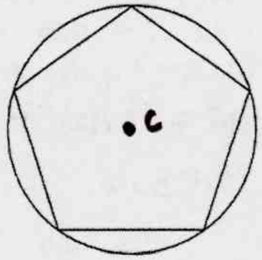
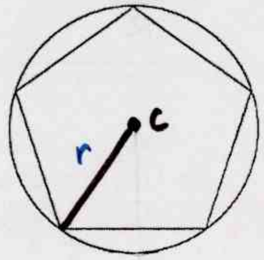
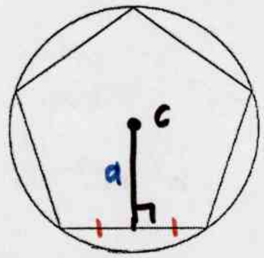
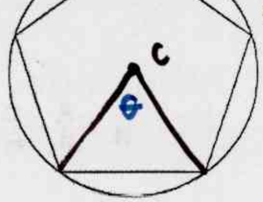
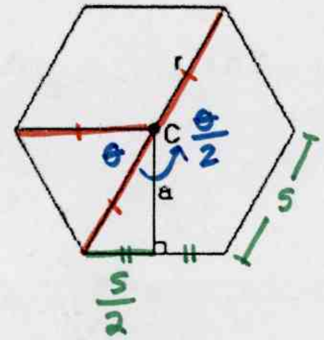
Section 11.6 Date ______

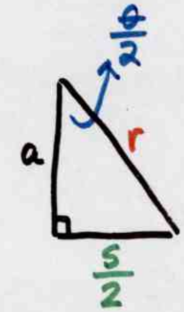
Areas of Regular Polygons

VOCABULARY	DEFINITION	EXAMPLE
CENTER of a POLYGON	The center of a polygon is the center of its circumscribed circle.	
RADIUS of a POLYGON r = radius	The radius of a polygon is the radius of its circumscribed circle. center to the vertex	
APOTHEM of a POLGON a = apothem	must be ⊥ The $\boxed{\text{distance}}$ from the center of to any side of the polygon is the apothem. center to the side (⊥) ⊥ bisector of the side	
CENTRAL ANGLE of a REGUALR POLYGON	The central angle of a regular polygon is and angle formed by two radii drawn to consecutive vertices of the polygon. m Central Angle = $\frac{360°}{n}$ $\theta = \frac{360}{n}$	n = 5 $\theta = \frac{360}{5} = 72°$ 

n = # of sides

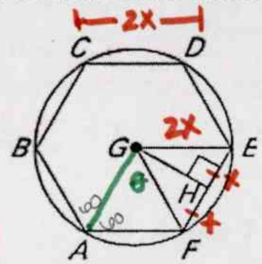
Hexagon n = 6 s = side length





In the diagram, *ABCDEF* is a regular hexagon inscribed in ⊙G. Find each angle measure.

n = 6



a. $m\angle EGF$

$\theta = \frac{360}{6}$

$m\angle EGF \boxed{= 60°}$

b. $m\angle EGH$

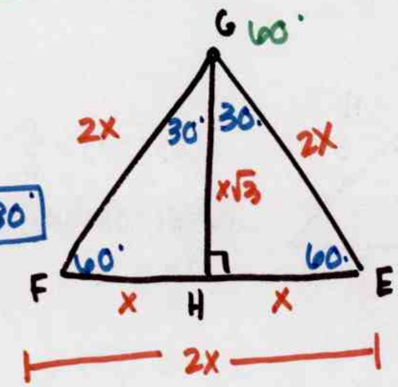
$\frac{\theta}{2} = \frac{60}{2}$

$m\angle EGH \boxed{= 30°}$

c. $m\angle HEG$

90 − 30

$\boxed{= 60°}$



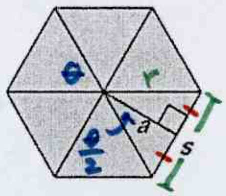
THEOREM 11.11
AREA of a
REGULAR
POLYGON

$A = \frac{aP}{2}$

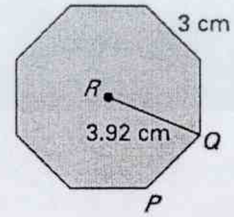
n = # of sides   s = side length

The area of a regular n-gon with side length s is half the product of the apothem a and the perimeter P (P = <u>n</u> · <u>s</u>), so

$A = \frac{1}{2}\underline{aP}$, or $A = \frac{1}{2}\,\underline{a}\,\underline{(n \cdot s)}$



Find the area of the regualr octagon.



Step 1: Identify and label all givens.

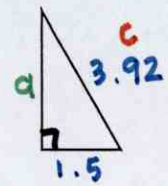
n=8   S=3   r= 3.92

P=8(3) =24   a= <u>3.6</u>

Step 2: Find the apothem a. Always draw the right triagle that contains the apothem, radius, and half the side length.

$a^2 = (3.92)^2 - (1.5)^2$

$a = 3.6$



S=3/2 =1.5

Step 3: Find the area A.

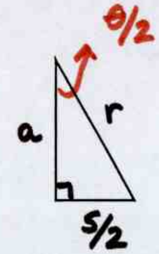
$A = \frac{aP}{2}$ $A = \frac{3.6(24)}{2}$ $\boxed{= 43.2cm^2}$

In order to find the area you need:

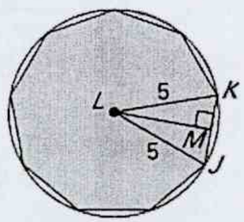
a = ___ need to find

P = <u>24</u>

n = <u>8</u>   s = <u>3</u>



A regular nonagon is inscribed in a circle with radius 5 units. Find the perimeter *P* and area *A* of the nonagon.



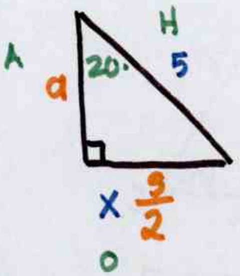
n=9   r=5   a= <u>4.7</u>

S= <u>3.4</u>

P= <u>30.6</u>   P=9(3.4)

$\theta = \frac{360}{9} = 40°$

$\frac{\theta}{2} = 20°$



$\cos(20) = \frac{a}{5}$ $\sin(20) = \frac{x}{5}$

$a = 5(\cos(20))$ $x = 5(\sin(20))$

$a = 4.7$ $x = 1.7$

$\frac{s}{2} = 1.7$

$S = 2(1.7)$

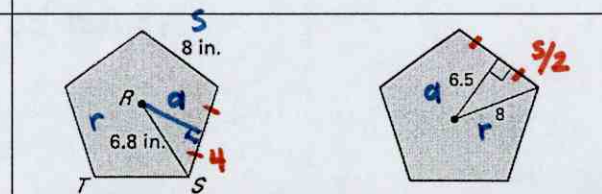
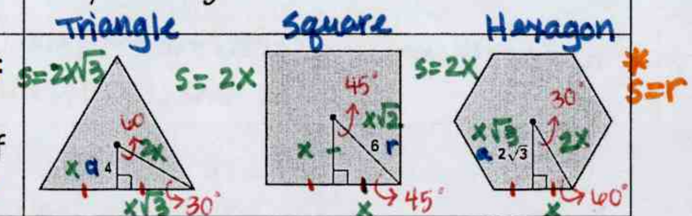
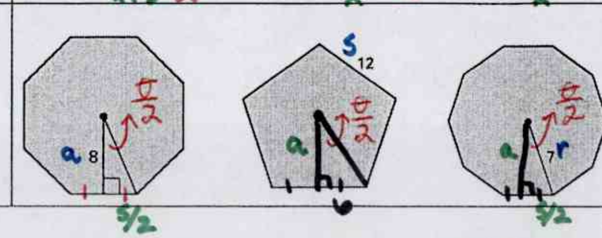
$S = 3.4$

$A = \frac{4.7(30.6)}{2}$

$\boxed{A = 71.9u^2}$

FINDING LENGTHS in a REGUALR N-GON

To find the area of a regular *n*-gon with radius *r*, you may need to first find the apothem *a* or the side length *s*.

You can use ...	... when you know n and ...	... as in ...
Pythagorean Theorem: $(\frac{1}{2}s)^2 + a^2 = r^2$ $b^2 + a^2 = c^2$	Two measures: *r* and *a* or *r* and *s*	
Special Right Triangles	Any one measure: *r* or *a* or *s* AND the value of *n* is 3, 4, or 6	
Trigonometry: S $\frac{O}{H}$ C $\frac{A}{H}$ T $\frac{O}{A}$	Any one measure: *r*, *a*, or *s* * must find $\frac{\theta}{2}$	

$\theta = \frac{360}{n}$

tan   tan   a → cos   s/2 → sin