

27. In 3-dimensional space, the set of all points 12 units from the origin is:

- B →
- A. a circle.
 - B. a sphere.
 - C. a line.
 - D. a cylinder.
 - E. 2 parallel planes.

Definition of Sphere:

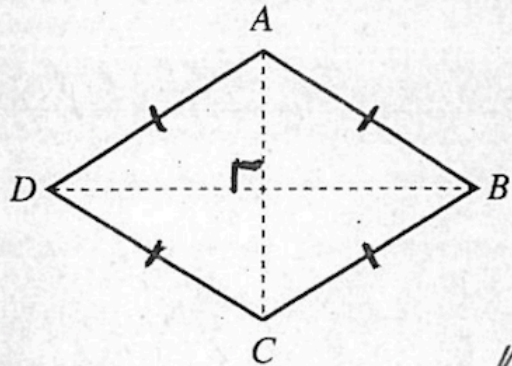
Set of all points equidistant from a fixed center point.

A circle is defined as
a set of points equidistant from
a fixed center point

ACT-57B

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44. If $AC = 10$ feet and $BD = 12$ feet in the rhombus $ABCD$ shown below, what is its area, in square feet?



- E. 11
G. 22
H. 30
→ J. 60
K. 120

Area of Rhombus

$$\text{Area of } \square = \frac{d_1 d_2}{2} \quad \begin{array}{l} d_1 = \text{diagonal}_1 \\ d_2 = \text{diagonal}_2 \end{array}$$

$$A = \frac{(10)(12)}{2} = 5(12) = 60$$

36. Which of the following figures in a plane separates it into half-planes?

F. A line

G. A ray

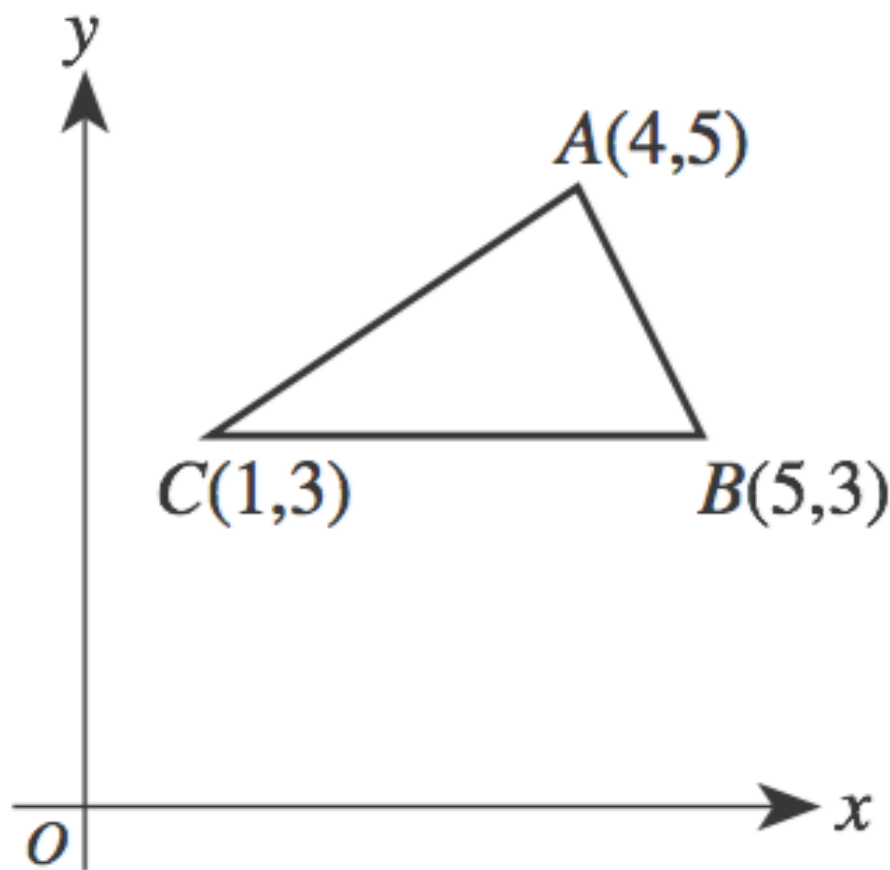
H. An angle

J. A point

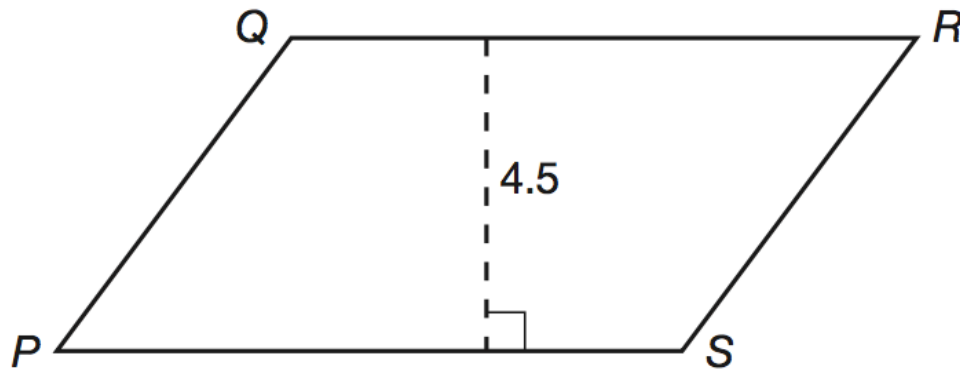
K. A line segment

59. In the figure below, the vertices of $\triangle ABC$ have (x,y) coordinates $(4,5)$, $(5,3)$, and $(1,3)$, respectively. What is the area of $\triangle ABC$?

- A. 4
B. $4\sqrt{2}$
C. $4\sqrt{3}$
D. 8
E. $8\sqrt{2}$



5. The height of the parallelogram below is 4.5 cm and the area is 36 sq cm. Find the length of side QR in centimeters.



- a. 31.5 cm
- b. 8 cm
- c. 15.75 cm
- d. 9 cm
- e. 6 cm

10. The area of a trapezoid is $\frac{1}{2}h(b_1 + b_2)$ where h is the altitude and b_1 and b_2 are the parallel bases. The two parallel bases of a trapezoid are 3 cm and 5 cm and the area of the trapezoid is 28 sq cm. Find the altitude of the trapezoid.

f. 14 cm

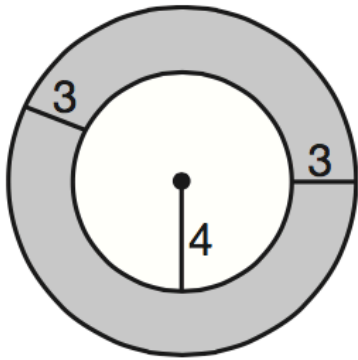
g. 9 cm

h. 19 cm

i. 1.9 cm

j. 7 cm

- 44.** Find the area of the shaded region. Recall that the area of a circle is πr^2 , where r is the radius of the circle.

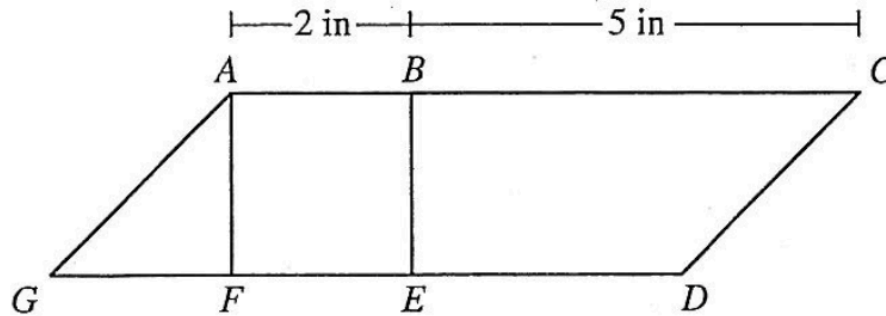


- f. 65π
- g. 6π
- h. 25π
- i. 5π
- j. 33π

51. The formula for the volume of a rectangular solid is $V = lwh$. If each dimension is tripled, how many times the original volume will the new volume be?

- a. 3
 - b. 9
 - c. $\frac{1}{3}$
 - d. 27
 - e. 81
-

15. In the figure below, F and E are points on \overline{GD} . What is the ratio of the area of square $ABEF$ to the area of parallelogram $ACDG$?



- A. 1:14
 B. 1:7
 C. 7:1
 D. 7:2
 → E. 2:7

AREA of Square and
 Parallelogram combined
 with Ratio. Good example
 of how ACT combined two
 math topics

$$\frac{\text{Area of Square}}{\text{Area of } \square} = \frac{2^2}{2 \times 7} = \frac{2 \cdot 2}{2 \cdot 7} = \frac{2}{7}$$

51
 42. In the figure below, a square is circumscribed about a circle with a 30-inch diameter. Points A, B, C, and D are the midpoints of the square's sides. What is the total area, in square inches, of the shaded regions?

DO YOUR FIGURING HERE.

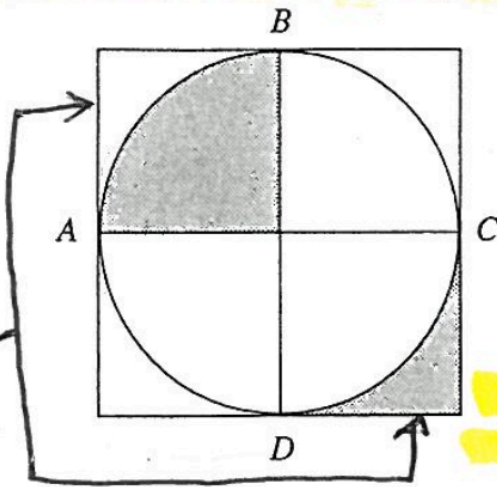
AREA OF SQUARES +
 CIRCLES

$$\frac{(30)^2 - \pi(15)^2}{4} + \frac{(15)^2 \pi}{4} =$$

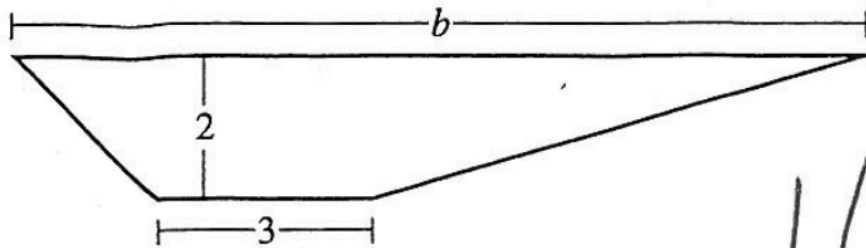
$\frac{1}{4}$ OF SQUARE $\rightarrow \frac{30^2}{4} = 225$

- F. 450
- G. 225
- H. 177
- J. 94
- K. 47

Now shaded AREA is $\frac{1}{4}$ OF SQUARE



51. The area of the trapezoid below is 16 square inches, the altitude is 2 inches, and the length of one base is 3 inches. What is the length, b , of the other base, in inches?



DO YOUR FIGURING HERE.

Trapezoid area formula

$$16 = \frac{(b_1 + 3) \cdot 2}{2}$$

$$16 = b_1 + 3$$

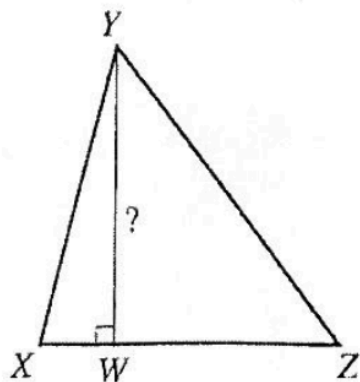
$$b_1 = 13$$

D

- A. $2\frac{2}{3}$
 B. 5
 C. 11
 → D. 13
 E. 15

$$A = \left(\frac{b_1 + b_2}{2} \right) \cdot h$$

22. The area of $\triangle XYZ$ below is 32 square inches. If \overline{XZ} is 8 inches long, how long is altitude \overline{YW} , in inches?



$$\text{Area of } \triangle = \frac{bh}{2}$$

Altitude is height

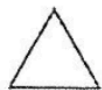
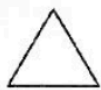
$$\overline{XZ} = \text{Base} = 8$$

Don't know height / Altitude

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

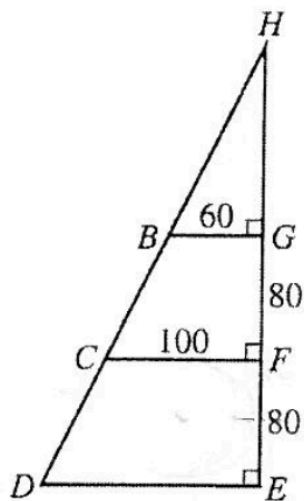
$$32 = \frac{8 \times h}{2} \Rightarrow 32 = 4h$$
$$h = 8$$

- F. 10
→ G. 8
H. 6
J. 4
K. 2



Use the following information to answer questions 39–41.

In the figure below, B and C are on \overline{HD} and G and F are on \overline{HE} . The measurements given are in inches. Both $BGFC$ and $CFED$ are trapezoids. The area, A , of a trapezoid is given by $A = \frac{1}{2}h(b_1 + b_2)$, where h is the height and b_1 and b_2 are the lengths of the 2 parallel sides.



39. What is the area of $BGFC$, in square inches?

- A. 2,500
 B. 5,400
 → C. 6,400
 D. 7,000
 E. 12,800

DO YOUR FIGURING HERE.

TRapezoid AREA

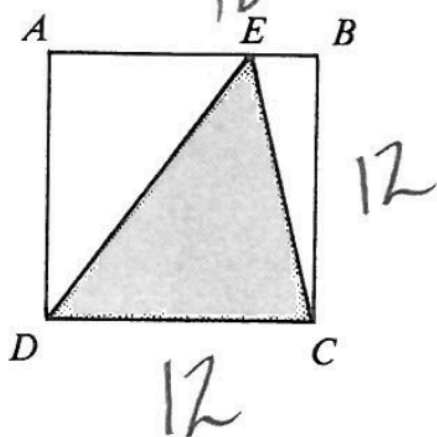
easier to frame as
 average of bases times
 the height

$$\frac{b_1 + b_2}{2} h$$

$$\frac{60 + 100}{2} (\overset{40}{\cancel{80}}) = 160 \times 40 = 6400$$

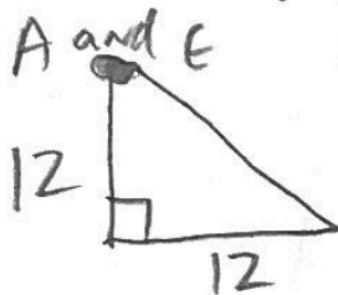
Application of given formula

28. In the figure below, square $ABCD$ has sides 12 centimeters long, and E is on side \overline{AB} . In square centimeters, what is the area of $\triangle DEC$?



DO YOUR FIGURING HERE.

No Matter Where E is on \overline{AB} , the Area of $\triangle DEC$ is the same.

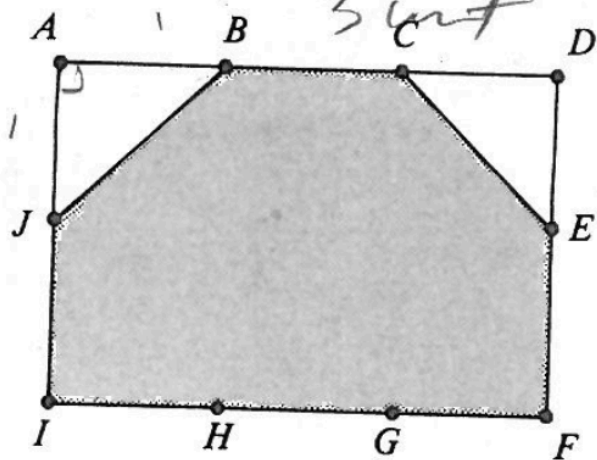


$$\frac{1}{2}bh = \frac{12 \cdot 12}{2} = 72$$

- F. 36
G. 48
H. 72
J. 96
K. 144

H.

39. In rectangle $ADFI$ below, the 10 labeled points are equally spaced along the perimeter. What is the ratio of the shaded area to the area of the entire rectangle?



To find shaded region, FIND Area of entire region and subtract unshaded region.

$$(3 \times 2) - \left[\left(\frac{1}{2}\right) + \left(\frac{1}{2}\right) \right] = \text{shaded} = 5 \text{ Region}$$

$$\frac{\text{Shaded Region}}{\text{Entire Region}} = \frac{5}{8}$$

The only answer that has 5 in Numerator

2 units

- A. $\frac{7}{8}$
- B. $\frac{5}{6}$
- C. $\frac{4}{5}$
- D. $\frac{3}{4}$
- E. $\frac{2}{3}$

B

40. If the circumference of the circle below is 93 parsecs, and O is the center of the circle, how many parsecs long

central angle is B

60. Which of the following expresses the number of meters a contestant must travel in a 3-lap race where the course is a circle of radius R meters?

F. $3R$

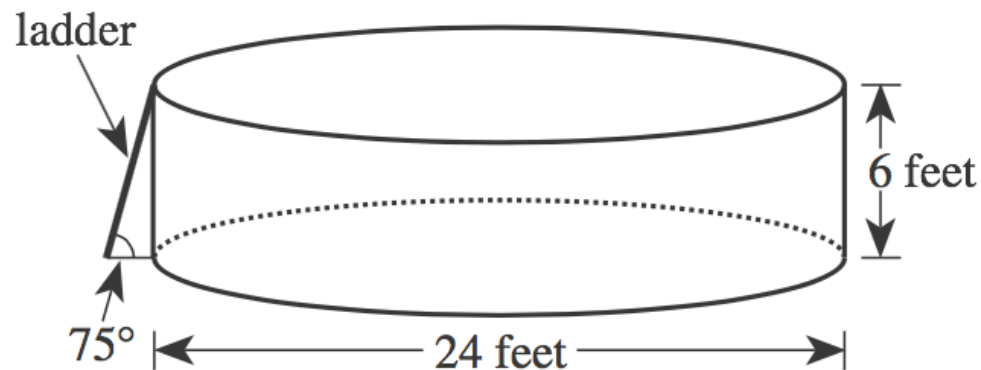
G. $3\pi R$

H. $3\pi R^2$

J. $6R$

K. $6\pi R$

The youth center has installed a swimming pool on level ground. The pool is a right circular cylinder with a diameter of 24 feet and a height of 6 feet. A diagram of the pool and its entry ladder is shown below.

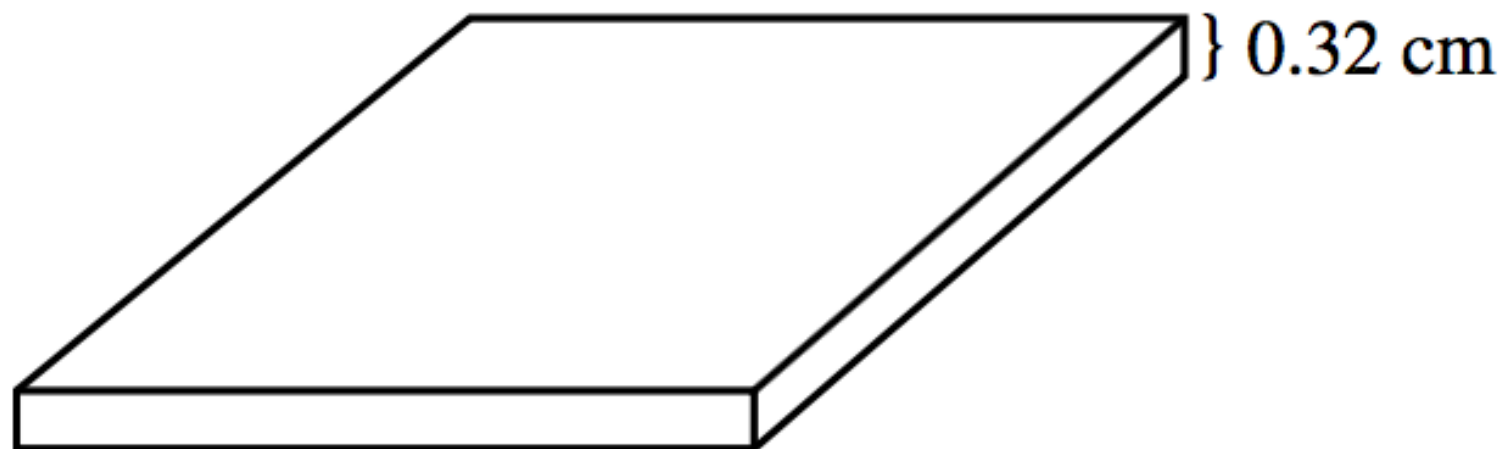


29. To the nearest cubic foot, what is the volume of water that will be in the pool when it is filled with water to a depth of 5 feet?

(Note: The volume of a cylinder is given by $\pi r^2 h$, where r is the radius and h is the height.)

- A. 942
- B. 1,885
- C. 2,262
- D. 9,047
- E. 11,310

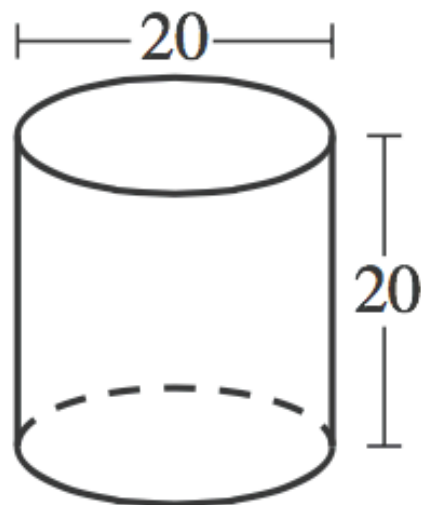
9. A computer chip 0.32 cm thick is made up of layers of silicon. If the top and bottom layers are each 0.03 cm thick and the inner layers are each 0.02 cm thick, how many inner layers are there?



- A. 13
- B. 15
- C. 16
- D. 52
- E. 64

- 31.** A right circular cylinder is shown in the figure below, with dimensions given in centimeters. What is the total surface area of this cylinder, in square centimeters?

(Note: The total surface area of a cylinder is given by $2\pi r^2 + 2\pi rh$ where r is the radius and h is the height.)



- A. 300π
- B. 400π
- C. 500π
- D. 600π
- E. $1,600\pi$

31. Meg pounded a stake into the ground. When she attached a leash to both the stake and her dog's collar, the dog could reach 9 feet from the stake in any direction. Using 3.14 for π , what is the approximate area of the lawn, in square feet, the dog could reach from the stake?

- A.** 28
- B.** 57
- C.** 113
- D.** 254
- E.** 283

10. A rectangle has an area of 32 square feet and a perimeter of 24 feet. What is the shortest of the side lengths, in feet, of the rectangle?

F. 1

G. 2

H. 3

J. 4

K. 8

20. The length of a rectangle is 3 times the length of a smaller rectangle. The 2 rectangles have the same width. The area of the smaller rectangle is A square units. The area of the larger rectangle is kA square units. Which of the following is the value of k ?

F. $\frac{1}{9}$

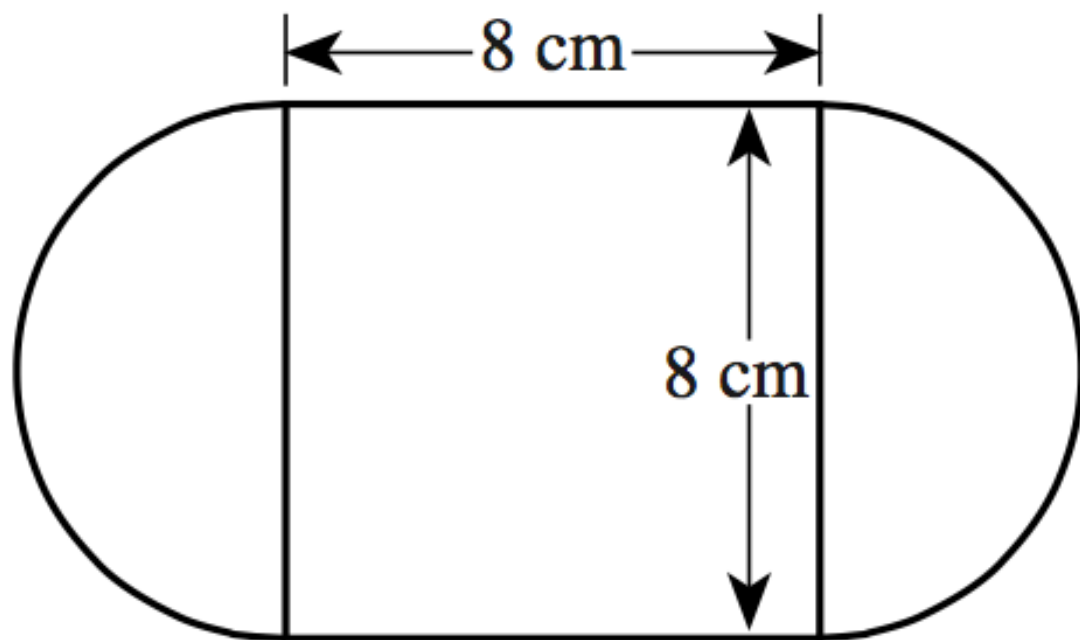
G. $\frac{1}{3}$

H. 1

J. 3

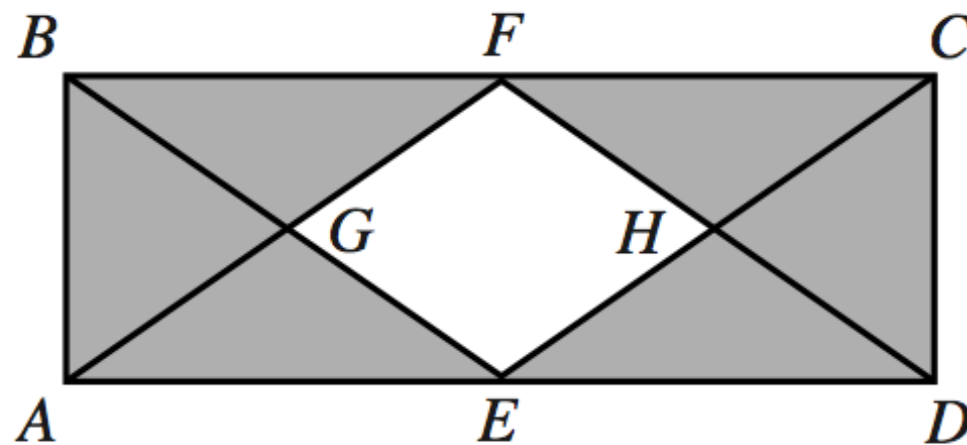
K. 9

37. The figure below consists of a square and 2 semicircles, with dimensions as shown. What is the outside perimeter, in centimeters, of the figure?



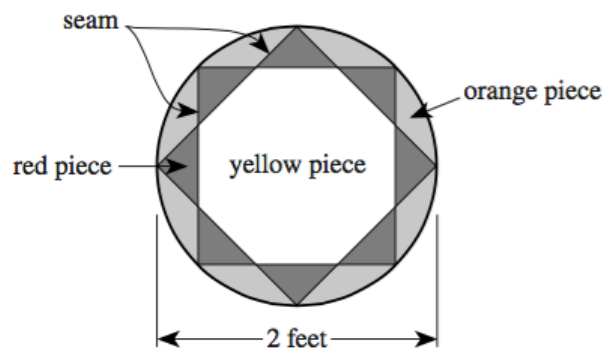
- A. $8 + 8\pi$
B. $16 + 8\pi$
C. $16 + 16\pi$
D. $32 + 8\pi$
E. $32 + 16\pi$

38. In the figure below, points E and F are the midpoints of sides \overline{AD} and \overline{BC} of rectangle $ABCD$, point G is the intersection of \overline{AF} and \overline{BE} , and point H is the intersection of \overline{CE} and \overline{DF} . The interior of $ABCD$ except for the interior of $EGFH$ is shaded. What is the ratio of the area of $EGFH$ to the area of the shaded region?



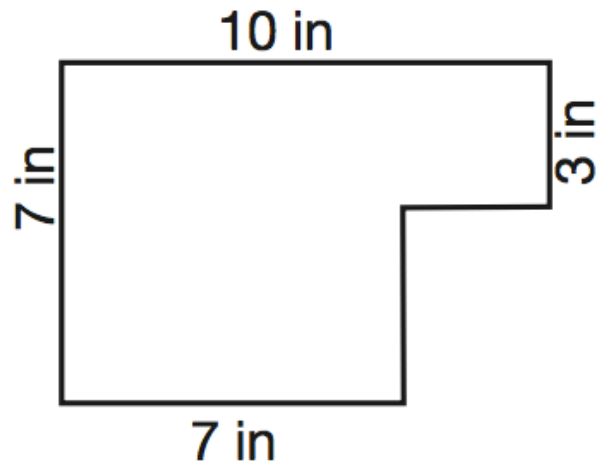
- F. 1:2
- G. 1:3
- H. 1:4
- J. 1:6
- K. Cannot be determined from the given information

The figure below shows the design of a circular stained-glass panel on display at Hopewell's Antique Shop. Seams separate the pieces of the panel. All red triangular pieces shown are congruent and have a common vertex with each adjoining triangular piece. The 2 squares shown are inscribed in the circle. The diameter of the panel is 2 feet.



44. The design of the stained-glass panel has how many lines of symmetry in the plane of the panel?
- F. 2
 - G. 4
 - H. 8
 - J. 16
 - K. Infinitely many
45. What is the area of the stained-glass panel, to the nearest 0.1 square foot?
- A. 3.1
 - B. 4.0
 - C. 6.2
 - D. 8.0
 - E. 12.6
46. Kaya wants to install a new circular stained-glass window in her living room. The design of the window will be identical to that of the panel. The diameter of the new window will be 75% longer than the diameter of the panel. The new window will be how many feet in diameter?
- F. 1.50
 - G. 2.50
 - H. 2.75
 - J. 3.50
 - K. 4.00

13. Find the area of the figure below.



- a. 79 square inches
- b. 91 square inches
- c. 70 square inches
- d. 64 square inches
- e. 58 square inches

- 73.** The Abrams' put a cement walkway around their rectangular pool. The pool's dimensions are 12 feet by 24 feet and the width of the walkway is 5 feet in all places. Find the area of the walkway.
- a. 748 square feet
 - b. 288 square feet
 - c. 460 square feet
 - d. 205 square feet
 - e. 493 square feet

49. If the circumference of a circle is $\frac{5}{2}\pi$ inches, how many inches long is its radius?

A. $\frac{2}{5}$

B. $\frac{4}{5}$

→ C. $\frac{5}{4}$

D. $\frac{\sqrt{5}}{2}$

E. $\sqrt{\frac{5}{2}}$

$$C = 2\pi r$$

$$\frac{\frac{5}{2}\pi}{2\pi} = \frac{2\pi r}{2\pi}$$

$$\frac{5}{4} = r$$

Circumference and
radius of circle

$$\frac{\frac{5\pi}{2}}{\frac{2\pi}{1}} = \frac{5\pi}{4\pi} = \frac{5}{4}$$

$\begin{aligned}\frac{5\pi}{2} &= 2\pi r \\ 5\pi &= 4\pi r \\ \frac{5}{4} &= r\end{aligned}$

14. The circumference of each tire on a bicycle is 50 inches. About how many revolutions does one of these bicycle tires make traveling 300 feet (3,600 inches) without slipping?

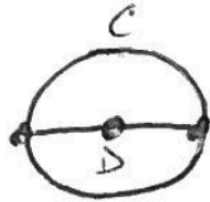
- F. 6
- G. 18
- H. 72
- J. 300
- K. 864

ACT-63E-SAMPLE

3600 inches
broken up into
50 inch increments
would TOTAL
72 increments

Circumference is distance
around a circle. If you
took the distance around the
circle and stretch it out, it
would be a straight line.
GO ON TO THE NEXT PAGE.

17



$$\pi = \frac{C}{D} \quad C = D\pi$$
$$C = 2\pi r$$

37. A square has sides that are the same length as the radius of a circle. If the circle has an area of 36π square units, how many units long is the perimeter of the square?

- A. 18
B. 24
C. 36
D. 72
E. 324



Circumference and Area

$$\text{Area of } O = \pi r^2$$

$$36\pi = \pi s^2$$

$$6 = s$$

$$\text{Perimeter of square} = 4s = 4(6) = 24$$

→ E. $\frac{\pi}{2}$

$$5 + \frac{\pi}{2} = K = \frac{\pi}{2}$$

36. A circle has a diameter of 6 inches. What is the circle's area, in square inches?

- G
- F. 6π
 - G. 9π
 - H. 12π
 - J. 18π
 - K. 36π



$$D = 2r$$
$$6 = 2r$$
$$3 = r$$

$$\text{Area} = \pi r^2$$
$$\text{Area} = \pi (3)^2$$
$$\text{Area} = 9\pi$$

47. The distance around a circular path is 1,000 meters. Which of the following most nearly approximates the radius of the path, in meters?

(Note: $\pi \approx 3.14$)

- A. 10
B. 18
C. 32
→ D. 159
E. 318

$$C = 2\pi r$$

$$1000 = 2\pi r$$

$$\frac{1000}{2\pi} = r \approx 159$$

$2r = 46$ $r = 23$

Circles

30. The diameter of a circle is 10 centimeters. What is its circumference, in centimeters?

- F. 5π
- G. 10π
- H. 20π
- J. 25π
- K. 100π

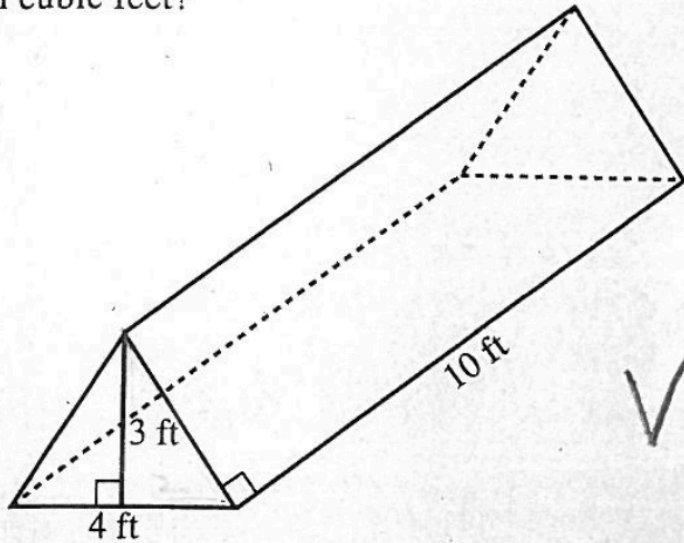
$C = D\pi$ or

$C = 2\pi r$ because $D = 2r$

$C = 10\pi$
because
 $D = 10$

G

45. A right, triangular prism that is 10 feet long, 4 feet wide, and 3 feet tall is shown below. What is its volume, in cubic feet?



- B
A. 50
→ B. 60
C. 84
D. 114
E. 120

DO YOUR FIGURING HERE.

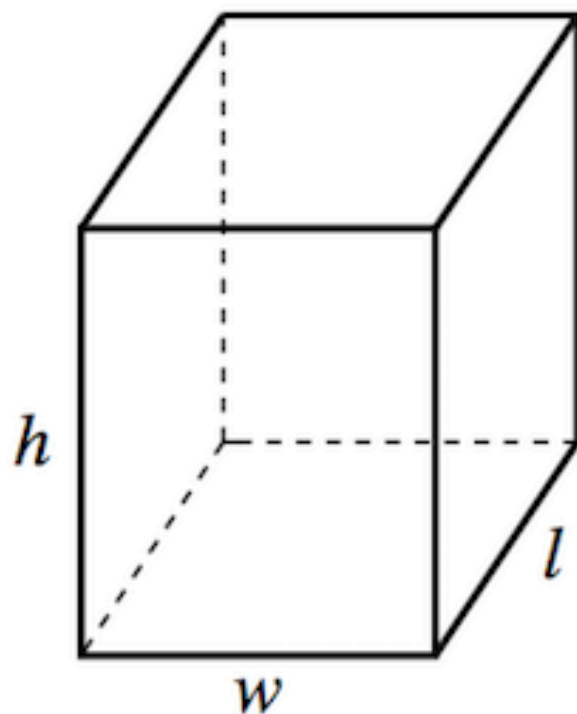
Volume of prism

Similar to volume of cylinder
area of triangle times depth

$$V = \frac{bh}{2} * d = \frac{4 * 3}{2} * 10 = 60$$

K. $x < -5$ or $x > 2$

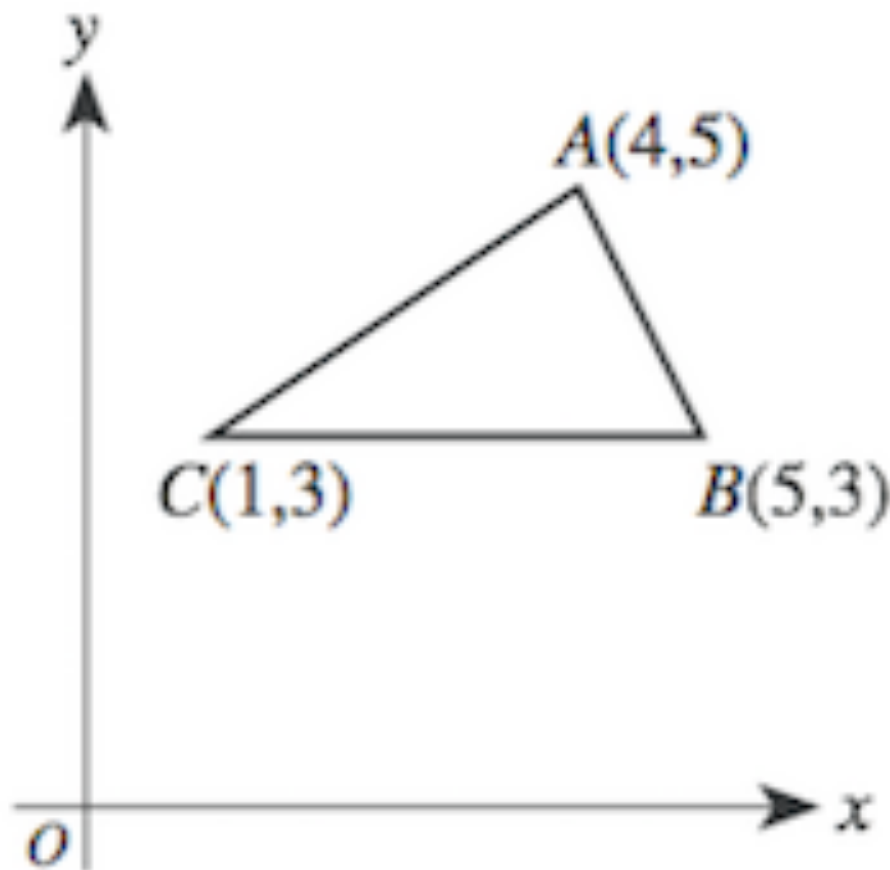
- 53.** A formula for the surface area (A) of the rectangular solid shown below is $A = 2lw + 2lh + 2wh$ where l represents length; w , width; and h , height. By doubling each of the dimensions (l , w , and h), the surface area will be multiplied by what factor?



- A.** 2
- B.** 4
- C.** 6
- D.** 8
- E.** 12

59. In the figure below, the vertices of $\triangle ABC$ have (x,y) coordinates $(4,5)$, $(5,3)$, and $(1,3)$, respectively. What is the area of $\triangle ABC$?

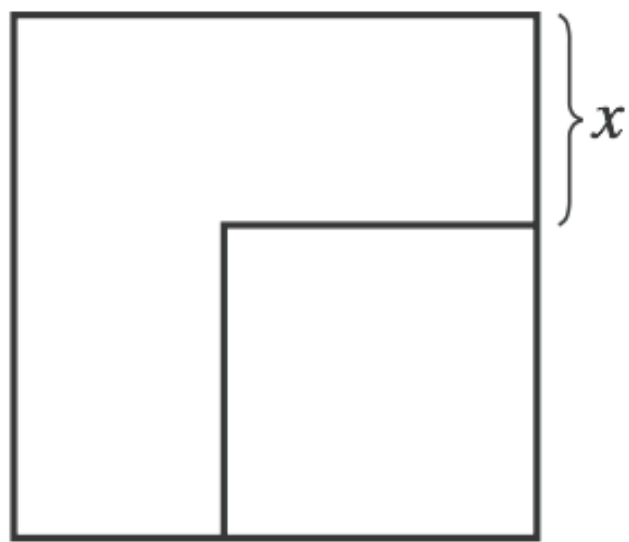
- A. 4
- B. $4\sqrt{2}$
- C. $4\sqrt{3}$
- D. 8
- E. $8\sqrt{2}$



29. Cube A has an edge length of 2 inches. Cube B has an edge length double that of Cube A. What is the volume, in cubic inches, of Cube B ?

- A.** 4
- B.** 8
- C.** 16
- D.** 32
- E.** 64

44. In the figure below, the area of the larger square is 50 square centimeters and the area of the smaller square is 18 square centimeters. What is x , in centimeters?



- F. 2
- G. $2\sqrt{2}$
- H. $4\sqrt{2}$
- J. 16
- K. 32

11. For a community service project, members of the junior class at San Carlos High School are going to varnish the rectangular dining room floor of a local nursing home. The floor is 60 feet wide and 80 feet long. Under the assumption that 1 can of varnish covers exactly 250 square feet, what is the minimum number of cans of varnish they will need in order to put 1 coat of varnish on this floor?

- A. 1
- B. 9
- C. 10
- D. 19
- E. 20



$$A = 80 \times 60 \\ = 4800$$

DO YOUR FIGURING HERE.

AREA and DIVISION

$$4800 \text{ divided by } 250 =$$

19.2. If you only bought 19 cans, you'd miss a spot.

20. Sergio plans to paint the 4 walls of his room with 1 coat of paint. The walls are rectangular, and, according to his measurements, each wall is 10 feet by 15 feet. He will not need to paint the single 3-foot-by-5-foot rectangular window in his room and the $3\frac{1}{2}$ -foot-by-7-foot rectangular door. Sergio knows that each gallon of paint covers between 300 and 350 square feet. If only 1-gallon cans of paint are available, which of the following is the minimum number of cans of paint Sergio needs to buy to paint his walls?

- F.** 1
- G.** 2
- H.** 3
- J.** 4
- K.** 5