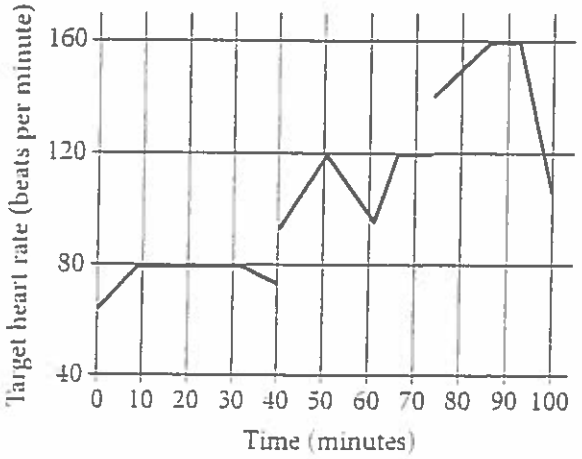
Geometry

1

John runs at different speeds as part of his training program. The graph shows his target heart rate at different times during his workout. On which interval is the target heart rate strictly increasing then strictly decreasing?



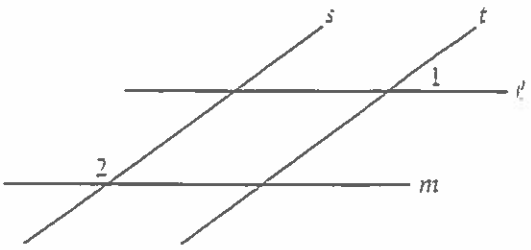
A) Between 0 and 30 minutes
B) Between 40 and 60 minutes
C) Between 50 and 65 minutes
D) Between 70 and 90 minutes

2

If $y = kx$, where k is a constant, and $y = 24$ when $x = 6$, what is the value of y when $x = 5$?

A) 6
B) 15
C) 20
D) 23

3



In the figure above, lines ℓ and m are parallel and lines s and t are parallel. If the measure of $\angle 1$ is 35°, what is the measure of $\angle 2$?

A) 35°
B) 55°
C) 70°
D) 145°

4

If $16 + 4x$ is 10 more than 14, what is the value of $8x$?

A) 2
B) 6
C) 16
D) 80

CONTINUE

19

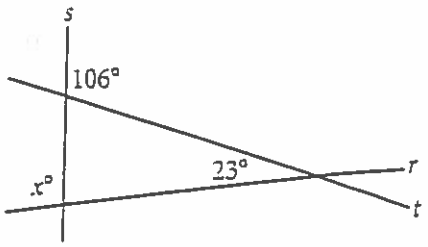
$$\frac{2x+6}{(x+2)^2}-\frac{2}{x+2}$$

The expression above is equivalent to $\frac{a}{(x+2)^2}$, where a is a positive constant and $x \neq -2$.

What is the value of a ?

20

Intersecting lines r, s, and t are shown below.



What is the value of x ?

STOP

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

Do not turn to any other section.

3

In a random sample of 200 cars of a particular model, 3 have a manufacturing defect. At this rate, how many of 10,000 cars of the same model will have a manufacturing defect?

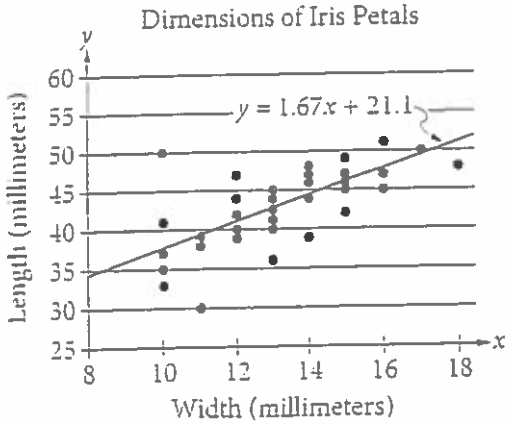
A) 150

B) 200

C) 250

D) 300

4



The scatterplot above shows data collected on the lengths and widths of *Iris setosa* petals. A line of best fit for the data is also shown. Based on the line of best fit, if the width of an *Iris setosa* petal is 19 millimeters, what is the predicted length, in millimeters, of the petal?

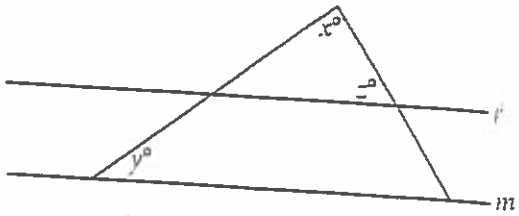
A) 21.10

B) 31.73

C) 52.83

D) 55.27

5



Note: Figure not drawn to scale.

In the figure above, lines ℓ and m are parallel, $y = 20$, and $z = 60$. What is the value of x ?

A) 120

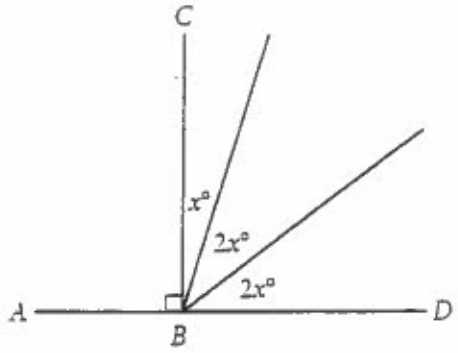
B) 100

C) 90

D) 80

CONTINUE

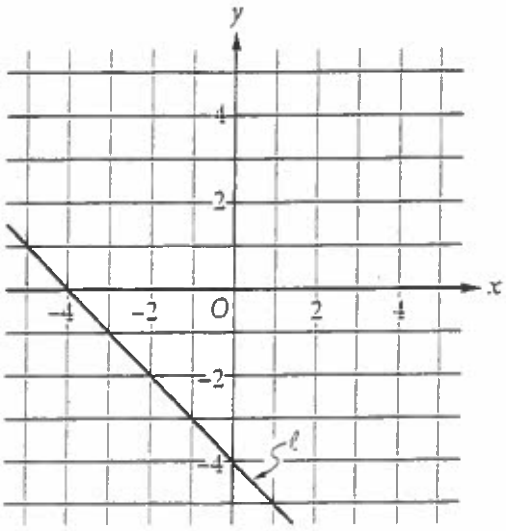
8



In the figure above, point B lies on $\overline{AD}$. What is the value of $3x$?

A) 18
B) 36
C) 54
D) 72

9



Which of the following is an equation of line ℓ in the xy-plane above?

A) $x - y = -4$
B) $x - y = 4$
C) $x + y = -4$
D) $x + y = 4$

CONTINUE

9

$$kx - 3y = 4$$

$$4x - 5y = 7$$

In the system of equations above, k is a constant and x and y are variables. For what value of k will the system of equations have no solution?

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

B) $\frac{16}{7}$

C) $-\frac{16}{7}$

D) $-\frac{12}{5}$

10

In the xy-plane, the parabola with equation $y = (x - 11)^2$ intersects the line with equation $y = 25$ at two points, A and B. What is the length of $\overline{AB}$?

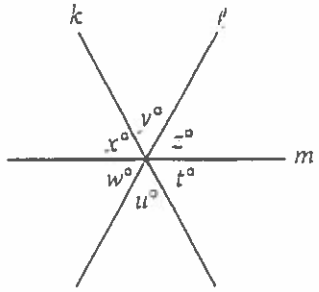
A) 10

B) 12

C) 14

D) 16

11



Note: Figure not drawn to scale.

In the figure above, lines k, ℓ, and m intersect at a point. If $x + y = u + w$, which of the following must be true?

I. $x = z$

II. $y = w$

III. $z = t$

A) I and II only

B) I and III only

C) II and III only

D) I, II, and III

12

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

In the quadratic equation above, a is a nonzero constant. The graph of the equation in the xy-plane is a parabola with vertex (c, d). Which of the following is equal to d ?

A) $-9a$

B) $-8a$

C) $-5a$

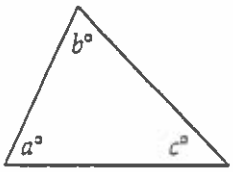
D) $-2a$

CONTINUE

31

Lynne has $8.00 to spend on apples and oranges. Apples cost $0.65 each, and oranges cost $0.75 each. If there is no tax on this purchase and she buys 5 apples, what is the maximum number of whole oranges she can buy?

32



Note: Figure not drawn to scale.

In the triangle above, $a = 34$. What is the value of $b + c$?

33

700, 1200, 1600, 2000, x

If the mean of the five numbers above is 1600, what is the value of x ?

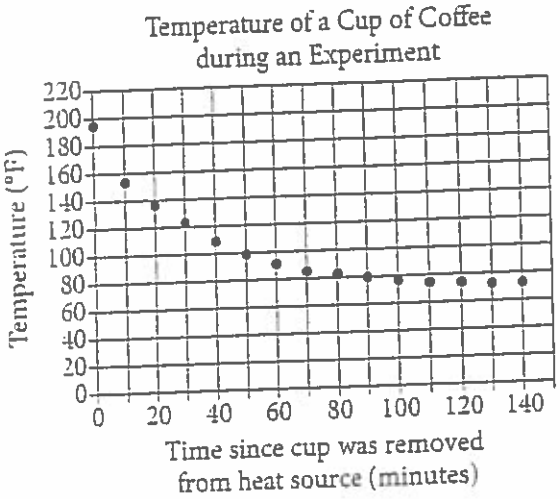
34

The relationship between x and y can be written as $y = mx$, where m is a constant. If $y = 17$ when $x = a$, what is the value of y when $x = 2a$?

CONTINUE

4

Questions 5 and 6 refer to the following information.



In an experiment, a heated cup of coffee is removed from a heat source, and the cup of coffee is then left in a room that is kept at a constant temperature. The graph above shows the temperature, in degrees Fahrenheit (°F), of the coffee immediately after being removed from the heat source and at 10-minute intervals thereafter.

5

Of the following, which best approximates the temperature, in degrees Fahrenheit, of the coffee when it is first removed from the heat source?

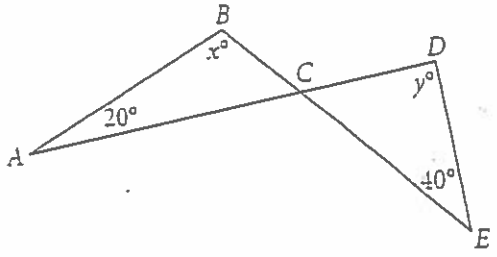
A) 75
B) 100
C) 155
D) 195

6

During which of the following 10-minute intervals does the temperature of the coffee decrease at the greatest average rate?

A) Between 0 and 10 minutes
B) Between 30 and 40 minutes
C) Between 50 and 60 minutes
D) Between 90 and 100 minutes

7



Note: Figure not drawn to scale.

In the figure above, $\overline{AD}$ intersects $\overline{BE}$ at C. If $x = 100$, what is the value of y ?

A) 100
B) 90
C) 80
D) 60

CONTINUE

3

The formula below is often used by project managers to compute E, the estimated time to complete a job, where O is the shortest completion time, P is the longest completion time, and M is the most likely completion time.

$$E = \frac{O + 4M + P}{6}$$

Which of the following correctly gives P in terms of E, O, and M ?

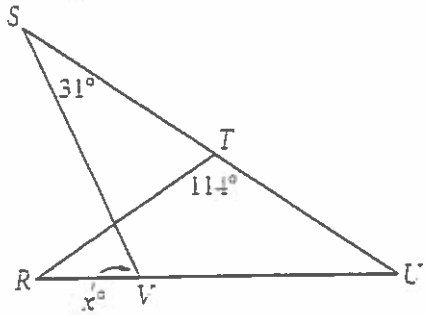
A) $P = 6E - O - 4M$

B) $P = -6E + O + 4M$

C) $P = \frac{O + 4M + E}{6}$

D) $P = \frac{O + 4M - E}{6}$

4



In the figure above, $RT = TU$. What is the value of x ?

A) 72

B) 66

C) 64

D) 58

5

The width of a rectangular dance floor is w feet. The length of the floor is 6 feet longer than its width. Which of the following expresses the perimeter, in feet, of the dance floor in terms of w ?

A) $2w + 6$

B) $4w + 12$

C) $w^2 + 6$

D) $w^2 + 6w$

6

$$y > 2x - 1$$

$$2x > 5$$

Which of the following consists of the y-coordinates of all the points that satisfy the system of inequalities above?

A) $y > 6$

B) $y > 4$

C) $y > \frac{5}{2}$

D) $y > \frac{3}{2}$

CONTINUE

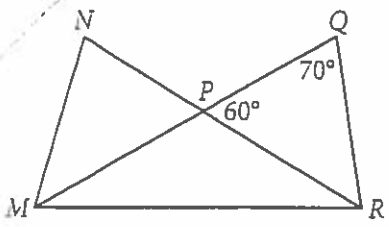
16

If $2x + 8 = 16$, what is the value of $x + 4$?

18

The number of radians in a 720-degree angle can be written as $a\pi$, where a is a constant. What is the value of a ?

17



In the figure above, $\overline{MQ}$ and $\overline{NR}$ intersect at point P, $NP = QP$, and $MP = PR$. What is the measure, in degrees, of $\angle QMR$? (Disregard the degree symbol when gridding your answer.)

start here
go to #19 on page 1086

16

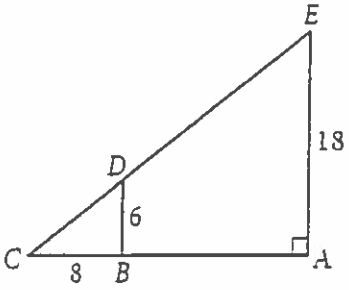
If $a^{\frac{b}{4}} = 16$ for positive integers a and b, what is one possible value of b ?

17

$$\frac{2}{3}t = \frac{5}{2}$$

What value of t is the solution of the equation above?

18



In the figure above, $\overline{BD}$ is parallel to $\overline{AE}$. What is the length of $\overline{CE}$?

CONTINUE

14

The growth rate of the sunflower from day 14 to day 35 is nearly constant. On this interval, which of the following equations best models the height h, in centimeters, of the sunflower t days after it begins to grow?

A) $h = 2.1t - 15$

B) $h = 4.5t - 27$

C) $h = 6.8t - 12$

D) $h = 13.2t - 18$

15

x	1	2	3	4	5
y	$\frac{11}{4}$	$\frac{25}{4}$	$\frac{39}{4}$	$\frac{53}{4}$	$\frac{67}{4}$

Which of the following equations relates y to x for the values in the table above?

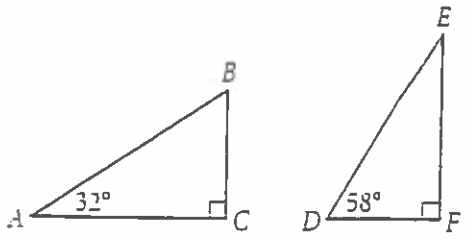
A) $y = \frac{1}{2} \cdot \left(\frac{5}{2}\right)^x$

B) $y = 2 \cdot \left(\frac{3}{4}\right)^x$

C) $y = \frac{3}{4}x + 2$

D) $y = \frac{7}{2}x - \frac{3}{4}$

16



Triangles ABC and DEF are shown above. Which of the following is equal to the ratio $\frac{BC}{AB}$?

A) $\frac{DE}{DF}$

B) $\frac{DF}{DE}$

C) $\frac{DF}{EF}$

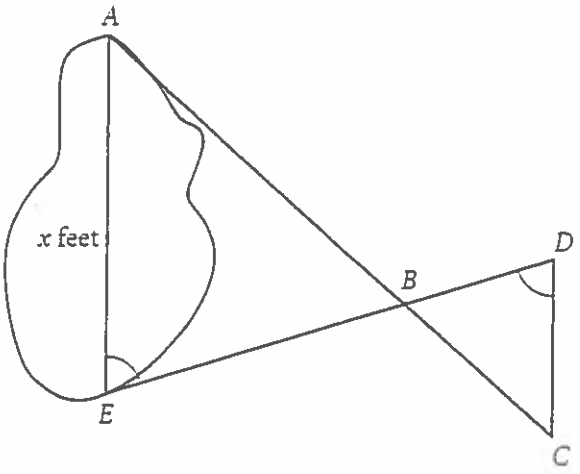
D) $\frac{EF}{DE}$

CONTINUE

16

If $t > 0$ and $t^2 - 4 = 0$, what is the value of t ?

17



A summer camp counselor wants to find a length, x, in feet, across a lake as represented in the sketch above. The lengths represented by AB, EB, BD, and CD on the sketch were determined to be 1800 feet, 1400 feet, 700 feet, and 800 feet, respectively. Segments AC and DE intersect at B, and $\angle AEB$ and $\angle CDB$ have the same measure. What is the value of x ?

18

$$x + y = -9$$
$$x + 2y = -25$$

According to the system of equations above, what is the value of x ?

19

In a right triangle, one angle measures $x°$, where $\sin x° = \frac{4}{5}$. What is $\cos(90° - x°)$?

20

If $a = 5\sqrt{2}$ and $2a = \sqrt{2x}$, what is the value of x ?

STOP

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

16

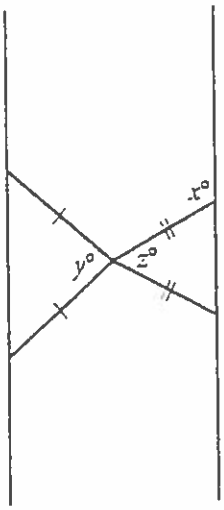
$$x^3(x^2 - 5) = -4x$$

If $x > 0$, what is one possible solution to the equation above?

17

If $\frac{7}{9}x - \frac{4}{9}x = \frac{1}{4} + \frac{5}{12}$, what is the value of x ?

18



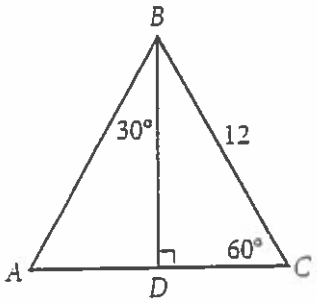
Note: Figure not drawn to scale.

Two isosceles triangles are shown above. If $180 - z = 2y$ and $y = 75$, what is the value of x ?

CONTINUE

4

19



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

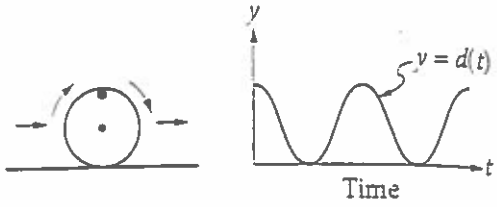
A) 4

B) 6

C) $6\sqrt{2}$

D) $6\sqrt{3}$

20



The figure on the left above shows a wheel with a mark on its rim. The wheel is rolling on the ground at a constant rate along a level straight path from a starting point to an ending point. The graph of $y = d(t)$ on the right could represent which of the following as a function of time from when the wheel began to roll?

A) The speed at which the wheel is rolling

B) The distance of the wheel from its starting point

C) The distance of the mark on the rim from the center of the wheel

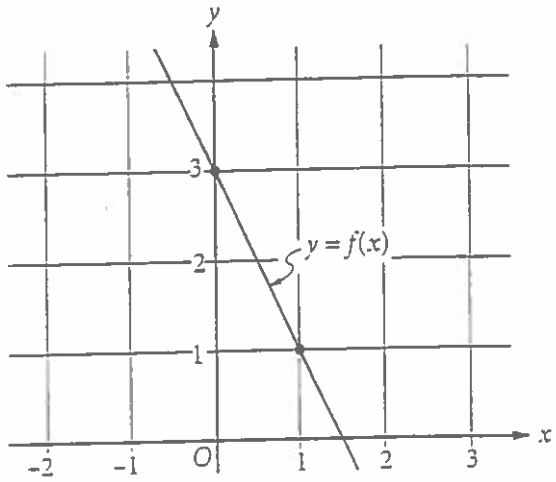
D) The distance of the mark on the rim from the ground

CONTINUE

19

Triangle PQR has right angle Q. If $\sin R = \frac{4}{5}$, what is the value of $\tan P$?

20

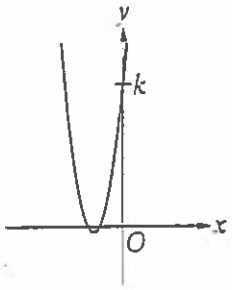


The graph of the linear function f is shown in the xy-plane above. The graph of the linear function g (not shown) is perpendicular to the graph of f and passes through the point $(1, 3)$. What is the value of $g(0)$?

STOP

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

10



The graph of $y = 2x^2 + 10x + 12$ is shown. If the graph crosses the y-axis at the point $(0, k)$, what is the value of k ?

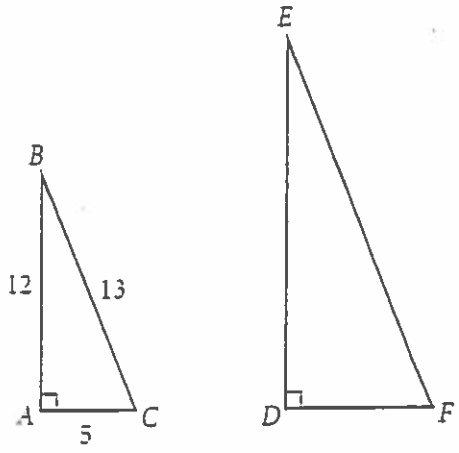
A) 2
B) 6
C) 10
D) 12

11

A circle in the xy-plane has center $(5, 7)$ and radius 2. Which of the following is an equation of the circle?

A) $(x-5)^2 + (y-7)^2 = 4$
B) $(x+5)^2 + (y+7)^2 = 4$
C) $(x-5)^2 + (y-7)^2 = 2$
D) $(x+5)^2 + (y+7)^2 = 2$

12



In the figure above, triangle ABC is similar to triangle DEF. What is the value of $\cos(E)$?

A) $\frac{12}{5}$
B) $\frac{12}{13}$
C) $\frac{5}{12}$
D) $\frac{5}{13}$

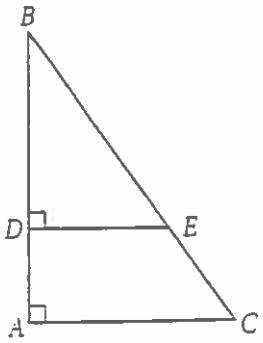
CONTINUE

35

$$y = x^2 - 4x + 4$$
$$y = 4 - x$$

If the ordered pair (x, y) satisfies the system of equations above, what is one possible value of x ?

36



In the figure above, $\tan B = \frac{3}{4}$. If $BC = 15$ and $DA = 4$, what is the length of $\overline{DE}$?

CONTINUE

19

At a lunch stand, each hamburger has 50 more calories than each order of fries. If 2 hamburgers and 3 orders of fries have a total of 1700 calories, how many calories does a hamburger have?

20

In triangle ABC, the measure of $\angle B$ is $90°$, $BC = 16$, and $AC = 20$. Triangle DEF is similar to triangle ABC, where vertices D, E, and F correspond to vertices A, B, and C, respectively, and each side of triangle DEF is $\frac{1}{3}$ the length of the corresponding side of triangle ABC. What is the value of $\sin F$?

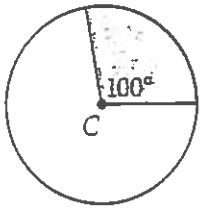
STOP

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

33

The score on a trivia game is obtained by subtracting the number of incorrect answers from twice the number of correct answers. If a player answered 40 questions and obtained a score of 50, how many questions did the player answer correctly?

34



Point C is the center of the circle above. What fraction of the area of the circle is the area of the shaded region?

CONTINUE

16

$$x^2 + x - 12 = 0$$

If a is a solution of the equation above and $a > 0$, what is the value of a ?

17

The sum of $-2x^2 + x + 31$ and $3x^2 + 7x - 8$ can be written in the form $ax^2 + bx + c$, where a, b, and c are constants. What is the value of $a + b + c$?

18

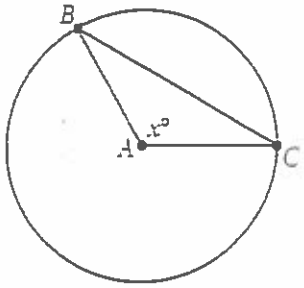
$$-x + y = -3.5$$
$$x + 3y = 9.5$$

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

19

A start-up company opened with 8 employees. The company's growth plan assumes that 2 new employees will be hired each quarter (every 3 months) for the first 5 years. If an equation is written in the form $y = ax + b$ to represent the number of employees, y, employed by the company x quarters after the company opened, what is the value of b ?

20



Note: Figure not drawn to scale.

In the circle above, point A is the center and the length of arc $\overset{\frown}{BC}$ is $\frac{2}{5}$ of the circumference of the circle. What is the value of x ?

STOP

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

5

$$C = 75h + 125$$

The equation above gives the amount C, in dollars, an electrician charges for a job that takes h hours. Ms. Sanchez and Mr. Roland each hired this electrician. The electrician worked 2 hours longer on Ms. Sanchez's job than on Mr. Roland's job. How much more did the electrician charge Ms. Sanchez than Mr. Roland?

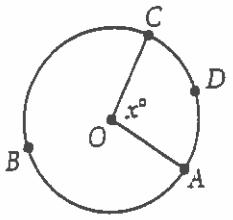
A) $75

B) $125

C) $150

D) $275

6



The circle above has center O, the length of arc $\overset{\frown}{ADC}$ is 5π, and $x = 100$. What is the length of arc $\overset{\frown}{ABC}$?

A) 9π

B) 13π

C) 18π

D) $\frac{13}{2}\pi$

7

If $\frac{8}{x} = 160$, what is the value of x ?

A) 1,280

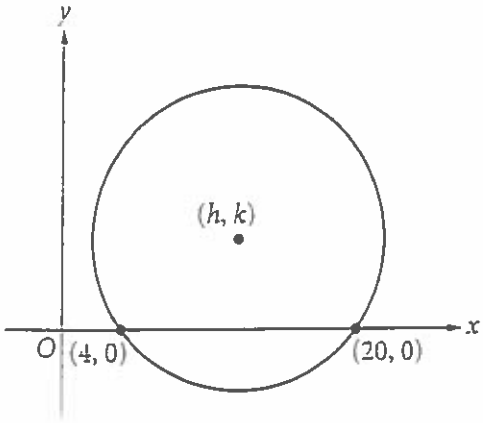
B) 80

C) 20

D) 0.05

CONTINUE

31



In the xy-plane above, the circle has center (h, k) and radius 10. What is the value of k ?

32

In the xy-plane, line ℓ has a y-intercept of -13 and is perpendicular to the line with equation $y = -\frac{2}{3}x$. If the point $(10, b)$ is on line ℓ, what is the value of b ?

33

	Blood type			
Rhesus factor	A	B	AB	O
+	33	9	3	37
−	7	2	1	x

Human blood can be classified into four common blood types—A, B, AB, and O. It is also characterized by the presence (+) or absence (−) of the rhesus factor. The table above shows the distribution of blood type and rhesus factor for a group of people. If one of these people who is rhesus negative (−) is chosen at random, the probability that the person has blood type B is $\frac{1}{9}$. What is the value of x ?

CONTINUE

19

How many liters of a 25% saline solution must be added to 3 liters of a 10% saline solution to obtain a 15% saline solution?

20

Points A and B lie on a circle with radius 1, and arc $\overset{\frown}{AB}$ has length $\frac{\pi}{3}$. What fraction of the circumference of the circle is the length of arc $\overset{\frown}{AB}$?

STOP

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

29

$$H = 1.88L + 32.01$$

The formula above can be used to approximate the height H, in inches, of an adult male based on the length L, in inches, of his femur. What is the meaning of 1.88 in this context?

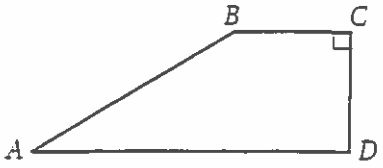
A) The approximate femur length, in inches, for a man with a height of 32.01 inches

B) The approximate increase in a man's femur length, in inches, for each increase of 32.01 inches in his height

C) The approximate increase in a man's femur length, in inches, for each one-inch increase in his height

D) The approximate increase in a man's height, in inches, for each one-inch increase in his femur length

30



In quadrilateral $ABCD$ above, $\overline{AD} \parallel \overline{BC}$ and $CD = \frac{1}{2}AB$. What is the measure of angle B ?

A) 150°

B) 135°

C) 120°

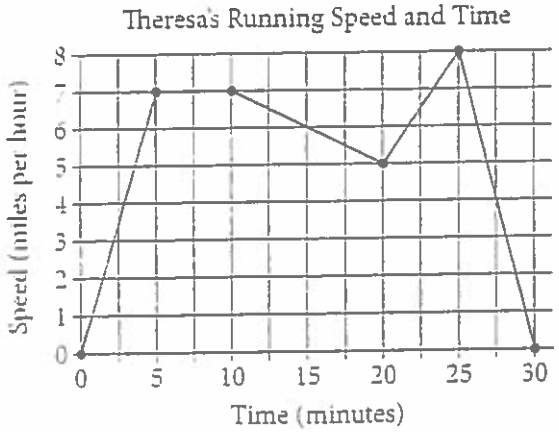
D) 90°

12

A customer paid $53.00 for a jacket after a 6 percent sales tax was added. What was the price of the jacket before the sales tax was added?

A) $47.60
B) $50.00
C) $52.60
D) $52.84

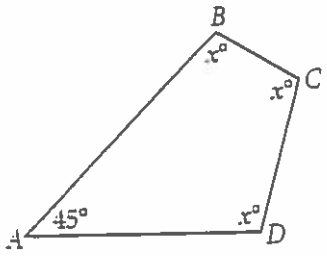
13



Theresa ran on a treadmill for thirty minutes, and her time and speed are shown on the graph above. According to the graph, which of the following statements is NOT true concerning Theresa's run?

A) Theresa ran at a constant speed for five minutes.
B) Theresa's speed was increasing for a longer period of time than it was decreasing.
C) Theresa's speed decreased at a constant rate during the last five minutes.
D) Theresa's speed reached its maximum during the last ten minutes.

14



In the figure above, what is the value of x ?

A) 45
B) 90
C) 100
D) 105

15

If 50 one-cent coins were stacked on top of each other in a column, the column would be approximately $3\frac{7}{8}$ inches tall. At this rate, which of the following is closest to the number of one-cent coins it would take to make an 8-inch-tall column?

A) 75
B) 100
C) 200
D) 390

CONTINUE