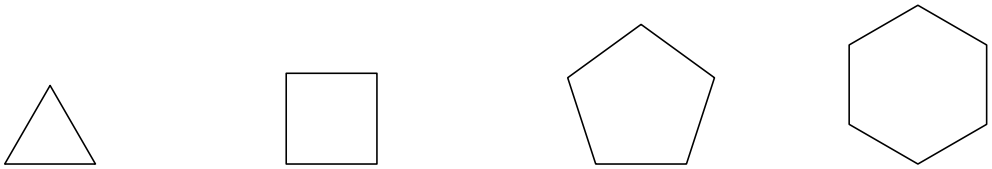
# Polygon Angle-Sum Theorems

**Today I Can**

1. Find the interior angles and sums of interior angles of polygons.
2. Find the exterior angles and sums of exterior angles of polygons.



| Polygon | # of Sides | # of Triangles Formed | Interior Angle Sum |
|---|---|---|---|
| Triangle | 3 | 1 | $1(180) = 180$ |
| Quadrilateral | 4 | 2 | $2(180) = 360$ |
| Pentagon | 5 | 3 | $3(180) = 540$ |
| Hexagon | 6 | 4 | $4(180) = 720$ |
| $n$-gon | $n$ | | |

**Polygon Angle-Sum Theorem**

The sum of the measures of the interior angles of an $n$-gon is

**Example 1.** What is the sum of the interior angles of each of the following?

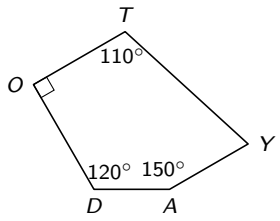
(a) Heptagon (7 sides)

(b) 17-gon

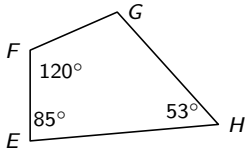
(c) The sum of the interior angle measures of a polygon is 1980. How many sides does it have?

**Example 2.** Find the measure of the indicated angle in each figure.

(a) What is $m\angle Y$ in pentagon $TODAY$?




(b) What is $m\angle G$ in quadrilateral $EFGH$?



**Equilateral Polygon**

A polygon in which all sides are congruent.

**Equiangular Polygon**

A polygon in which all angles are congruent.

**Regular Polygon**

A polygon which is equilateral and equiangular.

**Interior Angles for a Regular Polygon**

To find the measure of each interior angle, find the "average" angle measure.

$$\frac{180(n-2)}{n}$$

**Example 3.** Find the measure of each interior angle of the following.

(a) A regular nonagon

(b) A regular octagon

**Polygon Exterior Angle Sum**

The sum of the measures of the exterior angles of a polygon, one at each vertex, is $360^\circ$

Thus, to find the measure of each exterior angle of a regular polygon, divide $360^\circ$ by the number of sides.

**Example 4.** Find the measure of each exterior angle of a regular

(a) Octagon

(b) Nonagon

**Example 5.** Find the value of $x$ in the figure below.