Section 4: Math Test – Calculator

QUESTION 1

Choice B is correct. It's given that the helicopter's initial height is 40 feet above the ground and that when the helicopter's altitude begins to increase, it increases at a rate of 21 feet per second. Therefore, the altitude gain t seconds after the helicopter begins rising is represented by the expression $21t$. Adding this expression to the helicopter's initial height gives the helicopter's altitude above the ground y, in feet, t seconds after the helicopter begins to gain altitude: $y = 40 + 21t$.

Choice A is incorrect. This is the helicopter's altitude above the ground 1 second after it began to gain altitude, not t seconds after it began to gain altitude. Choice C is incorrect because adding the expression $-21t$ makes this function represent a decrease in altitude. Choice D is incorrect and is the result of using the initial height of 40 feet as the rate at which the helicopter's altitude increases per second and the rate of 21 feet per second as the initial height.

QUESTION 2

Choice A is correct. The text messaging plan charges a flat fee of \$5 per month for up to 100 text messages. This is represented graphically with a constant value of $y = 5$ for $0 \leq x \leq 100$. After 100 messages, each additional message sent costs \$0.25. This is represented graphically with an increase of 0.25 on the y-axis for every increase of 1 on the x-axis. Choice A matches these descriptions.

Choice B is incorrect. This choice shows a linear decrease after $x = 100$, indicating the price of the plan would decrease, rather than increase, after 100 text messages. Choices C and D are incorrect. These choices don't represent a constant value of $y = 5$ for $0 \leq x \leq 100$, which is needed to represent the \$5 per month for the first 100 text messages.

QUESTION 3

Choice B is correct. During the first 15 minutes Jake is in the theater, or from 0 to 15 minutes, Jake's popcorn amount decreases by half. This is represented graphically by a linear decrease. From 15 to 45 minutes, Jake stops eating popcorn. This is represented graphically by a constant y-value. From 45 to 90 minutes, Jake eats more popcorn. This is represented graphically by another linear decrease as the amount of popcorn in the bag gradually goes down. At 90 minutes, Jake spills all of his remaining popcorn. This is represented graphically by a vertical drop in the y-value to 0. Choice B matches these representations.

Choices A, C, and D are incorrect. At no point during this period of time did Jake buy more popcorn. All of these graphs represent an increase in the amount of popcorn in Jake's bag at some point during this period of time.

QUESTION 4

Choice C is correct. Subtracting 20 from both sides of the given equation yields $-x = -5$. Dividing both sides of the equation $-x = -5$ by -1 yields $x = 5$. Lastly, substituting 5 for x in $3x$ yields the value of $3x$, or $3(5) = 15$.

Choice A is incorrect. This is the value of x, not the value of $3x$. Choices B and D are incorrect. If $3x = 10$ or $3x = 35$, then it follows that $x = \frac{10}{3}$ or $x = \frac{35}{3}$, respectively. Substituting $\frac{10}{3}$ and $\frac{35}{3}$ for x in the given equation yields $\frac{50}{3} = 15$ and $\frac{25}{3} = 15$, respectively, both of which are false statements. Since $3x = 10$ and $3x = 35$ both lead to false statements, then $3x$ can't be equivalent to either 10 or 35.

QUESTION 5

Choice C is correct. The value of $f(-1)$ can be found by substituting -1 for x in the given function $f(x) = \frac{x+3}{2}$, which yields $f(-1) = \frac{-1+3}{2}$. Rewriting the numerator by adding -1 and 3 yields $\frac{2}{2}$, which equals 1. Therefore, $f(-1) = 1$.

Choice A is incorrect and may result from miscalculating the value of $\frac{-1+3}{2}$ as $\frac{-4}{2}$, or -2. Choice B is incorrect and may result from misinterpreting the value of x as the value of $f(-1)$. Choice D is incorrect and may result from adding the expression $-1 + 3$ in the numerator.

QUESTION 6

Choice D is correct. To determine which option is equivalent to the given expression, the expression can be rewritten using the distributive property by multiplying each term of the binomial $(x^2 - 3x)$ by $2x$, which gives $2x^3 - 6x^2$.

Choices A, B, and C are incorrect and may result from incorrectly applying the laws of exponents or from various computation errors when rewriting the expression.

QUESTION 7

Choice B is correct. Selecting employees from each store at random is most appropriate because it's most likely to ensure that the group surveyed will accurately represent each store location and all employees.

Choice A is incorrect. Surveying employees at a single store location will only provide an accurate representation of employees at that location, not at all 50 store locations. Choice C is incorrect. Surveying the highest- and lowest-paid employees will not give an accurate representation of employees across all pay grades at the company.

Choice D is incorrect. Collecting only the first 50 responses mimics the results of a self-selected survey. For example, the first 50 employees to respond to the survey could be motivated by an overwhelming positive or negative experience and thus will not accurately represent all employees.

QUESTION 8

Choice C is correct. The graph for Ian shows that the initial deposit was \$100 and that each week the total amount deposited increased by \$100. Therefore, Ian deposited \$100 each week. The graph for Jeremy shows that the initial deposit was \$300 and that each week the total amount deposited increased by \$50. Therefore, Jeremy deposited \$50 each week. Thus, Ian deposited \$50 more than Jeremy did each week.

Choice A is incorrect. This is the difference between the initial deposits in the savings accounts. Choice B is incorrect. This is the amount Ian deposited each week. Choice D is incorrect. This is half the amount that Jeremy deposited each week.

QUESTION 9

Choice C is correct. The value of the expression $h(5) - h(3)$ can be found by substituting 5 and 3 for x in the given function. Substituting 5 for x in the function yields $h(5) = 2^5$, which can be rewritten as $h(5) = 32$. Substituting 3 for x in the function yields $h(3) = 2^3$, which can be rewritten as $h(3) = 8$. Substituting these values into the expression $h(5) - h(3)$ produces $32 - 8 = 24$.

Choice A is incorrect. This is the value of $5 - 3$, not of $h(5) - h(3)$. Choice B is incorrect. This is the value of $h(5 - 3)$, or $h(2)$, not of $h(5) - h(3)$. Choice D is incorrect and may result from calculation errors.

QUESTION 10

Choice D is correct. The margin of error is applied to the sample statistic to create an interval in which the population statistic most likely falls. An estimate of 23% with a margin of error of 4% creates an interval of 23% ± 4%, or between 19% and 27%. Thus, it's plausible that the percentage of students in the population who see a movie at least once a month is between 19% and 27%.

Choice A is incorrect and may result from interpreting the estimate of 23% as the minimum number of students in the population who see a movie at least once per month. Choice B is incorrect and may result from interpreting the estimate of 23% as the minimum number of students in the population who see a movie at least once per month and adding half of the margin of error to conclude that it isn't possible that more than 25% of students in the population see a movie at least once per month. Choice C is incorrect and may result from interpreting the sample statistic as the researcher's level of confidence in the survey results and applying the margin of error to the level of confidence.

QUESTION 11

Choice A is correct. The mean number of each list is found by dividing the sum of all the numbers in each list by the count of the numbers in each list. The mean of list A is $\frac{1 + 2 + 3 + 4 + 5 + 6}{6} = 3.5$, and the mean of list B is $\frac{2 + 3 + 3 + 4 + 4 + 5}{6} = 3.5$. Thus, the means are the same. The standard deviations can be compared by inspecting the distances of the numbers in each list from the mean. List A contains two numbers that are 0.5 from the mean, two numbers that are 1.5 from the mean, and two numbers that are 2.5 from the mean. List B contains four numbers that are 0.5 from the mean and two numbers that are 1.5 from the mean. Overall, list B contains numbers that are closer to the mean than are the numbers in list A, so the standard deviations of the lists are different.

Choice B is incorrect and may result from assuming that two data sets with the same mean must also have the same standard deviation. Choices C and D are incorrect and may result from an error in calculating the means.

QUESTION 12

Choice C is correct. Let x represent the original price of the book. Then, 40% off of x is $(1 - 0.40)x$, or $0.60x$. Since the sale price is \$18.00, then $0.60x = 18$. Dividing both sides of this equation by 0.60 yields $x = 30$. Therefore, the original price of the book was \$30.

Choice A is incorrect and may result from computing 40% of the sale price. Choice B is incorrect and may result from computing 40% off the sale price instead of the original price. Choice D is incorrect and may result from computing the original price of a book whose sale price is \$18 when the sale is for 60% off the original price.

QUESTION 13

Choice C is correct. According to the bar graph, the number of insects in colony A at week 0 was approximately 80, and this number decreased over each respective two-week period to approximately 50, 32, 25, and 18. Similarly, the graph shows that the number of insects in colony B at week 0 was approximately 64, and this number also decreased over each respective two-week period to approximately 60, 40, 38, and 10. Finally, the graph shows that the number of insects in colony C at week 0 was approximately 58; however, the number of insects increased in week 2, to approximately 140. Therefore, only colony A and colony B showed a decrease in size every two weeks after the initial treatment.

Choice A is incorrect. Colony B also showed a decrease in size every two weeks. Choices B and D are incorrect. Colony C showed an increase in size between weeks 0 and 2.

QUESTION 14

Choice A is correct. According to the bar graph, the total number of insects in all three colonies in week 8 was approximately $20 + 10 + 50 = 80$, and the total number of insects at the time of initial treatment (week 0) was approximately $80 + 65 + 55 = 200$. The ratio of these approximations is 80 to 200, which is equivalent to 2 to 5. Therefore, the ratio 2 to 5 is closest to the ratio of the total number of insects in all three colonies in week 8 to the total number of insects at the time of initial treatment.

Choices B, C, and D are incorrect and may result from setting up ratios using weeks other than week 8 and week 0 or from calculation errors.

QUESTION 15

Choice B is correct. The formula for the volume V of a right circular cone is $V = \frac{1}{3}\pi r^2 h$, where r is the radius of the base and h is the height of the cone. It's given that the cone's volume is 24π cubic inches and its height is 2 inches. Substituting 24π for V and 2 for h yields $24\pi = \frac{1}{3}\pi r^2(2)$. Rewriting the right-hand side of this equation yields $24\pi = \left(\frac{2\pi}{3}\right)r^2$, which is equivalent to $36 = r^2$. Taking the square root of both sides of this equation gives $r = \pm 6$. Since the radius is a measure of length, it can't be negative. Therefore, the radius of the base of the cone is 6 inches.

Choice A is incorrect and may result from using the formula for the volume of a right circular cylinder instead of a right circular cone. Choice C is incorrect. This is the diameter of the cone. Choice D is incorrect and may result from not taking the square root when solving for the radius.

QUESTION 16

Choice C is correct. It's given that the population of City X was 120,000 in 2010, and that it increased by 20% from 2010 to 2015. Therefore, the population of City X in 2015 was $120{,}000\ (1 + 0.20) = 144{,}000$. It's also given that the population of City Y decreased by 10% from 2010 to 2015. If y represents the population of City Y in 2010, then $y(1 - 0.10) = 144{,}000$. Solving this equation for y yields $y = \frac{144{,}000}{1 - 0.10}$. Simplifying the denominator yields $\frac{144{,}000}{0.90}$, or 160,000.

Choice A is incorrect. If the population of City Y in 2010 was 60,000, then the population of City Y in 2015 would have been $60{,}000(0.90) = 54{,}000$, which is not equal to the City X population in 2015 of 144,000. Choice B is incorrect because $90{,}000(0.90) = 81{,}000$, which is not equal to the City X population in 2015 of 144,000. Choice D is incorrect because $240{,}000(0.90) = 216{,}000$, which is not equal to the City X population in 2015 of 144,000.

QUESTION 17

Choice D is correct. Dividing both sides of the equation $V = \frac{4}{3}\pi r^3$ by $\frac{4}{3}\pi$ results in $\frac{3V}{4\pi} = r^3$. Taking the cube root of both sides produces $\sqrt[3]{\frac{3V}{4\pi}} = r$. Therefore, $\sqrt[3]{\frac{3V}{4\pi}}$ gives the radius of the sphere in terms of the volume of the sphere.

Choice A is incorrect. This expression is equivalent to the reciprocal of r^3. Choice B is incorrect. This expression is equivalent to r^3. Choice C is incorrect. This expression is equivalent to the reciprocal of r.

QUESTION 18

Choice C is correct. It's given that the tablet user did not answer "Never," so the tablet user could have answered only "Rarely," "Often," or "Always." These answers make up 24.3% + 13.5% + 30.9% = 68.7% of the answers the tablet users gave in the survey. The answer "Always" makes up 30.9% of the answers tablet users gave in the survey. Thus, the probability is $\frac{30.9\%}{68.7\%}$, or $\frac{0.309}{0.687} = 0.44978$, which rounds up to 0.45.

Choice A is incorrect. This reflects the tablet users in the survey who answered "Always." Choice B is incorrect. This reflects all tablet users who did not answer "Never" or "Always." Choice D is incorrect. This reflects all tablet users in the survey who did not answer "Never."

QUESTION 19

Choice D is correct. The vertex form of a quadratic equation is $y = n(x - h)^2 + k$, where (h, k) gives the coordinates of the vertex of the parabola in the xy-plane and the sign of the constant n determines whether the parabola opens upward or downward. If n is negative, the parabola opens downward and the vertex is the maximum. The given equation has the values $h = 3$, $k = a$, and $n = -1$. Therefore, the vertex of the parabola is $(3, a)$ and the parabola opens downward. Thus, the parabola's maximum occurs at $(3, a)$.

Choice A is incorrect and may result from interpreting the given equation as representing a parabola in which the vertex is a minimum, not a maximum, and from misidentifying the value of h in the given equation as -3, not 3. Choice B is incorrect and may result from interpreting the given equation as representing a parabola in which the vertex is a minimum, not a maximum. Choice C is incorrect and may result from misidentifying the value of h in the given equation as -3, not 3.

QUESTION 20

Choice C is correct. Let m be the minimum value of the original data set. The range of a data set is the difference between the maximum value and the minimum value. The range of the original data set is therefore $84 - m$. The new data set consists of the original set and the positive integer 96. Thus, the new data set has the same minimum m and a maximum of 96. Therefore, the range of the new data set is $96 - m$. The difference in the two ranges can be found by subtracting the ranges: $(96 - m) - (84 - m)$. Using the distributive property, this can be rewritten as $96 - m - 84 + m$, which is equal to 12. Therefore, the range of the new data set must be 12 greater than the range of the original data set.

Choices A, B, and D are incorrect. Only the maximum value of the original data set is known, so the amount that the mean, median, and standard deviation of the new data set differ from those of the original data set can't be determined.

QUESTION 21

Choice B is correct. It's given that Clayton uses 100 milliliters of the 20% by mass solution, so $y = 100$. Substituting 100 for y in the given equation yields $0.10x + 0.20(100) = 0.18(x + 100)$, which can be rewritten as $0.10x + 20 = 0.18x + 18$. Subtracting $0.10x$ and 18 from both sides of the equation gives $2 = 0.08x$. Dividing both sides of this equation by 0.08 gives $x = 25$. Thus, Clayton uses 25 milliliters of the 10% by mass saline solution.

Choices A, C, and D are incorrect and may result from calculation errors.

QUESTION 22

Choice D is correct. It's given that the number of people Eleanor invited the first year was 30 and that the number of people invited doubles each of the following years, which is the same as increasing by a constant factor of 2. Therefore, the function f can be defined by $f(n) = 30(2)^n$, where n is the number of years after Eleanor began organizing the event. This is an increasing exponential function.

Choices A and B are incorrect. Linear functions increase or decrease by a constant number over equal intervals, and exponential functions increase or decrease by a constant factor over equal intervals.
Since the number of people invited increases by a constant factor each year, the function f is exponential rather than linear. Choice C is incorrect. The value of $f(n)$ increases as n increases, so the function f is increasing rather than decreasing.

QUESTION 23

Choice A is correct. The slope-intercept form of a linear equation in the xy-plane is $y = mx + b$, where m is the slope of the graph of the equation and b is the y-coordinate of the y-intercept of the graph. Any two ordered pairs (x_1, y_1) and (x_2, y_2) that satisfy a linear equation can be used to compute the slope of the graph of the equation using the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting the two pairs $(a, 0)$ and $(3a, -a)$ from the table into the formula gives $m = \frac{-a - 0}{3a - a}$, which can be rewritten as $\frac{-a}{2a}$, or $-\frac{1}{2}$. Substituting this value for m in the slope-intercept form of the equation produces $y = -\frac{1}{2}x + b$. Substituting values from the ordered pair $(a, 0)$ in the table into this equation produces $0 = -\frac{1}{2}(a) + b$, which simplifies to $b = \frac{a}{2}$. Substituting this value for b in the slope-intercept form of the equation produces $y = -\frac{1}{2}x + \frac{a}{2}$. Rewriting this equation in standard form by adding $\frac{1}{2}x$ to both sides and then multiplying both sides by 2 gives the equation $x + 2y = a$.

Choice B is incorrect and may result from a calculation error when determining the y-intercept of the graph of the equation. Choices C and D are incorrect and may result from an error in calculation when determining the slope of the graph of the equation.

QUESTION 24

Choice B is correct. The slope-intercept form of a linear equation is $y = mx + b$, where m is the slope of the graph of the equation and b is the y-coordinate of the y-intercept of the graph. Any two ordered pairs (x_1, y_1) and (x_2, y_2) that satisfy a linear equation can be used to compute the slope of the graph of the equation using the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting the coordinates of (120, 60) and (160, 80), which lie on the line of best fit, into this formula gives $m = \frac{80 - 60}{160 - 120}$, which simplifies to $\frac{20}{40}$, or 0.5. Substituting this value for m in the slope-intercept form of the equation produces $y = 0.5x + b$. Substituting values from the ordered pair (120, 60) into this equation produces $60 = 0.5(120) + b$, so $b = 0$. Substituting this value for b in the slope-intercept form of the equation produces $y = 0.5x + 0$, or $y = 0.5x$.

Choices A, C, and D are incorrect and may result from an error in calculation when determining the slope of the line of best fit.

QUESTION 25

Choice A is correct. The intersection point (x, y) of the two graphs can be found by multiplying the second equation in the system $1.6x + 0.5y = -1.3$ by 3, which gives $4.8x + 1.5y = -3.9$. The y-terms in the equation $4.8x + 1.5y = -3.9$ and the first equation in the system $2.4x - 1.5y = 0.3$ have coefficients that are opposites. Adding the left- and right-hand sides of the equations $4.8x + 1.5y = -3.9$ and $2.4x - 1.5y = 0.3$

produces $7.2x + 0.0y = -3.6$, which is equivalent to $7.2x = -3.6$. Dividing both sides of the equation by 7.2 gives $x = -0.5$. Therefore, the x-coordinate of the intersection point (x, y) of the system is -0.5.

Choice B is incorrect. An x-value of -0.25 produces y-values of -0.6 and -1.8 for each equation in the system, respectively. Since the same ordered pair doesn't satisfy both equations, neither point can be the intersection point. Choice C is incorrect. An x-value of 0.8 produces y-values of 1.08 and -5.16 for each equation in the system, respectively. Since the same ordered pair doesn't satisfy both equations, neither point can be the intersection point. Choice D is incorrect. An x-value of 1.75 produces y-values of 2.6 and -8.2 for each equation in the system, respectively. Since the same ordered pair doesn't satisfy both equations, neither point can be the intersection point.

QUESTION 26

Choice D is correct. A model for a quantity that increases by $r\%$ per time period is an exponential function of the form $P(t) = I\left(1+\frac{r}{100}\right)^t$, where I is the initial value at time $t = 0$ and each increase of t by 1 represents 1 time period. It's given that $P(t)$ is the number of pollen grains per square centimeter and t is the number of years after the first year the grains were deposited. There were 310 pollen grains at time $t = 0$, so $I = 310$. This number increased 1% per year after year $t = 0$, so $r = 1$. Substituting these values into the form of the exponential function gives $P(t) = 310\left(1+\frac{1}{100}\right)^t$, which can be rewritten as $P(t) = 310(1.01)^t$.

Choices A, B, and C are incorrect and may result from errors made when setting up an exponential function.

QUESTION 27

Choice A is correct. Subtracting $\left(\frac{2}{3}\right)(9x - 6)$ from both sides of the given equation yields $-4 = \left(\frac{1}{3}\right)(9x - 6)$, which can be rewritten as $-4 = 3x - 2$.

Choices B and D are incorrect and may result from errors made when manipulating the equation. Choice C is incorrect. This is the value of x.

QUESTION 28

Choice D is correct. The graph of a quadratic function in the form $f(x) = a(x - b)(x - c)$ intersects the x-axis at $(b, 0)$ and $(c, 0)$. The graph will be a parabola that opens upward if a is positive and downward if a is negative. For the function f, $a = 1$, $b = -3$, and $c = k$. Therefore, the graph of the function f opens upward and intersects the x-axis at $(-3, 0)$ and $(k, 0)$. Since k is a positive integer, the intersection point $(k, 0)$ will have an x-coordinate that is a positive integer. The only graph that opens upward, passes through the point $(-3, 0)$, and has another x-intercept with a positive integer as the x-coordinate is choice D.

Choices A and B are incorrect. Both graphs open downward rather than upward. Choice C is incorrect. The graph doesn't pass through the point (−3, 0).

QUESTION 29

Choice D is correct. It's given that L is the femur length, in inches, and H is the height, in inches, of an adult male. Because L is multiplied by 1.88 in the equation, for every increase in L by 1, the value of H increases by 1.88. Therefore, the meaning of 1.88 in this context is that a man's height increases by approximately 1.88 inches for each one-inch increase in his femur length.

Choices A, B, and C are incorrect and may result from misinterpreting the context and the values the variables are representing.

QUESTION 30

Choice A is correct. A segment can be drawn inside of quadrilateral *ABCD* from point *B* to point *F* (not shown) on segment *AD* such that segment *BF* is perpendicular to segment *AD*. This will create rectangle *FBCD* such that $FB = CD$. This will also create right triangle *ABF* such that $FB = \frac{1}{2}AB$. An acute angle in a right triangle has measure 30° if and only if the side opposite this angle is half the length of the hypotenuse. (Such a triangle is called a 30°-60°-90° triangle.) Since *AB* is the hypotenuse of right triangle *ABF* and $FB = \frac{1}{2}AB$, triangle *ABF* must be a 30°-60°-90° triangle and angle *ABF* must measure 60°. The measure of angle *ABC* equals the sum of the measures of angles *ABF* and *FBC*. Because angle *FBC* is in rectangle *FBCD*, it has a measure of 90°. Therefore, the measure of angle *ABC*, or angle *B* shown in the original figure, is $60° + 90° = 150°$.

Choice B is incorrect and may result from identifying triangle *ABF* as a 45°-45°-90° triangle and the measure of angle *ABF* as 45°. Choice C is incorrect and may result from adding the measures of angles *BAF* and *FBC* rather than angles *ABF* and *FBC*. Choice D is incorrect and may result from finding the measure of angle *D* rather than angle *B*.

QUESTION 31

The correct answer is 6. It's given that apples cost $0.65 each and oranges cost $0.75 each. If x is the number of apples, the cost for buying x apples is $0.65x$ dollars. If y is the number of oranges, the cost for buying y oranges is $0.75y$ dollars. Lynne has $8.00 to spend; therefore, the inequality for the number of apples and oranges Lynne can buy is $0.65x + 0.75y \leq 8.00$. Since Lynne bought 5 apples, $x = 5$. Substituting 5 for x yields $0.65(5) + 0.75y \leq 8.00$, which can be rewritten as $3.25 + 0.75y \leq 8.00$. Subtracting 3.25 from both sides of the inequality yields $0.75y \leq 4.75$. Dividing both sides of this inequality by 0.75 yields $y \leq 6.33$. Therefore, the maximum number of whole oranges Lynne can buy is 6.

QUESTION 32

The correct answer is 146. According to the triangle sum theorem, the sum of the measures of the three angles of a triangle is 180°. This triangle is made up of angles with measures of $a°$, $b°$, and $c°$. Therefore, $a + b + c = 180$. Substituting 34 for a yields $34 + b + c = 180$. Subtracting 34 from each side of the equation yields $b + c = 146$.

QUESTION 33

The correct answer is 2500. The mean number of the list is found by dividing the sum of all the numbers in the list by the count of numbers in the list. It's given that the mean of the five numbers in this list is 1600; therefore, $\frac{700 + 1200 + 1600 + 2000 + x}{5} = 1600$. Multiplying both sides of this equation by 5 gives $700 + 1200 + 1600 + 2000 + x = 8000$. The left-hand side of this equation can be rewritten as $5500 + x = 8000$. Subtracting 5500 from both sides of this equation gives $x = 2500$.

QUESTION 34

The correct answer is 34. Substituting the values $y = 17$ and $x = a$ into the equation $y = mx$ yields $17 = ma$. Solving for a gives $a = \frac{17}{m}$. This can be substituted for a in $x = 2a$, which yields $x = 2\left(\frac{17}{m}\right)$, or $x = \frac{34}{m}$. Substituting $x = \frac{34}{m}$ into the equation $y = mx$ yields $y = m\left(\frac{34}{m}\right)$. This equation can be rewritten as $y = 34$.

QUESTION 35

The correct answer is $\frac{5}{2}$. Applying the distributive property of multiplication on the left-hand side of $a(x + b) = 4x + 10$ yields $ax + ab = 4x + 10$. If $a(x + b) = 4x + 10$ has infinitely many solutions, then $ax + ab = 4x + 10$ must be true for all values of x. It follows that $ax = 4x$ and $ab = 10$. Since $ax = 4x$, it follows that $a = 4$. Substituting 4 for a in $ab = 10$ yields $4b = 10$. Dividing both sides of $4b = 10$ by 4 yields $b = \frac{10}{4}$, which simplifies to $\frac{5}{2}$. Either 5/2 or 2.5 may be entered as the correct answer.

QUESTION 36

The correct answer is $\frac{25}{4}$. If a line intersects a parabola at a point, the coordinates of the intersection point must satisfy the equation of the line and the equation of the parabola. Since the equation of the line is $y = c$, where c is a constant, the y-coordinate of the intersection point must be c. It follows then that substituting c for y in the equation for the parabola will result in another true equation: $c = -x^2 + 5x$. Subtracting c from both sides of $c = -x^2 + 5x$ and then dividing both sides by -1 yields $0 = x^2 - 5x + c$. The solution to this quadratic equation would give the x-coordinate(s) of the point(s) of intersection.

Since it's given that the line and parabola intersect at exactly one point, the equation $0 = x^2 - 5x + c$ has exactly one solution. A quadratic equation in the form $0 = ax^2 + bx + c$ has exactly one solution when its discriminant $b^2 - 4ac$ is equal to 0. In the equation $0 = x^2 - 5x + c$, $a = 1$, $b = -5$, and $c = c$. Therefore, $(-5)^2 - 4(1)(c) = 0$, or $25 - 4c = 0$. Subtracting 25 from both sides of $25 - 4c = 0$ and then dividing both sides by -4 yields $c = \frac{25}{4}$. Therefore, if the line $y = c$ intersects the parabola defined by $y = -x^2 + 5x$ at exactly one point, then $c = \frac{25}{4}$. Either 25/4 or 6.25 may be entered as the correct answer.

QUESTION 37

The correct answer is 293. It's given that a peregrine falcon's maximum speed while diving is 200 miles per hour and that 1 mile = 5280 feet. Therefore, a peregrine falcon's maximum speed while diving is $\left(\frac{200 \text{ miles}}{1 \text{ hour}}\right)\left(\frac{5280 \text{ feet}}{1 \text{ mile}}\right) = 1{,}056{,}000$ feet per hour. There are 60 minutes in 1 hour and 60 seconds in each minute, so there are (60)(60) = 3600 seconds in 1 hour. A peregrine falcon's maximum speed while diving is therefore $\left(\frac{1{,}056{,}000 \text{ feet}}{1 \text{ hour}}\right)\left(\frac{1 \text{ hour}}{3600 \text{ seconds}}\right)$, which is approximately 293.33 feet per second. To the nearest whole number, this is 293 feet per second.

QUESTION 38

The correct answer is 9. If x is the number of hours it will take the falcon to dive 0.5 mile, then the speed of 200 miles per hour can be used to create the proportion $\frac{200 \text{ miles}}{1 \text{ hour}} = \frac{0.5 \text{ mile}}{x \text{ hours}}$. This proportion can be rewritten as $x \text{ hours} = \frac{0.5 \text{ mile}}{200 \frac{\text{miles}}{\text{hour}}}$, which gives $x = 0.0025$. There are 60 minutes in 1 hour and 60 seconds in each minute, so there are (60)(60) = 3600 seconds in one hour. Therefore, 0.0025 hour is equivalent to $(0.0025 \text{ hour})\left(\frac{3600 \text{ seconds}}{1 \text{ hour}}\right) = 9$ seconds.