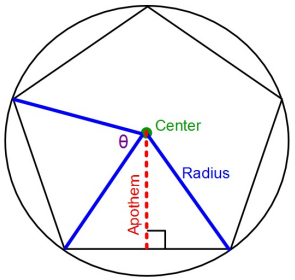
Wednesday, April 1, 2020

Sec 10-3: Areas of Regular Polygons



Center of a Regular Polygon
The center of the circumscribed circle

Radius of a Regular Polygon
Segment connecting the center to to a vertex.

Apothem of a Regular Polygon
Segment that represents the perpendicular distance from the center to one of the sides.

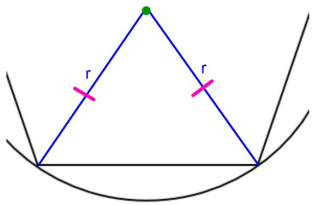
Central Angle of a Regular Polygon
Angle formed by consecutive radii.

Area of a Regular Polygon $A = \frac{1}{2}(a)(p)$

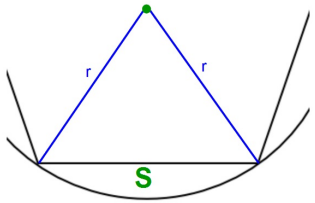
a = Apothem

p = perimeter of the polygon

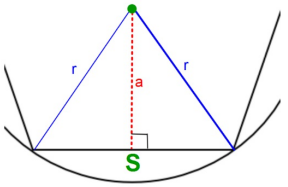
If you draw consecutive radii in a regular polygon you'll create an Isosceles Δ.

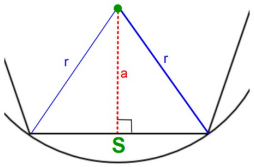


S is the length of one side of the Regular Polygon.



If you draw the apothem it becomes the height of this Isosceles triangle.





Area of this one triangle = $\frac{1}{2}(s)(a)$

or $= \frac{1}{2}(a)(s)$

Area of polygon = (Area of 1 Δ)(# Δ's)

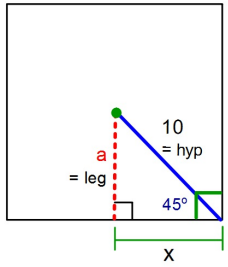
$= \frac{1}{2}(a)(s) \cdot$ # sides

Area of the polygon = $\frac{1}{2}(a)(s) \cdot$ # sides

Since $(s) \cdot$ # sides = perimeter

Area of a polygon = $\frac{1}{2}(a)(p)$ a = apothem, p = perimeter

Find the area of a square whose radius is 10.



Find the apothem:

$a = \frac{10}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{10\sqrt{2}}{2} = \boxed{5\sqrt{2}}$

Find the perimeter:

Find a side of the square:

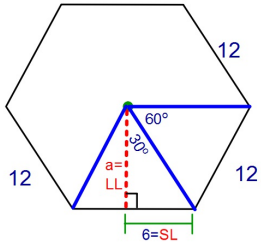
x=apothem=$5\sqrt{2}$

side = 2x=$2 \cdot 5\sqrt{2} = 10\sqrt{2}$

perimeter=side$\cdot 4 = \boxed{40\sqrt{2}}$

$A = \frac{1}{2}(5\sqrt{2})(40\sqrt{2}) = \boxed{200}$

Find the area of a regular hexagon whose sides are 12.



Perimeter:

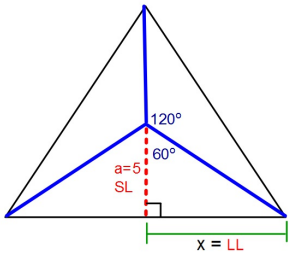
p= $12 \cdot 6 = \boxed{72}$

Find apothem:

a = $LL = SL \cdot \sqrt{3} = \boxed{6\sqrt{3}}$

$A = \frac{1}{2}(6\sqrt{3})(72) = \boxed{216\sqrt{3}}$

Find the area of an equilateral triangle whose apothem is 5.



We already have the apothem: a = 5

Find perimeter:

first find a side:

x= $LL = SL \cdot \sqrt{3} = 5 \cdot \sqrt{3} = \boxed{5\sqrt{3}}$

side= $2x = 2 \cdot 5\sqrt{3} = \boxed{10\sqrt{3}}$

perimeter= $3 \cdot$side= $3 \cdot 10\sqrt{3} = \boxed{30\sqrt{3}}$

$A = \frac{1}{2}(5)(30\sqrt{3}) = \boxed{75\sqrt{3}}$

You can now do Practice #13 which is posted on my blog.