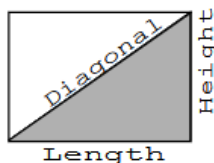


1

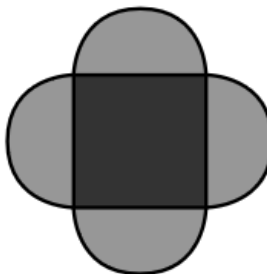
can be solved by counting, no formula 2D geometry

- 2003B 6. Many television screens are rectangles that are measured by the length of their diagonals. The ratio of the horizontal length to the height in a standard television screen is 4 : 3. The horizontal length of a “27-inch” television screen is closest, in inches, to which of the following?



- (A) 20      (B) 20.5      (C) 21      (D) 21.5      (E) 22

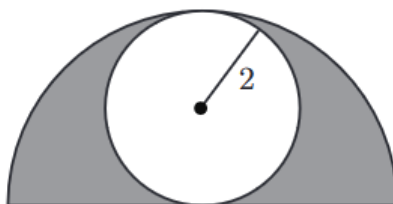
- 2006B 6. A region is bounded by semicircular arcs constructed on the side of a square whose sides measure  $2/\pi$ , as shown. What is the perimeter of this region?



- (A)  $\frac{4}{\pi}$       (B) 2      (C)  $\frac{8}{\pi}$       (D) 4      (E)  $\frac{16}{\pi}$

2009A

6. A circle of radius 2 is inscribed in a semicircle, as shown. The area inside the semicircle but outside the circle is shaded. What fraction of the semicircle's area is shaded?

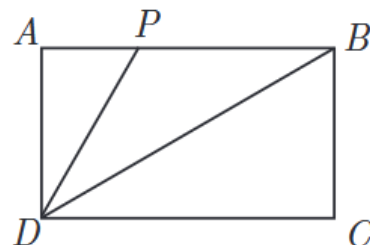


- (A)  $\frac{1}{2}$     (B)  $\frac{\pi}{6}$     (C)  $\frac{2}{\pi}$     (D)  $\frac{2}{3}$     (E)  $\frac{3}{\pi}$

2000

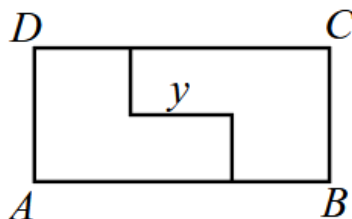
7. In rectangle  $ABCD$ ,  $AD = 1$ ,  $P$  is on  $\overline{AB}$ , and  $\overline{DB}$  and  $\overline{DP}$  trisect  $\angle ADC$ . What is the perimeter of  $\triangle BDP$ ?

- (A)  $3 + \frac{\sqrt{3}}{3}$     (B)  $2 + \frac{4\sqrt{3}}{3}$     (C)  $2 + 2\sqrt{2}$   
 (D)  $\frac{3 + 3\sqrt{5}}{2}$     (E)  $2 + \frac{5\sqrt{3}}{3}$



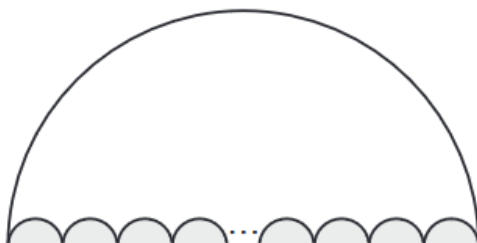
2006A

7. The  $8 \times 18$  rectangle  $ABCD$  is cut into two congruent hexagons, as shown, in such a way that the two hexagons can be repositioned without overlap to form a square. What is  $y$ ?



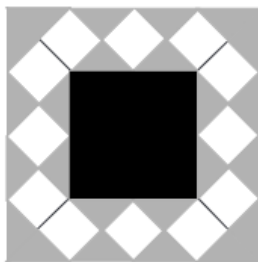
- (A) 6    (B) 7    (C) 8    (D) 9    (E) 10

- 2018B 7. In the figure below,  $N$  congruent semicircles are drawn along a diameter of a large semicircle, with their diameters covering the diameter of the large semicircle with no overlap. Let  $A$  be the combined area of the small semicircles and  $B$  be the area of the region inside the large semicircle but outside the small semicircles. The ratio  $A : B$  is  $1 : 18$ . What is  $N$ ?



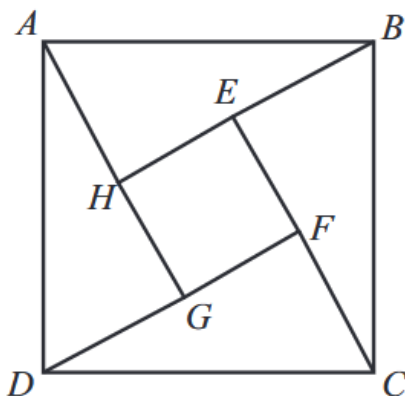
- (A) 16      (B) 17      (C) 18      (D) 19      (E) 36

- 2002A 8. Betsy designed a flag using blue triangles ( $\blacktriangle$ ), small white squares ( $\square$ ), and a red center square ( $\blacksquare$ ), as shown. Let  $B$  be the total area of the blue triangles,  $W$  the total area of the white squares, and  $R$  the area of the red square. Which of the following is correct?



- (A)  $B = W$       (B)  $W = R$       (C)  $B = R$       (D)  $3B = 2R$       (E)  $2R = W$

- 2005A 8. In the figure, the length of side  $AB$  of square  $ABCD$  is  $\sqrt{50}$ ,  $E$  is between  $B$  and  $H$ , and  $BE = 1$ . What is the the area of the inner square  $EFGH$  ?



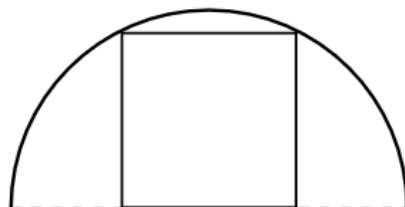
- (A) 25                      (B) 32                      (C) 36                      (D) 40                      (E) 42

- 2005B 8. An 8-foot by 10-foot floor is tiled with square tiles of size 1 foot by 1 foot. Each tile has a pattern consisting of four white quarter circles of radius  $1/2$  foot centered at each corner of the tile. The remaining portion of the tile is shaded. How many square feet of the floor are shaded?



- (A)  $80 - 20\pi$     (B)  $60 - 10\pi$     (C)  $80 - 10\pi$     (D)  $60 + 10\pi$     (E)  $80 + 10\pi$

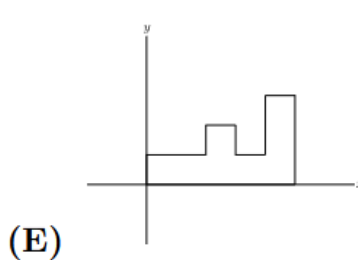
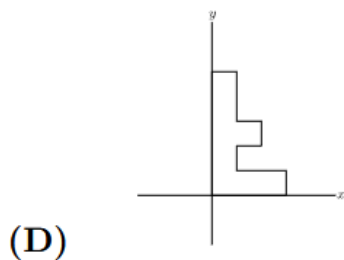
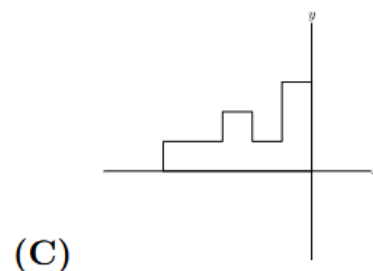
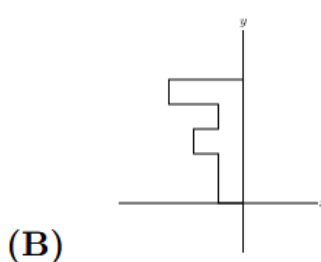
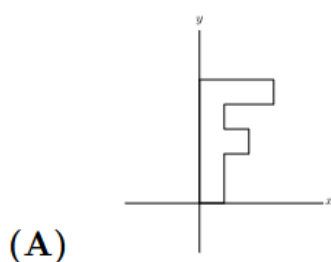
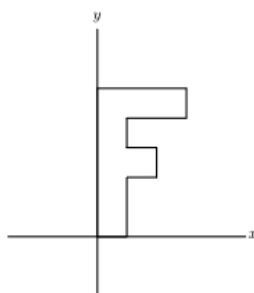
- 2006B 8. A square of area 40 is inscribed in a semicircle as shown. What is the area of the semicircle?



- (A)  $20\pi$             (B)  $25\pi$             (C)  $30\pi$             (D)  $40\pi$             (E)  $50\pi$

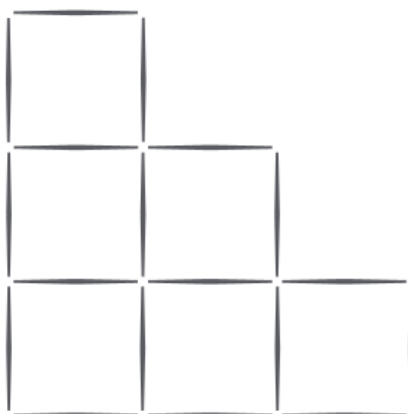
2015B

8. The letter F shown below is rotated  $90^\circ$  clockwise around the origin, then reflected in the  $y$ -axis, and then rotated a half turn around the origin. What is the final image?



2018B

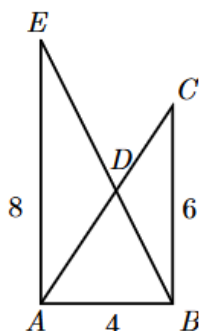
8. Sara makes a staircase out of toothpicks as shown:



This is a 3-step staircase and uses 18 toothpicks. How many steps would be in a staircase that used 180 toothpicks?

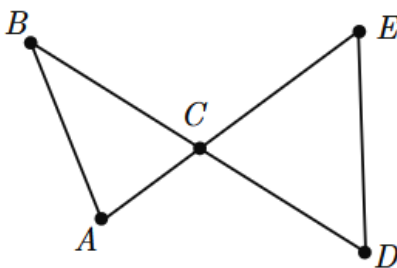
- (A) 10    (B) 11    (C) 12    (D) 24    (E) 30

- 2004A 9. In the Figure,  $\angle EAB$  and  $\angle ABC$  are right angles,  $AB = 4$ ,  $BC = 6$ ,  $AE = 8$ , and  $\overline{AC}$  and  $\overline{BE}$  intersect at  $D$ . What is the difference between the areas of  $\triangle ADE$  and  $\triangle BDC$ ?



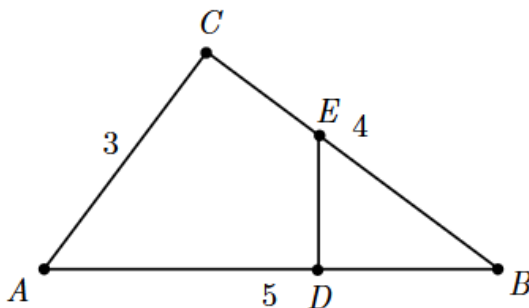
- (A) 2                      (B) 4                      (C) 5                      (D) 8                      (E) 9

- 2009B 9. Segment  $BD$  and  $AE$  intersect at  $C$ , as shown,  $AB = BC = CD = CE$ , and  $\angle A = \frac{5}{2}\angle B$ . What is the degree measure of  $\angle D$ ?



- (A) 52.5      (B) 55      (C) 57.5      (D) 60      (E) 62.5

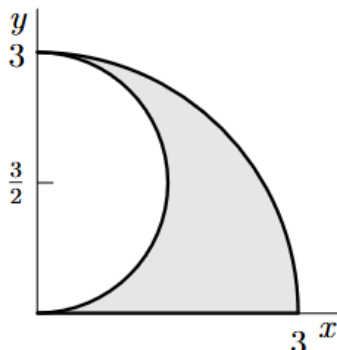
- 2011B 9. The area of  $\triangle EBD$  is one third of the area of  $3-4-5$   $\triangle ABC$ . Segment  $DE$  is perpendicular to segment  $AB$ . What is  $BD$ ?



- (A)  $\frac{4}{3}$       (B)  $\sqrt{5}$       (C)  $\frac{9}{4}$       (D)  $\frac{4\sqrt{3}}{3}$       (E)  $\frac{5}{2}$

2015B

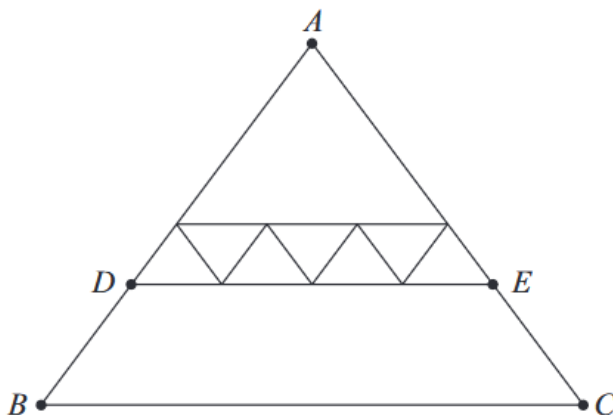
9. The shaded region below is called a shark's fin falcata, a figure studied by Leonardo da Vinci. It is bounded by the portion of the circle of radius 3 and center  $(0, 0)$  that lies in the first quadrant, the portion of the circle of radius  $\frac{3}{2}$  and center  $(0, \frac{3}{2})$  that lies in the first quadrant, and the line segment from  $(0, 0)$  to  $(3, 0)$ . What is the area of the shark's fin falcata?



- (A)  $\frac{4\pi}{5}$     (B)  $\frac{9\pi}{8}$     (C)  $\frac{4\pi}{3}$     (D)  $\frac{7\pi}{5}$     (E)  $\frac{3\pi}{2}$

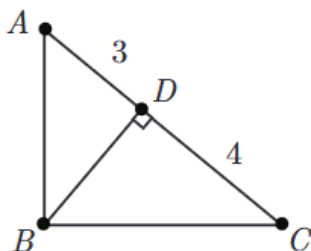
2018A

9. All of the triangles in the diagram below are similar to isosceles triangle  $ABC$ , in which  $AB = AC$ . Each of the 7 smallest triangles has area 1, and  $\triangle ABC$  has area 40. What is the area of trapezoid  $DBCE$ ?



- (A) 16    (B) 18    (C) 20    (D) 22    (E) 24

- 2009A 10. Triangle  $ABC$  has a right angle at  $B$ . Point  $D$  is the foot of the altitude from  $B$ ,  $AD = 3$ , and  $DC = 4$ . What is the area of  $\triangle ABC$ ?

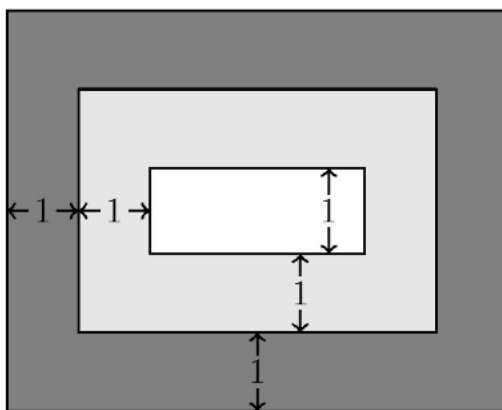


- (A)  $4\sqrt{3}$     (B)  $7\sqrt{3}$     (C) 21    (D)  $14\sqrt{3}$     (E) 42

- 2012B 10. How many ordered pairs of positive integers  $(M, N)$  satisfy the equation  $\frac{M}{6} = \frac{6}{N}$ ?

- (A) 6    (B) 7    (C) 8    (D) 9    (E) 10

- 2016A 10. A rug is made with three different colors as shown. The areas of the three differently colored regions form an arithmetic progression. The inner rectangle is one foot wide, and each of the two shaded regions is 1 foot wide on all four sides. What is the length in feet of the inner rectangle?



- (A) 1    (B) 2    (C) 4    (D) 6    (E) 8



