PSAT™ 8/9

Practice Test #2

ANSWER EXPLANATIONS

These answer explanations are for students taking the digital PSAT 8/9 in nondigital format.

PSAT™ 8/9

Math

Module 1
(27 questions)

QUESTION 1

Choice B is correct. If a point (x, y) lies on both lines in the graph of a system of two linear equations, the ordered pair (x, y) is a solution to the system. The graph shown is the graph of a system of two linear equations, where the two lines in the graph intersect at the point $(3, 4)$. Therefore, the point $(3, 4)$ lies on both lines, so the ordered pair $(3, 4)$ is the solution to the system.

Choice A is incorrect. The point $(2, 3)$ lies on one, not both, of the lines in the graph shown. *Choice C* is incorrect. The point $(4, 5)$ lies on one, not both, of the lines in the graph shown. *Choice D* is incorrect. The point $(5, 6)$ lies on one, not both, of the lines in the graph shown.

QUESTION 2

Choice C is correct. It's given that x represents years after 2010. Therefore, 2010 is represented by $x = 0$. On the model shown, the point with an x-coordinate of 0 has a y-coordinate of 20,000. Thus, the model estimates that in 2010, the city had 20,000 residents.

Choice A is incorrect. This is the value of x that represents the year 2010. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect. This is approximately the number of residents the model estimates the city had in 2014, not 2010.

QUESTION 3

Choice B is correct. It's given that the bar graph shows the number of each type of monkey in a sanctuary. The bar representing the number of mandrills has a height of 5; therefore, there are 5 mandrills in the sanctuary. The bar representing vervets has a height of 11; therefore, there are 11 vervets in the sanctuary. Therefore, there are $11 - 5$, or 6, more vervets in this sanctuary than mandrills.

Choice A is incorrect. This is the number of vervets in the sanctuary. *Choice C* is incorrect. This is the number of mandrills in the sanctuary. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 4

Choice A is correct. Applying the distributive property on the left-hand side of the given equation yields $3x + 5x + 20 = 76$, or $8x + 20 = 76$. Subtracting 20 from each side of this equation yields $8x = 56$. Dividing each side of this equation by 8 yields $x = 7$.

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 is the solution to the equation $x + 4 = 76$, not $3x + 5(x + 4) = 76$.

QUESTION 5

Choice A is correct. It's given that $f(x) = \frac{16}{x}$. Substituting 17 for x in this function yields $f(17) = \frac{16}{17}$. Therefore, when $x = 17$, the value of $f(x)$ is $\frac{16}{17}$.

Choice B is incorrect. This is the value of the reciprocal of $f(x)$ when $x = 17$. *Choice C* is incorrect. This is the value of $f(x)$ when $x = 1$. *Choice D* is incorrect. This is the value of x when $x = 17$.

QUESTION 6

The correct answer is 3. It's given that the y-intercept of the graph shown is $(0, y)$. The graph passes through the point $(0, 3)$. Therefore, the value of y is 3.

QUESTION 7

The correct answer is 5. Let p represent the number of packages of dinner rolls that should be bought for the party. It's given that dinner rolls are sold in packages of 12. Therefore, $12p$ represents the number of dinner rolls that should be bought for the party. It's also given that 50 dinner rolls are needed; therefore, $12p \geq 50$. Dividing both sides of this inequality by 12 yields $p \geq \frac{50}{12}$, or approximately $p \geq 4.17$. Since the number of packages of dinner rolls must be a whole number, the minimum number of packages that should be bought for the party is 5.

QUESTION 8

Choice D is correct. Let x represent the number that 21 is 21% of. It follows that $\frac{21}{x} = \frac{21}{100}$. Multiplying each side of this equation by x yields $21 = \frac{21x}{100}$. Multiplying each side of this equation by 100 yields $2{,}100 = 21x$. Dividing each side of this equation by 21 yields $100 = x$. Therefore, 21 is 21% of 100.

Choice A is incorrect. 21% of 0 is 0, not 21. *Choice B* is incorrect. 21% of 1 is 0.21, not 21. *Choice C* is incorrect. 21% of 42 is 8.82, not 21.

QUESTION 9

Choice C is correct. It's given that the technician charges $\$60$ per hour for labor. Therefore, if the job takes x hours, the technician will charge $\left(\frac{\$60}{1\text{ hour}}\right)(x\text{ hours})$, or $\$60x$, for labor. It's also given that the technician charges $\$120$ for parts. Therefore, $f(x)=60x+120$ represents the total amount, in dollars, the technician will charge for this job if it takes x hours.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect. This function represents the total amount, in dollars, the technician charges for labor only, not the total amount charged for labor and parts. *Choice D* is incorrect. This function represents the total amount, in dollars, the technician would charge if the charge for parts were subtracted from, rather than added to, the charge for labor.

QUESTION 10

Choice B is correct. It's given that function f is defined by $f(x)=80-6x$. The value of $f(7)$ can be found by substituting 7 for x in the given function, which yields $f(7)=80-6(7)$, or $f(7)=80-42$, which is equivalent to $f(7)=38$. Therefore, the value of $f(7)$ is 38.

Choice A is incorrect. This is the value of $80-67$, not $80-6(7)$. *Choice C* is incorrect. This is the value of $80-6(1)$, not $80-6(7)$. *Choice D* is incorrect. This is the value of $80-6+7$, not $80-6(7)$.

QUESTION 11

Choice A is correct. Let x represent the number of rabbit snails that Naomi bought. It's given that each rabbit snail costs $\$8$. Therefore, the total cost, in dollars, of the rabbit snails that Naomi bought can be represented by the expression $8x$. It's also given that each nerite snail costs $\$6$, and that Naomi bought 2 nerite snails. Therefore, the total cost, in dollars, of the nerite snails that Naomi bought is $6(2)$, or 12. Since Naomi bought both the rabbit snails and the nerite snails for a total of $\$52$, the equation $8x+12=52$ can be used to represent the situation. Subtracting 12 from both sides of this equation yields $8x=40$. Dividing both sides of this equation by 8 yields $x=5$. Therefore, Naomi bought 5 rabbit snails.

Choice B is incorrect. This is the total cost, in dollars, of the nerite snails that Naomi bought, not the number of rabbit snails. *Choice C* is incorrect. This is the cost, in dollars, of one rabbit snail and one nerite snail, not the number of rabbit snails that Naomi bought. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 12

Choice A is correct. The x-intercept of a graph is the point where the graph intersects the x-axis. The graph of function f, where $y=f(x)$, intersects the x-axis at $(-12, 0)$. Therefore, the x-intercept of the graph of f is $(-12, 0)$.

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 13

The correct answer is 1,800. The area, A, of a triangle can be found using the formula $A=\frac{1}{2}bh$, where b is the base length of the triangle and h is the height of the triangle. It's given that the triangle has a base length of 40 centimeters and a height of 90 centimeters. Substituting 40 for b and 90 for h in the formula $A=\frac{1}{2}bh$ yields $A=\frac{1}{2}(40)(90)$, or $A=1{,}800$. Therefore, the area, in square centimeters, of the triangle is 1,800.

QUESTION 14

The correct answer is 14.1. It's given that a participant completes the bicycle race with an average speed of 24,816 yards per hour and 1 mile = 1,760 yards. It follows that this average speed is equivalent to $\left(\frac{24{,}816 \text{ yards}}{1 \text{ hour}}\right)\left(\frac{1 \text{ mile}}{1{,}760 \text{ yards}}\right)$, which yields $\frac{14.1 \text{ miles}}{1 \text{ hour}}$, or 14.1 miles per hour.

QUESTION 15

Choice C is correct. For the graph shown, the x-axis represents temperature, in kelvins, and the y-axis represents volume, in liters. Therefore, the estimated volume, in liters, of the hydrogen when its temperature is 500 kelvins is represented by the y-coordinate of the point on the graph that has an x-coordinate of 500. The point on the graph with an x-coordinate of 500 has a y-coordinate of 7. Therefore, the estimated volume, in liters, of the hydrogen when its temperature is 500 kelvins is 7.

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 16

Choice B is correct. Subtracting 34 from each side of the given equation yields $p=q+r-34$. Thus, the equation $p=q+r-34$ correctly expresses p in terms of q and r.

Choice A is incorrect. This equation can be rewritten as $p-34=q+r$. *Choice C* is incorrect. This equation can be rewritten as $p-34=-q-r$. *Choice D* is incorrect. This equation can be rewritten as $p+34=-q-r$.

QUESTION 17

Choice C is correct. The Pythagorean theorem states that for a right triangle, $a^2+b^2=c^2$, where a and b represent the lengths of the legs of the triangle and c represents the length of its hypotenuse. In the triangle shown, the legs have lengths of 3 and 7. Substituting 3 for a and 7 for b in the equation $a^2+b^2=c^2$

yields $3^2 + 7^2 = c^2$, which is equivalent to $9 + 49 = c^2$, or $58 = c^2$. Taking the positive square root of both sides of this equation yields $\sqrt{58} = c$. Thus, the value of c is approximately 7.6. Therefore, of the given choices, 7.6 is the closest to the length of the triangle's hypotenuse.

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 18

Choice D is correct. It's given that the number of coins in the collection increased from 9 to 90. It follows that the number of coins in the collection increased by $90 - 9$, or 81. Let x% represent the percentage that 81 is of 9. The value of x can be found using the proportion $\frac{81}{9} = \frac{x}{100}$, or $9 = \frac{x}{100}$. Multiplying both sides of this equation by 100 yields $900 = x$. Thus, when the number of coins in the collection increased from 9 to 90, the percent increase was 900%.

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 C is correct. It's given that in triangle QRS, sides QR and RS each have a length of x centimeters. Therefore, the expression $2x$ represents the sum of the lengths, in centimeters, of sides QR and RS. It's also given that side SQ has a length of y centimeters. Therefore, the expression $2x + y$ represents the sum of the lengths, in centimeters, of sides QR, RS, and SQ. Since $2x + y$ is the sum of the lengths, in centimeters, of the three sides of the triangle and $2x + y = 37$, it follows that 37 is the sum of the lengths, in centimeters, of the three sides of the triangle.

Choice A is incorrect. The difference, in centimeters, between the lengths of sides QR and SQ is $x - y$, not 37. *Choice B* is incorrect. The difference, in centimeters, between the lengths of sides QR and RS is $x - x$, or 0, not 37. *Choice D* is incorrect. The length, in centimeters, of one of the two sides of equal length is x, not 37.

QUESTION 20

The correct answer is $\frac{5}{13}$. The graph of a line in the xy-plane can be represented by the equation $y = mx + b$, where m is the slope of the line and b is the y-coordinate of the y-intercept. The given equation can be written as $y = \left(\frac{5}{13}\right)x - 23$. Therefore, the slope of the graph of this equation in the xy-plane is $\frac{5}{13}$. Note that 5/13, .3846, 0.385, and 0.384 are examples of ways to enter a correct answer.

QUESTION 21

The correct answer is 6.21. It's given that the samples of pumice were cut in the shape of a cube. It's also given that the length of the edge of one of these cubes is 3.000 centimeters. Therefore, the volume of this cube is $(3.000 \text{ centimeters})^3$, or 27 cubic centimeters. Since the density of this cube is 0.230 grams per cubic centimeter, it follows that the mass of this cube is $\left(\frac{0.230 \text{ grams}}{1 \text{ cubic centimeter}}\right)(27 \text{ cubic centimeters})$, or 6.21 grams.

QUESTION 22

Choice C is correct. A line in the *xy*-plane that passes through 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 $(0, 0.2)$ and $(5, 9.3)$. It follows that the slope of this line is approximately $\frac{9.3 - 0.2}{5 - 0}$, which is equivalent to $\frac{9.1}{5}$, or 1.82. Therefore, of the given choices, 1.8 is closest to the slope of the line of best fit shown.

Choice A is incorrect. This value is closest to the *y*-coordinate of the *y*-intercept of the line of best fit shown. *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 23

Choice A is correct. The perimeter of a rectangle is equal to the sum of 2 times its length and 2 times its width. It's given that the rectangle's length is 50 inches and the width is x inches. Therefore, the perimeter, in inches, is $2(50) + 2x$, or $100 + 2x$, which is equivalent to $2x + 100$. It's given that the perimeter is at most 210 inches; therefore, $2x + 100 \leq 210$ represents this situation.

Choice B is incorrect. This inequality represents a situation where the perimeter is at least, rather than at most, 210 inches. *Choice C* is incorrect. This inequality represents a situation where 2 times the length, rather than the length, is 50 inches. *Choice D* is incorrect. This inequality represents a situation where 2 times the length, rather than the length, is 50 inches, and the perimeter is at least, rather than at most, 210 inches.

QUESTION 24

Choice D is correct. Since $8x$ is a common factor of each term in the given expression, the expression can be rewritten as $8x(x^9 - x^8 + 11)$.

Choice A is incorrect. This expression is equivalent to $7x^{11} - 7x^{10} + 87x^2$. *Choice B* is incorrect. This expression is equivalent to $8^{10}x - 8^9x + 88x$. *Choice C* is incorrect. This expression is equivalent to $8x^{11} - 8x^{10} + 88x^2$.

QUESTION 25

Choice D is correct. Each of the tables gives the same three values of x: 1, 2, and 4. Substituting 1 for x in the given equation yields $\left(\frac{3}{5}\right)(1) + \frac{3}{4}y = 7$, or $\frac{3}{5} + \frac{3}{4}y = \frac{35}{5}$.

Subtracting $\frac{3}{5}$ from both sides of this equation yields $\frac{3}{4}y=\frac{32}{5}$. Multiplying both sides of this equation by $\frac{4}{3}$ yields $y=\frac{128}{15}$. Therefore, when $x=1$, the corresponding value of y for the given equation is $\frac{128}{15}$. Substituting 2 for x in the given equation yields $\left(\frac{3}{5}\right)(2)+\frac{3}{4}y=7$, or $\frac{6}{5}+\frac{3}{4}y=\frac{35}{5}$. Subtracting $\frac{6}{5}$ from both sides of this equation yields $\frac{3}{4}y=\frac{29}{5}$. Multiplying both sides of this equation by $\frac{4}{3}$ yields $y=\frac{116}{15}$. Therefore, when $x=2$, the corresponding value of y for the given equation is $\frac{116}{15}$. Substituting 4 for x in the given equation yields $\left(\frac{3}{5}\right)(4)+\frac{3}{4}y=7$, or $\frac{12}{5}+\frac{3}{4}y=\frac{35}{5}$. Subtracting $\frac{12}{5}$ from both sides of this equation yields $\frac{3}{4}y=\frac{23}{5}$. Multiplying both sides of this equation by $\frac{4}{3}$ yields $y=\frac{92}{15}$. Therefore, when $x=4$, the corresponding value of y for the given equation is $\frac{92}{15}$. The table in choice D gives x-values of 1, 2, and 4 and corresponding y-values of $\frac{128}{15}$, $\frac{116}{15}$, and $\frac{92}{15}$, respectively. Therefore, the table in choice D gives three values of x and their corresponding values of y for the given equation.

Choice A is incorrect. This table gives three values of x and their corresponding values of y for the equation $\frac{3}{5}x+\frac{3}{4}+y=7$. *Choice B* is incorrect. This table gives three values of x and their corresponding values of y for the equation $\frac{3}{5}x+y=10$. *Choice C* is incorrect. This table gives three values of x and their corresponding values of y for the equation $\frac{3}{5}x+\frac{3}{4}y=8$.

QUESTION 26

Choice B is correct. The length of a segment in the xy-plane can be found using the distance formula, $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$, where (x_1, y_1) and (x_2, y_2) are the endpoints of the segment. The segment shown has endpoints at $(-6, 4)$ and $(3, 10)$. Substituting $(-6, 4)$ and $(3, 10)$ for (x_1, y_1) and (x_2, y_2), respectively, in the distance formula yields $\sqrt{(3-(-6))^2+(10-4)^2}$, or $\sqrt{9^2+6^2}$, which is equivalent to $\sqrt{81+36}$, or $\sqrt{117}$. Let x represent the length, in units, of the other leg of this triangle. The area, A, of a right triangle can be calculated using the formula $A=\frac{1}{2}bh$, where b and h are the lengths of the legs of the triangle. It's given that the area of the triangle is $36\sqrt{13}$ square units. Substituting $36\sqrt{13}$ for A, $\sqrt{117}$ for b, and x for h in the formula $A=\frac{1}{2}bh$ yields $36\sqrt{13}=\frac{1}{2}(\sqrt{117})(x)$. Multiplying both sides of this equation by 2 yields $72\sqrt{13}=x\sqrt{117}$. Dividing both sides of this equation by $\sqrt{117}$ yields $\frac{72\sqrt{13}}{\sqrt{117}}=x$. Multiplying the numerator and denominator on the left-hand side of this equation by $\sqrt{117}$ yields $\frac{72\sqrt{1{,}521}}{117}=x$, or $\frac{72(39)}{117}=x$, which is equivalent to $\frac{2{,}808}{117}=x$, or $24=x$. Therefore, the length, in units, of the other leg of this triangle is 24.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. $3\sqrt{13}$ is equivalent to $\sqrt{117}$, which is the length, in units, of the line segment shown in the xy-plane, not the length, in units, of the other leg of the triangle. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 27

The correct answer is 31. Subtracting 7 from both sides of the equation $x^2+6x+7=0$ yields $x^2+6x=-7$. To complete the square, adding $\left(\frac{6}{2}\right)^2$, or 3^2, to both sides of this equation yields $x^2+6x+3^2=-7+3^2$, or $(x+3)^2=2$. Taking the square root of both sides of this equation yields $x+3=\pm\sqrt{2}$. Subtracting 3 from both sides of this equation yields $x=-3\pm\sqrt{2}$. Therefore, the solutions r and s to the equation $x^2+6x+7=0$ are $-3-\sqrt{2}$ and $-3+\sqrt{2}$. Since $r<s$, it follows that $r=-3-\sqrt{2}$ and $s=-3+\sqrt{2}$. Subtracting 8 from both sides of the equation $x^2+8x+8=0$ yields $x^2+8x=-8$. To complete the square, adding $\left(\frac{8}{2}\right)^2$, or 4^2, to both sides of this equation yields $x^2+8x+4^2=-8+4^2$, or $(x+4)^2=8$. Taking the square root of both sides of this equation yields $x+4=\pm\sqrt{8}$, or $x+4=\pm2\sqrt{2}$. Subtracting 4 from both sides of this equation yields $x=-4\pm2\sqrt{2}$. Therefore, the solutions t and u to the equation $x^2+8x+8=0$ are $-4-2\sqrt{2}$ and $-4+2\sqrt{2}$. Since $t<u$, it follows that $t=-4-2\sqrt{2}$ and $u=-4+2\sqrt{2}$. It's given that the solutions to $x^2+14x+c=0$, where c is a constant, are $r+t$ and $s+u$. It follows that this equation can be written as $(x-(r+t))(x-(s+u))=0$, which is equivalent to $x^2-(r+t+s+u)x+(r+t)(s+u)=0$. Therefore, the value of c is $(r+t)(s+u)$. Substituting $-3-\sqrt{2}$ for r, $-4-2\sqrt{2}$ for t, $-3+\sqrt{2}$ for s, and $-4+2\sqrt{2}$ for u in this equation yields $((-3-\sqrt{2})+(-4-2\sqrt{2}))((-3+\sqrt{2})+(-4+2\sqrt{2}))$, which is equivalent to $(-7-3\sqrt{2})(-7+3\sqrt{2})$, or $(-7)(-7)-(3\sqrt{2})(3\sqrt{2})$, which is equivalent to $49-18$, or 31. Therefore, the value of c is 31.

Math

Module 2
(27 questions)

QUESTION 1

Choice C is correct. For each point on the scatterplot shown, the *x*-value represents the weight, in pounds, of a female gray wolf and the *y*-value represents the number of offspring that wolf produced. The point on the graph with an *x*-value of 50 has a *y*-value of 6. Therefore, the 50-pound gray wolf produced 6 offspring.

Choice A is incorrect. One of the wolves produced 8 offspring, but its weight was greater than 50 pounds. *Choice B* is incorrect. Three of the wolves produced 7 offspring each, but their weights were each greater than 50 pounds. *Choice D* is incorrect. Two of the wolves produced 5 offspring each, but their weights were each less than 50 pounds.

QUESTION 2

Choice A is correct. According to the first equation in the given system, $y = 4$. Substituting 4 for y in the second equation in the given system yields $x = 4 + 6$, or $x = 10$.

Choice B is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is the value of y, not x. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 3

Choice D is correct. The height of each bar in the graph shown represents the number of volunteers who chose the gift labeled with the letter specified at the bottom of the bar. The bar for gift C has a height of 18. Therefore, 18 volunteers chose gift C.

Choice A is incorrect. This is the number of volunteers who chose gift D, not gift C. *Choice B* is incorrect. This is the number of volunteers who chose gift B, not gift C. *Choice C* is incorrect. This is the number of volunteers who chose gift A, not gift C.

QUESTION 4

Choice B is correct. If a number from the data set is selected at random, the probability of selecting a negative number is the count of negative numbers in the data set divided by the total count of numbers in the data set. It's given that a data set of three numbers is shown. It follows that the total count of numbers in the data set is 3. In the data set shown, -13 is the only negative number. It follows that the count of negative numbers in the data set is 1. Therefore, if a number from the data set is selected at random, the probability of selecting a negative number is $\frac{1}{3}$.

Choice A is incorrect. This is the probability of selecting a negative number from a data set that doesn't contain any negative numbers. *Choice C* is incorrect. This is the probability of selecting a positive number, not a negative number, from the data set. *Choice D* is incorrect. This is the probability of selecting a negative number from a data set that contains only negative numbers.

QUESTION 5

Choice B is correct. A line in the *xy*-plane with a slope of m and a *y*-intercept of $(0, b)$ can be represented by the equation $y = mx + b$. It's given that the line has a slope of $-\frac{1}{2}$. Therefore, $m = -\frac{1}{2}$. It's also given that the line passes through the point $(0, 3)$. Therefore, $b = 3$. Substituting $-\frac{1}{2}$ for m and 3 for b in the equation $y = mx + b$ yields $y = -\frac{1}{2}x + 3$. Therefore, the equation $y = -\frac{1}{2}x + 3$ represents this line.

Choice A is incorrect. This equation represents a line in the *xy*-plane that passes through the point $(0, -3)$, not $(0, 3)$. *Choice C* is incorrect. This equation represents a line in the *xy*-plane that has a slope of $\frac{1}{2}$, not $-\frac{1}{2}$, and passes through the point $(0, -3)$, not $(0, 3)$. *Choice D* is incorrect. This equation represents a line in the *xy*-plane that has a slope of $\frac{1}{2}$, not $-\frac{1}{2}$.

QUESTION 6

The correct answer is 66. It's given that a product costs 11.00 dollars per pound. Therefore, the cost for 6 pounds of the product is $\left(\frac{11.00 \text{ dollars}}{1 \text{ pound}}\right)(6 \text{ pounds})$, which is equivalent to 66.00, or 66, dollars.

QUESTION 7

The correct answer is 15. It's given that the equation $46 = 2x + 2y$ gives the perimeter of a rectangular rug that has length x, in feet, and width y, in feet. It's also given that the width of the rug is 8 feet. Substituting 8 for y in the equation $46 = 2x + 2y$ yields $46 = 2x + 2(8)$, or $46 = 2x + 16$. Subtracting 16 from both sides of this equation yields $30 = 2x$. Dividing both sides of this equation by 2 yields $15 = x$. Since x represents the length, in feet, of the rug, it follows that the length of the rug is 15 feet.

QUESTION 8

Choice C is correct. On the line of best fit, an x-value of 1,200 corresponds to a y-value between 10 and 12. Therefore, of the given choices, 11 is closest to the y-value predicted by the line of best fit at $x = 1{,}200$.

Choice A is incorrect. This is the integer value closest to the y-value predicted by the line of best fit at $x = 1{,}800$. *Choice B* is incorrect. This is the integer value closest to the y-value predicted by the line of best fit at $x = 1{,}500$. *Choice D* is incorrect. This is the integer value closest to the y-value predicted by the line of best fit at $x = 600$.

QUESTION 9

Choice A is correct. The given expression can be rewritten as $(8 \cdot 7)(y \cdot y)(z \cdot z)$, which is equivalent to $(56)(y^2)(z^2)$, or $56y^2z^2$.

Choice B is incorrect. This expression is equivalent to $(8yz)(y)(7)$. *Choice C* is incorrect. This expression is equivalent to $(8z)(y)(7)$. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 10

Choice D is correct. It's given that the food truck buys forks for $\$0.04$ each. Therefore, the cost, in dollars, of x forks can be represented by the expression $0.04x$. It's also given that the food truck buys plates for $\$0.48$ each. Therefore, the cost, in dollars, of y plates can be represented by the expression $0.48y$. Since the total cost of x forks and y plates is $\$661.76$, the equation $0.04x + 0.48y = 661.76$ represents this situation.

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 in which the food truck buys forks for $\$0.48$ each and plates for $\$0.04$ each.

QUESTION 11

Choice B is correct. The triangle shown is a right triangle, where the interior angle shown with a right angle symbol has a measure of 90°. It's shown that the other two interior angles measure 13° and a°. The sum of the measures of the interior angles of a triangle is 180°; therefore, $90 + 13 + a = 180$. Combining like terms on the left-hand side of this equation yields $103 + a = 180$. Subtracting 103 from both sides of this equation yields $a = 77$.

Choice A is incorrect. This is the measure, in degrees, of the other acute interior angle of the right triangle, not the value of a. *Choice C* is incorrect. This is the measure, in degrees, of the right angle of the right triangle, not the value of a. *Choice D* is incorrect. This is the sum of the measures, in degrees, of the other two interior angles of the right triangle, not the value of a.

QUESTION 12

Choice D is correct. It's given that at the beginning of the 1st week of the year there was $\$600$ in a savings account and Gabriella deposits $\$35$ in that savings account at the end of each week. Therefore, the amount of money, in dollars, in the savings account at the end of the 4th week of that year is $600+4(35)$, or 740.

Choice A is incorrect. This is the amount of money, in dollars, that will be in the account at the end of the 4th week if Gabriella withdraws, rather than deposits, $\$35$ at the end of each week. *Choice B* is incorrect. This is the amount of money, in dollars, that will be in the account at the end of the 1st week, not the 4th week. *Choice C* is incorrect and may result from conceptual or calculation errors.

QUESTION 13

The correct answer is 22. The given equation, $x^2=(22)(22)$, is equivalent to $x^2=(22)^2$. Taking the square root of each side of this equation yields $x=\pm 22$. Thus, the positive solution to the given equation is 22.

QUESTION 14

The correct answer is 980. It's given that the ratio 140 to m is equivalent to the ratio 4 to 28. Therefore, the value of m can be found by solving the equation $\frac{140}{m}=\frac{4}{28}$. Multiplying each side of this equation by m yields $140=\frac{4m}{28}$. Multiplying each side of this equation by 28 yields $3{,}920=4m$. Dividing each side of this equation by 4 yields $980=m$. Therefore, the value of m is 980.

QUESTION 15

Choice B is correct. Dividing each side of the given equation by 3 yields $x-9=8$. Therefore, the value of $x-9$ is 8.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is the value of $3x-27$, not $x-9$. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 16

Choice C is correct. An equation defining the linear function f can be written in the form $f(x)=mx+b$, where m is the slope and $(0, b)$ is the y-intercept of the graph of $y=f(x)$ in the xy-plane. The slope of the graph of $y=f(x)$ can be found using the formula $m=\frac{y_2-y_1}{x_2-x_1}$, where (x_1, y_1) and (x_2, y_2) are any two points that the graph passes through. If $f(0)=17$, it follows that the graph of $y=f(x)$ passes through the point $(0, 17)$. If $f(1)=17$, it follows that the graph of $y=f(x)$ passes through the point $(1, 17)$. Substituting $(0, 17)$ and $(1, 17)$ for (x_1, y_1) and (x_2, y_2), respectively, in the formula $m=\frac{y_2-y_1}{x_2-x_1}$ yields $m=\frac{17-17}{1-0}$, which is equivalent to $m=\frac{0}{1}$, or $m=0$. Since the graph of $y=f(x)$ passes through $(0, 17)$, it follows that $b=17$. Substituting 0 for m and 17 for b in the equation $f(x)=mx+b$ yields $f(x)=0x+17$, or $f(x)=17$. Thus, the equation that defines f is $f(x)=17$.

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. It's given that the function $f(x) = 55.20 - 0.16x$ gives the estimated surface water temperature, in degrees Celsius, of a body of water on the xth day of the year. Substituting 326 for x in the given function yields $f(326) = 55.20 - 0.16(326)$, which is equivalent to $f(326) = 55.20 - 52.16$, or $f(326) = 3.04$. Therefore, the estimated surface water temperature, in degrees Celsius, of this body of water on the 326th day of the year is 3.04.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is the rate of change, in degrees Celsius per day, of the estimated surface water temperature. *Choice D* is incorrect. This is the change, in degrees Celsius, in the estimated surface water temperature over 326 days.

QUESTION 18

Choice B is correct. It's given by the first equation in the system that $y = -\frac{1}{5}x$. Substituting $-\frac{1}{5}x$ for y in the second equation in the system, $y = \frac{1}{7}x$, yields $-\frac{1}{5}x = \frac{1}{7}x$. Adding $-\frac{1}{5}x$ to both sides of this equation yields $0 = \frac{1}{7}x + \frac{1}{5}x$, which is equivalent to $0 = \frac{5}{35}x + \frac{7}{35}x$, or $0 = \frac{12}{35}x$. Multiplying both sides of this equation by $\frac{35}{12}$ yields $0 = x$. Therefore, the value of x is 0.

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

QUESTION 19

Choice A is correct. In the given function, $s(t)$ represents the approximate mass, in grams, of the sample that remains t years after the sample starts to decay. It follows that the best interpretation of $s(87) = 23$ is that approximately 23 grams of the sample remains 87 years after the sample starts to decay.

Choice B is incorrect. The mass of the sample has decreased by approximately $184 - 23$, or 161, grams, not 23 grams, 87 years after the sample starts to decay. *Choice C* is incorrect. The mass of the sample has decreased by approximately 78 grams, not 87 grams, 23 years after the sample starts to decay. *Choice D* is incorrect. This would be the best interpretation of $s(23) = 87$, not $s(87) = 23$.

QUESTION 20

The correct answer is 2,432. It's given that 4 cups = 1 quart. It follows that 76 quarts is equivalent to $(76 \text{ quarts})\left(\frac{4 \text{ cups}}{1 \text{ quart}}\right)$, or 304 cups. It's also given that 8 fluid ounces = 1 cup. It follows that 304 cups is equivalent to $(304 \text{ cups})\left(\frac{8 \text{ fluid ounces}}{1 \text{ cup}}\right)$, or 2,432 fluid ounces.

QUESTION 21

The correct answer is 25. It's given that a piece of wire has a length of 32 inches and 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. It follows that the equation $x+y=32$ represents this situation. It's also given that the value of x is 4 more than 3 times the value of y, or $x=3y+4$. Substituting $3y+4$ for x in the equation $x+y=32$ yields $3y+4+y=32$. Combining like terms on the left-hand side of this equation yields $4y+4=32$. Subtracting 4 from both sides of this equation yields $4y=28$. Dividing both sides of this equation by 4 yields $y=7$. Substituting 7 for y in the equation $x=3y+4$ yields $x=3(7)+4$, or $x=25$. Therefore, the value of x is 25.

QUESTION 22

Choice D is correct. It's given that triangle XYZ is similar to triangle TUV. Therefore, each side of triangle XYZ is k times its corresponding side of triangle TUV, where k is a constant. It follows that the perimeter of triangle XYZ is k times the perimeter of triangle TUV. It's also given that $\overline{TU}$ corresponds to $\overline{XY}$ and the length of $\overline{TU}$ is 18. Let x represent the length of $\overline{XY}$. It follows that $x=18k$. The table shows that the perimeters of triangles TUV and XYZ are 37 and 333, respectively. It follows that $333=37k$, or $9=k$. Substituting 9 for k in the equation $x=18k$ yields $x=(18)(9)$, or $x=162$. Therefore, the length of $\overline{XY}$ is 162.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect. This is the length of $\overline{TU}$, not the length of $\overline{XY}$. *Choice C* is incorrect and may result from conceptual or calculation errors.

QUESTION 23

Choice D is correct. The volume, V, of a sphere can be found using the formula $V=\frac{4}{3}\pi r^3$, where r is the radius of the sphere. It's given that the sphere has a radius of $\frac{17}{5}$ feet. Substituting $\frac{17}{5}$ for r in the formula $V=\frac{4}{3}\pi r^3$ yields $V=\frac{4}{3}\pi\left(\frac{17}{5}\right)^3$, which is equivalent to $V=\frac{4}{3}\pi\left(\frac{4{,}913}{125}\right)$, or $V=\frac{19{,}652\pi}{375}$. Therefore, the volume, in cubic feet, of the sphere is $\frac{19{,}652\pi}{375}$.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect. This is the volume, in cubic feet, of a sphere with a radius of $\sqrt[3]{\frac{17}{5}}$ feet. *Choice C* is incorrect and may result from conceptual or calculation errors.

QUESTION 24

Choice C is correct. It's given that the dot plot represents a data set of the number of bursts for 13 eruptions of a steam vent. The median of a data set with an odd number of elements is the middle element when the elements are in numerical order. For 13 elements in numerical order, this is the 7th element. For this data set, the first 4 elements have a value of 1, and the next 5 elements have a value of 2. Thus, the 7th element in the ordered data set is 2 and the median

number of bursts for the original data set is 2. If an additional eruption with 11 bursts is added to this data set to create a new data set of 14 eruptions, the median of the new data set will be between the 7th and 8th elements in the ordered set, which will also be 2. Therefore, the median number of bursts for the new data set will be the same as the median number of bursts for the original data set. The mean number of bursts for the original data set is found by adding the values of all 13 elements and dividing that sum by the number of elements, 13. Since the data is shown in a dot plot, the sum of the values of the elements can be found by multiplying each element's value by its frequency: $1(4)+2(5)+3(2)+4(1)+5(1)$, or 29. Therefore, the mean number of bursts for the original data set is $\frac{29}{13}$. If an additional eruption with 11 bursts is added to this data set to create a new data set of 14 bursts, the mean number of bursts for the new data set is $\frac{29+11}{14}$, or $\frac{40}{14}$. Since $\frac{40}{14}>\frac{29}{13}$, the mean number of bursts for the new data set is greater than the mean number of bursts for the original data set. Therefore, of the median number of bursts and the mean number of bursts, only the mean number of bursts is greater for the new data set than for the original data set.

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

QUESTION 25

Choice D is correct. It's given that during a certain day at a factory, the number of 7-inch concrete screws the factory makes is n and the number of 4-inch concrete screws the factory makes is 22. It's also given that during this day the number of 9-inch concrete screws the factory makes is 5 times the number of 7-inch concrete screws, or $5n$. Therefore, the total number of 7-inch, 9-inch, and 4-inch concrete screws is $n+5n+22$, or $6n+22$. It's given that during this day, the factory makes 100 concrete screws total. Thus, the equation $6n+22=100$ represents this situation.

Choice A is incorrect. This equation represents a situation where the total length, in inches, of all the concrete screws, rather than the total number of concrete screws, is 100. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This equation represents a situation where the total number of 9-inch concrete screws and 4-inch concrete screws, not including the 7-inch concrete screws, is 100.

QUESTION 26

Choice B is correct. It's given that the number b is 80% less than 24. It follows that b is equal to 24 minus 80% of 24, which can be written as $b=24-\left(\frac{80}{100}\right)24$. This is equivalent to $b=24-0.8(24)$, or $b=4.8$. It's also given that the number a is 190% greater than the number b. It follows that a is equal to b plus 190% of b. Since $b=4.8$, this can be written as $a=4.8+\left(\frac{190}{100}\right)4.8$. This is equivalent to $a=4.8+1.9(4.8)$, or $a=13.92$.

Choice A is incorrect. This would be the value of a if a were 190% of b, not 190% greater than b. *Choice C* is incorrect. This is $(190-80)\%$ of 24. *Choice D* is incorrect. This would be the value of a if b were 80% of 24, not 80% less than 24, and a were 190% of b, not 190% greater than b.

QUESTION 27

The correct answer is 12. The volume, V, of a right square prism can be calculated using the formula $V=s^2h$, where s represents the length of an edge of the base and h represents the height of the prism. It's given that the volume of the prism is 2,016 cubic units and the height is 14 units. Substituting 2,016 for V and 14 for h in the formula $V=s^2h$ yields $2{,}016=(s^2)(14)$. Dividing both sides of this equation by 14 yields $144=s^2$. Taking the square root of both sides of this equation yields two solutions: $-12=s$ and $12=s$. The length can't be negative, so $12=s$. Therefore, the length, in units, of an edge of the base is 12.