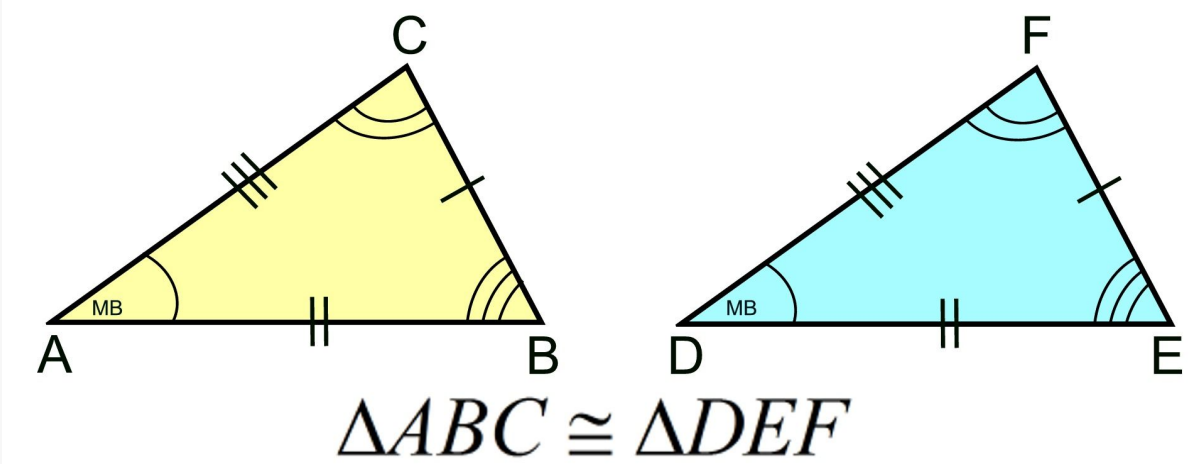
Taking a look at Triangle Congruences

What do we mean by having Congruent Triangles?

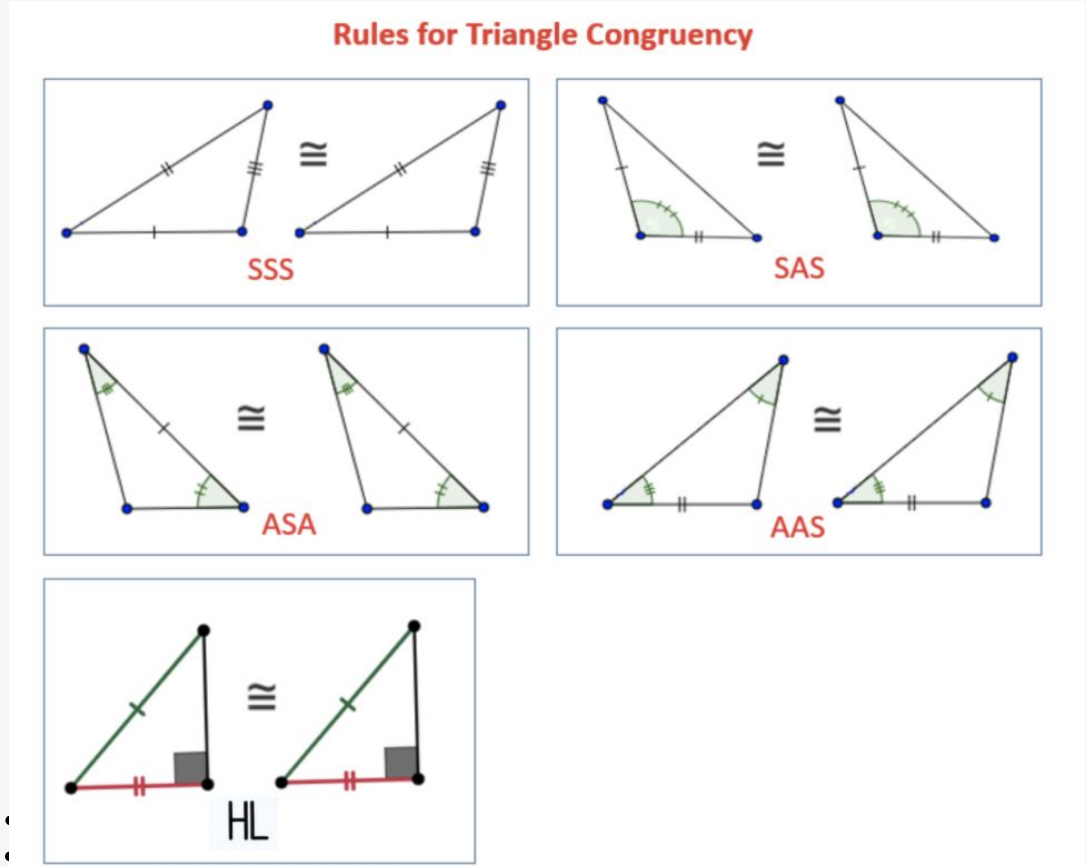
Congruent triangles are triangles that have the **same size and shape**. This means that the corresponding sides are equal and the corresponding angles are equal.



There are five theorems that we can use to determine if two triangles are congruent: **SSS**, **SAS**, **ASA**, **AAS** and **HL**.

- S = Side, A= Angle, HL= Hypotenuse Leg

**Note: not all the six corresponding elements of both triangles must be found to determine that the two triangles are congruent. There are 5 conditions for determining that two triangles are congruent that we could use. They are the SSS, SAS, ASA, AAS, and HL congruence properties.



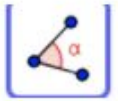
Our Task: Is to explore why SSA is not a condition that we can use to explain that two triangles are congruent

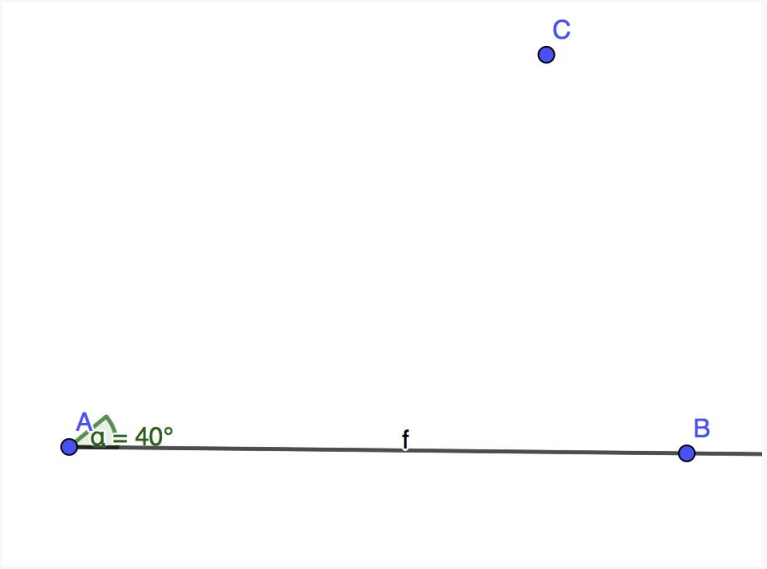
We will be using Geogebra Classic

Go to www.geogebra.org/classic

We will be utilizing Geogebra to help use visualize why SSA isn't one of the conditions to prove two triangles are congruent to each other.

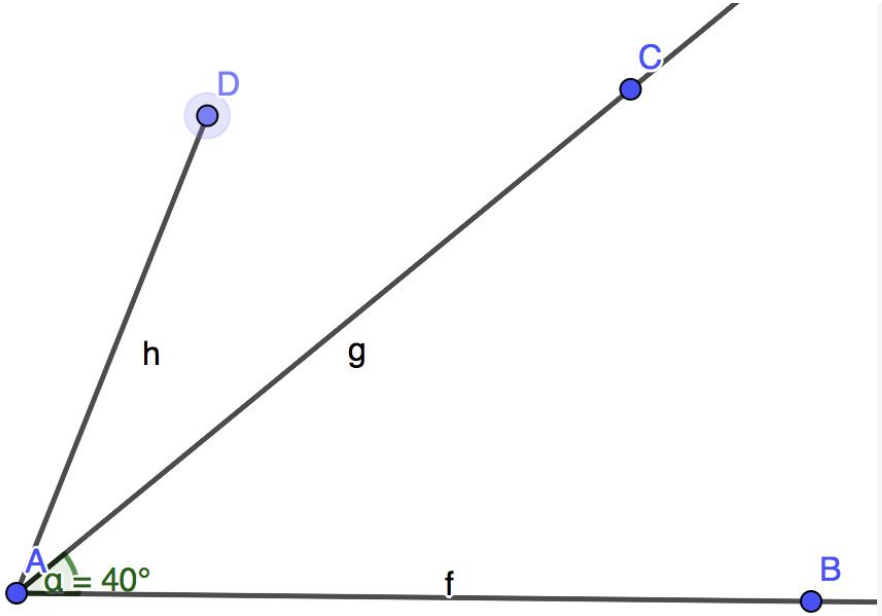
Step 1: Using the segment tools create a Ray- Go to  click on it then click on the option that says Ray. Click in your work area and you should see a line appear, then go further down the line and click again.

Step 2:Create an angle using the segment tools- Go to  click on it and then click on the angle with the given measure. Going in Counter Clockwise click B then A. Type in 40 degrees and hit okay.



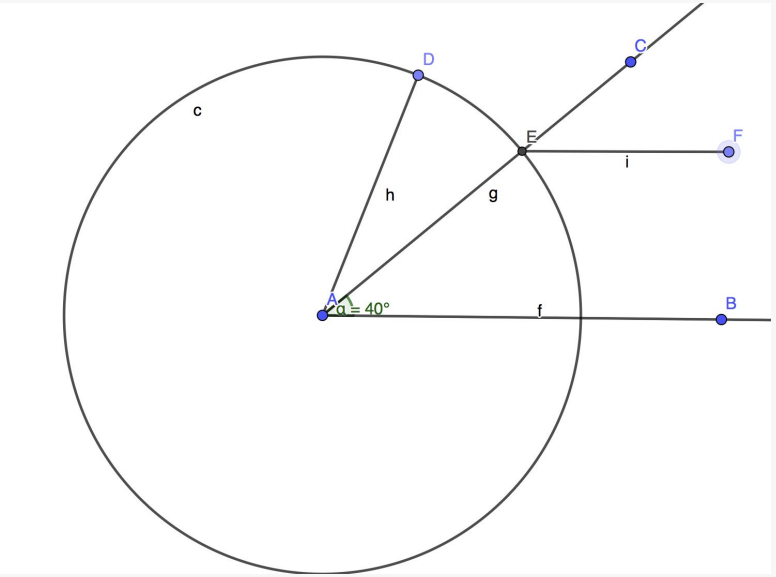
Step 3: Make a line along the 40 degrees- Go to  click on the ray button and make a ray connected to the 40 degree angle.

Step 4: Create a line segment connected to the 40 degree angle that is 5 units in length. Go to  click on segment with given length, go to point A click it and type 5 units then hit okay. You can go to this tool  to be able to move the segment around.



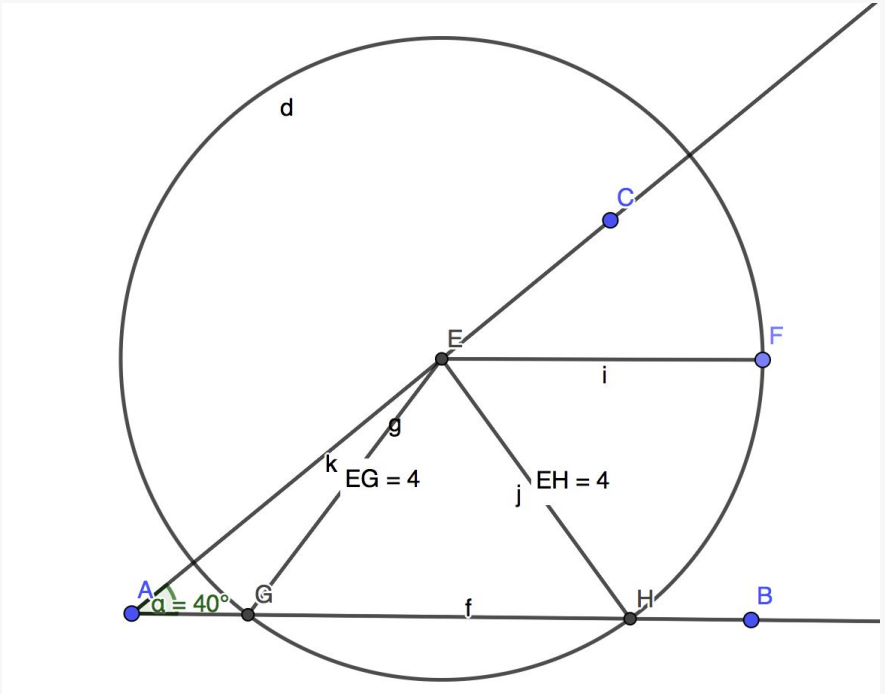
Step 5: Make a Circle with the center being A- Go to  click on the circle with Center through Point. Create a circle from point A to point D. Where the circle intersects with the ray AC put a point of intersection. Go to  hit intersect, then click on the intersection that we created. You can hide the circle and the line segment if you want to make the diagram look less cluttered.

Step 6: Create the last Side of the triangle- From point E create a line segment with a given length of 4. Go to  click on segment with given length, go to point E and enter the length 4 units.



Step 7: Move the line segment EF around to try and close the triangle. What do you notice?

Step 8: Create a circle with the center being E- Go to  click on the circle with Center through Point. Create a circle from point E to F. Notice that there are two intersections formed. Create the points of the intersection. Then draw line segments from E to G and then E to H.



What are our findings that make SSA not a condition to be able to use when

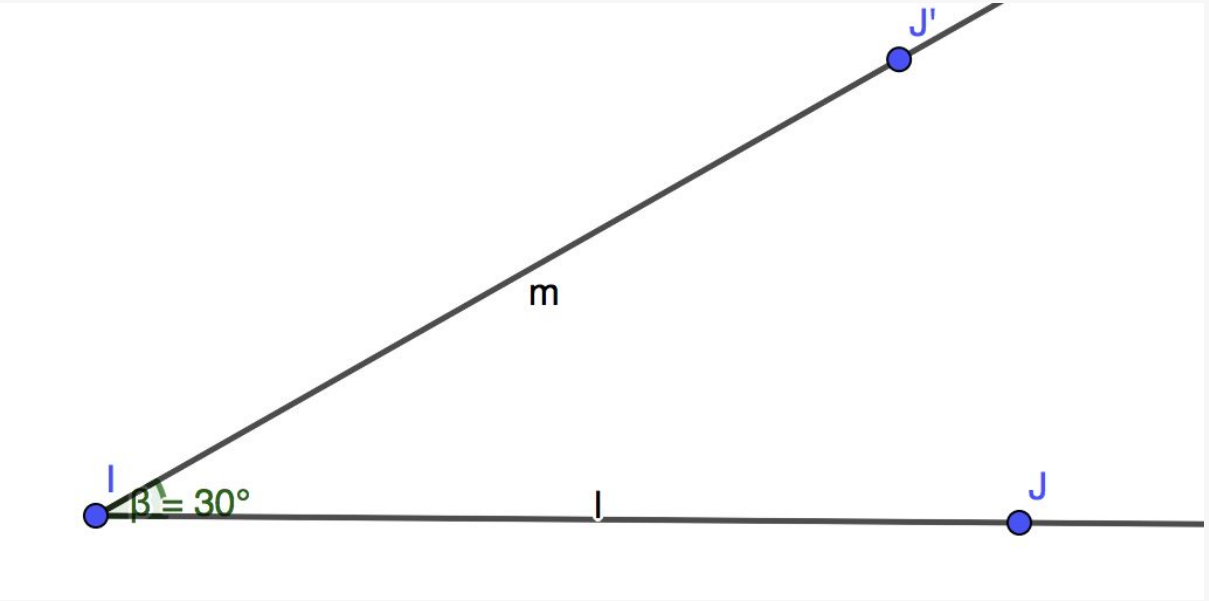
proving two triangles are congruent

Let's take a look at another problem and see what happens if we change the measurements of the sides and angle

Step 1: Create a Ray- Go to click on it then click on the option that says Ray.

Step 2: Go to click on it and then click on the angle with the given measure. Going in Counter Clockwise click J then I. Type in 30 degrees

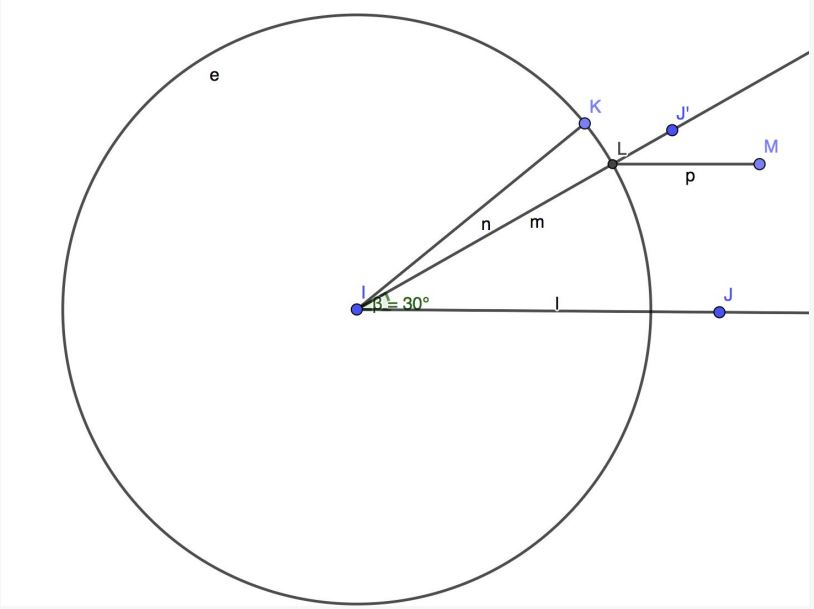
Step 3: Make a line along the 30 degrees- Go to click on the ray button and make a ray connected to the 30 degree angle.



Step 4: Create a line segment 6 units in length. From point I.

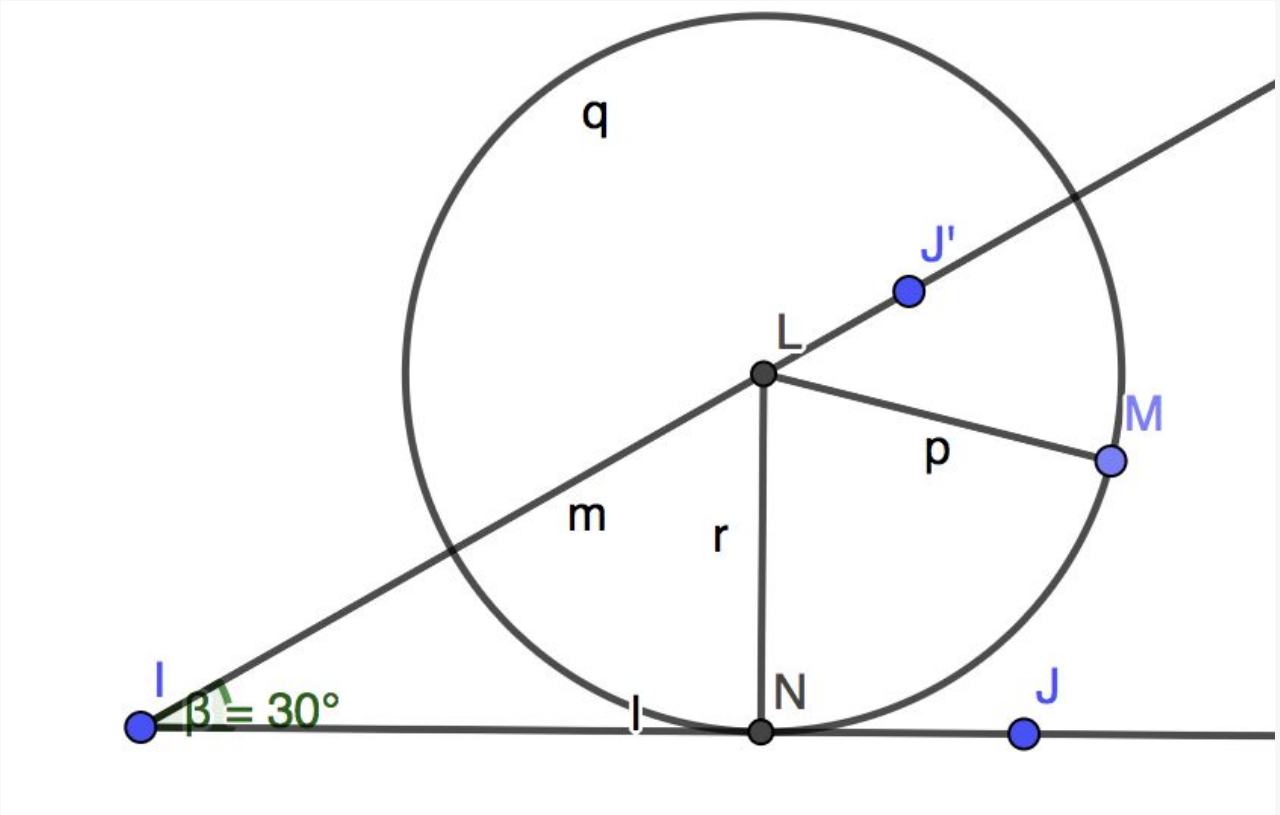
Step 5: Make a Circle with the center being I- Go to  click on the circle with Center through Point. Create a circle from point I to point K. Where the circle intersects with the ray put a point of intersection. Go to  hit intersect, then click on the intersection that we created. Now we have point L.

Step 6: Create the last Side of the triangle- From point L create a line segment with a given length of 3. Go to  click on segment with given length, go to point L and enter the length 3 units.



Step 7: Move the line segment CF around to try and close the triangle. What do you notice?

Step 8: Create a circle with the center being L- Go to  click on the circle with Center through Point. Create a circle from point L to M. Notice where an intersection is made and mark that point. Now we have Point N.



If we said that SSA isn’t a theorem used to prove two triangles congruent then why does this work?

Let's explore further.

First connect the Triangle using segments

Then find the missing angles.

What do you notice about the other angles? What theorem is this triangle a demonstration of?