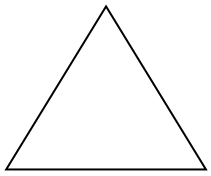
# 6-1 Angles of Polygons KEY

**Objective:** Find the sum of the measures of the interior angles of a polygon.
Find the measure of one interior angle of a regular polygon.
Find the sum of the measures of the exterior angles of a polygon.
Find the measure of one exterior angle of a regular polygon.

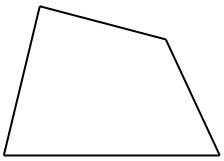
## I. Investigate the Sum of Interior Polygon Angle Measures:

**A.** In each polygon, draw all the diagonals (connects any 2 **nonconsecutive** vertices) from ONE vertex. Notice: this divides each polygon into **triangles.** (type of shape)

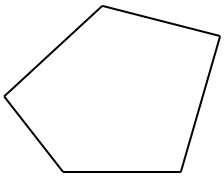
**Triangle**



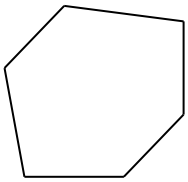
**Quadrilateral**



**Pentagon**



**Hexagon**



**B.** Complete the table below. What is the pattern in the sum of the measures of the interior angles of any convex n-gon? **Find the number of triangles and multiply it by 180 degrees.**

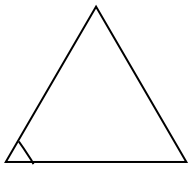
| Polygon Name | Number of Sides | Number of Triangles | Sum of Measures of Interior Angles |
|---|---|---|---|
| **Triangle** | 3 | 1 | 1 (Δ) • 180° = 180° |
| **Quadrilateral** | 4 | 2 | 2 (Δ) • 180° = 360° |
| **Pentagon** | **5** | **3** | **3 (Δ) • 180° = 540** |
| **Hexagon** | **6** | **4** | **4 (Δ) • 180° = 720** |
| **Heptagon** | **7** | **5** | **5 (Δ) • 180° = 900** |
| **Octagon** | **8** | **6** | **6 (Δ) • 180° = 1080** |
| **Nonagon** | **9** | **7** | **7 (Δ) • 180° = 1260** |
| **Decagon** | **10** | **8** | **8 (Δ) • 180° = 1440** |
| **11-gon** | **11** | **9** | **9 (Δ) • 180° = 1620** |
| **Dodecagon** | **12** | **10** | **10 (Δ) • 180° = 1800** |
| **n-gon** | **n** | **n - 2** | **(n - 2)**• 180° = **S** |

## II. Investigate the Measure of one Interior Angle of a Regular Polygon:

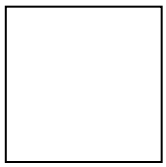
**A.** From the table above, write the sum of the interior angles of each polygon on the top back of this sheet (#1-6).

**B.** How would I find the measure of one interior angle of each of those polygon (HINT: If each polygon is regular, the interior angles are all **congruent**. You may **not** use a protractor.)

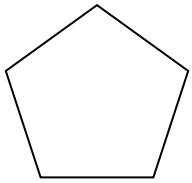
**Find the sum of the angles and then divide it by the number of angles.**

1. 

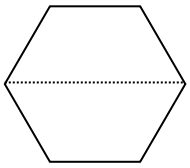
180° Sum  60° interior ∠

2. 

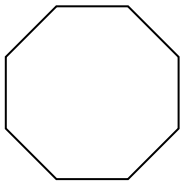
360° Sum  90° interior ∠

3. 

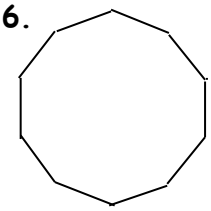
540° Sum  108° interior ∠

4. 

720° Sum  120° interior ∠

5. 

1080° Sum  135° interior ∠

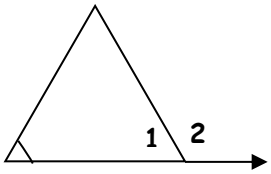
6. 

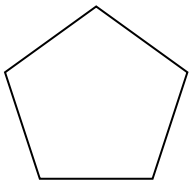
1440° Sum  144° interior ∠

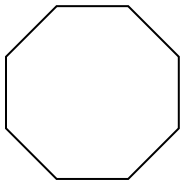
**C.** Describe the relationship between an interior angle and the sum of the interior angles of a regular polygon. **The interior angle • the number of angles = the sum of the angles.**

**III. Investigate the measure of an Exterior Angle of a Regular Polygon (one at each vertex):**

**A.** Draw an exterior angle at one vertex of each polygon. Label the exterior angle ∠2 and its corresponding interior angle ∠1. What is the relationship of ∠1 and ∠2? **Linear Pair/Supp.**

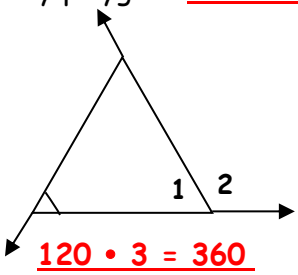
Ex. 


7. 

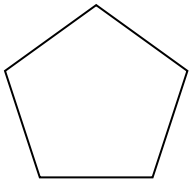
8. 

**IV. Investigate the Sum of the Exterior Polygon Angle Measures:**

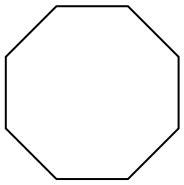
**A.** Draw one exterior angle at each vertex of each polygon. After determining the measure of each exterior angle at each vertex, add up all of the exterior angles (1 at each vertex) for each polygon. What do you notice about the sum of the exterior angles (one at each vertex) of any polygon? **The sum of the angles will be 360° no matter how many sides it has.**

Ex. 


Sum **120 • 3 = 360**

9. 

Sum **72 • 5 = 360**

10. 

Sum **45 • 8 = 360**

**SUMMARIZE YOUR FINDINGS:**

- The **SUM** of the measures of the **INTERIOR** angles of a convex n-gon is **(n – 2)• 180°**
- The measure of **EACH INTERIOR** angle of a regular n-gon is **(n – 2)• 180° ÷ n**
- The **SUM** of the measures of the **EXTERIOR** angles of a convex polygon, one angle at each vertex, is **360°**
- The measure of **EACH EXTERIOR** angle of a regular n-gon is **360° ÷ n**