The SAT®

Practice Test #9

ANSWER EXPLANATIONS

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

Math

Module 1
(27 questions)

QUESTION 1

Choice B is correct. The perimeter of a triangle is the sum of the lengths of all three of its sides. It's given that the lengths of two sides of a triangle are 4 centimeters and 6 centimeters. Let x represent the length, in centimeters, of the third side of this triangle. The sum of the lengths, in centimeters, of all three sides of the triangle can be represented by the expression $4+6+x$. Since it's given that the perimeter of the triangle is 18 centimeters, it follows that $4+6+x=18$, or $10+x=18$. Subtracting 10 from both sides of this equation yields $x=8$. Therefore, the length, in centimeters, of the third side of this triangle is 8.

Choice A is incorrect. If the length of the third side of this triangle were 2 centimeters, the perimeter, in centimeters, of the triangle would be $4+6+2$, or 12, not 18. *Choice C* is incorrect. If the length of the third side of this triangle were 10 centimeters, the perimeter, in centimeters, of the triangle would be $4+6+10$, or 20, not 18. *Choice D* is incorrect. If the length of the third side of this triangle were 24 centimeters, the perimeter, in centimeters, of the triangle would be $4+6+24$, or 34, not 18.

QUESTION 2

Choice C is correct. It's given that $16x+30=190$. Subtracting 30 from each side of this equation yields $16x=160$. Therefore, the equation $16x=160$ is equivalent to the given equation and has the same solution.

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 3

Choice B is correct. It's given that Ty plans to walk at an average speed of 4 kilometers per hour. The number of kilometers Ty will walk is determined by the expression $4s$, where s is the number of hours Ty walks. The given goal of at least 24 kilometers means that the inequality $4s \geq 24$ represents the situation. Dividing both sides of this inequality by 4 gives $s \geq 6$, which corresponds to a minimum of 6 hours Ty must walk.

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 4

Choice A is correct. It's given that $g(x) = x^2 + 9$. Substituting 25 for $g(x)$ in this equation yields $25 = x^2 + 9$. Subtracting 9 from both sides of this equation yields $16 = x^2$. Taking the square root of each side of this equation yields $x = \pm 4$. It follows that $g(x) = 25$ when the value of x is 4 or -4. Only 4 is listed among the choices.

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 5

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 6

The correct answer is 9. 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. It follows that the mean height, in centimeters, of these plants is the sum of the heights, in centimeters, of each plant, $6 + 10 + 13 + 2 + 15 + 22 + 10 + 4 + 4 + 4$, or 90, divided by the number of plants in the data set, 10. Therefore, the mean height, in centimeters, of these plants is $\frac{90}{10}$, or 9.

QUESTION 7

The correct answer is 224. It's given that a student council group uses the function $p(x) = 5x - 220$ to determine their profit $p(x)$, in dollars, for selling x school posters. Substituting 900 for $p(x)$ in the given function yields $900 = 5x - 220$. Adding 220 to each side of this equation yields $1{,}120 = 5x$. Dividing each side of this equation by 5 yields $224 = x$. Therefore, in order to earn a profit of $900, they must sell 224 school posters.

QUESTION 8

Choice A is correct. Since Jay walks at a speed of 3 miles per hour for w hours, Jay walks a total of $3w$ miles. Since Jay runs at a speed of 5 miles per hour for r hours, Jay runs a total of $5r$ miles. Therefore, the total number of miles Jay travels can be represented by $3w+5r$. Since the combined total number of miles is 14, the equation $3w+5r=14$ represents this situation.

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 9

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 10

Choice B is correct. Adding 57 to each side of the given equation yields $y=px+57$. Therefore, the equation $y=px+57$ correctly expresses y in terms of p and x.

Choice A 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 11

Choice A is correct. Since it's given that the account balance, $A(t)$, in dollars, after t years can be modeled by an exponential function, it follows that function A can be written in the form $A(t)=Nr^t$, where N is the initial value of the function and r is a constant related to the growth of the function. It's given that the initial balance of the account is $36,100.00, so it follows that the initial value of the function, or N, must be 36,100.00. Substituting 36,100.00 for N in the equation $A(t)=Nr^t$ yields $A(t)=36{,}100.00r^t$. It's given that the account balance after 13 years, or when $t=13$, is $68,071.93. It follows that $A(13)=68{,}071.93$, or $36{,}100.00r^{13}=68{,}071.93$. Dividing each side of the equation $36{,}100.00r^{13}=68{,}071.93$ by 36,100.00 yields $r^{13}=\frac{68{,}071.93}{36{,}100.00}$. Taking the 13th root of both sides of this equation yields $r=\sqrt[13]{\frac{68{,}071.93}{36{,}100.00}}$, or r is approximately equal to 1.05. Substituting 1.05 for r in the equation $A(t)=36{,}100.00r^t$ yields $A(t)=36{,}100.00(1.05)^t$, so the equation $A(t)=36{,}100.00(1.05)^t$ could define A.

Choice B is incorrect. Substituting 0 for t in this function indicates an initial balance of $31,971.93, rather than $36,100.00. *Choice C* is incorrect. Substituting 0 for t in this function indicates an initial balance of $31,971.93, rather than $36,100.00. Additionally, this function indicates the account balance is decreasing, rather than increasing, over time. *Choice D* is incorrect. This function indicates the account balance is decreasing, rather than increasing, over time.

QUESTION 12

Choice B is correct. Since $\overline{PR}$ and $\overline{QS}$ are diameters of the circle shown, $\overline{OS}$, $\overline{OR}$, $\overline{OP}$, and $\overline{OQ}$ are radii of the circle and are therefore congruent. Since $\angle SOP$ and $\angle ROQ$ are vertical angles, they are congruent. Therefore, arc PS and arc QR are formed by congruent radii and have the same angle measure, so they are congruent arcs. Similarly, $\angle SOR$ and $\angle POQ$ are vertical angles, so they are congruent. Therefore, arc SR and arc PQ are formed by congruent radii and have the same angle measure, so they are congruent arcs. Let x represent the length of arc SR. Since arc SR and arc PQ are congruent arcs, the length of arc PQ can also be represented by x. It's given that the length of arc PS is twice the length of arc PQ. Therefore, the length of arc PS can be represented by the expression $2x$. Since arc PS and arc QR are congruent arcs, the length of arc QR can also be represented by $2x$. This gives the expression $x+x+2x+2x$. Since it's given that the circumference is 144π, the expression $x+x+2x+2x$ is equal to 144π. Thus $x+x+2x+2x=144\pi$, or $6x=144\pi$. Dividing both sides of this equation by 6 yields $x=24\pi$. Therefore, the length of arc QR is $2(24\pi)$, or 48π.

Choice A is incorrect. This is the length of arc PQ, not arc QR. *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 13

The correct answer is 40. It's given in the first equation of the system that $y=-2x$. Substituting $-2x$ for y in the second equation of the system yields $3x+(-2x)=40$. Combining like terms on the left-hand side of this equation yields $x=40$. Therefore, the value of x is 40.

QUESTION 14

The correct answer is 14. The maximum value is the largest value in the data set. The frequency refers to the number of times a data value occurs. The given frequency table shows that for this data set, the data value 6 occurs three times, the data value 7 occurs three times, the data value 8 occurs eight times, the data value 9 occurs eight times, the data value 10 occurs nine times, the data value 11 occurs eleven times, the data value 12 occurs nine times, the data value 13 occurs zero times, and the data value 14 occurs six times. Therefore, the maximum data value in the data set is 14.

QUESTION 15

Choice C is correct. The Pythagorean theorem states that for a right triangle, the sum of the squares of the lengths of the two legs is equal to the square of the length of the hypotenuse. It's given that one leg of a right triangle has a length of 43.2 millimeters. It's also given that the hypotenuse of the triangle has a length of 196.8 millimeters. Let b represent the length of the other leg of the triangle, in millimeters. Therefore, by the Pythagorean theorem, $43.2^2 + b^2 = 196.8^2$, or $1{,}866.24 + b^2 = 38{,}730.24$. Subtracting 1,866.24 from both sides of this equation yields $b^2 = 36{,}864$. Taking the positive square root of both sides of this equation yields $b = 192$. Therefore, the length of the other leg of the triangle, in millimeters, is 192.

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 a wire with a length of 106 inches is cut into two parts. It's also given that one part has a length of x inches and the other part has a length of y inches. This can be represented by the equation $x + y = 106$. It's also given that the value of x is 6 more than 4 times the value of y. This can be represented by the equation $x = 4y + 6$. Substituting $4y + 6$ for x in the equation $x + y = 106$ yields $4y + 6 + y = 106$, or $5y + 6 = 106$. Subtracting 6 from each side of this equation yields $5y = 100$. Dividing each side of this equation by 5 yields $y = 20$. Substituting 20 for y in the equation $x = 4y + 6$ yields $x = 4(20) + 6$, or $x = 86$.

Choice A is incorrect. This value represents less than half of the total length of 106 inches; however, x represents the length of the longer part of the wire, since it's given that the value of x is 6 more than 4 times the value of y. *Choice B* is incorrect. This value represents less than half of the total length of 106 inches; however, x represents the length of the longer part of the wire, since it's given that the value of x is 6 more than 4 times the value of y. *Choice C* is incorrect. This represents a part that is 6 more than the length of the other part, rather than 6 more than 4 times the length of the other part.

QUESTION 17

Choice B is correct. It's given that $f(x) = (x + 6)(x + 5)(x - 4)$ and $y = f(x) - 3$. Substituting $(x + 6)(x + 5)(x - 4)$ for $f(x)$ in the equation $y = f(x) - 3$ yields $y = (x + 6)(x + 5)(x - 4) - 3$. Substituting -6 for x in this equation yields $y = (-6 + 6)(-6 + 5)(-6 - 4) - 3$, or $y = -3$. Substituting -5 for x in the equation $y = (x + 6)(x + 5)(x - 4) - 3$ yields $y = (-5 + 6)(-5 + 5)(-5 - 4) - 3$, or $y = -3$. Substituting 4 for x in the equation $y = (x + 6)(x + 5)(x - 4) - 3$ yields $y = (4 + 6)(4 + 5)(4 - 4) - 3$, or $y = -3$. Therefore, when $x = -6$ then $y = -3$, when $x = -5$ then $y = -3$, and when $x = 4$ then $y = -3$. Thus, the table of values in choice B represents $y = f(x) - 3$.

Choice A is incorrect. This table represents $y=x-3$ rather than $y=f(x)-3$.
Choice C is incorrect. This table represents $y=x+3$ rather than $y=f(x)-3$.
Choice D is incorrect. This table represents $y=f(x)+3$ rather than $y=f(x)-3$.

QUESTION 18

Choice D is correct. It's given that a hose puts $88x$ ounces of water in a bucket in $5y$ minutes. Therefore, the rate at which the hose puts water in the bucket, in ounces per minute, can be represented by the expression $\frac{88x}{5y}$. Let w represent the number of ounces of water the hose puts in the bucket in $9y$ minutes at this rate. It follows that the rate at which the hose puts water in the bucket, in ounces per minute, can be represented by the expression $\frac{w}{9y}$. The expressions $\frac{88x}{5y}$ and $\frac{w}{9y}$ represent the same rate, so it follows that $\frac{88x}{5y}=\frac{w}{9y}$. Multiplying both sides of this equation by $9y$ yields $\frac{792xy}{5y}=w$, or $\frac{792x}{5}=w$. Therefore, the number of ounces of water the hose puts in the bucket in $9y$ minutes can be represented by the expression $\frac{792x}{5}$.

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 19

Choice D 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 distinct and parallel. The graphs of two lines in the xy-plane represented by equations in the form $Ax+By=C$, where A, B, and C are constants, are parallel if the coefficients for x and y in one equation are proportional to the corresponding coefficients in the other equation. The first equation in the given system can be written in the form $Ax+By=C$ by subtracting $9y$ from both sides of the equation to yield $4x-18y=5$. The second equation in the given system can be written in the form $Ax+By=C$ by subtracting $4x$ from both sides of the equation to yield $-4x+hy=2$. The coefficient of x in this second equation, -4, is -1 times the coefficient of x in the first equation, 4. For the lines to be parallel, the coefficient of y in the second equation, h, must also be -1 times the coefficient of y in the first equation, -18. Thus, $h=-1(-18)$, or $h=18$. Therefore, if the given system has no solution, the value of h is 18.

Choice A is incorrect. If the value of h is -9, then the given system would have one solution, rather than no solution. *Choice B* is incorrect. If the value of h is 0, then the given system would have one solution, rather than no solution. *Choice C* is incorrect. If the value of h is 9, then the given system would have one solution, rather than no solution.

QUESTION 20

The correct answer is 52. It's given that 13 is p% of 25. It follows that $\frac{13}{25}=\frac{p}{100}$. Multiplying both sides of this equation by 100 gives $52=p$. Therefore, the value of p is 52.

QUESTION 21

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 22

Choice B is correct. It's given that $g(x)=f(x-1)$. Since $f(x)=(x+6)(x+5)(x+1)$, it follows that $f(x-1)=(x-1+6)(x-1+5)(x-1+1)$. Combining like terms yields $f(x-1)=(x+5)(x+4)(x)$. Therefore, $g(x)=x(x+5)(x+4)$. The x-intercepts of a graph in the xy-plane are the points where $y=0$. The x-coordinates of the x-intercepts of the graph of $y=g(x)$ in the xy-plane can be found by solving the equation $0=x(x+5)(x+4)$. Applying the zero product property to this equation yields three equations: $x=0$, $x+5=0$, and $x+4=0$. Solving each of these equations for x yields $x=0$, $x=-5$, and $x=-4$, respectively. Therefore, the x-intercepts of the graph of $y=g(x)$ are $(0, 0)$, $(-5, 0)$, and $(-4, 0)$. It follows that the values of a, b, and c are 0, -5, and -4. Thus, the value of $a+b+c$ is $0+(-5)+(-4)$, which is equal to -9.

Choice A is incorrect. This is the value of $a+b+c$ if $g(x)=f(x+1)$. *Choice C* is incorrect. This is the value of $a+b+c-1$ if $g(x)=(x-6)(x-5)(x-1)$. *Choice D* is incorrect. This is the value of $a+b+c$ if $f(x)=(x-6)(x-5)(x-1)$.

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 A is correct. It's given that $g(x)=f(x+5)$. Since $f(x)=4x^2+64x+262$, it follows that $f(x+5)=4(x+5)^2+64(x+5)+262$. Expanding the quantity $(x+5)^2$ in this equation yields $f(x+5)=4(x^2+10x+25)+64(x+5)+262$. Distributing the 4 and the 64 yields $f(x+5)=4x^2+40x+100+64x+320+262$. Combining like terms yields $f(x+5)=4x^2+104x+682$. Therefore, $g(x)=4x^2+104x+682$. For a quadratic function defined by an equation of the form $g(x)=a(x-h)^2+k$, where a, h, and k are constants and a is positive, $g(x)$ reaches its minimum, k,

when the value of x is h. The equation $g(x)=4x^2+104x+682$ can be rewritten in this form by completing the square. This equation is equivalent to $g(x)=4(x^2+26x)+682$, or $g(x)=4(x^2+26x+169-169)+682$. This equation can be rewritten as $g(x)=4((x+13)^2-169)+682$, or $g(x)=4(x+13)^2-4(169)+682$, which is equivalent to $g(x)=4(x+13)^2+6$. This equation is in the form $g(x)=a(x-h)^2+k$, where $a=4$, $h=-13$, and $k=6$. Therefore, $g(x)$ reaches its minimum when the value of x is -13.

Choice B is incorrect. This is the value of x for which $f(x)$, rather than $g(x)$, reaches its minimum. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect. This is the value of x for which $f(x-5)$, rather than $f(x+5)$, reaches its minimum.

QUESTION 25

Choice D is correct. It's given that w represents the total fence area, in square feet. Since the fence will be stained twice, the amount of stain, in gallons, will need to cover $2w$ square feet. It's also given that one gallon of stain will cover 170 square feet. Dividing the total area, in square feet, of the surface to be stained by the number of square feet covered by one gallon of stain gives the number of gallons of stain that will be needed. Dividing $2w$ by 170 yields $\frac{2w}{170}$, or $\frac{w}{85}$. Therefore, the equation that represents the total amount of stain S, in gallons, needed to stain the fence of the yard twice is $S=\frac{w}{85}$.

Choice A is incorrect. This equation represents the total amount of stain, in gallons, needed to stain the fence once, not twice. *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 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 1,260. Since it's given that prisms X and Y are similar, all the linear measurements of prism Y are k times the respective linear measurements of prism X, where k is a positive constant. Therefore, the surface area of prism Y is k^2 times the surface area of prism X and the volume of prism Y is k^3 times the volume of prism X. It's given that the surface area of prism Y is 1,450 cm^2, and the surface area of prism X is 58 cm^2, which implies that $1{,}450 = 58k^2$. Dividing both sides of this equation by 58 yields $\frac{1{,}450}{58} = k^2$, or $k^2 = 25$. Since k is a positive constant, $k = 5$. It's given that the volume of prism Y is 1,250 cm^3. Therefore, the volume of prism X is equal to $\frac{1{,}250}{k^3}$ cm^3, which is equivalent to $\frac{1{,}250}{5^3}$ cm^3, or 10 cm^3. Thus, the sum of the volumes, in cm^3, of the two prisms is $1{,}250 + 10$, or 1,260.

Math

Module 2
(27 questions)

QUESTION 1

Choice B is correct. Subtracting 7 from each side of the given equation yields $w = 350$. Therefore, the value of w that is the solution to the given equation is 350.

Choice A is incorrect. This is the value of w that is the solution to the equation $7w = 357$, not $w + 7 = 357$. *Choice C* is incorrect. This is the value of w that is the solution to the equation $w - 7 = 357$, not $w + 7 = 357$. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 2

Choice B is correct. The expression $16(x + 15)$ can be rewritten as $16(x) + 16(15)$, which is equivalent to $16x + 240$.

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 D is correct. If a member of the organization is selected at random, the probability that the selected member is at least 40 years old is equal to the number of members who are at least 40 years old divided by the total number of members. According to the table, there are a total of 135 members of the organization, and 107 of these members are at least 40 years old. Therefore, the probability that the selected member is at least 40 years old is $\frac{107}{135}$.

Choice A is incorrect. This is the probability that the selected member is less than 40 years old. *Choice B* is incorrect. This is the probability that the selected member lives east of the river. *Choice C* is incorrect. This is the probability that the selected member lives west of the river.

QUESTION 4

Choice B is correct. Adding the second equation in the given system to the first equation in the given system yields $3x+(-3x+y)=12+(-6)$, which is equivalent to $y=6$.

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 5

Choice D is correct. The equation of a line in the xy-plane can be written as $y=mx+b$, where m represents the slope of the line and $(0, b)$ represents the y-intercept of the line. It's given that the slope of the line is $\frac{1}{9}$. It follows that $m=\frac{1}{9}$. It's also given that the line passes through the point $(0, 14)$. It follows that $b=14$. Substituting $\frac{1}{9}$ for m and 14 for b in $y=mx+b$ yields $y=\frac{1}{9}x+14$. Thus, the equation $y=\frac{1}{9}x+14$ represents this line.

Choice A is incorrect. This equation represents a line with a slope of $-\frac{1}{9}$ and a y-intercept of $(0, -14)$. *Choice B* is incorrect. This equation represents a line with a slope of $-\frac{1}{9}$ and a y-intercept of $(0, 14)$. *Choice C* is incorrect. This equation represents a line with a slope of $\frac{1}{9}$ and a y-intercept of $(0, -14)$.

QUESTION 6

The correct answer is 70. Based on the figure, the angle with measure 110° and the angle vertical to the angle with measure x° are same side interior angles. Since vertical angles are congruent, the angle vertical to the angle with measure x° also has measure x°. It's given that lines s and t are parallel. Therefore, same side interior angles between lines s and t are supplementary. It follows that $x+110=180$. Subtracting 110 from both sides of this equation yields $x=70$.

QUESTION 7

The correct answer is 1. It's given that the function f is defined by $f(x)=x+\frac{8}{11}$. Substituting $\frac{3}{11}$ for x in the given function yields $f\left(\frac{3}{11}\right)=\frac{3}{11}+\frac{8}{11}$, which gives $f\left(\frac{3}{11}\right)=\frac{11}{11}$, or $f\left(\frac{3}{11}\right)=1$. Therefore, when $x=\frac{3}{11}$, the value of $f(x)$ is 1.

QUESTION 8

Choice D is correct. A linear relationship can be represented by an equation of the form $y=mx+b$, where m and b are constants. It's given in the table that when $x=0$, $y=18$. Substituting 0 for x and 18 for y in $y=mx+b$ yields $18=m(0)+b$, or $18=b$. Substituting 18 for b in the equation $y=mx+b$ yields $y=mx+18$. It's also given in the table that when $x=1$, $y=13$. Substituting 1 for x and 13 for y in the equation $y=mx+18$ yields $13=m(1)+18$, or $13=m+18$. Subtracting 18 from both sides of this equation yields $-5=m$. Therefore, the equation $y=-5x+18$ represents the relationship between x and y.

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 9

Choice A is correct. The solution to a system of equations is the ordered pair (x, y) that satisfies all equations in the system. It's given by the first equation in the system that $x+7=10$. Substituting 10 for $x+7$ into the second equation yields $10^2=y$, or $y=100$. The x-coordinate of the solution to the system of equations can be found by subtracting 7 from both sides of the equation $x+7=10$, which yields $x=3$. Therefore, the ordered pair $(3, 100)$ is a solution to the given system of equations.

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 10

Choice D is correct. The given function f is a linear function. Therefore, the graph of $y=f(x)$ in the xy-plane has one x-intercept at the point $(k, 0)$, where k is a constant. Substituting 0 for $f(x)$ and k for x in the given function yields $0=7k-84$. Adding 84 to both sides of this equation yields $84=7k$. Dividing both sides of this equation by 7 yields $12=k$. Therefore, the x-intercept of the graph of $y=f(x)$ in the xy-plane is $(12, 0)$.

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

QUESTION 11

Choice C is correct. It's given that the relationship between t and n is exponential. The table shows that the value of n increases as the value of t increases. Therefore, the relationship between t and n can be represented by an increasing exponential equation of the form $n=a(1+b)^t$, where a and b are positive constants. The table shows that when $t=0$, $n=604$. Substituting 0 for t and 604 for n in the equation $n=a(1+b)^t$ yields $604=a(1+b)^0$, which is equivalent to $604=a(1)$, or $604=a$. Substituting 604 for a in the equation $n=a(1+b)^t$ yields $n=604(1+b)^t$. The table also shows that when $t=1$, $n=606.42$. Substituting 1 for t and 606.42 for n in the equation $n=604(1+b)^t$ yields $606.42=604(1+b)^1$, or $606.42=604(1+b)$. Dividing both sides of this equation by 604 yields approximately $1.004=1+b$. Subtracting 1 from both sides of this equation yields that the value of b is approximately 0.004. Substituting 0.004 for b in the equation $n=604(1+b)^t$ yields $n=604(1+0.004)^t$. Therefore, of the choices, choice C best represents the relationship between t and n.

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 12

Choice D is correct. It's given that the function w models the volume of liquid, in milliliters, in a container t seconds after it begins draining from a hole at the bottom. The given function $w(t)=300-4t$ can be rewritten as $w(t)=-4t+300$. Thus, for each increase of t by 1, the value of $w(t)$ decreases by $4(1)$, or 4. Therefore, the predicted volume, in milliliters, draining from the container each second is 4 milliliters.

Choice A is incorrect. This is the amount of liquid, in milliliters, in the container before the liquid begins draining. *Choice B* is incorrect and may result from conceptual errors. *Choice C* is incorrect and may result from conceptual errors.

QUESTION 13

The correct answer is 45. It's given that $h(0)=45$. Therefore, for the given function h, when $x=0$, $h(x)=45$. Substituting 0 for x and 45 for $h(x)$ in the given function, $h(x)=x+b$, yields $45=0+b$, or $45=b$. Therefore, the value of b is 45.

QUESTION 14

The correct answer is either 2 or -12. The left-hand side of the given equation can be rewritten by factoring. The two values that multiply to -24 and add to 10 are 12 and -2. It follows that the given equation can be rewritten as $(z+12)(z-2)=0$. Setting each factor equal to 0 yields two equations: $z+12=0$ and $z-2=0$. Subtracting 12 from both sides of the equation $z+12=0$ results in $z=-12$. Adding 2 to both sides of the equation $z-2=0$ results in $z=2$. Note that 2 and -12 are examples of ways to enter a correct answer.

QUESTION 15

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 16

Choice C is correct. Let x be the 2015 population of Greenville. It's given that the population increased by 7% from 2015 to 2016. The increase in population can be written as $(0.07)x$. The 2016 population of Greenville is given as the sum of the 2015 population of Greenville and the increase in population from 2015 to 2016. This can be rewritten as $x+(0.07)x$, or $1.07x$. Therefore, the value of k is 1.07.

Choice A is incorrect. This is the percent, represented as a decimal, that the population increased from 2015 to 2016, not the value of k. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect. This is the value of k if the population increased by 70%, not 7%, from 2015 to 2016.

QUESTION 17

Choice B is correct. Standard deviation is a measure of the spread of a data set from its mean. The dot plot for class A and the dot plot for class B have the same shape. Thus, the frequency distributions for both class A and class B are the same. Since both class A and class B have the same frequency distribution of glue sticks brought in by each student, it follows that both class A and class B have the same spread of the number of glue sticks brought in by each student from their respective means. Therefore, the standard deviation of the number of glue sticks brought in by each student for class A is equal to the standard deviation of the number of glue sticks brought in by each student for class B.

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 18

Choice B is correct. In the statement "$m(330)$ is approximately equal to 362," the input of the function, 330, is the value of t, the elapsed time, in days, since the animal was born. The approximate value of the function, 362, is the predicted body mass, in kilograms, of the animal after that time has elapsed. Therefore, the predicted body mass of the animal was approximately 362 kg 330 days after it was born.

Choice A is incorrect. This would be the best interpretation of the statement "$m(362)$ is approximately equal to 330." *Choice C* is incorrect. The number $\frac{330}{7}$ is the number of weeks, not the number of days, after the animal was born. *Choice D* is incorrect. This would be the best interpretation of the statement "$m(362)$ is approximately equal to $\frac{330}{7}$."

QUESTION 19

Choice C is correct. It's given that triangle XYZ is similar to triangle RST, such that X, Y, and Z correspond to R, S, and T, respectively. Since corresponding angles of similar triangles are congruent, it follows that the measure of $\angle Z$ is congruent to the measure of $\angle T$. It's given that the measure of $\angle Z$ is 20°. Therefore, the measure of $\angle T$ is 20°.

Choice A is incorrect and may result from a conceptual error. *Choice B* is incorrect. This is half the measure of $\angle Z$. *Choice D* is incorrect. This is twice the measure of $\angle Z$.

QUESTION 20

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 21

The correct answer is -19. It's given that function f is defined by $f(x)=a^x+b$, where a and b are constants and $a>0$. It's also given that the graph of $y=f(x)$ in the xy-plane has a y-intercept at $(0, -25)$ and passes through the point $(2, 23)$. Since the graph has a y-intercept at $(0, -25)$, $f(0)=-25$. Substituting 0 for x in the given equation yields $f(0)=a^0+b$, or $f(0)=1+b$, and substituting -25 for $f(0)$ in this equation yields $-25=1+b$. Subtracting 1 from each side of this equation yields $-26=b$. Substituting -26 for b in the equation $f(x)=a^x+b$ yields $f(x)=a^x-26$. Since the graph also passes through the point $(2, 23)$, $f(2)=23$. Substituting 2 for x in the equation $f(x)=a^x-26$ yields $f(2)=a^2-26$, and substituting 23 for $f(2)$ yields $23=a^2-26$. Adding 26 to each side of this equation yields $49=a^2$. Taking the square root of both sides of this equation yields $\pm 7=a$. Since it's given that $a>0$, the value of a is 7. It follows that the value of $a+b$ is $7-26$, or -19.

QUESTION 22

Choice D is correct. All the tables in the choices have the same three values of x, so each of the three values of x can be substituted in the given inequality to compare the corresponding values of y in each of the tables. Substituting 3 for x in the given inequality yields $y>13(3)-18$, or $y>21$. Therefore, when $x=3$, the corresponding value of y is greater than 21. Substituting 5 for x in the given inequality yields $y>13(5)-18$, or $y>47$. Therefore, when $x=5$, the corresponding value of y is greater than 47. Substituting 8 for x in the given inequality yields $y>13(8)-18$, or $y>86$. Therefore, when $x=8$, the corresponding value of y is greater than 86. For the table in choice D, when $x=3$, the corresponding value of y is 26, which is greater than 21; when $x=5$, the corresponding value of y is 52, which is greater than 47; when $x=8$, the corresponding value of y is 91, which is greater than 86. Therefore, the table in choice D gives values of x and their corresponding values of y that are all solutions to the given inequality.

Choice A is incorrect. In the table for choice A, when $x = 3$, the corresponding value of y is 21, which is not greater than 21; when $x = 5$, the corresponding value of y is 47, which is not greater than 47; when $x = 8$, the corresponding value of y is 86, which is not greater than 86. *Choice B* is incorrect. In the table for choice B, when $x = 5$, the corresponding value of y is 42, which is not greater than 47; when $x = 8$, the corresponding value of y is 86, which is not greater than 86. *Choice C* is incorrect. In the table for choice C, when $x = 3$, the corresponding value of y is 16, which is not greater than 21; when $x = 5$, the corresponding value of y is 42, which is not greater than 47; when $x = 8$, the corresponding value of y is 81, which is not greater than 86.

QUESTION 23

Choice D is correct. Since the number of yards in 1 mile is 1,760, the number of square yards in 1 square mile is $(1{,}760)(1{,}760) = 3{,}097{,}600$. Therefore, if the area of the town is 4.36 square miles, it is $4.36(3{,}097{,}600) = 13{,}505{,}536$, in square yards.

Choice A is incorrect and may result from dividing the number of yards in a mile by the square mileage of the town. *Choice B* is incorrect and may result from multiplying the number of yards in a mile by the square mileage of the town. *Choice C* is incorrect and may result from dividing the number of square yards in a square mile by the square mileage of the town.

QUESTION 24

Choice A is correct. When a square is inscribed in a circle, a diagonal of the square is a diameter of the circle. It's given that a square is inscribed in a circle and the length of a radius of the circle is $\frac{20\sqrt{2}}{2}$ inches. Therefore, the length of a diameter of the circle is $2\left(\frac{20\sqrt{2}}{2}\right)$ inches, or $20\sqrt{2}$ inches. It follows that the length of a diagonal of the square is $20\sqrt{2}$ inches. A diagonal of a square separates the square into two right triangles in which the legs are the sides of the square and the hypotenuse is a diagonal. Since a square has 4 congruent sides, each of these two right triangles has congruent legs and a hypotenuse of length $20\sqrt{2}$ inches. Since each of these two right triangles has congruent legs, they are both 45-45-90 triangles. In a 45-45-90 triangle, the length of the hypotenuse is $\sqrt{2}$ times the length of a leg. Let s represent the length of a leg of one of these 45-45-90 triangles. It follows that $20\sqrt{2} = \sqrt{2}(s)$. Dividing both sides of this equation by $\sqrt{2}$ yields $20 = s$. Therefore, the length of a leg of one of these 45-45-90 triangles is 20 inches. Since the legs of these two 45-45-90 triangles are the sides of the square, it follows that the side length of the square is 20 inches.

Choice B is incorrect. This is the length of a radius, in inches, of the circle. *Choice C* is incorrect. This is the length of a diameter, in inches, of the circle. *Choice D* is incorrect and may result from conceptual or calculation errors.

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 D is correct. A y-intercept of a graph in the xy-plane is a point where the graph intersects the y-axis, or a point where $x=0$. Substituting 0 for x in the equation defining function f yields $f(0)=a(2.2^0+2.2^b)$, or $f(0)=a(1+2.2^b)$. So, the y-coordinate of the y-intercept of the graph is $a(1+2.2^b)$, or equivalently, $a+a(2.2)^b$. It's given that function g is equivalent to function f, where $0<a<b$. It follows that $k=2.2^b$. Since $a(2.2)^b$ can't be equal to 0, the coefficient a can't be equal to $a+a(2.2)^b$. Since $0<a$, the constant k, which is equal to 2.2^b, can't be equal to $a+a(2.2)^b$. Therefore, function g doesn't display the y-coordinate of the y-intercept of the graph of $y=f(x)$ in the xy-plane as a constant or coefficient. It's also given that function h is equivalent to function f, where $0<a<b$. The equation defining f can be rewritten as $f(x)=a(2.2)^x+a(2.2)^b$. It follows that $m=a(2.2)^b$. Since $a(2.2)^b$ can't be equal to 0, the coefficient a can't be equal to $a+a(2.2)^b$. Since $0<a$, the constant m, which is equal to $a(2.2)^b$, can't be equal to $a+a(2.2)^b$. Therefore, function h doesn't display the y-coordinate of the y-intercept of the graph of $y=f(x)$ in the xy-plane as a constant or coefficient. Thus, neither function g nor function h displays the y-coordinate of the y-intercept of the graph of $y=f(x)$ in the xy-plane as a constant or coefficient.

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 50. An equation of the form $ax^2+bx+c=0$, where a, b, and c are constants, has no real solutions if and only if its discriminant, b^2-4ac, is negative. Applying the distributive property to the left-hand side of the equation $x(kx-56)=-16$ yields $kx^2-56x=-16$. Adding 16 to each side of this equation yields $kx^2-56x+16=0$. Substituting k for a, -56 for b, and 16 for c in b^2-4ac yields a discriminant of $(-56)^2-4(k)(16)$, or $3{,}136-64k$. If the given equation has no real solution, it follows that the value of $3{,}136-64k$ must be negative. Therefore, $3{,}136-64k<0$. Adding $64k$ to both sides of this inequality yields $3{,}136<64k$. Dividing both sides of this inequality by 64 yields $49<k$, or $k>49$. Since it's given that k is an integer, the least possible value of k is 50.