

Discovering Ways Triangles Are Congruent

Materials needed: rulers, pencils, patty paper, do now questions, closure questions.

Lesson Goal: For students to understand that there are several short cut methods that can lead to the congruency of triangles.

Do Now Activity: Ask students to identify which figures are congruent and tell why.

Make a definition with the students that congruent figures are those figures where the corresponding angles are congruent and the corresponding sides are congruent.

Next give students a copy of Parts of a Triangle. In this lesson students will discover they need at least 3 parts to get congruent triangles.

Copy angle A on a sheet of patty paper. Put the Parts of the Triangle paper away. Remember the sides of the angle you just copied are rays so you can make sides AB and AC as long as you would like. Make the angle A on the patty paper into a triangle. You cannot change the size of angle A, but you can lengthen the rays that make up the angle because that does not change the size. After students have made a triangle on the patty paper have them compare their triangles with each other by placing them on top of each other. Are the triangles congruent? (Students should conclude that the triangles are not congruent.) Have students label on the patty paper that only one angle was copied.

Copy side AB on a sheet of patty paper. Put the Parts of the Triangle aside. Make the side AB on the patty paper into a triangle. You cannot change the size of side AB, but you can attach two other sides to the given side to make a triangle. After students have made a new triangle on the patty paper have them compare their triangles with a neighbors triangle. Are the triangles congruent? (Students should conclude that the triangles are not congruent.) Have students label on the patty paper that only one side was copied.

Copy angle A on a sheet of patty paper. Have students trace side AB on to angle A. Put the Parts of the Triangle aside. Have students extend the other side of angle A to whatever length they would like. Then have the students label point C and complete the triangle. After students have made a new triangle on the patty paper have them compare it a neighbor's triangle. Are the triangles congruent? (Students should conclude that the triangles are not congruent.) Have students label on the patty paper that two angles were copied.

Copy side AB and BC to make any triangle. After they have labeled A, B, and C have the students complete the triangle. After students have made a new triangle on the patty paper have them compare it a neighbor's triangle. Are the triangles congruent? (Students should conclude that the triangles are not congruent.) Have students label on the patty paper that two sides were copied.

What have we learned so far? Congruent triangles cannot be made by copying one angle, one side, two angles, or two sides. There is too much unknown information to produce congruent triangles.

Since we did not get congruent triangles with one angle, one side, two angles, or two sides, let's try three parts.

Copy side AB, BC, and CA on three different sheets of patty paper. Have students place them on top of each other so the vertices match up. Once the papers are line up have students copy the line segments onto one sheet of patty paper. After students have made a new triangle on the patty paper have them compare it with triangle ABC. Are the

triangles congruent? (The triangles are congruent.) Remind students that they did not copy any of the angles, only the three sides. What can they conclude? (If the three corresponding sides of the two triangles are congruent the triangles are congruent.)

We finally have a way that makes two triangles congruent. This method is known as SSS because the three corresponding sides were congruent.

Copy angle A, side AB and angle B on a sheet of patty paper. Have students put triangle ABC aside and then complete their triangle. After students have made a new triangle on the patty paper have them compare it with their neighbor's triangle. Are the triangles congruent? (The triangles are congruent.) Remind students that they did not all the six parts. They only copied angle A, side AB, and angle B. (If two angles and the side between them on one triangle are congruent to two angles and the side between them on another triangle, the triangles are congruent.

Stop and project Congruence Shortcut on the board. Have students try to make two different triangles from two angles and the included side. What do they learn? (Only one triangle can be made from the two angles and the included side.) This method is known as ASA.

Copy angle A and sides AB and AC on a sheet of patty paper. Have students triangle ABC aside and then complete their triangle. After students have made a new triangle on the patty paper have them compare it with their neighbor's triangle. Are the triangles congruent? (The triangles are congruent.) Remind students that they did not all the six parts. They only copied angle A and the two sides that make up angle A. (If two sides and the included angle of one triangle are congruent to two sides and the included angle of another triangle the triangles are congruent.

Stop and project Congruence Shortcut on the board. Have students try to make two different triangles from one angle and the two sides that make up the angle. What do they learn? (Only one triangle can be made from the two sides and the included angle.) This method is known as ASA.

What methods work so far? SSS, ASA, and SAS.

Have students copy angles A, B, and C to make a triangle. After they copy one angle, have them put triangle ABC aside, extend one of the sides of the angle, label the endpoint B and then copy angle B. This should look familiar. It is what they did for AA. Have students complete the triangle and then compare their third angle with the side of angle C. What do they notice. All three angles are congruent. Does this produce congruent triangles? (No because not side measurements were given.)

Model SSA with the computer program. Students should notice that the triangles are not congruent.

Closure:

Have students begin with triangle ABC and label parts of triangle XYZ so they are congruent by SSS, ASA, and SAS.