**Activity 2.2.3 ASA Congruence**

In this activity you will discover and prove our second theorem about congruent triangles.



1. Included sides. For each pair of angles in ∆XYZ, name the included side.

Angles: *XYZ* and *YZX* Included Side:

Angles: *XYZ* and *ZXY* Included Side:

Angles: *ZXY* and *YZX* Included Side:

2. Experiment. Work with one other student. You will each draw two triangles using a ruler and protractor.

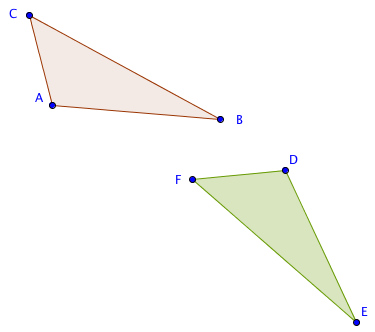
a. Agree upon the measure of two angles of the triangle and the included side.

Our two angles measure \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Our included side measures \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

b. Now draw your triangles. Cut one triangle out and place it on the other. What do you notice?

c. Formulate a conjecture: If two angles and the included side of one triangle are congruent to two angles and the included side of another triangle then \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.



3. Proving the ASA Congruence Theorem. Study this proof and fill in the blanks.

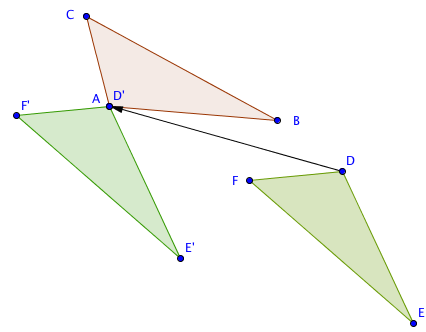
Given ∆*ABC* and ∆*DEF* with

m*BAC* = m*EDF*,

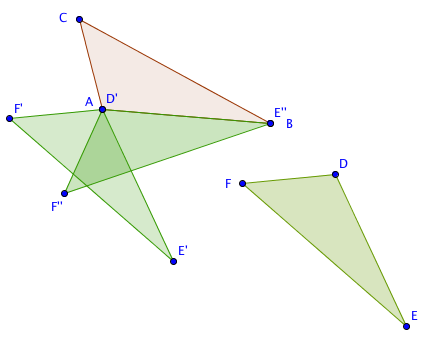
*ABC* = m*DEF*, and

*AB* = *DE*

Prove ∆*ABC*∆*DEF*.

*Step 1*. If *A* and *D* do not coincide then translate ∆*DEF* by the vector from *D* to *A*.

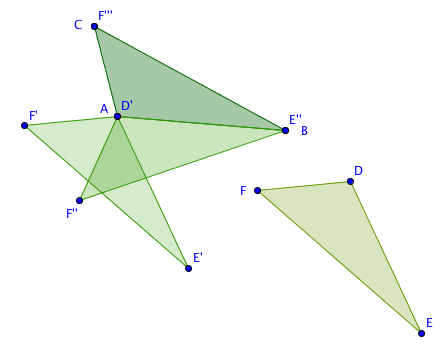
Now *D’* is the same point as \_\_\_\_\_\_\_.



*Step 2*. If and do not coincide then rotate ∆ about point *A* through *E’AB.*

*Step 3.* will now coincide with since we were given that *AB* = \_\_\_\_\_\_\_.

*Step 4.* If *F’’* is on the opposite side of from *C*, reflect ∆*D’’E’’F’’* over .



*D’’* is the same as which point? \_\_\_\_\_

*Step 5*. *E’’’D’’’F’’’* will now coincide with *BAC* since we were given m*BAC* = m\_\_\_\_\_\_, and *D’’’E’’’F’’’* will now coincide with *ABC* since we were given m*ABC* = m\_\_\_\_\_\_.

6. Therefore ray coincides with ray and ray coincides with ray . These two rays intersect at point *C*. Is it possible for them to intersect at another point? Explain. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If we agree that two lines can only intersect at one point, we can conclude that point *F’’’* coincides with point *C.*

*Step 7*. Since ∆*ABC* is the image of ∆*DEF* under an isometry, ∆*ABC*∆*DEF*.

4. Now state the theorem you have just proved. We will call this the ASA Congruence Theorem.

If \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,

then \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

5. What properties of transformations were used in the proof?

6. How was this proof similar to the proof of the SAS Congruence Theorem? How was it different?