

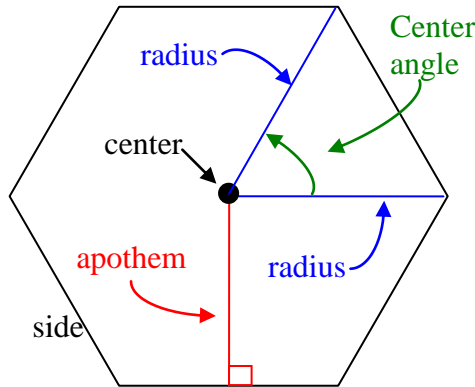
<name>

Class: Honors Geometry

Date: <date>

Topic: Lesson 9-5 (Trigonometry and Area)

Labeled  
regular  
polygon



Center  
angles are  
constant for  
type

# sides	Polygon name	Center angle measure
3	Triangle	120°
4	Square	90°
5	Pentagon	72°
6	Hexagon	60°
8	Octagon	45°
9	Nonagon	40°
10	Decagon	36°
$n$	$N$ -gon	$\frac{360^\circ}{n}$

Given radius  
find area

What info we know:

$$n = 5$$

$$m\angle_{Center} = \frac{360^\circ}{5} = 72^\circ$$

$$r = 18 \text{ (hyp)}$$

What we need:

Apothem (adj side)  $\rightarrow$  cosine

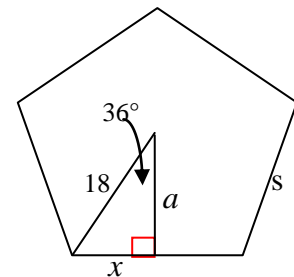
Perimeter...side ( $2 \cdot$  opp side)  $\rightarrow$  sine

Answer:

$$\cos 36 = \frac{a}{18}; a = 18 \cos 36 = 14.5623$$

$$\sin 36 = \frac{x}{18}; x = 18 \sin 36 = 10.580134; s = 2x = 21.16027; p = 5s = 105.80134$$

$$A = \frac{1}{2}ap = \frac{1}{2}(14.5623)(105.80134) = 770.355 \text{ cm}^2 \approx 770.4 \text{ cm}^2$$



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Given  
apothem  
find area

What info we know:

$$n = 6$$

$$m\angle Center = \frac{360^\circ}{6} = 60^\circ$$

$$a = 6 \text{ (adj side)}$$

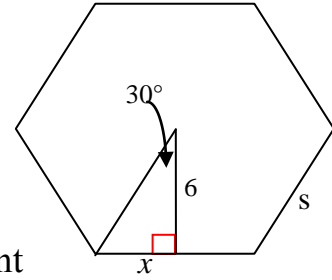
What we need:

Perim...side (2 · opp side) → tangent

Answer:

$$\tan 30 = \frac{x}{6}; x = 6 \tan 30 = 3.4641; s = 2x = 6.9282; p = 6s = 41.5692$$

$$A = \frac{1}{2}ap = \frac{1}{2}(6)(41.5692) = 124.707 \text{ ft}^2 \approx 124.7 \text{ ft}^2$$



Given side  
find area

What info we know:

$$n = 8$$

$$m\angle Center = \frac{360^\circ}{8} = 45^\circ$$

$$s = 8; p = 8s = 64 \text{ (opposite side - } \frac{1}{2}$$

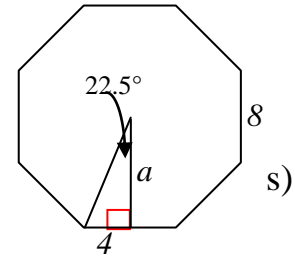
What we need:

Apothem (adjacent side) → tangent

Answer:

$$\tan 22.5 = \frac{4}{a}; a = \frac{4}{\tan 22.5} = 9.65685$$

$$A = \frac{1}{2}ap = \frac{1}{2}(9.65685)(64) = 309.019 \text{ m}^2 \approx 309.0 \text{ m}^2$$



General triangle area formula

If you have a triangle for which you know two sides and the included angle (SAS) then:

Theorem 9-1

$$Area = \frac{1}{2}b(c \sin A) = \frac{1}{2}bc(\sin A)$$

