CollegeBoard

International

SAT Test DECEMBER 2018

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 circle 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

NOTES

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

2. All variables and expressions used represent real numbers 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.
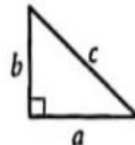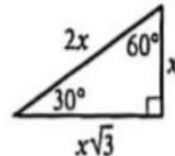
REFERENCE

$A = \pi r^2$
$C = 2\pi r$

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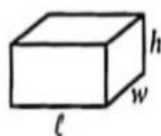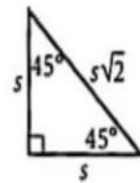
$A = \frac{1}{2}bh$

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

Special Right Triangles

$V = \ell wh$
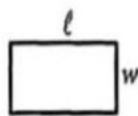
$V = \pi r^2 h$

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

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

$V = \frac{1}{3}\ell wh$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π and

The sum of the measures in degrees of the angles of a triangle is 180.
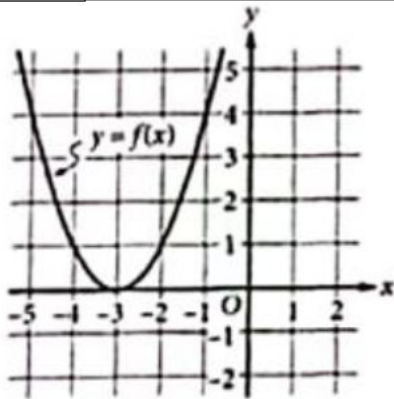

1

$$c = 3n + 40$$

The equation above gives the cost, in dollars, of the materials and tools Kyla used to make n toy cars to sell at a craft fair. If the cost of her materials and tools was 115$, how many toy cars did Kyla make?

A) 40

B) 35

C) 30

D) 25

2

The graph of $y = f(x)$ is the parabola shown in the xy-plane, If $f(a) = 0$, what is the value of a ?

A) -9

B) -3

C) 3

D) 9

3

$$\sqrt{x - 7} = 7$$

What value of x satisfies the given equation?

A) 0

B) 14

C) 42

D) 56

4

The distance d in feet, traveled by a falling object t seconds after the object is dropped can be modeled by the equation $d = 16t^2$, which of the following expresses the number of seconds after the object is dropped in terms of the distance traveled?

A) $t = \dfrac{4}{\sqrt{d}}$

B) $t = \dfrac{\sqrt{d}}{4}$

C) $t = \dfrac{4}{d^2}$

D) $t = \dfrac{d^2}{4}$

5

A rental-company manager is supplying chairs and umbrellas for a pool party that 90 guest will attend the manager will provide enough chairs for at least $\frac{2}{3}$ of the guests and umbrellas for at most $\frac{2}{3}$ of the guests, where each umbrella shades 3 guests, which of the following systems represents the number of chairs, c, and the number of umbrellas , u , that the manger will provide for the party?

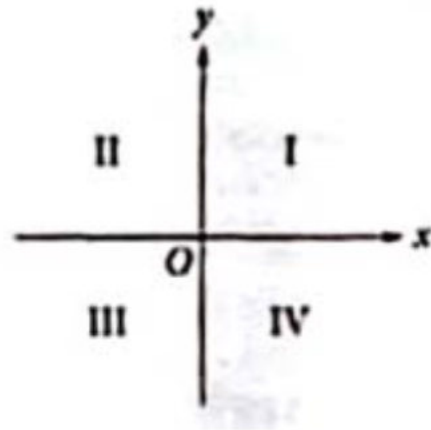A) $C \leq 60$

   $U \geq 20$

B) $C \geq 60$

   $U \geq 20$

C) $C \leq 60$

   $U \leq 20$

D) $C \geq 60$

   $U \leq 20$

6

The graph (not shown) of a linear function , where $y = h(x)$, is a line completely contained in only quadrants $I\ and\ Il$. Which of the following could define the function h?

A) $h(x) = 3x + 3$

B) $h(x) = 3x$

C) $h(x) = 3$

D) $h(x) = -3$

7

The function p is defined by $p(h) = 2h + h^2$ .If $k > -2$ and $p(k) = p(-2)$, what is the value of k ?

A) -1

B) 0

C) 1

D) 2

8

The total volume of the water in the five great Lakes is 5,439 cubic miles. The lakes have volumes of 116 cubic miles , 393 cubic miles , 850cubic miles x cubic miles , and y cubic miles , where $x > y$ .Which of the following equations represents the relationship between x and y ?

A) $x - y = 6.798$

B) $x - y = 4,080$

C) $x + y = 6.798$

D) $x + y = 4.080$

9

A certain new car depreciates by 20% during each of its first 5 years of ownership. If V_0 represents the value of the car when purchased and t represents the number of years since it was purchased , which of the following functions , $V(t)$, can be used to approximate the value of the car for $0 \leq t \leq 5$?

A) $V(t) = V_0(0.20)^t$

B) $V(t) = V_0(1.20)^t$
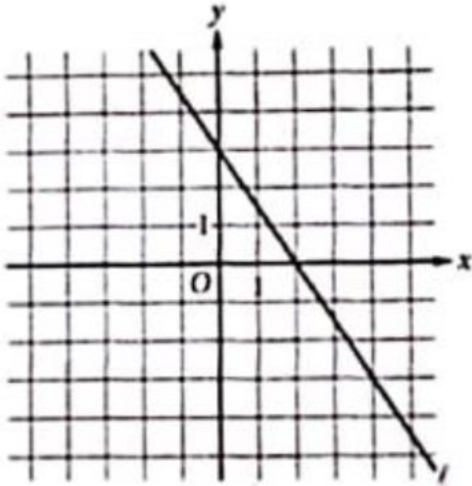
C) $V(t) = V_0(0.80)^t$

D) $V(t) = V_0(1.80)^t$

10

In the xy-plane, a circle has center (0, 0) and radius 2. Which of the following is an equation of this circle?

A) $2x^2 + y^2 = 0$

B) $x^2 + y^2 = 4$

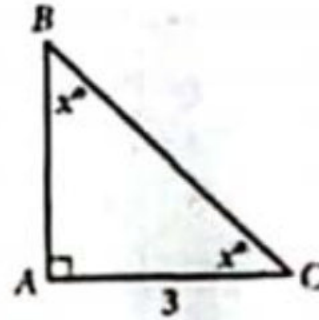C) $(x + 2)^2 + (y + 2)^2 = 0$

D) $(x + 2)^2 + (y + 2)^2 = 0$

11

Line l is shown in the xy-plane above, which of the following is an equation of line l ?

A) $2x - 3y = 6$

B) $2x + 3y = 6$

C) $3x - 2y = 6$

D) $3x + 2y = 6$

12

Triangle ABC is similar to triangle WXY (not shown), where $\angle C$ corresponds to $\angle Y$, what is the tangent of $\angle Y$?

A) $3\sqrt{2}$

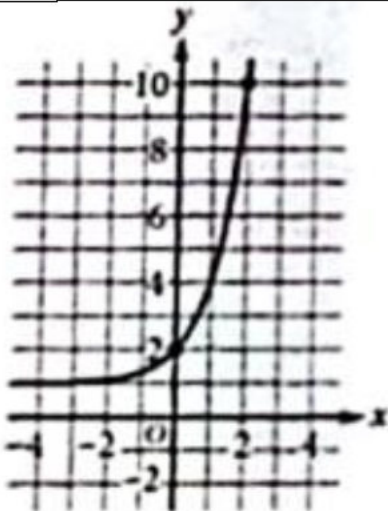B) 3

C) 1

D) $\frac{3}{3\sqrt{2}}$

13

$$\frac{2x + 1}{x + 3} - 1$$

Which of the following is equivalent to the given expression?

A) $\frac{2x}{x+2}$

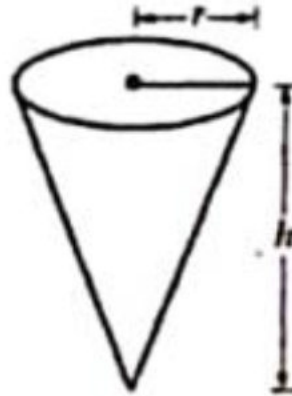B) $\frac{2x}{x+3}$

C) $\frac{x+4}{x+3}$

D) $\frac{x-2}{x+3}$

14

Which of the following is a equation of the graph shown?

A) $y = 3^x$

B) $y = 3^x + 1$

C) $y = 2^x$

D) $y = 2^x + 1$

15

The figure above represents a right circular cone with radius r and height h. A second right circular cone has 8 times the volume as the cone shown. Which of the following could be the dimensions of the second cone? (The volume of a cone with base radius r and height h is $\frac{1}{3}\pi r^2 h$.)

A) Radius = 2r, height = 2h

B) Radius = 2r, height = 4h

C) Radius = 4r, height = h

D) Radius = 4r, height = 4h

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 circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle 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: $\frac{7}{12}$ Answer: 2.5

Write answer in boxes. ← Fraction line ← Decimal point

Grid in result.

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.

16

$$\frac{1}{2}x - 700 = 0$$

What value of x satisfies the equation above?

17

$$(2x - 1)(x + 5)$$

The given expression is equivalent to $ax^2 + bx + c$, where $a, b, and\ c$ are constants. What is the value of b?

18

$$3x + 5 + x = 2(2x + b)$$

In the equation above, b is a constant. If the equation has infinitely many solutions, what is the value of b?

19

$$2x - 3y = 22$$

$$-4x + 5y = -66$$

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

20

$$\frac{1}{t} + \frac{1}{18 - t} = \frac{1}{4}$$

What is one possible value of t that satisfies the equation above?

Math Test – Calculator

55 MINUTES, 38 QUESTIONS

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


DIRECTIONS

For questions 1-30, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. **For questions 31-38,** solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 31 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.**

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

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REFERENCE

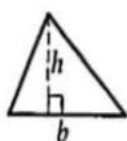

$A = \pi r^2$
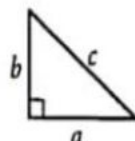$C = 2\pi r$
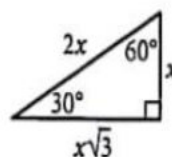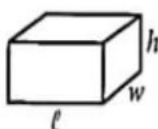
$A = \ell w$

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

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

Special Right Triangles

$V = \ell wh$
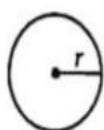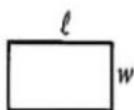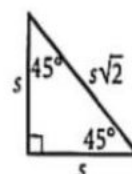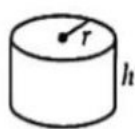
$V = \pi r^2 h$

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

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

$V = \frac{1}{3}\ell wh$

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

If $38 = 11 + 3x$, what is the value x?

A) 9

B) 13

C) 22

D) 27

2

A store charges \$4.00 per pound for apricots. At this rate, what will the store charge for 2.5 pounds of apricots?

A) \$6.00

B) \$8.00

C) \$10.00

D) \$12.00

3

A messenger delivered 10 packages on Monday before 11 a.m. and 4 packages per hour after 11 a.m. In which of the following equations does P represent the total number of packages the messenger had delivered on Monday h hours after 11 a.m.?

A) $P = 40h$

B) $P = 14h$

C) $P = 4 + 10h$

D) $P = 10 + 4h$

4

$$(x - 1)(x - 2)(x - 3) = 0$$

Which of the following is NOT a value of x that satisfies the equation above?

A) 0

B) 1

C) 2

D) 3

5

The line graph below shows the percentage of US workers who walk to work based on census data collected in the years 1980, 1990, 2000, and 2010.
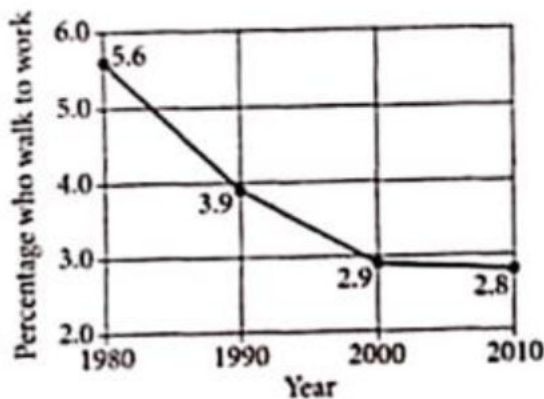
Of the following time periods, which had the greatest average yearly decrease in the percentage of workers who walk to work?

A) 1980 to 2010

B) 1980 to 1990

C) 1990 to 2000

D) 2000 to 2010

6
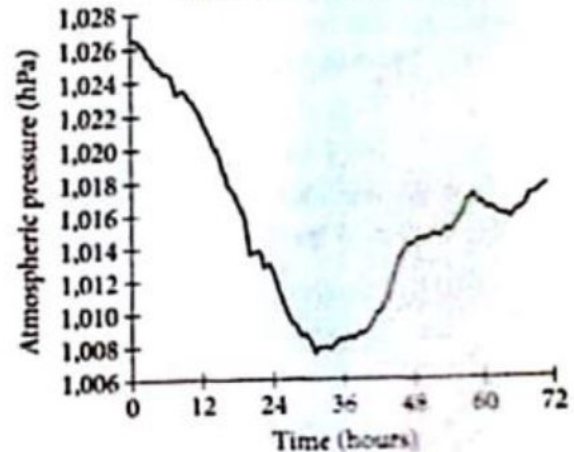
The graph above shows the atmospheric pressure, in hectopascals (hpa), for a town in Australia over a 72-hour period. Based on the graph. Which of the following statements is (are) true?

I. The minimum atmospheric pressure occurred during the first 24 hours of the time period.

II. The atmospheric pressure 36 hours into the time period was greater than the atmospheric pressure at the end of the time period.

A) Neither I nor II

B) I only

C) II only

D) Both I and II

7

An object moves along a straight path from a starting point. The distance y, in meters, of the object from its starting point after x seconds is shown in the graph below.
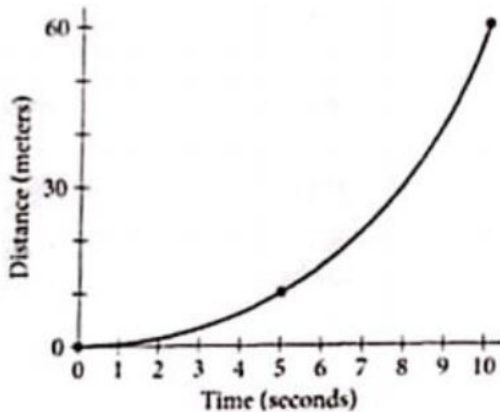
Which of the following is true?

A) The object traveled farther during the period $0 < x < 5$ than during the period $5 < x < 10$.

B) The object traveled farther during the period $5 < x < 10$ than during the period $0 < x < 5$.

C) The object traveled the same during the period $0 < x < 5$ as during the period $5 < x < 10$.

D) The distance the object traveled during the periods $0 < x < 5$ and $5 < x < 10$ cannot be determined from the graph.

8

An equation of a line in the xy-plane is $y = mx + b$ where m and b are constants. Which of the following changes to the equation would correspond to a vertical shift of the line by 3 units up?

A) Increasing the value of m by 3

B) Increasing the value of b by 3

C) Increasing the values of both m and b by 3

D) Increasing the values of both m and b by 1.5

9

An object's momentum is the product of its mass and its velocity. What is the velocity, in meters per second, of an 8-kilogram object that has a momentum of 56 kilogram meters per second?

A) 7

B) 28

C) 64

D) 448

Questions 10 and 11 refer to the following information.

$$Q = \frac{\pi}{4} d^2 v$$

The flow Q, in cubic inches per second, of water that flows through a cylindrical pipe with diameter d, in inches, and with velocity v, in inches per second, can be modeled by the equation above.

10

For a certain cylindrical pipe, which of the following best represents the graph of the water's flow rate Q versus the water's velocity v?

A)

B)

C)

D)
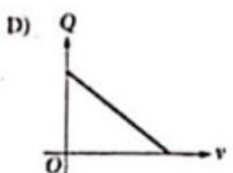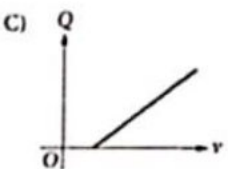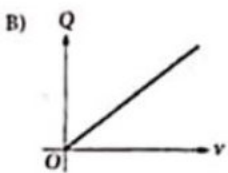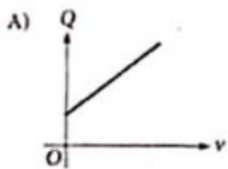
11

The velocity of water is 45 inches per second through cylindrical pipe A and 75 inches per second through cylindrical pipe B. If both pipes have the same diameter, what is the ratio of the flow rate in pipe A to the flow rate in pipe B?

A) 9 to 25
B) 3 to 5
C) 5 to 3
D) 25 to 9

12

The population of a city was approximately 300,000 once year and 330,000 the next year. Using these data, Maia modeled the population of the city for a 10-year period with an exponential function of the form $y = ab^t$. Where a and b are constants and t is the number of years after the start of 10-year period. Which of following statements best characterizes the change in population that her model predicts?

A) The model predicts an increase of 30,000 people every year during the 10-year period.
B) The model predicts an increase of 330,000 people every year during the 10-year period.
C) The model predicts a 10% increase over the prior year's population every year during the 10-year period.
D) The model predicts a 100% increase over the initial population at the end of the 10-year period.

13
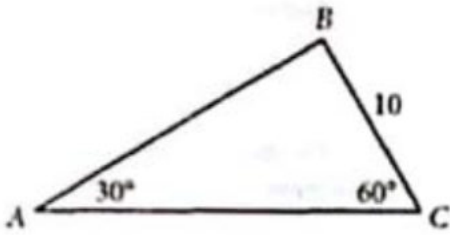
In triangle *ABC* above, what is the length of $\overline{AB}$?

A) 10

B) 20

C) $10\sqrt{3}$

D) $\frac{10\sqrt{3}}{3}$

14

The scatterplot below shows the number of congressional representatives, x, and population y, in thousands, for 25 of the 50 states in the United States.
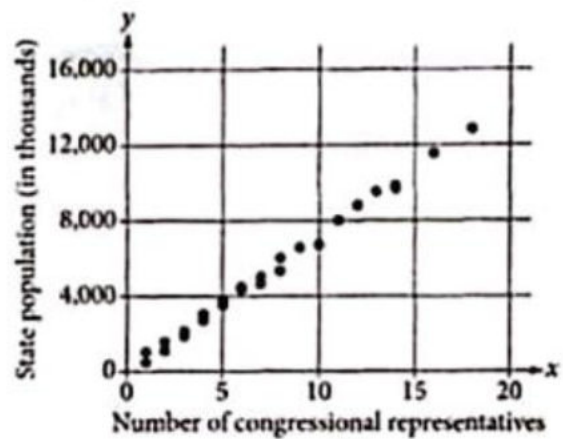
Which of the following could be an equation of a line of best fit for these data?

A) $y = -31 + 716x$

B) $y = -31 - 716x$

C) $y = -31 + 7x$

D) $y = -31 - 7x$

15

A sample of students was selected at random from all ninth-grade students in a large school district. The proportion of the students in the sample who were 14 years old was 80%, with an associated margin of error of 5%. Which of the following is NOT a plausible number of 14-year-olds in the 3,601 ninth-grade students in the school district?

   A) 2,750
   B) 2,900
   C) 3,050
   D) 3,200

16

The graph of a polynomial equation in the xy-plane contains the points (-1,0),(2, 0), and (3, 0). Which of the following could be the equation of the graph?

   A) $y = -x(2x)(3x)$
   B) $y = (x - 1)(x + 2)(x + 3)$
   C) $y = x(x - 1)(x - 2)(x + 3)$
   D) $y = (x + 1)^2(x - 2)(x - 3)$
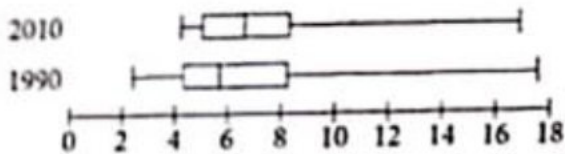
17

$$6x - 8y = 24$$

$$-\frac{2}{3}x + \frac{8}{9}y = m$$

In the system of equations above, m is a constant. If the system has more than one solution. What is the value of m?

   A) $-\frac{8}{3}$
   B) $-\frac{1}{3}$
   C) $\frac{2}{3}$
   D) $\frac{8}{3}$

Questions 18 and 19 refer to the following information.

The box plots above show the distribution of the average amount of energy used per person, in tons of oil equivalent (toe). For 25 countries, in 1990 and in 2010.

18

Which of the following correctly compares the median and range of these distributions?

A) The median in 2010 is greater than median in 1990, and the range in 2010 is less than the range in 1990.

B) The median in 2010 is greater than median in 1990, and the range in 2010 is greater than the range in 1990.

C) The median in 2010 is less than median in 1990, and the range in 2010 is less than the range in 1990.

D) The median in 2010 is less than median in 1990, and the range in 2010 is greater than the range in 1990.

19

The mean of the 1990 data set is 8.0 toe, and the mean of 2010 data set is 7.5 toe. What is the percent decrease of the mean from 1990 to 2010?

A) 0.5%

B) 5%

C) 6.25%

D) 6.67%

20

For the function f, if $f(z) = 3z$, which of the following is equivalent to $f(z - 2)$?

A) $-3z$

B) $3z - 2$

C) $3z - 6$

D) $-3z + 6$

21

The distribution of the number of days served in office by the first 43 presidents of the United States has a mean of approximately 1,900 days. The ninth president. William Henry Harrison, served only 31 days, the few number of days as president. What would be the effect on the mean of the distribution if the number of days William Henry Harrison served from the data?

A) The mean would decrease.

B) The mean would increase.

C) The mean would be unchanged.

D) The effect on the mean cannot be determined.

22
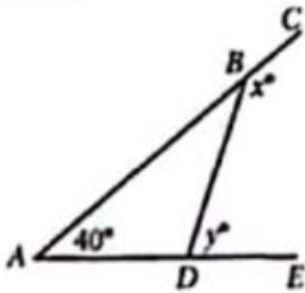
In the figure above, sides *AB* and *AD* of tringle *ABD* are extended to points C and E, respectively. If $y = 72$, what is the value of *x*?

A) 104

B) 108

C) 112

D) 148

23

The shaded region shown above represents the solution to which of the following systems of inequalities?

A) $y < x$
   $y \leq 4$

B) $y < x$
   $y \geq 4$

C) $y > x$
   $y \leq 4$

D) $y > x$
   $y \geq 4$

Miranda jogged home from a friend's house along a straight path without making any stops. The graph above gives Miranda's dist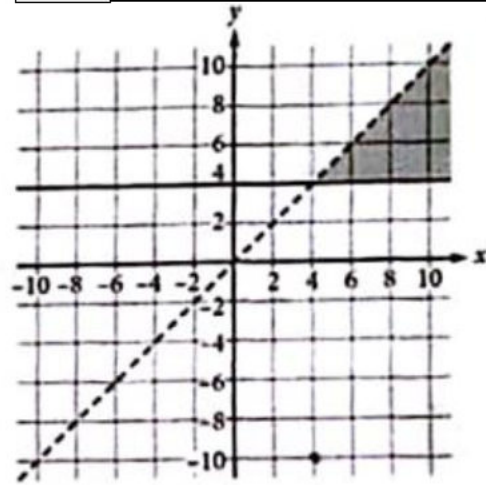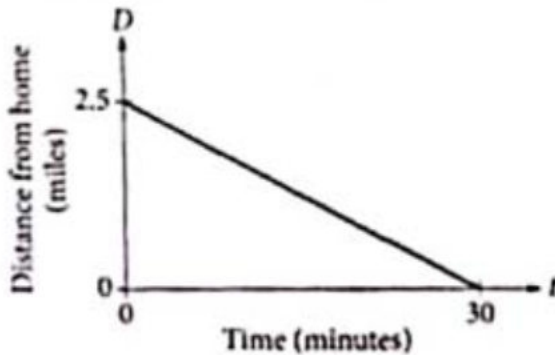ance D, in miles, from home as a function of the time t, in minutes, after she left her friend's house. Which of the following statements is true about Miranda's jog home?

A) Miranda's speed in miles per minute, decreased at a constant rate.

B) After jogging for approximately 2.5 miles, Miranda was 30 minutes from home.

C) Miranda's distance from home decreased at a constant rate of 12 miles per minutes.

D) Miranda's distance from home decreased at a constant rate of 1 mile per 12 minutes.

25

A polling agency conducted a survey about public opinion on car-sharing services. The agency surveyed a random sample of adult residents from three large cities in the United States and reported that 73% support car-sharing services, with an associated margin of error of 4%. Based on the study design, what is the largest population to which these survey results can be generalized?

A) All adult residents of the United States

B) All adult residents of large cities in the United States

C) All adult residents who support car-sharing services

D) All adult residents of the three large cities in the survey

26

$$\frac{2x - 6}{x^2 - x - 6}$$

Which of the following expressions is equivalent to the expression above for $x > 5$?

A) $\frac{1}{x+1}$

B) $\frac{1}{x-2}$

C) $\frac{2}{x-1}$

D) $\frac{2}{x+2}$

27

$$3x = 6y + 8$$

In the xy-plane, the graph of which of the following equations is perpendicular to the graph of the equation above?

A) $y = -2x + 10$

B) $y = -\frac{1}{3}x + 4$

C) $y = \frac{1}{2}x - 6$

D) $y = 2x - 6$

28

A data set consists of 50 positive values, and the mean of the data is m. A new data set is made by increasing each value in the original data set by 8. Which of the following represents the mean of the new data set in terms of m?

A) $m + 8$

B) $m + 50$

C) $8m$

D) $8m + 50$

29

A music artist released a new album. The function f models the weekly sales, in dollars, of the album x weeks since the first week of sales. The model predicts that each week the album will have 2% fewer sales than the previous week. Which of the following could define f?

A) $f(x) = 350(0.02)^x$

B) $f(x) = 350(0.80)^x$

C) $f(x) = 350(0.98)^x$

D) $f(x) = 350(1.02)^x$

30

If $a = \frac{2}{3}b + 4$, which of the following expresses b in terms of a?

A) $b = \frac{2}{3}a + 4$

B) $b = \frac{2}{3}a - 6$

C) $b = \frac{2}{3}a - 4$

D) $b = \frac{2}{3}a - 6$

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 circles accurately. You will receive credit only if the circles are filled in correctly.

2. Mark no more than one circle 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

Season	Number of birthdays
Spring	5
Summer	4
Autumn	x
Winter	7

The table above shows the number of birthdays in each of the four seasons for the students in a class. If 16 of the students' birthdays are in the summer or autumn, what is the value of x?

32

$$x + y = 7$$
$$x - y = 1$$

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

33
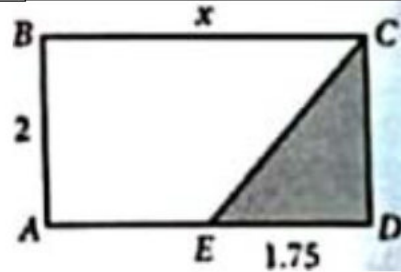
in rectangle $ABCD$ above, $AB = 2$ and $ED = 1.75$. If a point is selected at random from inside the rectangle, the probability that the point selected will be in the shaded region is 0.25. What is the value of x?

34

A right circular cylinder has a base area of 110 square inches and a volume of 1650 cubic inches. What is the height, in inches, of the cylinder?

35

At 1:00p.m. The population of bacteria in a liquid medium is 80 thousand. The population doubles every 40 minutes. If the population at 5:00 p.m. Will be n thousand, what is the value of n?

36

A class X cargo ship can hold a maximum of 18,000 standard containers. A class X cargo ship can hold 20% more containers than a class Y cargo ship. How many more containers can a class X cargo ship hold than a class Y cargo ship?

Question 37 and 38 refer to the following information.

Instrument	Rented	Owned	Total
Violin	8	12	20
Viola	5	5	10
Cello	6	2	8
Bass	5	1	6
Total	24	20	44

The table above shows the number of each type of string instrument played at a high school orchestra concert and the number of each type owned or rented.

37

What fraction of the violins played at the concert were rented?

38

An additional 4 cellos and x basses were played at the next concert. If the ratio of cellos to basses was the same for both concerts. What is the value of x?

Dec. 2018 Int. Ans. Key

Section 3		Section 4			
1	D	1	A	21	B
2	B	2	C	22	D
3	D	3	D	23	B
4	B	4	A	24	D
5	D	5	B	25	D
6	C	6	A	26	D
7	B	7	B	27	A
8	D	8	B	28	A
9	C	9	A	29	C
10	B	10	B	30	D
11	D	11	B	31	12
12	C	12	C	32	4
13	D	13	C	33	3.5
14	B	14	A	34	15
15	A	15	D	35	5120
16	1400	16	D	36	3000
17	9	17	A	37	2/5 or 0.4
18	2.5 or 5/2	18	A	38	3
19	22	19	C		
20	6 OR 12	20	C		