NOTES 11.3 – AREAS OF REGULAR POLYGONS
Equilateral & Equiangular

Side

Center

Apothem — From center ⊥ to side at midpoint

Radius — From center to a vertex
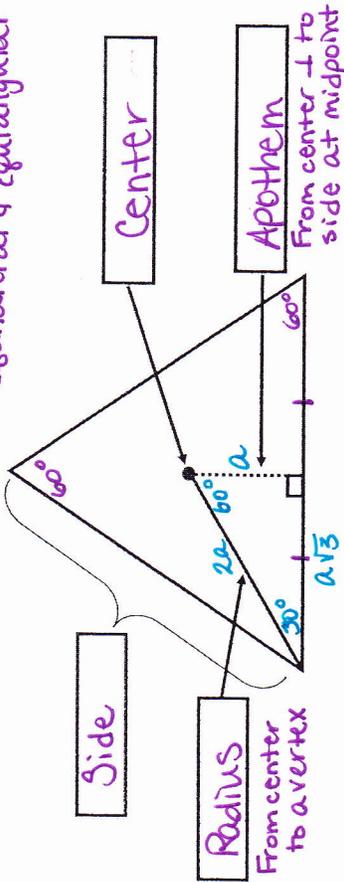
$$A_{REGULAR\ POLYGON} = \frac{1}{2}(Perimeter)(apothem)$$

EXAMPLE 1: Find the indicated measures for the regular triangle.

12 cm $2\sqrt{3}\ cm = a$

$P = 12(3) = 36$
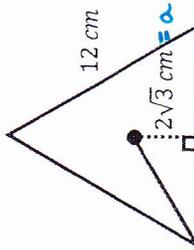
$A = \frac{1}{2}Pa$
$= \frac{1}{2}(36)(2\sqrt{3})$
$= 36\sqrt{3}$

$P = \underline{36\ cm}$

$A = \underline{36\sqrt{3}\ cm^2}$

EXAMPLE 2: Find the indicated measures for the equilateral triangle.

18 m

$P = 18(3) = 54$

$\sqrt{3} \cdot a\sqrt{3} = 9 \cdot \sqrt{3}$
$3a = 9\sqrt{3}$
$a = 3\sqrt{3}$

$A = \frac{1}{2}Pa$
$= \frac{1}{2}(54)(3\sqrt{3})$
$= 27(3\sqrt{3}) = 81\sqrt{3}$

$P = \underline{54\ m}$

$a = \underline{3\sqrt{3}\ m}$

$A = \underline{81\sqrt{3}\ m^2}$

Side

Center

Apothem

Radius
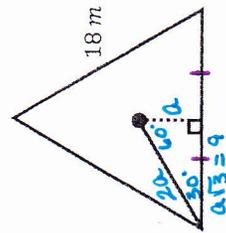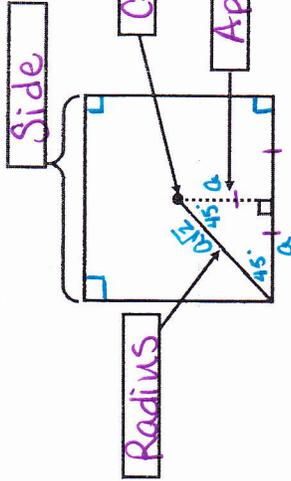
$$A_{REGULAR\ POLYGON} = \frac{1}{2}(Perimeter)(apothem)$$

EXAMPLE 3: Find the indicated measures for the regular polygon below.

9 in $a = \frac{9}{2}$

$a\sqrt{2}$ $\frac{9}{2}\sqrt{2}$
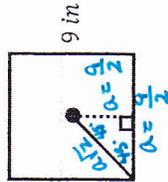
$P = 9(4) = 36$

$A = \frac{1}{2}Pa$
$= \frac{1}{2}(36)\left(\frac{9}{2}\right)$
$= 18\left(\frac{9}{2}\right)$
$= 81$

$P = \underline{36\ in}$

$r = \underline{\frac{9}{2}\sqrt{2}\ in}$

$A = \underline{81\ in^2}$

EXAMPLE 4: Find the indicted measures for the square below.

$a\sqrt{2} = 5\sqrt{2}\ cm$ $a = 5$ $a = 5$ 10
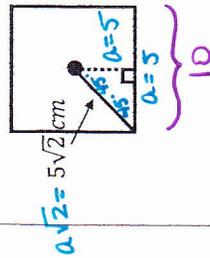
$P = 10(4) = 40$

$A = \frac{1}{2}Pa$
$= \frac{1}{2}(40)(5)$
$= 20(5)$
$= 100$

$a = \underline{5\ cm}$

$P = \underline{40\ cm}$

$A = \underline{100\ cm^2}$

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Center

Radius

Side

Apothem $=a\sqrt{3}$
Not a this time!

$a\sqrt{3}$

a
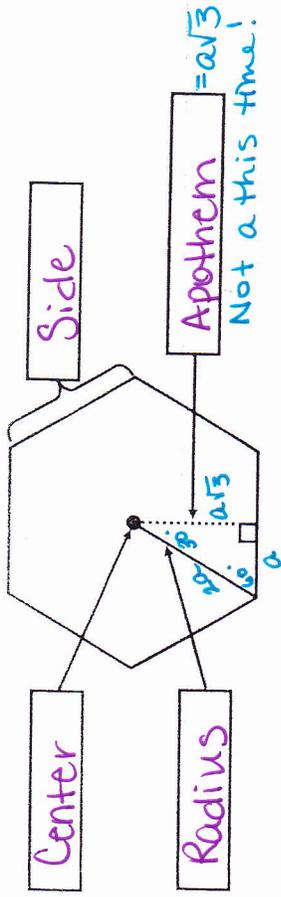
$$A_{REGULAR\ POLYGON} = \frac{1}{2}(Perimeter)(apothem)$$

EXAMPLE 5: Find the indicated measures for the regular polygon below.

$4\sqrt{3}\ cm = a\sqrt{3}$

$a = 4$

$P = 8(6)$
$= 48$
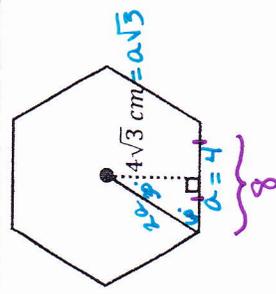
$A = \frac{1}{2}Pa$
$= \frac{1}{2}(48)(4\sqrt{3})$
$= 24(4\sqrt{3})$
$= 96\sqrt{3}$

P = $\underline{48cm}$

A = $\underline{96\sqrt{3}\ cm^2}$

Apothem = $4\sqrt{3}$

EXAMPLE 6: Find the indicated measures for the regular polygon below.

$a\sqrt{3} = 6\sqrt{3}$
$12\ cm$

$a = 6$
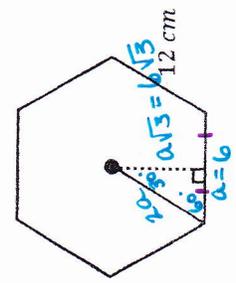
$P = 12(6)$
$= 72$

$A = \frac{1}{2}Pa$
$= \frac{1}{2}(72)(6\sqrt{3})$
$= 36(6\sqrt{3})$
$= 216\sqrt{3}$

P = $\underline{72cm}$

a = $\underline{6\sqrt{3}\ cm}$

A = $\underline{216\sqrt{3}\ cm^2}$

Apothem = $6\sqrt{3}$

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