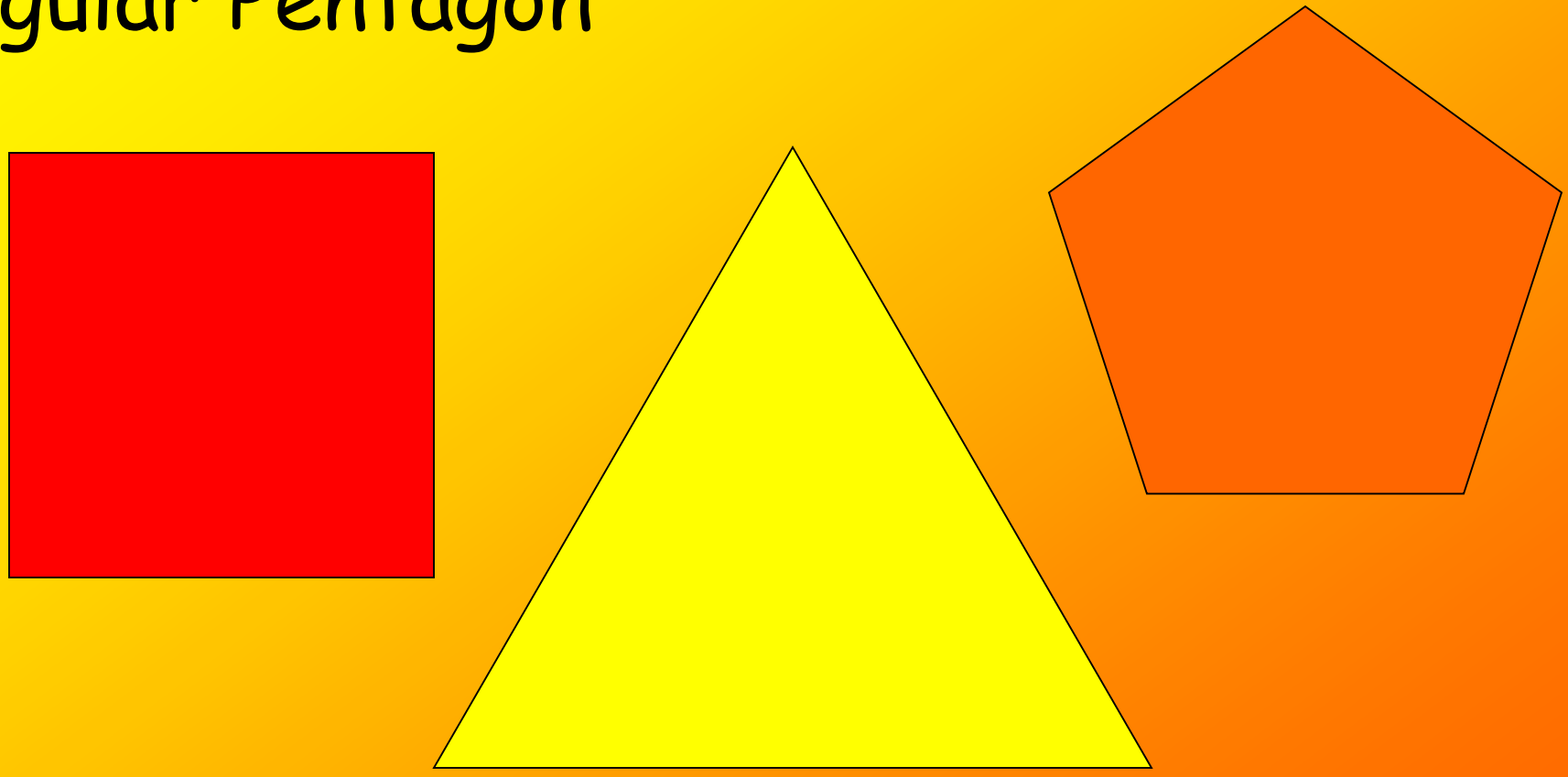
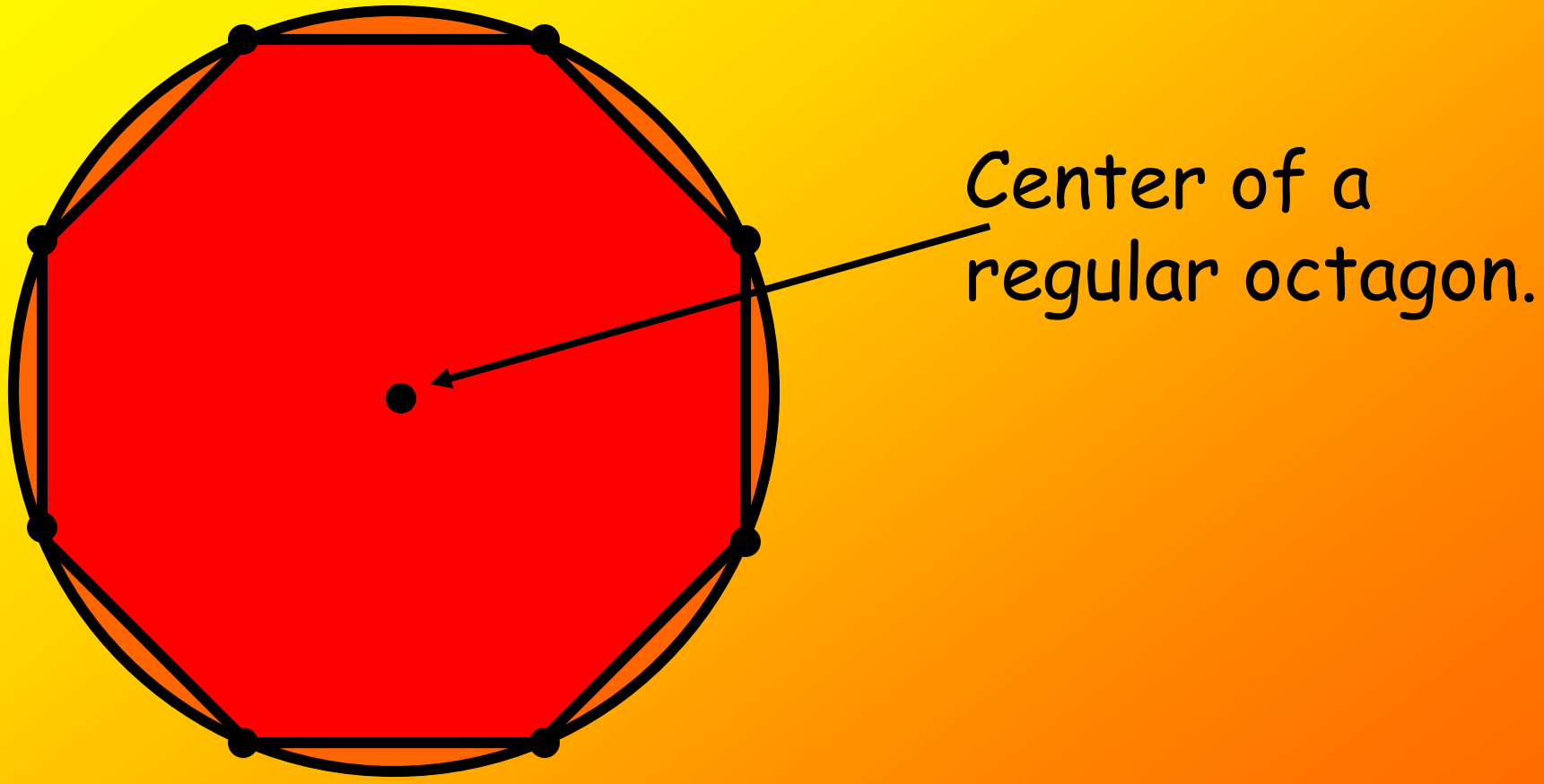
11.4 Area of Regular Polygons

Regular Polygon – *A polygon with congruent sides and interior angles.*

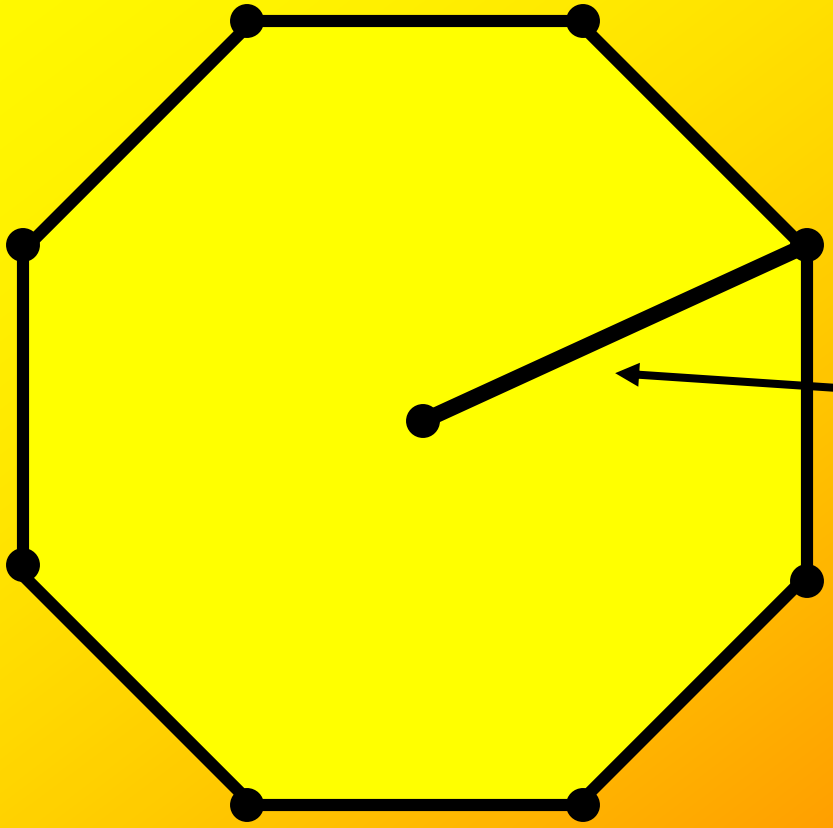
Example: Square, Equilateral Triangle, Regular Pentagon



Center of a Regular Polygon – the center of the polygon's circumscribed circle

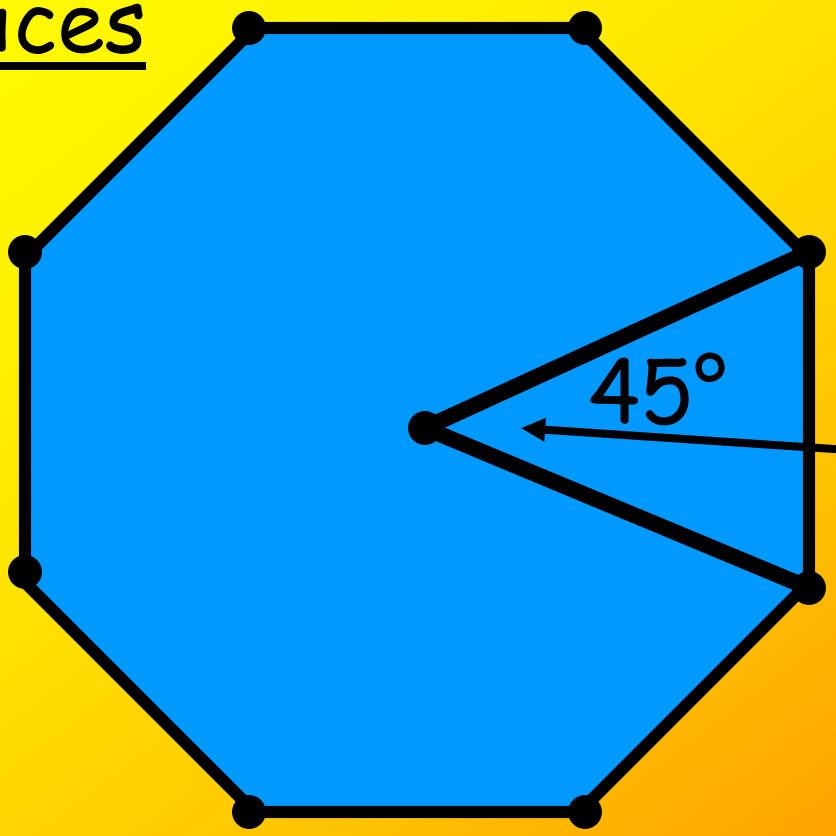


Radius of a Regular Polygon – the distance from the center to any vertex



Radius of a regular octagon.

Central Angle of a Regular Polygon – an angle formed by two radii drawn to two consecutive vertices



Central Angle of a regular octagon.

To find the measure of a central angle, divide 360 by the number of sides of the regular polygon. Ex: For an octagon – 360/8 = 45°

Ex1 – find the measure of the central angle of a regular pentagon.

$$\frac{360}{5} = 72°$$

Ex2 – find the measure of the central angle of an equilateral triangle.

$$\frac{360}{3} = 120°$$

Ex3 – find the number of sides of a regular polygon with a central angle measure of 90°.

$$\frac{360}{n} = 90°$$

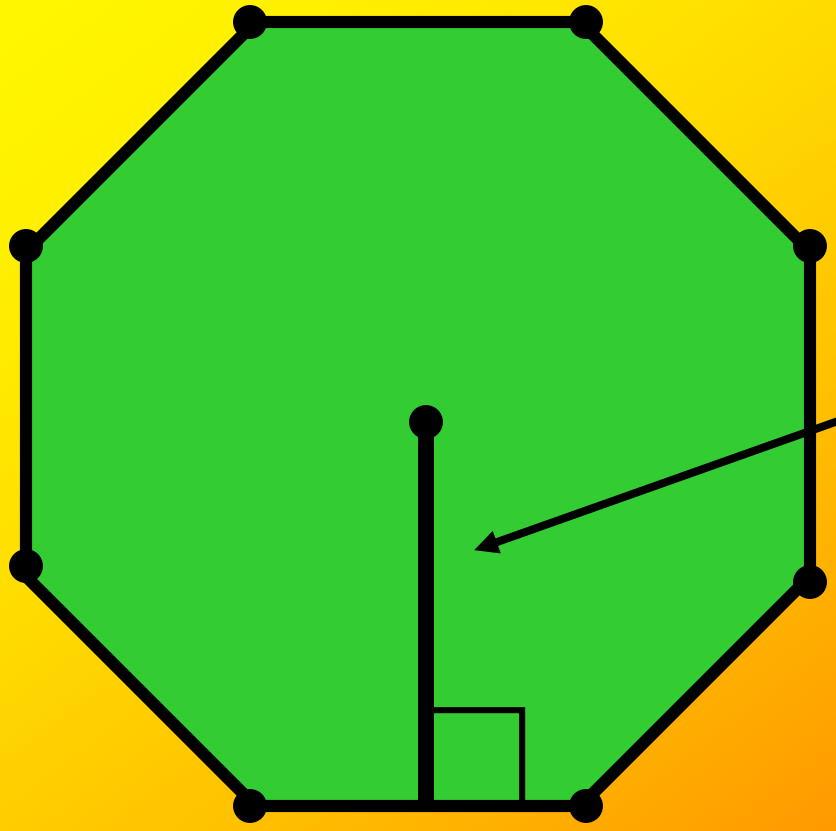
$$n = 4$$

Ex4 – find the number of sides of a regular polygon with a central angle measure of 60°.

$$\frac{360}{n} = 60°$$

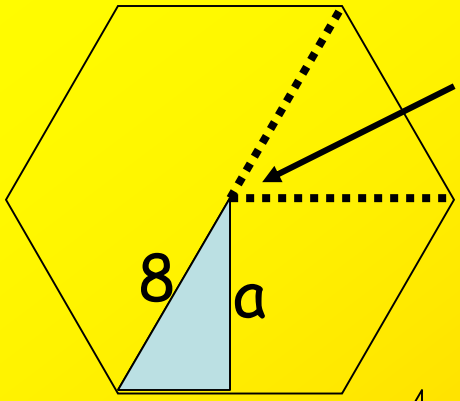
$$n = 6$$

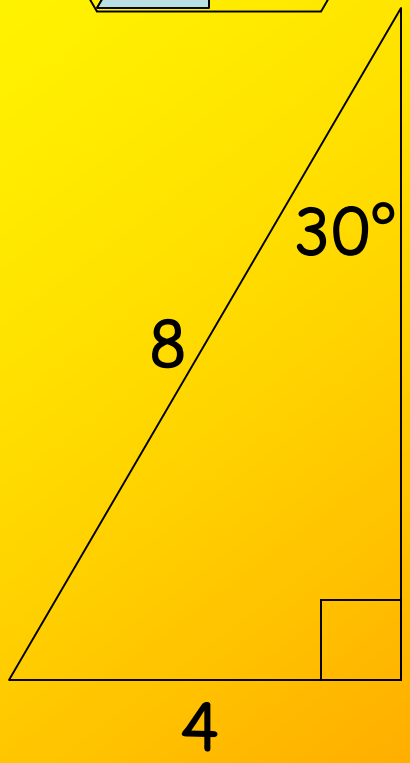
Apothem of a Regular Polygon – the perpendicular distance from the center of a polygon to a side.



Apothem of a regular octagon.

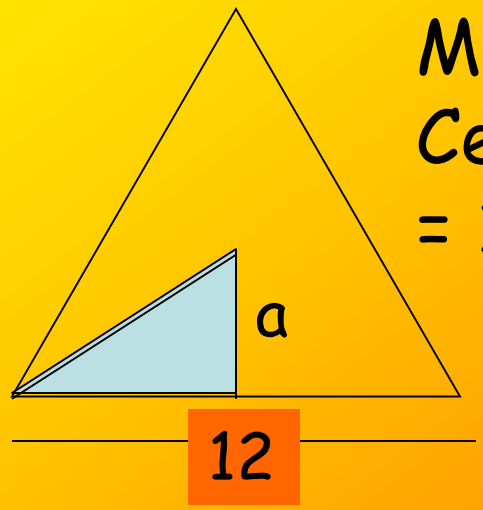
Ex1 – Find the length of the apothem in a regular hexagon with a radius of 8m.



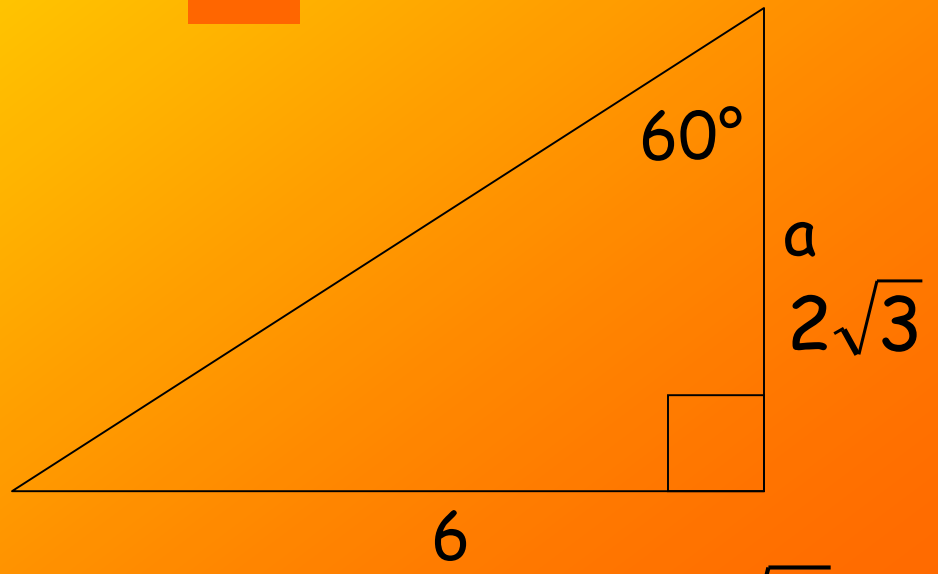


$a = 4\sqrt{3}m$

Ex2 – Find the length of the apothem in an equilateral triangle with side length 12ft.

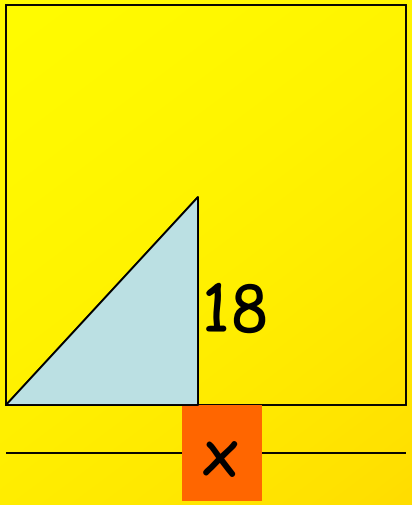


Measure of a Central angle = 120°

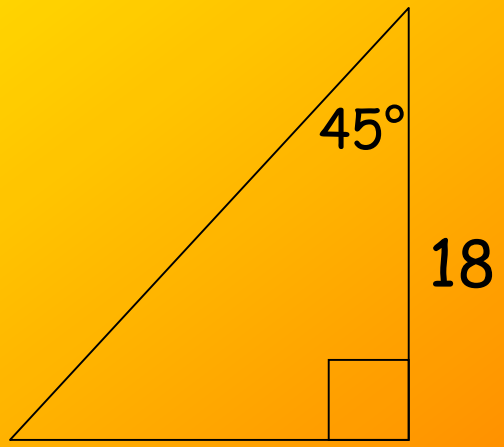


$a = 2\sqrt{3}ft$

Ex3 – Find the side length of a square with an apothem length of 18in.



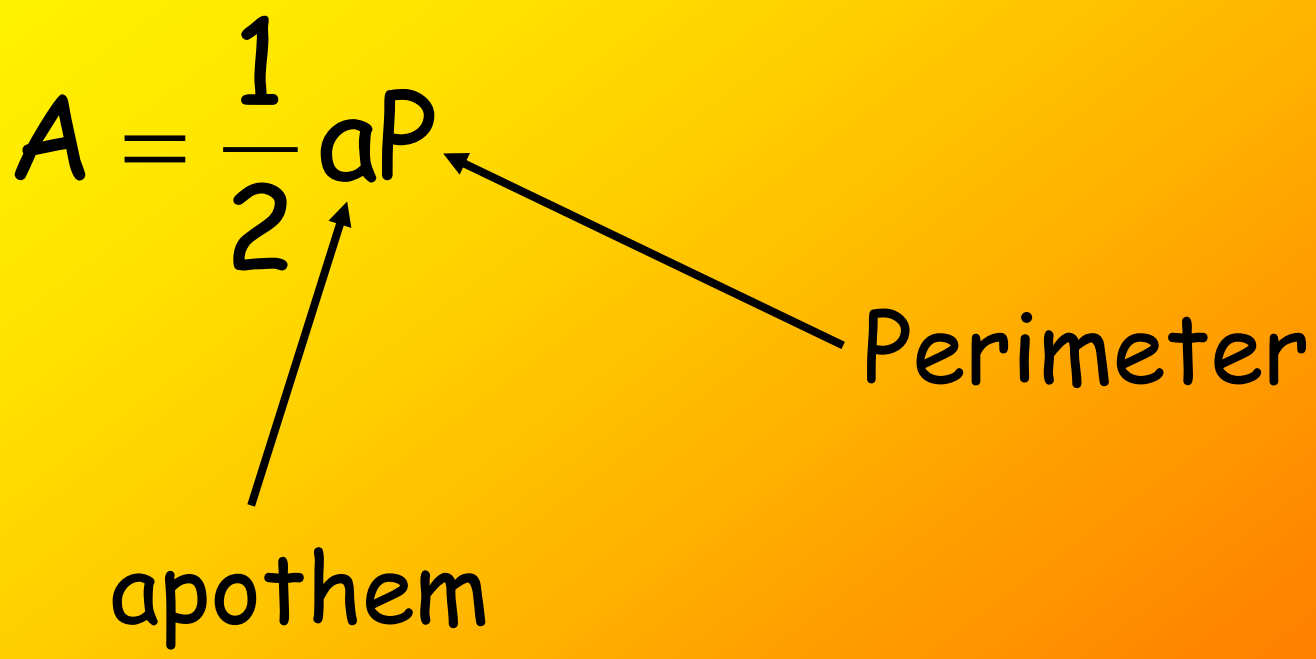
Measure of a Central angle = 90°



= 18

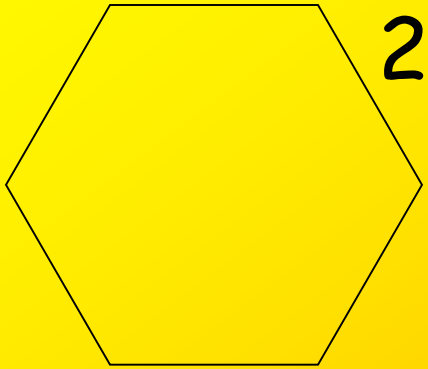
x = 36in

Formula for Area of a Regular Polygon



Ex1 Find the area of a regular hexagon with side length 22ft.

$a = 11\sqrt{3}$



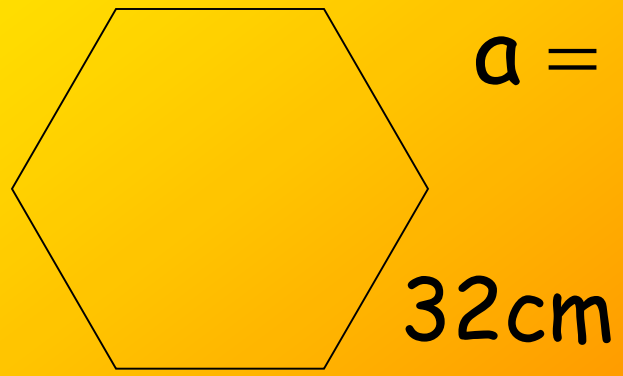
P = 6(22) = 132 ft

$A = (\frac{1}{2})(11\sqrt{3})(132)$

$A = 726\sqrt{3}\,ft^2$

Ex2 Find the area of a regular hexagon with side length 32cm.

$a = 16\sqrt{3}$



P = 6(32) = 192cm

$A = (\frac{1}{2})(16\sqrt{3})(192)$

$A = 1536\sqrt{3}\,cm^2$

Guided Practice Worksheet Answers

1. $a = 11\sqrt{3}\text{ft}$

   $A = 726\sqrt{3}\text{ft}^2$

2. $a = 16\sqrt{3}\text{cm}$

   $A = 1536\sqrt{3}\text{cm}^2$

3. $\text{side} = 28\sqrt{3}\text{in}$

   $A = 588\sqrt{3}\text{in}^2$

4. $a = 4\sqrt{3}\text{m}$

   $A = 96\sqrt{3}\text{m}^2$

5. $a = 8\text{cm}$

   $A = 256\text{cm}^2$

6. $a = 9.71\text{m}$

   $A = 342.44\text{m}^2$

7. $P = 91.84\text{ft}$

   $A = 636.48\text{ft}^2$

8. $P = 24\sqrt{3}\text{cm}$

   $A = 48\sqrt{3}\text{cm}^2$