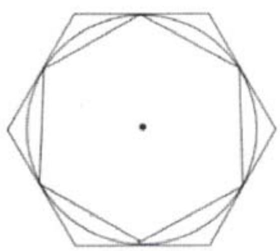
MATH PROBLEM OF THE MONTH (May)

Solution

A regular hexagon is inscribed inside a circle, and this circle is inscribed inside a larger regular hexagon. Find the exact value of the ratio of the area of the larger hexagon to the area of the smaller hexagon.



$\frac{4}{3}$. A regular hexagon is composed of 6 equilateral triangles with each triangle having an area of $\frac{\sqrt{3}}{4}s^2$, where s is the length of a side of the hexagon. The outer hexagon has triangle sides of length $\frac{2r}{\sqrt{3}}$, while the inner hexagon is composed of equilateral triangles with side length r. Thus, the ratio of areas is:

$6\times\frac{\sqrt{3}}{4}\left(\frac{2r}{\sqrt{3}}\right)^2$ to $6\times\frac{\sqrt{3}}{4}r^2$. This reduces to $\frac{4}{3}$.