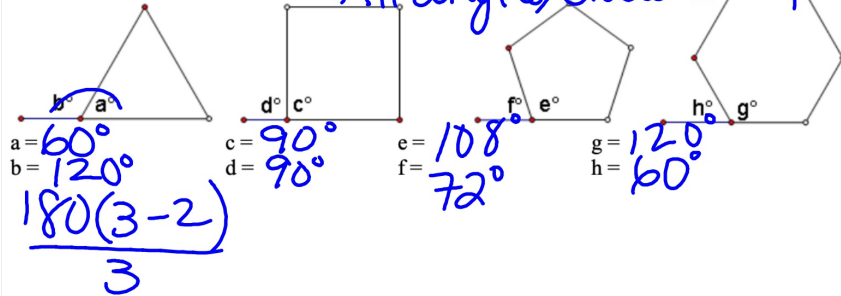


1. Each of the shapes below are regular polygons. Find the measure of each angle. All angles/sides are equal



2. How many sides does a quadrilateral have? 4

Find the sum of the interior measures of a quadrilateral

$$180(4-2) = 360^\circ$$

3. How many sides does a dodecagon have? 12

Find the sum of the interior measures of a dodecagon.

$$180(12-2) = 1800^\circ$$

4. How many sides does a heptagon have? 7

Find the sum of the interior measures of a heptagon.

$$180(7-2) = 900^\circ$$

5. How many sides does a triangle have? 3

Find the measure of one interior angle in a regular triangle

$$\frac{180(3-2)}{3} = 60^\circ$$

6. How many sides does a pentagon have? 5

Find the measure of one interior angle in a regular pentagon

$$\frac{180(5-2)}{5} = 108^\circ$$

7. If the sum of the interior angles in a polygon is 2340, find the number of sides the polygon has.

$$2340 = 180(n-2)$$

$$13 = n - 2$$

$$n = 15$$

8. If one of the interior angles in a regular polygon is 156, find the number of sides the polygon has.

$$156 = \frac{180(n-2)}{n}$$

$$156n = 180n - 360$$

$$-24n = -360$$

$$n = 15$$

## H. Geometry

### 6-1: The Polygon Angle-Sum Theorems

Date: \_\_\_\_\_

**Objective:** I can find the sums of the measures of the exterior angles and interior angles of polygons.

Do "Explore and Reason" and Habits of Mind in your student companion, page 131.

Fill in the essential question for this section: How does the number of sides in a convex polygon relate to the sum of the measures of its int/ext angles?



This leads us to a theorem about the interior angles of a polygon.

#### Theorem 6-1: Polygon Interior Angle-Sum Theorem

The sum of the measures of the interior angles of a convex polygon is  $180(n-2)$

If...



Then...  $m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 + m\angle 5 + m\angle 6 + m\angle 7 = 180^\circ \cdot (7 - 2) = 900^\circ$

**Additional Example:** The school zone traffic sign has 3 right angles and the other 2 angles are congruent. Find the measure of the other two interior angles.

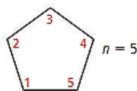


#### Corollary to Theorem 6-1

The measure of a single interior angle

a regular polygon is  $\frac{180(n-2)}{n}$

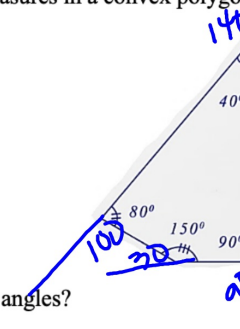
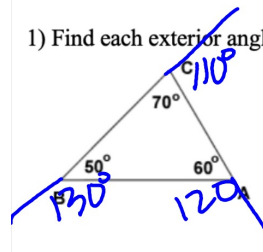
If...



Then...  $m\angle 1 = \frac{180^\circ \cdot (5 - 2)}{5} = 108^\circ$

#### Example 3: What is the sum of the EXTERIOR angle measures in a convex polygon?

1) Find each exterior angle in the polygons below.



2) What do you notice about the sum of all of the exterior angles?

$= 360^\circ$

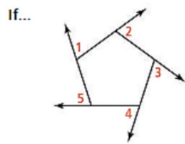
3) Do you think this is true for all polygons, regardless of the number of sides?

yes, it is true for all convex polygons w/ sides  $n$ .

This leads us to a theorem about the exterior angles of polygons.

**Theorem 6-2: Polygon Exterior Angle-Sum Theorem**

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



Then...  $m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 + m\angle 5 = 360^\circ$

Do Try It 3, page 133 in your student companion.

EX3. p.133  
 $360^\circ$ .

**Example 4:**

Suppose  $\angle 1 \cong \angle 3$ ,  $m\angle 1 = 3x^\circ$ , and  $m\angle 2 = 2x^\circ$ .

What is the measure of each exterior angle?

Handwritten solution for Example 4:

$$67.5^\circ$$

$$2x$$

$$3x$$

$$45^\circ$$

$$67.5^\circ$$

$$8x + 180 = 360$$

$$8x = 180$$

$$x = 22.5$$

Do Try It 4 and Habits of Mind, page 133 in your student companion.

Handwritten solution for Do Try It 4:

$$1 + 2 + 3 + 4 + 5 + 6 = 360$$

$$2x + 4(x + 30) = 360$$

$$6x + 120 = 360$$

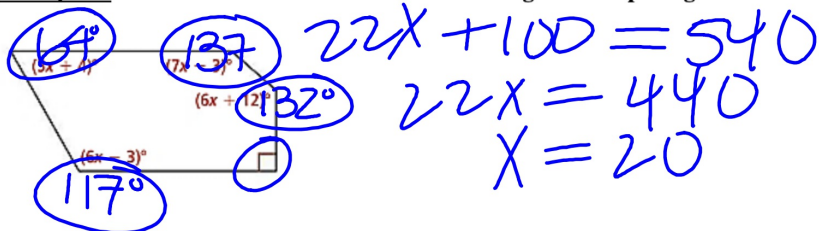
$$6x = 240$$

$$x = 40$$

$$\angle 5 = x$$

$$\angle 3 = x + 30 = 70^\circ$$

**Example 5: What are the measures of the interior angles of the pentagon shown?**



Handwritten solution for Example 5:

$$22x + 100 = 540$$

$$22x = 440$$

$$x = 20$$

Do Try It 5 and "Habits of Mind", page 133 in your student companion.

**Check for Understanding**

1) What is the sum of the angle measures of a linear pair?

Handwritten solution for Question 1:

$$3x + 26.4 = 180(n-2)$$

$$3x + 26.4 = 180(98)$$

$$100(3x + 26.4) = 17640$$

$$300x + 2640 = 17640$$

$$300x = 15000$$

$$x = 50$$

2) What is the sum of an interior angle and an exterior angle at any vertex of a polygon?

Handwritten solution for Question 2:

$$180^\circ$$

3) Does the number of sides matter when finding the sum of the exterior angles?

Handwritten solution for Question 3:

No.

$$= 360^\circ$$

**In your Book**

Read Concept Summary and #1-10 page 249 (page 134 in your student companion)

Tomorrow's assignment is page 249 #13, 14, 16-25, 28, 29

$$\begin{aligned} n-2 \\ n = \# \text{ of sides} \quad 180(47) \\ n-2 = \# \text{ of } \Delta s \quad 8460 = 180(n-2) \\ n = 49 \end{aligned}$$

**Classwork: 6.1 Practice Worksheet**