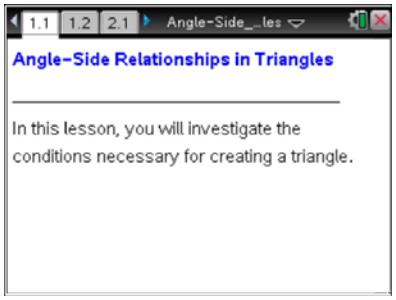
Angle-Side Relationships in Triangles
Student Activity

Name _____
Class _____

Open the TI-Nspire document
Angle-Side_Relationships_in_Triangles.tns.

How many triangles can you create given three angles and three segments? This lesson will help you answer the question and investigate some necessary conditions for creating a triangle.



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Press ctrl ▶ and ctrl ◀ to navigate through the lesson.

1. You have three angles and three segments. Move the angles and segments by grabbing the open and closed circles on each.
   a. What does the open circle do?

   b. What does the closed circle do?

2. Connect two of the segments by dragging the open circle of one segment to the open circle of the second segment. Move the vertex of the angle to the intersection of the segments. Rotate the angle and segments to align the segments with the sides of the angle. Describe how you did this.

3. Separate the angles and segments. Your task is to build a triangle. Start by attaching one of the angles to the longest segment.
   a. Were you able to form a triangle? Record your results in the table below and include a sketch with labels.

∠1 attached to longest segment	∠2 attached to longest segment	∠3 attached to longest segment

   b. What conjectures can you make about creating a triangle starting with the longest segment and an angle? Discuss your results with another student.

4. Separate the angles and segments. Then use all of the angles and segments to form a triangle, starting with the largest angle, $\angle 3$.
   a. Describe what you did to form the triangle.

   b. Does it make a difference where the longest side is located in the triangle? Explain your thinking.

5. Separate the angles and segments.
   a. Predict a triangle you could build using all six pieces. Make a sketch and label the pieces of the triangle.

   b. Make a conjecture about the location of the smallest angle in the triangle. Explain your reasoning.

   c. Use all of the pieces to form a triangle, starting with the smallest angle. Does your conjecture hold? Why or why not?

Move to page 2.1.

Apply what you have learned to the following problems. Make sketches if needed to visualize the possible triangles.

6. Use all six pieces.
   a. Predict a triangle you could build. Make a sketch and label the pieces of the triangle.

   b. Describe how to build your triangle.

   c. Build your triangle using the given angles and segments. How does it match the triangle you sketched in question 5a?

7. In $\triangle ABC$, $\angle B$ is 80°, $\angle C$ is 55°, and side $\overline{AC}$ is 10 centimeters. Which of the following are possible choices for the missing side lengths? Explain your thinking for each of the choices.
   a. BC = 12 cm, AB = 2 cm

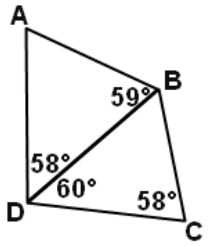
   b. BC = 6 cm, AB = 4 cm

   c. BC = 7 cm, AB = 8 cm

8. In $\triangle DEF$, $\overline{DE}$ is 12 inches, $\overline{DF}$ is 5 inches, and $\overline{EF}$ is 13 inches. Angle F is 67°. Which of the following could be the measure of $\angle E$? Explain your reasoning.

   23° 80° 90° 120°

9. In the diagram, which segment is the longest? Explain how you know.



10. If you are given three segments and three angles that form a triangle, how many possible triangles can you form? Justify your answer.