Let x represent the number of rabbit snails that Naomi bought. It's given that each rabbit snail costs \$8. Therefore, the total cost, in dollars, of the rabbit snails that Naomi bought can be represented by the expression $8x$. It's also given that each nerite snail costs \$6, and that Naomi bought 2 nerite snails. Therefore, the total cost, in dollars, of the nerite snails that Naomi bought is $6(2)$, or 12. Since Naomi bought both the rabbit snails and the nerite snails for a total of \$52, the equation $8x + 12 = 52$ can be used to represent the situation. Subtracting 12 from both sides of this equation yields $8x = 40$. Dividing both sides of this equation by 8 yields $x = 5$. Therefore, Naomi bought 5 rabbit snails.

Choice B is incorrect. This is the total cost, in dollars, of the nerite snails that Naomi bought, not the number of rabbit snails. *Choice C* is incorrect. This is the cost, in dollars, of one rabbit snail and one nerite snail, not the number of rabbit snails that Naomi bought. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 12

Choice A is correct. The x -intercept of a graph is the point where the graph intersects the x -axis. The graph of function f , where $y = f(x)$, intersects the x -axis at $(-12, 0)$. Therefore, the x -intercept of the graph of f is $(-12, 0)$.

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 13

The correct answer is 1,800. The area, A , of a triangle can be found using the formula $A = \frac{1}{2}bh$, where b is the base length of the triangle and h is the height of the triangle. It's given that the triangle has a base length of 40 centimeters and a height of 90 centimeters. Substituting 40 for b and 90 for h in the formula $A = \frac{1}{2}bh$ yields $A = \frac{1}{2}(40)(90)$, or $A = 1,800$. Therefore, the area, in square centimeters, of the triangle is 1,800.

QUESTION 14

The correct answer is 14.1. It's given that a participant completes the bicycle race with an average speed of 24,816 yards per hour and $1 \text{ mile} = 1,760 \text{ yards}$. It follows that this average speed is equivalent to $\left(\frac{24,816 \text{ yards}}{1 \text{ hour}}\right)\left(\frac{1 \text{ mile}}{1,760 \text{ yards}}\right)$, which yields $\frac{14.1 \text{ miles}}{1 \text{ hour}}$, or 14.1 miles per hour.

QUESTION 15

Choice C is correct. For the graph shown, the x-axis represents temperature, in kelvins, and the y-axis represents volume, in liters. Therefore, the estimated volume, in liters, of the hydrogen when its temperature is 500 kelvins is represented by the y-coordinate of the point on the graph that has an x-coordinate of 500. The point on the graph with an x-coordinate of 500 has a y-coordinate of 7. Therefore, the estimated volume, in liters, of the hydrogen when its temperature is 500 kelvins is 7.

Choice A is incorrect and may result from conceptual errors. *Choice B* is incorrect and may result from conceptual errors. *Choice D* is incorrect and may result from conceptual errors.

QUESTION 16

Choice B is correct. Subtracting 34 from each side of the given equation yields $p = q + r - 34$. Thus, the equation $p = q + r - 34$ correctly expresses p in terms of q and r .

Choice A is incorrect. This equation can be rewritten as $p - 34 = q + r$. *Choice C* is incorrect. This equation can be rewritten as $p - 34 = -q - r$. *Choice D* is incorrect. This equation can be rewritten as $p + 34 = -q - r$.

QUESTION 17

Choice C is correct. The Pythagorean theorem states that for a right triangle, $a^2 + b^2 = c^2$, where a and b represent the lengths of the legs of the triangle and c represents the length of its hypotenuse. In the triangle shown, the legs have lengths of 3 and 7. Substituting 3 for a and 7 for b in the equation $a^2 + b^2 = c^2$

yields $3^2 + 7^2 = c^2$, which is equivalent to $9 + 49 = c^2$, or $58 = c^2$. Taking the positive square root of both sides of this equation yields $\sqrt{58} = c$. Thus, the value of c is approximately 7.6. Therefore, of the given choices, 7.6 is the closest to the length of the triangle's hypotenuse.

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 18

Choice D is correct. It's given that the number of coins in the collection increased from 9 to 90. It follows that the number of coins in the collection increased by $90 - 9$, or 81. Let $x\%$ represent the percentage that 81 is of 9. The value of x can be found using the proportion $\frac{81}{9} = \frac{x}{100}$, or $9 = \frac{x}{100}$. Multiplying both sides of this equation by 100 yields $900 = x$. Thus, when the number of coins in the collection increased from 9 to 90, the percent increase was 900%.

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 19

Choice C is correct. It's given that in triangle QRS , sides QR and RS each have a length of x centimeters. Therefore, the expression $2x$ represents the sum of the lengths, in centimeters, of sides QR and RS . It's also given that side SQ has a length of y centimeters. Therefore, the expression $2x + y$ represents the sum of the lengths, in centimeters, of sides QR , RS , and SQ . Since $2x + y$ is the sum of the lengths, in centimeters, of the three sides of the triangle and $2x + y = 37$, it follows that 37 is the sum of the lengths, in centimeters, of the three sides of the triangle.

Choice A is incorrect. The difference, in centimeters, between the lengths of sides QR and SQ is $x - y$, not 37. *Choice B* is incorrect. The difference, in centimeters, between the lengths of sides QR and RS is $x - x$, or 0, not 37. *Choice D* is incorrect. The length, in centimeters, of one of the two sides of equal length is x , not 37.

QUESTION 20

The correct answer is $\frac{5}{13}$. The graph of a line in the xy -plane can be represented by the equation $y = mx + b$, where m is the slope of the line and b is the y -coordinate of the y -intercept. The given equation can be written as $y = \left(\frac{5}{13}\right)x - 23$. Therefore, the slope of the graph of this equation in the xy -plane is $\frac{5}{13}$. Note that $5/13$, .3846, 0.385, and 0.384 are examples of ways to enter a correct answer.

QUESTION 21

The correct answer is 6.21. It's given that the samples of pumice were cut in the shape of a cube. It's also given that the length of the edge of one of these cubes is 3.000 centimeters. Therefore, the volume of this cube is $(3.000 \text{ centimeters})^3$, or 27 cubic centimeters. Since the density of this cube is 0.230 grams per cubic centimeter, it follows that the mass of this cube is $\left(\frac{0.230 \text{ grams}}{1 \text{ cubic centimeter}}\right)(27 \text{ cubic centimeters})$, or 6.21 grams.

QUESTION 22

Choice C is correct. A line in the xy -plane that passes through points (x_1, y_1) and (x_2, y_2) has a slope of $\frac{y_2 - y_1}{x_2 - x_1}$. The line of best fit shown passes approximately through the points $(0, 0.2)$ and $(5, 9.3)$. It follows that the slope of this line is approximately $\frac{9.3 - 0.2}{5 - 0}$, which is equivalent to $\frac{9.1}{5}$, or 1.82. Therefore, of the given choices, 1.8 is closest to the slope of the line of best fit shown.

Choice A is incorrect. This value is closest to the y -coordinate of the y -intercept of the line of best fit shown. **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 23

Choice A is correct. The perimeter of a rectangle is equal to the sum of 2 times its length and 2 times its width. It's given that the rectangle's length is 50 inches and the width is x inches. Therefore, the perimeter, in inches, is $2(50) + 2x$, or $100 + 2x$, which is equivalent to $2x + 100$. It's given that the perimeter is at most 210 inches; therefore, $2x + 100 \leq 210$ represents this situation.

Choice B is incorrect. This inequality represents a situation where the perimeter is at least, rather than at most, 210 inches. **Choice C** is incorrect. This inequality represents a situation where 2 times the length, rather than the length, is 50 inches. **Choice D** is incorrect. This inequality represents a situation where 2 times the length, rather than the length, is 50 inches, and the perimeter is at least, rather than at most, 210 inches.

QUESTION 24

Choice D is correct. Since $8x$ is a common factor of each term in the given expression, the expression can be rewritten as $8x(x^9 - x^8 + 11)$.

Choice A is incorrect. This expression is equivalent to $7x^{11} - 7x^{10} + 87x^2$. **Choice B** is incorrect. This expression is equivalent to $8^{10}x - 8^9x + 88x$. **Choice C** is incorrect. This expression is equivalent to $8x^{11} - 8x^{10} + 88x^2$.

QUESTION 25

Choice D is correct. Each of the tables gives the same three values of x : 1, 2, and 4. Substituting 1 for x in the given equation yields $\left(\frac{3}{5}\right)(1) + \frac{3}{4}y = 7$, or $\frac{3}{5} + \frac{3}{4}y = \frac{35}{5}$.

Subtracting $\frac{3}{5}$ from both sides of this equation yields $\frac{3}{4}y = \frac{32}{5}$. Multiplying both sides of this equation by $\frac{4}{3}$ yields $y = \frac{128}{15}$. Therefore, when $x = 1$, the corresponding value of y for the given equation is $\frac{128}{15}$. Substituting 2 for x in the given equation yields $(\frac{3}{5})(2) + \frac{3}{4}y = 7$, or $\frac{6}{5} + \frac{3}{4}y = \frac{35}{5}$. Subtracting $\frac{6}{5}$ from both sides of this equation yields $\frac{3}{4}y = \frac{29}{5}$. Multiplying both sides of this equation by $\frac{4}{3}$ yields $y = \frac{116}{15}$. Therefore, when $x = 2$, the corresponding value of y for the given equation is $\frac{116}{15}$. Substituting 4 for x in the given equation yields $(\frac{3}{5})(4) + \frac{3}{4}y = 7$, or $\frac{12}{5} + \frac{3}{4}y = \frac{35}{5}$. Subtracting $\frac{12}{5}$ from both sides of this equation yields $\frac{3}{4}y = \frac{23}{5}$. Multiplying both sides of this equation by $\frac{4}{3}$ yields $y = \frac{92}{15}$. Therefore, when $x = 4$, the corresponding value of y for the given equation is $\frac{92}{15}$. The table in choice D gives x -values of 1, 2, and 4 and corresponding y -values of $\frac{128}{15}$, $\frac{116}{15}$, and $\frac{92}{15}$, respectively. Therefore, the table in choice D gives three values of x and their corresponding values of y for the given equation.

Choice A is incorrect. This table gives three values of x and their corresponding values of y for the equation $\frac{3}{5}x + \frac{3}{4}y = 7$. *Choice B* is incorrect. This table gives three values of x and their corresponding values of y for the equation $\frac{3}{5}x + y = 10$. *Choice C* is incorrect. This table gives three values of x and their corresponding values of y for the equation $\frac{3}{5}x + \frac{3}{4}y = 8$.

QUESTION 26

Choice B is correct. The length of a segment in the xy -plane can be found using the distance formula, $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$, where (x_1, y_1) and (x_2, y_2) are the endpoints of the segment. The segment shown has endpoints at $(-6, 4)$ and $(3, 10)$. Substituting $(-6, 4)$ and $(3, 10)$ for (x_1, y_1) and (x_2, y_2) , respectively, in the distance formula yields $\sqrt{(3 - (-6))^2 + (10 - 4)^2}$, or $\sqrt{9^2 + 6^2}$, which is equivalent to $\sqrt{81 + 36}$, or $\sqrt{117}$. Let x represent the length, in units, of the other leg of this triangle. The area, A , of a right triangle can be calculated using the formula

$A = \frac{1}{2}bh$, where b and h are the lengths of the legs of the triangle. It's given that the area of the triangle is $36\sqrt{13}$ square units. Substituting $36\sqrt{13}$ for A , $\sqrt{117}$ for b , and x for h in the formula $A = \frac{1}{2}bh$ yields $36\sqrt{13} = \frac{1}{2}(\sqrt{117})(x)$. Multiplying both sides of this equation by 2 yields $72\sqrt{13} = x\sqrt{117}$. Dividing both sides of this equation by $\sqrt{117}$ yields $\frac{72\sqrt{13}}{\sqrt{117}} = x$. Multiplying the numerator and denominator on the left-hand side of this equation by $\sqrt{117}$ yields $\frac{72\sqrt{1,521}}{117} = x$, or $\frac{72(39)}{117} = x$, which is equivalent to $\frac{2,808}{117} = x$, or $24 = x$. Therefore, the length, in units, of the other leg of this triangle is 24.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. $3\sqrt{13}$ is equivalent to $\sqrt{117}$, which is the length, in units, of the line segment shown in the xy -plane, not the length, in units, of the other leg of the triangle. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 27

The correct answer is 31. Subtracting 7 from both sides of the equation

$x^2 + 6x + 7 = 0$ yields $x^2 + 6x = -7$. To complete the square, adding $\left(\frac{6}{2}\right)^2$, or 3^2 , to

both sides of this equation yields $x^2 + 6x + 3^2 = -7 + 3^2$, or $(x + 3)^2 = 2$. Taking

the square root of both sides of this equation yields $x + 3 = \pm\sqrt{2}$. Subtracting 3

from both sides of this equation yields $x = -3 \pm \sqrt{2}$. Therefore, the solutions r

and s to the equation $x^2 + 6x + 7 = 0$ are $-3 - \sqrt{2}$ and $-3 + \sqrt{2}$. Since $r < s$, it

follows that $r = -3 - \sqrt{2}$ and $s = -3 + \sqrt{2}$. Subtracting 8 from both sides of

the equation $x^2 + 8x + 8 = 0$ yields $x^2 + 8x = -8$. To complete the square, adding

$\left(\frac{8}{2}\right)^2$, or 4^2 , to both sides of this equation yields $x^2 + 8x + 4^2 = -8 + 4^2$, or

$(x + 4)^2 = 8$. Taking the square root of both sides of this equation yields

$x + 4 = \pm\sqrt{8}$, or $x + 4 = \pm 2\sqrt{2}$. Subtracting 4 from both sides of this equation

yields $x = -4 \pm 2\sqrt{2}$. Therefore, the solutions t and u to the equation

$x^2 + 8x + 8 = 0$ are $-4 - 2\sqrt{2}$ and $-4 + 2\sqrt{2}$. Since $t < u$, it follows that

$t = -4 - 2\sqrt{2}$ and $u = -4 + 2\sqrt{2}$. It's given that the solutions to $x^2 + 14x + c = 0$,

where c is a constant, are $r + t$ and $s + u$. It follows that this equation can

be written as $(x - (r + t))(x - (s + u)) = 0$, which is equivalent to

$x^2 - (r + t + s + u)x + (r + t)(s + u) = 0$. Therefore, the value of c is $(r + t)(s + u)$.

Substituting $-3 - \sqrt{2}$ for r , $-4 - 2\sqrt{2}$ for t , $-3 + \sqrt{2}$ for s , and $-4 + 2\sqrt{2}$ for u

in this equation yields $((-3 - \sqrt{2}) + (-4 - 2\sqrt{2}))((-3 + \sqrt{2}) + (-4 + 2\sqrt{2}))$,

which is equivalent to $(-7 - 3\sqrt{2})(-7 + 3\sqrt{2})$, or $(-7)(-7) - (3\sqrt{2})(3\sqrt{2})$, which

is equivalent to $49 - 18$, or 31. Therefore, the value of c is 31.