

## Interior &amp; Exterior Angles of a Triangle

ID: 8775

 Time required  
40 minutes

## Activity Overview

*In this activity, students will measure interior and exterior angles of a triangle and make conjectures about their relationships.*

## Topic: Triangles &amp; Congruence

- *Use inductive reasoning to conjecture a theorem about the total measures of a triangle's interior angles.*
- *Prove that the sum of the measures of the interior angles of a triangle is  $180^\circ$ .*
- *Prove that the sum of the measures of the exterior angles of a triangle is  $360^\circ$ .*

## Teacher Preparation

- *This activity is designed to be used in a high school or middle school geometry classroom.*
- *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 needed, review with students the definitions of the following angles before the activity: Interior angle, exterior angle, remote interior angle, adjacent interior angle.*
- **Note:** *Measurements can display 0, 1, or 2 decimal digits. If 0 digits are displayed, the value shown will round from the actual value. To change the number of digits displayed:*
  1. Move the cursor over the coordinate value so it is highlighted.
  2. Press  $\oplus$  to display additional decimal digits or  $\ominus$  to hide digits.
- **To download the student worksheet, go to [education.ti.com/exchange](http://education.ti.com/exchange) and enter "8775" in the keyword search box.**

## Associated Materials

- *InteriorExteriorAngles\_Student.doc*
- *Cabri Jr. application*

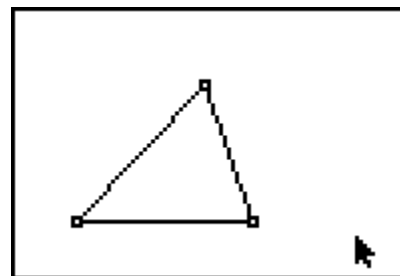
## Suggested Related Activities

*To download any activity listed, go to [education.ti.com/exchange](http://education.ti.com/exchange) and enter the number in the quick search box.*

- *Investigating the Angle-Sum Theorem of Polygons (TI-84 Plus family) — 7303*
- *Angles and Transversals (TI-84 Plus family) — 4034*
- *Angles in a Polygon (TI-84 Plus family) — 7428*
- *Transversals (TI-84 Plus family) — 10989*

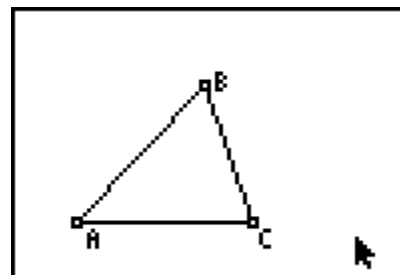
**Problem 1 – Interior angles of a triangle**

Students should open a new Cabri Jr. file. They will construct a triangle using the **Triangle** tool.



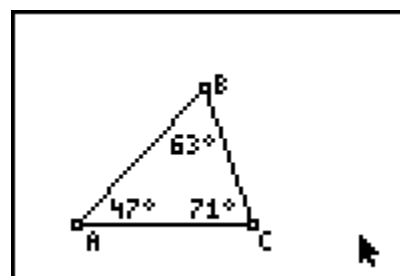
Select the **Alph-Num** tool to label the vertices *A*, *B*, and *C* as shown.

**Note:** Press **ENTER** to start the label, then press **ENTER** again to end the label.



Have students measure the three interior angles of the triangle using the **Measure > Angle** tool.

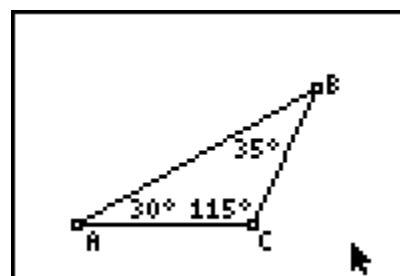
**Note:** To measure an angle, press **ENTER** on three points, with the vertex of the angle being the second point selected.



Students should record this data in the first row of the chart on the student worksheet.

Students should drag a vertex of the triangle to change the angle measures. Have them try to create different types of triangles (acute, obtuse, right) and record two more sets of data in the chart.

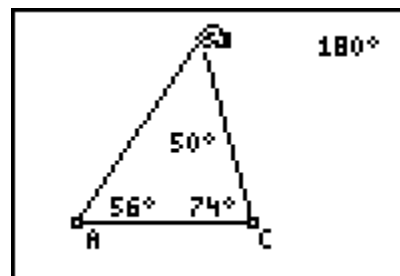
From here, they should make a conjecture about the three interior angles.



Instruct students to use the **Calculate** tool to find the sum of the three interior angles of the triangle.

Drag a vertex and observe the results. Ask: *Do the results support your conjecture?*

Have students save the file as *IntAngle*.



**Problem 2 – One exterior angle of a triangle**

Students should continue using the previous file, but instruct them to save the file as *ExtAngle* using the **Save As** option.

Have students construct a line through the two lower vertices of the triangle (*A* and *C*) using the **Line** tool.

**Note:** To be certain that the line passes through a vertex, be sure that the vertex point is flashing before pressing **ENTER**.

Next, students should create a new point on the line to the right of the triangle using the **Point > Point On** tool. Label it *D*.

Direct students to measure the exterior angle  $\angle BCD$  with the **Measure > Angle** tool. Record this measure and the measures of the interior angles on the chart on the student worksheet.

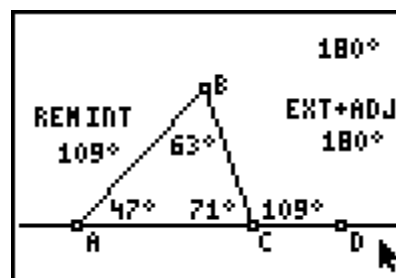
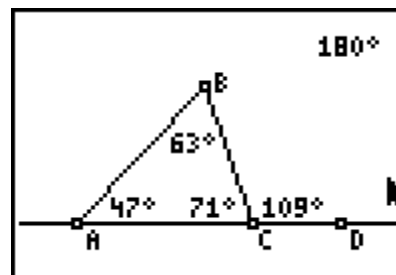
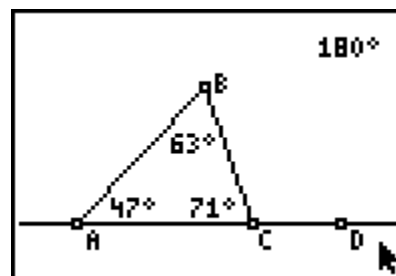
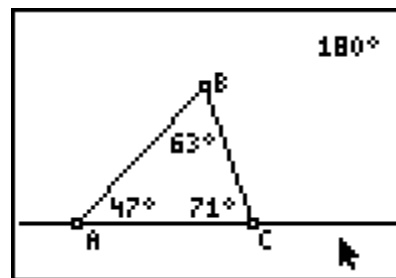
They can then drag a vertex of the triangle to change the angle measures, and add two more sets of data to the chart.

Students should now make some observations about the exterior angle and its relationship to other angles in the chart.

Encourage them to make calculations as needed to test their conjectures. If needed, suggest that they calculate the sums of pairs of angles in the chart.

Again, students can drag a vertex and observe the results. Ask: *Do the results support your conjectures?*

Before proceeding, have students save the file as *ExtAngle*.

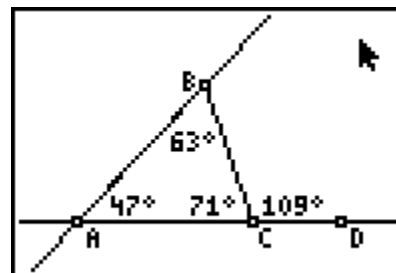


**Problem 3 – Three exterior angles of a triangle**

Students should continue using the previous file, but instruct them to save the file as *ExtAng3* using the **Save As** tool.

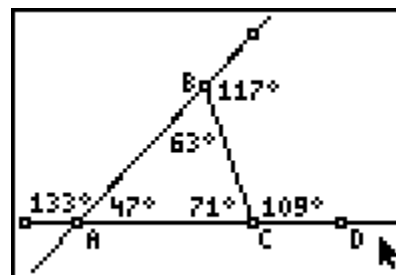
**Note:** Press the **[ALPHA]** button to access the numeric character “3.”

Students will select the **Line** tool and construct a line through vertices *A* and *B* of the triangle as shown.



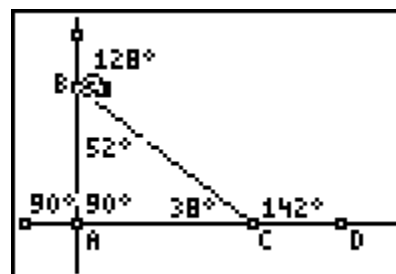
Next, students should measure one exterior angle at each vertex.

**Note:** It is not necessary to create an additional point on the line before measuring the angle.



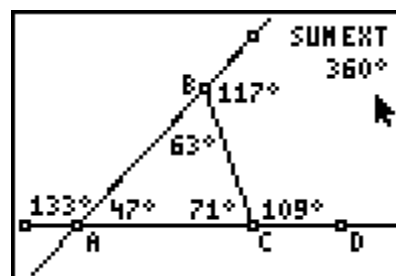
Have them record the measures of the three exterior angles into the chart on the student worksheet.

They can then drag a vertex of the triangle and record more data into the chart.



Instruct students to make a conjecture about the three exterior angles, and have them calculate the sum of the three exterior angles.

Tell them to drag a vertex and observe the results. Ask: *Do the results support your conjectures?*



**Exercises – Solutions**

1.  $\angle B = 43^\circ$ ,  $\angle BCD = 143^\circ$
2.  $\angle BCA = 117^\circ$ ,  $\angle B = 32^\circ$
3.  $\angle BCA = 81^\circ$ , int  $\angle A = 42^\circ$ , ext  $\angle A = 138^\circ$
4.  $\angle BCA = 83^\circ$ , ext  $\angle A = 140^\circ$ ,  $\angle ABC = 57^\circ$ , ext  $\angle B = 123^\circ$