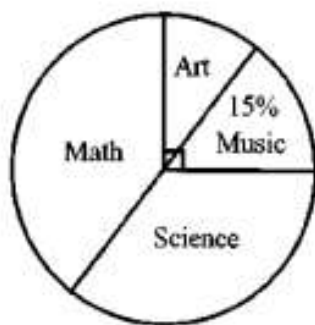




1



A total of 40 students in Mr. Lee's class voted for their favorite subject. The results are shown in the pie chart above. How many students voted for math?

- A) 12
- B) 14
- C) 16
- D) 18

2

If $3r + 5 = 10$, what is the value of $6r + 5$?

- A) 10
- B) 15
- C) 20
- D) 21

3

If $a^{-2} = \frac{1}{5}$, what is the value of $5a^2$?

- A) 1
- B) 5
- C) 10
- D) 25

4

When a certain number p is divided by 10, the quotient is k and the remainder is r . Which of the following expressions represents r ?

- A) $r = p - 10k$
- B) $r = 10p - k$
- C) $r = 10(k - p)$
- D) $r = 10k - p$

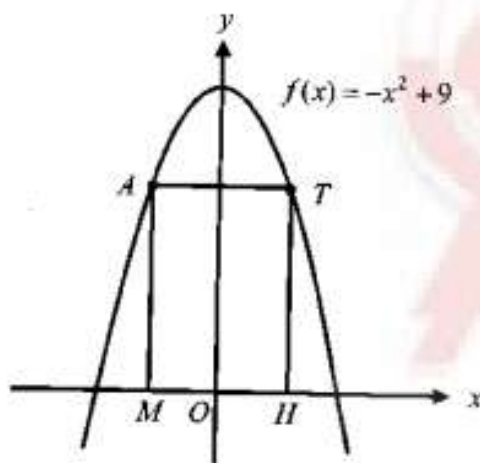


5

If $\frac{5}{12} = \frac{1}{a} + \frac{1}{b}$ and $ab = 24$, what is the value of $a + b$?

- A) 25
- B) 13
- C) 11
- D) 10

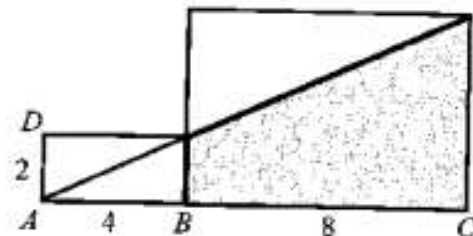
6



The graph of function f is shown in the xy -plane above. If length of \overline{MA} of the rectangle $MATH$ is 5, what is the length of \overline{AT} ?

- A) 2
- B) 2.5
- C) 3
- D) 4

7



Two rectangles are shown in the figure above. If $AB = 4$, $AD = 2$, and $BC = 8$, what is the area of the shaded region?

- A) 32
- B) 36
- C) 48
- D) 64

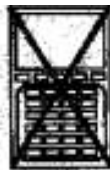
8

$$ax - by = 9$$

$$3x + y = 3$$

If the system of linear equations above has infinitely many solutions, what is the value of $a + b$?

- A) -3
- B) 6
- C) 9
- D) 12



9

x	$g(x)$
-3	6
-2	0
0	-6
2	-2
3	0
4	6

The function g is defined by a polynomial. Some selected values of x and $g(x)$ are shown in the table above. Which of the following is true?

- I. $(x - 3)$ is a factor of $g(x)$.
- II. $(x - 2)$ is a factor of $g(x)$.
- III. $(x + 2)$ is a factor of $g(x)$.

- A) I and II only
 B) I and III only
 C) II and III only
 D) I, II, and III

10

If y is inversely proportional to x^2 , and $y = 10$ when $x = 2$, what is the value of y when $x = 10$?

- A) $\frac{2}{5}$
 B) 2
 C) 50
 D) 250

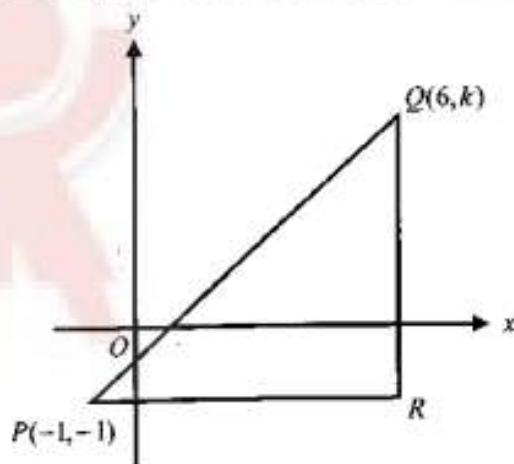
11

$$y = k(x - 4)(x + 2)$$

The graph of the quadratic equation above, where k is a constant, has a vertex at point (a, b) in the xy -plane. Which of the following is equal to a ?

- A) -1
 B) 0
 C) 1
 D) 2

12



The figure PQR in the xy -plane is an isosceles right triangle. Which of the following is equal to k ?

- A) 6
 B) 7
 C) 8
 D) 9



13

$$\frac{2i}{1-i} = a + bi$$

If $i = \sqrt{-1}$ in the equation above, where a and b are constants, what is the value of a ?

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

14

$$\frac{1}{x} = \frac{x}{2x+1}$$

What are the solutions to the equation above?

- A) $x = -1 \pm \sqrt{2}$
- B) $x = 1 \pm \sqrt{2}$
- C) $x = 1 \pm \sqrt{3}$
- D) $x = \frac{1 \pm \sqrt{2}}{2}$

15

$$P = \frac{9}{2}K + 40$$

The equation above shows how the value of P relates to the value of K . Based on the equation, which of the following must be true?

- I. When the value of K increases by 1, the value of P increases by 40.
- II. When the value of K increases by 2, the value of P increases by 9.
- III. When the value of K increases by 4, the value of P increases by 18.

- A) I and II only
- B) I and III only
- C) II and III only
- D) I, II, and III



16

$$x^2 - ax = -10$$

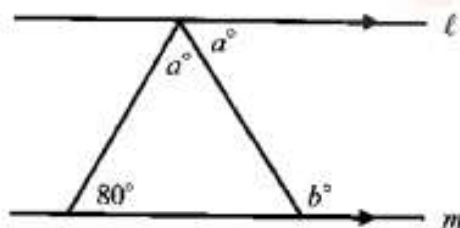
The quadratic equation above has two real solutions. If one of the solutions is 5 and a is a constant, what is the other solution?

17

$$\frac{15}{x-1} - 7 = 3 - \frac{5}{x-1}$$

If $x > 1$, what is the solution to the equation above?

18

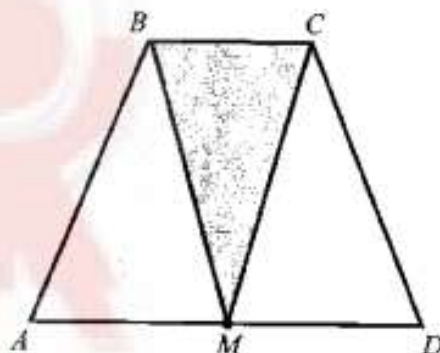


In the figure above, line ℓ is parallel to line m . What is the value of b ?

19

At a certain party, an executive committee provided one soda for 8 people, one large bag of chips for 4 people, and one cheese cake for 6 people. If the total number of sodas, large bag of chips, and cheese cakes was 78, how many people were at the party?

20



The figure above shows trapezoid $ABCD$. If M is the midpoint of \overline{AD} and $AD = 3 \cdot BC$, what fraction of the area of the trapezoid is shaded?

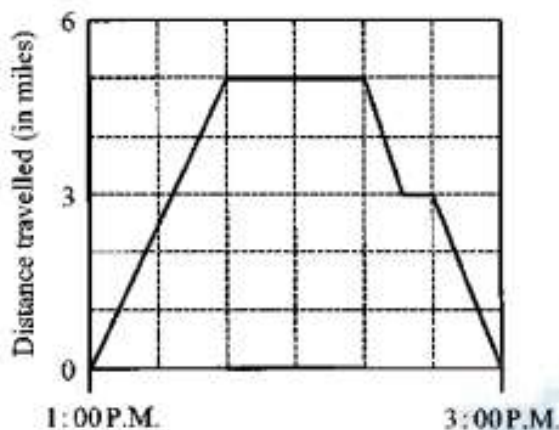
STOP

If you finish before time is called, you may check your work on this section only.

Do not turn to any other section in the test.



1



Bernard began to ride a bicycle to the town library, and then rode to the book store to buy a novel. After 10 minutes, he began to ride home again. If the graph above shows his trip, how long did he stay in the library?

- A) 10 minutes
- B) 20 minutes
- C) 30 minutes
- D) 40 minutes

2

If $\frac{2}{k} = 9$ and $9k + h = 20$, what is the value of h ?

- A) 9.5
- B) 12
- C) 15.5
- D) 18

3

n	-1	0	1	2	a
$f(n)$	0	3	6	9	b

The table above shows some values of the linear function f . Which of the following defines b ?

- A) $b = a + 3$
- B) $b = a + 5$
- C) $b = 2a + 4$
- D) $b = 3a + 3$

4

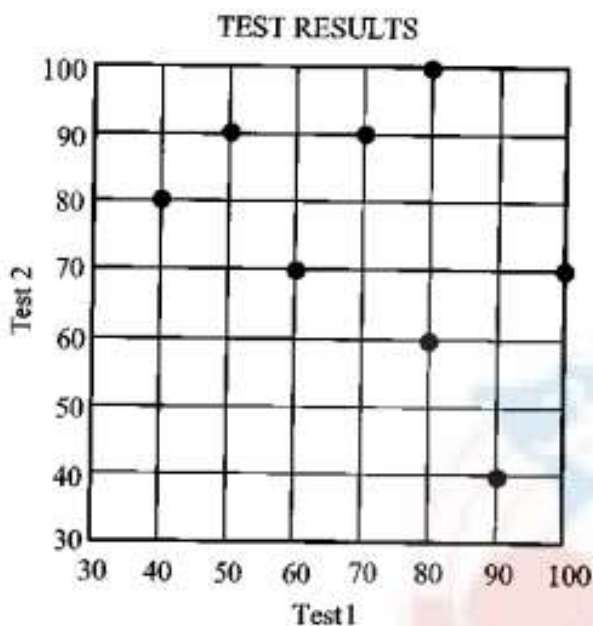
Gender	Subject		Total
	Art	Music	
Males	30		65
Females		20	
Total			100

The incomplete table above shows the results of a survey about subject preference given to 100 students. What is the probability of art students being females?

- A) $\frac{7}{25}$
- B) $\frac{1}{3}$
- C) $\frac{1}{4}$
- D) $\frac{2}{5}$



Questions 5 and 6 refer to the following information.



The scatterplot above relates two sets of data on a graph and shows the results of a class of students' last two algebra tests. Both the vertical and horizontal axes show the scores.

5

What is the average (arithmetic mean) score for Test 1?

- A) 68.35
- B) 70.50
- C) 71.25
- D) 74.75

6

Which of the following is the greatest change in scores between test 1 and test 2?

- A) 60
- B) 50
- C) 40
- D) 30

7

$$L = 0.2(t - 2010) + 10$$

The lifespan of a certain bird has been tracked from the year 2010, and the average lifespan is modeled by the equation above. In 2010 the lifespan of the bird was 10 years. What is the meaning of the number 0.2 in the equation?

- A) The lifespan in the year 2010
- B) The life span increase each year from 2010
- C) The lifespan increase every 10 year
- D) The life span decrease each year from 2010

8

$$x^2 - 2x + y^2 + 2y - 3 = 0$$

The equation of a circle in the xy -plane is shown above. What is the diameter of the circle?

- A) $\sqrt{5}$
- B) $2\sqrt{5}$
- C) 5
- D) 10



9

$$\begin{aligned}x - 4y &= -3 \\4x - y &= 12\end{aligned}$$

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

- A) 5
- B) 6
- C) 8
- D) 9

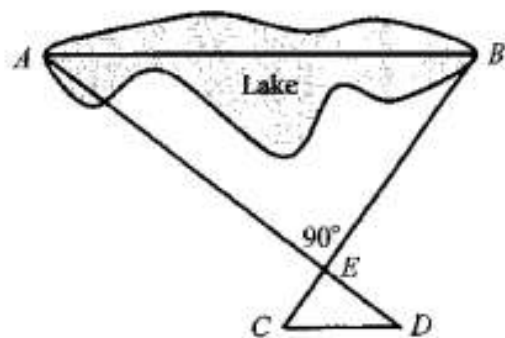
10

$$(a^k)^{\frac{2}{3}} = \frac{1}{a^2}$$

In the equation above, if $a > 0$, what is the value of k ?

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

11



Jackson wants to measure the length AB of a lake. In the figure above, \overline{AB} is parallel to \overline{CD} , $DE = 6$ feet, $CD = 10$ feet, and $BE = 300$ feet. What is the length of the lake?

- A) 250 feet
- B) 275 feet
- C) 375 feet
- D) 500 feet

12

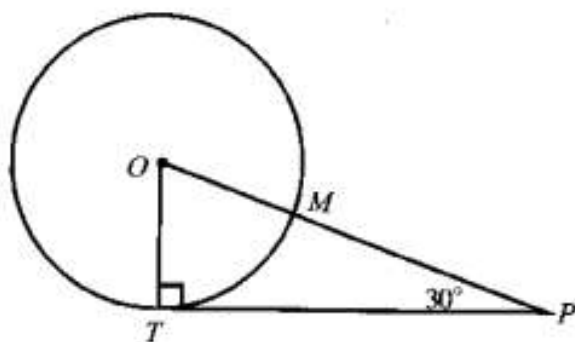
$$2x^2y - 3xy^2 - xy(3x + 5y - 2)$$

Which of the following is equivalent to the expression above?

- A) $xy(x - 8y - 2)$
- B) $xy(x + 8y - 2)$
- C) $-xy(x - 8y + 2)$
- D) $-xy(x + 8y - 2)$



13



In the figure above, point O is the center of the circle. If the length of \overline{TP} is $10\sqrt{3}$, what is the length of minor arc \widehat{TM} ?

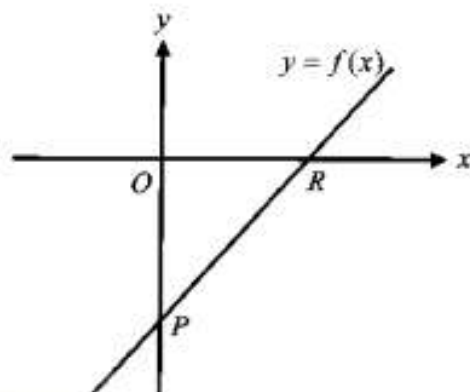
- A) $\frac{5\pi}{3}$
- B) $\frac{7\pi}{3}$
- C) $\frac{8\pi}{3}$
- D) $\frac{10\pi}{3}$

14

A certain number is proportional to another number in the ratio 3 : 7. If 12 is subtracted from the sum of the numbers, the result is 38. What is the average (arithmetic mean) of the numbers?

- A) 10
- B) 12
- C) 25
- D) 40

15



The function f , defined by $f(x) = mx - m$, is graphed in the xy -plane above. Which of the following expressions represents the area of triangle OPR ?

- A) $\frac{m}{2}$
- B) m
- C) $\frac{m^2}{2}$
- D) m^2

16

If pipe S can fill a certain water tank in 3 hours and pipe U can empty it in 4 hours, how long, in hours, would it take to fill the empty tank when both pipes are open?

- A) 6
- B) 8
- C) 10
- D) 12



17

$$\frac{1}{R} + \frac{1}{S} = \frac{1}{T}$$

When electrical circuits are connected in parallel, the reciprocal of the total resistance is found by adding the reciprocals of each resistance as shown above. Which of the following gives S in terms of R and T ?

- A) $S = \frac{R-T}{RT}$
 B) $S = \frac{T-R}{RT}$
 C) $S = \frac{RT}{R-T}$
 D) $S = \frac{RT}{T-R}$

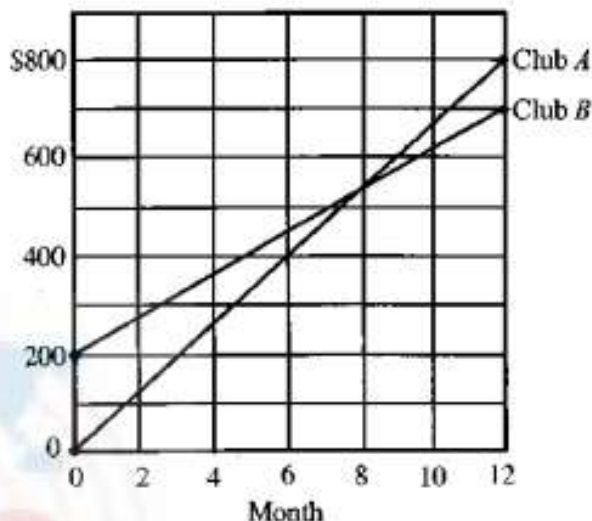
18

$$h(t) = 36t - 6t^2$$

The function h above shows the height, in feet, of an object thrown upward after t seconds. How long, in seconds, does the object stay in the air higher than 48 feet?

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

Questions 19 and 20 refer to the following information.



Two health clubs offer different membership plans. The graph above shows the yearly cost, including a membership fee plus a monthly charge, for each club.

19

Which of the following is closest to the monthly charge, in dollars, for club B?

- A) 42
 B) 67
 C) 70
 D) 72

20

Which of the following best approximates the total cost, in dollars, for club B when both plans are the same?

- A) 510
 B) 525
 C) 533
 D) 550



21

$$y = a(x-2)^2 + b$$

$$y = 5$$

In the system of equations above, for which of the following values of a and b does the system have no solution?

- A) $a = 1$ and $b = -4$
- B) $a = 2$ and $b = 5$
- C) $a = -1$ and $b = 6$
- D) $a = -2$ and $b = 4$

22

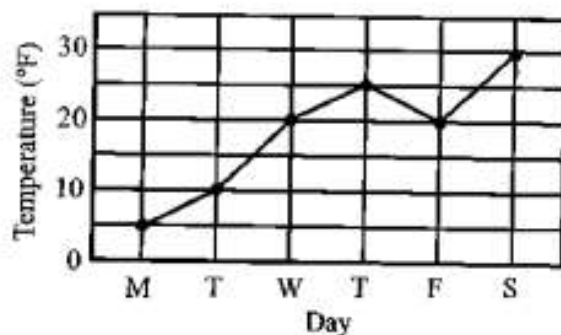
$$D(t) = 30 - at^2$$

An apple falls from the branch of a tree to the ground 30 feet below. The distance, D , the apple is from the ground is represented by the equation above, where a is a constant and t is time in seconds.

If $D(0.1) - D(0.2) = 6$, what is the value of a ?

- A) 160
- B) 180
- C) 200
- D) 240

23

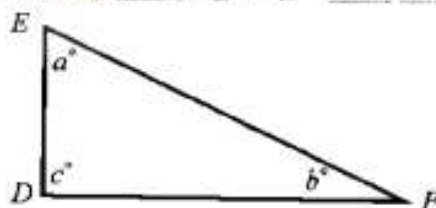


The graph above shows the daily high temperatures in Albany, New York, for 6 days in January. Which of the following describes the data?

- I. mean = median
- II. mean = mode
- III. median = mode

- A) I and II only
- B) II and III only
- C) III only
- D) I, II, and III

24



Note: Figure not drawn to scale.

In the figure above, if $\sin(a^\circ) = \cos(b^\circ)$, which of the following must be true?

- A) $a = b$
- B) $a > b$
- C) $a = 60$
- D) $c = 90$

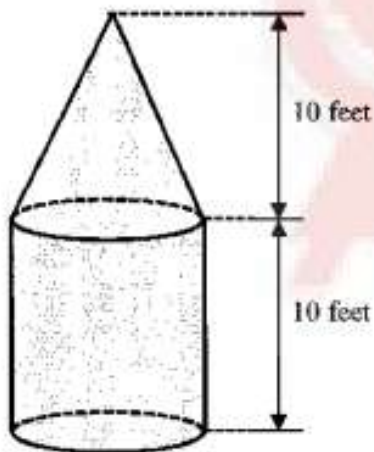


25

In an art class, $\frac{2}{3}$ of the students are girls and $\frac{2}{5}$ of girls are seniors. If $\frac{1}{3}$ of senior girls have passed the final art test, which of the following could be the number of students in this class?

- A) 20
- B) 30
- C) 45
- D) 60

26



The figure above shows a silo built from a right circular cone and a right circular cylinder. If the volume of the cylinder is 1911 cubic feet, what is the volume of the silo, in cubic feet?

- A) 2125
- B) 2548
- C) 2684
- D) 3017

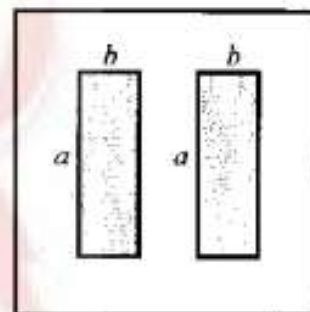
27

$$k = x^2 - 5x$$

In the equation above, for how many integers x is the number k negative?

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

28

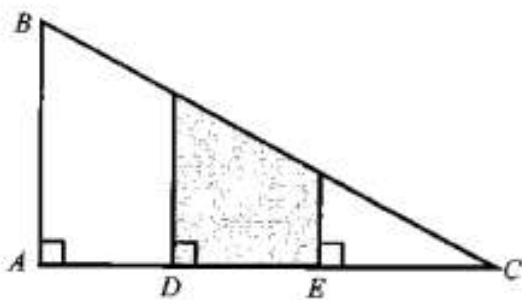


In figure above, two identical rectangles lie inside a square and the dimensions of the rectangle are a and b respectively. If the distance from the rectangles to the square and each other are 4 inches, and $a:b = 5:2$. What is the area of the square in square inches?

- A) 625
- B) 676
- C) 729
- D) 784



29



In the figure above, $AD = DE = EC$. If the area of triangle ABC is 81, what is the area of the shaded region?

- A) 24
- B) 27
- C) 30
- D) 40.5

30

$$a - b + 3i\sqrt{5} = \sqrt{5} + (a + b)i$$

In the equation above, a and b are constants. If $i = \sqrt{-1}$, what is the value of $a^2 - b^2$?

- A) $8\sqrt{3}$
- B) 12
- C) 15
- D) $12\sqrt{3}$



31

x	$f(x)$
1	7
3	13
5	19
a	b

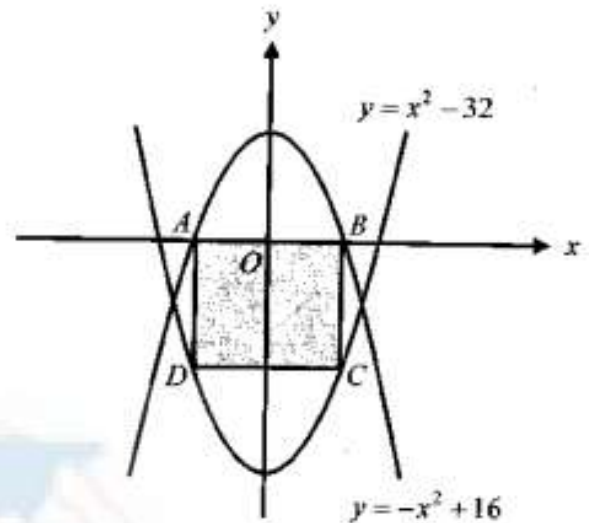
x	$g(x)$
0	12
1	14
2	16
a	b

The tables above show some values of the linear functions f and g . What is the value of $a+b$?

32

Mr. Benjamin has brought grammar work books to distribute to the students in his reading class. If he gives each student 5 books, he will have 10 books left over, and if he gives each student 7 books, he will need an additional 20 books. How many students are in the class?

33



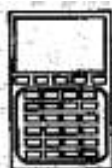
In the xy -plane above, what is the area of rectangle $ABCD$?

34

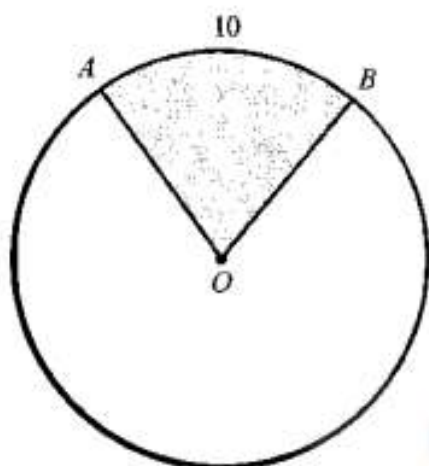
$$f(x) = x^2 + ax + b$$

$$g(x) = f(x-3)$$

In the functions above, a and b are constants. If $g(3) = 5$ and $g(4) = 10$, what is the value of a ?



35



In the figure above, central angle AOB has a measure of $\frac{\pi}{3}$ radians. If the length of minor arc \widehat{AB} is 10, what is the area of the shaded sector? (Round your answer to the nearest tenth.)

36

$$P(x) = x^2 + 4x - k$$

In the quadratic function above, if $P(0) = 5$, what is the minimum value of P ?

Questions 5 and 6 refer to the following information.

$$R = 100x$$

$$C = 85x + 2000$$

A smartphone production company expressed a relationship between revenue (R) and cost (C) for selling x units of a product as shown above.

37

For what value of x will the product start to return a profit?

38

For what value of x , will the company achieve a profit of \$100,000?