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CollegeBoard SAT®

6TSL02

1

What is 10% of 470?

A) 37

B) 47

C) 423

D) 460

2

$$4x + 6 = 18$$

Which equation has the same solution as the given equation?

A) $4x = 108$

B) $4x = 24$

C) $4x = 12$

D) $4x = 3$

3

The total cost, in dollars, to rent a surfboard consists of a \$25 service fee and a \$10 per hour rental fee. A person rents a surfboard for t hours and intends to spend a maximum of \$75 to rent the surfboard. Which inequality represents this situation?

A) $10t \leq 75$

B) $10 + 25t \leq 75$

C) $25t \leq 75$

D) $25 + 10t \leq 75$

4

The function g is defined by $g(x) = x^2 + 9$. For which value of x is $g(x) = 25$?

A) 4

B) 5

C) 9

D) 13

5

Each face of a fair 14-sided die is labeled with a number from 1 through 14, with a different number appearing on each face. If the die is rolled one time, what is the probability of rolling a 2?

A) $\frac{1}{14}$

B) $\frac{2}{14}$

C) $\frac{12}{14}$

D) $\frac{13}{14}$

6

A printer produces posters at a constant rate of 42 posters per minute. At what rate, in posters per hour, does the printer produce the posters?

CONTINUE

7

The function f is defined by the equation $f(x) = 7x + 2$. What is the value of $f(x)$ when $x = 4$?

8

A teacher is creating an assignment worth 70 points. The assignment will consist of questions worth 1 point and questions worth 3 points. Which equation represents this situation, where x represents the number of 1-point questions and y represents the number of 3-point questions?

A) $4xy = 70$

B) $4(x + y) = 70$

C) $3x + y = 70$

D) $x + 3y = 70$

9

Right triangles LMN and PQR are similar, where L and M correspond to P and Q, respectively. Angle M has a measure of 53°. What is the measure of angle Q ?

A) 37°

B) 53°

C) 127°

D) 143°

10

$$y = -3x$$
$$4x + y = 15$$

The solution to the given system of equations is (x, y). What is the value of x ?

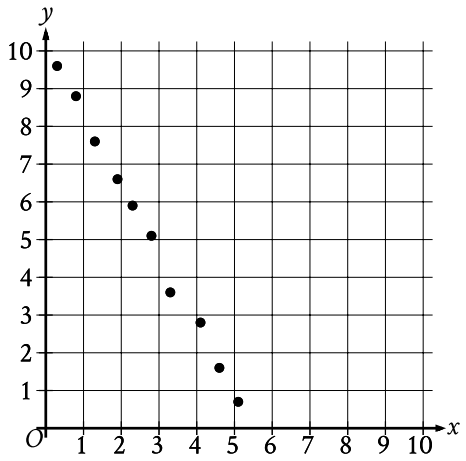
A) 1

B) 5

C) 15

D) 45

11



Which of the following equations is the most appropriate linear model for the data shown in the scatterplot?

A) $y = -1.9x - 10.1$

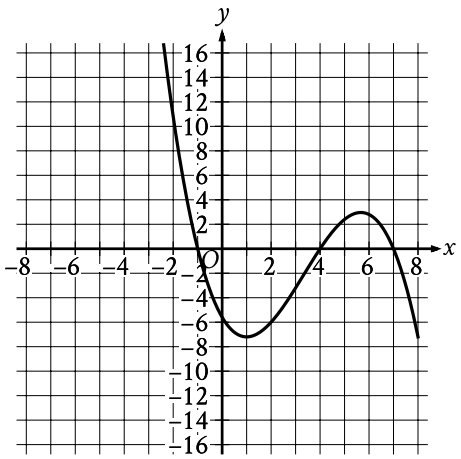
B) $y = -1.9x + 10.1$

C) $y = 1.9x - 10.1$

D) $y = 1.9x + 10.1$

CONTINUE

12



The graph of $y = f(x)$ is shown, where the function f is defined by $f(x) = ax^3 + bx^2 + cx + d$ and a, b, c, and d are constants. For how many values of x does $f(x) = 0$?

A) One

B) Two

C) Three

D) Four

13

Vivian bought party hats and cupcakes for $71. Each package of party hats cost $3, and each cupcake cost $1. If Vivian bought 10 packages of party hats, how many cupcakes did she buy?

14

$$z^2 + 10z - 24 = 0$$

What is one of the solutions to the given equation?

15

Bacteria are growing in a liquid growth medium. There were 300,000 cells per milliliter during an initial observation. The number of cells per milliliter doubles every 3 hours. How many cells per milliliter will there be 15 hours after the initial observation?

A) 1,500,000

B) 2,400,000

C) 4,500,000

D) 9,600,000

16

Which expression is equivalent to $6x^8y^2 + 12x^2y^2$?

A) $6x^2y^2(2x^6)$

B) $6x^2y^2(x^4)$

C) $6x^2y^2(x^6 + 2)$

D) $6x^2y^2(x^4 + 2)$

CONTINUE

17

A neighborhood consists of a 2-hectare park and a 35-hectare residential area. The total number of trees in the neighborhood is 3,934. The equation $2x + 35y = 3{,}934$ represents this situation. Which of the following is the best interpretation of x in this context?

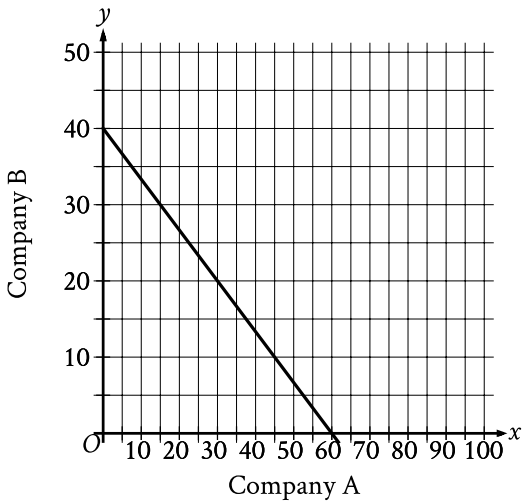
A) The average number of trees per hectare in the park

B) The average number of trees per hectare in the residential area

C) The total number of trees in the park

D) The total number of trees in the residential area

18



The graph shows the relationship between the number of shares of stock from Company A, x, and the number of shares of stock from Company B, y, that Simone can purchase. Which equation could represent this relationship?

A) $y = 8x + 12$

B) $8x + 12y = 480$

C) $y = 12x + 8$

D) $12x + 8y = 480$

19

Circle A has a radius of $3n$ and circle B has a radius of $129n$, where n is a positive constant. The area of circle B is how many times the area of circle A?

A) 43

B) 86

C) 129

D) 1,849

CONTINUE

20

Data value	Frequency
6	3
7	3
8	8
9	8
10	9
11	11
12	9
13	0
14	6

The frequency table summarizes the 57 data values in a data set. What is the maximum data value in the data set?

21

A circle in the xy-plane has a diameter with endpoints $(2, 4)$ and $(2, 14)$. An equation of this circle is $(x - 2)^2 + (y - 9)^2 = r^2$, where r is a positive constant. What is the value of r?

22

The measure of angle A is $\frac{2\pi}{3}$ radians. The measure of angle B is $\frac{5\pi}{12}$ radians greater than the measure of angle A. What is the measure of angle B, in degrees?

A) 75
B) 120
C) 195
D) 390

23

A certain town has an area of 4.36 square miles. What is the area, in square yards, of this town? (1 mile = 1,760 yards)

A) 404
B) 7,674
C) 710,459
D) 13,505,536

CONTINUE

24

x	y
18	130
23	160
26	178

For line h, the table shows three values of x and their corresponding values of y. Line k is the result of translating line h down 5 units in the xy-plane. What is the x-intercept of line k?

A) $\left(-\frac{26}{3}, 0\right)$

B) $\left(-\frac{9}{2}, 0\right)$

C) $\left(-\frac{11}{3}, 0\right)$

D) $\left(-\frac{17}{6}, 0\right)$

25

In the xy-plane, the graph of the equation $y = -x^2 + 9x - 100$ intersects the line $y = c$ at exactly one point. What is the value of c?

A) $-\frac{481}{4}$

B) -100

C) $-\frac{319}{4}$

D) $-\frac{9}{2}$

CONTINUE

26

$$2x + 3y = 7$$
$$10x + 15y = 35$$

For each real number r, which of the following points lies on the graph of each equation in the xy-plane for the given system?

A) $\left(\frac{r}{5} + 7, -\frac{r}{5} + 35\right)$

B) $\left(-\frac{3r}{2} + \frac{7}{2}, r\right)$

C) $\left(r, \frac{2r}{3} + \frac{7}{3}\right)$

D) $\left(r, -\frac{3r}{2} + \frac{7}{2}\right)$

27

The perimeter of an equilateral triangle is 624 centimeters. The height of this triangle is $k\sqrt{3}$ centimeters, where k is a constant. What is the value of k?

STOP

If you finish before time is called, you may check your work on this module only.
Do not turn to any other module in the test.

1

Tilly earns p dollars for every w hours of work. Which expression represents the amount of money, in dollars, Tilly earns for $39w$ hours of work?

A) $39p$

B) $\frac{p}{39}$

C) $p + 39$

D) $p - 39$

2

For a training program, Juan rides his bike at an average rate of 5.7 minutes per mile. Which function m models the number of minutes it will take Juan to ride x miles at this rate?

A) $m(x) = \frac{x}{5.7}$

B) $m(x) = x + 5.7$

C) $m(x) = x - 5.7$

D) $m(x) = 5.7x$

3

$$3x = 12$$
$$-3x + y = -6$$

The solution to the given system of equations is (x, y). What is the value of y ?

A) -3

B) 6

C) 18

D) 30

4

$$s = 40 + 3t$$

The equation gives the speed s, in miles per hour, of a certain car t seconds after it began to accelerate. What is the speed, in miles per hour, of the car 5 seconds after it began to accelerate?

A) 40

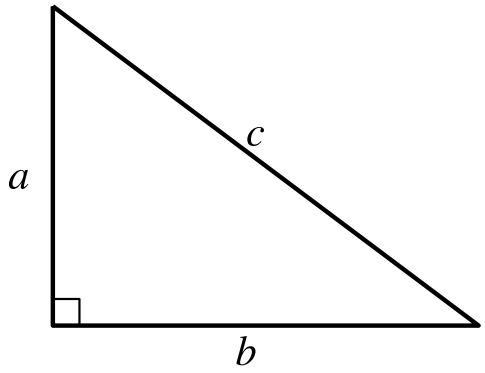
B) 43

C) 45

D) 55

CONTINUE

5



Note: Figure not drawn to scale.

For the right triangle shown, $a = 4$ and $b = 5$. Which expression represents the value of c ?

A) $4 + 5$

B) $\sqrt{(4)(5)}$

C) $\sqrt{4 + 5}$

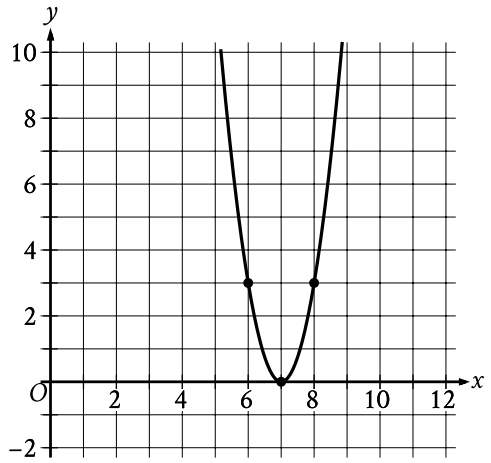
D) $\sqrt{4^2 + 5^2}$

6

$$4x + 5 = 165$$

What is the solution to the given equation?

7



The x-intercept of the graph shown is $(x, 0)$. What is the value of x ?

8

The function f is defined by $f(x) = \frac{1}{10}x - 2$. What is the y-intercept of the graph of $y = f(x)$ in the xy-plane?

A) $(-2, 0)$

B) $(0, -2)$

C) $\left(0, \frac{1}{10}\right)$

D) $\left(\frac{1}{10}, 0\right)$

CONTINUE

9

The function f is defined by $f(x) = 7x^3$. In the xy-plane, the graph of $y = g(x)$ is the result of shifting the graph of $y = f(x)$ down 2 units. Which equation defines function g ?

A) $g(x) = \frac{7}{2}x^3$

B) $g(x) = 7x^{\frac{3}{2}}$

C) $g(x) = 7x^3 + 2$

D) $g(x) = 7x^3 - 2$

10

$$x + 7 = 10$$
$$(x + 7)^2 = y$$

Which ordered pair (x, y) is a solution to the given system of equations?

A) $(3, 100)$

B) $(3, 3)$

C) $(3, 10)$

D) $(3, 70)$

11

Which expression is equivalent to $(7x^3 + 7x) - (6x^3 - 3x)$?

A) $x^3 + 10x$

B) $-13x^3 + 10x$

C) $-13x^3 + 4x$

D) $x^3 + 4x$

12

The function p is defined by $p(n) = 7n^3$. What is the value of n when $p(n)$ is equal to 56?

A) 2

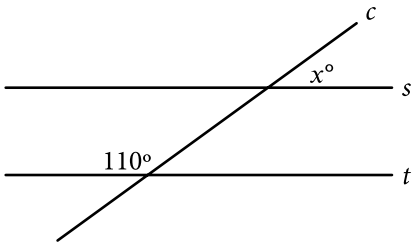
B) $\frac{8}{3}$

C) 7

D) 8

CONTINUE

13



Note: Figure not drawn to scale.

In the figure shown, line c intersects parallel lines s and t. What is the value of x ?

14

A list of 10 data values is shown.

6, 8, 16, 4, 17, 26, 8, 5, 5, 5

What is the mean of these data?

15

The equation $E(t) = 5(1.8)^t$ gives the estimated number of employees at a restaurant, where t is the number of years since the restaurant opened. Which of the following is the best interpretation of the number 5 in this context?

A) The estimated number of employees when the restaurant opened

B) The increase in the estimated number of employees each year

C) The number of years the restaurant has been open

D) The percent increase in the estimated number of employees each year

16

$$g(x) = x^2 + 55$$

What is the minimum value of the given function?

A) 0

B) 55

C) 110

D) 3,025

CONTINUE

17

Each year, the value of an investment increases by 0.49% of its value the previous year. Which of the following functions best models how the value of the investment changes over time?

A) Decreasing exponential

B) Decreasing linear

C) Increasing exponential

D) Increasing linear

18

The population of Greenville increased by 7% from 2015 to 2016. If the 2016 population is k times the 2015 population, what is the value of k ?

A) 0.07

B) 0.7

C) 1.07

D) 1.7

19

Which expression is equivalent to $a^{\frac{11}{12}}$,

where $a > 0$?

A) $\sqrt[12]{a^{132}}$

B) $\sqrt[144]{a^{132}}$

C) $\sqrt[121]{a^{132}}$

D) $\sqrt[11]{a^{132}}$

20

An event planner is planning a party. It costs the event planner a onetime fee of \$35 to rent the venue and \$10.25 per attendee. The event planner has a budget of \$200. What is the greatest number of attendees possible without exceeding the budget?

21

If $|4x - 4| = 112$, what is the positive value of $x - 1$?

22

A cube has an edge length of 68 inches. A solid sphere with a radius of 34 inches is inside the cube, such that the sphere touches the center of each face of the cube. To the nearest cubic inch, what is the volume of the space in the cube not taken up by the sphere?

A) 149,796

B) 164,500

C) 190,955

D) 310,800

CONTINUE

23

What is the diameter of the circle in the xy-plane with equation $(x - 5)^2 + (y - 3)^2 = 16$?

A) 4

B) 8

C) 16

D) 32

24

For the exponential function f, the value of $f(1)$ is k, where k is a constant. Which of the following equivalent forms of the function f shows the value of k as the coefficient or the base?

A) $f(x) = 50(1.6)^{x+1}$

B) $f(x) = 80(1.6)^{x}$

C) $f(x) = 128(1.6)^{x-1}$

D) $f(x) = 204.8(1.6)^{x-2}$

25

A model estimates that at the end of each year from 2015 to 2020, the number of squirrels in a population was 150% more than the number of squirrels in the population at the end of the previous year. The model estimates that at the end of 2016, there were 180 squirrels in the population. Which of the following equations represents this model, where n is the estimated number of squirrels in the population t years after the end of 2015 and $t \leq 5$?

A) $n = 72(1.5)^{t}$

B) $n = 72(2.5)^{t}$

C) $n = 180(1.5)^{t}$

D) $n = 180(2.5)^{t}$

CONTINUE

26

$$5x + 7y = 1$$

$$ax + by = 1$$

In the given pair of equations, a and b are constants. The graph of this pair of equations in the xy-plane is a pair of perpendicular lines. Which of the following pairs of equations also represents a pair of perpendicular lines?

A) $10x + 7y = 1$
$ax - 2by = 1$

B) $10x + 7y = 1$
$ax + 2by = 1$

C) $10x + 7y = 1$
$2ax + by = 1$

D) $5x - 7y = 1$
$ax + by = 1$

27

$$x^2 - 34x + c = 0$$

In the given equation, c is a constant. The equation has no real solutions if $c > n$. What is the least possible value of n?

STOP

If you finish before time is called, you may check your work on this module only.
Do not turn to any other module in the test.

Math

Module 1
(27 questions)

QUESTION 1

Choice B is correct. 10% of a quantity means $\frac{10}{100}$ times the quantity. Therefore, 10% of 470 can be represented as $\frac{10}{100}(470)$, which is equivalent to $0.10(470)$, or 47. Therefore, 10% of 470 is 47.

Choice A is incorrect. This is 10% of 370, not 10% of 470. *Choice C* is incorrect. This is 90% of 470, not 10% of 470. *Choice D* is incorrect. This is $470-10$, not 10% of 470.

QUESTION 2

Choice C is correct. Subtracting 6 from both sides of the given equation yields $4x=12$, which is the equation given in choice C. Since this equation is equivalent to the given equation, it has the same solution as the given equation.

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

QUESTION 3

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

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

QUESTION 5

Choice A is correct. The total number of possible outcomes for rolling a fair 14-sided die is 14. The number of possible outcomes for rolling a 2 is 1. The probability of rolling a 2 is the number of possible outcomes for rolling a 2 divided by the total number of possible outcomes, or $\frac{1}{14}$.

Choice B is incorrect. This is the probability of rolling a number no greater than 2. *Choice C* is incorrect. This is the probability of rolling a number greater than 2. *Choice D* is incorrect. This is the probability of rolling a number other than 2.

QUESTION 6

The correct answer is $2{,}520$. There are 60 minutes in one hour. At a rate of 42 posters per minute, the number of posters produced in one hour can be determined by $\left(\frac{42 \text{ posters}}{1 \text{ minute}}\right)\left(\frac{60 \text{ minutes}}{1 \text{ hour}}\right)$, which is $2{,}520$ posters per hour.

QUESTION 7

The correct answer is 30. The value of $f(x)$ when $x=4$ can be found by substituting 4 for x in the given equation $f(x)=7x+2$. This yields $f(4)=7(4)+2$, or $f(4)=30$. Therefore, when $x=4$, the value of $f(x)$ is 30.

QUESTION 8

Choice D is correct. Since x represents the number of 1-point questions and y represents the number of 3-point questions, the assignment is worth a total of $1 \cdot x+3 \cdot y$, or $x+3y$, points. Since the assignment is worth 70 points, the equation $x+3y=70$ represents this situation.

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 9

Choice B is correct. It's given that triangle LMN is similar to triangle PQR. Corresponding angles of similar triangles are congruent. Since angle M and angle Q correspond to each other, they must be congruent. Therefore, if the measure of angle M is 53°, then the measure of angle Q is also 53°.

Choice A is incorrect and may result from concluding that angle M and angle Q are complementary rather than congruent. *Choice C* is incorrect and may result from concluding that angle M and angle Q are supplementary rather than congruent. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 10

Choice C is correct. The given system of linear equations can be solved by the substitution method. Substituting $-3x$ for y from the first equation in the given system into the second equation yields $4x+\left(-3x\right)=15$, or $x=15$.

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. This is the absolute value of y, not the value of x.

QUESTION 11

Choice B is correct. The equation representing a linear model can be written in the form $y=a+bx$, or $y=bx+a$, where b is the slope of the graph of the model and $\left(0,a\right)$ is the y-intercept of the graph of the model. The scatterplot shows that as the x-values of the data points increase, the y-values of the data points decrease, which means the graph of an appropriate linear model has a negative slope. Therefore, $b<0$. The scatterplot also shows that the data points are close to the y-axis at a positive value of y. Therefore, the y-intercept of the graph of an appropriate linear model has a positive y-coordinate, which means $a>0$. Of the given choices, only choice B, $y=-1.9x+10.1$, has a negative value for b, the slope, and a positive value for a, the y-coordinate of the y-intercept.

Choice A is incorrect. The graph of this model has a y-intercept with a negative y-coordinate, not a positive y-coordinate. *Choice C* is incorrect. The graph of this model has a positive slope, not a negative slope, and a y-intercept with a negative y-coordinate, not a positive y-coordinate. *Choice D* is incorrect. The graph of this model has a positive slope, not a negative slope.

QUESTION 12

Choice C is correct. If a value of x satisfies $f\left(x\right)=0$, the graph of $y=f\left(x\right)$ will contain a point $\left(x,0\right)$ and thus touch the x-axis. Since there are 3 points at which this graph touches the x-axis, there are 3 values of x for which $f\left(x\right)=0$.

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

QUESTION 15

Choice D is correct. Let y represent the number of cells per milliliter x hours after the initial observation. Since the number of cells per milliliter doubles every 3 hours, the relationship between x and y can be represented by an exponential equation of the form $y=a(b)^{\frac{x}{k}}$, where a is the number of cells per milliliter during the initial observation and the number of cells per milliliter increases by a factor of b every k hours. It's given that there were 300,000 cells per milliliter during the initial observation. Therefore, $a=300{,}000$. It's also given that the number of cells per milliliter doubles, or increases by a factor of 2, every 3 hours. Therefore, $b=2$ and $k=3$. Substituting 300,000 for a, 2 for b, and 3 for k in the equation $y=a(b)^{\frac{x}{k}}$ yields $y=300{,}000(2)^{\frac{x}{3}}$. The number of cells per milliliter there will be 15 hours after the initial observation is the value of y in this equation when $x=15$. Substituting 15 for x in the equation $y=300{,}000(2)^{\frac{x}{3}}$ yields $y=300{,}000(2)^{\frac{15}{3}}$, or $y=300{,}000(2)^5$. This is equivalent to $y=300{,}000(32)$, or $y=9{,}600{,}000$. Therefore, 15 hours after the initial observation, there will be 9,600,000 cells per milliliter.

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 16

Choice C is correct. Since each term of the given expression has a common factor of $6x^2y^2$, it may be rewritten as $6x^2y^2\left(x^6\right)+6x^2y^2\left(2\right)$, or $6x^2y^2\left(x^6+2\right)$.

Choice A is incorrect. This expression is equivalent to $12x^8y^2$, not $6x^8y^2+12x^2y^2$. *Choice B* is incorrect. This expression is equivalent to $6x^6y^2$, not $6x^8y^2+12x^2y^2$. *Choice D* is incorrect. This expression is equivalent to $6x^6y^2+12x^2y^2$, not $6x^8y^2+12x^2y^2$.

QUESTION 17

Choice A is correct. It's given that a neighborhood consists of a 2-hectare park and a 35-hectare residential area and that the total number of trees in the neighborhood is 3,934. It's also given that the equation $2x+35y=3{,}934$ represents this situation. Since the total number of trees for a given area can be determined by taking the number of hectares times the average number of trees per hectare, this must mean that the terms $2x$ and $35y$ correspond to the number of trees in the park and in the residential area, respectively. Since $2x$ corresponds to the number of trees in the park, and 2 is the size of the park, in hectares, x must represent the average number of trees per hectare in the park.

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

QUESTION 18

Choice B is correct. The graph shown is a line passing through the points $\left(0,40\right)$ and $\left(60,0\right)$. 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 $8\left(0\right)+12\left(40\right)=480$, or $480=480$, which is true. Substituting 60 for x and 0 for y in the equation $8x+12y=480$ yields $8\left(60\right)+12\left(0\right)=480$, 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 $\left(0,40\right)$ is not on the graph of this equation, since $40=8\left(0\right)+12$, or $40=12$, is not true. *Choice C* is incorrect. The point $\left(0,40\right)$ is not on the graph of this equation, since $40=12\left(0\right)+8$, or $40=8$, is not true. *Choice D* is incorrect. The point $\left(0,40\right)$ is not on the graph of this equation, since $12\left(0\right)+8\left(40\right)=480$, or $320=480$, is not true.

QUESTION 19

Choice D is correct. The area of a circle can be found by using the formula $A=\pi r^2$, where A is the area and r is the radius of the circle. It's given that the radius of circle A is $3n$. Substituting this value for r into the formula $A=\pi r^2$ gives $A=\pi\left(3n\right)^2$, or $9\pi n^2$. It's also given that the radius of circle B is $129n$. Substituting this value for r into the formula $A=\pi r^2$ gives $A=\pi\left(129n\right)^2$, or

$16{,}641\pi n^2$. Dividing the area of circle *B* by the area of circle *A* gives $\frac{16{,}641\pi n^2}{9\pi n^2}$, which simplifies to $1{,}849$. Therefore, the area of circle *B* is $1{,}849$ times the area of circle *A*.

Choice A is incorrect. This is how many times greater the radius of circle *B* is than the radius of circle *A*. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is the coefficient on the term that describes the radius of circle *B*.

QUESTION 20

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

QUESTION 21

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 22

Choice C is correct. It's given that the measure of angle R is $\frac{2\pi}{3}$ radians, and the measure of angle T is $\frac{5\pi}{12}$ radians greater than the measure of angle R. Therefore, the measure of angle T is equal to $\frac{2\pi}{3}+\frac{5\pi}{12}$ radians. Multiplying $\frac{2\pi}{3}$ by $\frac{4}{4}$ to get a common denominator with $\frac{5\pi}{12}$ yields $\frac{8\pi}{12}$. Therefore, $\frac{2\pi}{3}+\frac{5\pi}{12}$ is equivalent to $\frac{8\pi}{12}+\frac{5\pi}{12}$, or $\frac{13\pi}{12}$. Therefore, the measure of angle T is $\frac{13\pi}{12}$ radians. The measure of angle T, in degrees, can be found by multiplying its measure, in

radians, by $\frac{180}{\pi}$. This yields $\frac{13\pi}{12}\times\frac{180}{\pi}$, which is equivalent to 195 degrees. Therefore, the measure of angle T is 195 degrees.

Choice A is incorrect. This is the number of degrees that the measure of angle T is greater than the measure of angle R. *Choice B* is incorrect. This is the measure of angle R, in degrees. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 23

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

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

QUESTION 24

Choice D is correct. The equation of line h can be written in slope-intercept form $y=mx+b$, where m is the slope of the line and $(0,b)$ is the y-intercept of the line. It's given that line h contains the points $(18,130)$, $(23,160)$, and $(26,178)$. Therefore, its slope m can be found as $\frac{160-130}{23-18}$, or 6. Substituting 6 for m in the equation $y=mx+b$ yields $y=6x+b$. Substituting 130 for y and 18 for x in this equation yields $130=6(18)+b$, or $130=108+b$. Subtracting 108 from both sides of this equation yields $22=b$. Substituting 22 for b in $y=6x+b$ yields $y=6x+22$. Since line k is the result of translating line h down 5 units, an equation of line k is $y=6x+22-5$, or $y=6x+17$. Substituting 0 for y in this equation yields $0=6x+17$. Solving this equation for x yields $x=-\frac{17}{6}$. Therefore, the x-intercept of line k is $\left(-\frac{17}{6},0\right)$.

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 25

Choice C is correct. In the xy-plane, the graph of the line $y=c$ is a horizontal line that crosses the y-axis at $y=c$ and the graph of the quadratic equation $y=-x^2+9x-100$ is a parabola. A parabola can intersect a horizontal line at exactly one point only at its vertex. Therefore, the value of c should be equal to the y-coordinate of the vertex of the graph of the given equation. For a quadratic equation in vertex form, $y=a(x-h)^2+k$, the vertex of its graph in the xy-plane is (h,k). The given quadratic equation, $y=-x^2+9x-100$, can be rewritten as

$y=-\left(x^2-2\left(\frac{9}{2}\right)x+\left(\frac{9}{2}\right)^2\right)+\left(\frac{9}{2}\right)^2-100$, or $y=-\left(x-\frac{9}{2}\right)^2+\left(-\frac{319}{4}\right)$. Thus, the value of c is equal to $-\frac{319}{4}$.

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

QUESTION 26

Choice B is correct. The two given equations are equivalent because the second equation can be obtained from the first equation by multiplying each side of the equation by 5. Thus, the graphs of the equations are coincident, so if a point lies on the graph of one of the equations, it also lies on the graph of the other equation. A point (x,y) lies on the graph of an equation in the *xy*-plane if and only if this point represents a solution to the equation. It is sufficient, therefore, to find the point that represents a solution to the first given equation. Substituting the *x*- and *y*-coordinates of choice B, $-\frac{3r}{2}+\frac{7}{2}$ and r, for x and y, respectively, in the first equation yields $2\left(-\frac{3r}{2}+\frac{7}{2}\right)+3r=7$, which is equivalent to $-3r+7+3r=7$, or $7=7$. Therefore, the point $\left(-\frac{3r}{2}+\frac{7}{2},r\right)$ represents a solution to the first equation and thus lies on the graph of each equation in the *xy*-plane for the given system.

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

QUESTION 27

The correct answer is 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 $k=104$.

Math

Module 2
(27 questions)

QUESTION 1

Choice A is correct. It's given that Tilly earns p dollars for every w hours of work. This can be represented by the proportion $\frac{p}{w}$. The amount of money, x, Tilly earns for $39w$ hours of work can be found by setting up the proportion $\frac{p}{w}=\frac{x}{39w}$. This can be rewritten as $39pw=xw$. Dividing both sides by w results in $x=39p$.

Choice B is incorrect. This is the amount of money Tilly earns in dollars per hour, not the amount of money Tilly earns for $39w$ hours of work. *Choice C* is incorrect. This is the amount of money Tilly earns for w hours of work plus 39, not the amount of money Tilly earns for $39w$ hours of work. *Choice D* is incorrect. This is the amount of money Tilly earns for w hours of work minus 39, not the amount of money Tilly earns for $39w$ hours of work.

QUESTION 2

Choice D is correct. It's given that Juan rides his bike at an average rate of 5.7 minutes per mile. The number of minutes it will take Juan to ride x miles can be determined by multiplying his average rate by the number of miles, x, which yields $5.7x$. Therefore, the function $m(x)=5.7x$ models the number of minutes it will take Juan to ride x miles.

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 3

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

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

QUESTION 4

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 5

Choice D is correct. By the Pythagorean theorem, if a right triangle has a hypotenuse with length c and legs with lengths a and b, then $c^2=a^2+b^2$. In the right triangle shown, the hypotenuse has length c and the legs have lengths a and b. It's given that $a=4$ and $b=5$. Substituting 4 for a and 5 for b in the Pythagorean theorem yields $c^2=4^2+5^2$. Taking the square root of both sides of this equation yields $c=\pm\sqrt{4^2+5^2}$. Since the length of a side of a triangle must be positive, the value of c is $\sqrt{4^2+5^2}$.

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

QUESTION 6

The correct answer is 40. Subtracting 5 from both sides of the given equation yields $4x=160$. Dividing both sides of this equation by 4 yields $x=40$. Therefore, the solution to the given equation is 40.

QUESTION 7

The correct answer is 7. It's given that the x-intercept of the graph shown is $(x,0)$. The graph passes through the point $(7,0)$. Therefore, the value of x is 7.

QUESTION 8

Choice B is correct. The y-intercept of the graph of a function in the xy-plane is the point on the graph where $x=0$. It's given that $f(x)=\frac{1}{10}x-2$. Substituting 0 for x in this equation yields $f(0)=\frac{1}{10}(0)-2$, or $f(0)=-2$. Since it's given that $y=f(x)$, it follows that $y=-2$ when $x=0$. Therefore, the y-intercept of the graph of $y=f(x)$ in the xy-plane is $(0,-2)$.

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 9

Choice D is correct. If the graph of $y=g(x)$ is the result of shifting the graph of $y=f(x)$ down k units in the *xy*-plane, the function g can be defined by an equation of the form $g(x)=f(x)-k$. It's given that $f(x)=7x^3$ and the graph of $y=g(x)$ is the result of shifting the graph of $y=f(x)$ down 2 units. Substituting $7x^3$ for $f(x)$ and 2 for k in the equation $g(x)=f(x)-k$ yields $g(x)=7x^3-2$.

Choice A is incorrect and may result from conceptual errors. *Choice B* is incorrect and may result from conceptual errors. *Choice C* is incorrect. This equation defines a function g for which the graph of $y=g(x)$ is the result of shifting the graph of $y=f(x)$ up, not down, 2 units.

QUESTION 10

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

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

QUESTION 11

Choice A is correct. Applying the distributive property, the given expression can be written as $7x^3+7x-6x^3+3x$. Grouping like terms in this expression yields $(7x^3-6x^3)+(7x+3x)$. Combining like terms in this expression yields x^3+10x.

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 12

Choice A is correct. It's given that $p(n)=7n^3$. Substituting 56 for $p(n)$ in this equation yields $56=7n^3$. Dividing each side of this equation by 7 yields $8=n^3$. Taking the cube root of each side of this equation yields $2=n$. Therefore, when $p(n)$ is equal to 56, the value of n is 2.

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

QUESTION 14

The correct answer is 10. The mean of a data set is calculated by dividing the sum of the data values by the number of data values in the data set. For this data set, the mean can be calculated as $\frac{6+8+16+4+17+26+8+5+5+5}{10}$, which is equivalent to $\frac{100}{10}$, or 10.

QUESTION 15

Choice A is correct. For an exponential function of the form $E(t)=a(b)^t$, where a and b are constants, the initial value of the function—that is, the value of the function when $t=0$—is a and the value of the function increases by a factor of b each time t increases by 1. Since the function $E(t)=5(1.8)^t$ gives the estimated number of employees at a restaurant and t is the number of years since the restaurant opened, the best interpretation of the number 5 in this context is the estimated number of employees when $t=0$, or when the restaurant opened.

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

QUESTION 16

Choice B is correct. For a quadratic function defined by an equation of the form $g(x)=a(x-h)^2+k$, where a, h, and k are constants and $a>0$, the minimum value of the function is k. In the given function, $a=1$, $h=0$, and $k=55$. Therefore, the minimum value of the given function is 55.

Choice A is incorrect. This is the value of x for which the given function reaches its minimum value, not the minimum value of the function. *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 17

Choice C is correct. Because the value of the investment increases each year, the function that best models how the value of the investment changes over time is an increasing function. It's given that each year, the value of the investment increases by 0.49% of its value the previous year. Since the value of the investment changes by a fixed percentage each year, the function that best

models how the value of the investment changes over time is an exponential function. Therefore, the function that best models how the value of the investment changes over time is an increasing exponential function.

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 18

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

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

QUESTION 19

Choice B is correct. Since $\frac{12}{12}=1$, multiplying the exponent of the given expression by $\frac{12}{12}$ yields an equivalent expression: $a^{\left(\frac{11}{12}\right)\left(\frac{12}{12}\right)}=a^{\left(\frac{132}{144}\right)}$. Since $\frac{132}{144}=132\left(\frac{1}{144}\right)$, the expression $a^{\frac{132}{144}}$ can be rewritten as $a^{(132)\left(\frac{1}{144}\right)}$. Applying properties of exponents, this expression can be rewritten as $\left(a^{132}\right)^{\frac{1}{144}}$. An expression of the form $(m)^{\frac{1}{k}}$, where $m>0$ and $k>0$, is equivalent to $\sqrt[k]{m}$. Therefore, $\left(a^{132}\right)^{\frac{1}{144}}$ is equivalent to $\sqrt[144]{a^{132}}$.

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 20

The correct answer is 16. 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 $\$200$, so this situation can be represented by the inequality $35+10.25x\le 200$. The greatest number of attendees can be found by solving this inequality for x. Subtracting 35 from both sides of this inequality gives $10.25x\le 165$. Dividing both sides of this inequality by 10.25 results in approximately $x\le 16.098$. Since the question is stated in terms of attendees, rounding x down to the nearest whole number, 16, gives the greatest number of attendees possible.

QUESTION 21

The correct answer is 28. The given absolute value equation can be rewritten as two linear equations: $4x-4=112$ and $-(4x-4)=112$, or $4x-4=-112$. Adding 4 to both sides of the equation $4x-4=112$ results in $4x=116$. Dividing both sides of this equation by 4 results in $x=29$. Adding 4 to both sides of the equation $4x-4=-112$ results in $4x=-108$. Dividing both sides of this equation by 4 results in $x=-27$. Therefore, the two values of $x-1$ are $29-1$, or 28, and $-27-1$, or -28. Thus, the positive value of $x-1$ is 28.

Alternate approach: The given equation can be rewritten as $|4(x-1)|=112$, which is equivalent to $4|x-1|=112$. Dividing both sides of this equation by 4 yields $|x-1|=28$. This equation can be rewritten as two linear equations: $x-1=28$ and $-(x-1)=28$, or $x-1=-28$. Therefore, the positive value of $x-1$ is 28.

QUESTION 22

Choice A is correct. The volume of a cube can be found by using the formula $V=s^3$, where V is the volume and s is the edge length of the cube. Therefore, the volume of the given cube is $V=68^3$, or 314,432 cubic inches. The volume of a sphere can be found by using the formula $V=\frac{4}{3}\pi r^3$, where V is the volume and r is the radius of the sphere. Therefore, the volume of the given sphere is $V=\frac{4}{3}\pi(34)^3$, or approximately 164,636 cubic inches. The volume of the space in the cube not taken up by the sphere is the difference between the volume of the cube and volume of the sphere. Subtracting the approximate volume of the sphere from the volume of the cube gives $314,432-164,636=149,796$ cubic inches.

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 B is correct. The standard form of an equation of a circle in the *xy*-plane is $(x-h)^2+(y-k)^2=r^2$, where the coordinates of the center of the circle are (h,k) and the length of the radius of the circle is r. For the circle in the *xy*-plane with equation $(x-5)^2+(y-3)^2=16$, it follows that $r^2=16$. Taking the square root of both sides of this equation yields $r=4$ or $r=-4$. Because r represents the length of the radius of the circle and this length must be positive, $r=4$. Therefore, the radius of the circle is 4. The diameter of a circle is twice the length of the radius of the circle. Thus, $2(4)$ yields 8. Therefore, the diameter of the circle is 8.

Choice A is incorrect. This is the radius of the circle. *Choice C* is incorrect. This is the square of the radius of the circle. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 24

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 25

Choice B is correct. Since the model estimates that the number of squirrels in the population increased by a fixed percentage, 150%, each year, the model can be represented by an exponential equation of the form $n=a\left(1+\frac{p}{100}\right)^{t}$, where a is the estimated number of squirrels in the population at the end of 2015, and the model estimates that at the end of each year, the number is p% more than the number at the end of the previous year. Since the model estimates that at the end of each year, the number was 150% more than the number at the end of the previous year, $p=150$. Substituting 150 for p in the equation $n=a\left(1+\frac{p}{100}\right)^{t}$ yields $n=a\left(1+\frac{150}{100}\right)^{t}$, which is equivalent to $n=a(1+1.5)^{t}$, or $n=a(2.5)^{t}$. It's given that the estimated number of squirrels at the end of 2016 was 180. This means that when $t=1$, $n=180$. Substituting 1 for t and 180 for n in the equation $n=a(2.5)^{t}$ yields $180=a(2.5)^{1}$, or $180=2.5a$. Dividing each side of this equation by 2.5 yields $72=a$. Substituting 72 for a in the equation $n=a(2.5)^{t}$ yields $n=72(2.5)^{t}$.

Choice A is incorrect. This equation represents a model where at the end of each year, the estimated number of squirrels was 150% of, not 150% more than, the estimated number at the end of the previous year. *Choice C* is incorrect. This equation represents a model where at the end of each year, the estimated number of squirrels was 150% of, not 150% more than, the estimated number at the end of the previous year, and the estimated number of squirrels at the end of 2015, not the end of 2016, was 180. *Choice D* is incorrect. This equation represents a model where the estimated number of squirrels at the end of 2015, not the end of 2016, was 180.

QUESTION 26

Choice B is correct. Two lines are perpendicular if their slopes are negative reciprocals, meaning that the slope of the first line is equal to -1 divided by the slope of the second line. Each equation in the given pair of equations can be written in slope-intercept form, $y = mx + b$, where m is the slope of the graph of the equation in the xy-plane and $(0,b)$ is the y-intercept. For the first equation, $5x + 7y = 1$, subtracting $5x$ from both sides gives $7y = -5x + 1$, and dividing both sides of this equation by 7 gives $y = -\frac{5}{7}x + \frac{1}{7}$. Therefore, the slope of the graph of this equation is $-\frac{5}{7}$. For the second equation, $ax + by = 1$, subtracting ax from both sides gives $by = -ax + 1$, and dividing both sides of this equation by b gives $y = -\frac{a}{b}x + \frac{1}{b}$. Therefore, the slope of the graph of this equation is $-\frac{a}{b}$. Since the graph of the given pair of equations is a pair of perpendicular lines, the slope of the graph of the second equation, $-\frac{a}{b}$, must be the negative reciprocal of the slope of the graph of the first equation, $-\frac{5}{7}$. The negative reciprocal of $-\frac{5}{7}$ is $\frac{-1}{\left(-\frac{5}{7}\right)}$, or $\frac{7}{5}$. Therefore, $-\frac{a}{b} = \frac{7}{5}$, or $\frac{a}{b} = -\frac{7}{5}$. Similarly, rewriting the equations in choice B in slope-intercept form yields $y = -\frac{10}{7}x + \frac{1}{7}$ and $y = -\frac{a}{2b}x + \frac{1}{2b}$. It follows that the slope of the graph of the first equation in choice B is $-\frac{10}{7}$ and the slope of the graph of the second equation in choice B is $-\frac{a}{2b}$. Since $\frac{a}{b} = -\frac{7}{5}$, $-\frac{a}{2b}$ is equal to $-\left(\frac{1}{2}\right)\left(-\frac{7}{5}\right)$, or $\frac{7}{10}$. Since $\frac{7}{10}$ is the negative reciprocal of $-\frac{10}{7}$, the pair of equations in choice B represents a pair of perpendicular lines.

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

QUESTION 27

The correct answer is 289. A quadratic equation of the form $ax^2 + bx + c = 0$, where a, b, and c are constants, has no real solutions when the value of the discriminant, $b^2 - 4ac$, is less than 0. In the given equation, $x^2 - 34x + c = 0$, $a = 1$ and $b = -34$. Therefore, the discriminant of the given equation can be expressed as $(-34)^2 - 4(1)(c)$, or $1{,}156 - 4c$. It follows that the given equation has no real solutions when $1{,}156 - 4c < 0$. Adding $4c$ to both sides of this inequality yields $1{,}156 < 4c$. Dividing both sides of this inequality by 4 yields $289 < c$, or $c > 289$. It's given that the equation $x^2 - 34x + c = 0$ has no real solutions when $c > n$. Therefore, the least possible value of n is 289.