The SAT®

Practice Test #7

ANSWER EXPLANATIONS

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

SAT®

Math

Module 1
(27 questions)

QUESTION 1

Choice B is correct. In the given scatterplot, the *x*-values represent the distance above sea level, in feet, and the *y*-values represent the temperature, in °F. The point on the line of best fit with an *x*-value of $4{,}000$ has a corresponding *y*-value of 35. Therefore, at a distance of $4{,}000$ feet above sea level, the temperature predicted by the line of best fit is 35°F.

Choice A is incorrect. This is the temperature, in °F, predicted by the line of best fit at a distance of 0 feet above sea level. *Choice C* is incorrect. This is the measured temperature, in °F, at a distance of $6{,}000$ feet above sea level. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 2

Choice D is correct. It's given that rectangle P has an area of 72 square inches. If a rectangle with an area of 20 square inches is removed from rectangle P, the area, in square inches, of the resulting figure is $72-20$, or 52.

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 3

Choice B is correct. Subtracting 61 from each side of the given equation yields $|p|=4$. By the definition of absolute value, if $|p|=4$, then $p=4$ or $p=-4$. Of the given choices, 4 is a solution to the given equation.

Choice A is incorrect. This is the quotient, not the difference, of 65 and 61. *Choice C* is incorrect. This is the sum, not the difference, of 65 and 61. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 4

Choice A is correct. It's given that p represents the number of pounds of strawberries Lorenzo purchased and Lorenzo paid $\$1.90$ per pound for the strawberries. It follows that the total amount, in dollars, Lorenzo paid for strawberries can be represented by $1.90p$. It's given that Lorenzo paid $\$2$ for the box of cereal. If Lorenzo paid a total of $\$9.60$ for the box of cereal and strawberries, it follows that the equation $1.90p+2=9.60$ can be used to find p.

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 5

Choice D is correct. It's given that the bar graph summarizes the charge, in kilowatt-hours (kWh), a battery received each day for 15 days. The height of each bar in the bar graph shown represents the number of days the battery received the charge, in kWh, specified at the bottom of the bar. The bar for a charge of 0 kWh reaches a height of 6. Therefore, the battery received a charge of 0 kWh for 6 of these days.

Choice A is incorrect. This is the charge, in kWh, that the battery received, not the number of days the battery received this charge. *Choice B* is incorrect. This is the number of days the battery received a charge of either 8, 16, or 23 kWh. *Choice C* is incorrect. This is the number of days the battery received a charge of 11 kWh.

QUESTION 6

The correct answer is 9. It's given that the equation $y=px+r$ defines the line. In this equation, p represents the slope of the line and r represents the y-coordinate of the y-intercept of the line. It's given that the line has a slope of 9. Therefore, the value of p is 9.

QUESTION 7

The correct answer is either 14, -5, or -4. The x-intercepts of a graph in the xy-plane are the points at which the graph intersects the x-axis, or when the value of y is 0. Substituting 0 for y in the given equation yields $0=3(x-14)(x+5)(x+4)$. Dividing both sides of this equation by 3 yields $0=(x-14)(x+5)(x+4)$. Applying the zero product property to this equation yields three equations: $x-14=0$, $x+5=0$, and $x+4=0$. Adding 14 to both sides of the equation $x-14=0$ yields $x=14$, subtracting 5 from both sides of the equation $x+5=0$ yields $x=-5$, and subtracting 4 from both sides of the equation $x+4=0$ yields $x=-4$. Therefore, the x-coordinates of the x-intercepts of the graph of the given equation are 14, -5, and -4. Note that 14, -5, and -4 are examples of ways to enter a correct answer.

QUESTION 8

Choice A is correct. It's given that the graph shown gives the estimated value y, in dollars, of a tablet as a function of the number of months since it was purchased, x. The y-intercept of a graph is the point at which the graph intersects the y-axis, or when x is 0. The graph shown intersects the y-axis at the point $(0, 225)$. It follows that 0 months after the tablet was purchased, or when the tablet was purchased, the estimated value of the tablet was 225 dollars. Therefore, the best interpretation of the y-intercept is that the estimated value of the tablet was \$225 when it was purchased.

Choice B is incorrect. The estimated value of the tablet 24 months after it was purchased was \$50, not \$225. *Choice C* is incorrect. The estimated value of the tablet had decreased by $\$225 - \$50$, or \$175, not \$225, in the 24 months after it was purchased. *Choice D* is incorrect and may result from conceptual errors.

QUESTION 9

Choice B is correct. It's given that triangles EFG and JKL are congruent such that angle E corresponds to angle J. Corresponding angles of congruent triangles are congruent, so angle E and angle J must be congruent. Therefore, if the measure of angle E is $45°$, then the measure of angle J is also $45°$.

Choice A is incorrect. This is the measure of angle K, not angle J. *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 10

Choice D is correct. It's given that the function f is defined by $f(x) = \frac{1}{2}(x + 6)$. Substituting 4 for x in the given function yields $f(4) = \frac{1}{2}(4 + 6)$, or $f(4) = 5$. Therefore, the value of $f(4)$ is 5.

Choice A is incorrect. This is the value of $2(4 + 6)$, not $\frac{1}{2}(4 + 6)$. *Choice B* is incorrect. This is the value of $2 + (4 + 6)$, not $\frac{1}{2}(4 + 6)$. *Choice C* is incorrect. This is the value of $4 + 6$, not $\frac{1}{2}(4 + 6)$.

QUESTION 11

Choice C is correct. The solution to a system of two equations corresponds to the point where the graphs of the equations intersect. The graphs of the linear function and the absolute value function shown intersect at a point with an x-coordinate between -4 and -3 and a y-coordinate between 4 and 5. Of the given choices, only $\left(-\frac{7}{2}, \frac{9}{2}\right)$ has an x-coordinate between -4 and -3 and a y-coordinate between 4 and 5.

Choice A is incorrect. This is the y-intercept of the graph of the linear function. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect. This is the vertex of the graph of the absolute value function.

QUESTION 12

Choice D is correct. It's given that the system has infinitely many solutions. A system of two linear equations has infinitely many solutions when the two linear equations are equivalent. When one equation is a multiple of another equation, the two equations are equivalent. Multiplying each side of the given equation by 2 yields $2(y) = 2(6x + 3)$. Thus, $2(y) = 2(6x + 3)$ is equivalent to the given equation and could be the second equation in the system.

Choice A is incorrect. The system consisting of this equation and the given equation has one solution rather than infinitely many solutions. *Choice B* is incorrect. The system consisting of this equation and the given equation has one solution rather than infinitely many solutions. *Choice C* is incorrect. The system consisting of this equation and the given equation has no solutions rather than infinitely many solutions.

QUESTION 13

The correct answer is 294. Subtracting 18 from each side of the given equation yields $\frac{6}{7}p = 36$. Multiplying each side of this equation by $\frac{7}{6}$ yields $p = 42$. Multiplying each side of this equation by 7 yields $7p = 294$. Therefore, the value of $7p$ is 294.

QUESTION 14

The correct answer is 3. It's given that $y = 9x + 12$. Substituting $9x + 12$ for y in the second equation in the system, $x + 7y = 20$, yields $x + 7(9x + 12) = 20$, which gives $x + 63x + 84 = 20$, or $64x + 84 = 20$. Subtracting 84 from each side of this equation yields $64x = -64$. Dividing each side of this equation by 64 yields $x = -1$. Substituting -1 for x in the first equation in the system, $y = 9x + 12$, yields $y = 9(-1) + 12$, or $y = 3$. Therefore, the value of y is 3.

QUESTION 15

Choice A is correct. For a circle in the *xy*-plane that has the equation $(x - h)^2 + (y - k)^2 = r^2$, where h, k, and r are constants, (h, k) is the center of the circle and the positive value of r is the radius of the circle. In the given equation, $h = 13$ and $r^2 = 64$. Taking the square root of each side of $r^2 = 64$ yields $r = \pm 8$. Therefore, the center of the circle is at $(13, k)$ and the radius is 8.

Choice B is incorrect. This gives the center and radius of a circle with equation $(x - k)^2 + (y - 13)^2 = 64$, not $(x - 13)^2 + (y - k)^2 = 64$. *Choice C* is incorrect. This gives the center and radius of a circle with equation $(x - k)^2 + (y - 13)^2 = 4{,}096$, not $(x - 13)^2 + (y - k)^2 = 64$. *Choice D* is incorrect. This gives the center and radius of a circle with equation $(x - 13)^2 + (y - k)^2 = 4{,}096$, not $(x - 13)^2 + (y - k)^2 = 64$.

QUESTION 16

Choice C is correct. It's given that the function f is defined by $f(x)=|x-4x|$. It's also given that $f(5)-f(a)=-15$. Substituting 5 for x in the function $f(x)=|x-4x|$ yields $f(5)=|5-4(5)|$ and substituting a for x in the function $f(x)=|x-4x|$ yields $f(a)=|a-4a|$. Therefore, $f(5)=15$ and $f(a)=|-3a|$. Substituting 15 for $f(5)$ and $|-3a|$ for $f(a)$ in the equation $f(5)-f(a)=-15$ yields $15-|-3a|=-15$. Subtracting 15 from both sides of this equation yields $-|-3a|=-30$. Dividing both sides of this equation by -1 yields $|-3a|=30$. By the definition of absolute value, if $|-3a|=30$, then $-3a=30$ or $-3a=-30$. Dividing both sides of each of these equations by -3 yields $a=-10$ or $a=10$, respectively. Thus, of the given choices, a value of a that satisfies $f(5)-f(a)=-15$ is 10.

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 17

Choice B is correct. Each of the given choices is an equation of the form $f(x)=a(b)^{x-k}$, where a, b, and k are constants. For an equation of this form, the coefficient, a, is equal to the value of the function when the exponent is equal to 0, or when $x=k$. It follows that in the equation $f(x)=33(1.5)^x$, the coefficient, 33, is equal to the value of $f(0)$. Substituting 0 for x in this equation yields $f(0)=33(1.5)^0$, which is equivalent to $f(0)=33(1)$, or $f(0)=33$. Thus, the value of c is 33 and the equation $f(x)=33(1.5)^x$ shows the value of c as the coefficient.

Choice A is incorrect. This equation shows the value of $f(-1)$, not $f(0)$, as the coefficient. *Choice C* is incorrect. This equation shows the value of $f(1)$, not $f(0)$, as the coefficient. *Choice D* is incorrect. This equation shows the value of $f(2)$, not $f(0)$, as the coefficient.

QUESTION 18

Choice B is correct. It's given that t minutes after an initial observation, the number of bacteria in a population is $40{,}000(2)^{\frac{t}{790}}$. This expression consists of the initial number of bacteria, 40,000, multiplied by the expression $2^{\frac{t}{790}}$. The time, in minutes, it takes for the number of bacteria to double is the increase in the value of t that causes the expression $2^{\frac{t}{790}}$ to double. Since the base is 2, the expression $2^{\frac{t}{790}}$ will double when the exponent increases by 1. Since the exponent of this expression is $\frac{t}{790}$, the exponent will increase by 1 when t increases by 790. Therefore, the time, in minutes, it takes for the number of bacteria in the population to double is 790.

Alternate approach: The initial number of bacteria in the population can be found by substituting 0 for t in the given function. This yields $f(0)=40{,}000(2)^{\frac{0}{790}}$, or $f(0)=40{,}000$. Therefore, the initial number of bacteria present in the population is 40,000, so the bacteria population will have doubled when $f(t)=80{,}000$.

Substituting 80,000 for $f(t)$ in the given function yields $80{,}000 = 40{,}000(2)^{\frac{t}{790}}$. Dividing both sides of this equation by 40,000 yields $2 = 2^{\frac{t}{790}}$, or $2^1 = 2^{\frac{t}{790}}$. It follows that $1 = \frac{t}{790}$. Multiplying both sides of this equation by 790 yields $790 = t$. Therefore, the time, in minutes, it takes for the number of bacteria in the population to double is 790.

Choice A is incorrect. This is the base of the exponent, not the time it takes for the number of bacteria in the population to double. *Choice C* is incorrect. This is the number of minutes it takes for the population to double twice. *Choice D* is incorrect. This is the number of bacteria that are initially observed, not the time it takes for the number of bacteria in the population to double.

QUESTION 19

Choice D is correct. Adding $\frac{2}{t}$ to each side of the given equation yields $\frac{12}{n} = -\frac{2}{w} + \frac{2}{t}$. The fractions on the right side of this equation have a common denominator of tw; therefore, the equation can be written as $\frac{12}{n} = \frac{2w}{tw} - \frac{2t}{tw}$, or $\frac{12}{n} = \frac{2w - 2t}{tw}$, which is equivalent to $\frac{12}{n} = \frac{2(w - t)}{tw}$. Dividing each side of this equation by 2 yields $\frac{6}{n} = \frac{w - t}{tw}$. Since n, t, w, and $w - t$ are all positive quantities, taking the reciprocal of each side of the equation $\frac{6}{n} = \frac{w - t}{tw}$ yields an equivalent equation: $\frac{n}{6} = \frac{tw}{w - t}$. Multiplying each side of this equation by 6 yields $n = \frac{6tw}{w - t}$.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is equivalent to $\frac{1}{n}$ rather than n.

QUESTION 20

The correct answer is 5. For the graph shown, x represents time, in minutes, and y represents temperature, in degrees Celsius (°C). Therefore, the average rate of change, in °C per minute, of the recorded temperature of the air in the chamber between two x-values is the difference in the corresponding y-values divided by the difference in the x-values. The graph shows that at $x = 5$, the corresponding y-value is 14. The graph also shows that at $x = 7$, the corresponding y-value is 24. It follows that the average rate of change, in °C per minute, from $x = 5$ to $x = 7$ is $\frac{24 - 14}{7 - 5}$, which is equivalent to $\frac{10}{2}$, or 5.

QUESTION 21

The correct answer is 87. It's given that in August, the car dealer completed 15 more than 3 times the number of sales the car dealer completed in September. Let x represent the number of sales the car dealer completed in September. It follows that $3x + 15$ represents the number of sales the car dealer completed in August. It's also given that in August and September, the car dealer completed 363 sales. It follows that $x + (3x + 15) = 363$, or $4x + 15 = 363$. Subtracting 15 from each side of this equation yields $4x = 348$. Dividing each side of this equation by 4 yields $x = 87$. Therefore, the car dealer completed 87 sales in September.

QUESTION 22

Choice B is correct. Since it's given that P is the center of a circle with a radius of 9 inches, and that points Q and R lie on that circle, it follows that $\overline{PQ}$ and $\overline{RP}$ of triangle PQR each have a length of 9 inches. Let the length of $\overline{QR}$ be x inches. It follows that the perimeter of triangle PQR is $9+9+x$ inches. Since it's given that the perimeter of triangle PQR is 31 inches, it follows that $9+9+x=31$, or $18+x=31$. Subtracting 18 from both sides of this equation gives $x=13$. Therefore, the length, in inches, of $\overline{QR}$ is 13.

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 23

Choice A is correct. It's given that the four odd integers are consecutive, ordered from least to greatest, and that the first odd integer is represented by x. It follows that the second odd integer is represented by $x+2$, the third odd integer is represented by $x+4$, and the fourth odd integer is represented by $x+6$. Therefore, the product of 12 and the fourth odd integer is represented by $12(x+6)$, and 26 less than the sum of the first and third odd integers is represented by $x+(x+4)-26$. Since the product of 12 and the fourth odd integer is at most 26 less than the sum of the first and third odd integers, it follows that $12(x+6)\leq x+(x+4)-26$.

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 24

Choice B is correct. The linear relationship between x and y can be represented by an equation of the form $y-y_1=m(x-x_1)$, where m is the slope of the graph of the equation in the xy-plane and (x_1, y_1) is a point on the graph. The slope of a line can be found using two points on the line and the slope formula $m=\frac{y_2-y_1}{x_2-x_1}$. Each value of x and its corresponding value of y in the table can be represented by a point (x, y). Substituting the points $(-s, 21)$ and $(s, 15)$ for (x_1, y_1) and (x_2, y_2), respectively, in the slope formula yields $m=\frac{15-21}{s-(-s)}$, which gives $m=\frac{-6}{2s}$, or $m=-\frac{3}{s}$. Substituting $-\frac{3}{s}$ for m and the point $(s, 15)$ for (x_1, y_1) in the equation $y-y_1=m(x-x_1)$ yields $y-15=-\frac{3}{s}(x-s)$. Distributing $-\frac{3}{s}$ on the right-hand side of this equation yields $y-15=-\frac{3x}{s}+3$. Adding 15 to each side of this equation yields $y=-\frac{3x}{s}+18$. Multiplying each side of this equation by s yields $sy=-3x+18s$. Adding $3x$ to each side of this equation yields $3x+sy=18s$. Therefore, the equation $3x+sy=18s$ represents this relationship.

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 25

Choice C is correct. The sine of an angle is equal to the cosine of its complementary angle. Since angles with measures $24°$ and $66°$ are complementary to each other, $\sin 24°$ is equal to $\cos 66°$ and $\sin 66°$ is equal to $\cos 24°$. Substituting $\cos 66°$ for $\sin 24°$ and $\cos 24°$ for $\sin 66°$ in the given expression yields $(\cos 66°)(\cos 66°)+(\cos 24°)(\cos 24°)$, or $(\cos 66°)^2+(\cos 24°)^2$.

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

QUESTION 26

Choice A is correct. It's given that the cost of renting a carpet cleaner is $\$52$ for the first day and $\$26$ for each additional day. Therefore, the cost $C(d)$, in dollars, of renting the carpet cleaner for d days is the sum of the cost for the first day, $\$52$, and the cost for the additional $d-1$ days, $\$26(d-1)$. It follows that $C(d)=52+26(d-1)$, which is equivalent to $C(d)=52+26d-26$, or $C(d)=26d+26$.

Choice B is incorrect. This function gives the cost of renting a carpet cleaner for d days if the cost is $\$78$, not $\$52$, for the first day and $\$26$ for each additional day. *Choice C* is incorrect. This function gives the cost of renting a carpet cleaner for d days if the cost is $\$26$, not $\$52$, for the first day and $\$52$, not $\$26$, for each additional day. *Choice D* is incorrect. This function gives the cost of renting a carpet cleaner for d days if the cost is $\$130$, not $\$52$, for the first day and $\$52$, not $\$26$, for each additional day.

QUESTION 27

The correct answer is $-\frac{13}{2}$. The value of x for which $f(x)$ reaches its minimum can be found by rewriting the given equation in the form $f(x)=(x-h)^2+k$, where $f(x)$ reaches its minimum, k, when the value of x is h. The given equation, $f(x)=(x-2)(x+15)$, can be rewritten as $f(x)=x^2+13x-30$. By completing the square, this equation can be rewritten as $f(x)=\left(x^2+13x+\left(\frac{13}{2}\right)^2\right)-30-\left(\frac{13}{2}\right)^2$, which is equivalent to $f(x)=\left(x+\frac{13}{2}\right)^2-\frac{289}{4}$, or $f(x)=\left(x-\left(-\frac{13}{2}\right)\right)^2-\frac{289}{4}$. Therefore, $f(x)$ reaches its minimum when the value of x is $-\frac{13}{2}$. Note that -13/2 and -6.5 are examples of ways to enter a correct answer.

Alternate approach: The graph of $y=f(x)$ in the xy-plane is a parabola. The value of x for the vertex of a parabola is the x-value of the midpoint between the two x-intercepts of the parabola. Since it's given that $f(x)=(x-2)(x+15)$, it follows that the two x-intercepts of the graph of $y=f(x)$ in the xy-plane occur when $x=2$ and $x=-15$, or at the points $(2, 0)$ and $(-15, 0)$. The midpoint between two points, (x_1, y_1) and (x_2, y_2), is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$. Therefore, the midpoint between $(2, 0)$ and $(-15, 0)$ is $\left(\frac{2-15}{2}, \frac{0+0}{2}\right)$, or $\left(-\frac{13}{2}, 0\right)$. It follows that $f(x)$ reaches its minimum when the value of x is $-\frac{13}{2}$. Note that -13/2 and -6.5 are examples of ways to enter a correct answer.

Math

Module 2

(27 questions)

QUESTION 1

Choice A is correct. It’s given that a total of 165 people contributed to a charity event as either a donor or a volunteer. It’s also given that 130 people contributed as a donor. It follows that $165 - 130$, or 35, people contributed as a volunteer.

Choice B is incorrect. This is the number of people who contributed as a donor, not a volunteer. *Choice C* is incorrect. This is the total number of people who contributed as either a donor or a volunteer, not the number of people who contributed as a volunteer. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 2

Choice B is correct. It’s given that there are 250 trees in a park and of these trees, 6% are birch trees. The number of birch trees in the park can be calculated by multiplying the number of trees in the park by $\frac{6}{100}$. Therefore, the number of birch trees in the park is $250\left(\frac{6}{100}\right)$, or 15.

Choice A is incorrect. This is the percentage of trees in the park that are birch trees, not the number of birch trees in the park. *Choice C* is incorrect. This is 30%, not 6%, of 250. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 3

Choice C is correct. The vertex of the graph of a quadratic function in the *xy*-plane is the point at which the graph is either at its minimum or maximum *y*-value. In the graph shown, the minimum *y*-value occurs at the point $(0, 2)$.

Choice A is incorrect. The graph shown doesn’t pass through the point $(0, -2)$. *Choice B* is incorrect. The graph shown doesn’t pass through the point $(0, -3)$. *Choice D* is incorrect. The graph shown doesn’t pass through the point $(0, 3)$.

QUESTION 4

Choice A is correct. It's given that there are 2,358 raccoons in a 131-square-mile area. The estimated population density, in raccoons per square mile, is the estimated number of raccoons divided by the number of square miles. Therefore, the estimated population density of this area is $\frac{2{,}358 \text{ raccoons}}{131 \text{ square miles}}$, or 18 raccoons per square mile.

Choice B is incorrect. This is the number of square miles in the area, not the estimated number of raccoons per square mile in this area. *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 5

Choice B is correct. The probability of selecting a positive number is the number of positive numbers in the data set divided by the total number of numbers in the data set. There is 1 positive number in this data set. There are 3 total numbers in this data set. Thus, if a number from this data set is selected at random, the probability of selecting a positive number is $\frac{1}{3}$.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is the probability of selecting a negative number from this data set. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 6

The correct answer is 2,850. It's given that the function $f(x) = 45x + 600$ gives the monthly fee, in dollars, a facility charges to keep x crates in storage. Substituting 50 for x in this function yields $f(50) = 45(50) + 600$, or $f(50) = 2{,}850$. Therefore, the monthly fee, in dollars, the facility charges to keep 50 crates in storage is 2,850.

QUESTION 7

The correct answer is $\frac{11}{4}$. It's given that the function f is defined by $f(x) = 5\left(\frac{1}{4} - x\right)^2 + \frac{11}{4}$. Substituting $\frac{1}{4}$ for x in this equation yields $f\left(\frac{1}{4}\right) = 5\left(\frac{1}{4} - \frac{1}{4}\right)^2 + \frac{11}{4}$, which is equivalent $f\left(\frac{1}{4}\right) = 5(0)^2 + \frac{11}{4}$, or $f\left(\frac{1}{4}\right) = \frac{11}{4}$. Therefore, the value of $f\left(\frac{1}{4}\right)$ is $\frac{11}{4}$. Note that 11/4 or 2.75 are examples of ways to enter a correct answer.

QUESTION 8

Choice C is correct. It's given that $8x = 6$. Multiplying each side of this equation by 9 yields $72x = 54$. Therefore, the value of $72x$ is 54.

Choice A is incorrect. This is the value of $4x$, not $72x$. *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 9

Choice C is correct. Since x is a common factor of each term in the given expression, the given expression can be rewritten as $x(23x^2+2x+9)$.

Choice A is incorrect. This expression is equivalent to $23x^3+46x^2+207x$.
Choice B is incorrect. This expression is equivalent to $207x^4+18x^3+9x$.
Choice D is incorrect. This expression is equivalent to $34x^3+34x^2+34x$.

QUESTION 10

Choice D is correct. The given expression can be rewritten as $(9x^3+6x^3)+5x^2+5x+(7-5)$. Combining like terms in this expression yields $15x^3+5x^2+5x+2$.

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 11

Choice D is correct. It's given that the equation $80S+90C=1{,}120$ represents this situation, where S is the number of square tokens won, C is the number of circle tokens won, and $1{,}120$ is the total number of points the tokens are worth. It follows that $80S$ represents the total number of points the square tokens are worth. Therefore, each square token is worth 80 points. It also follows that $90C$ represents the total number of points the circle tokens are worth. Therefore, each circle token is worth 90 points. Since a circle token is worth 90 points and a square token is worth 80 points, then a circle token is worth $90-80$, or 10, more points than a square token.

Choice A is incorrect and may result from conceptual or calculation errors.
Choice B is incorrect. This is the number of points a circle token is worth.
Choice C is incorrect. This is the number of points a square token is worth.

QUESTION 12

Choice D is correct. A line in the xy-plane that passes through the points (x_1, y_1) and (x_2, y_2) has a slope of $\frac{y_2-y_1}{x_2-x_1}$. The line of best fit shown passes approximately through the points $(1, 3.3)$ and $(7, 14.5)$. It follows that the slope of this best fit line is approximately $\frac{14.5-3.3}{7-1}$, which is equivalent to $\frac{11.2}{6}$, or approximately 1.87. Therefore, of the given choices, 2 is closest to the slope of the line of best fit shown.

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 13

The correct answer is 4.41. The area, A, of a circle is given by the formula $A = \pi r^2$, where r is the radius of the circle. It's given that the area of the circle is $b\pi$ square inches, where b is a constant, and the radius of the circle is 2.1 inches. Substituting $b\pi$ for A and 2.1 for r in the formula $A = \pi r^2$ yields $b\pi = \pi(2.1^2)$. Dividing both sides of this equation by π yields $b = 4.41$. Therefore, the value of b is 4.41.

QUESTION 14

The correct answer is 153. Since it's given that $\overline{PQ}$ is parallel to $\overline{XY}$ and angle Y is a right angle, angle ZQP is also a right angle. Angle ZPQ is complementary to angle XZY, which means its measure, in degrees, is $90 - 63$, or 27. Since angle XPQ is supplementary to angle ZPQ, its measure, in degrees, is $180 - 27$, or 153.

QUESTION 15

Choice C is correct. It's given that t represents the number of years since the account was opened. Therefore, $\frac{t}{10}$ represents the number of 10-year periods since the account was opened. Since the value of the account doubles during each of these 10-year periods, the value of the account can be found by multiplying the initial value by $\frac{t}{10}$ factors of 2. This is equivalent to $2^{\frac{t}{10}}$. It's given that the initial value of the account is \$890. Therefore, the value of the account $M(t)$, in dollars, t years after the account was opened can be represented by $M(t) = 890(2)^{\frac{t}{10}}$.

Choice A is incorrect. This equation represents the value of an account if the value of the account halves, not doubles, every 10 years. *Choice B* is incorrect. This equation represents the value of an account if the value of the account decreases by 90%, not doubles, every 2, not 10, years. *Choice D* is incorrect. This equation represents the value of an account if the value of the account increases by a factor of 10, not doubles, every 2, not 10, years.

QUESTION 16

Choice A is correct. The inequality $y < x$ indicates that for any solution to the given system of inequalities, the value of x must be greater than the corresponding value of y. The inequality $x < 22$ indicates that for any solution to the given system of inequalities, the value of x must be less than 22. Of the given choices, only choice A contains values of x that are each greater than the corresponding value of y and less than 22. Therefore, for choice A, all the values of x and their corresponding values of y are solutions to the given system of inequalities.

Choice B is incorrect. The values in this table aren't solutions to the inequality $y < x$. *Choice C* is incorrect. The values in this table aren't solutions to the inequality $x < 22$. *Choice D* is incorrect. The values in this table aren't solutions to the inequality $y < x$ or the inequality $x < 22$.

QUESTION 17

Choice A is correct. For positive values of a, $\frac{a^m}{a^n}=a^{(m-n)}$, where m and n are integers. Since it's given that $h>0$ and $q>0$, this property can be applied to rewrite the given expression as $(h^{(15-5)})(q^{(7-21)})$, which is equivalent to $h^{10}q^{-14}$. For positive values of a, $a^{-n}=\frac{1}{a^n}$. This property can be applied to rewrite the expression $h^{10}q^{-14}$ as $(h^{10})\left(\frac{1}{q^{14}}\right)$, which is equivalent to $\frac{h^{10}}{q^{14}}$.

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 18

Choice D is correct. Adding the second equation to the first equation in the given system of equations yields $3y-3y=4x+9x+17-23$, or $0=13x-6$. Adding 6 to each side of this equation yields $6=13x$. Multiplying each side of this equation by 3 yields $18=39x$. Therefore, the value of $39x$ is 18.

Choice A is incorrect. This is the value of $-39x$, not $39x$. *Choice B* is incorrect. This is the value of $-13x$, not $39x$. *Choice C* is incorrect. This is the value of $13x$, not $39x$.

QUESTION 19

Choice B is correct. It's given that the function h estimates that the object is 3,364 feet above the ground when it's dropped at $t=0$. Substituting 3,364 for $h(t)$ and 0 for t in the function h yields $3{,}364=-16(0)^2+b$, or $3{,}364=b$. Substituting 3,364 for b in the function h yields $h(t)=-16t^2+3{,}364$. When the object hits the ground, its height will be 0 feet above the ground. Substituting 0 for $h(t)$ in $h(t)=-16t^2+3{,}364$ yields $0=-16t^2+3{,}364$. Adding $16t^2$ to each side of this equation yields $16t^2=3{,}364$. Dividing each side of this equation by 16 yields $t^2=210.25$. Since the object will hit the ground at a positive number of seconds after it's dropped, the value of t can be found by taking the positive square root of each side of this equation, which yields $t=14.50$. It follows that the function estimates the object will hit the ground approximately 14.50 seconds after being dropped.

Choice A is incorrect. The function estimates that 7.25 seconds after being dropped, the object's height will be $-16(7.25)^2+3{,}364$ feet, or 2,523 feet, above the ground. *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 120. The solutions to a quadratic equation of the form $ax^2+bx+c=0$ can be calculated using the quadratic formula and are given by $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$. The given equation is in the form $ax^2+bx+c=0$, where $a=2$, $b=-8$, and $c=-7$. It follows that the solutions to the given equation are $x=\frac{8\pm\sqrt{(-8)^2-4(2)(-7)}}{2(2)}$, which is equivalent to $x=\frac{8\pm\sqrt{64+56}}{4}$, or $x=\frac{8\pm\sqrt{120}}{4}$. It's given that one solution to the equation $2x^2-8x-7=0$ can be written as $\frac{8-\sqrt{k}}{4}$. The solution $\frac{8-\sqrt{120}}{4}$ is in this form. Therefore, the value of k is 120.

QUESTION 21

The correct answer is 1,660. It's given that a line intersects two parallel lines, forming four acute angles and four obtuse angles. When two parallel lines are intersected by a transversal line, the angles formed have the following properties: two adjacent angles are supplementary, and alternate interior angles are congruent. Therefore, each of the four acute angles have the same measure, and each of the four obtuse angles have the same measure. It's also given that the measure of one of the acute angles is $(9x-560)°$. If two angles are supplementary, then the sum of their measures is 180°. Therefore, the measure of the obtuse angle adjacent to any of the acute angles is $(180-(9x-560))°$, or $(180-9x+560)°$, which is equivalent to $(-9x+740)°$. It's given that the sum of the measures of one of the acute angles and three of the obtuse angles is $(-18x+w)°$. It follows that $(9x-560)+3(-9x+740)=(-18x+w)$, which is equivalent to $9x-560-27x+2{,}220=-18x+w$, or $-18x+1{,}660=-18x+w$. Adding $18x$ to both sides of this equation yields $1{,}660=w$.

QUESTION 22

Choice B is correct. An equation that defines a linear function f can be written in the form $f(x)=mx+b$, where m and b are constants. It's given in the table that when $x=-4$, $f(x)=0$. Substituting -4 for x and 0 for $f(x)$ in the equation $f(x)=mx+b$ yields $0=m(-4)+b$, or $0=-4m+b$. Adding $4m$ to both sides of this equation yields $4m=b$. Substituting $4m$ for b in the equation $f(x)=mx+b$ yields $f(x)=mx+4m$. It's also given in the table that when $x=-\frac{19}{5}$, $f(x)=1$. Substituting $-\frac{19}{5}$ for x and 1 for $f(x)$ in the equation $f(x)=mx+4m$ yields $1=m\left(-\frac{19}{5}\right)+4m$, or $1=\frac{1}{5}m$. Multiplying both sides of this equation by 5 yields $m=5$. Substituting 5 for m in the equation $f(x)=mx+4m$ yields $f(x)=5x+4(5)$, or $f(x)=5x+20$. If $h(x)=f(x)-13$, substituting $5x+20$ for $f(x)$ in this equation yields $h(x)=(5x+20)-13$, or $h(x)=5x+7$.

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. This is an equation that defines the linear function f, not h.

QUESTION 23

Choice C is correct. It's given that $g(c+7)=\frac{c}{4}$. Therefore, for the given linear function g, when $x=c+7$, $g(x)=\frac{c}{4}$. Substituting $c+7$ for x and $\frac{c}{4}$ for $g(x)$ in $g(x)=b-15x$ yields $\frac{c}{4}=b-15(c+7)$. Applying the distributive property to the right-hand side of this equation yields $\frac{c}{4}=b-15c-105$. Adding $15c$ to both sides of this equation yields $\frac{c}{4}+15c=b-105$. Adding 105 to both sides of this equation yields $\frac{c}{4}+15c+105=b$, or $\frac{61c}{4}+105=b$. Therefore, the expression that represents the value of b is $\frac{61c}{4}+105$.

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 24

Choice B is correct. It's given that angle Z in triangle XYZ is a right angle. Thus, side YZ is the leg opposite angle X and side XZ is the leg adjacent to angle X. The tangent of an acute angle in a right triangle is the ratio of the length of the leg opposite the angle to the length of the leg adjacent to the angle. It follows that $\tan X=\frac{YZ}{XZ}$. It's given that $\tan X=\frac{12}{35}$ and the length of side YZ is 24 units. Substituting $\frac{12}{35}$ for $\tan X$ and 24 for YZ in the equation $\tan X=\frac{YZ}{XZ}$ yields $\frac{12}{35}=\frac{24}{XZ}$. Multiplying both sides of this equation by $35(XZ)$ yields $12(XZ)=24(35)$, or $12(XZ)=840$. Dividing both sides of this equation by 12 yields $XZ=70$. The length XY can be calculated using the Pythagorean theorem, which states that if a right triangle has legs with lengths of a and b and a hypotenuse with length c, then $a^2+b^2=c^2$. Substituting 70 for a and 24 for b in this equation yields $70^2+24^2=c^2$, or $5{,}476=c^2$. Taking the square root of both sides of this equation yields $\pm 74=c$. Since the length of the hypotenuse must be positive, $74=c$. Therefore, the length of XY is 74 units. The perimeter of a triangle is the sum of the lengths of all sides. Thus, $(74+70+24)$ units, or 168 units, is the perimeter of triangle XYZ.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This would be the perimeter, in units, for a right triangle where the length of side YZ is 12 units, not 24 units. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 25

Choice C is correct. It's given that in the *xy*-plane, the graph of the given equation 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 (h, k) is the center of the circle and r is the length of the circle's radius. Subtracting $6y$ from both sides of the equation $x^2+14x+y^2=6y+109$ yields $x^2+14x+y^2-6y=109$. By completing the square, this equation can be rewritten as $\left(x^2+14x+\left(\frac{14}{2}\right)^2\right)+\left(y^2-6y+\left(\frac{-6}{2}\right)^2\right)=109+\left(\frac{14}{2}\right)^2+\left(\frac{-6}{2}\right)^2$. This equation can be rewritten as $(x^2+14x+49)+(y^2-6y+9)=109+49+9$, or $(x+7)^2+(y-3)^2=167$. Therefore, $r^2=167$. Taking the square root of both sides of this equation yields $r=\sqrt{167}$ and $r=-\sqrt{167}$. Since r is the length of the circle's radius, r must be positive. Therefore, the length of the circle's radius is $\sqrt{167}$.

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 the speed of a vehicle is increasing at a rate of 7.3 meters per second squared. It's given to use $1 \text{ mile} = 1{,}609$ meters. There are 60 seconds in 1 minute; therefore, 60^2 or 3,600 seconds squared is equal to 1 minute squared. It follows that the rate of 7.3 meters per second squared is equivalent to $\left(\frac{7.3 \text{ meters}}{1 \text{ second squared}}\right)\left(\frac{1 \text{ mile}}{1{,}609 \text{ meters}}\right)\left(\frac{3{,}600 \text{ seconds squared}}{1 \text{ minute squared}}\right)$, or approximately 16.33 miles per minute squared. The rate, in miles per minute squared, rounded to the nearest tenth is 16.3.

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 14. It's given by the first equation of the system of equations that $y=-2.5$. Substituting -2.5 for y in the second given equation, $y=x^2+8x+k$, yields $-2.5=x^2+8x+k$. Adding 2.5 to both sides of this equation yields $0=x^2+8x+k+2.5$. A quadratic equation of the form $0=ax^2+bx+c$, where a, b, and c are constants, has no real solutions if and only if its discriminant, b^2-4ac, is negative. In the equation $0=x^2+8x+k+2.5$, where k is a positive integer constant, $a=1$, $b=8$, and $c=k+2.5$. Substituting 1 for a, 8 for b, and $k+2.5$ for c in b^2-4ac yields $8^2-4(1)(k+2.5)$, or $64-4(k+2.5)$. Since this value must be negative, $64-4(k+2.5)<0$. Adding $4(k+2.5)$ to both sides of this inequality yields $64<4(k+2.5)$. Dividing both sides of this inequality by 4 yields $16<k+2.5$. Subtracting 2.5 from both sides of this inequality yields $13.5<k$. Since k is a positive integer constant, the least possible value of k is 14.