The SAT®

Practice Test #6

ANSWER EXPLANATIONS

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

CollegeBoard SAT®

Math

Module 1
(27 questions)

QUESTION 1

Choice A is correct. Subtracting 8 from both sides of the given equation yields $p+3=2$. Subtracting 3 from both sides of this equation yields $p=-1$.

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 2

Choice D is correct. An appropriate model should follow the trend of the data points and should have data points both above and below the model. The scatterplot shows that the data points have an increasing trend that is curved. Therefore, an appropriate model should be an increasing curve with data points both above and below the model. Of the given choices, only the model in choice D is an increasing curve with data points both above and below the model.

Choice A is incorrect. Since the trend of the data points isn't linear, a line isn't the most appropriate model for the data. *Choice B* is incorrect. Since the trend of the data points is increasing and isn't linear, a decreasing line isn't the most appropriate model for the data. *Choice C* is incorrect. All the data points are below the model shown in this graph.

QUESTION 3

Choice D is correct. Adding 53 to each side of the given equation yields $k^2=144$. Taking the square root of each side of this equation yields $k=\pm 12$. Therefore, the positive solution to the given equation is 12.

Choice A is incorrect. This is the positive solution to the equation $k^2-53=20{,}683$, not $k^2-53=91$. *Choice B* is incorrect. This is the positive solution to the equation $k^2-53=5{,}131$, not $k^2-53=91$. *Choice C* is incorrect. This is the positive solution to the equation $k^2-53=1{,}391$, not $k^2-53=91$.

QUESTION 4

Choice D is correct. It's given that during a portion of a flight, a small airplane's cruising speed varied between 150 miles per hour and 170 miles per hour. It's also given that s represents the cruising speed, in miles per hour, during this portion of the flight. It follows that the airplane's cruising speed, in miles per hour, was at least 150, which means $s \geq 150$, and was at most 170, which means $s \leq 170$. Therefore, the inequality that best represents this situation is $150 \leq s \leq 170$.

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 5

Choice A is correct. It's given that the variable y represents the height, in meters, of the object above the ground. The graph shows that the height of the object was increasing from $x = 0$ to $x = 2$, and decreasing from $x = 2$ to $x = 4$. Therefore, the height of the object was increasing for the entire interval of time from $x = 0$ to $x = 2$.

Choice B is incorrect. The height of the object wasn't increasing for this entire interval of time, as it was decreasing from $x = 2$ to $x = 4$. *Choice C* is incorrect. The height of the object was decreasing, not increasing, for this entire interval of time. *Choice D* is incorrect. The height of the object was decreasing, not increasing, for this entire interval of time.

QUESTION 6

The correct answer is 31. It's given that 1 yard is equal to 36 inches. Therefore, 1,116 inches is equivalent to $(1{,}116 \text{ inches})\left(\frac{1 \text{ yard}}{36 \text{ inches}}\right)$, or 31 yards.

QUESTION 7

The correct answer is 11. It's given that the function $f(x) = 14 + 4x$ represents the total cost, in dollars, of attending an arcade when x games are played. Substituting 58 for $f(x)$ in the given equation yields $58 = 14 + 4x$. Subtracting 14 from each side of this equation yields $44 = 4x$. Dividing each side of this equation by 4 yields $11 = x$. Therefore, 11 games can be played for a total cost of $58.

QUESTION 8

Choice D is correct. It's given that when $x = 0$, $f(x) = 30$. Substituting 0 for x and 30 for $f(x)$ in the given function yields $30 = 0 + b$, or $30 = b$. Therefore, the value of b is 30.

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 B is correct. The function P gives the estimated number of marine mammals in a certain area, where t is the number of years since a study began. Since the value of $P(0)$ is the value of $P(t)$ when $t=0$, it follows that $P(0)=1{,}800$ means that the value of $P(t)$ is 1,800 when $t=0$. Since t is the number of years since the study began, it follows that $t=0$ is 0 years since the study began, or when the study began. Therefore, the best interpretation of $P(0)=1{,}800$ in this context is the estimated number of marine mammals in the area was 1,800 when the study began.

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 10

Choice B is correct. It's given that the shop's inventory starts with 4,500 paper cups and that the manager estimates that 70 of these paper cups are used each day. Let x represent the number of days in which the estimated supply of paper cups will reach 1,700. The equation $4{,}500-70x=1{,}700$ represents this situation. Subtracting 4,500 from both sides of this equation yields $-70x=-2{,}800$. Dividing both sides of this equation by -70 yields $x=40$. Therefore, based on this estimate, the supply of paper cups will reach 1,700 in 40 days.

Choice A is incorrect. After 20 days, the estimated supply of paper cups would be $4{,}500-70(20)$, or 3,100 cups, not 1,700 cups. *Choice C* is incorrect. After 60 days, the estimated supply of paper cups would be $4{,}500-70(60)$, or 300 cups, not 1,700 cups. *Choice D* is incorrect. After 80 days, the estimated supply of paper cups would be $4{,}500-70(80)$, or $-1{,}100$ cups, which isn't possible.

QUESTION 11

Choice A is correct. In each choice, the values of x are 2, 4, and 6. Substituting the first value of x, 2, for x in the given inequality yields $y>4(2)+8$, or $y>16$. Therefore, when $x=2$, the corresponding value of y must be greater than 16. Of the given choices, only choice A is a table where the value of y corresponding to $x=2$ is greater than 16. To confirm that the other values of x in this table and their corresponding values of y are also solutions to the given inequality, the values of x and y in the table can be substituted for x and y in the given inequality. Substituting 4 for x and 30 for y in the given inequality yields $30>4(4)+8$, or $30>24$, which is true. Substituting 6 for x and 41 for y in the given inequality yields $41>4(6)+8$, or $41>32$, which is true. It follows that for choice A, all the values of x and their corresponding values of y are solutions to the given inequality.

Choice B is incorrect. Substituting 2 for x and 8 for y in the given inequality yields $8>4(2)+8$, or $8>16$, which is false. *Choice C* is incorrect. Substituting 2 for x and 13 for y in the given inequality yields $13>4(2)+8$, or $13>16$, which is false. *Choice D* is incorrect. Substituting 2 for x and 13 for y in the given inequality yields $13>4(2)+8$, or $13>16$, which is false.

QUESTION 12

Choice B is correct. The expression $(x^2+11)^2$ can be written as $(x^2+11)(x^2+11)$, which is equivalent to $x^2(x^2+11)+11(x^2+11)$. Distributing x^2 and 11 to (x^2+11) yields $x^4+11x^2+11x^2+121$, or x^4+22x^2+121. The expression $(x-5)(x+5)$ is equivalent to $(x-5)x+(x-5)5$. Distributing x and 5 to $(x-5)$ yields $x^2-5x+5x-25$, or x^2-25. Therefore, the expression $(x^2+11)^2+(x-5)(x+5)$ is equivalent to $(x^4+22x^2+121)+(x^2-25)$, or $x^4+22x^2+121+x^2-25$. Combining like terms in this expression yields x^4+23x^2+96.

Choice A is incorrect. Equivalent expressions must be equivalent for any value of x. Substituting 0 for x in this expression yields -14, whereas substituting 0 for x in the given expression yields 96. *Choice C* is incorrect. Equivalent expressions must be equivalent for any value of x. Substituting 0 for x in this expression yields 121, whereas substituting 0 for x in the given expression yields 96. *Choice D* is incorrect. Equivalent expressions must be equivalent for any value of x. Substituting 0 for x in this expression yields 146, whereas substituting 0 for x in the given expression yields 96.

QUESTION 13

The correct answer is $\frac{1}{2}$. The value of $h(2)$ is the value of $h(x)$ when $x=2$. Substituting 2 for x in the given equation yields $h(2)=\frac{8}{5(2)+6}$, which is equivalent to $h(2)=\frac{8}{16}$, or $h(2)=\frac{1}{2}$. Therefore, the value of $h(2)$ is $\frac{1}{2}$. Note that 1/2 and .5 are examples of ways to enter a correct answer.

QUESTION 14

The correct answer is $\frac{15}{2}$. The area, A, of a triangle is given by the formula $A=\frac{1}{2}bh$, where b is the length of the base of the triangle and h is the height of the triangle. In the right triangle shown, the length of the base of the triangle is 5 inches, and the height is 3 inches. It follows that $b=5$ and $h=3$. Substituting 5 for b and 3 for h in the formula $A=\frac{1}{2}bh$ yields $A=\frac{1}{2}(5)(3)$, which is equivalent to $A=\frac{1}{2}(15)$, or $A=\frac{15}{2}$. Therefore, the area of the triangle, in square inches, is $\frac{15}{2}$. Note that 15/2 and 7.5 are examples of ways to enter a correct answer.

QUESTION 15

Choice B is correct. It's given that the graph models the number of active projects a company was working on x months after the end of November 2012. Therefore, the value of x that corresponds to the end of November 2012 is 0. The point at which $x=0$ is the y-intercept of the graph. It follows that the y-intercept of the graph shown is the point (0, 5). Therefore, according to the model, the predicted number of active projects the company was working on at the end of November 2012 is 5.

Choice A is incorrect. This is the value of x that corresponds to the end of November 2012, not the predicted number of active projects the company was working on at the end of November 2012. *Choice C* is incorrect. This is the predicted number of active projects the company was working on 2 months after the end of November 2012. *Choice D* is incorrect. This is the predicted number of active projects the company was working on 4 months after the end of November 2012.

QUESTION 16

Choice C is correct. It's given that the relationship between x and y is linear. An equation representing a linear relationship can be written in the form $y = mx + b$, where m is the slope and b is the y-coordinate of the y-intercept of the graph of the relationship in the xy-plane. It's given that for every increase in the value of x by 1, the value of y increases by 8. The slope of a line can be expressed as the change in y over the change in x. Thus, the slope, m, of the line representing this relationship can be expressed as $\frac{8}{1}$, or 8. Substituting 8 for m in the equation $y = mx + b$ yields $y = 8x + b$. It's also given that when the value of x is 2, the value of y is 18. Substituting 2 for x and 18 for y in the equation $y = 8x + b$ yields $18 = 8(2) + b$, or $18 = 16 + b$. Subtracting 16 from each side of this equation yields $2 = b$. Substituting 2 for b in the equation $y = 8x + b$ yields $y = 8x + 2$. Therefore, the equation $y = 8x + 2$ represents this relationship.

Choice A is incorrect. This equation represents a relationship where for every increase in the value of x by 1, the value of y increases by 2, not 8, and when the value of x is 2, the value of y is 22, not 18. *Choice B* is incorrect. This equation represents a relationship where for every increase in the value of x by 1, the value of y increases by 2, not 8, and when the value of x is 2, the value of y is 12, not 18. *Choice D* is incorrect. This equation represents a relationship where for every increase in the value of x by 1, the value of y increases by 3, not 8, and when the value of x is 2, the value of y is 32, not 18.

QUESTION 17

Choice D is correct. It's given that the values of P, N, and C are positive. Therefore, dividing each side of the given equation by N yields $\frac{P}{N} = 19 - C$. Subtracting 19 from each side of this equation yields $\frac{P}{N} - 19 = -C$. Dividing each side of this equation by -1 yields $19 - \frac{P}{N} = C$, or $C = 19 - \frac{P}{N}$.

Choice A is incorrect. This equation is equivalent to $P = NC - 19$, not $P = N(19 - C)$. *Choice B* is incorrect. This equation is equivalent to $P = 19 - NC$, not $P = N(19 - C)$. *Choice C* is incorrect. This equation is equivalent to $P = N(C - 19)$, not $P = N(19 - C)$.

QUESTION 18

Choice D is correct. Adding 40 to both sides of the given equation yields $w^2 + 12w = 40$. To complete the square, adding $\left(\frac{12}{2}\right)^2$, or 6^2, to both sides of this equation yields $w^2 + 12w + 6^2 = 40 + 6^2$, or $(w + 6)^2 = 76$. Taking the square root of both sides of this equation yields $w + 6 = \pm\sqrt{76}$, or $w + 6 = \pm 2\sqrt{19}$. Subtracting 6 from both sides of this equation yields $w = -6 \pm 2\sqrt{19}$. Therefore, the solutions to the given equation are $-6 + 2\sqrt{19}$ and $-6 - 2\sqrt{19}$. Of these two solutions, only $-6 + 2\sqrt{19}$ is given as a choice.

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. If a data set contains an odd number of data values, the median is represented by the middle data value in the list when the data values are listed in ascending or descending order. Since the numbers of employees are given as ranges of values rather than specific values, it's only possible to determine the range in which the median falls, rather than the exact median. Since there are 17 restaurants included in the data set and the numbers of employees are listed in ascending order, it follows that the median number of employees will be represented by the ninth restaurant in the list. Since the first 2 restaurants each have 2 to 7 employees, numbers of employees in the 2 to 7 range would be represented by the first and second restaurants in the list. The next 4 restaurants each have 8 to 13 employees. Therefore, numbers of employees in the 8 to 13 range will be represented by the third through sixth restaurants in the list. The next 2 restaurants each have 14 to 19 employees. Therefore, numbers of employees in the 14 to 19 range will be represented by the seventh and eighth restaurants in the list. Since the next 7 restaurants each have 20 to 25 employees, numbers of employees in the 20 to 25 range will be represented by the ninth through fifteenth restaurants in the list. This means that the ninth restaurant in the list, which has the median number of employees for the restaurants in this town, has a number of employees in the 20 to 25 range. Of the given choices, the only number of employees in the 20 to 25 range is 21.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect. This is the position of the median in the list, not the value of the median. *Choice C* is incorrect and may result from conceptual or calculation errors.

QUESTION 20

The correct answer is $\frac{189}{5}$. A y-intercept of a graph in the xy-plane is a point where the graph intersects the y-axis, which is a point with an x-coordinate of 0. Substituting 0 for x in the given equation yields $\frac{3(0)}{7}=-\frac{5y}{9}+21$, or $0=-\frac{5y}{9}+21$. Subtracting 21 from both sides of this equation yields $-21=-\frac{5y}{9}$. Multiplying both sides of this equation by -9 yields $189=5y$. Dividing both sides of this equation by 5 yields $\frac{189}{5}=y$. Therefore, the y-coordinate of the y-intercept of the graph of the given equation in the xy-plane is $\frac{189}{5}$. Note that 189/5 and 37.8 are examples of ways to enter a correct answer.

QUESTION 21

The correct answer is -24. Since the graph passes through the point $(0, -6)$, it follows that when the value of x is 0, the value of y is -6. Substituting 0 for x and -6 for y in the given equation yields $-6=2(0)^2+b(0)+c$, or $-6=c$. Therefore, the value of c is -6. Substituting -6 for c in the given equation yields $y=2x^2+bx-6$. Since the graph passes through the point $(-1, -8)$, it follows that when the value of x is -1, the value of y is -8. Substituting -1 for x and -8 for y in the equation $y=2x^2+bx-6$ yields $-8=2(-1)^2+b(-1)-6$, or $-8=2-b-6$, which is equivalent to $-8=-4-b$. Adding 4 to each side of this equation yields $-4=-b$. Dividing each side of this equation by -1 yields $4=b$. Since the value of b is 4 and the value of c is -6, it follows that the value of bc is $(4)(-6)$, or -24.

Alternate approach: The given equation represents a parabola in the xy-plane with a vertex at $(-1, -8)$. Therefore, the given equation, $y=2x^2+bx+c$, which is written in standard form, can be written in vertex form, $y=a(x-h)^2+k$, where (h, k) is the vertex of the parabola and a is the value of the coefficient on the x^2 term when the equation is written in standard form. It follows that $a=2$. Substituting 2 for a, -1 for h, and -8 for k in this equation yields $y=2(x-(-1))^2+(-8)$, or $y=2(x+1)^2-8$. Squaring the binomial on the right-hand side of this equation yields $y=2(x^2+2x+1)-8$. Multiplying each term inside the parentheses on the right-hand side of this equation by 2 yields $y=2x^2+4x+2-8$, which is equivalent to $y=2x^2+4x-6$. From the given equation $y=2x^2+bx+c$, it follows that the value of b is 4 and the value of c is -6. Therefore, the value of bc is $(4)(-6)$, or -24.

QUESTION 22

Choice D is correct. It's given that in 2008 Zinah earned 14% more than in 2007. Let h represent the amount Zinah earned in 2007 and let j represent the amount that Zinah earned in 2008. This situation can be represented by the equation $j=\left(1+\frac{14}{100}\right)h$, or $j=1.14h$. It's also given that in 2009 Zinah earned 4% more than in 2008. Let k represent the amount Zinah earned in 2009. This situation can be represented by the equation $k=\left(1+\frac{4}{100}\right)j$, or $k=1.04j$. Substituting $1.14h$ for j in the equation $k=1.04j$ yields $k=(1.04)(1.14h)$, or $k=1.1856h$. If Zinah earned y times as much in 2009 as in 2007, then the value of y is 1.1856.

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 23

Choice A is correct. According to the graph, the center of circle A has coordinates $(-2, 0)$, and the radius of circle A is 3. It's given that circle B is the result of shifting circle A down 6 units and increasing the radius so that the radius of circle B is 2 times the radius of circle A. It follows that the center of circle B is 6 units below the center of circle A. The point that's 6 units below $(-2, 0)$ has the same x-coordinate as $(-2, 0)$ and has a y-coordinate that is 6 less than the y-coordinate of $(-2, 0)$. Therefore, the coordinates of the center of circle B are $(-2, 0-6)$, or $(-2, -6)$. Since the radius of circle B is 2 times the radius of circle A, the radius of circle B is $(2)(3)$. A circle in the xy-plane can be defined by an equation of the form $(x-h)^2+(y-k)^2=r^2$, where the coordinates of the center of the circle are (h, k) and the radius of the circle is r. Substituting -2 for h, -6 for k, and $(2)(3)$ for r in this equation yields $(x-(-2))^2+(y-(-6))^2=((2)(3))^2$, which is equivalent to $(x+2)^2+(y+6)^2=(2)^2(3)^2$, or $(x+2)^2+(y+6)^2=(4)(9)$. Therefore, the equation $(x+2)^2+(y+6)^2=(4)(9)$ defines circle B.

Choice B is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This equation defines a circle that's the result of shifting circle A up, not down, by 6 units and increasing the radius. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 24

Choice C is correct. In the triangle shown, the measure of angle B is 30° and angle C is a right angle, which means that it has a measure of 90°. Since the sum of the angles in a triangle is equal to 180°, the measure of angle A is equal to $180° - (30+90)°$, or 60°. In a right triangle whose acute angles have measures 30° and 60°, the lengths of the legs can be represented by the expressions x, $x\sqrt{3}$, and $2x$, where x is the length of the leg opposite the angle with measure 30°, $x\sqrt{3}$ is the length of the leg opposite the angle with measure 60°, and $2x$ is the length of the hypotenuse. In the triangle shown, the hypotenuse has a length of 54. It follows that $2x=54$, or $x=27$. Therefore, the length of the leg opposite angle B is 27 and the length of the leg opposite angle A is $27\sqrt{3}$. The tangent of an acute angle in a right triangle is defined as the ratio of the length of the leg opposite the angle to the length of the leg adjacent to the angle. The length of the leg opposite angle A is $27\sqrt{3}$ and the length of the leg adjacent to angle A is 27. Therefore, the value of $\tan A$ is $\frac{27\sqrt{3}}{27}$, or $\sqrt{3}$.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect. This is the value of $\frac{1}{\tan A}$, not the value of $\tan A$. *Choice D* is incorrect. This is the length of the leg opposite angle A, not the value of $\tan A$.

QUESTION 25

Choice D is correct. It's given that an exponential model estimates that the number of comments on an article increased by a fixed percentage at the end of each hour. Therefore, the model can be represented by an exponential equation of the form $C=Ka^t$, where C is the estimated number of comments on the article t hours after the article was first featured on the home page and K and a are constants. It's also given that when the article was first featured on the home page of the news website, there were 40 comments on the article. This means that when $t=0$, $C=40$. Substituting 0 for t and 40 for C in the equation $C=Ka^t$ yields $40=Ka^0$, or $40=K$. It's also given that the number of comments on the article at the end of an hour had increased by 190% of the number of comments on the article at the end of the previous hour. Multiplying the percent increase by the number of comments on the article at the end of the previous hour yields the number of estimated additional comments the article has on its home page: $(40)\left(\frac{190}{100}\right)$, or 76 comments. Thus, the estimated number of comments for the following hour is the sum of the comments from the end of the previous hour and the number of additional comments, which is $40+76$, or 116. This means that when $t=1$, $C=116$. Substituting 1 for t, 116 for C, and 40 for K in the equation $C=Ka^t$ yields $116=40a^1$, or $116=40a$. Dividing both sides of this equation by 40 yields $2.9=a$. Substituting 40 for K and 2.9 for a in the equation $C=Ka^t$ yields $C=40(2.9)^t$. Thus, the equation that best represents this model is $C=40(2.9)^t$.

Choice A is incorrect. This model represents a situation where the number of comments at the end of each hour increased by 19% of the number of comments at the end of the previous hour, rather than 190%. *Choice B* is incorrect. This model represents a situation where the number of comments at the end of each hour increased by 90% of the number of comments at the end of the previous hour, rather than 190%. *Choice C* is incorrect. This model represents a situation where the number of comments at the end of each hour was 19 times the number of comments at the end of the previous hour, rather than increasing by 190% of the number of comments at the end of the previous hour.

QUESTION 26

Choice A is correct. It's given that the table shows values of x and their corresponding values of $g(x)$, where $g(x)=\frac{f(x)}{x+3}$. It's also given that f is a linear function. It follows that an equation that defines f can be written in the form $f(x)=mx+b$, where m represents the slope and b represents the y-coordinate of the y-intercept $(0, b)$ of the graph of $y=f(x)$ in the xy-plane. The slope of the graph of $y=f(x)$ can be found using two points, (x_1, y_1) and (x_2, y_2), that are on the graph of $y=f(x)$, and the formula $m=\frac{y_2-y_1}{x_2-x_1}$. Since the table shows values of x and their corresponding values of $g(x)$, substituting values of x and $g(x)$ in the equation $g(x)=\frac{f(x)}{x+3}$ can be used to define function f. Using the first pair of values from the table, $x=-27$ and $g(x)=3$, yields $3=\frac{f(-27)}{-27+3}$, or $3=\frac{f(-27)}{-24}$. Multiplying each side of this equation by -24 yields $-72=f(-27)$, so the point $(-27, -72)$

is on the graph of $y=f(x)$. Using the second pair of values from the table, $x=-9$ and $g(x)=0$, yields $0=\frac{f(-9)}{-9+3}$, or $0=\frac{f(-9)}{-6}$. Multiplying each side of this equation by -6 yields $0=f(-9)$, so the point $(-9, 0)$ is on the graph of $y=f(x)$. Substituting $(-27, -72)$ and $(-9, 0)$ 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 $m=\frac{0-(-72)}{-9-(-27)}$, or $m=4$. Substituting 4 for m in the equation $f(x)=mx+b$ yields $f(x)=4x+b$. Since $0=f(-9)$, substituting -9 for x and 0 for $f(x)$ in the equation $f(x)=4x+b$ yields $0=4(-9)+b$, or $0=-36+b$. Adding 36 to both sides of this equation yields $36=b$. It follows that 36 is the y-coordinate of the y-intercept $(0, b)$ of the graph of $y=f(x)$. Therefore, the y-intercept of the graph of $y=f(x)$ is $(0, 36)$.

Choice B is incorrect. 12 is the y-coordinate of the y-intercept of the graph of $y=g(x)$. *Choice C* is incorrect. 4 is the slope of the graph of $y=f(x)$. *Choice D* is incorrect. -9 is the x-coordinate of the x-intercept of the graph of $y=f(x)$.

QUESTION 27

The correct answer is 54. It's given that in triangle ABC, point D on side AB is connected by a line segment with point E on side AC such that line segment DE is parallel to side BC. It follows that parallel segments DE and BC are intersected by sides AB and AC. If two parallel segments are intersected by a third segment, corresponding angles are congruent. Thus, corresponding angles C and AED are congruent and corresponding angles B and ADE are congruent. Since triangle ADE has two angles that are each congruent to an angle in triangle ABC, triangle ADE is similar to triangle ABC by the angle-angle similarity postulate, where side DE corresponds to side BC, and side AE corresponds to side AC. Since the lengths of corresponding sides in similar triangles are proportional, it follows that $\frac{DE}{BC}=\frac{AE}{AC}$. Since point E lies on side AC, $AE+CE=AC$. It's given that $CE=2AE$. Substituting $2AE$ for CE in the equation $AE+CE=AC$ yields $AE+2AE=AC$, or $3AE=AC$. It's given that $BC=162$. Substituting 162 for BC and $3AE$ for AC in the equation $\frac{DE}{BC}=\frac{AE}{AC}$ yields $\frac{DE}{162}=\frac{AE}{3AE}$, or $\frac{DE}{162}=\frac{1}{3}$. Multiplying both sides of this equation by 162 yields $DE=54$. Thus, the length of line segment DE is 54.

Math

Module 2

(27 questions)

QUESTION 1

Choice B is correct. Substituting 72 for $f(x)$ in the given function yields $72 = 8x$. Dividing each side of this equation by 8 yields $9 = x$. Therefore, $f(x) = 72$ when the value of x is 9.

Choice A is incorrect. This is the value of x for which $f(x) = 64$, not $f(x) = 72$. *Choice C* is incorrect. This is the value of x for which $f(x) = 512$, not $f(x) = 72$. *Choice D* is incorrect. This is the value of x for which $f(x) = 640$, not $f(x) = 72$.

QUESTION 2

Choice A is correct. It's given that angle 1 and angle 2 are vertical angles, and the measure of angle 1 is 72°. Vertical angles have equal measures. Therefore, the measure of angle 2 is 72°.

Choice B is incorrect. This is the measure of an angle that is supplementary, not congruent, to angle 1. *Choice C* is incorrect. This is the sum of the measures of angle 1 and angle 2. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 3

Choice B is correct. If a house from the street is selected at random, the probability of selecting a house that is blue is equal to the number of houses on the street that are blue divided by the total number of houses on the street. Since there are 2 blue houses on a street with 7 total houses, the probability of selecting a house that is blue from this street is $\frac{2}{7}$.

Choice A is incorrect. This is the probability of selecting a house that is blue from a street on which 1 of the 7 houses is blue. *Choice C* is incorrect. This is the probability of selecting a house that is not blue from this street. *Choice D* is incorrect. This is the probability of selecting a house that is blue from a street on which all the houses are blue.

QUESTION 4

Choice A is correct. The graph of function f shows that as x increases, $f(x)$ also increases, which means $f(x)$ is an increasing function. The graph of f is a line, which indicates a constant rate of change. A function that has a constant rate of change is a linear function. Therefore, function f can be described as increasing linear.

Choice B is incorrect. For a decreasing function, as x increases, $f(x)$ decreases, rather than increases. *Choice C* is incorrect. The graph of an exponential function isn't a line. *Choice D* is incorrect. For a decreasing function, as x increases, $f(x)$ decreases, rather than increases, and the graph of an exponential function isn't a line.

QUESTION 5

Choice B is correct. The y-intercept of a graph is the point where the graph intersects the y-axis. The graph of function f shown intersects the y-axis at the point $(0, -4)$. Therefore, the y-intercept of the graph is $(0, -4)$.

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

QUESTION 6

The correct answer is 6. The first equation in the given system is $x=8$. Substituting 8 for x in the second equation in the given system yields $8+3y=26$. Subtracting 8 from both sides of this equation yields $3y=18$. Dividing both sides of this equation by 3 yields $y=6$. Therefore, the value of y is 6.

QUESTION 7

The correct answer is 10. It's given that the amount of Hanna's food order was \$50 and that Hanna gave a tip of 20% of the amount of the bill. 20% of 50 can be calculated as $\left(\frac{20}{100}\right)(50)$, which yields $\frac{1000}{100}$, or 10. Therefore, the amount, in dollars, of the tip Hanna gave is 10.

QUESTION 8

Choice B is correct. Since x^3 is a common factor of each term in the given expression, the expression can be rewritten as $x^3(5x^2-6x+8)$.

Choice A is incorrect. This expression is equivalent to $5x^5-6x^4$. *Choice C* is incorrect. This expression is equivalent to $40x^5-48x^4+8x^3$. *Choice D* is incorrect. This expression is equivalent to $-36x^9+48x^8+6x^5$.

QUESTION 9

Choice A is correct. It's given that the ratio of the length of line segment XY to the length of line segment ZV is 6 to 1, which means $\frac{XY}{ZV}=\frac{6}{1}$. It's given that the length of line segment XY is 102 inches. If the length, in inches, of line segment ZV is represented by ℓ, the value of ℓ can be calculated by solving the equation $\frac{102}{\ell}=\frac{6}{1}$, or $\frac{102}{\ell}=6$. Multiplying each side of this equation by ℓ yields $102=6\ell$. Dividing each side of this equation by 6 yields $17=\ell$. Therefore, the length of line segment ZV is 17 inches.

Choice B is incorrect. This is the length, in inches, of line segment ZV if the length of line segment XY is 576, not 102, inches. *Choice C* is incorrect. This is the length, in inches, of line segment XY, not line segment ZV. *Choice D* is incorrect. This is the length, in inches, of line segment ZV if the ratio of the length of line segment XY to the length of line segment ZV is 1 to 6, not 6 to 1.

QUESTION 10

Choice A is correct. Dividing each side of the given equation by 7 yields $\frac{7(2x-3)}{7}=\frac{63}{7}$, or $2x-3=9$. Therefore, the equation $2x-3=9$ is equivalent to the given equation and has the same solution.

Choice B is incorrect. This equation is equivalent to $7(2x-3)=392$, not $7(2x-3)=63$. *Choice C* is incorrect. Distributing 7 on the left-hand side of the given equation yields $14x-21=63$, not $2x-21=63$. *Choice D* is incorrect. Distributing 7 on the left-hand side of the given equation yields $14x-21=63$, not $2x-21=70$.

QUESTION 11

Choice D is correct. It's given that the function f defined by $f(t)=14t+9$ gives the estimated length, in inches, of a vine plant t months after Tavon purchased it. For a function defined by an equation of the form $f(t)=mt+b$, where m and b are constants, b represents the value of $f(0)$, or the value of $f(t)$ when the value of t is 0. Therefore, for the function defined by $f(t)=14t+9$, 9 represents the value of $f(t)$ when the value of t is 0. This means that 0 months after the vine plant was purchased, the estimated length of the vine plant was 9 inches. Therefore, the best interpretation of 9 in this context is the estimated length of the vine plant was 9 inches when Tavon purchased it.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect. The vine plant is expected to grow 14 inches, not 9 inches, each month. *Choice C* is incorrect and may result from conceptual or calculation errors.

QUESTION 12

Choice C is correct. Applying the zero product property to the given equation yields three equations: $x+2=0$, $x-5=0$, and $x+9=0$. Subtracting 2 from both sides of the equation $x+2=0$ yields $x=-2$. Adding 5 to both sides of the equation $x-5=0$ yields $x=5$. Subtracting 9 from both sides of the equation $x+9=0$ yields $x=-9$. Therefore, the solutions to the given equation are -2, 5, and -9. It follows that a positive solution to the given equation is 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 D is incorrect and may result from conceptual or calculation errors.

QUESTION 13

The correct answer is 774. It's given that Brian saves $\frac{2}{5}$ of the \$215 he earns each week from his job. Therefore, Brian saves $\left(\frac{2}{5}\right)(\$215)$, or \$86, per week. If Brian continues to save at this rate of \$86 per week for 9 weeks, then he will save a total of $(9)(86)$, or 774, dollars.

QUESTION 14

The correct answer is 5. Let x represent the width, in inches, of the rectangle. It's given that the length of the rectangle is 4 inches less than 7 times its width, or $7x-4$ inches. The area of a rectangle is equal to its width multiplied by its length. Multiplying the width, x inches, by the length, $7x-4$ inches, yields $x(7x-4)$ square inches. It's given that the rectangle has an area of 155 square inches, so it follows that $x(7x-4)=155$, or $7x^2-4x=155$. Subtracting 155 from both sides of this equation yields $7x^2-4x-155=0$. Factoring the left-hand side of this equation yields $(7x+31)(x-5)=0$. Applying the zero product property to this equation yields two solutions: $x=-\frac{31}{7}$ and $x=5$. Since x is the rectangle's width, in inches, which must be positive, the value of x is 5. Therefore, the width of the rectangle, in inches, is 5.

QUESTION 15

Choice B is correct. If a data set contains an even number of data values, when the data values are listed in ascending or descending order, the median is between the two middle values. The given data set contains 8 values. When listed in ascending order, the data set is 4, 4, 4, 5, 5, 6, 10, 18 and the two middle values are 5 and 5. Since the two middle values are the same, the median must be 5.

Choice A is incorrect. This value is between the two middle values in the list shown, not the two middle values when the data values are listed in ascending or descending order. *Choice C* is incorrect. This is the mean, not the median, of the data set. *Choice D* is incorrect. This is the range, not the median, of the data set.

QUESTION 16

Choice A is correct. The volume, V, of a right circular cylinder is given by the formula $V=\pi r^2 h$, where πr^2 is the area of the base of the cylinder and h is the height. It's given that a right circular cylinder has a volume of 432 cubic centimeters and the area of the base is 24 square centimeters. Substituting 432 for V and 24 for πr^2 in the formula $V=\pi r^2 h$ yields $432=24h$. Dividing both sides of this equation by 24 yields $18=h$. Therefore, the height of the cylinder, in centimeters, is 18.

Choice B is incorrect. This is the area of the base, in square centimeters, not the height, in centimeters, of the cylinder. *Choice C* is incorrect. This is the height, in centimeters, of a cylinder if its volume is 432 cubic centimeters and the area of its base is 2, not 24, cubic centimeters. *Choice D* is incorrect. This is the height, in centimeters, of a cylinder if its volume is 432 cubic centimeters and the area of its base is $\frac{1}{24}$, not 24, cubic centimeters.

QUESTION 17

Choice D is correct. Since the square of a real number is never negative, the given equation isn't true for any real value of x. Therefore, the given equation has zero distinct real 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 C is incorrect and may result from conceptual or calculation errors.

QUESTION 18

Choice B is correct. It's given that line k is defined by $y=7x+\frac{1}{8}$. For an equation in slope-intercept form $y=mx+b$, m represents the slope of the line defined by this equation in the xy-plane and b represents the y-coordinate of the y-intercept of this line. Therefore, the slope of line k is 7. It's also given that line j is perpendicular to line k in the xy-plane. Therefore, the slope of line j is the opposite reciprocal of the slope of line k. The opposite reciprocal of 7 is $-\frac{1}{7}$. Therefore, the slope of line j is $-\frac{1}{7}$.

Choice A is incorrect. This is the opposite reciprocal of the y-coordinate of the y-intercept, not the slope, of line k. *Choice C* is incorrect. This is the y-coordinate of the y-intercept of line k, not the slope of line j. *Choice D* is incorrect. This is the slope of a line that is parallel, not perpendicular, to line k.

QUESTION 19

Choice A is correct. It's given that there is a linear relationship between the number of cars, c, on a commuter train and the maximum number of passengers and crew, p, that the train can carry. It follows that this relationship can be represented by an equation of the form $p=mc+b$, where m is the rate of change of p in this relationship and b is a constant. The rate of change of p in this relationship can be calculated by dividing the difference in any two values of p by the difference in the corresponding values of c. Using two pairs of values given in the table, the rate of change of p in this relationship is $\frac{284-174}{5-3}$, or 55. Substituting 55 for m in the equation $p=mc+b$ yields $p=55c+b$. The value of b can be found by substituting any value of c and its corresponding value of p for c and p, respectively, in this equation. Substituting 10 for c and 559 for p yields $559=55(10)+b$, or $559=550+b$. Subtracting 550 from both sides of this equation yields $9=b$. Substituting 9 for b in the equation $p=55c+b$ yields $p=55c+9$. Subtracting 9 from both sides of this equation yields $p-9=55c$. Subtracting p from both sides of this equation yields $-9=55c-p$, or $55c-p=-9$.

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 $\frac{7}{24}$. An expression of the form $\sqrt[n]{a^m}$, where m and n are integers greater than 1 and $a\geq0$, is equivalent to $a^{\frac{m}{n}}$. Therefore, the expression on the right-hand side of the given equation, $\sqrt[3]{4^7}$, is equivalent to $4^{\frac{7}{3}}$. Thus, $4^{8c}=4^{\frac{7}{3}}$. It follows that $8c=\frac{7}{3}$. Dividing both sides of this equation by 8 yields $c=\frac{7}{24}$. Note that 7/24, .2916, .2917, 0.219, and 0.292 are examples of ways to enter a correct answer.

QUESTION 21

The correct answer is 1,677. Adding the first equation to the second equation in the given system yields $(x-2)+(x-2)+(-4)(y+7)+4(y+7)=117+442$, or $2(x-2)=559$. Multiplying both sides of this equation by 3 yields $6(x-2)=1{,}677$. Therefore, the value of $6(x-2)$ is 1,677.

QUESTION 22

Choice B is correct. The Pythagorean theorem states that for a right triangle, $c^2=a^2+b^2$, where c represents the length of the hypotenuse and a and b represent the lengths of the legs. It's given that in triangle ABC, angle B is a right angle. Therefore, triangle ABC is a right triangle, where the hypotenuse is side AC and the legs are sides AB and BC. It's given that the lengths of sides AB and BC are $10\sqrt{37}$ and $24\sqrt{37}$, respectively. Substituting these values for a and b in the formula $c^2=a^2+b^2$ yields $c^2=(10\sqrt{37})^2+(24\sqrt{37})^2$, which is equivalent to $c^2 = 100(37) + 576(37)$, or $c^2 = 676(37)$. Taking the square root of both sides of this equation yields $c = \pm 26\sqrt{37}$. Since c represents the length of the hypotenuse, side AC, c must be positive. Therefore, the length of side AC is $26\sqrt{37}$.

Choice A is incorrect. This is the result of solving the equation $c = 24\sqrt{37} - 10\sqrt{37}$, not $c^2 = (10\sqrt{37})^2 + (24\sqrt{37})^2$. *Choice C* is incorrect. This is the result of solving the equation $c = 10\sqrt{37} + 24\sqrt{37}$, not $c^2 = (10\sqrt{37})^2 + (24\sqrt{37})^2$. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 23

Choice A is correct. The equation $f(x) = (1.84)^{\frac{x}{4}}$ can be rewritten as $f(x) = (1.84)^{\left(\frac{1}{4}\right)(x)}$, which is equivalent to $f(x) = \left(1.84^{\frac{1}{4}}\right)^x$, or approximately $f(x) = (1.16467)^x$. Since it's given that $f(x) = (1.84)^{\frac{x}{4}}$ can be rewritten as $f(x) = \left(1 + \frac{p}{100}\right)^x$, where p is a constant, it follows that $1 + \frac{p}{100}$ is approximately equal to 1.16467. Therefore, $\frac{p}{100}$ is approximately equal to 0.16467. It follows that the value of p is approximately equal to 16.467. Of the given choices, 16 is closest to the value of p.

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

QUESTION 24

Choice D is correct. It's given that $f(24) < 0$. Substituting 24 for $f(x)$ in the equation $f(x) = a\sqrt{x + b}$ yields $f(24) = a\sqrt{24 + b}$. Therefore, $a\sqrt{24 + b} < 0$. Since $\sqrt{24 + b}$ can't be negative, it follows that $a < 0$. It's also given that the graph of $y = f(x)$ passes through the point $(-24, 0)$. It follows that when $x = -24$, $f(x) = 0$. Substituting -24 for x and 0 for $f(x)$ in the equation $f(x) = a\sqrt{x + b}$ yields $0 = a\sqrt{-24 + b}$. By the zero product property, either $a = 0$ or $\sqrt{-24 + b} = 0$. Since $a < 0$, it follows that $\sqrt{24 + b} = 0$. Squaring both sides of this equation yields $-24 + b = 0$. Adding 24 to both sides of this equation yields $b = 24$. Since $a < 0$ and b is 24, it follows that $a < b$ must be true.

Choice A is incorrect. The value of $f(0)$ is $a\sqrt{b}$, which must be negative. *Choice B* is incorrect. The value of $f(0)$ is $a\sqrt{b}$, which could be -24, but doesn't have to be. *Choice C* is incorrect and may result from conceptual or calculation errors.

QUESTION 25

Choice A is correct. It's given that points A and B lie on the circle with center C. Therefore, $\overline{AC}$ and $\overline{BC}$ are both radii of the circle. Since all radii of a circle are congruent, $\overline{AC}$ is congruent to $\overline{BC}$. The length of $\overline{AC}$, or the distance from point A to point C, can be found using the distance formula, which gives the distance between two points, (x_1, y_1) and (x_2, y_2), as $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$. Substituting the given coordinates of point A, $(h + 1, k + \sqrt{102})$, for (x_1, y_1) and the given coordinates of point C, (h, k), for (x_2, y_2) in the distance formula yields $\sqrt{(h + 1 - h)^2 + (k + \sqrt{102} - k)^2}$, or $\sqrt{1^2 + (\sqrt{102})^2}$, which is equivalent to $\sqrt{1 + 102}$, or $\sqrt{103}$. Therefore, the length of $\overline{AC}$ is $\sqrt{103}$ and the length of $\overline{BC}$ is $\sqrt{103}$. It's given that angle ACB is a right angle. Therefore, triangle ACB is a right triangle with legs $\overline{AC}$ and $\overline{BC}$ and hypotenuse $\overline{AB}$. By the Pythagorean theorem, if a right triangle has a hypotenuse with length c and legs with lengths a and b, then $a^2 + b^2 = c^2$. Substituting $\sqrt{103}$ for a and b in this equation yields $(\sqrt{103})^2 + (\sqrt{103})^2 = c^2$, or $103 + 103 = c^2$, which is equivalent to $206 = c^2$. Taking the positive square root of both sides of this equation yields $\sqrt{206} = c$. Therefore, the length of $\overline{AB}$ is $\sqrt{206}$.

Choice B is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This would be the length of $\overline{AB}$ if the length of $\overline{AC}$ were 103, not $\sqrt{103}$. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 26

Choice A is correct. An equation of a line of best fit for data set F can be written in the form $y = a + bx$, where a is the y-coordinate of the y-intercept of the line of best fit and b is the slope. The line of best fit shown for data set E has a y-intercept at approximately $(0, 12)$. It's given that data set F is created by multiplying the y-coordinate of each data point from data set E by 3.9. It follows that a line of best fit for data set F has a y-intercept at approximately $(0, 12(3.9))$, or $(0, 46.8)$. Therefore, the value of a is approximately 46.8. The slope of a line that passes through points (x_1, y_1) and (x_2, y_2) can be calculated as $\frac{y_2 - y_1}{x_2 - x_1}$. Since the line of best fit shown for data set E passes approximately through the point $(12, 30)$, it follows that a line of best fit for data set F passes approximately through the point $(12, 30(3.9))$, or $(12, 117)$. Substituting $(0, 46.8)$ and $(12, 117)$ for (x_1, y_1) and (x_2, y_2), respectively, in $\frac{y_2 - y_1}{x_2 - x_1}$ yields $\frac{117 - 46.8}{12 - 0}$, which is equivalent to $\frac{70.2}{12}$, or 5.85. Therefore, the value of b is approximately 5.85, or approximately 5.9. Thus, $y = 46.8 + 5.9x$ could be an equation of a line of best fit for data set F.

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 an equation of a line of best fit for data set E, not data set F.

QUESTION 27

The correct answer is -28. 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 for x and y in the other equation. The first equation in the given system, $48x-64y=48y+24$, can be written in the form $Ax+By=C$ by subtracting $48y$ from both sides of the equation to yield $48x-112y=24$. The second equation in the given system, $ry=\frac{1}{8}-12x$, can be written in the form $Ax+By=C$ by adding $12x$ to both sides of the equation to yield $12x+ry=\frac{1}{8}$. The coefficient of x in the second equation is $\frac{1}{4}$ times the coefficient of x in the first equation. That is, $48\left(\frac{1}{4}\right)=12$. For the lines to be parallel, the coefficient of y in the second equation must also be $\frac{1}{4}$ times the coefficient of y in the first equation. Therefore, $-112\left(\frac{1}{4}\right)=r$, or $-28=r$. Thus, if the given system has no solution, the value of r is -28.