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by Benjamin Bloch, Ph.D.

1. The outer circle area A' is n times the inner circle area A , thus $A' = nA$.
The annular area, $A^* = A' - A = nA - A = A(n-1)$.
Therefore $A^*/A = n-1$.
In terms of the radii, $A' = \pi r'^2$ and $A = \pi r^2$ thus $A' = nA$ becomes $\pi r'^2 = n\pi r^2$ and therefore $n = r'^2 / r^2$.
Finally, $A^*/A = n - 1 = (r'^2 / r^2) - 1$.
2. If $A^*/A = 3$, then $n - 1 = 3$, and $n = 4$. When the outer circle area is 4 times the inner circle area, the annular area is 3 times the inner circle area.
3. Because the outer circle circumference $C' = 2\pi r'$ and the inner circle circumference $C = 2\pi r$, $C'/C = r' / r = \sqrt{n}$.