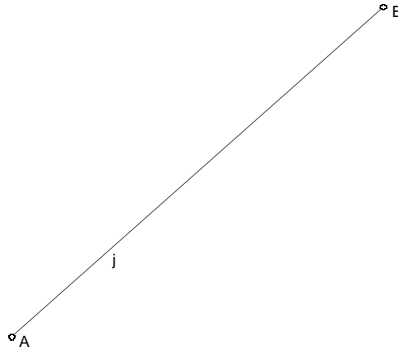


### *Investigation: Triangle congruencies.*

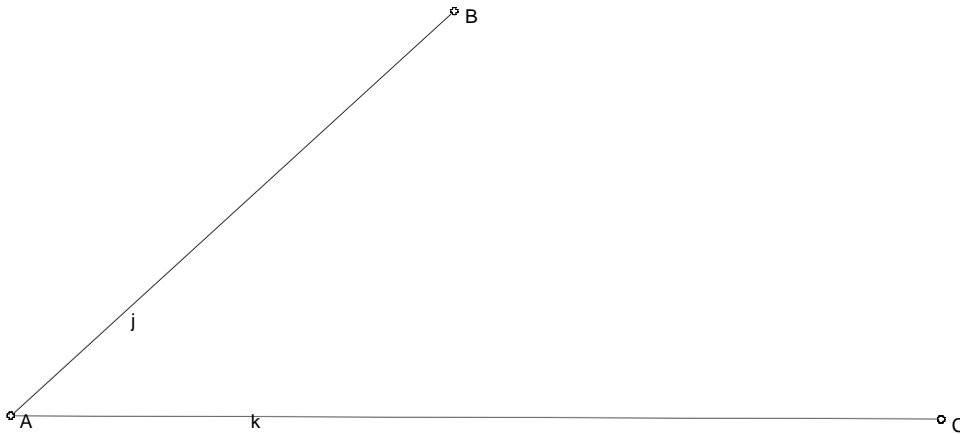
In this investigation you will be discovering the properties of triangle congruencies. Specifically, if there are more than 4 ways to prove a triangle congruent.

#### Step-By-Step

1. Choose New Sketch from the file menu.
2. Set the Preferences to show labels for straight objects and points.
  - a. Choose Preferences from the Display menu.
  - b. Click Points and Straight Objects in the Autoshow Labels section, then make sure that the Distance Unit is inches, the Angle Unit is degrees, the Precision should be hundredths first, then units next, finally it should say hundredths again. Then click OK.
3. We are going to draw a segment AB.
  - a. First click on the black dot in the upper left hand corner, this makes points. Go to your blank sheet and make the two points in your sheet. Put A in the lower left hand corner and B somewhat in the middle of the page. They should have automatically been labeled A and B. If they were not, go to the upper left hand corner and click the object that looks like an arrow. Go near where the letters are and move it close to it. You should see a hand come up. When the hand is up, double click to rename the point. Make sure that A and B are somewhat close together.
  - b. Now go to the upper left hand corner again and select the object that looks like a line segment. Your cursor should look like an X. Place the X on the point labeled A, click and hold. Drag the cursor over to point B so they connect. You should now have line segment AB. You should notice that the line segment has been defined for you also.

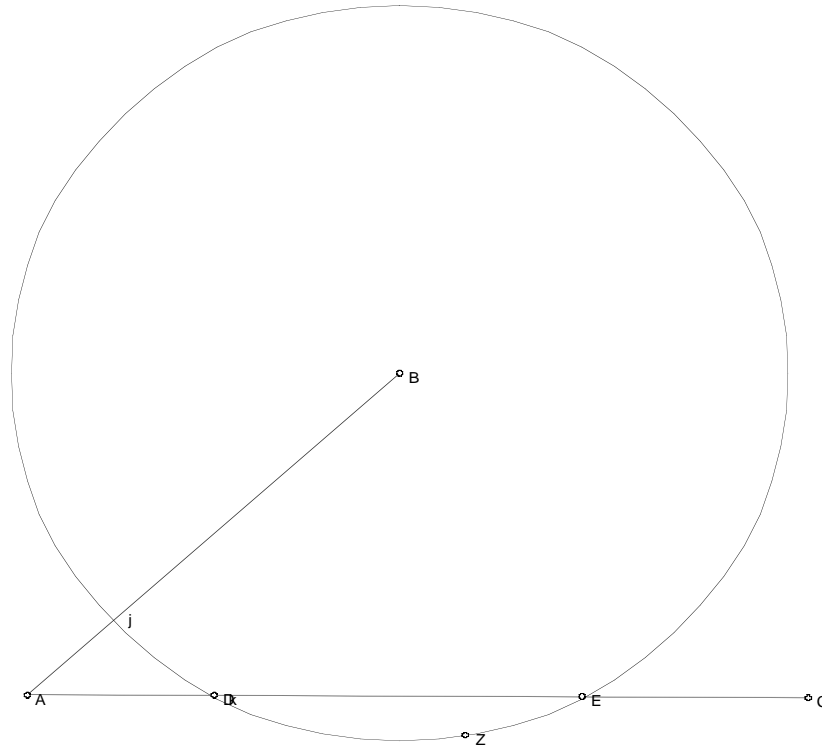


4. Draw another point not on segment AB.
  - a. Select the black dot from the upper left hand corner and place your point to the right of B, in the mid to lower right hand corner. This point should have been labeled C. If it did not, rename it as before.
5. Now connect points A and C.
  - a. Click on the line segment in the upper left hand corner. Start at point A, click and hold; drag your cursor over to point C. You should now have a line segment from A to C.



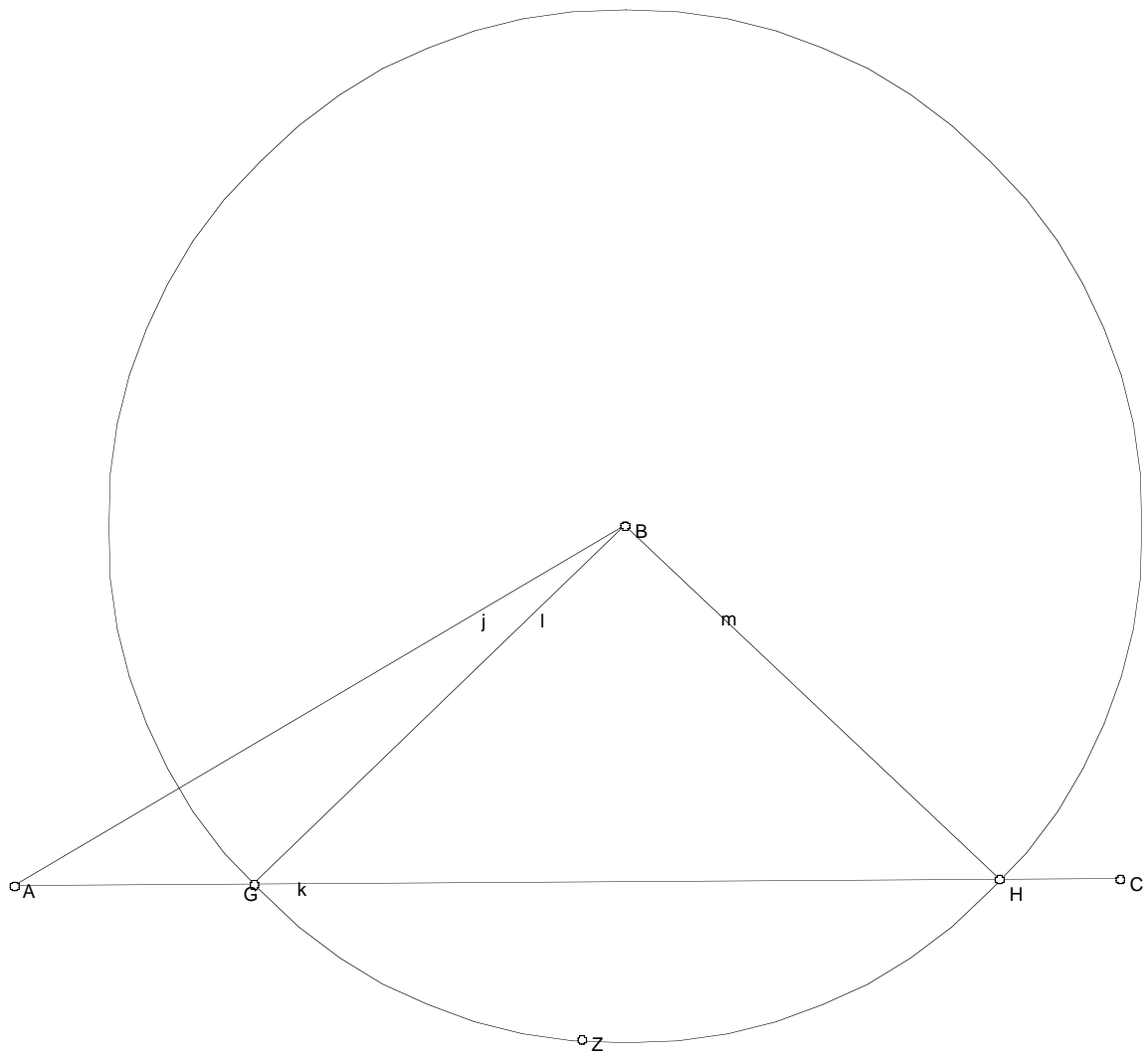
6. Draw a circle with center at point B that intersects segment AC in two points. Label the intersecting points G and H. This will help us draw our segments accurately later.
  - a. In the upper left hand corner select the object that looks like a circle. Your cursor should look like a circle with a plus sign in it. Place that cursor on top of the point B. Click and hold the button on top of the point B, and drag the mouse down towards the segment AC. You should see your circle starting to get bigger. Drag your mouse down until the circle intersects the

segment  $AC$  in two different places. Once it does that, release the button. You should also see a point once you release the button; label this point  $Z$  as we did before.



- b. Now we are going to put points where the circle intersects segment  $AC$ . To do this, select the point from the upper left hand corner. Go to where your circle intersects and place points there. Label the point closest to  $A$ :  $G$ , and the point closest to  $C$ :  $H$ . Look above if you don't remember how to label points.
7. Draw segment  $BG$  and segment  $BH$ .
- a. In the upper left hand corner select the object that looks like a segment. Place the cursor over the point  $B$ , click and hold, and then drag your cursor down to the point  $G$ . Do the same with the point  $B$  to  $H$ . You should now have line segments  $BG$  and  $BH$ .

This is what your picture should look like.



8. Measure the lengths of segment AB, BH, BG, AG, and AH.
  - a. To measure the length of AB, we have to make sure we have the arrow selected in the upper left hand corner. Move your arrow on top of the point A. Click and release. The point A should

look like it is highlighted. Next, move your cursor so it is on top of point B. Now in order to select both of these points at the same time we need to hold down the shift key. So hold down the shift key and click and release. Both of these points should be highlighted now, if not repeat the process until you get it. Once you have both points highlighted, go to the distance choice under the Measure menu. You should now see the distance of segment AB in the upper left hand corner. We now need to de-select before measuring anything else. To do this just click anywhere in the white space.

- b. Repeat this process for the distances of BH, BG, AG, and AH. List them in the space provided.

BH:

BG:

AG:

AH:

9. Measure  $\angle ABG$ ,  $\angle BAG$ ,  $\angle AGB$ ,  $\angle ABH$ ,  $\angle BAH$ ,  $\angle AHB$

- a. To measure  $\angle ABG$ , we are going to need our arrow again. So select it from the upper left hand corner. We are going to have to select all three of these points this time in the order that they are written. So move your cursor above point A and click it, it should be highlighted. Now to select the other two points we are going to have to hold down the shift key. So while holding the shift key down, select the other two points B and G. Once you do that you should see all three points highlighted. Go to the angle option in the measure menu. You should now see the measure of the angle in the upper left hand corner. De-select as before to measure a new angle.
- b. Repeat this process for all of the other angles. List your answers in the space provided.

$\angle ABG$ :

$\angle BAG$ :

$\angle AGB$ :

$\angle ABH$ :

$\angle BAH$ :

$\angle AHB$ :

10. List the sides of  $\triangle ABG$  that are congruent to the sides of  $\triangle ABH$ .

11. List the angles of  $\triangle ABG$  that are congruent to the angles of  $\triangle ABH$ .

12. Move the point B up and down to see what happens with the measures of the sides and the measure of the angles. What do you notice?

13. Decide whether this statement is true or false and why.

*If two sides and a nonincluded angle of one triangle are congruent to two sides and a nonincluded angle of the other triangle, then the triangles are congruent.*