

Math

Module 1

(27 questions)

QUESTION 1

Choice C is correct. For the given line graph, the percent of cars for sale at a used car lot on a given day is represented on the vertical axis. The percent of cars for sale is the smallest when the height of the line graph is the lowest. The lowest height of the line graph occurs for cars with a model year of 2014.

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 2

Choice A is correct. The solution to this system of linear equations is represented by the point that lies on both lines shown, or the point of intersection of the two lines. According to the graph, the point of intersection occurs when $x = 4$ and $y = -5$, or at the point $(4, -5)$. Therefore, the solution (x, y) to the system is $(4, -5)$.

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 3

Choice D is correct. The cost of the rental fee depends on the number of hours the surfboard is rented. Multiplying t hours by 10 dollars per hour yields a rental fee of $10t$ dollars. The total cost of the rental consists of the rental fee plus the 25 dollar service fee, which yields a total cost of $25 + 10t$ dollars. Since the person intends to spend a maximum of 75 dollars to rent the surfboard, the total cost must be at most 75 dollars. Therefore, the inequality $25 + 10t \leq 75$ represents this situation.

Choice A is incorrect. This represents a situation where the rental fee, not the total cost, is at most 75 dollars. *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 4

Choice A is correct. When a graph is translated up 4 units, each point on the resulting graph is 4 units above the point on the original graph. In other words, the y -value of each point on the graph increases by 4. The graph shown passes through the points $(1, -1)$, $(2, -2)$, and $(3, -1)$. It follows that when the graph shown is translated up 4 units, the resulting graph will pass through the points $(1, -1 + 4)$, $(2, -2 + 4)$, and $(3, -1 + 4)$. These points are $(1, 3)$, $(2, 2)$, and $(3, 3)$, respectively. Of the given choices, only the graph in choice A passes through the points $(1, 3)$, $(2, 2)$, and $(3, 3)$.

Choice B is incorrect. This is the result of translating the graph down, rather than up, 4 units. *Choice C* is incorrect. This is the result of translating the graph left, rather than up, 4 units. *Choice D* is incorrect. This is the result of translating the graph right, rather than up, 4 units.

QUESTION 5

Choice D is correct. In the given equation, s is the speed, in miles per hour, of a certain car t seconds after it began to accelerate. Therefore, the speed of the car, in miles per hour, 5 seconds after it began to accelerate can be found by substituting 5 for t in the given equation, which yields $s = 40 + 3(5)$, or $s = 55$. Thus, the speed of the car 5 seconds after it began to accelerate is 55 miles per hour.

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 6

The correct answer is 77. It's given that the function f is defined by $f(x) = x^2 + x + 71$. Substituting 2 for x in function f yields $f(2) = (2)^2 + 2 + 71$, which is equivalent to $f(2) = 4 + 2 + 71$, or $f(2) = 77$. Therefore, the value of $f(2)$ is 77.

QUESTION 7

The correct answer is 25. The total cost of the party is found by adding the onetime fee of the venue to the cost per attendee times the number of attendees. Let x be the number of attendees. The expression $35 + 10.25x$ thus represents the total cost of the party. It's given that the budget is \$300, so this situation can be represented by the inequality $35 + 10.25x \leq 300$. Subtracting 35 from both sides of this inequality gives $10.25x \leq 265$. Dividing both sides of this inequality by 10.25 results in approximately $x \leq 25.854$. Since the question is stated in terms of attendees, rounding 25.854 down to the greatest whole number gives the greatest number of attendees possible, which is 25.

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 B is correct. It's given that triangle ABC is congruent to triangle DEF . Corresponding angles of congruent triangles are congruent and, therefore, have equal measure. It's given that angle A corresponds to angle D , and that the measure of angle A is 18° . It's also given that the measures of angles B and E are 90° . Since these angles have equal measure, they are corresponding angles. It follows that angle C corresponds to angle F . Let x° represent the measure of angle C . Since the sum of the measures of the interior angles of a triangle is 180° , it follows that $18^\circ + 90^\circ + x^\circ = 180^\circ$, or $108^\circ + x^\circ = 180^\circ$. Subtracting 108° from both sides of this equation yields $x^\circ = 72^\circ$. Therefore, the measure of angle C is 72° . Since angle C corresponds to angle F , it follows that the measure of angle F is also 72° .

Choice A is incorrect. This is the measure of angle D , not the measure of angle F .

Choice C is incorrect. This is the measure of angle E , not the measure of angle F .

Choice D is incorrect. This is the sum of the measures of angles E and F , not the measure of angle F .

QUESTION 10

Choice B is correct. Multiplying both sides of the given equation by 4 yields $(4)(4x + 2) = (4)(12)$, or $16x + 8 = 48$. Therefore, the value of $16x + 8$ is 48.

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 11

Choice B is correct. Applying the commutative property of multiplication, the expression $(m^4 q^4 z^{-1})(mq^5 z^3)$ can be rewritten as $(m^4 m)(q^4 q^5)(z^{-1} z^3)$. For positive values of x , $(x^a)(x^b) = x^{a+b}$. Therefore, the expression $(m^4 m)(q^4 q^5)(z^{-1} z^3)$ can be rewritten as $(m^{4+1})(q^{4+5})(z^{-1+3})$, or $m^5 q^9 z^2$.

Choice A is incorrect and may result from multiplying, not adding, the exponents.

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 12

Choice B is correct. It's given that the airplane descends at a constant rate of 400 feet per minute. Since the altitude decreases by a constant amount during each fixed time period, the relationship between the airplane's altitude and time is linear. Since the airplane descends from an altitude of 9,500 feet to 5,000 feet, the airplane's altitude is decreasing with time. Thus, the relationship is best modeled by a decreasing linear function.

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 13

The correct answer is 1. Subtracting the second equation from the first equation in the given system of equations yields $(3x - 3x) + (6 - 4) = 4y - 2y$, which is equivalent to $0 + 2 = 2y$, or $2 = 2y$. Dividing each side of this equation by 2 yields $1 = y$.

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 A is correct. The function f gives the area of the rectangle, in ft^2 , if its width is w ft. Since the value of $f(14)$ is the value of $f(w)$ if $w = 14$, it follows that $f(14) = 1,176$ means that $f(w)$ is 1,176 if $w = 14$. In the given context, this means that if the width of the rectangle is 14 ft, then the area of the rectangle is 1,176 ft^2 .

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 interpreting $f(w)$ as the width, in ft, of the rectangle if its area is $w \text{ ft}^2$, rather than as the area, in ft^2 , of the rectangle if its width is w ft.

QUESTION 16

Choice D is correct. Since the number of bacteria doubles every day, the relationship between t and y can be represented by an exponential equation of the form $y = a(b)^t$, where a is the number of bacteria at the start of the observation and the number of bacteria increases by a factor of b every day. It's given that there are 44,000 bacteria at the start of the observation. Therefore, $a = 44,000$. It's also given that the number of bacteria doubles, or increases by a factor of 2, every day. Therefore, $b = 2$. Substituting 44,000 for a and 2 for b in the equation $y = a(b)^t$ yields $y = 44,000(2)^t$.

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 equation represents a situation where the number of bacteria is decreasing by half, not doubling, every day.

QUESTION 17

Choice D is correct. The table shows an increasing exponential relationship between the number of years, x , since Hana started training in pole vault and the estimated height $h(x)$, in meters, of her best pole vault for that year. The relationship can be written as $h(x) = Ca^x$, where C and a are positive constants. It's given that when $x = 0$, $h(x) = 1.23$. Substituting 0 for x and 1.23 for $h(x)$ in $h(x) = Ca^x$ yields $1.23 = Ca^0$, or $1.23 = C$. Substituting 1.23 for C in $h(x) = Ca^x$ yields $h(x) = 1.23a^x$. It's also given that when $x = 2$, $h(x) = 1.54$. Substituting 2 for x and 1.54 for $h(x)$ in $h(x) = 1.23a^x$ yields $1.54 = 1.23a^2$. Dividing each side of this equation by 1.23 yields $\frac{1.54}{1.23} = \frac{1.23a^2}{1.23}$, or a^2 is approximately equal to 1.252. Since a is positive, a is approximately equal to $\sqrt{1.252}$, or 1.12. Substituting 1.12 for a in $h(x) = 1.23a^x$ yields $h(x) = 1.23(1.12)^x$.

Choice A is incorrect. When $x = 0$, the value of $h(x)$ in this function is equal to 1.12 rather than 1.23, and it is decreasing rather than increasing. *Choice B* is incorrect. When $x = 0$, the value of $h(x)$ in this function is equal to 1.12 rather than 1.23. *Choice C* is incorrect. This function is decreasing rather than increasing.

QUESTION 18

Choice A is correct. The x -intercept of a graph in the xy -plane is the point on the graph where $y = 0$. It's given that function h is defined by $h(x) = 4x + 28$. Therefore, the equation representing the graph of $y = h(x)$ is $y = 4x + 28$. Substituting 0 for y in the equation $y = 4x + 28$ yields $0 = 4x + 28$. Subtracting 28 from both sides of this equation yields $-28 = 4x$. Dividing both sides of this equation by 4 yields $-7 = x$. Therefore, the x -intercept of the graph of $y = h(x)$ in the xy -plane is $(-7, 0)$. It's given that the x -intercept of the graph of $y = h(x)$ is $(a, 0)$. Therefore, $a = -7$. The y -intercept of a graph in the xy -plane is the point on the graph where $x = 0$. Substituting 0 for x in the equation $y = 4x + 28$ yields $y = 4(0) + 28$, or $y = 28$. Therefore, the y -intercept of the graph of $y = h(x)$ in the xy -plane is $(0, 28)$. It's given that the y -intercept of the graph of $y = h(x)$ is $(0, b)$. Therefore, $b = 28$. If $a = -7$ and $b = 28$, then the value of $a + b$ is $-7 + 28$, or 21.

Choice B is incorrect. This is the value of b , not $a + b$. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect. This is the value of $-a + b$, not $a + b$.

QUESTION 19

Choice A is correct. Substituting 3 for x in the given inequality yields $y < 5(3) + 6$, or $y < 21$. Therefore, when $x = 3$, the corresponding value of y is less than 21. Substituting 5 for x in the given inequality yields $y < 5(5) + 6$, or $y < 31$. Therefore, when $x = 5$, the corresponding value of y is less than 31. Substituting 7 for x in

the given inequality yields $y < 5(7) + 6$, or $y < 41$. Therefore, when $x = 7$, the corresponding value of y is less than 41. For the table in choice A, when $x = 3$, the corresponding value of y is 17, which is less than 21; when $x = 5$, the corresponding value of y is 27, which is less than 31; and when $x = 7$, the corresponding value of y is 37, which is less than 41. Therefore, the table in choice A gives values of x and their corresponding values of y that are all solutions to the given inequality.

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 20

The correct answer is 35. The first equation in the given system of equations defines y as $4x + 1$. Substituting $4x + 1$ for y in the second equation in the given system of equations yields $4(4x + 1) = 15x - 8$. Applying the distributive property on the left-hand side of this equation yields $16x + 4 = 15x - 8$. Subtracting $15x$ from each side of this equation yields $x + 4 = -8$. Subtracting 4 from each side of this equation yields $x = -12$. Substituting -12 for x in the first equation of the given system of equations yields $y = 4(-12) + 1$, or $y = -47$. Substituting -12 for x and -47 for y into the expression $x - y$ yields $-12 - (-47)$, or 35.

QUESTION 21

The correct answer is 113. It's given that the legs of a right triangle have lengths 24 centimeters and 21 centimeters. In a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the two legs. It follows that if h represents the length, in centimeters, of the hypotenuse of the right triangle, $h^2 = 24^2 + 21^2$. This equation is equivalent to $h^2 = 1,017$. Taking the square root of each side of this equation yields $h = \sqrt{1,017}$. This equation can be rewritten as $h = \sqrt{9 \cdot 113}$, or $h = \sqrt{9} \cdot \sqrt{113}$. This equation is equivalent to $h = 3\sqrt{113}$. It's given that the length of the triangle's hypotenuse, in centimeters, can be written in the form $3\sqrt{d}$. It follows that the value of d is 113.

QUESTION 22

Choice A is correct. It's given that the length of each side of a scale model is $\frac{1}{10}$ times the length of the corresponding side of the actual floor of a ballroom. Therefore, the area of the scale model is $\left(\frac{1}{10}\right)^2$, or $\frac{1}{100}$, times the area of the actual floor of the ballroom. It's given that the area of the floor of the ballroom is 600 square meters. Therefore, the area, in square meters, of the scale model is $\left(\frac{1}{100}\right)(600)$, or 6.

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 C is correct. The graph of the equation $(x-h)^2 + (y-k)^2 = r^2$ in the xy -plane is a circle with center (h, k) and a radius of length r . The radius of a circle is the distance from the center of the circle to any point on the circle. If a circle in the xy -plane intersects the y -axis at exactly one point, then the perpendicular distance from the center of the circle to this point on the y -axis must be equal to the length of the circle's radius. It follows that the x -coordinate of the circle's center must be equivalent to the length of the circle's radius. In other words, if the graph of $(x-h)^2 + (y-k)^2 = r^2$ is a circle that intersects the y -axis at exactly one point, then $r=|h|$ must be true. The equation in choice C is $(x-4)^2 + (y-9)^2 = 16$, or $(x-4)^2 + (y-9)^2 = 4^2$. This equation is in the form $(x-h)^2 + (y-k)^2 = r^2$, where $h=4$, $k=9$, and $r=4$, and represents a circle in the xy -plane with center $(4, 9)$ and radius of length 4. Substituting 4 for r and 4 for h in the equation $r=|h|$ yields $4=|4|$, or $4=4$, which is true. Therefore, the equation in choice C represents a circle in the xy -plane that intersects the y -axis at exactly one point.

Choice A is incorrect. This is the equation of a circle that does not intersect the y -axis at any point. **Choice B** is incorrect. This is an equation of a circle that intersects the x -axis, not the y -axis, at exactly one point. **Choice D** is incorrect. This is the equation of a circle with the center located on the y -axis and thus intersects the y -axis at exactly two points, not exactly one point.

QUESTION 24

Choice C is correct. Since angles B and E each have the same measure and angles C and F each have the same measure, triangles ABC and DEF are similar, where side BC corresponds to side EF . To determine whether two similar triangles are congruent, it is sufficient to determine whether one pair of corresponding sides are congruent. Therefore, to determine whether triangles ABC and DEF are congruent, it is sufficient to determine whether sides BC and EF have equal length. Thus, the lengths of BC and EF are sufficient to determine whether triangle ABC is congruent to triangle DEF .

Choice A is incorrect and may result from conceptual errors. **Choice B** is incorrect and may result from conceptual errors. **Choice D** is incorrect. The given information is sufficient to determine that triangles ABC and DEF are similar, but not whether they are congruent.

QUESTION 25

Choice D is correct. It's given that the result of increasing the quantity x by 1,800% is 684. It follows that $x + \left(\frac{1,800}{100}\right)x = 684$, which is equivalent to $x + 18x = 684$, or $19x = 684$. Dividing each side of this equation by 19 yields $x = 36$. Therefore, the value of x is 36.

Choice A is incorrect. The result of increasing the quantity 12,996 by 1,800% is 246,924, not 684. **Choice B** is incorrect. The result of increasing the quantity 12,312 by 1,800% is 233,928, not 684. **Choice C** is incorrect. The result of increasing the quantity 38 by 1,800% is 722, not 684.

QUESTION 26

Choice A is correct. It's given that the window repair specialist charges \$220 for the first two hours of repair plus an hourly fee for each additional hour. Let n represent the hourly fee for each additional hour after the first two hours. Since it's given that x is the number of hours of repair, it follows that the charge generated by the hourly fee after the first two hours can be represented by the expression $n(x - 2)$. Therefore, the total cost, in dollars, for x hours of repair is $f(x) = 220 + n(x - 2)$. It's given that the total cost for 5 hours of repair is \$400. Substituting 5 for x and 400 for $f(x)$ into the equation $f(x) = 220 + n(x - 2)$ yields $400 = 220 + n(5 - 2)$, or $400 = 220 + 3n$. Subtracting 220 from both sides of this equation yields $180 = 3n$. Dividing both sides of this equation by 3 yields $n = 60$. Substituting 60 for n in the equation $f(x) = 220 + n(x - 2)$ yields $f(x) = 220 + 60(x - 2)$, which is equivalent to $f(x) = 220 + 60x - 120$, or $f(x) = 60x + 100$. Therefore, the total cost, in dollars, for x hours of repair is $f(x) = 60x + 100$.

Choice B is incorrect. This function represents the total cost, in dollars, for x hours of repair where the specialist charges \$340, rather than \$220, for the first two hours of repair. **Choice C** is incorrect. This function represents the total cost, in dollars, for x hours of repair where the specialist charges \$160, rather than \$220, for the first two hours of repair, and an hourly fee of \$80, rather than \$60, after the first two hours. **Choice D** is incorrect. This function represents the total cost, in dollars, for x hours of repair where the specialist charges \$380, rather than \$220, for the first two hours of repair, and an hourly fee of \$80, rather than \$60, after the first two hours.

QUESTION 27

The correct answer is $\frac{29}{3}$. Applying the distributive property to the left-hand side of the given equation, $x(x + 1) - 56$, yields $x^2 + x - 56$. Applying the distributive property to the right-hand side of the given equation, $4x(x - 7)$, yields $4x^2 - 28x$. Thus, the equation becomes $x^2 + x - 56 = 4x^2 - 28x$. Combining like terms on the left- and right-hand sides of this equation yields $0 = (4x^2 - x^2) + (-28x - x) + 56$, or $3x^2 - 29x + 56 = 0$. For a quadratic equation in the form $ax^2 + bx + c = 0$, where a , b , and c are constants, the quadratic formula gives the solutions to the equation in the form $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. Substituting 3 for a , -29 for b , and 56 for c from the equation $3x^2 - 29x + 56 = 0$ into the quadratic formula yields $x = \frac{(29 \pm \sqrt{(-29)^2 - 4(3)(56)})}{2(3)}$, or $x = \frac{29}{6} \pm \frac{13}{6}$. It follows that the solutions to the given equation are $\frac{29}{6} + \frac{13}{6}$ and $\frac{29}{6} - \frac{13}{6}$. Adding these two solutions gives the sum of the solutions: $\frac{29}{6} + \frac{13}{6} + \frac{29}{6} - \frac{13}{6}$, which is equivalent to $\frac{29}{6} + \frac{29}{6}$, or $\frac{29}{3}$. Note that $\frac{29}{3}$, 9.666, and 9.667 are examples of ways to enter a correct answer.