

CUT & GLUE SORT

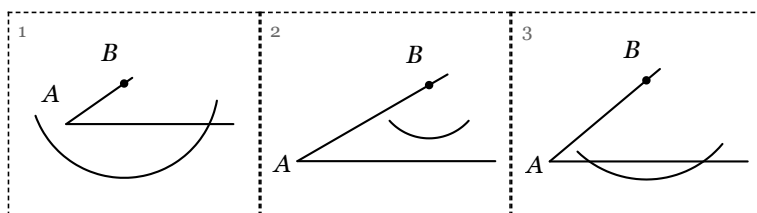


WHY SSA IS NOT A CONGRUENCE CRITERION

How Many Triangles Fit?

Two triangles, one, or none · 12 arc drawings · 3 rows

FREE



Row 1. Two triangles: the arc meets the bottom side at two points.

Row 2. One triangle: the arc meets the bottom side at one point only.

Row 3. No triangle: the arc does not reach the bottom side.

Cut & Glue Sort — how to run it

25 minutes, with cutting

1. Give each student pages 3 and 4, scissors and glue.
2. Say this once: *“C must be on the bottom side and on the arc. Count the points where the arc meets the bottom side. That is the number of triangles. Glue each piece in its row.”*
3. Check the rows with page 5. Every row holds four pieces.

Rows	page 3, one per student.
Pieces	page 4, one per student. The students cut.
Answers	page 5, for you.

What the pieces show. Each piece gives the same three parts of a triangle ABC: the angle at A, the side AB, and the side BC (the radius of the arc). The angle is not between the two sides, so this is SSA. The pieces show that SSA can give two triangles, one triangle or none. That is why SSA does not prove two triangles congruent.

Two common mistakes. Many students think SSA always gives two triangles. The one-triangle row is there for them. In two pieces the arc just touches the bottom side. In one piece BC is longer than AB, so the arc swings past A. In one piece the angle at A is obtuse. Other students do not believe that no triangle is a real answer. The no-triangle row shows that it is.

The bottom side starts at A. When BC is longer than AB, the arc passes to the left of A. There is no side there, so the arc meets the bottom side only once. If a student puts that piece in row 1, ask: *“Where does the bottom side start?”*

Guessing does not work. A student who puts every piece that the arc reaches in the two-triangle row gets only eight of the twelve right, and that row ends up with too many pieces.



This is the free lesson this activity came from. The worksheet, the full answers and the lesson plan are on it.

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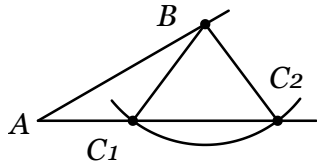
Cut & Glue Sort — how many triangles fit?

SSA

Name _____

Period _____

Date _____



Each piece shows an angle at A. B is on the top side. An arc is drawn with its center at B.

The third corner C must be on the bottom side, and on the arc. **Each point where the arc meets the bottom side gives one triangle ABC.** In this example there are two points, C1 and C2, so two triangles fit.

The bottom side starts at A. Count the points on each piece. Glue each piece in its row.

Row 1. Two triangles: the arc meets the bottom side at two points.

Row 2. One triangle: the arc meets the bottom side at one point only.

Row 3. No triangle: the arc does not reach the bottom side.

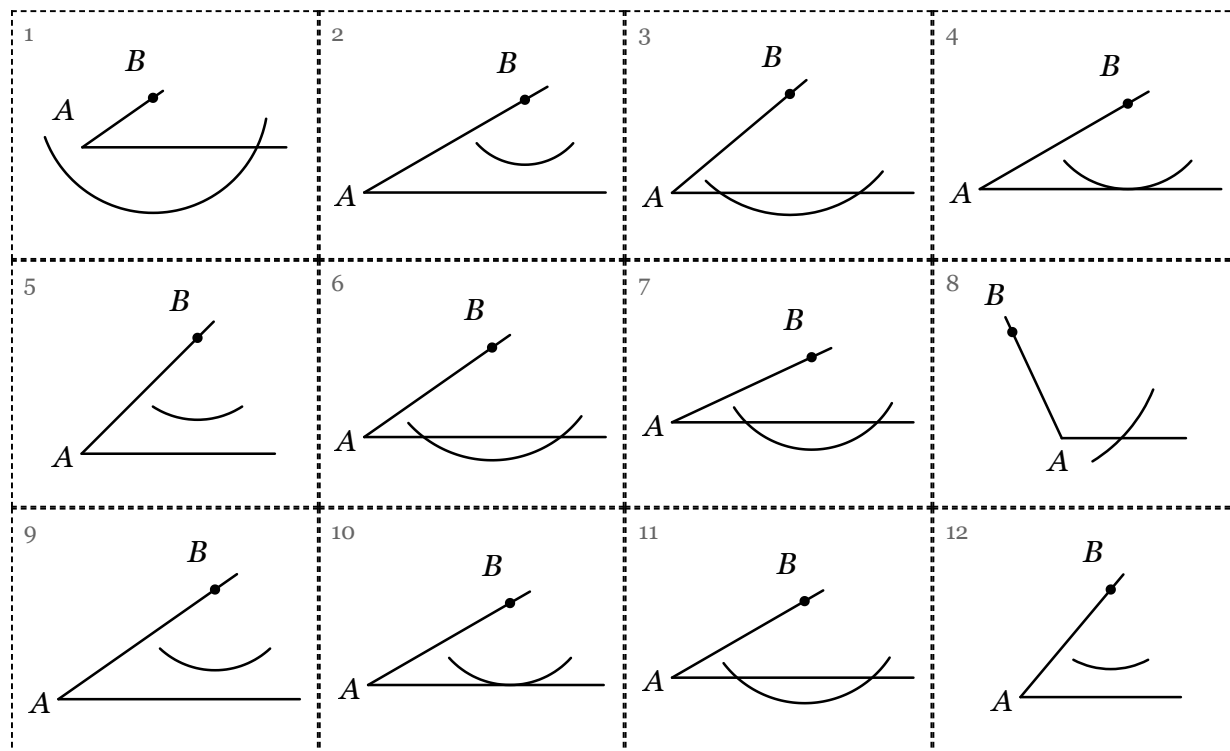


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Cut & Glue Sort — the pieces

Cut along the dashed lines

Cut out the twelve pieces. Glue each one in its row on the other sheet.



Every row holds four pieces. The numbers below are the ones each drawing was made from. They are not printed on the pieces.

1 Two triangles: the arc meets the bottom side at two points.

Pieces 3, 6, 7, 11.

Piece 3: BC is 5.5: longer than the distance from B (4.5) and shorter than AB (7). The arc crosses the bottom side twice, so C can go in two places and two different triangles fit.

Piece 6: BC is 6.5: longer than the distance from B (5.2) and shorter than AB (9). The arc crosses the bottom side twice, so C can go in two places and two different triangles fit.

Piece 7: BC is 6: longer than the distance from B (4.2) and shorter than AB (10). The arc crosses the bottom side twice, so C can go in two places and two different triangles fit.

Piece 11: BC is 6: longer than the distance from B (4.5) and shorter than AB (9). The arc crosses the bottom side twice, so C can go in two places and two different triangles fit.

2 One triangle: the arc meets the bottom side at one point only.

Pieces 1, 4, 8, 10.

Piece 1: BC is 8, longer than AB (6). The arc crosses the bottom side once and then passes to the left of A, where there is no side. So there is one triangle.

Piece 4: BC is 4, exactly the distance from B to the bottom side. The arc just touches it at one point, so there is one triangle (with a right angle at C).

Piece 8: The angle at A is 115° , which is obtuse, and BC (6.5) is longer than AB (5). The arc crosses the bottom side once, so there is one triangle.

Piece 10: BC is 3.5, exactly the distance from B to the bottom side. The arc just touches it at one point, so there is one triangle (with a right angle at C).

3 No triangle: the arc does not reach the bottom side.

Pieces 2, 5, 9, 12.

Piece 2: BC is 2.8 and the distance from B to the bottom side is 4. The arc is too short to reach it, so no triangle can be drawn.

Piece 5: BC is 3.5 and the distance from B to the bottom side is 4.9. The arc is too short to reach it, so no triangle can be drawn.

Piece 9: BC is 3.8 and the distance from B to the bottom side is 5.2. The arc is too short to reach it, so no triangle can be drawn.

Piece 12: BC is 3.4 and the distance from B to the bottom side is 4.6. The arc is too short to reach it, so no triangle can be drawn.

The pieces in row 1 are the reason SSA is not a criterion. Two different triangles have the same angle at A, the same AB and the same BC. So these three parts do not decide the triangle.