LESSON 2

## Geometry

# Triangle Sum Theorem

The triangle sum theorem states that the sum of the interior angles of any triangle equals 180°. In this activity, students demonstrate the theorem, which may be applied in order to determine the third angle of a triangle when the other two angles are known.

### Objective

Demonstrate the triangle sum theorem.

### Skills

- Understanding the properties of plane figures
- Applying the triangle sum theorem
- Spatial reasoning

### NCTM Expectations

**Geometry**

- Precisely describe, classify, and understand relationships among types of two- and three-dimensional objects using their defining properties.

**Try It!** *Perform the Try It! activity on the next page.*

## Talk About It

Discuss the Try It! activity.

- **Say:** *When you assembled the triangles so that each of the different angles met at a point, you were demonstrating, in one way, the triangle sum theorem. State this theorem in your own words.*
- **Ask:** *If you know two of a triangle's interior angles, how can you use this information and the triangle sum theorem to find the third?*
- **Ask:** *Are there other ways to assemble these three triangles and still satisfy the theorem?*
- **Ask:** *If three triangles are similar but not congruent, will you still be able to assemble them to form a straight angle? Explain.*
- **Ask:** *Can a right triangle contain an obtuse angle? Explain.*

## Solve It

Reread the problem with the students. Have them write a formula that reflects what they have demonstrated with the AngLegs™ triangles: In any triangle, $\angle A + \angle B + \angle C = 180°$.

## More Ideas

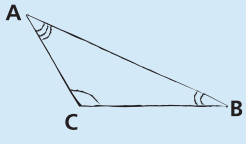
For other ways to teach about the triangle sum theorem—

- Have students confirm their findings by measuring the interior angles of each triangle carefully with a protractor. Note: Instruct students to measure from the center groove on the AngLegs pieces. Some rounding may have to be done.
- Have students assemble equilateral triangles made from various AngLegs pieces. For example, students can assemble a green equilateral triangle, a yellow equilateral triangle, and a red equilateral triangle. **Ask:** *The triangles are not congruent. Why can you still assemble them into a straight line?*

## Standardized Practice

Have students try the following problem.

*Find $\angle C$ if $\angle A$ is 35° and $\angle B$ is 21°.*




**A.** 56° **B.** 124°
**C.** 145° **D.** 304°

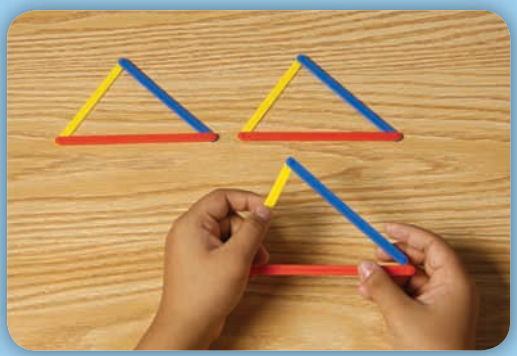
## Try It! 30 minutes | Groups of 4

Here is a problem about the triangle sum theorem.

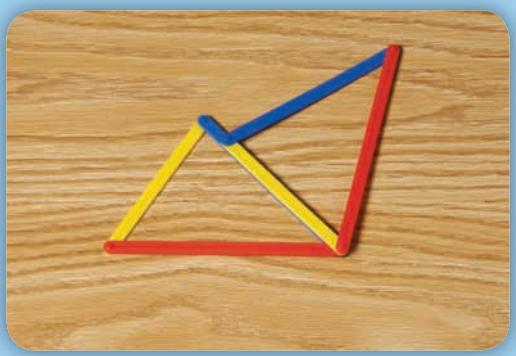
*Farah works for an architectural firm that designs theme parks. Her current client wants a park with three distinct areas—one for rides, one for stage shows, and one for concessions. Each area must be triangular and identical in size and shape. These three triangular areas must touch without gaps or overlaps and form a straight line on one side, where the parking lot will be. Farah thinks she can apply the triangle sum theorem to the problem. How can Farah arrange the three areas to satisfy the client's demands?*

Introduce the problem. Then have students do the activity to solve the problem. Distribute the materials.

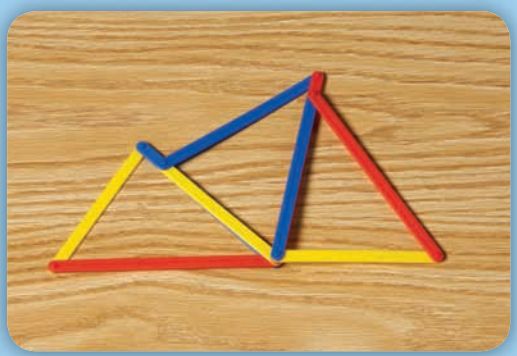
**Materials**
- AngLegs™ Set



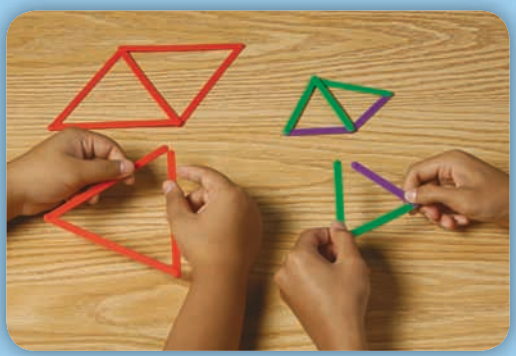
**1.** Have students create three identical scalene triangles using 1 blue, 1 red, and 1 yellow AngLegs piece. You may refer to the various angles in terms of the legs that form them.



**2.** Now have students begin to assemble the triangles so that the three different angles meet at the same point. Begin by orienting the first triangle as shown. Attach another triangle to it, matching up the blue-red angle of the original figure with the red-yellow angle in the second triangle.



**3.** Have students attach the third triangle by its blue-yellow angle. **Say:** *Look at the structure you just assembled from the three triangles.* **Ask:** *What do you notice about the bottom of the figure?* Elicit that it forms a straight line (straight angle). **Ask:** *How many degrees are there in a straight line or straight angle? What is the sum of the three angles in any triangle?*



**4.** Have students test the triangle sum theorem, first with an isosceles triangle (2 green, 1 purple), and then with an equilateral triangle (3 red). **Ask:** *Does the theorem hold true for these types of triangles too?*

AngLegs™ included in this sampler!