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CollegeBoard

International

SAT® Test MARCH 2019

IMPORTANT REMINDERS

1

a no. 2 pencil is required for the test. do not use a mechanical pencil or pen.

2

sharing any questions with anyone is a violation of test security and Fairness policies and may result in your scores being canceled.

Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

Turn to Section 3 of your answer sheet to answer the questions in this section.


DIRECTIONS

For questions 1-15, solve each problem, choose the best answer from the choices provided, and fill in the corresponding bubble on your answer sheet. **For questions 16-20,** solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

1. The use of a calculator **is not permitted**.

2. All variables and expressions used represent real numbers unless otherwise indicated.

3. Figures provided in this test are drawn to scale unless otherwise indicated.

4. All figures lie in a plane unless otherwise indicated.

5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.
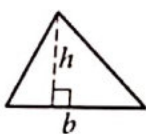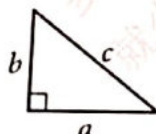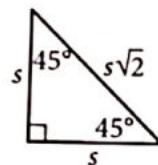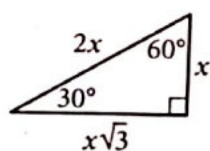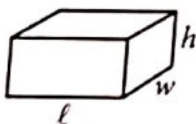
REFERENCE
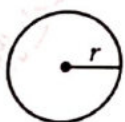
$A = \pi r^2$
$C = 2\pi r$
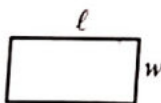
$A = \ell w$

$A = \frac{1}{2} bh$

$c^2 = a^2 + b^2$

Special Right Triangles

$V = \ell w h$

$V = \pi r^2 h$

$V = \frac{4}{3}\pi r^3$

$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\ell w h$

The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

1

$$y = x + 3$$

In the equation above, what is the value of y when $x = 3$?

A) 6

B) 3

C) 0

D) −3

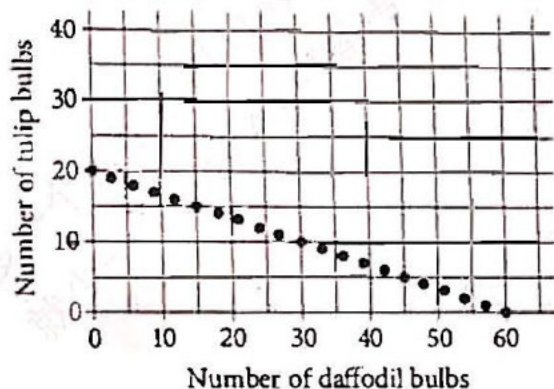**2**

What is the solution to $3x - 5 = 4(x + 2)$?

A) $\dfrac{13}{7}$

B) $\dfrac{3}{7}$

C) −7

D) −13

1

On April 1, a bamboo stalk had a height of 18 inches. This type of bamboo grows at an average rate of 12 inches per day. At this rate, which of the following represents the estimated height h, in inches, of the bamboo stalk d days after April 1?

A) $h = 12d$

B) $h = 12d + 18$

C) $h = 18d$

D) $h = 18d + 12$

1


Alice is shopping at a garden center where tulip bulbs cost $1.50 each and daffodil bulbs cost $0.50 each. Each point on the graph above represents one combination of tulip and daffodil bulbs that Alice can buy using her entire gardening budget. Based on the graph, if Alice spends her entire budget on daffodil bulbs, how many daffodil bulbs does she buy?

A) 20

B) 30

C) 60

D) 80

5

Stopping Distances
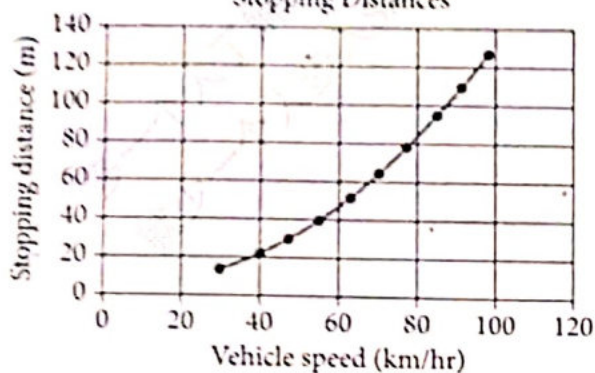
The graph above shows the quadratic function *f*. The stopping distance $f(x)$, in meters (m), is the distance required to stop a vehicle based on the speed x, in kilometers per hour (km/hr), of the vehicle. Which of the following is the best interpretation of the equation $f(91) = 110$ in the context of the problem?

A) A vehicle traveling 91 km/hr requires 110 m to stop.

B) A vehicle traveling 110 km/hr requires 91 m to stop.

C) The vertex of the graph of *f* is (91, 110).

D) The *x*- and *y*-intercepts of the graph of *f* are 91 and 110, respectively.
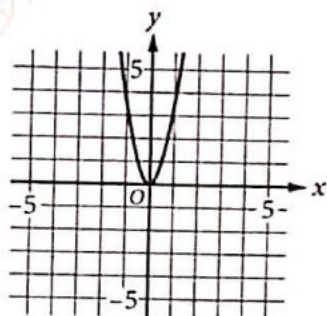
6

What is the degree measure of an angle with a measure of π radians?
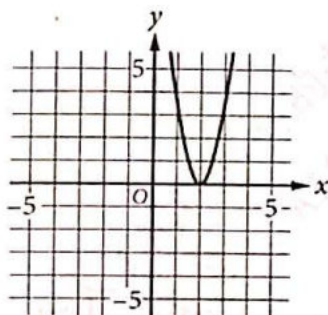
A) 90°

B) 180°

C) 225°

D) 270°

7

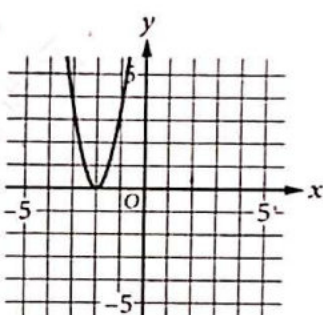The graph of $y = f(x)$ is shown in the xy-plane.

Which of the following graphs could be the graph of $y = f(x) + 2$ in the xy-plane?

A)

B)

C)
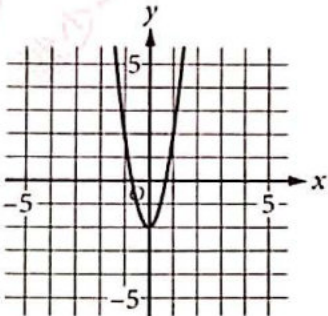
D)
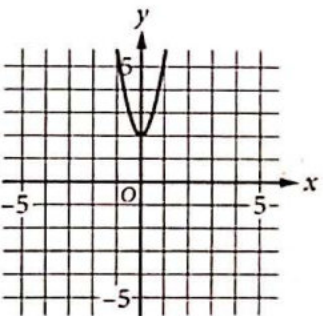
8

$$\sqrt{5x} = 10$$

What are all values of x that satisfy the given equation?

A) 2 only

B) 20 only

C) -2 and 2

D) -20 and 20

9
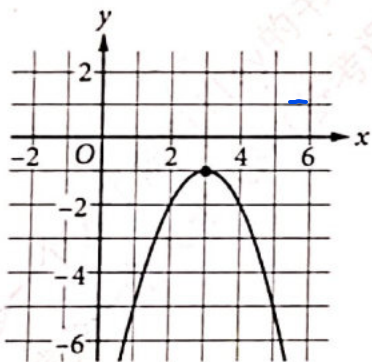
Which of the following is an equation of the quadratic function graphed in the xy-plane above?

A) $y = -(x-3)^2 - 1$

B) $y = -(x+3)^2 - 1$

C) $y = (x+3)^2 + 1$

D) $y = (x-3)^2 + 1$

10

$$\frac{x^4 - 16}{x - 2}$$

Which of the following is equivalent to the expression above, where $x > 2$?

A) $x^3 - 8$

B) $x^3 + 8$

C) $(x-2)(x^2-4)$

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

11
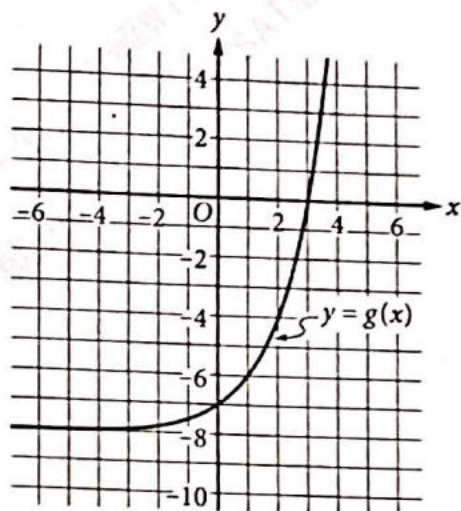
The exponential function g is graphed in the xy-plane shown, where $y = g(x)$. If $g(m) = 0$, where m is a constant, what is the value of m ?

A) -8

B) -7

C) 0

D) 3

12

Which of the following is a solution of the equation $x^2 + 2 = 5x$?

A) $\dfrac{-5 + \sqrt{21}}{2}$

B) $\dfrac{-5 + \sqrt{17}}{2}$

C) $\dfrac{5 - \sqrt{21}}{2}$

D) $\dfrac{5 - \sqrt{17}}{2}$

13

A small rectangular box has a volume of 2 cubic feet. A large rectangular box is 5 yards long, 3 yards wide, and 6 inches deep. What is the ratio of the volume of the large box to the volume of the small box? (1 yard = 3 feet, and 1 foot = 12 inches.)

A) 45 to 2

B) 45 to 1

C) 135 to 4

D) 135 to 1

14

$$3x - 5y = 7$$

$$ax + 15y = 11$$

In the system of equations above, a is a constant. If the system of equations has no solution, what is the value of a ?

A) −9

B) −3

C) 3

D) 9

15

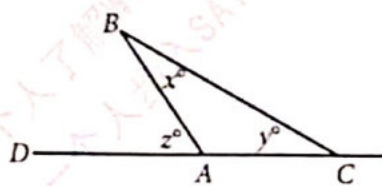In triangle ABC above, side $\overline{CA}$ is extended to point D. Which of the following expresses x in terms of y and z ?

A) $y + z$

B) $-y + z$

C) $-2y + z$

D) $180 - y + z$

DIRECTIONS

For questions 16-20, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the bubbles accurately. You will receive credit only if the bubbles are filled in correctly.
2. Mark no more than one bubble in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If [3 1 / 2] is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)
6. **Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Answer: $\frac{7}{12}$

Write answer in boxes. → Fraction line

Grid in result.

Answer: 2.5

← Decimal point

Acceptable ways to grid $\frac{2}{3}$ **are:**

2 / 3   . 6 6 6   . 6 6 7

Answer: 201 – either position is correct

2 0 1   2 0 1

NOTE:
You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

16

If $2x + 3 = 8$, what is the value of $6x + 9$?

17

If $(2x + 3)(x + 2) = ax^2 + bx + c$ for all x, what is the value of $a + b + c$?

18

x	y
7	4
4	10
1	16

The table above shows the coordinates of three points on a line in the xy-plane. What is the value of x when y = 0 ?

19

At a certain college, the economics club plans to sell T-shirts as a fund-raiser. The president of the club estimates that when the price of a T-shirt is $18, there will be 60 T-shirts sold, and for every $1 the price of the shirt is reduced, 10 additional T-shirts will be sold. Based on this estimate, what is the maximum amount of revenue, in dollars, the club can earn from T-shirt sales? (Revenue equals price times number sold. Disregard the $ sign when gridding your answer.)

20

$$0 \leq x \leq y \leq 6$$

What is the area, in the xy-plane, of the region consisting of all points that satisfy the inequality above?

STOP

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

Math Test – Calculator

55 MINUTES, 38 QUESTIONS

Turn to Section 4 of your answer sheet to answer the questions in this section.

1

Every 1 inch on a scale model of a car represents 32 inches on the actual car. The diameter of a wheel on the scale model is 0.5 inch. Which of the following is the diameter, in inches, of a wheel on the actual car?

A) 32

B) 16

C) 2

D) 1

2

Chirag was given a $50 gift card to a local market. Each day, Chirag used the gift card to purchase only breakfast from the market. The total cost per breakfast, including taxes, was $4.50, and no additional money was added to the card. Which of the following expressions represents the amount A, in dollars, left on the gift card after d days of use?

A) $A = 50 - 4.50d$

B) $A = 50 + 4.50d$

C) $A = 50d - 4.50$

D) $A = 50d + 4.50$

3

box plot A

box plot B

20 30 40 50 60
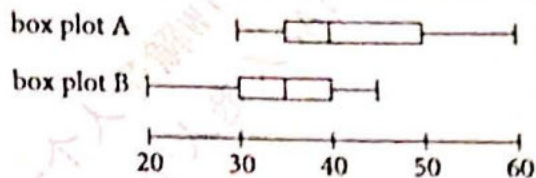
Based on the two box plots above, which of the following statements is true?

A) The range of box plot A is greater than the range of box plot B.

B) The range of box plot A is less than the range of box plot B.

C) The range of box plot A is equal to the range of box plot B.

D) It cannot be determined if the range of box plot A is different from the range of box plot B.

4

Which of the following expressions is equivalent to $2(x^2 - 1) + 3(x^2 + 2)$?

A) $2x^2 - 6$

B) $5x^2 + 3$

C) $5x^2 + 4$

D) $6x^2 - 2$

5

	Purchase equipment	Rent equipment	Total
Floor sander	347	211	558
Power washer	286	134	420
Total	633	345	978

The table above shows the numbers of customers who have purchased or rented either a floor sander or a power washer from a home-improvement store. Based on the table, what proportion of the floor-sander customers purchased their equipment?

A) $\dfrac{347}{633}$

B) $\dfrac{558}{978}$

C) $\dfrac{347}{558}$

D) $\dfrac{633}{978}$

6

A certain beverage contains 6% fruit juice by volume. How much fruit juice, in ounces, is in a bottle filled with 20 ounces of this beverage?

A) 0.6

B) 1.2

C) 6.0

D) 12.0

7

A company charges $0.30 per word to write the first 400 words of a résumé and $0.20 per word to write each word after the first 400 words. The company charges a standard $10 formatting fee for each résumé. What is the company's total charge for writing a 475-word résumé?

A) $145

B) $135

C) $125

D) $115

8

Oona purchased p pounds of peanuts and a pounds of almonds. The peanuts cost $2.45 per pound, and the almonds cost $3.15 per pound. Oona spent a total of $14.35 on peanuts and almonds. The equation below represents this situation.

$$2.45p + 3.15a = 14.35$$

What is the meaning of the term $3.15a$ in this context?

A) The total cost of almonds in Oona's purchase

B) The total cost of peanuts in Oona's purchase

C) The total pounds of almonds Oona purchased

D) The total pounds of peanuts Oona purchased

Questions 9-11 refer to the following information.

Average distance (AU)	Absolute magnitude
1.83	18.4
1.99	16.6
2.24	16.8
2.35	16.2
2.37	17.9
2.40	17.2
2.51	16.5
2.61	17.6
2.66	17.3
2.75	15.8
2.82	17.1
2.91	15.6
2.98	17.0
3.14	15.4
3.23	15.8

The average distance from the Sun, in astronomical units (AU), and the corresponding absolute magnitude of 15 asteroids are shown in the table.

An astronomical unit (AU) is approximately 150 million kilometers. Absolute magnitude is a measure of brightness.

9

What is the median of the distances from the Sun, in AU, of the 15 asteroids listed in the table?

A) 2.56

B) 2.59

C) 2.61

D) 2.66

10

Of the asteroids in the table having an average distance from the Sun of less than 2.50 AU, one asteroid is to be selected at random. What is the probability that the selected asteroid will have an absolute magnitude greater than 17.0 ?

A) $\dfrac{2}{5}$

B) $\dfrac{1}{2}$

C) $\dfrac{3}{5}$

D) $\dfrac{3}{4}$

11

What is the range of the absolute magnitudes of the asteroids listed in the table?

A) 0.1

B) 3.0

C) 15.8

D) 16.8

12

$$5x + 2y = 40$$
$$5x + 4y = 60$$

If (x, y) is the solution to the system of equations above, what is the value of y ?

A)   5

B)   10

C)   15

D)   20

13

$$P = 0.1747 + 0.0639t$$

The equation above models the average price P, in dollars, of a loaf of white bread in the United States t years after 1970. According to the model, which of the following is the best interpretation of the coefficient 0.0639 in this context?

A)   In 1970, the predicted average price of a loaf of white bread was approximately $0.0639.

B)   The predicted average price of a loaf of white bread t years after 1970 is 0.0639 times greater than the predicted average price of a loaf of white bread in 1970.

C)   Each year after 1970, the predicted average price of a loaf of white bread has increased by approximately $0.0639.

D)   Every 0.0639 year after 1970, the predicted average price of a loaf of white bread has increased by $1.

14

Average Heart Rate versus Longevity
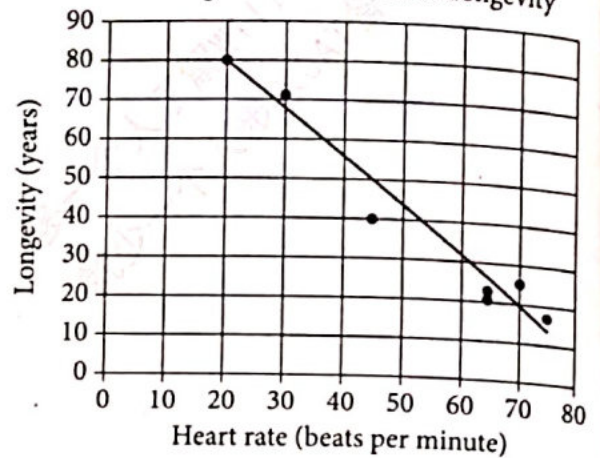
The scatterplot above shows the average heart rate and longevity for 7 different types of animals. A line of best fit for the data is also shown. According to the line of best fit, which of the following best estimates the decrease in longevity, in years, for each increase of 10 beats per minute of heart rate?

A)   1

B)   12

C)   24

D)   32

15

$$T(x) = 24(0.97)^x$$

A sample of bacteria in a liquid growth medium that has an initial temperature of 24 degrees Celsius (°C) is placed in a refrigerator with the temperature set to 0°C. The function above approximates the temperature T, in °C, of the medium x minutes after being placed in the refrigerator. Which of the following best approximates the amount that the temperature, in °C, of the medium has decreased after 20 minutes?

A) $T(0)$

B) $T(20)$

C) $\dfrac{T(20)}{T(0)}$

D) $T(0) - T(20)$

16

x	y
0	2
3	0

The table above shows the coordinates of two points that lie on line l in the xy-plane. If the slope of line l is m, what is the value of m ?

A) $-\dfrac{3}{2}$

B) $-\dfrac{2}{3}$

C) $\dfrac{2}{3}$

D) $\dfrac{3}{2}$

17

In the xy-plane, line k has a slope of -3 and passes through the point $(-2, 7)$. Which of the following is an equation of line k ?

A) $3x + y = 1$

B) $2x + y = 3$

C) $-2x + y = 11$

D) $-3x + y = 13$
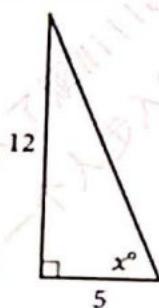
A right triangle is shown above. What is the value of $\cos x°$?

A) $\dfrac{5}{12}$

B) $\dfrac{12}{5}$

C) $\dfrac{5}{13}$

D) $\dfrac{12}{13}$
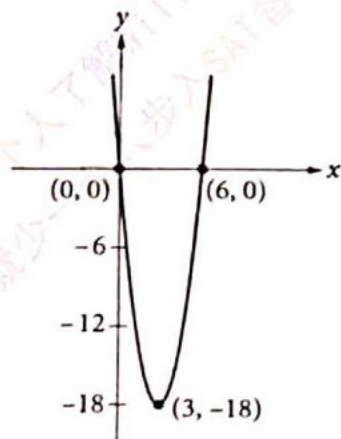
Which of the following is an equation of the parabola shown in the xy-plane above?

A) $y = \dfrac{1}{2}x(x + 6)$

B) $y = \dfrac{1}{2}x(x - 6)$

C) $y = -2x(x + 6)$

D) $y = 2x(x - 6)$

20

Actual Voters versus Registered Voters
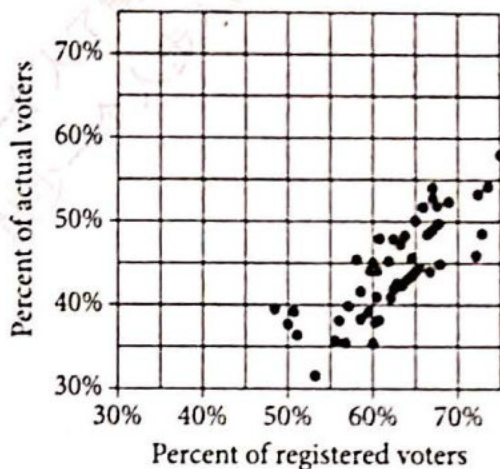
The scatterplot above shows the percent of residents who were registered to vote, x, and the percent of residents who actually voted, y, on election day in 2010, for each of the 50 states in the United States. Which of the following could be the slope of a line of best fit for the data?

A) −6.4

B) 0.8

C) 6.4

D) 8.8

21

The 2010 population of Tulsa, Oklahoma, was 391,886. Three years later, the population had grown by 1.59%. The 2013 population was how many times the 2010 population?

A) 1.0159

B) 1.159

C) 1.59

D) 2.59

22

If $\dfrac{1}{x} + \dfrac{1}{2x} = 2$, where $x > 0$, what is the value of $\dfrac{2x}{3}$?

A) 8

B) $\dfrac{3}{2}$

C) $\dfrac{1}{2}$

D) $\dfrac{1}{9}$

23

In ancient Egypt, from 2810 BC to 2800 BC, the course of the Nile riverbed moved eastward at least 2 meters per year but no more than 3 meters per year. Which of the following inequalities represents all possible values for the total distance d, in meters, the Nile riverbed moved eastward for 4 consecutive years during this time period?

A) $0 \le d \le 2$

B) $2 \le d \le 3$

C) $4 \le d \le 8$

D) $8 \le d \le 12$
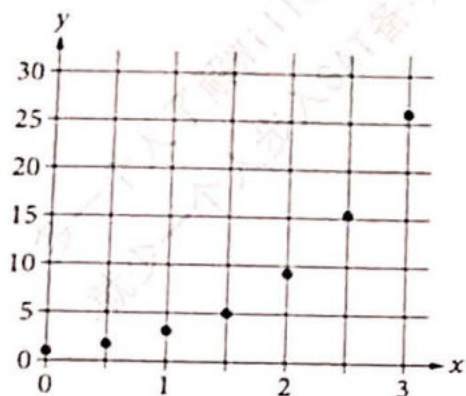
Which of the following exponential equations best models the data shown?

A) $y = 2^{-x}$

B) $y = 2^x$

C) $y = 3^{-x}$

D) $y = 3^x$

$$y = 2x + a$$
$$y = x^2 + a$$

In the system of equations above, a is a positive constant. If the system is graphed in the xy-plane, which of the following ordered pairs represents a point where the two graphs intersect?

A) $(0, a)$

B) $(a, 0)$

C) $(2, a)$

D) $(a, 2)$

26

Sphere A has radius k, and sphere B has radius $3k$. Which of the following are true? (The surface area of a sphere with radius r is $4\pi r^2$.)

    I. The surface area of sphere B is 9 times the surface area of sphere A.

    II. The volume of sphere B is 27 times the volume of sphere A.

A) I only
B) II only
C) I and II
D) Neither I nor II

27

• A town newspaper polled 500 voters selected at random from a list of all registered voters in the town. Of those polled, 41% approved of their state governor's performance. Which of the following is the largest population to which the results of the poll can be applied?

A) All registered voters who receive the newspaper
B) All registered voters who participated in the poll
C) All registered voters in the state
D) All registered voters in the town

28

The height of a triangle is one-fourth the length of its base. Which of the following equations gives the area, A, of this triangle in terms of its base, b ?

A) $A = \dfrac{b^2}{16}$

B) $A = \dfrac{b^2}{8}$

C) $A = \dfrac{b^2}{4}$

D) $A = \dfrac{b^2}{2}$

29

A study estimated that the mean number of times per year each person in the town of Shelton shops at a grocery store is 91, with an associated margin of error of 3. The study also estimated that the mean number of times per year each person in the town of Whitsville shops at a grocery store is 95, with an associated margin of error of 4. Based on the study, which of the following is an appropriate conclusion?

A) The people of Whitsville shop at a grocery store more times per person per year than the people of Shelton.

B) The people of Shelton shop at a grocery store more times per person per year than the people of Whitsville.

C) The people of both towns shop at a grocery store the same number of times per person per year.

D) There is insufficient information to determine which town's people shop at a grocery store more times per person per year.

30

$$2x - 3y = 5m$$

$$10x + ky = 25$$

In the system of equations above, k and m are constants. If the system has infinitely many solutions, what is the value of $\dfrac{k}{m}$?

A) -15

B) $-\dfrac{1}{15}$

C) $\dfrac{1}{15}$

D) 15

DIRECTIONS

For questions **31-38**, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the bubbles accurately. You will receive credit only if the bubbles are filled in correctly.
2. Mark no more than one bubble in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If $3\ 1\ /\ 2$ is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)
6. **Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Answer: $\frac{7}{12}$

Write answer in boxes.

Grid in result.

Fraction line

Answer: 2.5

Decimal point

Acceptable ways to grid $\frac{2}{3}$ are:

Answer: 201 – either position is correct

NOTE:
You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

31

Each point in the scatterplot below shows the distance between two cities and the price of a ticket for a direct airplane flight between those cities. A line of best fit is also shown.
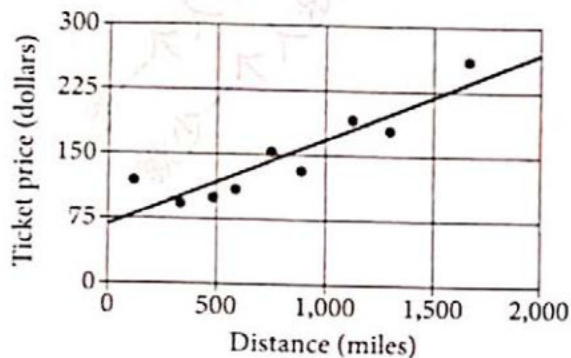
How many of the nine tickets have a higher price than the price predicted by the line of best fit?

32

A contractor is installing a new concrete runway at an airport, and 28,620 cubic yards of concrete will be required. The concrete supplier can pour 180 cubic yards of concrete per hour. If 4320 cubic yards of concrete have already been poured, how many more hours will it take to pour the rest of the concrete?
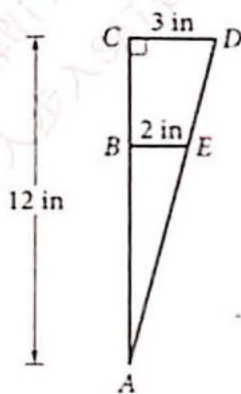
33

$$3(x - 2) = -3(x - 2)$$

If the equation above is true, what is the value of x ?

34

A microbiologist is growing mammalian cells in a liquid culture. At the beginning of each day, there are twice as many cells in the culture as there were at the beginning of the preceding day. If there are 100 cells at the beginning of day 1, how many cells will be in the culture at the beginning of day 6 ?

35

In right triangle *ACD* above, $\overline{BE}$ is parallel to $\overline{CD}$. What is the length, in inches, of $\overline{AB}$?

36

A fish tank in a pet store was less than half full of water when a worker turned on a hose to fill the tank at a constant rate. After the hose was on for 5 minutes, the tank was exactly half full. After the hose was on for 30 minutes, the tank was three-quarters full. How many minutes did it take after the hose was turned on for the tank to be completely filled with water?

Questions 37 and 38 refer to the following information.

A town's chamber of commerce printed a map of the business district. The map is 12 inches square, and 1 inch on the map represents an actual distance of 300 feet.

37

On the map, a parking lot for one business is represented by a square with side length 0.25 inches. What is the actual area, in square feet, of the parking lot?

38

A larger version of the same map of the business district is printed with the side length 50% longer than the side length of the previous map. On the larger map, what is the actual distance, in feet, represented by 1 inch?

STOP

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