

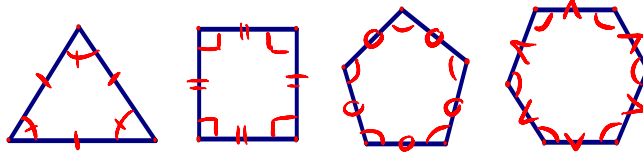


## 7.4— Regular Polygons

Recognize regular polygons and use a formula to find exterior angles of a regular polygon



**Investigate:** The following are regular polygons

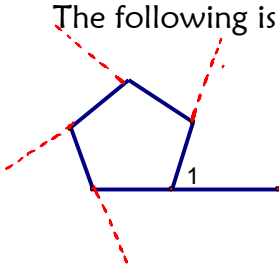


What are the two characteristics that must be met for a polygon to be regular?

- 1) equiangular
- 2) equilateral

Exterior Angles of an Equiangular (regular) Polygon:

The following is a **regular** pentagon. What is the measure of angle 1 in the diagram below?



What is the measure of the Sum of the Exterior Angles of a Pentagon?  $360^\circ$

If the Pentagon is equiangular, what is the measure of each Exterior Angle?  $\frac{360}{5} = 72$

The measure of each exterior angle, E, of an equiangular <sup>regular</sup> polygon is:

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

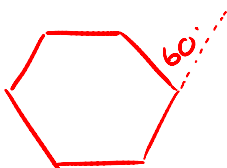
*n is the # of sides*

\*\*\*This formula can only be used for a polygon where each angle is THE SAME

Look for key words such as "**regular**," "**equiangular**," and "**each angle**."

If we can find one Exterior Angle of a **Regular** Polygon. What would be the *fastest* way to find an interior angle, I?

**Example 1:** Find the measure of an interior angle of a regular hexagon.



*longway:*

$$\begin{aligned} 180(n-2) &= 180(6-2) \\ &= 180(4) \\ &= 720 \\ 720 \div 6 &= 120^\circ \end{aligned}$$

*short way:*  $\text{ext } \angle = \frac{360}{6} = 60$

$\text{int } \angle = 180 - 60 = 120^\circ$

**Example 2:** Find the measure of each interior angle of a regular nonagon.

$$\text{ext } \angle : \frac{360}{9} = 40^\circ$$

$$\text{int } \angle = 180 - 40^\circ = 140^\circ$$

### Practice Problems

3) If each exterior angle of a regular polygon is 18 degrees, how many sides does it have?

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

$$18 = \frac{360}{n}$$

$$18n = 360$$

$$n = 20$$

20 sides

4) If each interior angle of a regular polygon is 108 degrees, how many sides does it have?

$$\text{int } \angle = 108$$

$$\text{ext } \angle = 72^\circ$$

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

$$72 = \frac{360}{n}$$

$$72n = 360$$

$$\boxed{n = 5}$$

5) Find the measure of **each angle** of a regular octagon.

$$\begin{aligned} \text{ext } \angle &= \frac{360}{8} \\ &= 45 \end{aligned}$$

$$\begin{aligned} \text{int } \angle &= 180 - 45 \\ &= \boxed{135^\circ} \end{aligned}$$

5) What is the **name** given to the polygon whose exterior angles each measure 50 degrees?

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

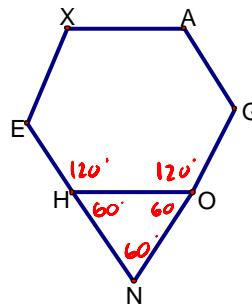
$$50 = \frac{360}{n}$$

$$50n = 360$$

$$n = 7.2$$

??? There is none!

6) **HEXAGO** is a regular hexagon. Find  $m\angle N$ .



$$= \frac{360}{6} = 60$$

$$\text{int } \angle = 180 - 60 = 120 \text{ (not needed)}$$

$$\boxed{m\angle N = 60^\circ}$$

Find  $\angle G = 120^\circ$