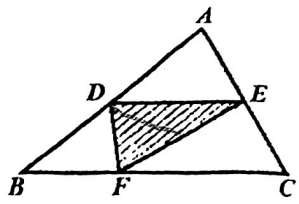
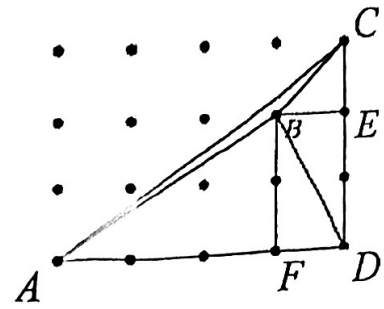
Example 1. The area of triangle ABC is 16 cm^2. D and E are midpoints of AB and AC, respectively. F is a point on BC such that $BF = 3$ cm. What is the area of triangle DEF?

(A) 12 (B) 9 (C) 8 (D) 4 (E) 3



$$S_{\Delta ABC} = S_{\Delta ADC} - S_{\Delta ABF} - 2S_{\Delta FDB} - S_{\Delta BCE}$$
$$= \frac{1}{2}\times 4\times 3 - \frac{1}{2}\times 3\times 2 - 2\times\frac{1}{2}\times 1\times 2 - \frac{1}{2}\times 1\times 1 = \frac{1}{2}$$

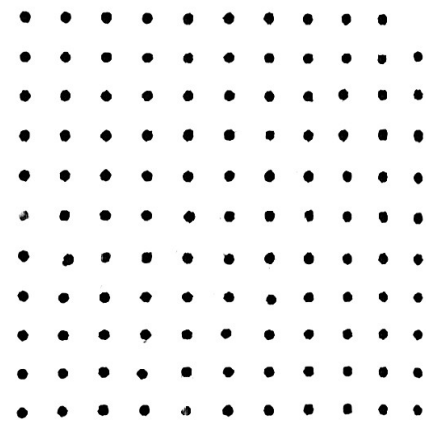


Method 2 (Our Solution):

By **Pick's Law**, $Area = \frac{3}{2} + 0 - 1 = \frac{1}{2}$.

☆**Example 8.** What is the area enclosed by the geoboard quadrilateral below?

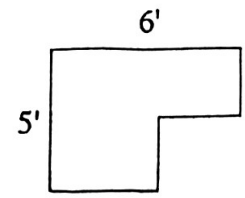
(A) 16 (B) 18 (C) 20 (D) 25 (E) 21



· of a larger rectangle as shown.

pe?

} (E) 10

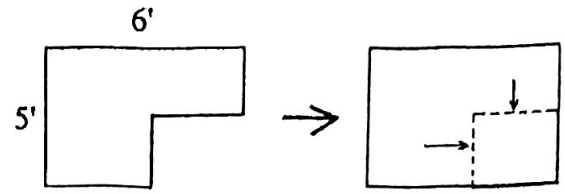


he two red colored

)wn side lengths (Note: the

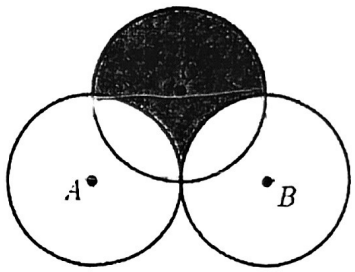
and after the move). The perimeter

.2.



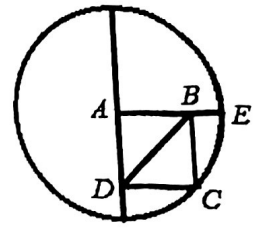
☆**Example 22.** (AMC 10) Circles A, B, and C each have radius 1. Circles A and B share one point of tangency. Circle C has a point of tangency with the midpoint of AB. What is the area inside circle C but outside circle A and circle B ?

(A) $3-\frac{\pi}{2}$ (B) $\frac{\pi}{2}$ (C) 2 (D) $\frac{3\pi}{4}$ (E) $1+\frac{\pi}{2}$



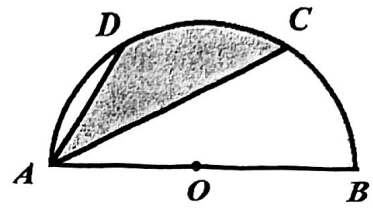
Example 23. $ABCD$ is a square with vertex A at the center of the circle. $AE = 10$ in. What is the number of square inches in the area of ΔBCD?

(A) 100 (B) 50 (C) 25 (D) 8π (E) 12π



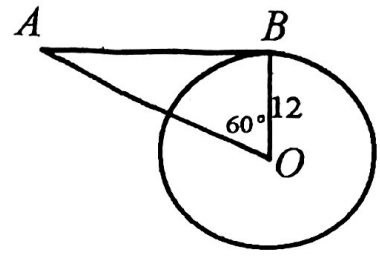
Example 27. D and C trisect the arc of the half circle as shown in the figure. Find the shaded area if the area of the half circle is 9π.

(A) 3π (B) 4π (C) 5π (D) 6π (E) 2π



Problem 17. What is the radius of a circle whose perimeter is 64π cm?
(A) 64 (B) 32 (C) 16 (D) 8 (E) 128

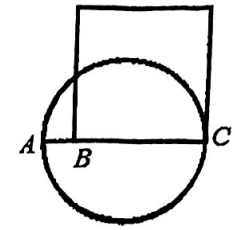
Problem 19. In the figure, the center of the circle is O and $\overline{AB}$ is tangent to the circle at point B. What is the area of the shaded region?



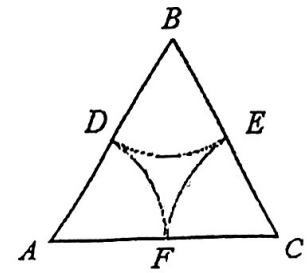
(A) $36\sqrt{3}-24\pi$ (B) $36\sqrt{3}-12\pi$
(C) $72\sqrt{3}-12\pi$ (D) $72\sqrt{3}-24\pi$
(E) $36\sqrt{3}-12\pi$

Problem 22. A square is constructed on diameter $\overline{AC}$ such that the area of the square is equal to the area of the circle. What percent of $\overline{AC}$ is $\overline{BC}$?

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



Problem 23. The length of a side of equilateral triangle ABC is 2. D, E, and F are the midpoints of $\overline{AB}$, $\overline{BC}$, and $\overline{AC}$, respectively. A, B, and C are the centers of the circles that contain arcs DF, DE, and FE, respectively. What is the area of the shaded region?

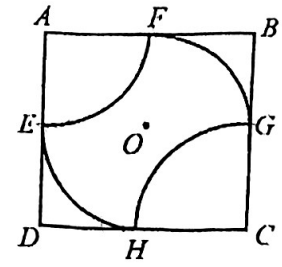


(A) $3\sqrt{2}-\frac{\pi}{2}$ (B) $\pi-\sqrt{3}$

(C) $2\sqrt{3}-\frac{\pi}{2}$ (D) $\sqrt{3}-\frac{\pi}{4}$

(E) $\sqrt{3}-\frac{\pi}{2}$

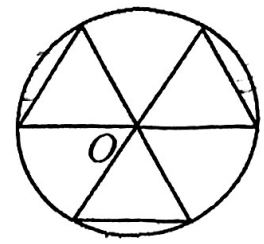
Problem 24. The figure shows a square with side of length 12. The center of the square is O, and E, F, G, and H are the midpoints of the sides. If the arcs shown have centers at A, O, and C, what is the area of the shaded region?



(A) 72 (B) $36+\frac{36\pi}{7}$ (C) $18\pi-18$

(D) 12π (E) $36-12\pi$

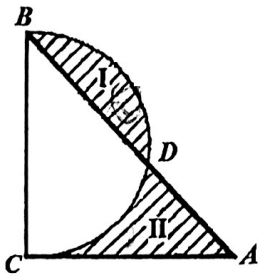
Problem 25. Circle O has a diameter of 20 cm and the triangles shown are equilateral. Find the percent of the circle that is shaded.



(A) $\frac{1}{2}-\frac{3\sqrt{3}}{2\pi}$ (B) $\frac{1}{2}-\frac{\sqrt{3}}{4\pi}$ (C) $\frac{1}{2}-\frac{\sqrt{3}}{\pi}$

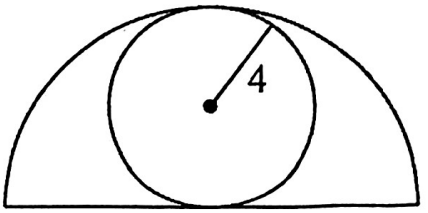
(D) $\frac{1}{2}-\frac{3\sqrt{3}}{4\pi}$ (E) $\frac{1}{2}-\frac{3\sqrt{3}}{\pi}$

Problem 26. As shown in the figure, right triangle ABC with $BC = 20$ *cm*. BDC is a half circle with the diameter BC. The difference between two shaded areas I and II is 23. Find AC in terms of π.



☆**Problem 27.** A circle of radius 4 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) $\frac{5\pi}{6}$ (C) $\frac{2}{\pi}$ (D) $\frac{2\pi}{3}$ (E) $\frac{3}{\pi}$.



☆ **Problem 28.** In trapezoid $ABCD$, AD is perpendicular to DC, $AD = AB = 4$, and $DC = 8$. In addition, E is on DC, and BE is parallel to AD. Find the area of ΔBEC.

(A) 4 (B) 8 (C) 12 (D) 18 (E) 10