The SAT®

Practice Test #3

ANSWER EXPLANATIONS

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

CollegeBoard SAT®

Math

Module 1

(27 questions)

QUESTION 1

Choice B is correct. Subtracting 12 from both sides of the given equation yields $k=324$. Therefore, the solution to the given equation is 324.

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 2

Choice C is correct. The value of $f(2)$ is the value of $f(x)$ when $x=2$. Substituting 2 for x in the given function yields $f(2)=(2)^3+15$, or $f(2)=8+15$, which is equivalent to $f(2)=23$. Therefore, the value of $f(2)$ is 23.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect. This is the value of $f(2)$ when $f(x)=x(3)+15$, rather than $f(x)=x^3+15$. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 3

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 4

Choice D is correct. The sum of consecutive interior angles between two parallel lines and on the same side of the transversal is 180 degrees. Since it's given that line m is parallel to line n, it follows that $x+26=180$. Subtracting 26 from both sides of this equation yields 154. Therefore, the value of x is 154.

Choice A is incorrect. This is half of the given angle measure. *Choice B* is incorrect. This is the value of the given angle measure. *Choice C* is incorrect. This is twice the value of the given angle measure.

QUESTION 5

Choice C is correct. It's given that John made a $\$16$ payment each month for p months. The total amount of these payments can be represented by the expression $16p$. The down payment can be added to that amount to find the total amount John paid, yielding the expression $16p+37$. It's given that John paid a total of $\$165$. Therefore, the expression for the total amount John paid can be set equal to that amount, yielding the equation $16p+37=165$.

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 6

The correct answer is 50. Substituting 8 for x in the given equation yields $y=5(8)+10$, or $y=50$. Therefore, the value of y is 50 when $x=8$.

QUESTION 7

The correct answer is 40. The height of each bar in the bar graph shown represents the number of cans collected by the group specified at the bottom of the bar. The bar for group 6 reaches a height of 40. Therefore, group 6 collected 40 cans.

QUESTION 8

Choice C is correct. If one of these students is selected at random, the probability of selecting a student whose vote for the new mascot was for a lion is given by the number of votes for a lion divided by the total number of votes. The given table indicates that the number of votes for a lion is 20 votes, and the total number of votes is 80 votes. The table gives the distribution of votes for 80 students, and the table shows a total of 80 votes were counted. It follows that each of the 80 students voted exactly once. Thus, the probability of selecting a student whose vote for the new mascot was for a lion is $\frac{20}{80}$, or $\frac{1}{4}$.

Choice A is incorrect and may result from conceptual or computational errors. *Choice B* is incorrect and may result from conceptual or computational errors. *Choice D* is incorrect and may result from conceptual or computational errors.

QUESTION 9

Choice A is correct. It's given that the electrician charges a onetime fee plus an hourly rate. It's also given that the graph represents the total charge, in dollars, for x hours of work. This graph shows a linear relationship in the *xy*-plane. Thus, the total charge y, in dollars, for x hours of work can be represented as $y = mx + b$, where m is the slope and $(0, b)$ is the *y*-intercept of the graph of the equation in the *xy*-plane. Since the given graph represents the total charge, in dollars, by an electrician for x hours of work, it follows that its slope is m, or the electrician's hourly rate.

Choice B is incorrect. The electrician's onetime fee is represented by the *y*-coordinate of the *y*-intercept, not the slope, of the graph. *Choice C* is incorrect and may result from conceptual errors. *Choice D* is incorrect and may result from conceptual errors.

QUESTION 10

Choice D is correct. The perimeter, P, of a square can be found using the formula $P = 4s$, where s is the length of each side of the square. It's given that square X has a side length of 12 centimeters. Substituting 12 for s in the formula for the perimeter of a square yields $P = 4(12)$, or $P = 48$. Therefore, the perimeter of square X is 48 centimeters. It's also given that the perimeter of square Y is 2 times the perimeter of square X. Therefore, the perimeter of square Y is $2(48)$, or 96, centimeters. Substituting 96 for P in the formula $P = 4s$ gives $96 = 4s$. Dividing both sides of this equation by 4 gives $24 = s$. Therefore, the length of one side of square Y is 24 centimeters.

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 11

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 12

Choice A is correct. An equation defining a linear function can be written in the form $h(x)=ax+b$, where a and b are constants. It's given that $h(0)=41$. Substituting 0 for x and 41 for $h(x)$ in the equation $h(x)=ax+b$ yields $41=a(0)+b$, or $b=41$. Substituting 41 for b in the equation $h(x)=ax+b$ yields $h(x)=ax+41$. It's also given that $h(1)=40$. Substituting 1 for x and 40 for $h(x)$ in the equation $h(x)=ax+41$ yields $40=a(1)+41$, or $40=a+41$. Subtracting 41 from the left- and right-hand sides of this equation yields $-1=a$. Substituting -1 for a in the equation $h(x)=ax+41$ yields $h(x)=-1x+41$, or $h(x)=-x+41$.

Choice B is incorrect. Substituting 0 for x and 41 for $h(x)$ in this equation yields $41=-0$, which isn't a true statement. *Choice C* is incorrect. Substituting 0 for x and 41 for $h(x)$ in this equation yields $41=-41(0)$, or $41=0$, which isn't a true statement. *Choice D* is incorrect. Substituting 41 for $h(x)$ in this equation yields $41=-41$, which isn't a true statement.

QUESTION 13

The correct answer is 410. It's given that t minutes after an initial observation, the number of bacteria in a population is $60{,}000(2)^{\frac{t}{410}}$. This expression consists of the initial number of bacteria, $60{,}000$, multiplied by the expression $2^{\frac{t}{410}}$. The time it takes for the number of bacteria to double is the increase in the value of t that causes the expression $2^{\frac{t}{410}}$ to double. Since the base of the expression $2^{\frac{t}{410}}$ is 2, the expression $2^{\frac{t}{410}}$ will double when the exponent increases by 1. Since the exponent of the expression $2^{\frac{t}{410}}$ is $\frac{t}{410}$, the exponent will increase by 1 when t increases by 410. Therefore the time, in minutes, it takes for the number of bacteria in the population to double is 410.

QUESTION 14

The correct answer is 76. It's given that the graph of $y=g(x)$ is the result of translating the graph of $y=f(x)$ up 4 units in the *xy*-plane. It follows that the graph of $y=g(x)$ is the same as the graph of $y=f(x)+4$. Substituting $g(x)$ for y in the equation $y=f(x)+4$ yields $g(x)=f(x)+4$. It's given that $f(x)=(x-6)(x-2)(x+6)$. Substituting $(x-6)(x-2)(x+6)$ for $f(x)$ in the equation $g(x)=f(x)+4$ yields $g(x)=(x-6)(x-2)(x+6)+4$. Substituting 0 for x in this equation yields $g(0)=(0-6)(0-2)(0+6)+4$, or $g(0)=76$. Thus, the value of $g(0)$ is 76.

QUESTION 15

Choice D is correct. It's given that the candle starts with 17 ounces of wax and has 6 ounces of wax remaining after a period of time has passed. The amount of wax the candle has lost during the time period can be found by subtracting the remaining amount of wax from the amount of wax the candle was made of, which yields $17-6$ ounces, or 11 ounces. This means the candle loses 11 ounces of wax during that period of time. It's given that the amount of wax decreases by 1 ounce every 4 hours. If h represents the number of hours the candle has been burning, it follows that $\frac{1}{4}=\frac{11}{h}$. Multiplying both sides of this equation by $4h$ yields $h=44$. Therefore, the candle has been burning for 44 hours.

Choice A is incorrect and may result from using the equation $\frac{1}{4}=\frac{h}{11}$ rather than $\frac{1}{4}=\frac{11}{h}$ to represent the situation, and then rounding to the nearest whole number. *Choice B* is incorrect. This is the amount of wax, in ounces, remaining in the candle, not the number of hours it has been burning. *Choice C* is incorrect and may result from using the equation $\frac{1}{4}=\frac{6}{h}$ rather than $\frac{1}{4}=\frac{11}{h}$ to represent the situation.

QUESTION 16

Choice A is correct. Subtracting $14j$ from each side of the given equation results in $5k=m-14j$. Dividing each side of this equation by 5 results in $k=\frac{m-14j}{5}$.

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

QUESTION 17

Choice B is correct. If two triangles are similar, then their corresponding angles are congruent. It's given that right triangle FGH is similar to right triangle JKL and angle F corresponds to angle J. It follows that angle F is congruent to angle J and, therefore, the measure of angle F is equal to the measure of angle J. The sine ratios of angles of equal measure are equal. Since the measure of angle F is equal to the measure of angle J, $\sin(F)=\sin(J)$. It's given that $\sin(F)=\frac{308}{317}$. Therefore, $\sin(J)$ is $\frac{308}{317}$.

Choice A is incorrect. This is the value of $\cos(J)$, not the value of $\sin(J)$. *Choice C* is incorrect. This is the reciprocal of the value of $\sin(J)$, not the value of $\sin(J)$. *Choice D* is incorrect. This is the reciprocal of the value of $\cos(J)$, not the value of $\sin(J)$.

QUESTION 18

Choice B is correct. Let x be the first integer and let y be the second integer. If the first integer is 11 greater than twice the second integer, then $x=2y+11$. If the product of the two integers is 546, then $xy=546$. Substituting $2y+11$ for x in this equation results in $(2y+11)y=546$. Distributing the y to both terms in the parentheses results in $2y^2+11y=546$. Subtracting 546 from both sides of this equation results in $2y^2+11y-546=0$. The left-hand side of this equation can be factored by finding two values whose product is $2(-546)$, or $-1{,}092$, and whose sum is 11. The two values whose product is $-1{,}092$ and whose sum is 11 are 39 and -28. Thus, the equation $2y^2+11y-546=0$ can be rewritten as

$2y^2 + 28y - 39y - 546 = 0$, which is equivalent to $2y(y - 14) + 39(y - 14) = 0$, or $(2y + 39)(y - 14) = 0$. By the zero product property, it follows that $2y + 39 = 0$ and $y - 14 = 0$. Subtracting 39 from both sides of the equation $2y + 39 = 0$ yields $2y = -39$. Dividing both sides of this equation by 2 yields $y = -\frac{39}{2}$. Since y is a positive integer, the value of y is not $-\frac{39}{2}$. Adding 14 to both sides of the equation $y - 14 = 0$ yields $y = 14$. Substituting 14 for y in the equation $xy = 546$ yields $x(14) = 546$. Dividing both sides of this equation by 14 results in $x = 39$. Therefore, the two integers are 14 and 39, so the smaller of the two integers is 14.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is the larger of the two integers. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 19

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 20

The correct answer is -3. Squaring both sides of the given equation yields $(x - 2)^2 = 3x + 34$, which can be rewritten as $x^2 - 4x + 4 = 3x + 34$. Subtracting $3x$ and 34 from both sides of this equation yields $x^2 - 7x - 30 = 0$. This quadratic equation can be rewritten as $(x - 10)(x + 3) = 0$. According to the zero product property, $(x - 10)(x + 3)$ equals zero when either $x - 10 = 0$ or $x + 3 = 0$. Solving each of these equations for x yields $x = 10$ or $x = -3$. Therefore, the given equation has two solutions, 10 and -3. Of these two solutions, -3 is the smallest solution to the given equation.

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. It's given that the sample is in the shape of a cube with edge lengths of 0.9 meters. Therefore, the volume of the sample is 0.90^3, or 0.729, cubic meters. It's also given that the sample has a density of 807 kilograms per 1 cubic meter. Therefore, the mass of this sample is 0.729 cubic meters$\left(\frac{807 \text{ kilograms}}{1 \text{ cubic meter}}\right)$, or 588.303 kilograms. Rounding this mass to the nearest whole number gives 588 kilograms. Therefore, to the nearest whole number, the mass, in kilograms, of this sample is 588.

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 D is correct. It's given that for $x>0$, $f(x)$ is equal to 201% of x. This is equivalent to $f(x)=\frac{201}{100}x$, or $f(x)=2.01x$, for $x>0$. This function indicates that as x increases, $f(x)$ also increases, which means f is an increasing function. Furthermore, $f(x)$ increases at a constant rate of 2.01 for each increase of x by 1. A function with a constant rate of change is linear. Thus, the function f can be described as an increasing linear function.

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 could describe the function $f(x)=(2.01)^x$, where $f(x)$ is equal to 201% of $f(x-1)$, not x, for $x>0$.

QUESTION 24

Choice C is correct. It's given that $f(x)=\frac{a}{x+b}$ and that the graph shown is a partial graph of $y=f(x)$. Substituting y for $f(x)$ in the equation $f(x)=\frac{a}{x+b}$ yields $y=\frac{a}{x+b}$. The graph passes through the point $(-7, -2)$. Substituting -7 for x and -2 for y in the equation $y=\frac{a}{x+b}$ yields $-2=\frac{a}{-7+b}$. Multiplying each side of this equation by $-7+b$ yields $-2(-7+b)=a$, or $14-2b=a$. The graph also passes through the point $(-5, -6)$. Substituting -5 for x and -6 for y in the equation $y=\frac{a}{x+b}$ yields $-6=\frac{a}{-5+b}$. Multiplying each side of this equation by

$-5+b$ yields $-6(-5+b)=a$, or $30-6b=a$. Substituting $14-2b$ for a in this equation yields $30-6b=14-2b$. Adding $6b$ to each side of this equation yields $30=14+4b$. Subtracting 14 from each side of this equation yields $16=4b$. Dividing each side of this equation by 4 yields $4=b$. Substituting 4 for b in the equation $14-2b=a$ yields $14-2(4)=a$, or $6=a$. Substituting 6 for a and 4 for b in the equation $f(x)=\frac{a}{x+b}$ yields $f(x)=\frac{6}{x+4}$. It's given that $g(x)=f(x+4)$. Substituting $x+4$ for x in the equation $f(x)=\frac{6}{x+4}$ yields $f(x+4)=\frac{6}{x+4+4}$, which is equivalent to $f(x+4)=\frac{6}{x+8}$. It follows that $g(x)=\frac{6}{x+8}$.

Choice A is incorrect. This could define function g if $g(x)=f(x-4)$. *Choice B* is incorrect. This could define function g if $g(x)=f(x)$. *Choice D* is incorrect. This could define function g if $g(x)=f(x)\cdot(x+4)$.

QUESTION 25

Choice C is correct. Factoring the denominator in the second term of the given expression gives $\frac{y+12}{x-8}+\frac{y(x-8)}{xy(x-8)}$. This expression can be rewritten with common denominators by multiplying the first term by $\frac{xy}{xy}$, giving $\frac{xy(y+12)}{xy(x-8)}+\frac{y(x-8)}{xy(x-8)}$. Adding these two terms yields $\frac{xy(y+12)+y(x-8)}{xy(x-8)}$. Using the distributive property to rewrite this expression gives $\frac{xy^2+12xy+xy-8y}{x^2y-8xy}$. Combining the like terms in the numerator of this expression gives $\frac{xy^2+13xy-8y}{x^2y-8xy}$.

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. It's given that 483 out of 803 voters responded that they would vote for Angel Cruz. Therefore, the proportion of voters from the poll who responded they would vote for Angel Cruz is $\frac{483}{803}$. It's also given that there are a total of $6{,}424$ voters in the election. Therefore, the total number of people who would be expected to vote for Angel Cruz is $6{,}424\left(\frac{483}{803}\right)$, or $3{,}864$. Since $3{,}864$ of the $6{,}424$ total voters would be expected to vote for Angel Cruz, it follows that $6{,}424-3{,}864$, or $2{,}560$ voters would be expected not to vote for Angel Cruz. The difference in the number of votes for and against Angel Cruz is $3{,}864-2{,}560$, or $1{,}304$ votes. Therefore, if $6{,}424$ people vote in the election, Angel Cruz would be expected to win by $1{,}304$ votes.

Choice A is incorrect. This is the difference in the number of voters from the poll who responded that they would vote for and against Angel Cruz. *Choice C* is incorrect. This is the total number of people who would be expected to vote for Angel Cruz. *Choice D* is incorrect. This is the difference between the total number of people who vote in the election and the number of voters from the poll.

QUESTION 27

The correct answer is 10. It's given that the graph of $x^2+x+y^2+y=\frac{199}{2}$ in the *xy*-plane is a circle. The equation of a circle in the *xy*-plane can be written in the form $(x-h)^2+(y-k)^2=r^2$, where the coordinates of the center of the circle are (h, k) and the length of the radius of the circle is r. The term $(x-h)^2$ in this equation can be obtained by adding the square of half the coefficient of x to both sides of the given equation to complete the square. The coefficient of x is 1. Half the coefficient of x is $\frac{1}{2}$. The square of half the coefficient of x is $\frac{1}{4}$. Adding $\frac{1}{4}$ to each side of $(x^2+x)+(y^2+y)=\frac{199}{2}$ yields $\left(x^2+x+\frac{1}{4}\right)+(y^2+y)=\frac{199}{2}+\frac{1}{4}$, or $\left(x+\frac{1}{2}\right)^2+(y^2+y)=\frac{199}{2}+\frac{1}{4}$. Similarly, the term $(y-k)^2$ can be obtained by adding the square of half the coefficient of y to both sides of this equation, which yields $\left(x+\frac{1}{2}\right)^2+\left(y^2+y+\frac{1}{4}\right)=\frac{199}{2}+\frac{1}{4}+\frac{1}{4}$, or $\left(x+\frac{1}{2}\right)^2+\left(y+\frac{1}{2}\right)^2=\frac{199}{2}+\frac{1}{4}+\frac{1}{4}$. This equation is equivalent to $\left(x+\frac{1}{2}\right)^2+\left(y+\frac{1}{2}\right)^2=100$, or $\left(x+\frac{1}{2}\right)^2+\left(y+\frac{1}{2}\right)^2=10^2$. Therefore, the length of the circle's radius is 10.

Math

Module 2

(27 questions)

QUESTION 1

Choice B is correct. The number of harvested potatoes Isabel saved to plant next year can be calculated by multiplying the total number of potatoes Isabel harvested, 760, by the proportion of potatoes she saved. Since she saved 10% of the potatoes she harvested, the proportion of potatoes she saved is $\frac{10}{100}$, or 0.1. Multiplying 760 by this proportion gives $760(0.1)$, or 76, potatoes that she saved to plant next year.

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 2

Choice B 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 $(0, 2)$. Therefore, the *y*-intercept of the graph shown 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 3

Choice C is correct. Since 1 meter is equal to 100 centimeters, 51 meters is equal to 51 meters$\left(\frac{100 \text{ centimeters}}{1 \text{ meter}}\right)$, or $5{,}100$ centimeters.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect and may result from dividing, rather than multiplying, 51 by 100. *Choice D* is incorrect. This is the length, in millimeters rather than centimeters, that is equivalent to a length of 51 meters.

QUESTION 4

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 5

Choice B is correct. Combining like terms inside the parentheses of the given expression, $20w-(4w+3w)$, yields $20w-(7w)$. Combining like terms in this resulting expression yields $13w$.

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 6

The correct answer is 27. Multiplying both sides of the given equation by 3 yields $3(6+x)=3(9)$, or $18+3x=27$. Therefore, the value of $18+3x$ is 27.

QUESTION 7

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 8

Choice A is correct. Since x is a factor of each term in the given expression, the expression is equivalent to $x(9x)+x(5)$, or $x(9x+5)$.

Choice B is incorrect. This expression is equivalent to $45x^2+5x$, not $9x^2+5x$.
Choice C is incorrect. This expression is equivalent to $9x^2+45x$, not $9x^2+5x$.
Choice D is incorrect. This expression is equivalent to $9x^3+5x^2$, not $9x^2+5x$.

QUESTION 9

Choice D is correct. The sum of the angle measures of a triangle is 180°. Adding the measures of angles B and C gives $52+17=69^\circ$. Therefore, the measure of angle A is $180-69=111^\circ$.

Choice A is incorrect and may result from subtracting the sum of the measures of angles B and C from $90°$, instead of from $180°$. *Choice B* is incorrect and may result from subtracting the measure of angle C from the measure of angle B. *Choice C* is incorrect and may result from adding the measures of angles B and C but not subtracting the result from $180°$.

QUESTION 10

Choice D is correct. Since the graphs of the equations in the given system intersect at the point (x, y), the point (x, y) represents a solution to the given system of equations. The first equation of the given system of equations states that $x = 8$. Substituting 8 for x in the second equation of the given system of equations yields $y = 8^2 + 8$, or $y = 72$. Therefore, the value of y is 72.

Choice A is incorrect. This is the value of x, not y. *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 11

Choice B is correct. The line of best fit shown intersects the *y*-axis at a positive *y*-value and has a negative slope. The graph of an equation of the form $y = a + bx$, where a and b are constants, intersects the *y*-axis at a *y*-value of a and has a slope of b. Of the given choices, only choice B represents a line that intersects the *y*-axis at a positive *y*-value, 13.5, and has a negative slope, -0.8.

Choice A is incorrect. This equation represents a line that has a positive slope, not a negative slope. *Choice C* is incorrect. This equation represents a line that intersects the *y*-axis at a negative *y*-value, not a positive *y*-value, and has a positive slope, not a negative slope. *Choice D* is incorrect. This equation represents a line that intersects the *y*-axis at a negative *y*-value, not a positive *y*-value.

QUESTION 12

Choice C is correct. It's given that $f(x) = 8\sqrt{x}$. Substituting 48 for $f(x)$ in this equation yields $48 = 8\sqrt{x}$. Dividing both sides of this equation by 8 yields $6 = \sqrt{x}$. This can be rewritten as $\sqrt{x} = 6$. Squaring both sides of this equation yields $x = 36$. Therefore, the value of x for which $f(x) = 48$ is 36.

Choice A is incorrect. If $x = 6$, $f(x) = 8\sqrt{6}$, not 48. *Choice B* is incorrect. If $x = 8$, $f(x) = 8\sqrt{8}$, not 48. *Choice D* is incorrect. If $x = 64$, $f(x) = 8\sqrt{64}$, which is equivalent to 64, not 48.

QUESTION 13

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 14

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

QUESTION 15

Choice C is correct. It's given by the first equation in the system that $y = 3x$. Substituting $3x$ for y in the equation $2x + y = 12$ yields $2x + 3x = 12$, or $5x = 12$.

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. The volume, V, of a cube can be found using the formula $V = s^3$, where s is the edge length of the cube. It's given that a cube has an edge length of 41 inches. Substituting 41 inches for s in this equation yields $V = 41^3$ cubic inches, or $V = 68{,}921$ cubic inches. Therefore, the volume of the cube is $68{,}921$ cubic inches.

Choice A is incorrect. This is the perimeter, in inches, of the cube. *Choice B* is incorrect. This is the area, in square inches, of a face of the cube. *Choice C* is incorrect. This is the surface area, in square inches, of the cube.

QUESTION 17

Choice D is correct. It's given that the function p models the population of Lowell t years after a census. Since there are 12 months in a year, m months after the census is equivalent to $\frac{m}{12}$ years after the census. Substituting $\frac{m}{12}$ for t in the equation $p(t)=90{,}000(1.06)^t$ yields $p\left(\frac{m}{12}\right)=90{,}000(1.06)^{\frac{m}{12}}$. Therefore, the function r that best models the population of Lowell m months after the census is $r(m)=90{,}000(1.06)^{\frac{m}{12}}$.

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 18

Choice A is correct. The given system of linear equations can be solved by the elimination method. Multiplying each side of the second equation in the given system by 3 yields $(2x+2y)(3)=(10)(3)$, or $6x+6y=30$. Subtracting this equation from the first equation in the given system yields
$(6x+7y)-(6x+6y)=(28)-(30)$, which is equivalent to
$(6x-6x)+(7y-6y)=28-30$, or $y=-2$.

Choice B is incorrect. This is the value of x, not the value of y. *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 B is correct. It's given that the minimum value of x is 12 less than 6 times another number n. Therefore, the possible values of x are all greater than or equal to the value of 12 less than 6 times n. The value of 6 times n is given by the expression $6n$. The value of 12 less than $6n$ is given by the expression $6n-12$. Therefore, the possible values of x are all greater than or equal to $6n-12$. This can be shown by the inequality $x\geq 6n-12$.

Choice A is incorrect. This inequality shows the possible values of x if the maximum, not the minimum, value of x is 12 less than 6 times n. *Choice C* is incorrect. This inequality shows the possible values of x if the maximum, not the minimum, value of x is 6 times n less than 12, not 12 less than 6 times n. *Choice D* is incorrect. This inequality shows the possible values of x if the minimum value of x is 6 times n less than 12, not 12 less than 6 times n.

QUESTION 20

The correct answer is 44. The mean of a data set is computed by dividing the sum of the values in the data set by the number of values in the data set. It's given that data set A consists of the heights of 75 buildings and has a mean of 32 meters. This can be represented by the equation $\frac{x}{75}=32$, where x represents the sum of the heights of the buildings, in meters, in data set A. Multiplying both sides of this equation by 75 yields $x=75(32)$, or $x=2{,}400$ meters. Therefore, the sum of the heights of the buildings in data set A is $2,400$ meters. It's also given that data set B consists of the heights of 50 buildings and has a mean of 62 meters. This can be represented by the equation $\frac{y}{50}=62$, where y represents the sum of the heights of the buildings, in meters, in data set B. Multiplying both sides of this equation by 50 yields $y=50(62)$, or $y=3,100$ meters. Therefore, the sum of the heights of the buildings in data set B is $3,100$ meters. Since it's given that data set C consists of the heights of the 125 buildings from data sets A and B, it follows that the mean of data set C is the sum of the heights of the buildings, in meters, in data sets A and B divided by the number of buildings represented in data sets A and B, or $\frac{2,400+3,100}{125}$, which is equivalent to 44 meters. Therefore, the mean, in meters, of data set C is 44.

QUESTION 21

The correct answer is $\frac{59}{9}$. When the graph of an equation in the form $Ax+By=C$, where A, B, and C are constants, is translated down k units in the *xy*-plane, the resulting graph can be represented by the equation $Ax+B(y+k)=C$. It's given that the graph of $9x-10y=19$ is translated down 4 units in the *xy*-plane. Therefore, the resulting graph can be represented by the equation $9x-10(y+4)=19$, or $9x-10y-40=19$. Adding 40 to both sides of this equation yields $9x-10y=59$. The *x*-coordinate of the *x*-intercept of the graph of an equation in the *xy*-plane is the value of x in the equation when $y=0$. Substituting 0 for y in the equation $9x-10y=59$ yields $9x-10(0)=59$, or $9x=59$. Dividing both sides of this equation by 9 yields $x=\frac{59}{9}$. Therefore, the *x*-coordinate of the *x*-intercept of the resulting graph is $\frac{59}{9}$. Note that 59/9, 6.555, and 6.556 are examples of ways to enter a correct answer.

QUESTION 22

Choice D is correct. Since the value of y increases by a constant factor, 4, for each increase of 1 in the value of x, the relationship between x and y is exponential. An exponential relationship between x and y can be represented by an equation of the form $y=a(b)^x$, where a is the value of x when $y=0$ and y increases by a factor of b for each increase of 1 in the value of x. Since $y=200$ when $x=0$, $a=200$. Since y increases by a factor of 4 for each increase of 1 in the value of x, $b=4$. Substituting 200 for a and 4 for b in the equation $y=a(b)^x$ yields $y=200(4)^x$. Thus, the equation $y=200(4)^x$ represents the relationship between x and y.

Choice A is incorrect and may result from conceptual errors. *Choice B* is incorrect. This equation represents a relationship where for each increase of 1 in the value of x, the value of y increases by a factor of 200, not 4, and when $x=0$, y is equal to 4, not 200. *Choice C* is incorrect and may result from conceptual errors.

QUESTION 23

Choice B is correct. Adding 9 to each side of the given equation yields $x^2-2x=9$. To complete the square, adding 1 to each side of this equation yields $x^2-2x+1=9+1$, or $(x-1)^2=10$. Taking the square root of each side of this equation yields $x-1=\pm\sqrt{10}$. Adding 1 to each side of this equation yields $x=1\pm\sqrt{10}$. Since it's given that one of the solutions to the equation can be written as $1+\sqrt{k}$, the value of k must be 10.

Alternate approach: It's given that $1+\sqrt{k}$ is a solution to the given equation. It follows that $x=1+\sqrt{k}$. Substituting $1+\sqrt{k}$ for x in the given equation yields $(1+\sqrt{k})^2-2(1+\sqrt{k})-9=0$, or $(1+\sqrt{k})(1+\sqrt{k})-2(1+\sqrt{k})-9=0$. Expanding the products on the left-hand side of this equation yields $1+2\sqrt{k}+k-2-2\sqrt{k}-9=0$, or $k-10=0$. Adding 10 to each side of this equation yields $k=10$.

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 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 further 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 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 25

Choice B is correct. It's given that the right triangle is isosceles. In an isosceles right triangle, the two legs have equal lengths, and the length of the hypotenuse is $\sqrt{2}$ times the length of one of the legs. Let ℓ represent the length, in inches, of each leg of the isosceles right triangle. It follows that the length of the hypotenuse is $\ell\sqrt{2}$ inches. The perimeter of a figure is the sum of the lengths of the sides of the figure. Therefore, the perimeter of the isosceles right triangle is $\ell+\ell+\ell\sqrt{2}$ inches. It's given that the perimeter of the triangle is $94+94\sqrt{2}$ inches. It follows that $\ell+\ell+\ell\sqrt{2}=94+94\sqrt{2}$. Factoring the left-hand side of this equation yields $(1+1+\sqrt{2})\ell=94+94\sqrt{2}$, or $(2+\sqrt{2})\ell=94+94\sqrt{2}$. Dividing both sides of this equation by $2+\sqrt{2}$ yields $\ell=\frac{94+94\sqrt{2}}{2+\sqrt{2}}$. Rationalizing the denominator of the right-hand side of this equation by multiplying the right-hand side of the equation by $\frac{2-\sqrt{2}}{2-\sqrt{2}}$ yields $\ell=\frac{(94+94\sqrt{2})(2-\sqrt{2})}{(2+\sqrt{2})(2-\sqrt{2})}$. Applying the distributive property to the numerator and to the denominator of the right-hand side of this equation yields $\ell=\frac{188-94\sqrt{2}+188\sqrt{2}-94\sqrt{4}}{4-2\sqrt{2}+2\sqrt{2}-\sqrt{4}}$. This is equivalent to $\ell=\frac{94\sqrt{2}}{2}$, or $\ell=47\sqrt{2}$. Therefore, the length, in inches, of one leg of the isosceles right triangle is $47\sqrt{2}$.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is the length, in inches, of the hypotenuse. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 26

Choice C is correct. It's given that the equation $-9x^2+30x+c=0$ has exactly one solution. A quadratic equation of the form $ax^2+bx+c=0$ has exactly one solution if and only if its discriminant, $-4ac+b^2$, is equal to zero. It follows that for the given equation, $a=-9$ and $b=30$. Substituting -9 for a and 30 for b into b^2-4ac yields $30^2-4(-9)(c)$, or $900+36c$. Since the discriminant must equal zero, $900+36c=0$. Subtracting $36c$ from both sides of this equation yields $900=-36c$. Dividing each side of this equation by -36 yields $-25=c$. Therefore, the value of c is -25.

Choice A is incorrect. If the value of c is 3, this would yield a discriminant that is greater than zero. Therefore, the given equation would have two solutions, rather than exactly one solution. *Choice B* is incorrect. If the value of c is 0, this would yield a discriminant that is greater than zero. Therefore, the given equation would have two solutions, rather than exactly one solution. *Choice D* is incorrect. If the value of c is -53, this would yield a discriminant that is less than zero. Therefore, the given equation would have no real solutions, rather than exactly one solution.

QUESTION 27

The correct answer is 6. 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 first equation in the given system is $\frac{3}{2}y-\frac{1}{4}x=\frac{2}{3}-\frac{3}{2}y$. Multiplying each side of this equation by 12 yields $18y-3x=8-18y$. Adding $18y$ to each side of this equation yields $36y-3x=8$, or $-3x+36y=8$. The second equation in the given system is $\frac{1}{2}x+\frac{3}{2}=py+\frac{9}{2}$.

Multiplying each side of this equation by 2 yields $x+3=2py+9$. Subtracting $2py$ from each side of this equation yields $x+3-2py=9$. Subtracting 3 from each side of this equation yields $x-2py=6$. Therefore, the two equations in the given system, written in standard form, are $-3x+36y=8$ and $x-2py=6$. As previously stated, if this system has no solution, the lines represented by the equations in the *xy*-plane are parallel and distinct, meaning the proportion $\frac{1}{-3}=\frac{-2p}{36}$, or $-\frac{1}{3}=-\frac{p}{18}$, is true and the proportion $\frac{6}{8}=\frac{1}{-3}$ is not true. The proportion $\frac{6}{8}=\frac{1}{-3}$ is not true. Multiplying each side of the true proportion, $-\frac{1}{3}=-\frac{p}{18}$, by -18 yields $6=p$. Therefore, if the system has no solution, then the value of p is 6.