

### Lesson 3.05 Exterior Angle Theorem

Students will be able to:

- Content Objective: Prove and apply the exterior angle theorem.
- Language Objective: Use the exterior angle theorem to solve for a missing angle and justify.



#### Warm Up

Construct an acute scalene triangle using a compass and straightedge. Use a ruler and protractor to measure and label the angles and side lengths of your triangle.

- Which interior angle is opposite the longest side of the triangle?
- Which interior angle is opposite the shortest side of the triangle?
- What can we conclude based on our observations?



#### Vocabulary Review

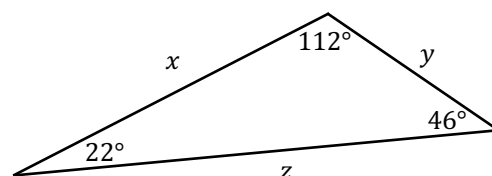
True or false. Identify whether each of the following statements are true or false.

- \_\_\_ The interior angles of a triangle sum to  $180^\circ$ .
- \_\_\_ One side of a triangle is greater than the sum of the other two sides.
- \_\_\_ The smallest angle is opposite the smallest side.
- \_\_\_ When two parallel lines are cut by a transversal, the measures of alternate exterior angles are equal.
- \_\_\_ The sum of two sides of a triangle is greater than the third side.
- \_\_\_ The longest side of a triangle is opposite the largest angle.



#### Graphic Organizer

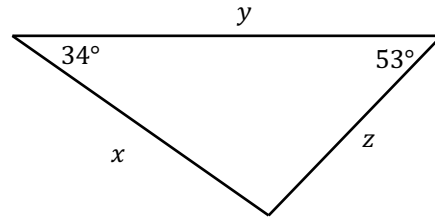
Longest Side  $\longleftrightarrow$  Largest Angle  
Shortest Side  $\longleftrightarrow$  Smallest Angle





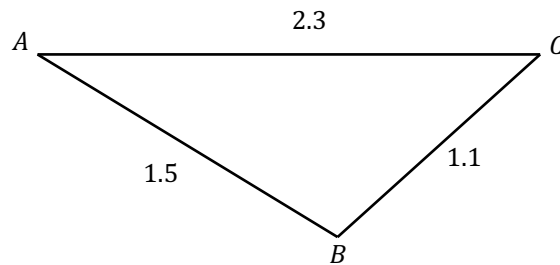
**Skill 1: Angle-Side Relationship**

Solve for the missing angle, then list the sides from shortest to longest given the triangle below.



**Exercise 1: Angle-Side Relationship**

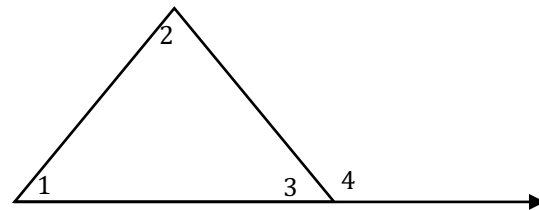
List the angles from smallest to largest given the triangle below.



**Skill 2: Exterior Angle Theorem**

Consider the diagram below:

- a. Identify the interior angle(s) of the triangle.
- b. Identify the exterior angle(s) of the triangle.



- c. Given the sentence "Scientists discovered a remote island off the coast of Kuai", define in your own words the meaning of the word "remote". Identify the two remote interior angles using this definition.
- d. Prove that  $m\angle 1 + m\angle 2 = m\angle 4$ .

Statement	Reason

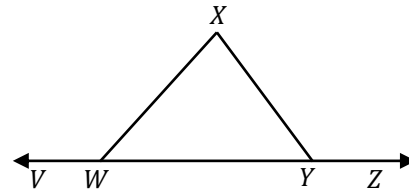
**Exterior Angle Theorem**  
The sum of the two remote interior angles is equal to the exterior angle of a triangle.



**Exercise 2: Exterior Angle Theorem**

In the diagram below,  $\overleftrightarrow{VWYZ}$  and  $\triangle WXY$  are shown with  $m\angle X = 80^\circ$  and  $m\angle XYZ = 120^\circ$ .

a. Find  $m\angle XYW$ .

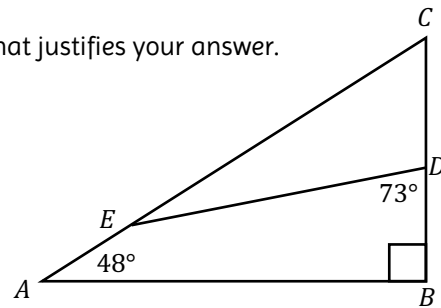


b. Find  $m\angle VWX$ .



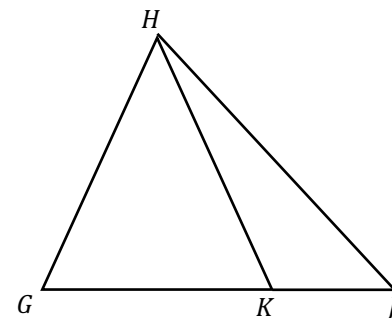
**Talk it Out**

Shown below is  $\triangle ABC$  and  $\triangle CED$ . Find  $m\angle CED$ . Show all work that justifies your answer.



**Check Point**

In the diagram of  $\triangle GHJ$  below,  $\overline{HK}$  is drawn to side  $\overline{GJ}$ . If  $m\angle J = 42^\circ$ ,  $m\angle JHK = 29^\circ$ , and  $m\angle G = 71^\circ$ , what type of triangle is  $\triangle GHK$ ? Justify your answer.





## 3.05- Problem Set

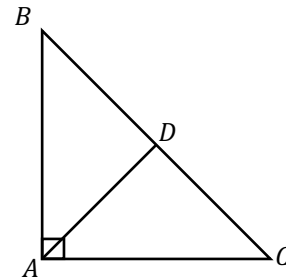
Name: \_\_\_\_\_

- Which of the following does *not* describe a triangle?
  - Isosceles Right
  - Obtuse Right
  - Acute Isosceles
  - Obtuse Scalene
- The angles in a triangle are in the ratio of 2:3:5. In degrees, the measure of the largest angle in the triangle is
  - $60^\circ$
  - $54^\circ$
  - $36^\circ$
  - $90^\circ$

- Given  $\triangle ABC$  below,  $\overline{AD}$  is the angle bisector of  $\angle BAC$  and  $m\angle C = 45^\circ$ .

- Find  $m\angle ADC$ .

- What does  $\overline{AD}$  represent in terms of triangle  $ABC$ ?



- The distance from Amir's house to school is 2 miles. Amir likes to take the scenic route to school on his walk home so that he can stop at the park. The Park is 0.7 miles from school. Which of the following are possible distances from the park to Amir's house? Draw a picture and circle all possible distances.
  - 0.5 miles
  - 1 mile
  - 1.5 miles
  - 0.8 miles
  - 3 miles
  - 2 miles
  - 1.4 miles
  - 0.6 miles