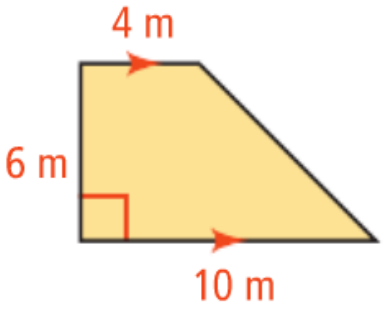
Warm Up:

Find the area:

1.



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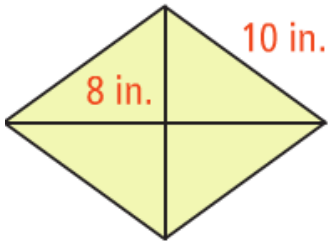

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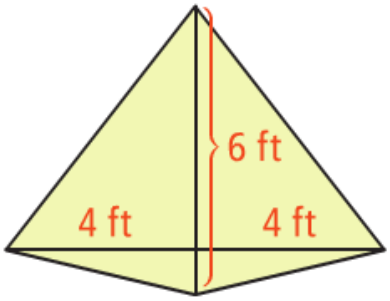

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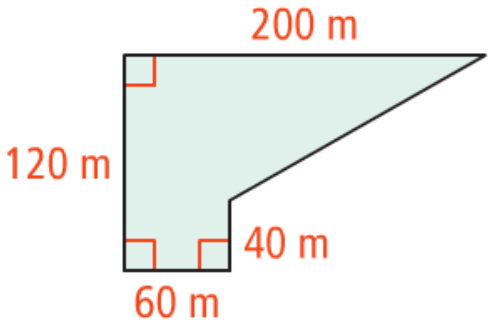


Learning Goal: Today I will learn how to find the area of circles and regular polygons.

Success Criteria: Given a diameter, I am able to calculate the area of a circle.
I am able to break a polygon into smaller pieces and find the area.

10-3 Area of Regular Polygons

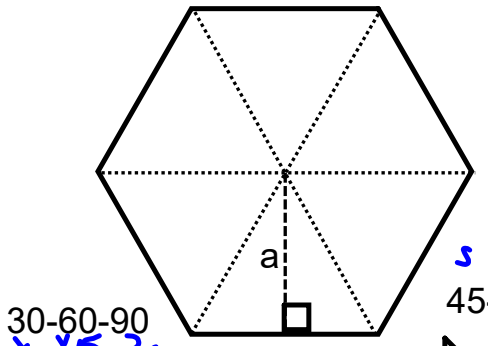
Flip books

Area of a Regular Polygon

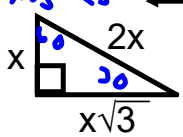
$A = \frac{1}{2}a \cdot p$ or $\frac{a \cdot p}{2}$

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

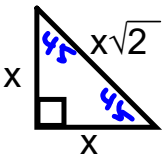
a - apothem
p - perimeter
p = number of sides • side length



30-60-90



45-45-90



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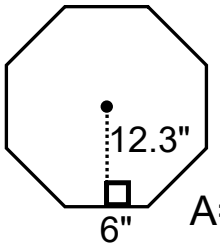
Example:



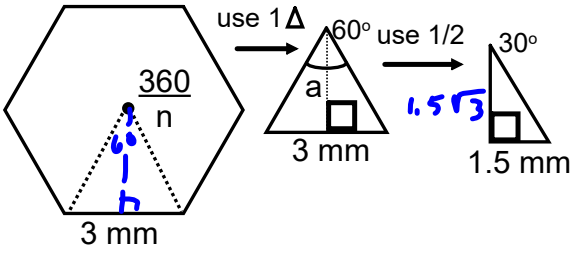
a = 12.3"
s = 6"
n=8

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

A=.5(12.3)(6)(8)

$A = 295.2in^2$

Example:



a = 1.5√3
s = 3
n = 6

$A = .5(1.5\sqrt{3})(3)(6)$

$A = 23.5mm^2$

10

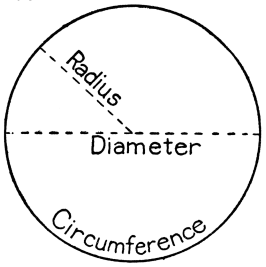
Area of Circles

$$A = \pi r^2$$

r= radius- A straight line from the center to the edge of a circle.

d= diameter- The distance across a circle. Twice the length of the radius.

c= circumference- The length of the outer edge of the circle.



$$d = 2r$$

$$r = \frac{d}{2}$$

$$c = 2\pi r$$

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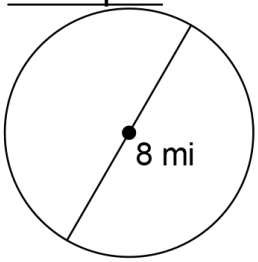
Example:

$$A = \pi r^2$$

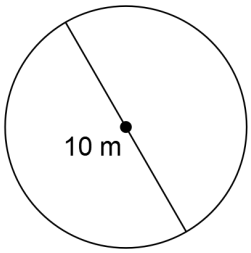


$$d = 8$$

$$r = \frac{8}{2} = 4$$

$$A = \pi(4)^2 = 16\pi mi^2$$

Example:



$$d = 10$$

$$r = \frac{d}{2} = \frac{10}{2} = 5$$

$$A = \pi(5)^2 = 25\pi m^2$$

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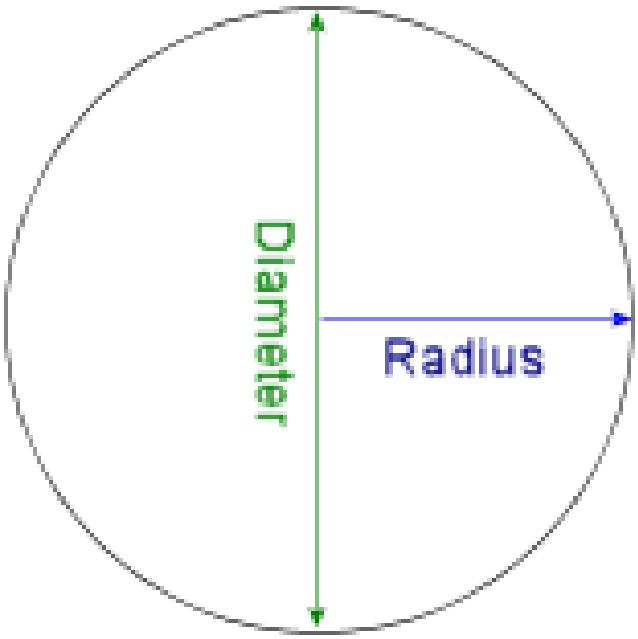
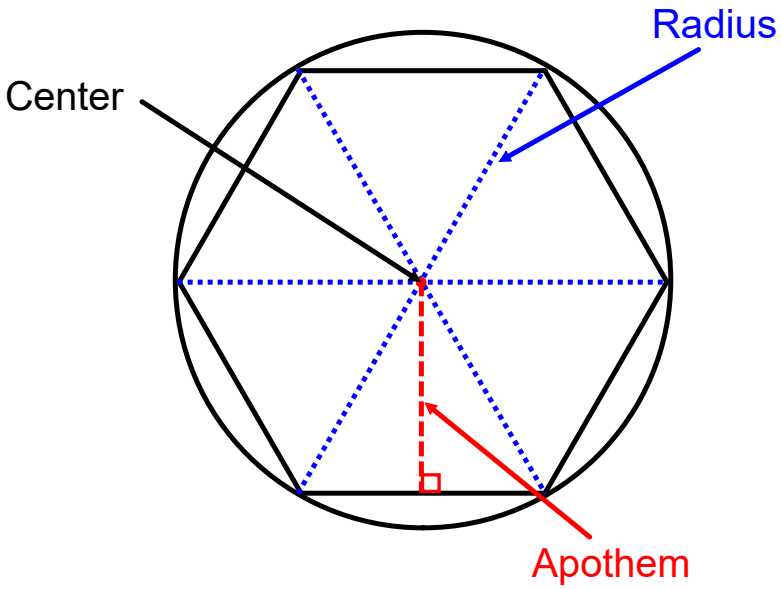
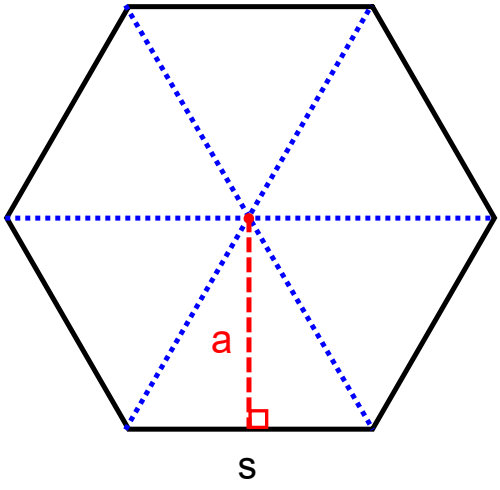
Understanding Circles

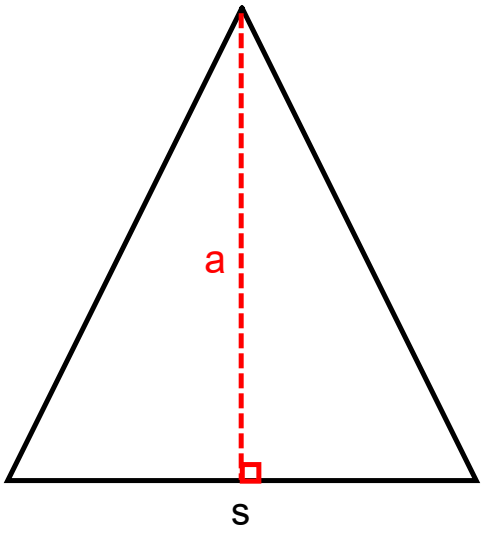


Understanding Regular Polygons



Understanding Regular Polygons

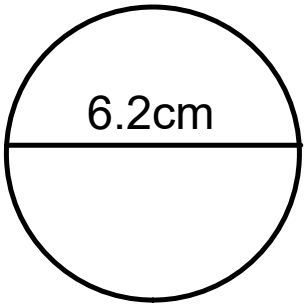




$A_{triangle} = \frac{1}{2}as$

$A_{polygon} = \frac{1}{2}ans$

$A_{polygon} = \frac{1}{2}ap$



Find the area and circumference of the circle.

$\frac{6.2}{2}$

$A = (3.1)^2\pi = 9.61\pi cm^2$

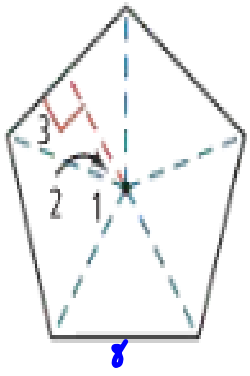
$30.19 cm^2$

$C = 3.1(2)\pi$

$C = 19.48 cm$

Problem 1 Finding Angle Measures

The figure at the right is a regular pentagon with radii and an apothem drawn. What is the measure of each numbered angle?



$m\angle 1 = \frac{360}{5} = 72$ Divide 360 by the number of sides.

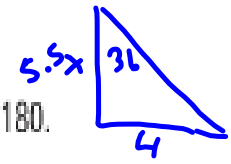
$m\angle 2 = \frac{1}{2}m\angle 1$ The apothem bisects the vertex angle of the isosceles triangle formed by the radii.

$= \frac{1}{2}(72) = 36$

$90 + 36 + m\angle 3 = 180$ The sum of the measures of the angles of a triangle is 180.

$m\angle 3 = 54$

$m\angle 1 = 72, m\angle 2 = 36$, and $m\angle 3 = 54$.



$\tan 36 = \frac{4}{x}$

$x = \frac{4}{\tan 36}$

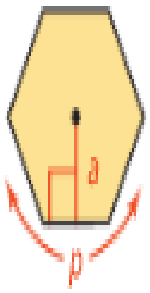
take note

Theorem 10-6 Area of a Regular Polygon

The area of a regular polygon is half the product of the apothem and the perimeter.

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

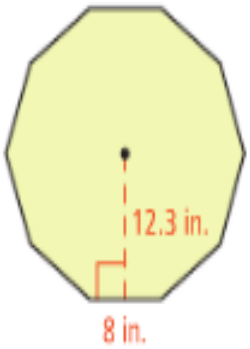
$$A = \frac{1}{2}asn$$



p=sn

Problem 2 Finding the Area of a Regular Polygon

What is the area of the regular decagon at the right?



Step 1 Find the perimeter of the regular decagon.

$p = ns$ Use the formula for the perimeter of an n-gon.

$= 10(8)$ Substitute 10 for n and 8 for s.

$= 80$ in.

Step 2 Find the area of the regular decagon.

$A = \frac{1}{2}ap$ Use the formula for the area of a regular polygon.

$= \frac{1}{2}(12.3)(80)$ Substitute 12.3 for a and 80 for p.

$= 492$

The regular decagon has an area of 492 in.^{2}.

Problem 3 Using Special Triangles to Find Area

Zoology **A honeycomb is made up of regular hexagonal cells. The length of a side of a cell is 3 mm. What is the area of a cell?**

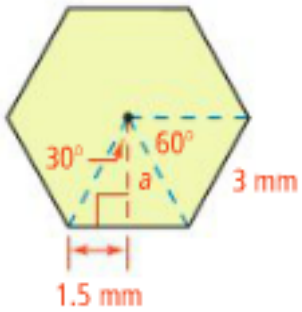
Know
You know the length of a side, which you can use to find the perimeter.

Need
The apothem

Plan
Draw a diagram to help find the apothem. Then use the area formula for a regular polygon.

Step 1 Find the apothem.

The radii form six 60° angles at the center, so you can use a 30°-60°-90° triangle to find the apothem.



$a = 1.5\sqrt{3}$ longer leg $= \sqrt{3} \cdot$ shorter leg

Step 2 Find the perimeter.

$p = ns$ Use the formula for the perimeter of an n-gon.

$= 6(3)$ Substitute 6 for n and 3 for s.

$= 18$ mm

Step 3 Find the area.

$A = \frac{1}{2}ap$ Use the formula for the area of a regular polygon.

$= \frac{1}{2}(1.5\sqrt{3})(18)$ Substitute $1.5\sqrt{3}$ for a and 18 for p.

≈ 23.3826859 Use a calculator.

The area is about 23 mm^2.

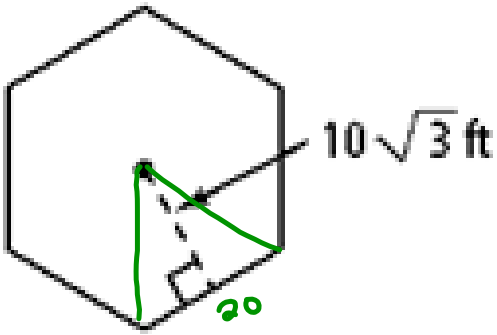
Find the area of a hexagon with $a = 17.1$ and $s = 23.4$.

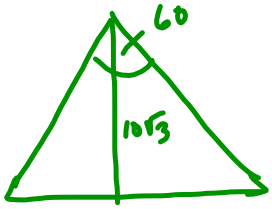
$A = \frac{1}{2} a s n$

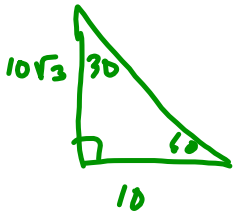
$A = \frac{1}{2}(6)(17.1)(23.4)$

$A = 1200.42 \text{ u}^2$

Find the area:



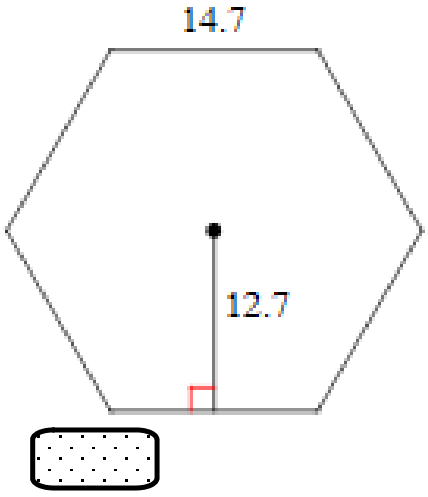




$A = \frac{1}{2}(10\sqrt{3})(6)(20)$

Closure: Today I learned how to find the area of a regular polygon.

1)



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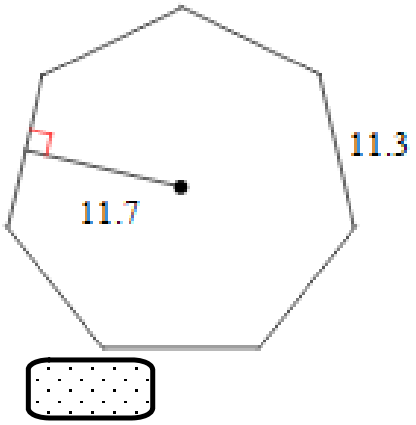
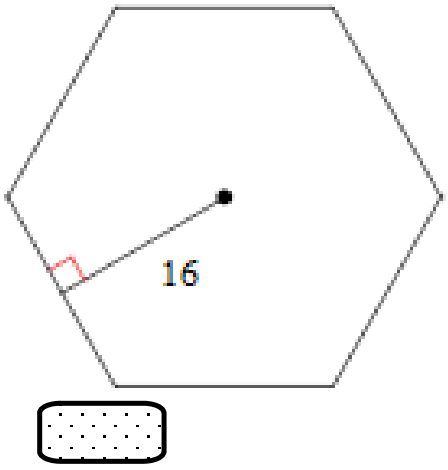


3)



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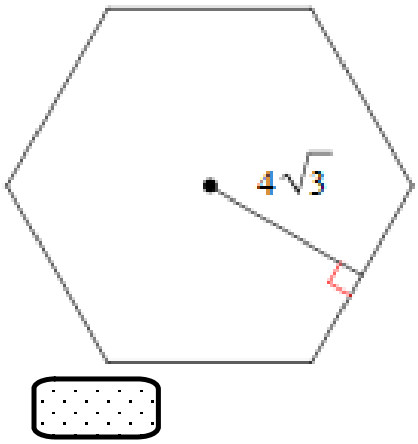

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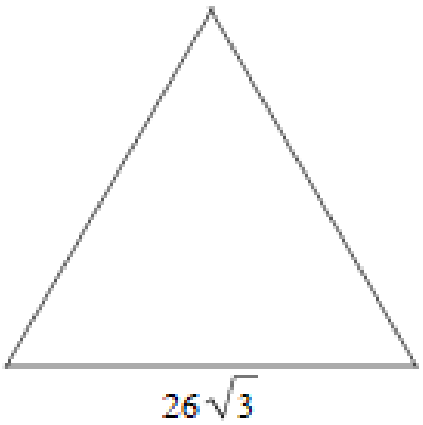
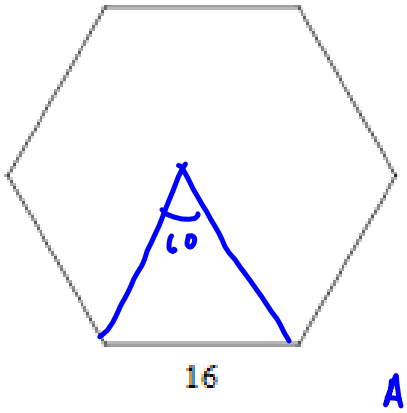
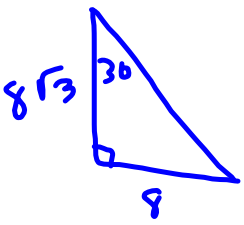


30 - 60 - 90
s $s\sqrt{3}$ 2s

6)





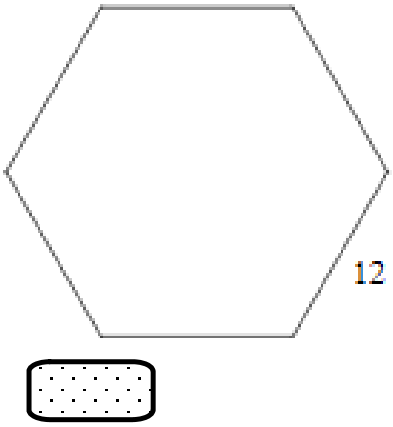
$\tan 30 = \frac{8}{x}$

$x = 8/\tan 30$

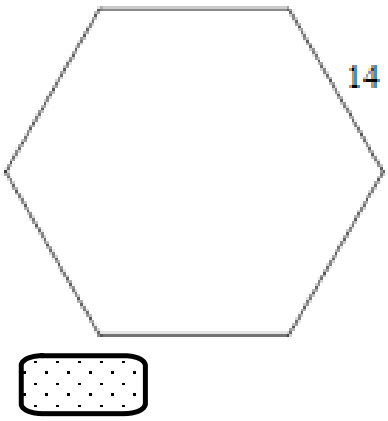
$A = \frac{1}{2}(8\sqrt{3})(16)(6)$

665.1

7)



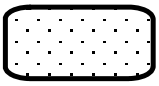
8)



9) hexagon

apothem = 12.1

side = 14



change on your paper please

10) octagon

apothem = 10

side = 8.3