Area of Regular Polygons- Investigation and Notes

Warm Up- REGULAR Nonagon

1. What does it mean to be a regular polygon?

all ≅ sides and all ≅ angles

2. **Proof**

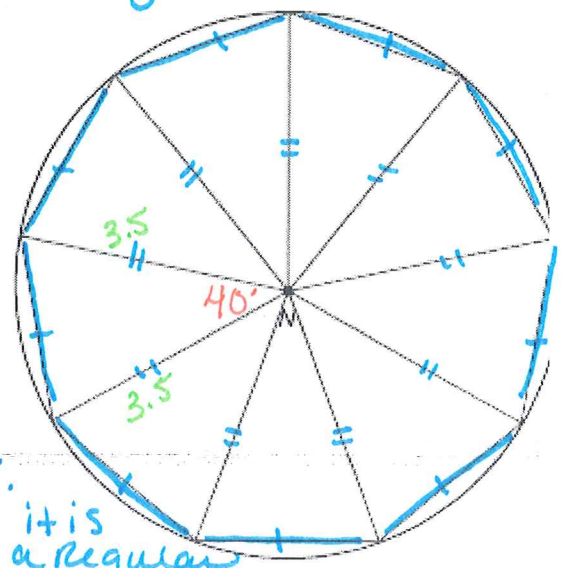
Given: all sides of the inscribed nonagon are congruent

Prove: the nonagon is a regular polygon.

Paragraph Proof

All radii are ≅

∴ all Δs are ≅ by SSS and the central angles are ≅ by CPCTC, resulting in The same sum for the Pairs of base ∠s to be, Remembering, base ∠s of isosc. Δs are ≅, all int ∠s are the same sum of ≅ base ∠s ∴ it is a Regular Polygon.



3. How many little triangles is the polygon broken into?

9

4. What is the degree measure of each central angle?

9 ≅ ∠s $\frac{360}{9} = 40°$

5. Measure in centimeters the length of the radii.

r = 3.5 cm

6. Find the area of ONE of the triangles. (Show all work)

$A = \frac{1}{2} ab \sin\theta$

$A = \frac{1}{2} 3.5 \times 3.5 \sin 40°$

$A = 6.125 \sin 40°$

$\boxed{A = 3.94 \text{ cm}^2}$

7. Find the area of the regular nonagon. (Show all work)

Area of the nonagon

$A = 9(\Delta)$

$A = 9(\frac{1}{2} 3.5 \times 3.5 \sin 40)$

$\boxed{A \approx 35.43 \text{ cm}^2}$

An Inscribed Regular Pentagon

$360 \div 5 = 72°$

1. Use a protractor to inscribe a regular pentagon in circle P by constructing the central angles first.

2. Measure the length of the radii.

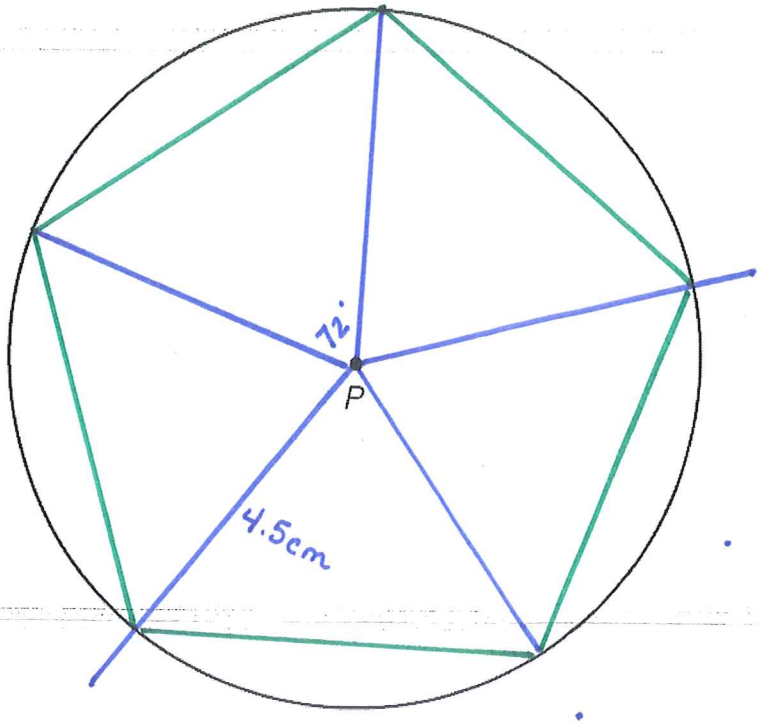
4.5cm

3. Find the area of the inscribed regular pentagon. (Show all work)

$A = 5\Delta$

$A = 5(\frac{1}{2}\, 4.5 \times 4.5 \sin 72)$

$\boxed{A \approx 48.15 cm^2}$



Finding the area of regular polygons Notes

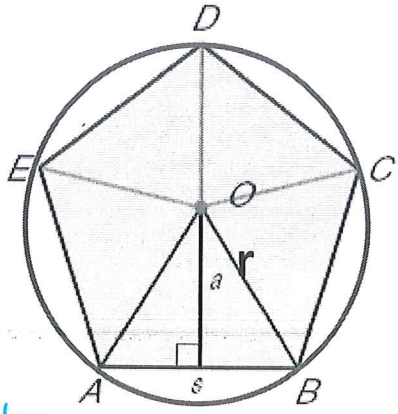
A. If you are given the radius (r) of a regular polygon you find the area by:

$A = n\frac{1}{2} r \cdot r \sin\theta$

B. If given the apothem(a) and the side length(s) you find the area by:

$A = n\frac{1}{2} b \cdot h$ which would be

$A = n\frac{1}{2} s \cdot a$



Examples:

Find the area of the octagon, given the following information.

1. QG= 6 in radius

$A = 8\frac{1}{2} 6 \cdot 6 \sin 45°$

$\boxed{A \approx 101.82 in^2}$

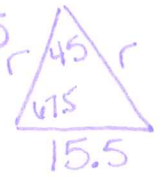
2. CQ= 21.3cm

$A = 8\frac{1}{2}(21.3)^2 \sin 45$

$\boxed{A \approx 1283.23 cm^2}$

3. Perimeter= 124in

$S = 15.5$



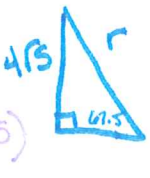
$\frac{\sin 67.5}{r} = \frac{\sin 45}{15.5}$

$r = 20.25 in$

$A = 8(\frac{1}{2}(20.25)^2 \sin 45)$

$\boxed{= 1159.8}$

4. QJ= $4\sqrt{5}$m



$\sin 67.5 = \frac{4\sqrt{5}}{r}$

$r = 9.68$ $A = 8\frac{1}{2}(9.68)(9.68)\sin 45°$

$\boxed{A = 265.03 m^2}$