

Congruent Triangles

ID: 8817

 Time required
 45 minutes

Topic: Triangles & Congruence

- *Investigate the SSS, SAS, and ASA sets of conditions for congruent triangles.*

Activity Overview

*In this activity, students will explore the results when a new triangle is created from an original triangle using the SSS, SAS, and ASA sets of conditions for congruence. In doing so, they will use the Cabri Jr. **Compass** tool to copy a segment and the **Rotation** tool to copy an angle.*

Teacher Preparation

- *This activity is designed to be used in a high school or middle school geometry classroom.*
- *The **Compass** tool copies a given length as a radius of a circle to a new location.*
- *The screenshots on pages 1–7 demonstrate expected student results.*

Classroom Management

- *This activity is designed to be **student-centered** with the teacher acting as a facilitator while students work cooperatively. Use the following pages as a framework as to how the activity will progress.*
- *If desired, have students work in groups with each group focusing on one of the problems.*
- *The student worksheet helps guide students through the activity and provides a place for students to record their answers and observations.*
- *The student worksheet includes an optional extension problem to investigate two corresponding sides and the NON-included angle.*

TI-84 Plus Applications

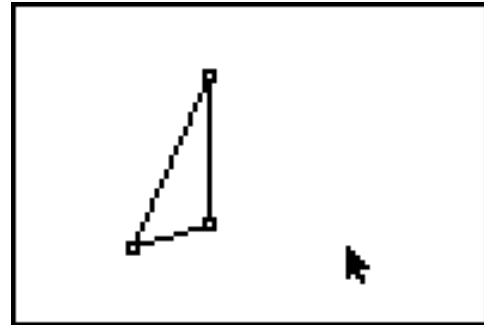
Cabri Jr.

Congruent Triangles

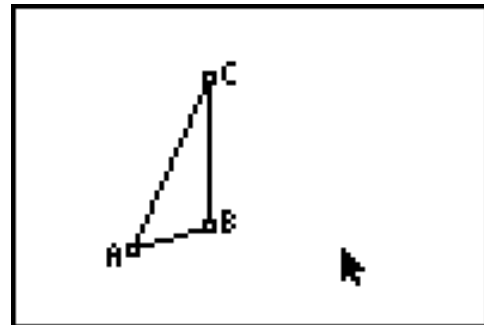
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Problem 1 – Three Corresponding Sides (SSS)

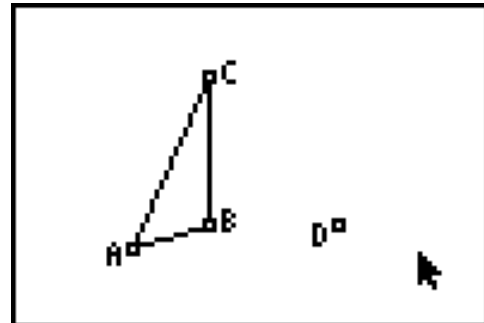
Step 1: Students should open a new Cabri Jr. file. They will first construct a scalene triangle using the **Triangle** tool.



Step 2: Select the **Alph-Num** tool to label the vertices A , B , and C as shown.



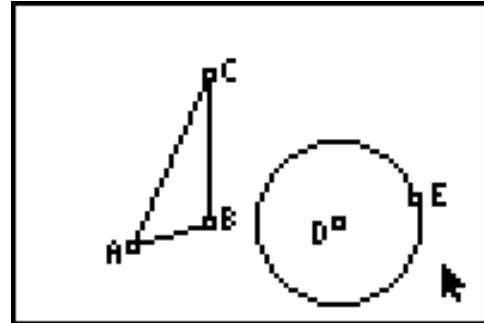
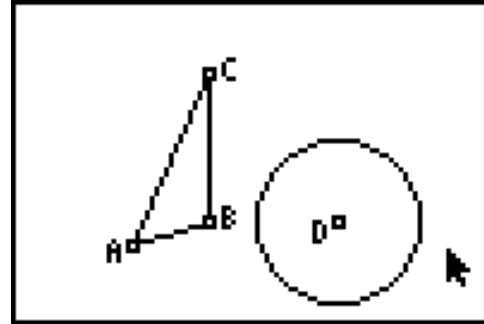
Step 3: Have students construct a free point on the screen using the **Point** tool. Label it point D with the **Alph-Num** tool.



Step 4: Students will select the **Compass** tool to copy \overline{AB} to point D .

- Press **ENTER** on \overline{AB} . A dashed circle will appear and follow the pointer.
- Press **ENTER** on point D . The compass circle is anchored at center D .

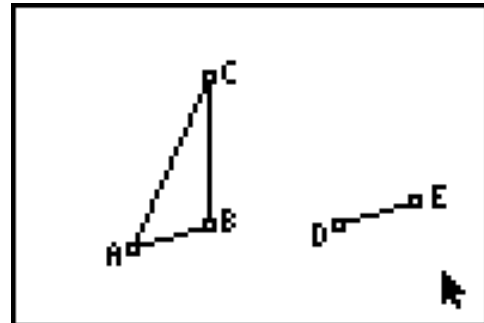
Have students construct a point on the compass circle and label it point E .



Step 5: Direct students to create \overline{DE} with the segment tool. This segment is a copy of \overline{AB} .

Hide the compass circle with the **Hide/Show > Object** tool.

Save this file as *CongTri*. This setup will be used again for Problems 2 and 3.



Step 6: Drag point E , and observe that the location of \overline{DE} can change but it will not change in length. You must drag either point A or point B to change the length of \overline{DE} .

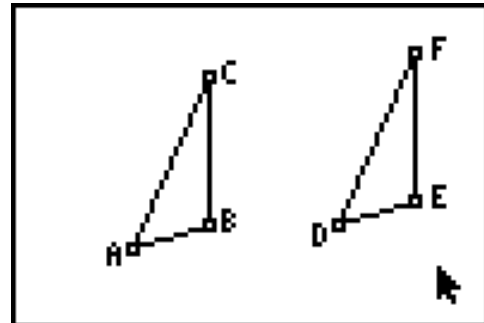
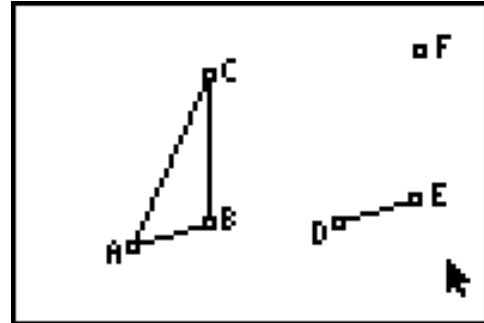
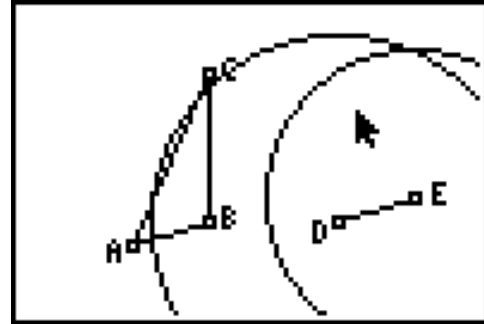
Step 7: To copy the other two segments of $\triangle ABC$, repeat the use of the **Compass** tool.

Students should copy \overline{AC} to point D .

Students should copy \overline{BC} to point E .

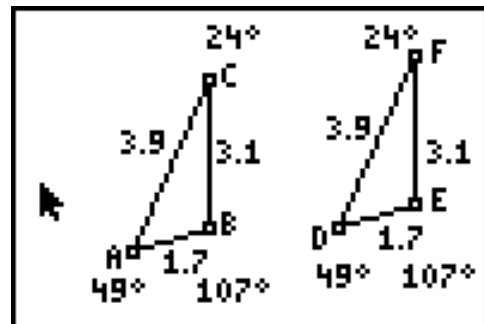
Find the intersection point of the two compass circles and hide the circles. Label the intersection point as F .

Finally, construct segments \overline{DF} and \overline{EF} to complete the new triangle.



Step 8: Students will now investigate whether $\triangle DEF$ is congruent to $\triangle ABC$.

Measure the sides and angles of both triangles to confirm that all corresponding parts are congruent. Use the **Measure > D. & Length** and **Measure > Angle** tools.

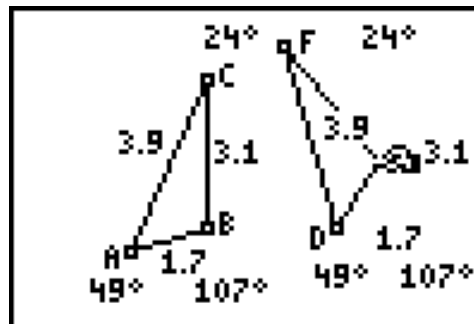
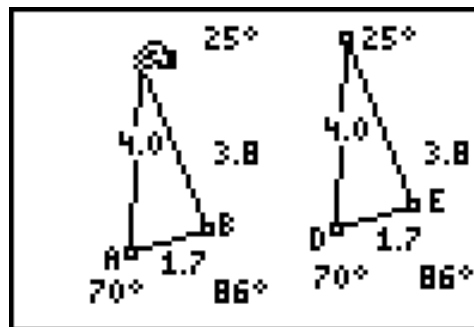


Step 9: Drag vertices of the triangles and observe the results.

Dragging vertices of $\triangle ABC$ will cause both triangles to change in size and shape.

Dragging vertices of $\triangle DEF$ will cause $\triangle DEF$ to change its location but its size and shape will remain the same as $\triangle ABC$. Notice that not all vertices of $\triangle DEF$ are available to be dragged, since they have been constructed to be dependent on $\triangle ABC$.

If students wish to save their work, use the **Save As** tool and *do not* reuse the name *CongTri*.



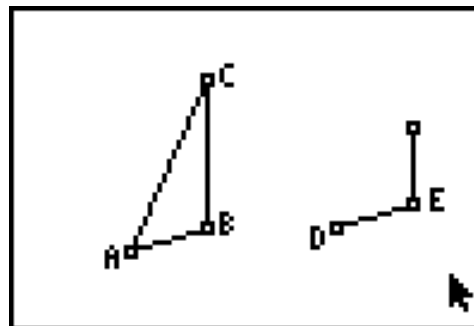
Problem 2 – Two Corresponding Sides and the Included Angle (SAS)

Step 1: Students should open the Cabri Jr. file *CongTri* that they created in Problem 1.

Recall that \overline{DE} is a copy of \overline{AB} .

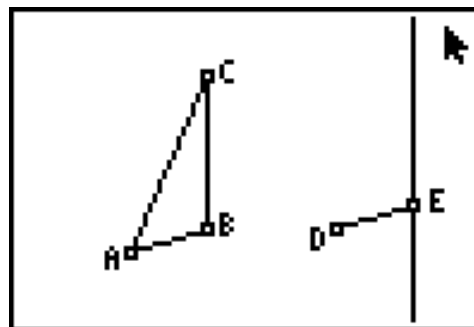
Step 2: Students will select the **Rotation** tool to copy $\angle ABC$.

- Press **ENTER** on point *E*. This is the center of rotation.
- Press **ENTER** on \overline{DE} . This is the object to be rotated.
- Press **ENTER** three times on the vertices *A*, *B*, and *C* in that order to identify the angle of rotation. A new rotated segment appears.



Step 3: Have students use the **Line** tool to construct a line from point *E* through the endpoint of the new segment.

Use the **Hide/Show > Object** tool to hide the endpoint of the rotated segment.

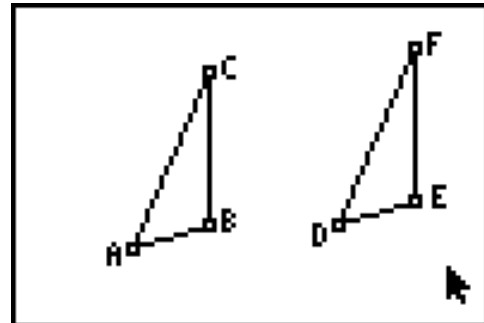
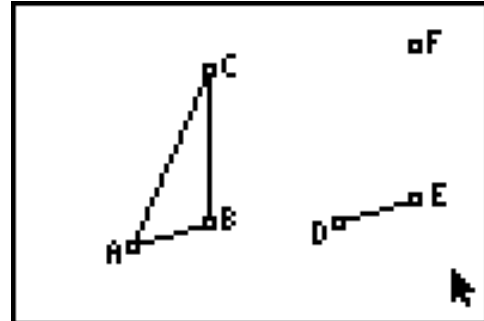
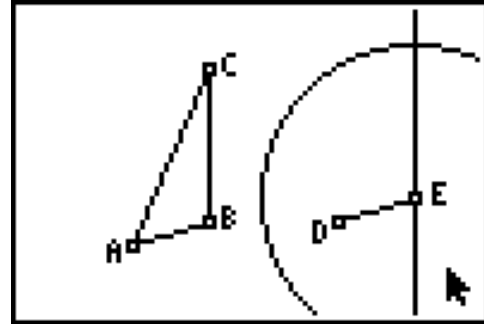


Step 4: Use the **Compass** tool to copy \overline{BC} to point E .

Create the intersection point of the compass circle and the line and label it point F .

Hide the compass circle and the line.

Finally, construct \overline{DF} and \overline{EF} to complete the new triangle.



Step 5: Students will now investigate whether $\triangle DEF$ is congruent to $\triangle ABC$.

Measure the sides and angles of both triangles to confirm that all corresponding parts are congruent.

Drag vertices of the triangles and observe the results.

If students wish to save their work, use the **Save As** tool and *do not* reuse the name *CongTri*.

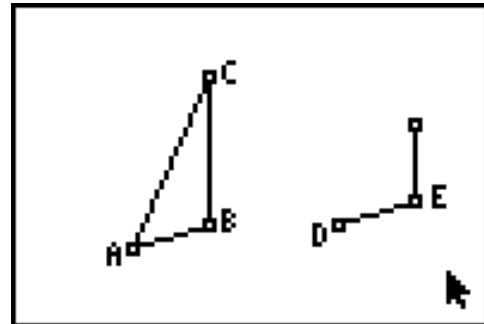
Problem 3 – Two Corresponding Angles and the Included Side (ASA)

Step 1: Students should open the Cabri Jr. file *CongTri* that they created in Problem 1.

Recall that \overline{DE} is a copy of \overline{AB} .

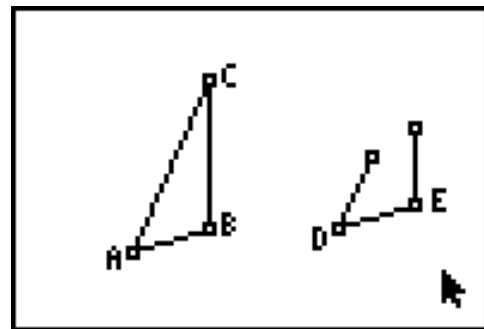
Step 2: Students will select the **Rotation** tool to copy $\angle ABC$.

- Press **ENTER** on point E . This is the center of rotation.
- Press **ENTER** on \overline{DE} . This is the object to be rotated.
- Press **ENTER** three times on the vertices A , B , and C in that order to identify the angle of rotation. A new rotated segment appears.



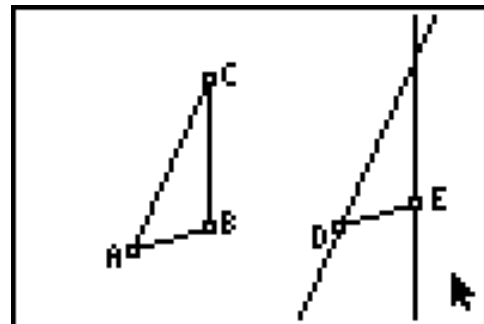
Step 3: Students will select the **Rotation** tool to copy $\angle BAC$.

- Press **ENTER** on point D . This is the center of rotation.
- Press **ENTER** on \overline{DE} . This is the object to be rotated.
- Press **ENTER** three times on the vertices B , A , and C in that order to identify the angle of rotation. A new rotated segment appears.



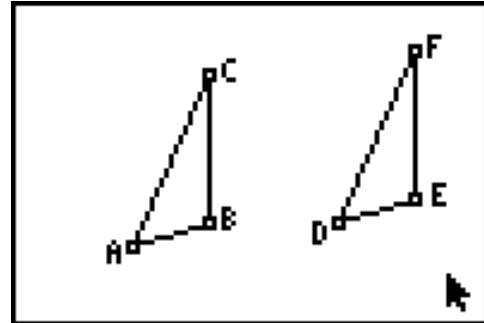
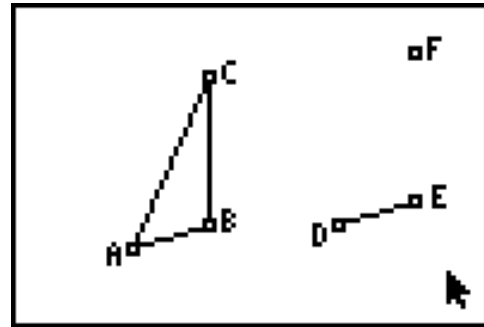
Step 4: Have students use the **Line** tool to construct lines over the new segments.

Use the **Hide/Show > Object** tool to hide the endpoints of the rotated segments.



Step 5: Create the intersection point of the two lines and label it point F . Hide the lines.

Finally, construct \overline{DF} and \overline{EF} to complete the new triangle.



Step 6: Students will now investigate whether $\triangle DEF$ is congruent to $\triangle ABC$.

Measure the sides and angles of both triangles to confirm that all corresponding parts are congruent.

Drag vertices of the triangles and observe the results.

If students wish to save their work, use the **Save As** tool and *do not* reuse the name *CongTri*.