



Make-Up

SAT[®] Test March 2019

IMPORTANT REMINDERS

❶

A No. 2 pencil is required for the test.
Do not use a mechanical pencil or pen.

❷

Sharing any questions with anyone
is a violation of Test Security
and Fairness policies and may result
in your scores being canceled.



1

If $f(x) = (x - 5)(x^2 - 1)$, what is the value of $f(3)$?

- A) -16
- B) -8
- C) 16
- D) 35

2

Which of the following is equal to $-(2 - 7i) - (4 - 3i)$? (Note: $i = \sqrt{-1}$.)

- A) $-6 - 10i$
- B) $-6 + 10i$
- C) $-6 - 4i$
- D) $-6 + 4i$

3

What is the solution for x in the equation $4x + 7(3x - 6) = -2(-4x - 3)$?

- A) $\frac{4}{11}$
- B) $\frac{12}{11}$
- C) $\frac{16}{11}$
- D) $\frac{48}{17}$

4

Chris has a 12-fluid-ounce bottle of shampoo from which he uses $\frac{1}{2}$ fluid ounce of shampoo every day. Which of the following is an expression for the number of fluid ounces of shampoo that Chris will have left after n days?

- A) $12 + \frac{1}{2}n$
- B) $12 - \frac{1}{2}n$
- C) $12n - \frac{1}{2}$
- D) $12n + \frac{1}{2}$

5

$$3x - 2y = 8$$

$$y = 3$$

In the system of equations above, what is the value of x ?

- A) $\frac{1}{2}$
- B) $\frac{2}{3}$
- C) $\frac{14}{3}$
- D) $\frac{17}{2}$



6

Which of the following is a factor of $4x^2 + 20x + 25$?

- A) $x + 10$
- B) $2x - 5$
- C) $2x + 5$
- D) $4x + 25$

7

On a 1,400-mile trip, a car averaged m miles per gallon of gasoline, and the average cost of gasoline was p dollars per gallon. What does $\frac{1,400p}{m}$ represent in relation to the trip?

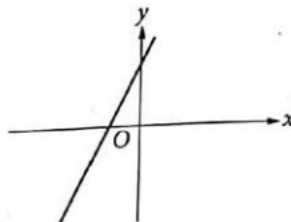
- A) The total time, in minutes, the car spent on the trip
- B) The total time, in hours, the car spent on the trip
- C) The amount of gasoline, in gallons, used on the trip
- D) The total cost, in dollars, of gasoline used on the trip

8

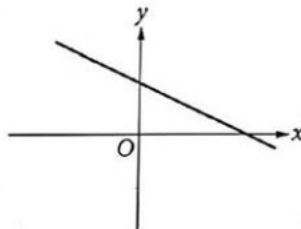
$$f(x) = -\frac{1}{2}(x-4) + 1$$

Which of the following could be the graph of the function f above in the xy -plane?

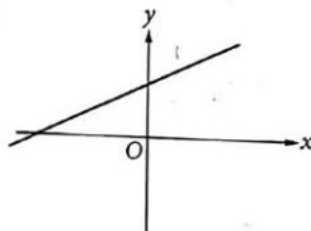
A)



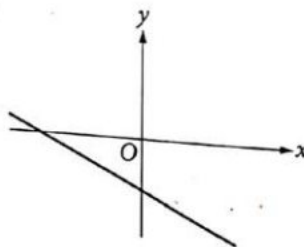
B)



C)



D)





9

The graph of $y = 8x - 5$ in the xy -plane is a line ℓ . Which of the following is an equation of the line that passes through the point $(2, 1)$ and is perpendicular to line ℓ ?

- A) $y = 8x - 1$
- B) $y = 8x - 15$
- C) $y = -\frac{1}{8}x + \frac{5}{4}$
- D) $y = -\frac{1}{8}x + \frac{17}{8}$

10

$$3 - \sqrt{x} = b$$

For which of the following values of b does the equation above have at least one real solution for x ?

- A) 1
- B) 4
- C) 5
- D) 9

11

Color choice	Print size (inches)			Total
	4 × 6	5 × 7	8 × 10	
Black/white	x	x	y	500
Color	$x + y$	y	y	500

The table above shows the distribution of 1,000 photographs developed by a professional photographer by print size and color choice. How many 5×7 photographs did the photographer develop?

- A) 100
- B) 200
- C) 300
- D) 400

12

The function $f(x) = 48.28x^2 - 334.70x + 785.96$ can be used to model the number of locations of a particular chain of grocery stores, where x is the number of years since 2005. If the same relationship was to be presented using a new function, g , such that $g(y)$ predicts the number of locations y years since 2010, which of the following could define g ?

- A) $g(y) = 48.28y^2 - 334.70y + 319.46$
- B) $g(y) = 48.28y^2 - 334.70y + 785.96$
- C) $g(y) = 48.28(y + 5)^2 - 334.70(y + 5) + 319.46$
- D) $g(y) = 48.28(y + 5)^2 - 334.70(y + 5) + 785.96$



13

If $\sqrt{x^4y} + \left(xy^{\frac{1}{4}}\right)^2 = 8$, what is the value of x^4y ?

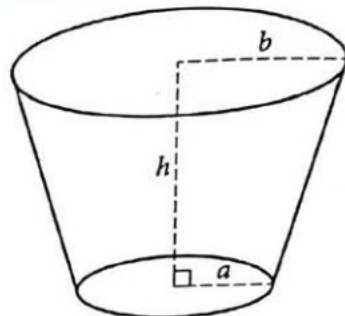
- A) 16
- B) 8
- C) 4
- D) 2

14

If the graph of $y = x^2 + 6x + c$ in the xy -plane does NOT cross the x -axis, which of the following is a possible value of c ?

- A) -9
- B) 0
- C) 6
- D) 12

15



$$V = \frac{1}{3} \pi h (a^2 + ab + b^2)$$

The figure and formula above are used to calculate the volume V of a conical frustum, using the distance h between the circular base with radius a and the circular base with radius b . If the ratio of a to b is 2:3, which of the following expresses h in terms of V and a ?

- A) $h = \frac{7V}{2\pi a^2}$
- B) $h = \frac{2V}{7\pi a^2}$
- C) $h = \frac{19V}{12\pi a^2}$
- D) $h = \frac{12V}{19\pi a^2}$

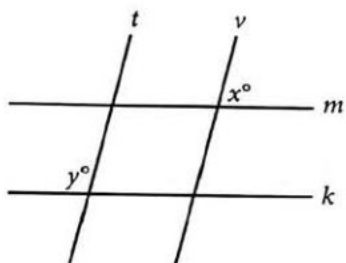


16

$$\frac{2x-5}{4} = -1$$

According to the equation above, what is the value of x ?

17



Note: Figure not drawn to scale.

In the figure above, lines m and k are parallel and lines t and v are parallel. If $103 \leq y \leq 104$, what is one possible value of x ?

18

The function k is defined as $k(x) = x^2 + 3x + n$, where n is a constant. If $k(2) = 9$, what is the value of $k(-4)$?

19

$$\begin{aligned} ax + 3y &= 10 \\ -2x + by &= 10 \end{aligned}$$

In the system of equations above, a and b are constants, and the solution (x, y) to the system is $(-1, -4)$. What is the value of ab ?

20

The circumference of a circle is 10π . A central angle of the circle intercepts an arc of length greater than or equal to 6 and less than or equal to 8. What is one possible measure of the angle in radians?

STOP

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



1

To rent a room for a party at an ice-skating rink, the charge is \$50 plus \$2 per person attending the party. What is the difference in total cost, in dollars, of a party that 30 people are attending and a party that 12 people are attending?

- A) 18
- B) 24
- C) 36
- D) 74

2

Water pours from a faucet at the rate of 1 quart every minute. How long will it take to fill a 5-gallon jug from the faucet? (1 gallon = 4 quarts)

- A) 5 minutes
- B) 15 minutes
- C) 20 minutes
- D) 25 minutes

3

If $c + 6 = 20$ and $d - 6 = 10$, what is the value of $c + d$?

- A) 10
- B) 14
- C) 20
- D) 30

4

The gas tank in Aubrey's car holds 15 gallons of gas when full. On average, her car travels 30 miles per gallon of gas. At this rate, how many miles can she travel on 3 full tanks of gas?

- A) 1,350
- B) 900
- C) 675
- D) 450

5

Mass-Weight Relationship on Planet X

	Mass of object (kg)	Weight of object (N)
Object 1	10	37
Object 2	20	74

The table above shows the mass, in kilograms (kg), and the weight, in newtons (N), of two objects on the surface of Planet X. The mass-weight relationship is proportional on the surface of Planet X. What is the weight, in newtons, of a 30 kg object on the surface of Planet X?

- A) 3.7
- B) 8.1
- C) 80
- D) 111



6

The cost of renting a truck is \$75 per day plus \$0.30 per mile driven. Craig paid \$88.50 to rent the truck for one day. For how many miles of driving was Craig charged?

- A) 13
- B) 45
- C) 295
- D) 545

7

Jen must buy 20 yards of rope for rock climbing. She goes to a store that charges \$1.20 per foot for rock-climbing rope. How much will Jen spend for the 20 yards of rope at this store? (1 yard = 3 feet)

- A) \$7.20
- B) \$24.00
- C) \$36.00
- D) \$72.00

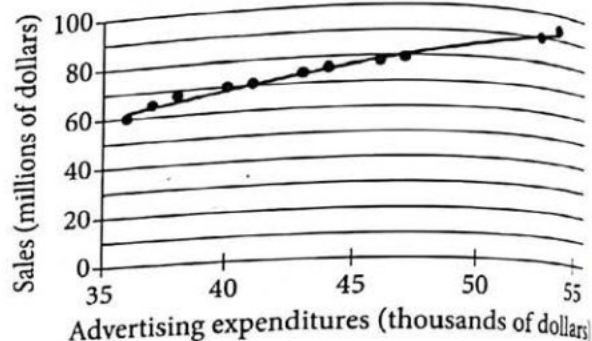
8

If $x < y$ and $y + 3 < 7$, which of the following could be the value of x ?

- A) 3
- B) 4
- C) 5
- D) 7

9

Sales versus Advertising Expenditures



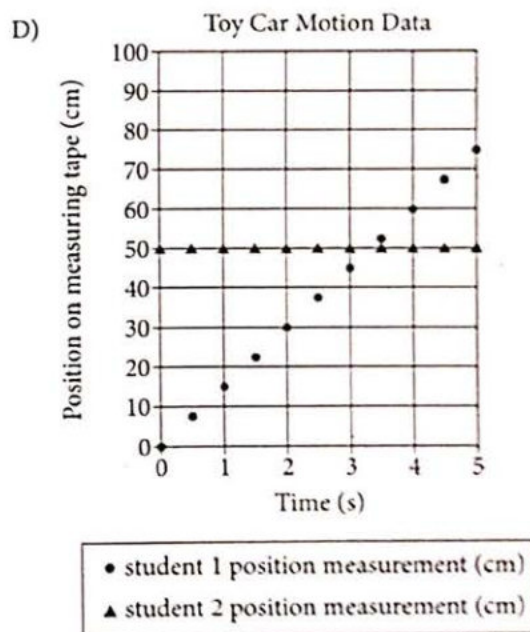
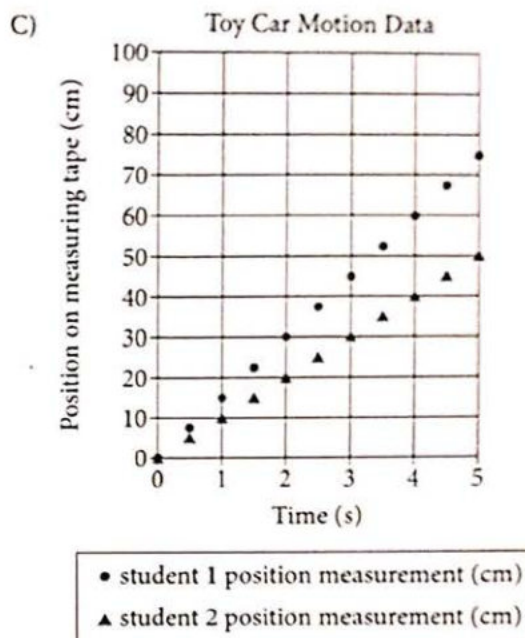
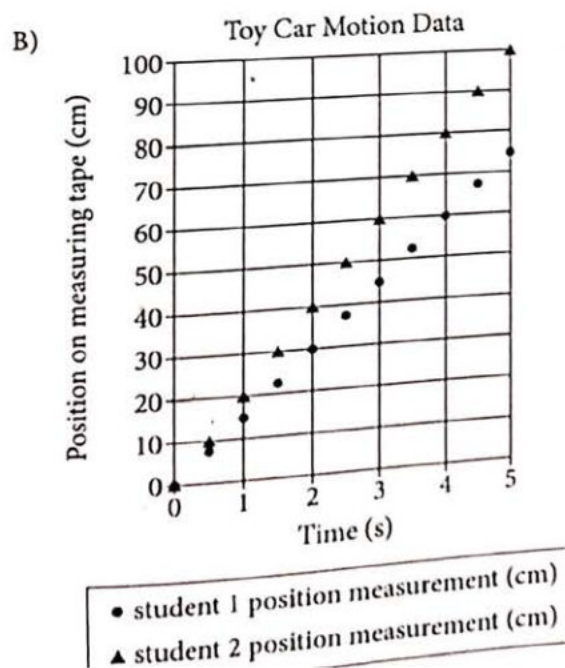
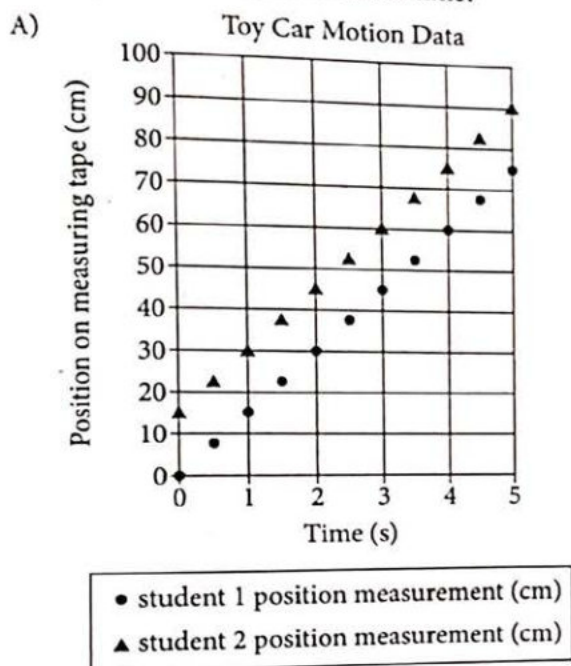
The scatterplot above shows a company's sales and advertising expenditures for each of 11 years. The line of best fit is also shown. According to the line of best fit, of the following, which is closest to the predicted sales for a year in which advertising expenditures were \$50,000?

- A) \$80,000,000
- B) \$85,000,000
- C) \$90,000,000
- D) \$95,000,000



10

Two students decide to observe a toy car as it travels along a straight track. Each student places a tape measure along the track, with the ends of the tape measures at different positions along the track. As the car travels along the track, which of the following graphs could represent the position of the car on each tape measure as a function of time?





11

x	-5	-3	-2	1	4
y	6.5	5.5	5	3.5	2

The table above shows some values of the variable x and the corresponding values of the variable y . Which of the following equations could represent the relationship between x and y ?

- A) $x - 2y = 4$
- B) $x + 2y = 8$
- C) $y = -x + \frac{3}{2}$
- D) $y = \frac{8 - x}{4}$

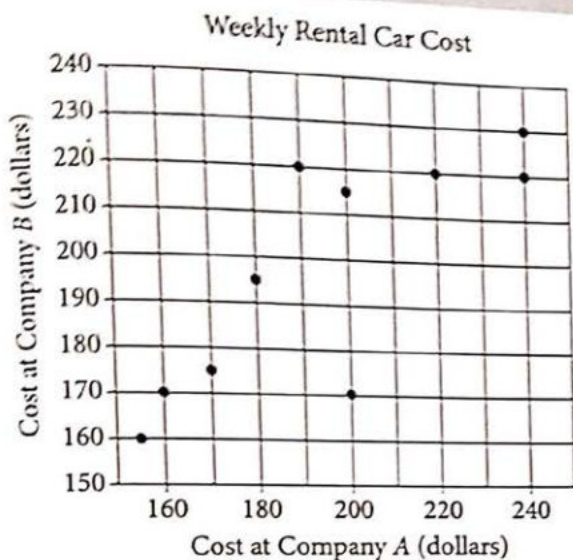
12

A rectangular parking lot is to be built to have a width of 100 yards and an area of at least 12,000 square yards but not greater than 13,000 square yards. The parking lot has length ℓ yards. The possible values of ℓ can be found by solving which of the following inequalities?

- A) $100\ell \geq 12,000$
- B) $100\ell \leq 13,000$
- C) $12,000 \leq 100\ell \leq 13,000$
- D) $12,000 \leq 100 + \ell \leq 13,000$



13



The scatterplot above shows the weekly rental cost, with unlimited mileage, of ten car models at two rental companies. Based on the scatterplot, for how many of the car models is the weekly rental cost at Company A greater than at Company B?

- A) Three
- B) Four
- C) Six
- D) Seven

14

Let a and b be constants such that

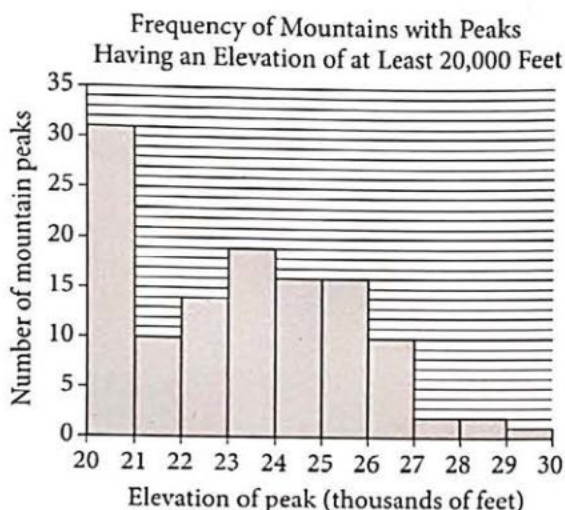
$$\frac{6x^2 + 4x - 9}{ax + b} = 2x + 4 + \frac{7}{ax + b} \text{ for all } x. \text{ What is the}$$

product ab ?

- A) -3
- B) -12
- C) -18
- D) -27



Questions 15 and 16 refer to the following information.



The histogram above shows the distribution of the peak elevations of the 121 mountains having peaks that are 20,000 feet or more above sea level. The first bar represents the number of mountain peaks with elevations of at least 20,000 feet but less than 21,000 feet. The second bar represents the number of mountain peaks with elevations of at least 21,000 feet but less than 22,000 feet, and so on.

15

Of the following, what is the best approximation of the percent of the 121 mountain peaks having elevations greater than 20,000 feet but less than 22,000 feet?

- A) 25%
- B) 34%
- C) 41%
- D) 50%

16

Which of the following could be the median elevation, in feet, of the 121 mountain peaks?

- A) 21,876
- B) 22,329
- C) 23,891
- D) 24,227

17

Do you think the Electoral College should no longer be used to elect the president?

A sample of 200 male students selected at random from a large university was asked the survey question shown above. Of those surveyed, 62 responded yes. For which of the following populations is 31 percent a reasonable estimate of the true proportion from that population that would respond yes to the survey question?

- A) All males
- B) All students
- C) All students who attend the large university
- D) All male students who attend the large university



18

Which of the following equations has exactly one solution?

- A) $x(x + 4) = 0$
- B) $(x + 1)(x - 1) = 0$
- C) $(x + 3)(x + 3) = 0$
- D) $(x - 1)(x - 3) = 0$

Questions 19 and 20 refer to the following information.

$$F = P(1 + r)^n$$

A broker uses the formula above to estimate the future value F of an investment. The investment P earns an annual rate of return r for n years.

19

What is the investment P in terms of F , r , and n ?

- A) $P = F(1 + r)^n$
- B) $P = \frac{(1 + r)^n}{F}$
- C) $P = \frac{F}{n(1 + r)}$
- D) $P = \frac{F}{(1 + r)^n}$

20

If the investment P is doubled, by what percent does the future value F increase?

- A) 50%
- B) 100%
- C) 150%
- D) 200%



21

Michael is decorating a right circular cylindrical candy jar by wrapping a piece of ribbon around the jar to form a circle. If the jar has a volume of 471 cubic inches and a height of 6 inches, which of the following is closest to the minimum length, in inches, of ribbon that goes around the jar?

- A) 15.7
 B) 31.4
 C) 47.1
 D) 78.5

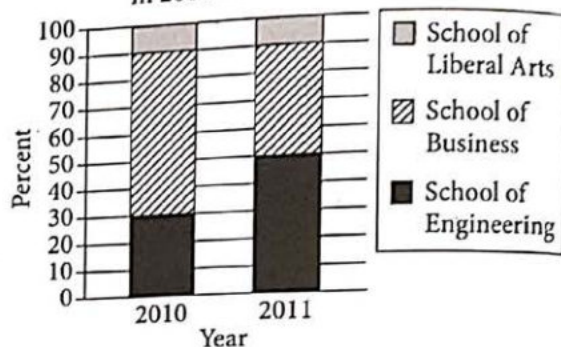
22

The cost of d dozen doughnuts is k dollars. At this rate, which of the following represents the cost of one doughnut? (1 dozen = 12)

- A) $\frac{k}{12d}$
 B) $\frac{d}{12k}$
 C) $\frac{12k}{d}$
 D) $\frac{12d}{k}$

23

Distribution of Enrollment
 at a University by School
 in 2010 and 2011



The segmented bar graph above shows the distribution of students at a university by school in 2010 and 2011. There were 10,000 students enrolled at the university in 2010. If there were 3,000 more students enrolled at the School of Engineering in 2011 than in 2010, which of the following best approximates the increase in the total number of students enrolled at the university from 2010 to 2011?

- A) 2,000
 B) 3,000
 C) 4,000
 D) 5,000



Questions 24 and 25 refer to the following information.

The student government at a college gave out promotional T-shirts to incoming freshmen over a 30-day period. By the end of the 16th day, 32 percent of the T-shirts had been distributed, and after another 8 days, a total of 44 percent of the T-shirts had been distributed. The relationship between the day of the promotion in the 30-day period and the percent of T-shirts that had been distributed is linear from the end of the first day until the end of the promotion.

24

By the end of which day were 38 percent of the T-shirts distributed?

- A) The 19th day
- B) The 20th day
- C) The 21st day
- D) The 22nd day

25

$$N = cd + k$$

In the formula above, N is the total number of T-shirts distributed by the end of day d , where c and k are constants. What does c represent?

- A) The percent of T-shirts distributed after the first day
- B) The percent of T-shirts distributed on day 1
- C) The number of T-shirts distributed per day after the first day
- D) The ratio of the total number of T-shirts distributed to the total number of days of the promotion

26

One mole of substance S contains 6.02×10^{23} molecules. If a sample of substance S contains 1.20×10^{22} molecules, approximately how many moles of substance S are in the sample?

- A) 0.50
- B) 0.20
- C) 0.050
- D) 0.020



27

A chemical company sells pure chemical *C* for \$89 per milliliter. At this rate, approximately how much would 0.15 liter of a 3% solution of chemical *C* cost? (Assume the cost of the solution is exactly the cost of the chemical *C* in the solution.)

- A) \$4
- B) \$40
- C) \$400
- D) \$4,000

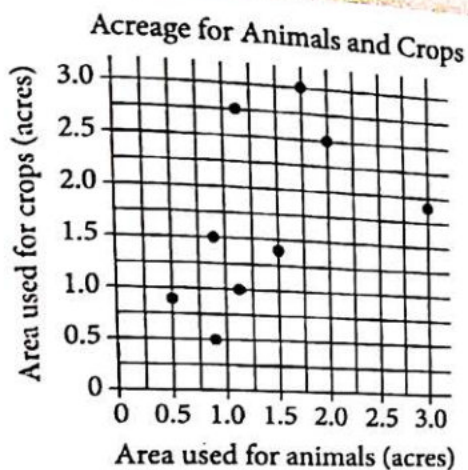
28

Results of Test for Exposure
to an Infectious Agent

	Positive	Negative
Exposed	126	3
Not exposed	191	12,553

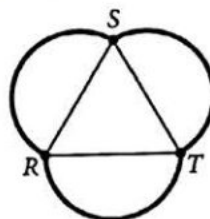
A test was done on 12,873 people to determine if they were exposed to an infectious agent. The table above shows the distribution of the results by whether a person was or was not exposed and whether the person tested positive or negative. According to the table, if a person tests positive for exposure, what is the approximate probability that the person was actually not exposed to the infectious agent?

- A) 1.5%
- B) 2.3%
- C) 40%
- D) 60%



The scatterplot above shows the areas of farmland used for animals and for crops on each of 9 farms. How many of the farms use at least 1.5 times but not more than 2 times as many acres for crops as for animals?

- A) 1
- B) 2
- C) 3
- D) 5



In the figure above, $\triangle RST$ is equilateral and each side of $\triangle RST$ is the diameter of a semicircle. If the total length of the three semicircles is 9π , what is the perimeter of $\triangle RST$?

- A) 6
- B) 9
- C) 12
- D) 18



31

A chemistry student repeated 4 trials of the same reaction and recorded how long it took for each reaction to be completed. The recorded times, in seconds, were 15, 10, 12, and 13. What is the average (arithmetic mean) of the number of seconds for the trials?

32

$$C = \frac{100w}{\ell}$$

The cephalic index C , shown above, can be used to classify animal skulls. The index is determined using the length ℓ and the width w of the skull. If a skull's cephalic index is at least 80 but no more than 90 and the length of the skull is 5 inches, what is a possible width, in inches, of the skull?

33

$$h(t) = 5 - 0.01t$$

Ashmit uses the function h defined above to model the height of water, in feet, of one pool at the fish hatchery t minutes after he starts draining it. According to the model, how many minutes after Ashmit starts draining the pool will the height of water be 3 feet?

34

High School Language Club Membership

	French	Mandarin	Spanish
Females	24	4	36
Males	11	7	28

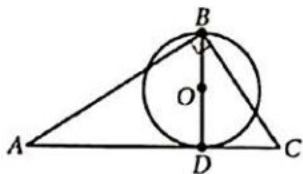
The table above shows the number of females and males in three different language clubs at a high school. What fraction of the students in the Spanish club are males?



35

If $(x - 8)^2$ is added to $(2x + 4)^2$, the result is how much greater than $5x^2$?

36



In the figure above, \overline{BD} is a diameter of the circle and $\triangle ABC$ is a right triangle. The circle is tangent to \overline{AC} at point D . If $AD = 9$ and $CD = 4$, what is the length of \overline{BD} ?

Questions 37 and 38 refer to the following information.

Due to a viral infection, the population of panda bears in a certain area in China was estimated to have decreased at an annual rate of 40 percent, for five consecutive years.

After the five years, biologists developed a vaccine that helped the panda bears become immune to the virus. The population of panda bears in the region then began to increase at an annual rate of 20 percent.

37

If the initial population of panda bears was 310, what was the population of panda bears five years after the virus started to spread? (Give your answer to the nearest integer.)

38

How many years after the population of panda bears reaches its lowest point will the population equal its original size? (Give your answer to the nearest integer.)

STOP

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