The SAT®

Practice Test #8

ANSWER EXPLANATIONS

These answer explanations are for students taking the digital SAT in nondigital format.

SAT®

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 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.

Math

Module 2

(27 questions)

QUESTION 1

Choice C is correct. The *y*-intercept of a graph is the point where the graph intersects the *y*-axis. The line graphed intersects the *y*-axis at the point $(0, 5)$. Therefore, the *y*-intercept of the line graphed is $(0, 5)$.

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 C is correct. The table shows that for a certain region in 2016, the average number of store employees in warehouse stores was 365 and the average number of store employees in supermarkets was 130. Subtracting 130 from 365 yields $365-130$, or 235. Therefore, the average number of store employees was 235 greater in warehouse stores than in supermarkets.

Choice A is incorrect. For this region in 2016, this is how much greater the average number of store employees was in department stores than in supermarkets. *Choice B* is incorrect. For this region in 2016, this is how much greater the average number of store employees was in warehouse stores than in department stores. *Choice D* is incorrect. For this region in 2016, this is the sum of the average number of store employees in warehouse stores and in supermarkets.

QUESTION 3

Choice D is correct. It's given that line m is parallel to line n, and line t intersects both lines. It follows that line t is a transversal. When two lines are parallel and intersected by a transversal, exterior angles on the same side of the transversal are supplementary. Thus, $x+33=180$. Subtracting 33 from both sides of this equation yields $x=147$. Therefore, the value of x is 147.

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 C is correct. It's given that the cost of renting a tent is $11 per day for d days. Multiplying the rental cost by the number of days yields 11d$, which represents the cost of renting the tent for d days before the insurance is added. Adding the onetime insurance fee of $10 to the rental cost of 11d$ gives the total cost c, in dollars, which can be represented by the equation $c=11d+10$.

Choice A is incorrect. This equation represents the total cost to rent the tent if the insurance fee was charged every day. *Choice B* is incorrect. This equation represents the total cost to rent the tent if the daily fee was $\$(d+11)$ for 10 days. *Choice D* is incorrect. This equation represents the total cost to rent the tent if the daily fee was $10 and the onetime fee was $11.

QUESTION 5

Choice D is correct. By the Pythagorean theorem, if a right triangle has a hypotenuse with length c and legs with lengths a and b, then $c^2=a^2+b^2$. In the right triangle shown, the hypotenuse has length c and the legs have lengths a and b. It's given that $a=4$ and $b=5$. Substituting 4 for a and 5 for b in the Pythagorean theorem yields $c^2=4^2+5^2$. Taking the square root of both sides of this equation yields $c=\pm\sqrt{4^2+5^2}$. Since the length of a side of a triangle must be positive, the value of c is $\sqrt{4^2+5^2}$.

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

QUESTION 6

The correct answer is 9. It's given that $g(x)=6x$. Substituting 54 for $g(x)$ in the given function yields $54=6x$. Dividing both sides of this equation by 6 yields $x=9$. Therefore, the value of x when $g(x)=54$ is 9.

QUESTION 7

The correct answer is 68. It's given that the function f is defined by $f(x)=8x^3+4$. Substituting 2 for x in this equation yields $f(2)=8(2)^3+4$, or $f(2)=8(8)+4$, which is equivalent to $f(2)=68$. Therefore, the value of $f(2)$ is 68.

QUESTION 8

Choice B is correct. The y-intercept of the graph of a function in the xy-plane is the point on the graph where $x=0$. It's given that $f(x)=\frac{1}{10}x-2$. Substituting 0 for x in this equation yields $f(0)=\frac{1}{10}(0)-2$, or $f(0)=-2$. Since it's given that $y=f(x)$, it follows that $y=-2$ when $x=0$. Therefore, the y-intercept of the graph of $y=f(x)$ in the xy-plane is $(0, -2)$.

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 9

Choice D is correct. Since x represents the number of 1-minute segments and y represents the number of 3-minute segments, the total length of the video is $1 \cdot x + 3 \cdot y$, or $x + 3y$, minutes. Since the video is 70 minutes long, the equation $x + 3y = 70$ represents this situation.

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

QUESTION 10

Choice D is correct. If the graph of $y = g(x)$ is the result of shifting the graph of $y = f(x)$ down k units in the xy-plane, the function g can be defined by an equation of the form $g(x) = f(x) - k$. It's given that $f(x) = 7x^3$ and the graph of $y = g(x)$ is the result of shifting the graph of $y = f(x)$ down 2 units. Substituting $7x^3$ for $f(x)$ and 2 for k in the equation $g(x) = f(x) - k$ yields $g(x) = 7x^3 - 2$.

Choice A is incorrect and may result from conceptual errors. *Choice B* is incorrect and may result from conceptual errors. *Choice C* is incorrect. This equation defines a function g for which the graph of $y = g(x)$ is the result of shifting the graph of $y = f(x)$ up, not down, 2 units.

QUESTION 11

Choice C is correct. The given system of linear equations can be solved by the substitution method. Substituting $-3x$ for y from the first equation in the given system into the second equation yields $4x + (-3x) = 15$, or $x = 15$.

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. This is the absolute value of y, not the value of x.

QUESTION 12

Choice B is correct. The sine of an acute angle in a right triangle is the ratio of the length of the side opposite that angle to the length of the hypotenuse. The hypotenuse of a right triangle is the side opposite the right angle. In right triangle ABC, side BC is the side opposite angle A and side AB is the hypotenuse. It's given that the length of side BC is 35 units and the length of side AB is 171 units. Therefore, the value of $\sin A$ is $\frac{35}{171}$.

Choice A is incorrect and may result from conceptual or calculation errors.
Choice C is incorrect. This is the ratio of the length of the hypotenuse to the length of the side opposite angle A rather than the ratio of the length of the side opposite angle A to the length of the hypotenuse. *Choice D* is incorrect. This is the length of the hypotenuse rather than $\sin A$.

QUESTION 13

The correct answer is 986. The area, A, of a rectangle is given by $A=\ell w$, where ℓ is the length of the rectangle and w is its width. It's given that the length of the rectangle is 34 centimeters (cm) and the width is 29 cm. Substituting 34 for ℓ and 29 for w in the equation $A=\ell w$ yields $A=(34)(29)$, or $A=986$. Therefore, the area, in square centimeters, of this rectangle is 986.

QUESTION 14

The correct answer is 24. The equation $\frac{24x}{ny}=4$ can be rewritten as $\left(\frac{24}{n}\right)\left(\frac{x}{y}\right)=4$. It's given that $\frac{x}{y}=4$. Substituting 4 for $\frac{x}{y}$ in the equation $\left(\frac{24}{n}\right)\left(\frac{x}{y}\right)=4$ yields $\left(\frac{24}{n}\right)(4)=4$. Multiplying both sides of this equation by n yields $(24)(4)=4n$. Dividing both sides of this equation by 4 yields $24=n$. Therefore, the value of n is 24.

QUESTION 15

Choice D is correct. It's given that the bowl starts with 20 ounces of water and has 9 ounces of water remaining after a period of time has passed. The amount of water the bowl has lost during the time period can be found by subtracting the remaining amount of water from the amount of water the bowl starts with, which yields $20-9$ ounces, or 11 ounces. This means the bowl loses 11 ounces of water during that period of time. It's given that the amount of water decreases by 1 ounce every 4 days. Letting t represent the number of days the bowl has been uncovered, it follows that $\frac{1}{4}=\frac{11}{t}$. Multiplying both sides of this equation by $4t$ yields $t=44$. Therefore, the bowl has been uncovered for 44 days.

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 the value of t for the equation $\frac{1}{4}=\frac{9}{t}$, not $\frac{1}{4}=\frac{11}{t}$.

QUESTION 16

Choice D is correct. The value of $4-3x$ can be found by isolating this expression in the given equation. Subtracting 2 from both sides of the given equation yields $9(4-3x)=8(4-3x)+16$. Subtracting $8(4-3x)$ from both sides of this equation yields $9(4-3x)-8(4-3x)=16$, which gives $1(4-3x)=16$, or $4-3x=16$. Therefore, the value of $4-3x$ is 16.

Choice A is incorrect and may result from conceptual or calculation errors.
Choice B is incorrect. This is the value of x, not $4-3x$. *Choice C* is incorrect and may result from conceptual or calculation errors.

QUESTION 17

Choice A is correct. It's given that a certain township consists of a 5-hectare industrial park and a 24-hectare neighborhood and that the total number of trees in the township is 4,529. It's also given that the equation $5x+24y=4{,}529$ represents this situation. Since the total number of trees for a given area can be determined by taking the size of the area, in hectares, times the average number of trees per hectare, the best interpretation of $5x$ is the number of trees in the industrial park and the best interpretation of $24y$ is the number of trees in the neighborhood. Since 5 is the size of the industrial park, in hectares, the best interpretation of x is the average number of trees per hectare in the industrial park.

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 18

Choice B is correct. Since $\frac{12}{12}=1$, multiplying the exponent of the given expression by $\frac{12}{12}$ yields an equivalent expression: $a^{\left(\frac{11}{12}\right)\left(\frac{12}{12}\right)}=a^{\left(\frac{132}{144}\right)}$. Since $\frac{132}{144}=132\left(\frac{1}{144}\right)$, the expression $a^{\frac{132}{144}}$ can be rewritten as $a^{(132)\left(\frac{1}{144}\right)}$. Applying properties of exponents, this expression can be rewritten as $(a^{132})^{\frac{1}{144}}$. An expression of the form $(m)^{\frac{1}{k}}$, where $m>0$ and $k>0$, is equivalent to $\sqrt[k]{m}$. Therefore, $(a^{132})^{\frac{1}{144}}$ is equivalent to $\sqrt[144]{a^{132}}$.

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 19

Choice A is correct. The median of a data set with an odd number of values that are in ascending or descending order is the middle value of the data set. Since the distribution of the values of both data set A and data set B form symmetric dot plots, and each data set has an odd number of values, it follows that the median is given by the middle value in each of the dot plots. Thus, the median of data set A is 13, and the median of data set B is 13. Therefore, statement I is true. Data set A and data set B have the same frequency for each of the values 11, 12, 14, and 15. Data set A has a frequency of 1 for values 10 and 16, whereas data set B has a frequency of 2 for values 10 and 16. Standard deviation is a measure of the spread of a data set; it is larger when there are more values farther from the mean, and smaller when there are more values closer to the mean. Since both distributions are symmetric with an odd number of values, the mean of each data set is equal to its median. Thus, each data set has a mean of 13. Since more of the values in data set A are closer to 13 than in data set B, it follows that data set A has a smaller standard deviation than data set B. Thus, statement II is false. Therefore, only statement I must be true.

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 46. It's given that O is the center of a circle and that points R and S lie on the circle. Therefore, $\overline{OR}$ and $\overline{OS}$ are radii of the circle. It follows that $OR=OS$. If two sides of a triangle are congruent, then the angles opposite them are congruent. It follows that the angles $\angle RSO$ and $\angle ORS$, which are across from the sides of equal length, are congruent. Let $x°$ represent the measure of $\angle RSO$. It follows that the measure of $\angle ORS$ is also $x°$. It's given that the measure of $\angle ROS$ is 88°. Because the sum of the measures of the interior angles of a triangle is 180°, the equation $x°+x°+88°=180°$, or $2x+88=180$, can be used to find the measure of $\angle RSO$. Subtracting 88 from both sides of this equation yields $2x=92$. Dividing both sides of this equation by 2 yields $x=46$. Therefore, the measure of $\angle RSO$, in degrees, is 46.

QUESTION 21

The correct answer is 1.8. It's given that the regular price of a shirt at a store is \$11.70, and the sale price of the shirt is 80% less than the regular price. It follows that the sale price of the shirt is $\$11.70\left(1-\frac{80}{100}\right)$, or $\$11.70(1-0.8)$, which is equivalent to \$2.34. It's also given that the sale price of the shirt is 30% greater than the store's cost for the shirt. Let x represent the store's cost for the shirt. It follows that $2.34=\left(1+\frac{30}{100}\right)x$, or $2.34=1.3x$. Dividing both sides of this equation by 1.3 yields $x=1.80$. Therefore, the store's cost, in dollars, for the shirt is 1.80. Note that 1.8 and 9/5 are examples of ways to enter a correct answer.

QUESTION 22

Choice A is correct. The volume of a cube can be found by using the formula $V=s^3$, where V is the volume and s is the edge length of the cube. Therefore, the volume of the given cube is $V=68^3$, or 314,432 cubic inches. The volume of a sphere can be found by using the formula $V=\frac{4}{3}\pi r^3$, where V is the volume and r is the radius of the sphere. Therefore, the volume of the given sphere is $V=\frac{4}{3}\pi(34)^3$, or approximately 164,636 cubic inches. The volume of the space in the cube not taken up by the sphere is the difference between the volume of the cube and volume of the sphere. Subtracting the approximate volume of the sphere from the volume of the cube gives $314{,}432-164{,}636=149{,}796$ cubic inches.

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 B is correct. A system of two linear equations in two variables, x and y, has no solution if the lines represented by the equations in the xy-plane are parallel and distinct. Lines represented by equations in standard form, $Ax+By=C$ and $Dx+Ey=F$, are parallel if the coefficients for x and y in one equation are proportional to the corresponding coefficients in the other equation, meaning

$\frac{D}{A}=\frac{E}{B}$; and the lines are distinct if the constants are not proportional, meaning $\frac{F}{C}$ is not equal to $\frac{D}{A}$ or $\frac{E}{B}$. The given equation, $y=6x+18$, can be written in standard form by subtracting $6x$ from both sides of the equation to yield $-6x+y=18$. Therefore, the given equation can be written in the form $Ax+By=C$, where $A=-6$, $B=1$, and $C=18$. The equation in choice B, $-6x+y=22$, is written in the form $Dx+Ey=F$, where $D=-6$, $E=1$, and $F=22$. Therefore, $\frac{D}{A}=\frac{-6}{-6}$, which can be rewritten as $\frac{D}{A}=1$; $\frac{E}{B}=\frac{1}{1}$, which can be rewritten as $\frac{E}{B}=1$; and $\frac{F}{C}=\frac{22}{18}$, which can be rewritten as $\frac{F}{C}=\frac{11}{9}$. Since $\frac{D}{A}=1$, $\frac{E}{B}=1$, and $\frac{F}{C}$ is not equal to 1, it follows that the given equation and the equation $-6x+y=22$ are parallel and distinct. Therefore, a system of two linear equations consisting of the given equation and the equation $-6x+y=22$ has no solution. Thus, the equation in choice B could be the second equation in the system.

Choice A is incorrect. The equation $-6x+y=18$ and the given equation represent the same line in the *xy*-plane. Therefore, a system of these linear equations would have infinitely many solutions, rather than no solution. *Choice C* is incorrect. The equation $-12x+y=36$ and the given equation represent lines in the *xy*-plane that are distinct and not parallel. Therefore, a system of these linear equations would have exactly one solution, rather than no solution. *Choice D* is incorrect. The equation $-12x+y=18$ and the given equation represent lines in the *xy*-plane that are distinct and not parallel. Therefore, a system of these linear equations would have exactly one solution, rather than no solution.

QUESTION 24

Choice C is correct. Since $P=(4, 5)$ and $Q=(4, 7)$, side PQ is parallel to the *y*-axis and has a length of 2. Since $P=(4, 5)$ and $R=(6, 5)$, side PR is parallel to the *x*-axis and has a length of 2. Therefore, triangle PQR is a right isosceles triangle, where $\angle P$ has measure 90° and $\angle Q$ and $\angle R$ each have measure 45°. It follows that if the measure of $\angle Q$ is t°, then $t=45$. Since $L=(4, 5)$ and $M=(4, 7+k)$, side LM is parallel to the *y*-axis and has a length of $k+2$. Since $L=(4, 5)$ and $N=(6+k, 5)$, side LN is parallel to the *x*-axis and has a length of $k+2$. Therefore, triangle LMN is a right isosceles triangle, where $\angle L$ has measure 90° and $\angle M$ and $\angle N$ each have measure 45°. Of the given choices, only $(90-t)^\circ$ is equal to 45°, so the measure of $\angle N$ is $(90-t)^\circ$.

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 B is correct. The two given equations are equivalent because the second equation can be obtained from the first equation by multiplying each side of the equation by 5. Thus, the graphs of the equations are coincident, so if a point lies on the graph of one of the equations, it also lies on the graph of the other equation. A point (x, y) lies on the graph of an equation in the *xy*-plane if and only if this point represents a solution to the equation. It is sufficient, therefore, to find the point that represents a solution to the first given equation. Substituting the x- and y-coordinates of choice B, $-\frac{3r}{2}+\frac{7}{2}$ and r, for x and y, respectively, in the first equation yields $2\left(-\frac{3r}{2}+\frac{7}{2}\right)+3r=7$, which is equivalent to $-3r+7+3r=7$, or $7=7$. Therefore, the point $\left(-\frac{3r}{2}+\frac{7}{2}, r\right)$ represents a solution to the first equation and thus lies on the graph of each equation in the xy-plane for the given system.

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 26

Choice D is correct. If $x^2-c^2 \leq 0$, then neither side of the given equation is defined and there can be no solution. Therefore, $x^2-c^2>0$. Subtracting $\frac{c^2}{\sqrt{x^2-c^2}}$ from both sides of the given equation yields $\frac{x^2}{\sqrt{x^2-c^2}}-\frac{c^2}{\sqrt{x^2-c^2}}=39$, or $\frac{x^2-c^2}{\sqrt{x^2-c^2}}=39$. Squaring both sides of this equation yields $\left(\frac{x^2-c^2}{\sqrt{x^2-c^2}}\right)^2=39^2$, or $\frac{(x^2-c^2)(x^2-c^2)}{x^2-c^2}=39^2$. Since x^2-c^2 is positive and, therefore, nonzero, the expression $\frac{x^2-c^2}{x^2-c^2}$ is defined and equivalent to 1. It follows that the equation $\frac{(x^2-c^2)(x^2-c^2)}{x^2-c^2}=39^2$ can be rewritten as $\left(\frac{x^2-c^2}{x^2-c^2}\right)(x^2-c^2)=39^2$, or $(1)(x^2-c^2)=39^2$, which is equivalent to $x^2-c^2=39^2$. Adding c^2 to both sides of this equation yields $x^2=c^2+39^2$. Taking the square root of both sides of this equation yields two solutions: $x=\sqrt{c^2+39^2}$ and $x=-\sqrt{c^2+39^2}$. Therefore, of the given choices, $-\sqrt{c^2+39^2}$ is one of the 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 C is incorrect and may result from conceptual or calculation errors.

QUESTION 27

The correct answer is 168. The quadratic function g gives the estimated depth of the seal, $g(t)$, in meters, t minutes after the seal enters the water. It's given that function g estimates that the seal reached its maximum depth of 302.4 meters 6 minutes after it entered the water. Therefore, function g can be expressed in vertex form as $g(t)=a(t-6)^2+302.4$, where a is a constant. Since it's also given that the seal reached the surface of the water after 12 minutes, $g(12)=0$. Substituting 12 for t and 0 for $g(t)$ in $g(t)=a(t-6)^2+302.4$ yields $0=a(12-6)^2+302.4$, or $36a=-302.4$. Dividing both sides of this equation by 36 gives $a=-8.4$. Substituting -8.4 for a in $g(t)=a(t-6)^2+302.4$ gives $g(t)=-8.4(t-6)^2+302.4$. Substituting 10 for t in $g(t)$ gives $g(10)=-8.4(10-6)^2+302.4$, which is equivalent to $g(10)=-8.4(4)^2+302.4$, or $g(10)=168$. Therefore, the estimated depth, to the nearest meter, of the seal 10 minutes after it entered the water was 168 meters.