

Math

Module 1

(27 questions)

QUESTION 1

Choice B is correct. In the given scatterplot, the x -values represent the distance above sea level, in feet, and the y -values represent the temperature, in $^{\circ}\text{F}$. The point on the line of best fit with an x -value of 4,000 has a corresponding y -value of 35. Therefore, at a distance of 4,000 feet above sea level, the temperature predicted by the line of best fit is 35°F .

Choice A is incorrect. This is the temperature, in $^{\circ}\text{F}$, predicted by the line of best fit at a distance of 0 feet above sea level. **Choice C** is incorrect. This is the measured temperature, in $^{\circ}\text{F}$, at a distance of 6,000 feet above sea level. **Choice D** is incorrect and may result from conceptual or calculation errors.

QUESTION 2

Choice D is correct. It's given that rectangle P has an area of 72 square inches. If a rectangle with an area of 20 square inches is removed from rectangle P, the area, in square inches, of the resulting figure is $72 - 20$, or 52.

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 3

Choice B is correct. Subtracting 61 from each side of the given equation yields $|p| = 4$. By the definition of absolute value, if $|p| = 4$, then $p = 4$ or $p = -4$. Of the given choices, 4 is a solution to the given equation.

Choice A is incorrect. This is the quotient, not the difference, of 65 and 61.

Choice C is incorrect. This is the sum, not the difference, of 65 and 61. **Choice D** is incorrect and may result from conceptual or calculation errors.

QUESTION 4

Choice A is correct. It's given that p represents the number of pounds of strawberries Lorenzo purchased and Lorenzo paid \$1.90 per pound for the strawberries. It follows that the total amount, in dollars, Lorenzo paid for strawberries can be represented by $1.90p$. It's given that Lorenzo paid \$2 for the box of cereal. If Lorenzo paid a total of \$9.60 for the box of cereal and strawberries, it follows that the equation $1.90p + 2 = 9.60$ can be used to find p .

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 5

Choice D is correct. It's given that the bar graph summarizes the charge, in kilowatt-hours (kWh), a battery received each day for 15 days. The height of each bar in the bar graph shown represents the number of days the battery received the charge, in kWh, specified at the bottom of the bar. The bar for a charge of 0 kWh reaches a height of 6. Therefore, the battery received a charge of 0 kWh for 6 of these days.

Choice A is incorrect. This is the charge, in kWh, that the battery received, not the number of days the battery received this charge. **Choice B** is incorrect. This is the number of days the battery received a charge of either 8, 16, or 23 kWh. **Choice C** is incorrect. This is the number of days the battery received a charge of 11 kWh.

QUESTION 6

The correct answer is 9. It's given that the equation $y = px + r$ defines the line. In this equation, p represents the slope of the line and r represents the y -coordinate of the y -intercept of the line. It's given that the line has a slope of 9. Therefore, the value of p is 9.

QUESTION 7

The correct answer is either 14, -5 , or -4 . The x -intercepts of a graph in the xy -plane are the points at which the graph intersects the x -axis, or when the value of y is 0. Substituting 0 for y in the given equation yields $0 = 3(x - 14)(x + 5)(x + 4)$. Dividing both sides of this equation by 3 yields $0 = (x - 14)(x + 5)(x + 4)$. Applying the zero product property to this equation yields three equations: $x - 14 = 0$, $x + 5 = 0$, and $x + 4 = 0$. Adding 14 to both sides of the equation $x - 14 = 0$ yields $x = 14$, subtracting 5 from both sides of the equation $x + 5 = 0$ yields $x = -5$, and subtracting 4 from both sides of the equation $x + 4 = 0$ yields $x = -4$. Therefore, the x -coordinates of the x -intercepts of the graph of the given equation are 14, -5 , and -4 . Note that 14, -5 , and -4 are examples of ways to enter a correct answer.

QUESTION 8

Choice A is correct. It's given that the graph shown gives the estimated value y , in dollars, of a tablet as a function of the number of months since it was purchased, x . The y -intercept of a graph is the point at which the graph intersects the y -axis, or when x is 0. The graph shown intersects the y -axis at the point $(0, 225)$. It follows that 0 months after the tablet was purchased, or when the tablet was purchased, the estimated value of the tablet was 225 dollars. Therefore, the best interpretation of the y -intercept is that the estimated value of the tablet was \$225 when it was purchased.

Choice B is incorrect. The estimated value of the tablet 24 months after it was purchased was \$50, not \$225. **Choice C** is incorrect. The estimated value of the tablet had decreased by $\$225 - \$50$, or \$175, not \$225, in the 24 months after it was purchased. **Choice D** is incorrect and may result from conceptual errors.

QUESTION 9

Choice B is correct. It's given that triangles EFG and JKL are congruent such that angle E corresponds to angle J . Corresponding angles of congruent triangles are congruent, so angle E and angle J must be congruent. Therefore, if the measure of angle E is 45° , then the measure of angle J is also 45° .

Choice A is incorrect. This is the measure of angle K , not angle J . **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. It's given that the function f is defined by $f(x) = \frac{1}{2}(x + 6)$. Substituting 4 for x in the given function yields $f(4) = \frac{1}{2}(4 + 6)$, or $f(4) = 5$. Therefore, the value of $f(4)$ is 5.

Choice A is incorrect. This is the value of $2(4 + 6)$, not $\frac{1}{2}(4 + 6)$. **Choice B** is incorrect. This is the value of $2 + (4 + 6)$, not $\frac{1}{2}(4 + 6)$. **Choice C** is incorrect. This is the value of $4 + 6$, not $\frac{1}{2}(4 + 6)$.

QUESTION 11

Choice C is correct. The solution to a system of two equations corresponds to the point where the graphs of the equations intersect. The graphs of the linear function and the absolute value function shown intersect at a point with an x -coordinate between -4 and -3 and a y -coordinate between 4 and 5. Of the given choices, only $\left(-\frac{7}{2}, \frac{9}{2}\right)$ has an x -coordinate between -4 and -3 and a y -coordinate between 4 and 5.

Choice A is incorrect. This is the y -intercept of the graph of the linear function. **Choice B** is incorrect and may result from conceptual or calculation errors. **Choice D** is incorrect. This is the vertex of the graph of the absolute value function.

QUESTION 12

Choice D is correct. It's given that the system has infinitely many solutions. A system of two linear equations has infinitely many solutions when the two linear equations are equivalent. When one equation is a multiple of another equation, the two equations are equivalent. Multiplying each side of the given equation by 2 yields $2(y) = 2(6x + 3)$. Thus, $2(y) = 2(6x + 3)$ is equivalent to the given equation and could be the second equation in the system.

Choice A is incorrect. The system consisting of this equation and the given equation has one solution rather than infinitely many solutions. *Choice B* is incorrect. The system consisting of this equation and the given equation has one solution rather than infinitely many solutions. *Choice C* is incorrect. The system consisting of this equation and the given equation has no solutions rather than infinitely many solutions.

QUESTION 13

The correct answer is 294. Subtracting 18 from each side of the given equation yields $\frac{6}{7}p = 36$. Multiplying each side of this equation by $\frac{7}{6}$ yields $p = 42$.

Multiplying each side of this equation by 7 yields $7p = 294$. Therefore, the value of $7p$ is 294.

QUESTION 14

The correct answer is 3. It's given that $y = 9x + 12$. Substituting $9x + 12$ for y in the second equation in the system, $x + 7y = 20$, yields $x + 7(9x + 12) = 20$, which gives $x + 63x + 84 = 20$, or $64x + 84 = 20$. Subtracting 84 from each side of this equation yields $64x = -64$. Dividing each side of this equation by 64 yields $x = -1$. Substituting -1 for x in the first equation in the system, $y = 9x + 12$, yields $y = 9(-1) + 12$, or $y = 3$. Therefore, the value of y is 3.

QUESTION 15

Choice A is correct. For a circle in the xy -plane that has the equation $(x - h)^2 + (y - k)^2 = r^2$, where h , k , and r are constants, (h, k) is the center of the circle and the positive value of r is the radius of the circle. In the given equation, $h = 13$ and $r^2 = 64$. Taking the square root of each side of $r^2 = 64$ yields $r = \pm 8$. Therefore, the center of the circle is at $(13, k)$ and the radius is 8.

Choice B is incorrect. This gives the center and radius of a circle with equation $(x - k)^2 + (y - 13)^2 = 64$, not $(x - 13)^2 + (y - k)^2 = 64$. *Choice C* is incorrect. This gives the center and radius of a circle with equation $(x - k)^2 + (y - 13)^2 = 4,096$, not $(x - 13)^2 + (y - k)^2 = 64$. *Choice D* is incorrect. This gives the center and radius of a circle with equation $(x - 13)^2 + (y - k)^2 = 4,096$, not $(x - 13)^2 + (y - k)^2 = 64$.

QUESTION 16

Choice C is correct. It's given that the function f is defined by $f(x) = |x - 4x|$. It's also given that $f(5) - f(a) = -15$. Substituting 5 for x in the function $f(x) = |x - 4x|$ yields $f(5) = |5 - 4(5)|$ and substituting a for x in the function $f(x) = |x - 4x|$ yields $f(a) = |a - 4a|$. Therefore, $f(5) = 15$ and $f(a) = |-3a|$. Substituting 15 for $f(5)$ and $|-3a|$ for $f(a)$ in the equation $f(5) - f(a) = -15$ yields $15 - |-3a| = -15$. Subtracting 15 from both sides of this equation yields $-|-3a| = -30$. Dividing both sides of this equation by -1 yields $|-3a| = 30$. By the definition of absolute value, if $|-3a| = 30$, then $-3a = 30$ or $-3a = -30$. Dividing both sides of each of these equations by -3 yields $a = -10$ or $a = 10$, respectively. Thus, of the given choices, a value of a that satisfies $f(5) - f(a) = -15$ is 10.

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 17

Choice B is correct. Each of the given choices is an equation of the form $f(x) = a(b)^{x-k}$, where a , b , and k are constants. For an equation of this form, the coefficient, a , is equal to the value of the function when the exponent is equal to 0, or when $x = k$. It follows that in the equation $f(x) = 33(1.5)^x$, the coefficient, 33, is equal to the value of $f(0)$. Substituting 0 for x in this equation yields $f(0) = 33(1.5)^0$, which is equivalent to $f(0) = 33(1)$, or $f(0) = 33$. Thus, the value of c is 33 and the equation $f(x) = 33(1.5)^x$ shows the value of c as the coefficient.

Choice A is incorrect. This equation shows the value of $f(-1)$, not $f(0)$, as the coefficient. *Choice C* is incorrect. This equation shows the value of $f(1)$, not $f(0)$, as the coefficient. *Choice D* is incorrect. This equation shows the value of $f(2)$, not $f(0)$, as the coefficient.

QUESTION 18

Choice B is correct. It's given that t minutes after an initial observation, the number of bacteria in a population is $40,000(2)^{\frac{t}{790}}$. This expression consists of the initial number of bacteria, 40,000, multiplied by the expression $2^{\frac{t}{790}}$. The time, in minutes, it takes for the number of bacteria to double is the increase in the value of t that causes the expression $2^{\frac{t}{790}}$ to double. Since the base is 2, the expression $2^{\frac{t}{790}}$ will double when the exponent increases by 1. Since the exponent of this expression is $\frac{t}{790}$, the exponent will increase by 1 when t increases by 790. Therefore, the time, in minutes, it takes for the number of bacteria in the population to double is 790.

Alternate approach: The initial number of bacteria in the population can be found by substituting 0 for t in the given function. This yields $f(0) = 40,000(2)^{\frac{0}{790}}$, or $f(0) = 40,000$. Therefore, the initial number of bacteria present in the population is 40,000, so the bacteria population will have doubled when $f(t) = 80,000$.

Substituting 80,000 for $f(t)$ in the given function yields $80,000 = 40,000(2)^{\frac{t}{790}}$.

Dividing both sides of this equation by 40,000 yields $2 = 2^{\frac{t}{790}}$, or $2^1 = 2^{\frac{t}{790}}$. It follows that $1 = \frac{t}{790}$. Multiplying both sides of this equation by 790 yields $790 = t$.

Therefore, the time, in minutes, it takes for the number of bacteria in the population to double is 790.

Choice A is incorrect. This is the base of the exponent, not the time it takes for the number of bacteria in the population to double. *Choice C* is incorrect. This is the number of minutes it takes for the population to double twice. *Choice D* is incorrect. This is the number of bacteria that are initially observed, not the time it takes for the number of bacteria in the population to double.

QUESTION 19

Choice D is correct. Adding $\frac{2}{t}$ to each side of the given equation yields

$\frac{12}{n} = -\frac{2}{w} + \frac{2}{t}$. The fractions on the right side of this equation have a common denominator of tw ; therefore, the equation can be written as $\frac{12}{n} = \frac{2w}{tw} - \frac{2t}{tw}$, or $\frac{12}{n} = \frac{2w-2t}{tw}$, which is equivalent to $\frac{12}{n} = \frac{2(w-t)}{tw}$. Dividing each side of this equation by 2 yields $\frac{6}{n} = \frac{w-t}{tw}$. Since n , t , w , and $w-t$ are all positive quantities, taking the reciprocal of each side of the equation $\frac{6}{n} = \frac{w-t}{tw}$ yields an equivalent equation: $\frac{n}{6} = \frac{tw}{w-t}$. Multiplying each side of this equation by 6 yields $n = \frac{6tw}{w-t}$.

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. This is equivalent to $\frac{1}{n}$ rather than n .

QUESTION 20

The correct answer is 5. For the graph shown, x represents time, in minutes, and y represents temperature, in degrees Celsius ($^{\circ}\text{C}$). Therefore, the average rate of change, in $^{\circ}\text{C}$ per minute, of the recorded temperature of the air in the chamber between two x -values is the difference in the corresponding y -values divided by the difference in the x -values. The graph shows that at $x = 5$, the corresponding y -value is 14. The graph also shows that at $x = 7$, the corresponding y -value is 24. It follows that the average rate of change, in $^{\circ}\text{C}$ per minute, from $x = 5$ to $x = 7$ is $\frac{24-14}{7-5}$, which is equivalent to $\frac{10}{2}$, or 5.

QUESTION 21

The correct answer is 87. It's given that in August, the car dealer completed 15 more than 3 times the number of sales the car dealer completed in September. Let x represent the number of sales the car dealer completed in September. It follows that $3x + 15$ represents the number of sales the car dealer completed in August. It's also given that in August and September, the car dealer completed 363 sales. It follows that $x + (3x + 15) = 363$, or $4x + 15 = 363$. Subtracting 15 from each side of this equation yields $4x = 348$. Dividing each side of this equation by 4 yields $x = 87$. Therefore, the car dealer completed 87 sales in September.

QUESTION 22

Choice B is correct. Since it's given that P is the center of a circle with a radius of 9 inches, and that points Q and R lie on that circle, it follows that $\overline{PQ}$ and $\overline{RP}$ of triangle PQR each have a length of 9 inches. Let the length of $\overline{QR}$ be x inches. It follows that the perimeter of triangle PQR is $9 + 9 + x$ inches. Since it's given that the perimeter of triangle PQR is 31 inches, it follows that $9 + 9 + x = 31$, or $18 + x = 31$. Subtracting 18 from both sides of this equation gives $x = 13$. Therefore, the length, in inches, of $\overline{QR}$ is 13.

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 23

Choice A is correct. It's given that the four odd integers are consecutive, ordered from least to greatest, and that the first odd integer is represented by x . It follows that the second odd integer is represented by $x + 2$, the third odd integer is represented by $x + 4$, and the fourth odd integer is represented by $x + 6$. Therefore, the product of 12 and the fourth odd integer is represented by $12(x + 6)$, and 26 less than the sum of the first and third odd integers is represented by $x + (x + 4) - 26$. Since the product of 12 and the fourth odd integer is at most 26 less than the sum of the first and third odd integers, it follows that $12(x + 6) \leq x + (x + 4) - 26$.

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 24

Choice B is correct. The linear relationship between x and y can be represented by an equation of the form $y - y_1 = m(x - x_1)$, where m is the slope of the graph of the equation in the xy -plane and (x_1, y_1) is a point on the graph. The slope of a line can be found using two points on the line and the slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Each value of x and its corresponding value of y in the table can be represented by a point (x, y) . Substituting the points $(-s, 21)$ and $(s, 15)$ for (x_1, y_1) and (x_2, y_2) , respectively, in the slope formula yields $m = \frac{15 - 21}{s - (-s)}$, which gives $m = \frac{-6}{2s}$, or $m = -\frac{3}{s}$. Substituting $-\frac{3}{s}$ for m and the point $(s, 15)$ for (x_1, y_1) in the equation $y - y_1 = m(x - x_1)$ yields $y - 15 = -\frac{3}{s}(x - s)$. Distributing $-\frac{3}{s}$ on the right-hand side of this equation yields $y - 15 = -\frac{3x}{s} + 3$. Adding 15 to each side of this equation yields $y = -\frac{3x}{s} + 18$. Multiplying each side of this equation by s yields $sy = -3x + 18s$. Adding $3x$ to each side of this equation yields $3x + sy = 18s$. Therefore, the equation $3x + sy = 18s$ represents this relationship.

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 C is correct. The sine of an angle is equal to the cosine of its complementary angle. Since angles with measures 24° and 66° are complementary to each other, $\sin 24^\circ$ is equal to $\cos 66^\circ$ and $\sin 66^\circ$ is equal to $\cos 24^\circ$. Substituting $\cos 66^\circ$ for $\sin 24^\circ$ and $\cos 24^\circ$ for $\sin 66^\circ$ in the given expression yields $(\cos 66^\circ)(\cos 66^\circ) + (\cos 24^\circ)(\cos 24^\circ)$, or $(\cos 66^\circ)^2 + (\cos 24^\circ)^2$.

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 D is incorrect and may result from conceptual or calculation errors.

QUESTION 26

Choice A is correct. It's given that the cost of renting a carpet cleaner is \$52 for the first day and \$26 for each additional day. Therefore, the cost $C(d)$, in dollars, of renting the carpet cleaner for d days is the sum of the cost for the first day, \$52, and the cost for the additional $d - 1$ days, $\$26(d - 1)$. It follows that $C(d) = 52 + 26(d - 1)$, which is equivalent to $C(d) = 52 + 26d - 26$, or $C(d) = 26d + 26$.

Choice B is incorrect. This function gives the cost of renting a carpet cleaner for d days if the cost is \$78, not \$52, for the first day and \$26 for each additional day. **Choice C** is incorrect. This function gives the cost of renting a carpet cleaner for d days if the cost is \$26, not \$52, for the first day and \$52, not \$26, for each additional day. **Choice D** is incorrect. This function gives the cost of renting a carpet cleaner for d days if the cost is \$130, not \$52, for the first day and \$52, not \$26, for each additional day.

QUESTION 27

The correct answer is $-\frac{13}{2}$. The value of x for which $f(x)$ reaches its minimum can be found by rewriting the given equation in the form $f(x) = (x - h)^2 + k$, where $f(x)$ reaches its minimum, k , when the value of x is h . The given equation, $f(x) = (x - 2)(x + 15)$, can be rewritten as $f(x) = x^2 + 13x - 30$. By completing the square, this equation can be rewritten as $f(x) = \left(x^2 + 13x + \left(\frac{13}{2}\right)^2\right) - 30 - \left(\frac{13}{2}\right)^2$, which is equivalent to $f(x) = \left(x + \frac{13}{2}\right)^2 - \frac{289}{4}$, or $f(x) = \left(x - \left(-\frac{13}{2}\right)\right)^2 - \frac{289}{4}$. Therefore, $f(x)$ reaches its minimum when the value of x is $-\frac{13}{2}$. Note that $-13/2$ and -6.5 are examples of ways to enter a correct answer.

Alternate approach: The graph of $y = f(x)$ in the xy -plane is a parabola. The value of x for the vertex of a parabola is the x -value of the midpoint between the two x -intercepts of the parabola. Since it's given that $f(x) = (x - 2)(x + 15)$, it follows that the two x -intercepts of the graph of $y = f(x)$ in the xy -plane occur when $x = 2$ and $x = -15$, or at the points $(2, 0)$ and $(-15, 0)$. The midpoint between two points, (x_1, y_1) and (x_2, y_2) , is $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$. Therefore, the midpoint between $(2, 0)$ and $(-15, 0)$ is $\left(\frac{2 - 15}{2}, \frac{0 + 0}{2}\right)$, or $\left(-\frac{13}{2}, 0\right)$. It follows that $f(x)$ reaches its minimum when the value of x is $-\frac{13}{2}$. Note that $-13/2$ and -6.5 are examples of ways to enter a correct answer.