

Math

Module 1 (27 questions)

QUESTION 1

Choice C is correct. It's given that t represents the number of seconds after the bus passes the marker. Substituting 2 for t in the given equation $d = 30t$ yields $d = 30(2)$, or $d = 60$. Therefore, the bus will be 60 feet from the marker 2 seconds after passing it.

Choice A is incorrect. This is the distance, in feet, the bus will be from the marker 1 second, not 2 seconds, after passing it. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect. This is the distance, in feet, the bus will be from the marker 3 seconds, not 2 seconds, after passing it.

QUESTION 2

Choice C is correct. It's given that 29 out of every 100 beads that the machine produces have a defect. It follows that if the machine produces k beads, then the number of beads that have a defect is $\frac{29}{100}k$, for some constant k . If a bead produced by the machine will be selected at random, the probability of selecting a bead that has a defect is given by the number of beads with a defect, $\frac{29}{100}k$, divided by the number of beads produced by the machine, k . Therefore, the probability of selecting a bead that has a defect is $\frac{\frac{29}{100}k}{k}$, or $\frac{29}{100}$.

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 3

Choice D is correct. The y -intercept of a graph in the xy -plane is the point at which the graph crosses the y -axis. The graph shown crosses the y -axis at the point $(0, 8)$. Therefore, the y -intercept of the graph shown is $(0, 8)$.

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 4

Choice D is correct. The given expression is equivalent

to $(2x^2 + x + (-9)) + (x^2 + 6x + 1)$, which can be rewritten as

$(2x^2 + x^2) + (x + 6x) + (-9 + 1)$. Adding like terms in this expression yields

$3x^2 + 7x + (-8)$, or $3x^2 + 7x - 8$.

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 5

Choice A is correct. It's given that the mean price of a carton of grape tomatoes in Utah was estimated to be \$4.23, with an associated margin of error of \$0.08. It follows that plausible values for this mean price are between $\$4.23 - \0.08 and $\$4.23 + \0.08 . Therefore, it's plausible that the mean price of a carton of grape tomatoes for all locations that sell this product in Utah is between \$4.15 and \$4.31.

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 6

The correct answer is .2. Subtracting 2.6 from each side of the given equation yields $x = 0.2$. Therefore, the value of x that's the solution to the given equation is 0.2. Note that .2 and $\frac{1}{5}$ are examples of ways to enter a correct answer.

QUESTION 7

The correct answer is 240. It's given that 80% of the 300 seeds sprouted.

Therefore, the number of seeds that sprouted can be calculated by multiplying

the number of seeds that were planted by $\frac{80}{100}$, which gives $300\left(\frac{80}{100}\right)$, or 240.

QUESTION 8

Choice A is correct. For the linear function f , it's given that $f(7) = 28$. Substituting 7 for x and 28 for $f(x)$ in the given function yields $28 = 4(7) + b$, or $28 = 28 + b$.

Subtracting 28 from each side of this equation yields $0 = b$. Therefore, the value of b is 0.

Choice B is incorrect. Substituting 1 for b in the given function yields $f(x) = 4x + 1$.

For this function, when the value of x is 7, the value of $f(x)$ is 29, not 28. *Choice C*

is incorrect. Substituting 4 for b in the given function yields $f(x) = 4x + 4$. For this

function, when the value of x is 7, the value of $f(x)$ is 32, not 28. *Choice D* is

incorrect. Substituting 7 for b in the given function yields $f(x) = 4x + 7$. For this

function, when the value of x is 7, the value of $f(x)$ is 35, not 28.

QUESTION 9

Choice B is correct. It's given that triangle LMN is similar to triangle PQR .

Corresponding angles of similar triangles are congruent. Since angle M and angle Q correspond to each other, they must be congruent. Therefore, if the measure of angle M is 53° , then the measure of angle Q is also 53° .

Choice A is incorrect and may result from concluding that angle M and angle Q are complementary rather than congruent. **Choice C** is incorrect and may result from concluding that angle M and angle Q are supplementary rather than congruent. **Choice D** is incorrect and may result from conceptual or calculation errors.

QUESTION 10

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 11

Choice B is correct. The equation representing a linear model can be written in the form $y = a + bx$, or $y = bx + a$, where b is the slope of the graph of the model and $(0, a)$ is the y -intercept of the graph of the model. The scatterplot shows that as the x -values of the data points increase, the y -values of the data points decrease, which means the graph of an appropriate linear model has a negative slope. Therefore, $b < 0$. The scatterplot also shows that the data points are close to the y -axis at a positive value of y . Therefore, the y -intercept of the graph of an appropriate linear model has a positive y -coordinate, which means $a > 0$. Of the given choices, only choice B, $y = -1.9x + 10.1$, has a negative value for b , the slope, and a positive value for a , the y -coordinate of the y -intercept.

Choice A is incorrect. The graph of this model has a y -intercept with a negative y -coordinate, not a positive y -coordinate. **Choice C** is incorrect. The graph of this model has a positive slope, not a negative slope, and a y -intercept with a negative y -coordinate, not a positive y -coordinate. **Choice D** is incorrect. The graph of this model has a positive slope, not a negative slope.

QUESTION 12

Choice D is correct. It's given that a model predicts the population of Bergen in 2005 was 15,000. The model also predicts that each year for the next 5 years, the population increased by 4% of the previous year's population. The predicted population in one of these years can be found by multiplying the predicted population from the previous year by 1.04. Since the predicted population in 2005 was 15,000, the predicted population 1 year later is $15,000(1.04)$. The predicted population 2 years later is this value times 1.04, which is $15,000(1.04)(1.04)$, or $15,000(1.04)^2$. The predicted population 3 years later is this value times 1.04, or $15,000(1.04)^3$. More generally, the predicted population, p , x years after 2005 is represented by the equation $p = 15,000(1.04)^x$.

Choice A is incorrect. Substituting 0 for x in this equation indicates the predicted population in 2005 was 0.96 rather than 15,000. **Choice B** is incorrect. Substituting 0 for x in this equation indicates the predicted population in 2005 was 1.04 rather than 15,000. **Choice C** is incorrect. This equation indicates the predicted population is decreasing, rather than increasing, by 4% each year.

QUESTION 13

The correct answer is 25. Subtracting the second equation from the first equation in the given system of equations yields $(2a - 2a) + (8b - 4b) = 198 - 98$, which is equivalent to $0 + 4b = 100$, or $4b = 100$. Dividing each side of this equation by 4 yields $b = 25$.

QUESTION 14

The correct answer is 6. Applying the distributive property to the expression $ry^4(15y - 9)$ yields $15ry^5 - 9ry^4$. Since $90y^5 - 54y^4$ is equivalent to $ry^4(15y - 9)$, it follows that $90y^5 - 54y^4$ is also equivalent to $15ry^5 - 9ry^4$. Since these expressions are equivalent, it follows that corresponding coefficients are equivalent. Therefore, $90 = 15r$ and $-54 = -9r$. Solving either of these equations for r will yield the value of r . Dividing both sides of $90 = 15r$ by 15 yields $6 = r$. Therefore, the value of r is 6.

QUESTION 15

Choice C is correct. If a value of x satisfies $f(x) = 0$, the graph of $y = f(x)$ will contain a point $(x, 0)$ and thus touch the x -axis. Since there are 3 points at which this graph touches the x -axis, there are 3 values of x for which $f(x) = 0$.

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

QUESTION 16

Choice D is correct. It's given that the expression $w(w + 9)$ represents the area, in square centimeters, of a rectangular cutting board, where w is the width, in centimeters, of the cutting board. The area of a rectangle can be calculated by multiplying its length by its width. It follows that the length, in centimeters, of the cutting board is represented by the expression $(w + 9)$.

Choice A is incorrect. This expression represents the area, in square centimeters, of the cutting board, not its length, in centimeters. *Choice B* is incorrect. This expression represents the width, in centimeters, of the cutting board, not its length. *Choice C* is incorrect. This is the difference between the length, in centimeters, and the width, in centimeters, of the cutting board, not its length, in centimeters.

QUESTION 17

Choice A is correct. To express $4j+9$ in terms of p and k , the given equation must be solved for $4j+9$. Since it's given that j is a positive number, $4j+9$ is not equal to zero. Therefore, multiplying both sides of the given equation by $4j+9$ yields the equivalent equation $p(4j+9)=k$. Since it's given that p is a positive number, p is not equal to zero. Therefore, dividing each side of the equation $p(4j+9)=k$ by p yields the equivalent equation $4j+9=\frac{k}{p}$.

Choice B is incorrect. This equation is equivalent to $p=\frac{4j+9}{k}$. *Choice C* is incorrect. This equation is equivalent to $p=k-4j-9$. *Choice D* is incorrect. This equation is equivalent to $p=k(4j+9)$.

QUESTION 18

Choice D is correct. The area of a circle can be found by using the formula $A=\pi r^2$, where A is the area and r is the radius of the circle. It's given that the radius of circle A is $3n$. Substituting this value for r into the formula $A=\pi r^2$ gives $A=\pi(3n)^2$, or $9\pi n^2$. It's also given that the radius of circle B is $129n$. Substituting this value for r into the formula $A=\pi r^2$ gives $A=\pi(129n)^2$, or $16,641\pi n^2$. Dividing the area of circle B by the area of circle A gives $\frac{16,641\pi n^2}{9\pi n^2}$, which simplifies to 1,849. Therefore, the area of circle B is 1,849 times the area of circle A .

Choice A is incorrect. This is how many times greater the radius of circle B is than the radius of circle A . *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is the coefficient on the term that describes the radius of circle B .

QUESTION 19

Choice C is correct. It's given that the measure of angle R is $\frac{2\pi}{3}$ radians, and the measure of angle T is $\frac{5\pi}{12}$ radians greater than the measure of angle R . Therefore, the measure of angle T is equal to $\frac{2\pi}{3}+\frac{5\pi}{12}$ radians. Multiplying $\frac{2\pi}{3}$ by $\frac{4}{4}$ to get a common denominator with $\frac{5\pi}{12}$ yields $\frac{8\pi}{12}$. Therefore, $\frac{2\pi}{3}+\frac{5\pi}{12}$ is equivalent to $\frac{8\pi}{12}+\frac{5\pi}{12}$, or $\frac{13\pi}{12}$. Therefore, the measure of angle T is $\frac{13\pi}{12}$ radians. The measure of angle T , in degrees, can be found by multiplying its measure, in radians, by $\frac{180}{\pi}$. This yields $\frac{13\pi}{12} \times \frac{180}{\pi}$, which is equivalent to 195 degrees. Therefore, the measure of angle T is 195 degrees.

Choice A is incorrect. This is the number of degrees that the measure of angle T is greater than the measure of angle R . *Choice B* is incorrect. This is the measure of angle R , in degrees. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 20

The correct answer is 7. When an equation is of the form $y = ax^2 + bx + c$, where a , b , and c are constants, the value of y reaches its minimum when $x = -\frac{b}{2a}$. Since the given equation is of the form $y = ax^2 + bx + c$, it follows that $a = 1$, $b = -14$, and $c = 22$. Therefore, the value of y reaches its minimum when $x = -\frac{(-14)}{2(1)}$, or $x = 7$.

QUESTION 21

The correct answer is 182. Let s represent the number of small candles the owner can purchase, and let ℓ represent the number of large candles the owner can purchase. It's given that the owner pays \$4.90 per candle to purchase small candles and \$11.60 per candle to purchase large candles. Therefore, the owner pays $4.90s$ dollars for s small candles and 11.60ℓ dollars for ℓ large candles, which means the owner pays a total of $4.90s + 11.60\ell$ dollars to purchase candles. It's given that the owner budgets \$2,200 to purchase candles. Therefore, $4.90s + 11.60\ell \leq 2,200$. It's also given that the owner must purchase a minimum of 200 candles. Therefore, $s + \ell \geq 200$. The inequalities $4.90s + 11.60\ell \leq 2,200$ and $s + \ell \geq 200$ can be combined into one compound inequality by rewriting the second inequality so that its left-hand side is equivalent to the left-hand side of the first inequality. Subtracting ℓ from both sides of the inequality $s + \ell \geq 200$ yields $s \geq 200 - \ell$. Multiplying both sides of this inequality by 4.90 yields $4.90s \geq 4.90(200 - \ell)$, or $4.90s \geq 980 - 4.90\ell$. Adding 11.60ℓ to both sides of this inequality yields $4.90s + 11.60\ell \geq 980 - 4.90\ell + 11.60\ell$, or $4.90s + 11.60\ell \geq 980 + 6.70\ell$. This inequality can be combined with the inequality $4.90s + 11.60\ell \leq 2,200$, which yields the compound inequality $980 + 6.70\ell \leq 4.90s + 11.60\ell \leq 2,200$. It follows that $980 + 6.70\ell \leq 2,200$. Subtracting 980 from both sides of this inequality yields $6.70\ell \leq 1,220$. Dividing both sides of this inequality by 6.70 yields approximately $\ell \leq 182.09$. Since the number of large candles the owner purchases must be a whole number, the maximum number of large candles the owner can purchase is the largest whole number less than 182.09, which is 182.

QUESTION 22

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 23

Choice B is correct. The mean of a data set is the sum of the values in the data set divided by the number of values in the data set. The new data set consists of the weights of the 71 tortoises in the original data set and one additional weight, 39. Since the additional weight, 39, is greater than any of the values in the original data set, the mean of the new data set is greater than the mean of the original data set. If a data set contains an odd number of data values, the median is represented by the middle data value in the list when the data values are listed in ascending or descending order. Since the original data set consists of the weights of 71 tortoises and is in ascending order, the median of the original data set is represented by the middle value, or the 36th value. Based on the frequencies shown in the table, the 36th value in this data set is 17. If a data set contains an even number of data values, the median is between the two middle data values when the values are listed in ascending or descending order. Since the new data set consists of the weights of 72 tortoises, the median of the new data set is between the 36th and 37th data values when the values are arranged in ascending order. To keep the data in ascending order, the additional value of 39 would be placed at the bottom of the frequency table with a frequency of 1. Therefore, based on the frequencies in the table, the 36th and 37th values in the new data set are both 17. It follows that the median of the new data set is 17, which is the same as the median of the original data set. Therefore, the mean of the new data set is greater than the mean of the original data set, and the medians of the two data sets are equal.

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 24

Choice C is correct. Subtracting the expression $(x - 29)$ from both sides of the given equation yields $0 = (x - a)(x - 29) - (x - 29)$, which can be rewritten as $0 = (x - a)(x - 29) + (-1)(x - 29)$. Since the two terms on the right-hand side of this equation have a common factor of $(x - 29)$, it can be rewritten as $0 = (x - 29)(x - a + (-1))$, or $0 = (x - 29)(x - a - 1)$. Since $x - a - 1$ is equivalent to $x - (a + 1)$, the equation $0 = (x - 29)(x - a - 1)$ can be rewritten as $0 = (x - 29)(x - (a + 1))$. By the zero product property, it follows that $x - 29 = 0$ or $x - (a + 1) = 0$. Adding 29 to both sides of the equation $x - 29 = 0$ yields $x = 29$. Adding $a + 1$ to both sides of the equation $x - (a + 1) = 0$ yields $x = a + 1$. Therefore, the two solutions to the given equation are 29 and $a + 1$. Thus, only $a + 1$ and 29, not a , are solutions to the given equation.

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 25

Choice C is correct. In the xy -plane, the graph of the line $y = c$ is a horizontal line that crosses the y -axis at $y = c$ and the graph of the quadratic equation $y = -x^2 + 9x - 100$ is a parabola. A parabola can intersect a horizontal line at exactly one point only at its vertex. Therefore, the value of c should be equal to the y -coordinate of the vertex of the graph of the given equation. For a quadratic equation in vertex form, $y = a(x - h)^2 + k$, the vertex of its graph in the xy -plane is (h, k) . The given quadratic equation, $y = -x^2 + 9x - 100$, can be rewritten as $y = -\left(x^2 - 2\left(\frac{9}{2}\right)x + \left(\frac{9}{2}\right)^2\right) + \left(\frac{9}{2}\right)^2 - 100$, or $y = -\left(x - \frac{9}{2}\right)^2 + \left(-\frac{319}{4}\right)$. Thus, the value of c is equal to $-\frac{319}{4}$.

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. For the function f , since the base of the exponent, 1.25, is greater than 1, the value of $(1.25)^x$ increases as x increases. Therefore, the value of $18(1.25)^x$ and the value of $18(1.25)^x + 41$ also increase as x increases. Since f is therefore an increasing function where $x \geq 0$, the function f has no maximum value. For the function g , since the base of the exponent, 0.73, is less than 1, the value of $(0.73)^x$ decreases as x increases. Therefore, the value of $9(0.73)^x$ also decreases as x increases. It follows that the maximum value of $g(x)$ for $x \geq 0$ occurs when $x = 0$. Substituting 0 for x in the function g yields $g(0) = 9(0.73)^0$, which is equivalent to $g(0) = 9(1)$, or $g(0) = 9$. Therefore, the maximum value of $g(x)$ for $x \geq 0$ is 9, which appears as a coefficient in equation II. So, of the two equations given, only II displays, as a constant or coefficient, the maximum value of the function it defines, where $x \geq 0$.

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 27

The correct answer is $\frac{284}{3}$. Since the perimeter of a triangle is the sum of the lengths of its sides, and the given triangle is equilateral, the length of each side is $\frac{852}{3}$, or 284, centimeters (cm). Right triangle AMO can be formed, where M is the midpoint of one of the triangle's sides, A is one of this side's endpoints, and O is the center of the circle. It follows that AM is $\frac{284}{2}$, or 142, cm. Additionally, triangle AMO has angles measuring 30° , 60° , and 90° , where the measure of angle OMA is 90° and the measure of angle OAM is 30° . It follows that the length

of side MO is half the length of hypotenuse AO , and the length of side AM is $\sqrt{3}$ times the length of side MO . It's given that $AO = w\sqrt{3}$ cm. Therefore, $MO = \frac{w\sqrt{3}}{2}$ cm and $AM = \frac{w\sqrt{3}\sqrt{3}}{2}$ cm, which is equivalent to $AM = \frac{3w}{2}$ cm. Since $AM = 142$ cm, it follows that $\frac{3w}{2} = 142$. Multiplying both sides of this equation by 2 yields $3w = 284$. Dividing both sides of this equation by 3 yields $w = \frac{284}{3}$. Note that $284/3$, 94.66, and 94.67 are examples of ways to enter a correct answer.