The SAT®

Practice Test #10

ANSWER EXPLANATIONS

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

SAT®

Math

Module 1

(27 questions)

QUESTION 1

Choice C is correct. For the given line graph, the percent of cars for sale at a used car lot on a given day is represented on the vertical axis. The percent of cars for sale is the smallest when the height of the line graph is the lowest. The lowest height of the line graph occurs for cars with a model year of 2014.

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

QUESTION 2

Choice A is correct. The solution to this system of linear equations is represented by the point that lies on both lines shown, or the point of intersection of the two lines. According to the graph, the point of intersection occurs when $x=4$ and $y=-5$, or at the point $(4, -5)$. Therefore, the solution (x, y) to the system is $(4, -5)$.

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 3

Choice D is correct. The cost of the rental fee depends on the number of hours the surfboard is rented. Multiplying t hours by 10 dollars per hour yields a rental fee of $10t$ dollars. The total cost of the rental consists of the rental fee plus the 25 dollar service fee, which yields a total cost of $25+10t$ dollars. Since the person intends to spend a maximum of 75 dollars to rent the surfboard, the total cost must be at most 75 dollars. Therefore, the inequality $25+10t\leq 75$ represents this situation.

Choice A is incorrect. This represents a situation where the rental fee, not the total cost, is at most 75 dollars. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect and may result from conceptual or calculation errors.

QUESTION 4

Choice A is correct. When a graph is translated up 4 units, each point on the resulting graph is 4 units above the point on the original graph. In other words, the y-value of each point on the graph increases by 4. The graph shown passes through the points $(1, -1)$, $(2, -2)$, and $(3, -1)$. It follows that when the graph shown is translated up 4 units, the resulting graph will pass through the points $(1, -1+4)$, $(2, -2+4)$, and $(3, -1+4)$. These points are $(1, 3)$, $(2, 2)$, and $(3, 3)$, respectively. Of the given choices, only the graph in choice A passes through the points $(1, 3)$, $(2, 2)$, and $(3, 3)$.

Choice B is incorrect. This is the result of translating the graph down, rather than up, 4 units. *Choice C* is incorrect. This is the result of translating the graph left, rather than up, 4 units. *Choice D* is incorrect. This is the result of translating the graph right, rather than up, 4 units.

QUESTION 5

Choice D is correct. In the given equation, s is the speed, in miles per hour, of a certain car t seconds after it began to accelerate. Therefore, the speed of the car, in miles per hour, 5 seconds after it began to accelerate can be found by substituting 5 for t in the given equation, which yields $s=40+3(5)$, or $s=55$. Thus, the speed of the car 5 seconds after it began to accelerate is 55 miles per hour.

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

QUESTION 6

The correct answer is 77. It's given that the function f is defined by $f(x)=x^2+x+71$. Substituting 2 for x in function f yields $f(2)=(2)^2+2+71$, which is equivalent to $f(2)=4+2+71$, or $f(2)=77$. Therefore, the value of $f(2)$ is 77.

QUESTION 7

The correct answer is 25. The total cost of the party is found by adding the onetime fee of the venue to the cost per attendee times the number of attendees. Let x be the number of attendees. The expression $35+10.25x$ thus represents the total cost of the party. It's given that the budget is \$300, so this situation can be represented by the inequality $35+10.25x\leq 300$. Subtracting 35 from both sides of this inequality gives $10.25x\leq 265$. Dividing both sides of this inequality by 10.25 results in approximately $x\leq 25.854$. Since the question is stated in terms of attendees, rounding 25.854 down to the greatest whole number gives the greatest number of attendees possible, which is 25.

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 B is correct. It's given that triangle ABC is congruent to triangle DEF. Corresponding angles of congruent triangles are congruent and, therefore, have equal measure. It's given that angle A corresponds to angle D, and that the measure of angle A is 18°. It's also given that the measures of angles B and E are $90°$. Since these angles have equal measure, they are corresponding angles. It follows that angle C corresponds to angle F. Let $x°$ represent the measure of angle C. Since the sum of the measures of the interior angles of a triangle is 180°, it follows that $18° + 90° + x° = 180°$, or $108° + x° = 180°$. Subtracting 108° from both sides of this equation yields $x° = 72°$. Therefore, the measure of angle C is $72°$. Since angle C corresponds to angle F, it follows that the measure of angle F is also $72°$.

Choice A is incorrect. This is the measure of angle D, not the measure of angle F.
Choice C is incorrect. This is the measure of angle E, not the measure of angle F.
Choice D is incorrect. This is the sum of the measures of angles E and F, not the measure of angle F.

QUESTION 10

Choice B is correct. Multiplying both sides of the given equation by 4 yields $(4)(4x+2)=(4)(12)$, or $16x+8=48$. Therefore, the value of $16x+8$ is 48.

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 11

Choice B is correct. Applying the commutative property of multiplication, the expression $(m^4q^4z^{-1})(mq^5z^3)$ can be rewritten as $(m^4m)(q^4q^5)(z^{-1}z^3)$. For positive values of x, $(x^a)(x^b)=x^{a+b}$. Therefore, the expression $(m^4m)(q^4q^5)(z^{-1}z^3)$ can be rewritten as $(m^{4+1})(q^{4+5})(z^{-1+3})$, or $m^5q^9z^2$.

Choice A is incorrect and may result from multiplying, not adding, the exponents.
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 12

Choice B is correct. It's given that the airplane descends at a constant rate of 400 feet per minute. Since the altitude decreases by a constant amount during each fixed time period, the relationship between the airplane's altitude and time is linear. Since the airplane descends from an altitude of 9,500 feet to 5,000 feet, the airplane's altitude is decreasing with time. Thus, the relationship is best modeled by a decreasing linear function.

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 13

The correct answer is 1. Subtracting the second equation from the first equation in the given system of equations yields $(3x-3x)+(6-4)=4y-2y$, which is equivalent to $0+2=2y$, or $2=2y$. Dividing each side of this equation by 2 yields $1=y$.

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 A is correct. The function f gives the area of the rectangle, in ft^2, if its width is w ft. Since the value of $f(14)$ is the value of $f(w)$ if $w=14$, it follows that $f(14)=1{,}176$ means that $f(w)$ is 1,176 if $w=14$. In the given context, this means that if the width of the rectangle is 14 ft, then the area of the rectangle is 1,176 ft^2.

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 interpreting $f(w)$ as the width, in ft, of the rectangle if its area is w ft^2, rather than as the area, in ft^2, of the rectangle if its width is w ft.

QUESTION 16

Choice D is correct. Since the number of bacteria doubles every day, the relationship between t and y can be represented by an exponential equation of the form $y=a(b)^t$, where a is the number of bacteria at the start of the observation and the number of bacteria increases by a factor of b every day. It's given that there are 44,000 bacteria at the start of the observation. Therefore, $a=44{,}000$. It's also given that the number of bacteria doubles, or increases by a factor of 2, every day. Therefore, $b=2$. Substituting 44,000 for a and 2 for b in the equation $y=a(b)^t$ yields $y=44{,}000(2)^t$.

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 equation represents a situation where the number of bacteria is decreasing by half, not doubling, every day.

QUESTION 17

Choice D is correct. The table shows an increasing exponential relationship between the number of years, x, since Hana started training in pole vault and the estimated height $h(x)$, in meters, of her best pole vault for that year. The relationship can be written as $h(x)=Ca^x$, where C and a are positive constants. It's given that when $x=0$, $h(x)=1.23$. Substituting 0 for x and 1.23 for $h(x)$ in $h(x)=Ca^x$ yields $1.23=Ca^0$, or $1.23=C$. Substituting 1.23 for C in $h(x)=Ca^x$ yields $h(x)=1.23a^x$. It's also given that when $x=2$, $h(x)=1.54$. Substituting 2 for x and 1.54 for $h(x)$ in $h(x)=1.23a^x$ yields $1.54=1.23a^2$. Dividing each side of this equation by 1.23 yields $\frac{1.54}{1.23}=\frac{1.23a^2}{1.23}$, or a^2 is approximately equal to 1.252. Since a is positive, a is approximately equal to $\sqrt{1.252}$, or 1.12. Substituting 1.12 for a in $h(x)=1.23a^x$ yields $h(x)=1.23(1.12)^x$.

Choice A is incorrect. When $x=0$, the value of $h(x)$ in this function is equal to 1.12 rather than 1.23, and it is decreasing rather than increasing. *Choice B* is incorrect. When $x=0$, the value of $h(x)$ in this function is equal to 1.12 rather than 1.23. *Choice C* is incorrect. This function is decreasing rather than increasing.

QUESTION 18

Choice A is correct. The x-intercept of a graph in the xy-plane is the point on the graph where $y=0$. It's given that function h is defined by $h(x)=4x+28$. Therefore, the equation representing the graph of $y=h(x)$ is $y=4x+28$. Substituting 0 for y in the equation $y=4x+28$ yields $0=4x+28$. Subtracting 28 from both sides of this equation yields $-28=4x$. Dividing both sides of this equation by 4 yields $-7=x$. Therefore, the x-intercept of the graph of $y=h(x)$ in the xy-plane is $(-7, 0)$. It's given that the x-intercept of the graph of $y=h(x)$ is $(a, 0)$. Therefore, $a=-7$. The y-intercept of a graph in the xy-plane is the point on the graph where $x=0$. Substituting 0 for x in the equation $y=4x+28$ yields $y=4(0)+28$, or $y=28$. Therefore, the y-intercept of the graph of $y=h(x)$ in the xy-plane is $(0, 28)$. It's given that the y-intercept of the graph of $y=h(x)$ is $(0, b)$. Therefore, $b=28$. If $a=-7$ and $b=28$, then the value of $a+b$ is $-7+28$, or 21.

Choice B is incorrect. This is the value of b, not $a+b$. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect. This is the value of $-a+b$, not $a+b$.

QUESTION 19

Choice A is correct. Substituting 3 for x in the given inequality yields $y<5(3)+6$, or $y<21$. Therefore, when $x=3$, the corresponding value of y is less than 21. Substituting 5 for x in the given inequality yields $y<5(5)+6$, or $y<31$. Therefore, when $x=5$, the corresponding value of y is less than 31. Substituting 7 for x in the given inequality yields $y<5(7)+6$, or $y<41$. Therefore, when $x=7$, the corresponding value of y is less than 41. For the table in choice A, when $x=3$, the corresponding value of y is 17, which is less than 21; when $x=5$, the corresponding value of y is 27, which is less than 31; and when $x=7$, the corresponding value of y is 37, which is less than 41. Therefore, the table in choice A gives values of x and their corresponding values of y that are all solutions to the given inequality.

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

QUESTION 20

The correct answer is 35. The first equation in the given system of equations defines y as $4x+1$. Substituting $4x+1$ for y in the second equation in the given system of equations yields $4(4x+1)=15x-8$. Applying the distributive property on the left-hand side of this equation yields $16x+4=15x-8$. Subtracting $15x$ from each side of this equation yields $x+4=-8$. Subtracting 4 from each side of this equation yields $x=-12$. Substituting -12 for x in the first equation of the given system of equations yields $y=4(-12)+1$, or $y=-47$. Substituting -12 for x and -47 for y into the expression $x-y$ yields $-12-(-47)$, or 35.

QUESTION 21

The correct answer is 113. It's given that the legs of a right triangle have lengths 24 centimeters and 21 centimeters. In a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the two legs. It follows that if h represents the length, in centimeters, of the hypotenuse of the right triangle, $h^2=24^2+21^2$. This equation is equivalent to $h^2=1{,}017$. Taking the square root of each side of this equation yields $h=\sqrt{1{,}017}$. This equation can be rewritten as $h=\sqrt{9\cdot 113}$, or $h=\sqrt{9}\cdot\sqrt{113}$. This equation is equivalent to $h=3\sqrt{113}$. It's given that the length of the triangle's hypotenuse, in centimeters, can be written in the form $3\sqrt{d}$. It follows that the value of d is 113.

QUESTION 22

Choice A is correct. It's given that the length of each side of a scale model is $\frac{1}{10}$ times the length of the corresponding side of the actual floor of a ballroom. Therefore, the area of the scale model is $\left(\frac{1}{10}\right)^2$, or $\frac{1}{100}$, times the area of the actual floor of the ballroom. It's given that the area of the floor of the ballroom is 600 square meters. Therefore, the area, in square meters, of the scale model is $\left(\frac{1}{100}\right)(600)$, or 6.

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 C is correct. The graph of the equation $(x-h)^2+(y-k)^2=r^2$ in the xy-plane is a circle with center (h, k) and a radius of length r. The radius of a circle is the distance from the center of the circle to any point on the circle. If a circle in the xy-plane intersects the y-axis at exactly one point, then the perpendicular distance from the center of the circle to this point on the y-axis must be equal to the length of the circle's radius. It follows that the x-coordinate of the circle's center must be equivalent to the length of the circle's radius. In other words, if the graph of $(x-h)^2+(y-k)^2=r^2$ is a circle that intersects the y-axis at exactly one point, then $r=|h|$ must be true. The equation in choice C is $(x-4)^2+(y-9)^2=16$, or $(x-4)^2+(y-9)^2=4^2$. This equation is in the form $(x-h)^2+(y-k)^2=r^2$, where $h=4$, $k=9$, and $r=4$, and represents a circle in the xy-plane with center $(4, 9)$ and radius of length 4. Substituting 4 for r and 4 for h in the equation $r=|h|$ yields $4=|4|$, or $4=4$, which is true. Therefore, the equation in choice C represents a circle in the xy-plane that intersects the y-axis at exactly one point.

Choice A is incorrect. This is the equation of a circle that does not intersect the y-axis at any point. *Choice B* is incorrect. This is an equation of a circle that intersects the x-axis, not the y-axis, at exactly one point. *Choice D* is incorrect. This is the equation of a circle with the center located on the y-axis and thus intersects the y-axis at exactly two points, not exactly one point.

QUESTION 24

Choice C is correct. Since angles B and E each have the same measure and angles C and F each have the same measure, triangles ABC and DEF are similar, where side BC corresponds to side EF. To determine whether two similar triangles are congruent, it is sufficient to determine whether one pair of corresponding sides are congruent. Therefore, to determine whether triangles ABC and DEF are congruent, it is sufficient to determine whether sides BC and EF have equal length. Thus, the lengths of BC and EF are sufficient to determine whether triangle ABC is congruent to triangle DEF.

Choice A is incorrect and may result from conceptual errors. *Choice B* is incorrect and may result from conceptual errors. *Choice D* is incorrect. The given information is sufficient to determine that triangles ABC and DEF are similar, but not whether they are congruent.

QUESTION 25

Choice D is correct. It's given that the result of increasing the quantity x by 1,800% is 684. It follows that $x+\left(\frac{1{,}800}{100}\right)x=684$, which is equivalent to $x+18x=684$, or $19x=684$. Dividing each side of this equation by 19 yields $x=36$. Therefore, the value of x is 36.

Choice A is incorrect. The result of increasing the quantity 12,996 by 1,800% is 246,924, not 684. *Choice B* is incorrect. The result of increasing the quantity 12,312 by 1,800% is 233,928, not 684. *Choice C* is incorrect. The result of increasing the quantity 38 by 1,800% is 722, not 684.

QUESTION 26

Choice A is correct. It's given that the window repair specialist charges \$220 for the first two hours of repair plus an hourly fee for each additional hour. Let n represent the hourly fee for each additional hour after the first two hours. Since it's given that x is the number of hours of repair, it follows that the charge generated by the hourly fee after the first two hours can be represented by the expression $n(x-2)$. Therefore, the total cost, in dollars, for x hours of repair is $f(x)=220+n(x-2)$. It's given that the total cost for 5 hours of repair is \$400. Substituting 5 for x and 400 for $f(x)$ into the equation $f(x)=220+n(x-2)$ yields $400=220+n(5-2)$, or $400=220+3n$. Subtracting 220 from both sides of this equation yields $180=3n$. Dividing both sides of this equation by 3 yields $n=60$. Substituting 60 for n in the equation $f(x)=220+n(x-2)$ yields $f(x)=220+60(x-2)$, which is equivalent to $f(x)=220+60x-120$, or $f(x)=60x+100$. Therefore, the total cost, in dollars, for x hours of repair is $f(x)=60x+100$.

Choice B is incorrect. This function represents the total cost, in dollars, for x hours of repair where the specialist charges \$340, rather than \$220, for the first two hours of repair. *Choice C* is incorrect. This function represents the total cost, in dollars, for x hours of repair where the specialist charges \$160, rather than \$220, for the first two hours of repair, and an hourly fee of \$80, rather than \$60, after the first two hours. *Choice D* is incorrect. This function represents the total cost, in dollars, for x hours of repair where the specialist charges \$380, rather than \$220, for the first two hours of repair, and an hourly fee of \$80, rather than \$60, after the first two hours.

QUESTION 27

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 $x=\frac{(-b\pm\sqrt{b^2-4ac})}{2a}$. Substituting 3 for a, -29 for b, and 56 for c from the equation $3x^2-29x+56=0$ into the quadratic formula yields $x=\frac{(29\pm\sqrt{(-29)^2-4(3)(56)})}{2(3)}$, 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.

Choice A is incorrect. This table represents a relationship between x and y such that the graph passes through the points $(0, 0)$, $(1, -7)$, and $(2, -9)$. *Choice B* is incorrect. This table represents a relationship between x and y such that the graph passes through the points $(0, 0)$, $(1, -3)$, and $(2, -1)$. *Choice C* is incorrect. This table represents a linear relationship between x and y such that the graph passes through the points $(0, -5)$, $(1, -7)$, and $(2, -9)$.

QUESTION 4

Choice D is correct. The perimeter of a figure is equal to the sum of the measurements of the sides of the figure. It's given that the rectangle has a length of 4 inches and a width of 9 inches. Since a rectangle has 4 sides, of which opposite sides are parallel and equal, it follows that the rectangle has two sides with a length of 4 inches and two sides with a width of 9 inches. Therefore, the perimeter of this rectangle is $4+4+9+9$, or 26 inches.

Choice A is incorrect. This is the sum, in inches, of the length and the width of the rectangle. *Choice B* is incorrect. This is the sum, in inches, of the two lengths and the width of the rectangle. *Choice C* is incorrect. This is the sum, in inches, of the length and the two widths of the rectangle.

QUESTION 5

Choice A is correct. Dividing each side of the given equation by 7 yields $m=\frac{2(n+p)}{7}$.

Choice B is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This equation is equivalent to $7+m=2(n+p)$, not $7m=2(n+p)$. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 6

The correct answer is 79. The median of a data set with an odd number of values is the middle value of the set when the values are ordered from least to greatest. Because the given data set consists of nine values that are ordered from least to greatest, the median is the fifth value in the data set. Therefore, the median of the data shown is 79.

QUESTION 7

The correct answer is 2. Substituting 8 for $f(x)$ in the given equation yields $8=4x$. Dividing the left- and right-hand sides of this equation by 4 yields $x=2$. Therefore, the value of x is 2 when $f(x)=8$.

QUESTION 8

Choice D is correct. The proportion of the paper clips that are size large can be written as $\frac{234{,}000}{300{,}000}$, or 0.78. Therefore, the percentage of the paper clips that are size large is $0.78(100)$, or 78%.

Choice A is incorrect. This is the percentage of the paper clips that are not size large. *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 D is correct. It's given that the function $f(x) = 8x + 4$ gives the estimated height, in feet, of a willow tree x years after its height was first measured. For a function defined by an equation of the form $f(x) = mx + b$, where m and b are constants, b represents the value of $f(x)$ when $x = 0$. It follows that in the given function, 4 represents the value of $f(x)$ when $x = 0$. Therefore, the best interpretation of 4 in this context is that the estimated height of the tree was 4 feet when it was first measured.

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

QUESTION 10

Choice B is correct. Since the point (x, y) is an intersection point of the graphs of the given equations in the xy-plane, the pair (x, y) should satisfy both equations, and thus is a solution of the given system. According to the first equation, $y = 76$. Substituting 76 in place of y in the second equation yields $x^2 - 5 = 76$. Adding 5 to both sides of this equation yields $x^2 = 81$. Taking the square root of both sides of this equation yields two solutions: $x = 9$ and $x = -9$. Of these two solutions, only -9 is given as a choice.

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 the value of coordinate y, rather than x, of the intersection point (x, y).

QUESTION 11

Choice A is correct. It's given that each side of equilateral triangle S is multiplied by a scale factor of k to create equilateral triangle T. Since the length of each side of triangle T is greater than the length of each side of triangle S, the scale factor of k must be greater than 1. Of the given choices, only $\frac{29}{28}$ is greater than 1.

Choice B is incorrect. If each side of equilateral triangle S is multiplied by a scale factor of 1, the length of each side of triangle T would be equal to the length of each side of triangle S. *Choice C* is incorrect. If each side of equilateral triangle S is multiplied by a scale factor of $\frac{28}{29}$, the length of each side of triangle T would be less than the length of each side of triangle S. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 12

Choice C is correct. If the two sides of a linear equation are equivalent, then the equation is true for any value. If an equation is true for any value, it has infinitely many solutions. Since the two sides of the given linear equation $66x = 66x$ are equivalent, the given equation has infinitely many solutions.

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 13

The correct answer is 41. The number of cupcakes Vivian bought can be found by first finding the amount Vivian spent on cupcakes. The amount Vivian spent on cupcakes can be found by subtracting the amount Vivian spent on party hats from the total amount Vivian spent. The amount Vivian spent on party hats can be found by multiplying the cost per package of party hats by the number of packages of party hats, which yields $\$3 \cdot 10$, or \$30. Subtracting the amount Vivian spent on party hats, \$30, from the total amount Vivian spent, \$71, yields $\$71 - \$30$, or \$41. Since the amount Vivian spent on cupcakes was \$41 and each cupcake cost \$1, it follows that Vivian bought 41 cupcakes.

QUESTION 14

The correct answer is 11,875. It's given that the exponential function g is defined by $g(x) = 19 \cdot a^x$, where a is a positive constant, and $g(3) = 2{,}375$. It follows that when $x = 3$, $g(x) = 2{,}375$. Substituting 3 for x and 2,375 for $g(x)$ in the given equation yields $2{,}375 = 19 \cdot a^3$. Dividing each side of this equation by 19 yields $125 = a^3$. Taking the cube root of both sides of this equation gives $a = 5$. Substituting 4 for x and 5 for a in the equation $g(x) = 19 \cdot a^x$ yields $g(4) = 19 \cdot 5^4$, or $g(4) = 11{,}875$. Therefore, the value of $g(4)$ is 11,875.

QUESTION 15

Choice B is correct. The sine of any acute angle is equal to the cosine of its complement. It's given that in right triangle RST, the sum of the measures of angle R and angle S is 90 degrees. Therefore, angle R and angle S are complementary, and the value of $\sin R$ is equal to the value of $\cos S$. It's given that the value of $\sin R$ is $\frac{\sqrt{15}}{4}$, so the value of $\cos S$ is also $\frac{\sqrt{15}}{4}$.

Choice A is incorrect. This is the value of $\tan S$. *Choice C* is incorrect. This is the value of $\frac{1}{\cos S}$. *Choice D* is incorrect. This is the value of $\frac{1}{\tan S}$.

QUESTION 16

Choice B is correct. The graph shown is a line passing through the points $(0, 40)$ and $(60, 0)$. Since the relationship between x and y is linear, if two points on the graph make a linear equation true, then the equation represents the relationship. Substituting 0 for x and 40 for y in the equation in choice B,

$8x+12y=480$, yields $8(0)+12(40)=480$, or $480=480$, which is true. Substituting 60 for x and 0 for y in the equation $8x+12y=480$ yields $8(60)+12(0)=480$, or $480=480$, which is true. Therefore, the equation $8x+12y=480$ represents the relationship between x and y.

Choice A is incorrect. The point $(0, 40)$ is not on the graph of this equation, since $40=8(0)+12$, or $40=12$, is not true. *Choice C* is incorrect. The point $(0, 40)$ is not on the graph of this equation, since $40=12(0)+8$, or $40=8$, is not true. *Choice D* is incorrect. The point $(0, 40)$ is not on the graph of this equation, since $12(0)+8(40)=480$, or $320=480$, is not true.

QUESTION 17

Choice B is correct. The given expression has a common factor of 2 in the denominator, so the expression can be rewritten as $\frac{8x(x-7)-3(x-7)}{2(x-7)}$. The three terms in this expression have a common factor of $(x-7)$. Since it's given that $x>7$, x can't be equal to 7, which means $(x-7)$ can't be equal to 0. Therefore, each term in the expression, $\frac{8x(x-7)-3(x-7)}{2(x-7)}$, can be divided by $(x-7)$, which gives $\frac{8x-3}{2}$.

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 18

Choice A is correct. The y-intercept of the graph of $y=f(x)$ in the xy-plane occurs at the point on the graph where $x=0$. In other words, when $x=0$, the corresponding value of $f(x)$ is the y-coordinate of the y-intercept. Substituting 0 for x in the given equation yields $f(0)=(-8)(2)^0+22$, which is equivalent to $f(0)=(-8)(1)+22$, or $f(0)=14$. Thus, when $x=0$, the corresponding value of $f(x)$ is 14. Therefore, the y-intercept of the graph of $y=f(x)$ in the xy-plane is $(0, 14)$.

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. This could be the y-intercept for $f(x)=(-8)(2)^x$, not $f(x)=(-8)(2)^x+22$.

QUESTION 19

Choice C is correct. It's given that the equation $3x+5y=32$ represents the situation where Keenan filled x small jars and y large jars with all the vegetable broth he made, which was 32 cups. Therefore, $3x$ represents the total number of cups of vegetable broth in the small jars and $5y$ represents the total number of cups of vegetable broth in the large jars.

Choice A is incorrect. The number of large jars Keenan filled is represented by y, not $5y$. *Choice B* is incorrect. The number of small jars Keenan filled is represented by x, not $5y$. *Choice D* is incorrect. The total number of cups of vegetable broth in the small jars is represented by $3x$, not $5y$.

QUESTION 20

The correct answer is 5. The standard form of an equation of a circle in the *xy*-plane is $(x-h)^2+(y-k)^2=r^2$, where h, k, and r are constants, the coordinates of the center of the circle are (h, k), and the length of the radius of the circle is r. It's given that an equation of the circle is $(x-2)^2+(y-9)^2=r^2$. Therefore, the center of this circle is $(2, 9)$. It's given that the endpoints of a diameter of the circle are $(2, 4)$ and $(2, 14)$. The length of the radius is the distance from the center of the circle to an endpoint of a diameter of the circle, which can be found using the distance formula, $\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$. Substituting the center of the circle $(2, 9)$ and one endpoint of the diameter $(2, 4)$ in this formula gives a distance of $\sqrt{(2-2)^2+(9-4)^2}$, or $\sqrt{0^2+5^2}$, which is equivalent to 5. Since the distance from the center of the circle to an endpoint of a diameter is 5, the value of r is 5.

QUESTION 21

The correct answer is $\frac{1}{4}$. For an equation in slope-intercept form $y=mx+b$, m represents the slope of the line in the *xy*-plane defined by this equation. It's given that line ℓ is defined by $3y+12x=5$. Subtracting $12x$ from both sides of this equation yields $3y=-12x+5$. Dividing both sides of this equation by 3 yields $y=-\frac{12}{3}x+\frac{5}{3}$, or $y=-4x+\frac{5}{3}$. Thus, the slope of line ℓ in the *xy*-plane is -4. Since line n is perpendicular to line ℓ in the *xy*-plane, the slope of line n is the negative reciprocal of the slope of line ℓ. The negative reciprocal of -4 is $-\frac{1}{(-4)}=\frac{1}{4}$. Note that 1/4 and .25 are examples of ways to enter a correct answer.

QUESTION 22

Choice D is correct. By the definition of absolute value, if $|-5x+13|=73$, then $-5x+13=73$ or $-5x+13=-73$. Subtracting 13 from both sides of the equation $-5x+13=73$ yields $-5x=60$. Dividing both sides of this equation by -5 yields $x=-12$. Subtracting 13 from both sides of the equation $-5x+13=-73$ yields $-5x=-86$. Dividing both sides of this equation by -5 yields $x=\frac{86}{5}$. Therefore, the solutions to the given equation are -12 and $\frac{86}{5}$, and it follows that the sum of the solutions to the given equation is $-12+\frac{86}{5}$, or $\frac{26}{5}$.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect. This is a solution, not the sum of the solutions, to the given equation. *Choice C* is incorrect and may result from conceptual or calculation errors.

QUESTION 23

Choice C is correct. For the form of the function in choice C, $f(x)=128(1.6)^{x-1}$, the value of $f(1)$ can be found as $128(1.6)^{1-1}$, which is equivalent to $128(1.6)^0$, or 128. Therefore, $k=128$, which is shown in $f(x)=128(1.6)^{x-1}$ as the 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 D is incorrect and may result from conceptual or calculation errors.

QUESTION 24

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 25

Choice D is correct. Since each choice has a term of $3x^2$, which can be written as $(3x)(x)$, and each choice has a term of $14b$, which can be written as $(7)(2b)$, the expression that has a factor of $x+2b$, where b is a positive integer constant, can be represented as $(3x+7)(x+2b)$. Using the distributive property of multiplication, this expression is equivalent to $3x(x+2b)+7(x+2b)$, or $3x^2+6xb+7x+14b$. Combining the x-terms in this expression yields $3x^2+(7+6b)x+14b$. It follows that the coefficient of the x-term is equal to $7+6b$. Thus, from the given choices, $7+6b$ must be equal to 7, 28, 42, or 49. Therefore, $6b$ must be equal to 0, 21, 35, or 42, respectively, and b must be equal to $\frac{0}{6}$, $\frac{21}{6}$, $\frac{35}{6}$, or $\frac{42}{6}$, respectively. Of these four values of b, only $\frac{42}{6}$, or 7, is a positive integer. It follows that $7+6b$ must be equal to 49 because this is the only choice for which the value of b is a positive integer constant. Therefore, the expression that has a factor of $x+2b$ is $3x^2+49x+14b$.

Choice A is incorrect. If this expression has a factor of $x+2b$, then the value of b is 0, which isn't positive. *Choice B* is incorrect. If this expression has a factor of $x+2b$, then the value of b is $\frac{21}{6}$, which isn't an integer. *Choice C* is incorrect. If this expression has a factor of $x+2b$, then the value of b is $\frac{35}{6}$, which isn't an integer.

QUESTION 26

Choice B is correct. The histograms shown have the same shape, but data set A contains values between 20 and 60 and data set B contains values between 10 and 50. Thus, the mean of data set A is greater than the mean of data set B. Therefore, the smallest possible difference between the mean of data set A and the mean of data set B is the difference between the smallest possible mean of data set A and the greatest possible mean of data set B. In data set A, since there are 3 integers in the interval greater than or equal to 20 but less than 30, 4 integers greater than or equal to 30 but less than 40, 7 integers greater than or equal to 40 but less than 50, and 9 integers greater than or equal to 50 but less than 60, the smallest possible mean for data set A is $\frac{(3 \cdot 20)+(4 \cdot 30)+(7 \cdot 40)+(9 \cdot 50)}{23}$. In data set B, since there are 3 integers greater than or equal to 10 but less than 20, 4 integers greater than or equal to 20 but less than 30, 7 integers greater than or equal to 30 but less than 40, and 9 integers greater than or equal to 40 but less than 50, the largest possible mean for data set B is $\frac{(3 \cdot 19)+(4 \cdot 29)+(7 \cdot 39)+(9 \cdot 49)}{23}$. Therefore, the smallest possible difference between the mean of data set A and the mean of data set B is $\frac{(3 \cdot 20)+(4 \cdot 30)+(7 \cdot 40)+(9 \cdot 50)}{23} - \frac{(3 \cdot 19)+(4 \cdot 29)+(7 \cdot 39)+(9 \cdot 49)}{23}$, which is equivalent to $\frac{(3 \cdot 20)-(3 \cdot 19)+(4 \cdot 30)-(4 \cdot 29)+(7 \cdot 40)-(7 \cdot 39)+(9 \cdot 50)-(9 \cdot 49)}{23}$. This expression can be rewritten as $\frac{3(20-19)+4(30-29)+7(40-39)+9(50-49)}{23}$, or $\frac{23}{23}$, which is equal to 1. Therefore, the smallest possible difference between the mean of data set A and the mean of data set B is 1.

Choice A is incorrect. This is the smallest possible difference between the ranges, not the means, of the data sets. *Choice C* is incorrect. This is the difference between the greatest possible mean, not the smallest possible mean, of data set A and the greatest possible mean of data set B. *Choice D* is incorrect. This is the smallest possible difference between the sum of the values in data set A and the sum of the values in data set B, not the smallest possible difference between the means.

QUESTION 27

The correct answer is 104. An equilateral triangle is a triangle in which all three sides have the same length and all three angles have a measure of 60°. The height of the triangle, $k\sqrt{3}$, is the length of the altitude from one vertex. The altitude divides the equilateral triangle into two congruent 30-60-90 right triangles, where the altitude is the side across from the 60° angle in each 30-60-90 right triangle. Since the altitude has a length of $k\sqrt{3}$, it follows from the properties of 30-60-90 right triangles that the side across from each 30° angle has a length of k and each hypotenuse has a length of $2k$. In this case, the hypotenuse of each 30-60-90 right triangle is a side of the equilateral triangle; therefore, each side length of the equilateral triangle is $2k$. The perimeter of a triangle is the sum of the lengths of each side. It's given that the perimeter of the equilateral triangle is 624; therefore, $2k+2k+2k=624$, or $6k=624$. Dividing both sides of this equation by 6 yields $k=104$.