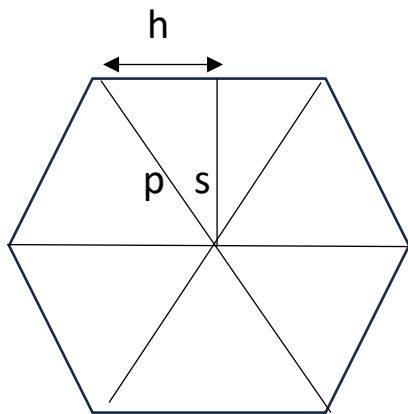


Area calculation of one regular polygon from the apothem :



$$\text{Area} = s \cdot 2h / 2 = s \cdot h \rightarrow h = \sqrt{p^2 - s^2}$$

$$\text{Area} = \sqrt{p^2 - s^2} \cdot s$$

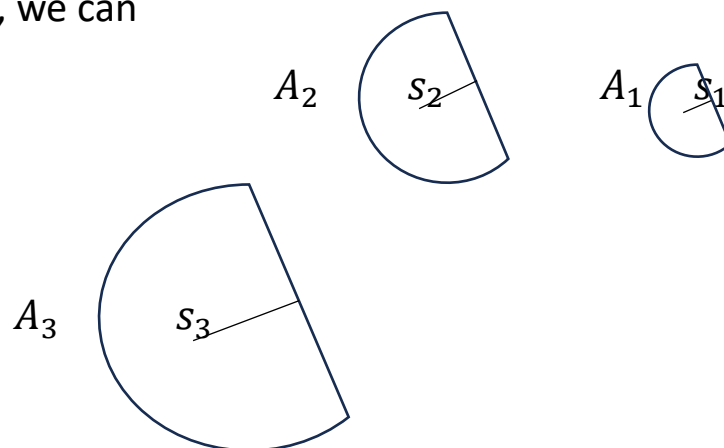
Knowing that s = apothem and p = radius = $\lambda \cdot s$

$$\text{Area}(s) = pL(s) \text{ and } \text{Area}(s)' = L(s) \rightarrow \text{Area}(s) = \sqrt{\lambda^2 - 1} \cdot s^2 \rightarrow$$

$$\text{Area}(s) = \sqrt{\lambda^2 - 1} \cdot s^2 \text{ and you only need to multiply by 6}$$

Or also:

In any figure, we can



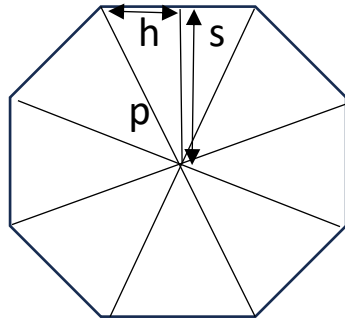
understanding that $2 A_1 = A_2$ and $3 A_1 = A_3$, therefore, $A_1 r = A_2$

$$r \cdot A_2 = A_3$$

$$r^2 \cdot A_1 = A_3 = s^2 \cdot \lambda^2 \cdot A_1 \rightarrow A_1(s) = r \cdot L_1(s) \rightarrow$$

$$A_1'(s) = 2s \cdot \lambda^2 \cdot A_1 = s \cdot \lambda \cdot L_1(s) \rightarrow \lambda = \frac{L_1(s)}{2A_1(s)} \quad \text{or } r = \frac{L_1(s)}{2A_1(s)} \cdot s$$

and in the case of an octahedron:



$$360^\circ/8 = 45^\circ = \frac{\pi}{4}$$

$$45^\circ/2 = 22.5^\circ = \frac{\pi}{8}$$

We know that p = radius and Area = $h \cdot s$ and $h = p \cdot \sin \frac{\pi}{8}$

$$p^2 = s^2 + h^2 \quad p^2 = s^2 + p^2 \cdot \sin^2 \frac{\pi}{8} \quad s^2 = p^2 (1 - \sin^2 \frac{\pi}{8})$$

$$\text{Area} = (p \cdot \sin \frac{\pi}{8}) \cdot p \cdot \sqrt{(1 - \sin^2 \frac{\pi}{8})}$$