Why Can’t We Use SSA to Prove Triangles Congruent?

Lesson Summary:
When proving triangles congruent by applying the SSS, ASA, and SAS theorems and postulates, students often asked why is there no SSA property. The following activity demonstrates the SSA property and shows students that two non-congruent triangles can be formed if two sides and a non-included angle are congruent.

Background Knowledge: Students must be proficient with proving triangles congruent and understand what SSS, ASA, and SAS. Students must also be able to identify congruent corresponding parts and parts that overlapping triangles have in common. Students must be familiar with Cabri Geometry, either on the P.C. or on the TI-92 calculator.

NCTM Curriculum Objectives
1) The student will be able to explore inductive and deductive reasoning through applications to various subject area.
2) The student will be able to identify congruent and similar figures using transformations with computer programs.
3) Explore compass and straight edge constructions in the context of geometric theorems.

Learning Objectives
1) Students will use their knowledge of Cabri software to construct two non-congruent triangles that have two pairs of congruent sides and a pair of congruent non-included angle.
2) The students will label all parts of their construction and be able to manipulate the construction to show different triangles and the measures of critical parts of the triangles.

Materials
Computers or calculators with Cabri geometry installed.
SSA lab worksheet

Procedure
Review the postulates of SSS, SAS, ASA
Divide the students into groups of no more than three (two is preferable)
Have students complete the lab worksheet.
Monitor students’ progress during the activity.
Use results from the lab activity as assessment.
Review findings prior to the conclusion of class.
Why Can’t We Use SSA to Prove Triangles Congruent?  

*Lab Worksheet*

**Team members:** ____________________________________________

**File name:** __________________

**Lab Goals:** When proving triangles congruent by applying the SSS, ASA, and SAS theorems and postulates, students often asked why is there no SSA property. The following activity demonstrates the SSA property and shows students that two non-congruent triangles can be formed if two sides and a non-included angle are congruent.

**Procedures**

1) Draw ray $\overrightarrow{AB}$. (use ray tool)

2) Draw circle C using a radius such that circle intersects ray $\overrightarrow{AB}$ in two places. Label the points of intersections D and E. (use circle tool and points of intersection tool)

3) Draw segments $\overline{AC}$, $\overline{DC}$, and $\overline{CE}$. (use segment tool)
4) What is true about the lengths of segments $\overline{CD}$ and $\overline{CE}$? Why? ____________

_______________________________________________________________

_______________________________________________________________

5) Now measure $\overline{CD}$ and $\overline{CE}$. Does it confirm your conclusion from above?

__________________________________

(use distance and length tool)

6) Find the measure of angle $\angle A$ and segment $\overline{AC}$. (use angle tool and distance and length tool)

Label your responses.

(use comments tool)

Angle $\angle A =$ _____

$\overline{AC} =$ _____

7) Consider triangles $\triangle ADC$ and $\triangle AEC$. List the congruent corresponding parts.

________________________________

8) Compare triangles $\triangle ADC$ and $\triangle AEC$. Are they congruent? _______

Why or why not? ______________________________________________

________________________________

9) Why would the triangles be described as following a SSA property? _______

________________________________

10) Is SSA a property that can be used to prove triangles congruent? _______

11) Write, in your own words, why SSA is not a valid method for proving two triangles congruent. __________________________

________________________________
12) Grab point A and drag it so that ray \( \overline{AB} \) still intersects the circle in two points. Do the results from above change? ____________________________

**Extension: Investigate A Special case of the Hinge Theorem**

1) Draw a circle C. (use circle tool)

2) Place points A and B on circle C. (use points on object tool)

3) Draw segments \( \overline{AC}, \overline{BC}, \) and \( \overline{AB} \) to form triangle \( \triangle ABC \). (use segment tool)

4) Grab point A or point B and move it along circle C. Watch what happens to the length of segment \( \overline{AB} \). Describe what happens to segment \( \overline{AB} \) as the measure of angle \( \angle ACB \) changes. __________________________________________________________

5) Draw another triangle \( \triangle DCE \) following the same steps above.
6) List the congruent corresponding parts of the two triangles. _______________

__________________________________________________________________

7) Grab the points and move them such that angle $\angle ACB$ is larger than angle $\angle DCE$. How do segments $AB$ and $DE$ compare? _____________________

Now grab the points and move them such that angle $\angle ACB$ is smaller than angle $\angle DCE$. Now how do segments $AB$ and $DE$ compare? _____________________

8) Finish the Hinge Theorem: If two sides of one triangle are congruent to two sides of another triangle, and the included angle of the first triangle is greater than the included angle of the second triangle, then

__________________________________________________________________

__________________________________________________________________