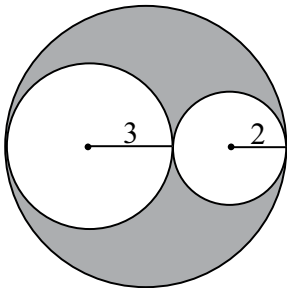
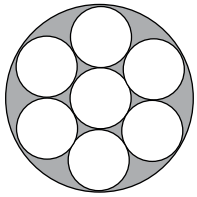
# Geometry of Circles

1. Circles of radius 2 and 3 are externally tangent and are circumscribed by a third circle, as shown in the figure. Find the area of the shaded region.




**(A)** $3\pi$ **(B)** $4\pi$ **(C)** $6\pi$ **(D)** $9\pi$ **(E)** $12\pi$

2. Each of the small circles in the figure has radius one. The innermost circle is tangent to the six circles that surround it, and each of those circles is tangent to the large circle and to its small-circle neighbors. Find the area of the shaded region.



**(A)** $\pi$ **(B)** $1.5\pi$ **(C)** $2\pi$ **(D)** $3\pi$ **(E)** $3.5\pi$

3. If an arc of $45^\circ$ on circle $A$ has the same length as an arc of $30^\circ$ on circle $B$, then the ratio of the area of circle $A$ to the area of circle $B$ is

**(A)** $\frac{4}{9}$ **(B)** $\frac{2}{3}$ **(C)** $\frac{5}{6}$ **(D)** $\frac{3}{2}$ **(E)** $\frac{9}{4}$

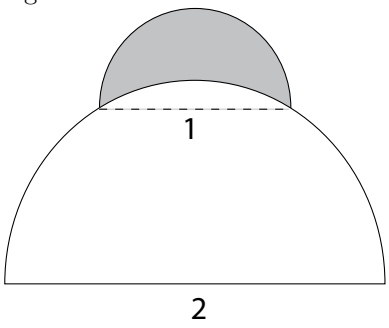
4. The number of inches in the perimeter of an equilateral triangle equals the number of square inches in the area of its circumscribed circle. What is the radius, in inches, of the circle?

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

5. Four distinct circles are drawn in a plane. What is the maximum number of points where at least two of the circles intersect?

**(A)** 8 **(B)** 9 **(C)** 10 **(D)** 12 **(E)** 16

6. A semicircle of diameter 1 sits at the top of a semicircle of diameter 2, as shown. The shaded area inside the smaller semicircle and outside the larger semicircle is called a *lune*. Determine the area of this lune.




**(A)** $\frac{1}{6}\pi - \frac{\sqrt{3}}{4}$ **(B)** $\frac{\sqrt{3}}{4} - \frac{1}{12}\pi$ **(C)** $\frac{\sqrt{3}}{4} - \frac{1}{24}\pi$ **(D)** $\frac{\sqrt{3}}{4} + \frac{1}{24}\pi$

**(E)** $\frac{\sqrt{3}}{4} + \frac{1}{12}\pi$