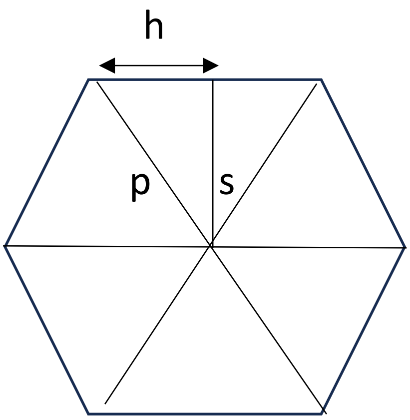
Area calculation of one regular polygon from the apothem :



Area = s.2h/2 $p^2 = s^2 + h^2$ →h=$\sqrt{p^2 - s^2}$
Area = $\sqrt{p^2 - s^2}$.s

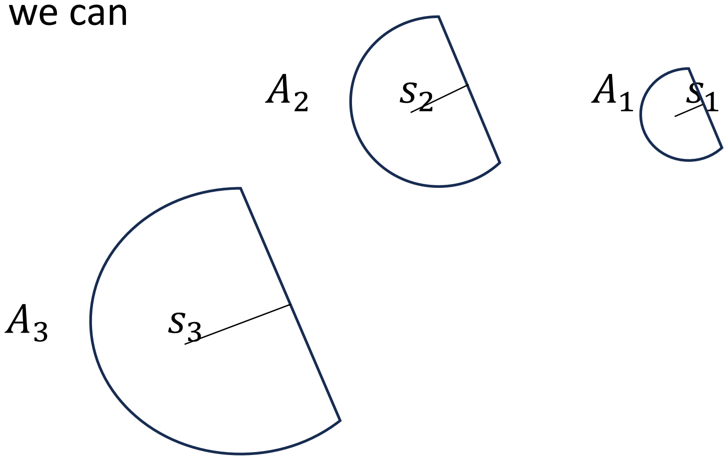
Knowing that s= apothem and p= radius = λ .s

Area (s)= pL (s) and Area (s)'= L(s) →Area(s)= $\sqrt{\lambda . s^2 - s^2}$.s→

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

Or also:

In any figure, we can



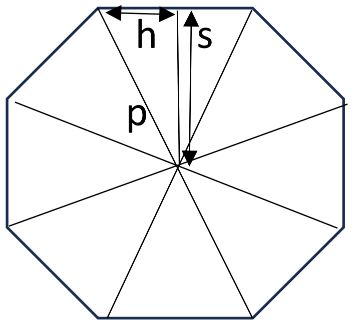
understanding that 2 A_1= $A_2$and 3 A_1=A_3 , therefore , . A_1r A_2=

r. A_2=A_3

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

$A_1'(s)$= 2s. $\lambda^2 . A_1$= s. λ. L_1(s) → λ=$\frac{L_1(\mathrm{s})}{2A_1(s)}$ r =$\frac{L_1(\mathrm{s})}{2A_1(s)} . s$

and in the case of an octahedron:



360º/8= 45º=$\frac{\pi}{4}$

45º/2= 22.5º =$\frac{\pi}{8}$

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

$p^2 = s^2 + h^2$ $p^2 = s^2$+$p^2 . Sin^2 \frac{\pi}{8}$ $s^2 = p^2$(1- $Sin^2 \frac{\pi}{8}$)

Area = (p.Sin $\frac{\pi}{8}$).p.$\sqrt{(1 - \ Sin^2 \frac{\pi}{8})}$