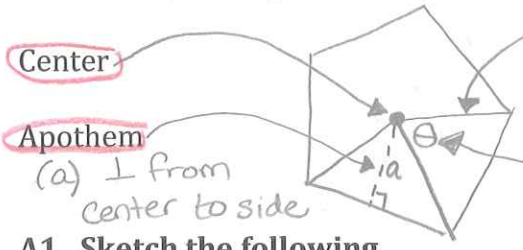
TOPIC: **11.6 Areas of Regular Polygons**	NAME: KEY DATE:

ESSENTIAL QUESTION: **How can you find the area of a regular pentagon?**

QUESTIONS:

Vocabulary of Regular Polygons:

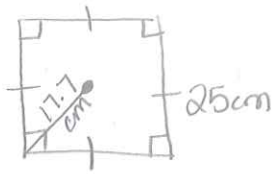


A1. Sketch the following.

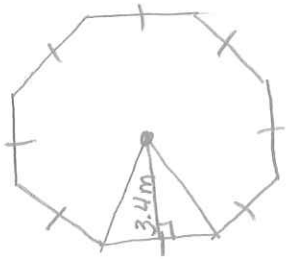
a. A regular quadrilateral with a perimeter of 100 cm and a radius of about 17.7 cm.

equiangular and equilateral ∴ SQUARE

$\frac{100}{4} = 25$cm



b. A regular octagon with an apothem of about 3.4 m.



Theorem 11.11: Area of a Regular Polygon

The area of a regular *n*-gon with side length *s* and apothem *a* is one-half the product of s, a, and n. (Also...the area of a regular *n*-gon with perimeter *P* is one-half the product of P, and a.)

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

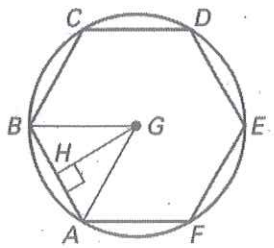
* Note
Perimeter = P
P = (side length)(# of sides)
P = s · n

A2. Name or find the measure of the part of the regular polygon.

a. Center: G

b. Radius: $\overline{GB}$ or $\overline{GA}$

c. Apothem: $\overline{GH}$



d. $m\angle AGB$: $\frac{360}{n} = \frac{360}{6} = 60°$

e. $m\angle HGA$: $\frac{60}{2} = 30°$

f. $m\angle BHG$: 90°

SUMMARY:

The area of a regular polygon can be found by

Area = $\frac{1}{2}$(side length)(apothem length)(# of sides)

$A = \frac{1}{2}(s)(a)(n)$ OR $A = \frac{1}{2}$(Perimeter)(a) $= \frac{1}{2} P \cdot a$

QUESTIONS:

A3. Find the area of each regular polygon.

a. Decagon with $a \approx 5.7cm$ *and* $s \approx 3.7cm$

↳ $n=10$

$A = \frac{1}{2}(3.7)(5.7)(10) \approx$ **105.45 cm^2**

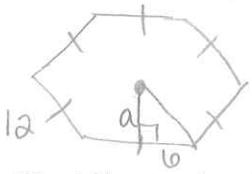
b. Octagon with $a \approx 12.1ft$ *and* $P \approx 80ft$

↳ $n=8$

$A = \frac{1}{2}P \cdot a = \frac{1}{2}(80)(12.1) =$ **484 ft^2**

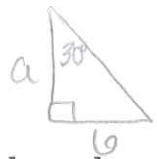
c. Hexagon with $P = 72ft$

↳ $n=6$ $A = \frac{1}{2}P(a) = \frac{1}{2}(72)(10.39) \approx$ **374.12 ft^2**



$\frac{72}{6} = 12'$ per side

$\frac{360}{6} = 60°$

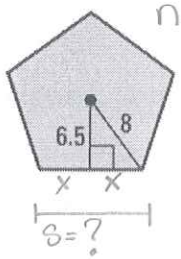


$\frac{\tan 30°}{1} = \frac{6}{a}$

$a \approx 10.39$

A4. Find the perimeter and area of the regular polygon.

a. $n=5$



$6.5^2 + x^2 = 8^2$

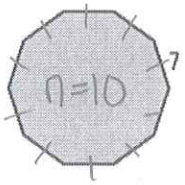
$x \approx \sqrt{21.75} \approx 4.66$

$s = 9.33$ $a = 6.5$

$A = \frac{1}{2}(9.33)(6.5)(5)$ (s, a, n)

$A \approx 151.61\ un^2$

b.



$P = (10)(7) = 70$

$\frac{360}{10} = 36°$

$36/2 = 18°$

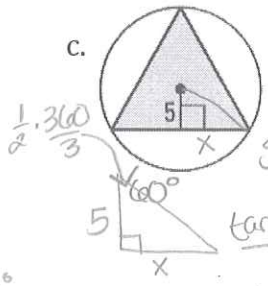
$\frac{\tan 18°}{1} = \frac{3.5}{a}$

$a = 10.77$

$A = \frac{1}{2}P \cdot a = \frac{1}{2}(70)(10.77)$

$= 376.95\ un^2$

c.



$a = 5$

$n = 3$

$\frac{1}{2} \cdot \frac{360}{3}$

$s = 2x$

$\frac{\tan 60°}{1} = \frac{x}{5}$

$x = 8.66$

$s = 2(8.66) = 17.32$

$A = \frac{1}{2}(17.32)(5)(3)$

$A = 129.9\ un^2$

A5. Find the side length of a regular 20-gon with an apothem of about 80 feet and an area of about 20,000 ft².

$n=20$ $a=80\,ft$ $A=20{,}000$ $s=?$

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

$20{,}000 = \frac{1}{2}(s)(80)(20)$

$20{,}000 = (s)(800)$

$s = 25\,ft$