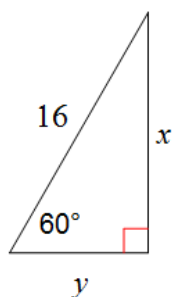


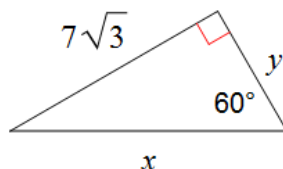
## Warm-up

Find the missing side lengths. Leave your answers as radicals in simplest form.

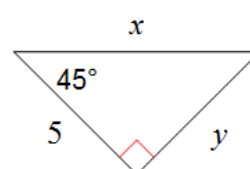
1)



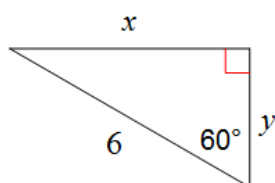
2)



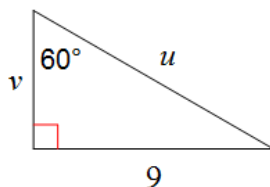
3)



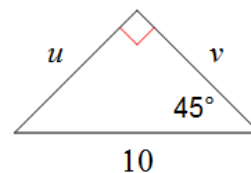
4)



5)



6)

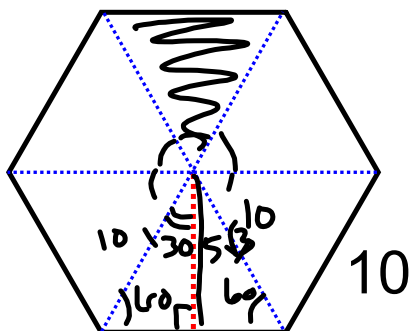


# Area of Regular Polygons

## (Section 11.5)

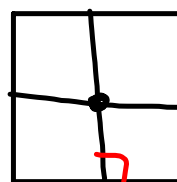
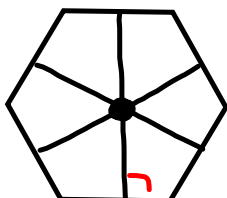
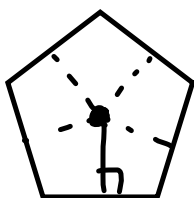
I CAN... Determine the apothem of a regular polygon  
Calculate the area of a regular polygon

Find the area of this regular hexagon.

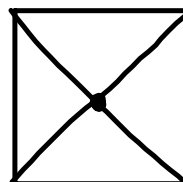
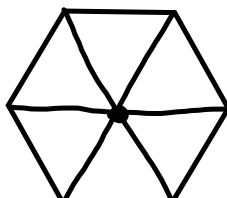
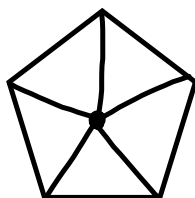


**Definitions:**

An apothem of a regular polygon is a segment joining the center to the midpoint of any side.



A radius of a regular polygon is a segment joining the center to any vertex.



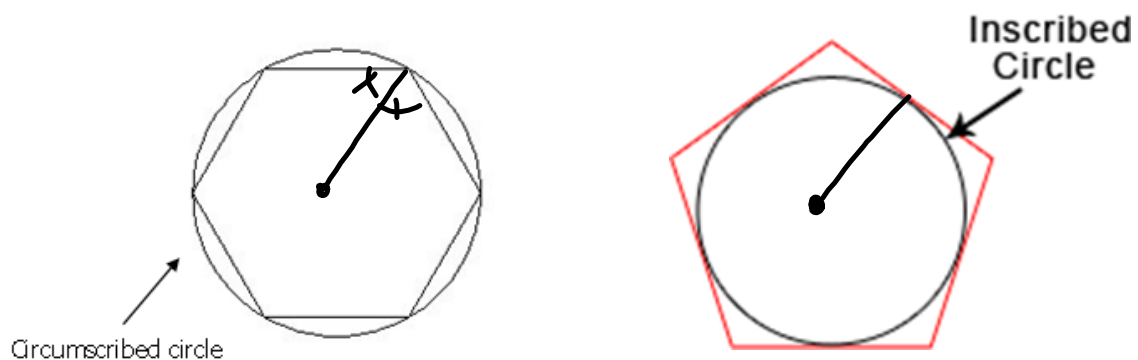
The area of a **regular** polygon equals one-half the product of the apothem and the perimeter.

$$A = \frac{1}{2}ap$$

Where  $a =$  apothem  
and  $p =$  perimeter

**Important Observations:**

- All apothems of a regular polygon are congruent.
- Only regular polygons have apothems.
- An apothem is a radius of a circle inscribed in the polygon.
- An apothem is the perpendicular bisector of a side
- A radius of a regular polygon is a radius of a circle circumscribed about the polygon.
- A radius of a regular polygon bisects an angle of the polygon.

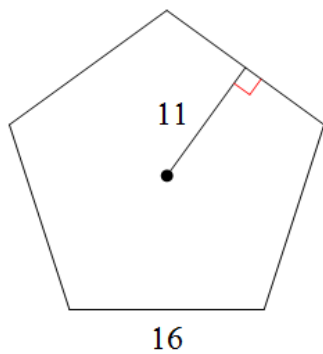


To find the Area of a REGULAR polygon:

$$A = \frac{1}{2}ap$$

Where  $a$  is the apothem  
and  $p$  is the perimeter

1)



$$a = 11$$

$$p = 80$$

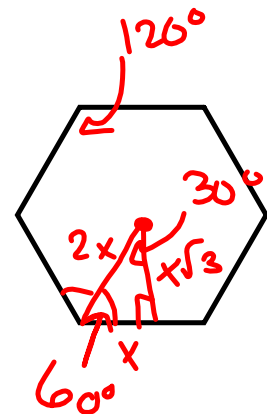
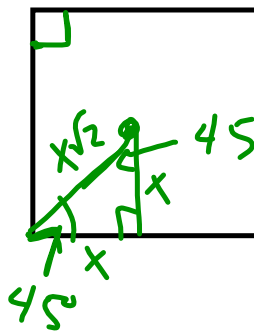
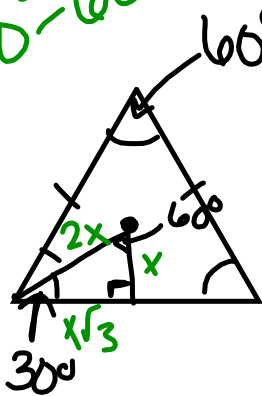
$$A = \frac{1}{2}(11)(80)$$

$$A = 440 \text{ u}^2$$

There are THREE regular polygons that will produce special situations when radii and apothems are drawn.

What is the measure of each angle in...

$30^\circ - 60^\circ - 90^\circ$



When you draw in an apothem and a radius what do you create in each figure??



## Sum of Interior Angles

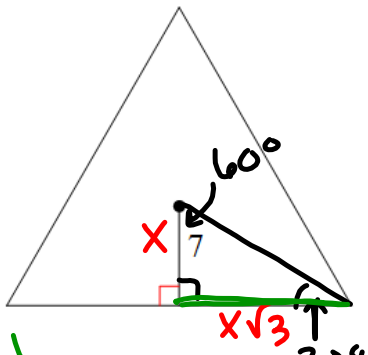
$n = \# \text{ of sides}$

$$(n-2) \cdot 180$$

Find the area of each regular polygon.

Given the apothem...

2)



$$a = 7$$

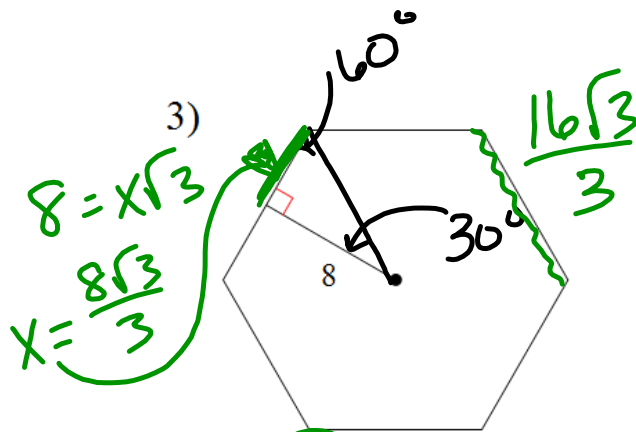
$$p = (4\sqrt{3}) \cdot 3 = 12\sqrt{3}$$

$$= 42\sqrt{3}$$

$$\therefore A = \frac{1}{2}(7)(42\sqrt{3})$$

$$A = 147\sqrt{3}$$

3)



$$a = 8$$

$$p = \frac{16\sqrt{3}}{3} \cdot 6 = \frac{96\sqrt{3}}{3} = 32\sqrt{3}$$

$$A = \frac{1}{2}(8)(32\sqrt{3})$$

$$A = 128\sqrt{3}$$

$$\frac{8}{\sqrt{3}} = \frac{8\sqrt{3}}{3}$$

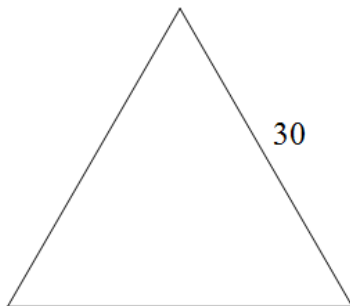
$$\frac{10}{\sqrt{3}} = \frac{10\sqrt{3}}{3}$$

$$\frac{15}{\sqrt{3}} = \frac{15\sqrt{3}}{3} \rightarrow 5\sqrt{3}$$

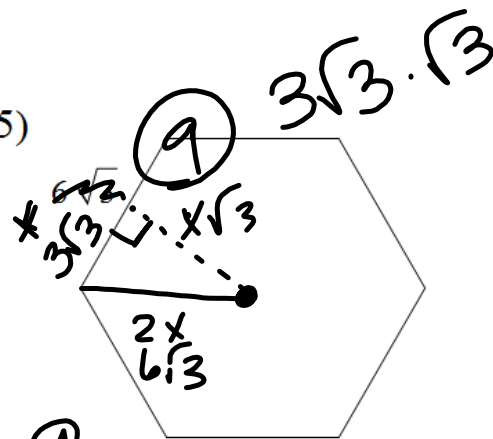
Find the area of each regular polygon.

Given a side...

4)



5)



$$a = 9$$

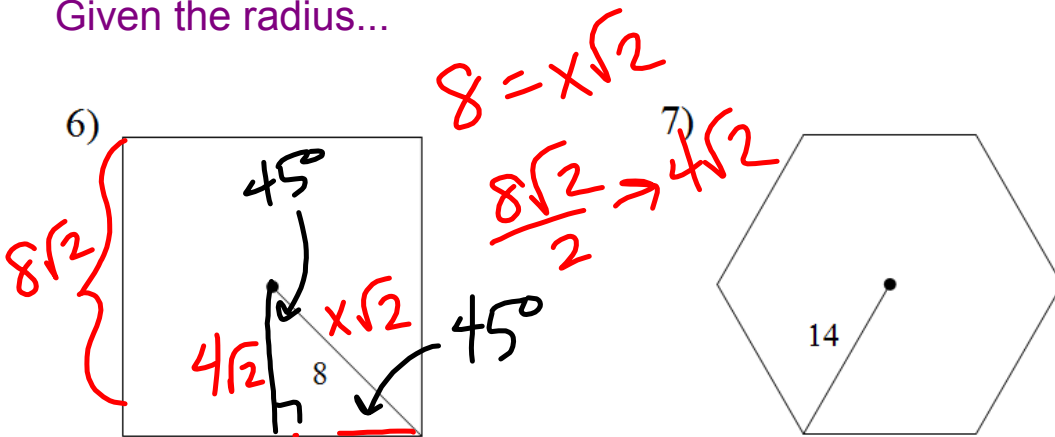
$$p = (6\sqrt{3}) \cdot 6 = 36\sqrt{3}$$

$$A = \frac{1}{2}(9)(36\sqrt{3})$$

$$A = 162\sqrt{3}$$

Find the area of each regular polygon.

Given the radius...



$$a = 4\sqrt{2}$$

$$P = (8\sqrt{2})4 = 32\sqrt{2}$$

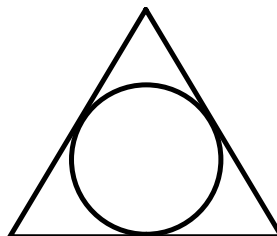
$$A = \frac{1}{2}(ap)$$

$$= \frac{1}{2}(4\sqrt{2})(32\sqrt{2})$$

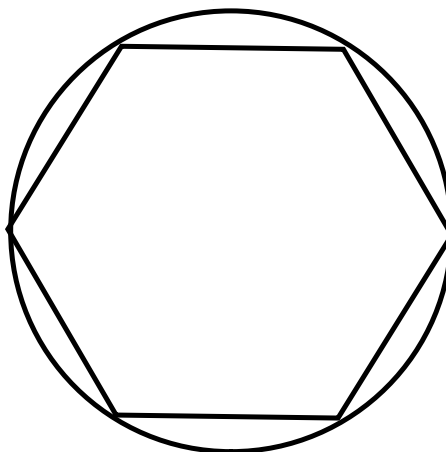
$$= 64 \cdot 2 \rightarrow 128$$

## Inscribed and Circumscribed Circles

- 8) Find the area of an equilateral triangle if the radius of the inscribed circle is 6.



- 9) A circle of radius 10 is circumscribed about a regular hexagon. Find the area of the hexagon.



## Homework

p. 533 #2a, 3a, 4a, 5 - 11, 15