

Lesson 4.3: Triangle Inequalities

In this lesson you will:

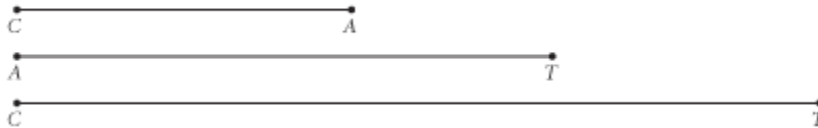
- determine whether you can form a triangle from any three segments
- discover a relationship between the side lengths and angle measures of a triangle
- look for a relationship between the measure of the exterior angle of a triangle and the measures of the corresponding remote interior angles

If you are given three segments, will you always be able to form a triangle with those segments as sides? In the following investigation, you will explore this question.

Investigation 4.3.1: “What is the Shortest Path from A to B ?”

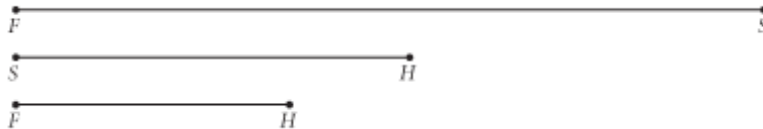
A.) Construct a triangle with each set of segments as sides.

Given:



Construct: $\triangle CAT$

Given:



Construct: $\triangle FSH$

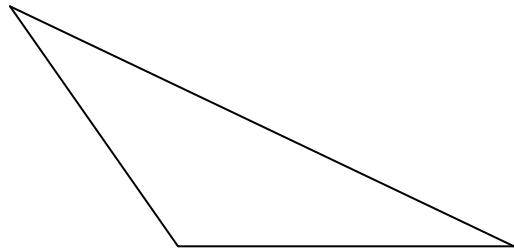
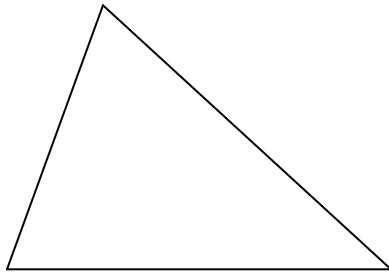
- B.) You should have been able to construct $\triangle CAT$, but not $\triangle FSH$. Why? Discuss your results with others. State your observations as your next conjecture.

Triangle Inequality Conjecture (C-20)

The sum of the lengths of any two sides of a triangle is _____ the length of the third side.

Investigation 4.3.2: “Where are the Largest and Smallest Angles?”

- A.) Measure the angles in your triangles below. Label the angle with the greatest measure $\angle L$, the angle with the second greatest measure $\angle M$, and the smallest angle $\angle S$.

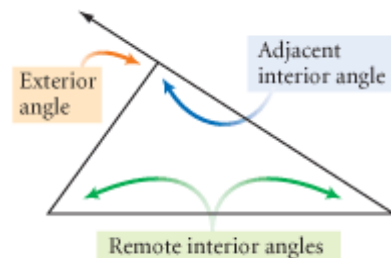


- B.) Measure the three sides. Label the longest side l , the second longest side m , and the shortest side s .
- C.) What side is opposite $\angle L$? _____ What side is opposite of $\angle M$? _____ What side is opposite of $\angle S$? _____
- D.) Discuss your results with others. Fill in the conjecture below that states where the largest and smallest angles are in a triangle, in relation to the longest and shortest sides.

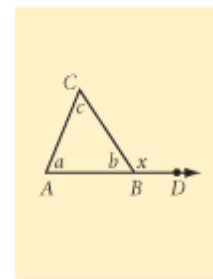
Side-Angle Inequality Conjecture (C-21)

In a triangle, if one side is longer than another side, then the angle opposite the longer side is _____ than the angle opposite the shorter side.

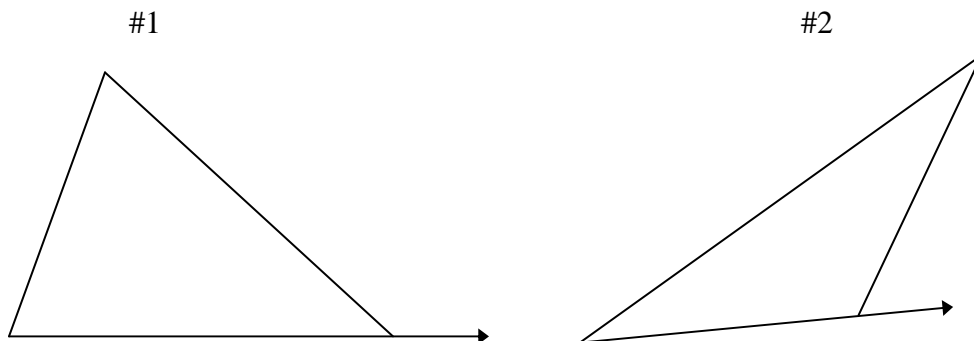
- *Add “exterior angle,” “adjacent interior angle,” and “remote interior angles” to your dictionary.



Investigation 4.3.3: “Exterior Angles of a Triangle”



A.) Label the vertices and angles on the triangles below like the picture to the right.



B.) Measure the exterior angle x on both triangles using a protractor.

#1 $x =$ _____

#2 $x =$ _____

C.) Measure the two remote interior angles, $\angle A$ and $\angle C$.

#1 $m\angle A =$ _____ $m\angle C =$ _____ #2 $m\angle A =$ _____ $m\angle C =$ _____

D.) How does the sum of $m\angle A$ and $m\angle C$ compare with x ?

E.) Discuss your results with your group. State your observations as a conjecture below.

Triangle Exterior Angle Conjecture (C-22)

The measure of an exterior angle of a triangle is _____ to the sum of the measures of the remote interior angles.

The investigation may have convinced you that the Triangle Exterior Angle Conjecture is true, but can you explain *why* it is true for every triangle?

⇒ASSIGNMENT: _____