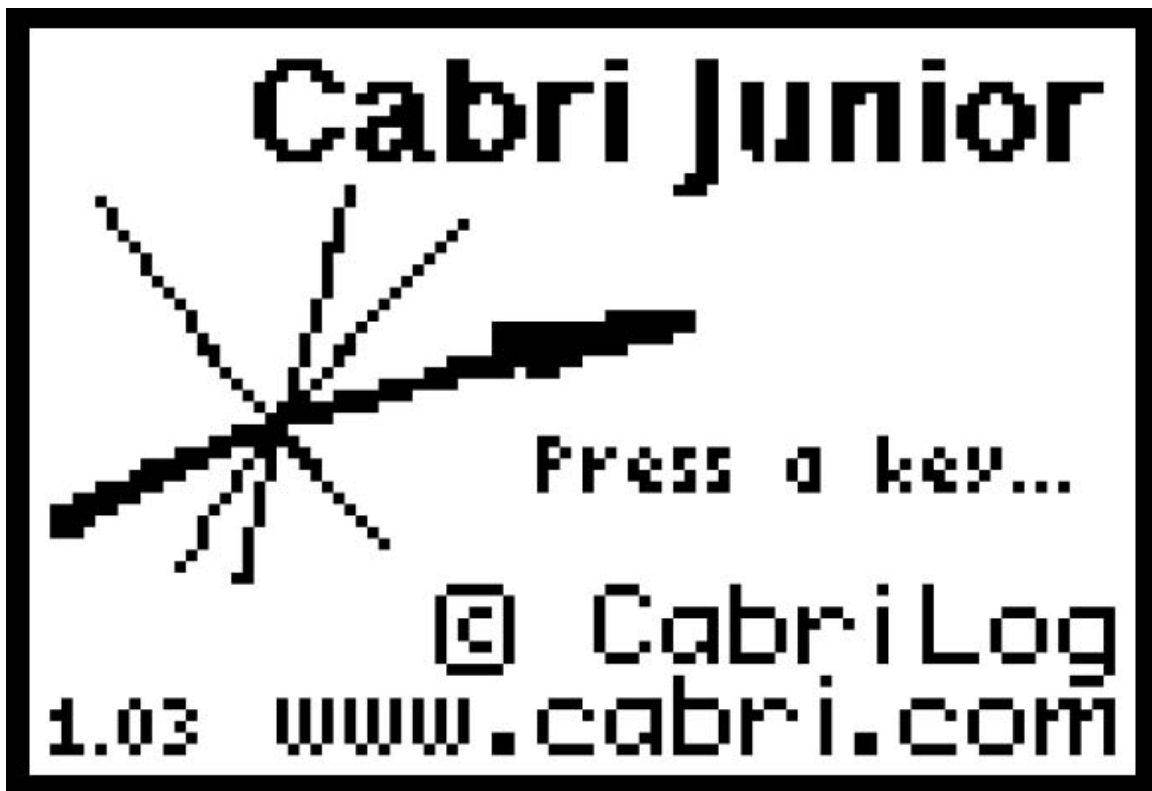


Dynamic Geometry: Program Basics

A Thirty-Minute Presentation

Featuring Cabri® Jr,
An “APPS” Program
For the TI-83 Plus™ and TI 84™



Dynamic Geometry: Program Basics

Cabri® Jr. is a menu driven geometry program that can dynamically present mathematical concepts. Using Cabri Jr., you can:

- Draw points, segments, lines, circles, triangles and quadrilaterals.
- Construct perpendicular and parallel lines; perpendicular and angle bisectors; and geometric loci.
- Transform objects through translation, reflection, rotation, and dilation.
- Compute lengths, areas, perimeters, and angle values of relevant objects.
- Display coordinates and equations of lines and circles.

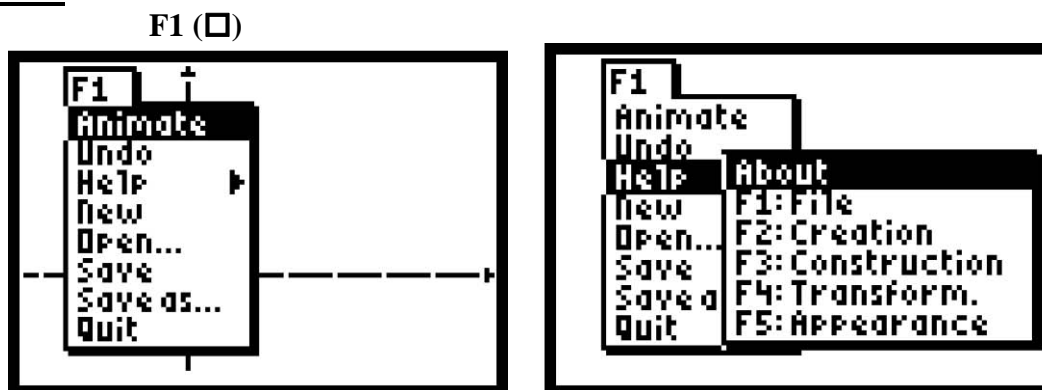
Each tool is selected displaying the appropriate menu by pressing a function key, highlighting the desired tool, and then pressing **ENTER**.

Function Keys (Blue keys on the top of the calculator)

When a function key is pressed, a menu of tools or submenus is displayed.

□ is F1 □ is F2 □ is F3 □ is F4 ♦ is F5

Menus

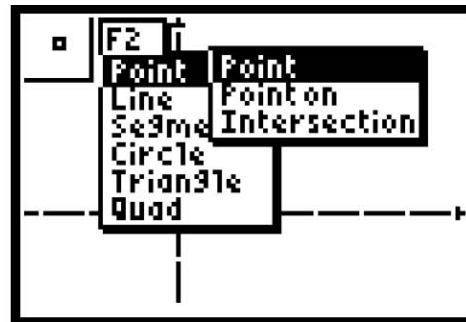
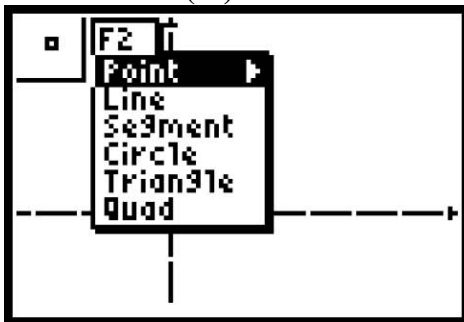


Note Even though the menu items do not list numbers, they are numbered starting with the top item as 1. **Help** on the **F1** menu is 3.

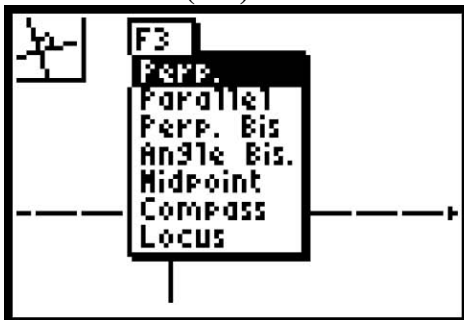
Some menu items contain a right arrow (▶) that indicates that there is a submenu item available. Use the up and down arrow keys to highlight menu items and use the right arrow key to display a submenu. Use up and down arrow keys to move within a submenu.

Some menu items end with ..., which indicates that a dialog box will appear when that item is selected.

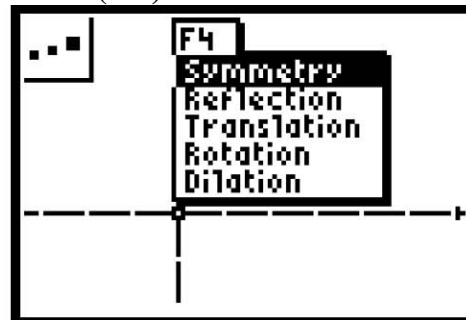
F2 (□)



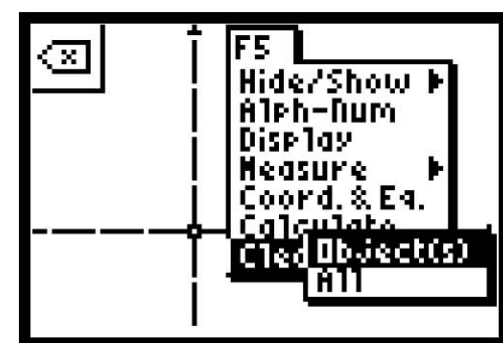
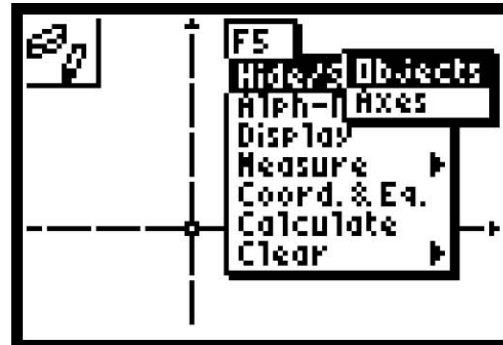
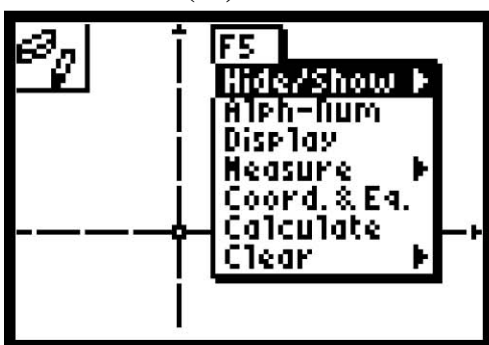
F3 (□)



F4 (□)



F5 (♦)

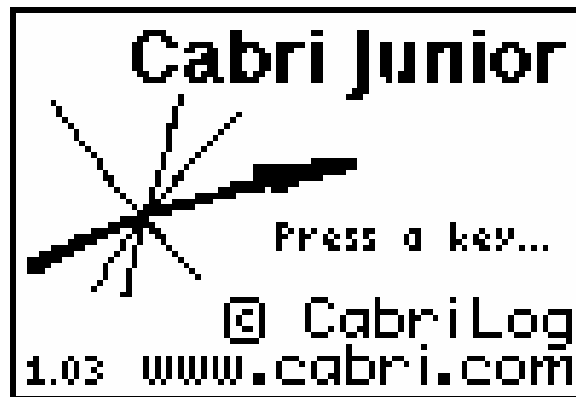


Getting Started

- Open Carbi Jr. by pressing the **1** key.
(The APPS listed on your calculator may be different from those listed below.)

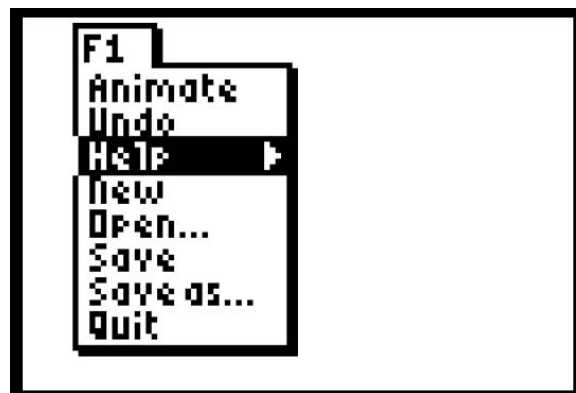


- Press the corresponding number for Cabri Jr. or cursor down, highlight **Cabri Jr** and press **ENTER**.



- Press any key. (One of the basic graphic screens will be displayed.)

The screen with the axis or the screen without the axis should appear. The **F1** menu may appear on a blank screen.

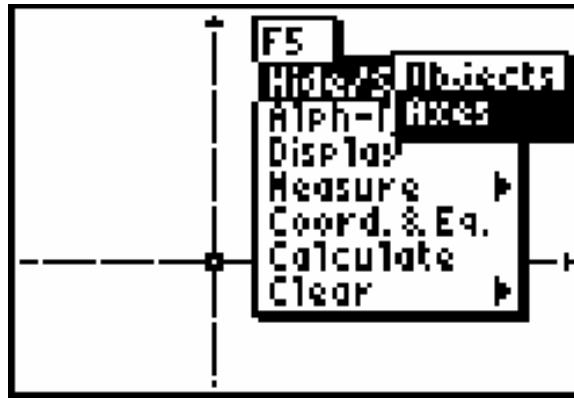


- If the **F1** menu appears, press **CLEAR** to display the screen with or without the axes shown.

Hide/Show Axes

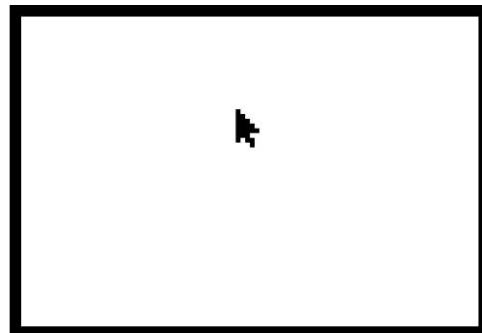
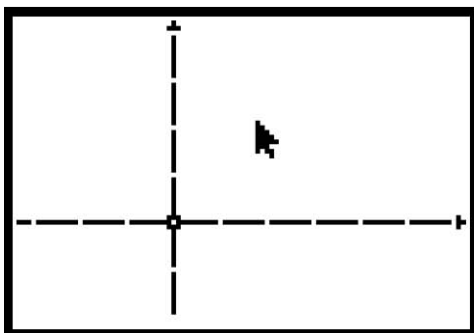
The **Hide/Show** menu (**F5**) has a submenu that allows you to hide or show the coordinate axes.

- Open the **F5** menu and select **Hide/Show**.
- Use the right arrow key to display the submenu and use the down arrow key to highlight **Axes**.



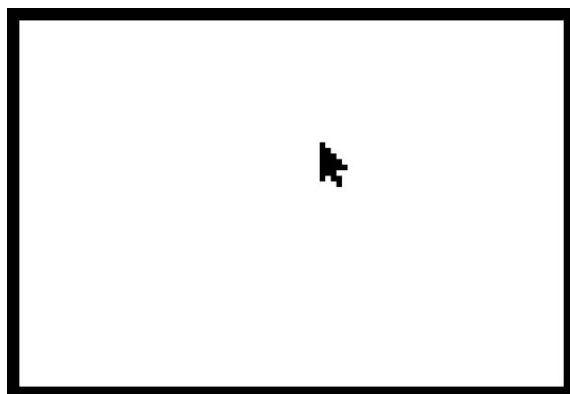
When the axes are displayed, selecting **Hide/Show:Axes** will hide the axes. When the axes are hidden, selecting **Hide/Show: Axes** will show the axes.

- Toggle between showing the axes and hiding the axes.



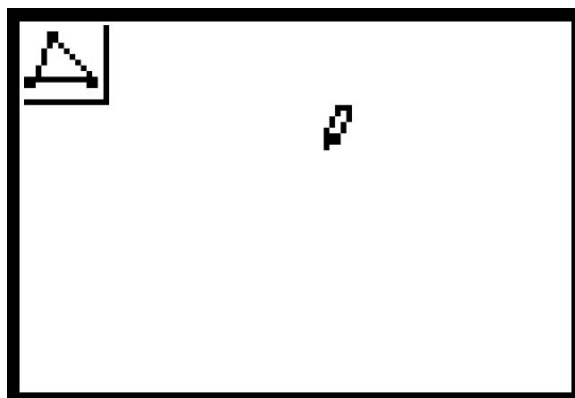
Exploration 1: Perpendicular Bisectors of the Sides of a Triangle

- **Hide** the coordinate axes to begin this activity.



Create a Triangle

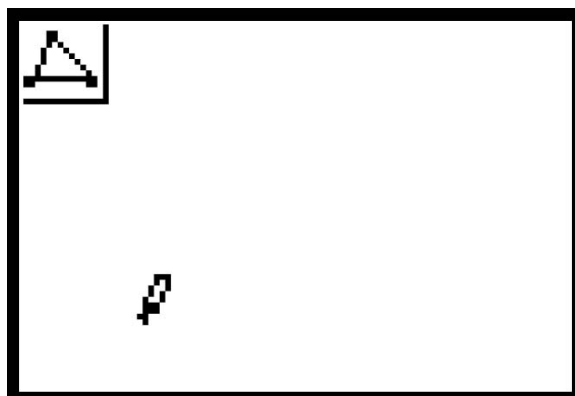
- Select the **Triangle** tool (F2).



Note The triangle in the upper left hand corner indicates that the **Triangle** tool is selected. The pointer has changed from a black arrow to a **Pen** (or **Pen Pointer**).

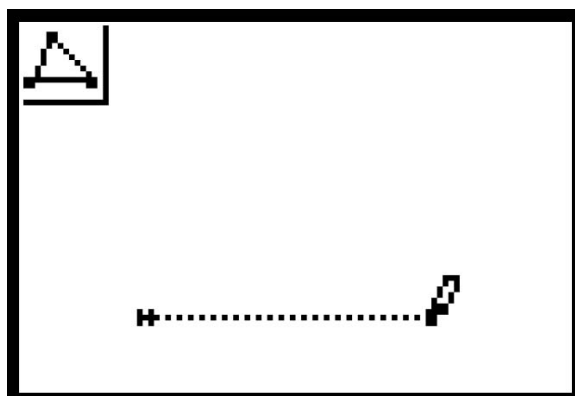
The **Pen** is the construction tool for drawing an object. The cursor stays a **Pen** all the time. When a point can be created, the cursor changes to a **Pen Pointer**.

- Press **ENTER** to place the first vertex of the triangle on the screen.



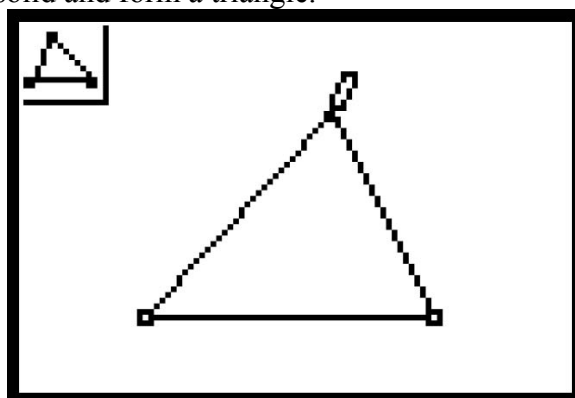
The point briefly flashes to indicate the point of the first vertex but it may be hard to see.

- Press the right arrow to move the **Pen** to the right side of the screen. A dotted segment is formed and the **Pen** moves.
- Press **ENTER** to create the second vertex of the triangle. The point briefly flashes.

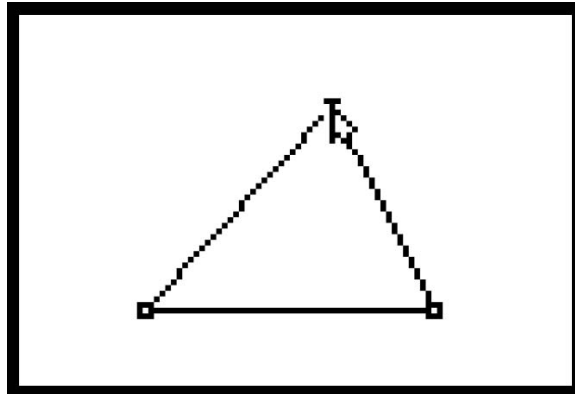


- Move the **Pen** up, then left to indicate the third vertex of the triangle. Make an acute scalene triangle.
- Press **ENTER** to set the point.

The dotted lines turn solid and form a triangle.



- Press the **CLEAR** key to disengage the triangle tool.



The cursor turned into a **Transparent Arrow**, which indicates a moveable object (points, labels, lines, segments, circles, measures, coordinated, equations) is near.

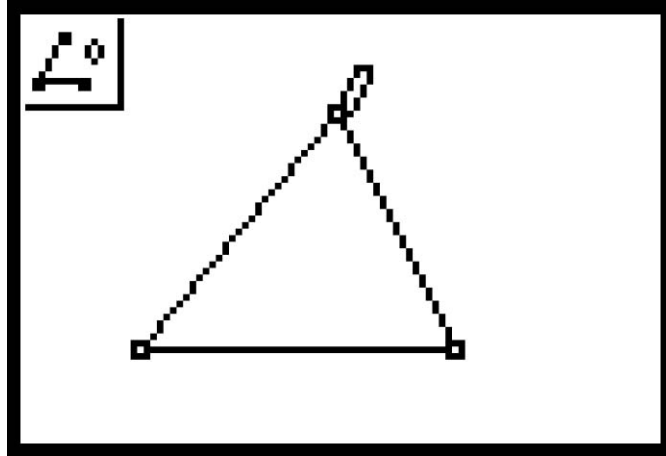
Measure the Angles

We are interested in the angle measures as we change the shape of the triangle so that we can investigate what happens to perpendicular bisectors in different types of triangles. Three points are used to measure an angle. The angle determined by the middle point is the angle that is measured.

- Highlight the **Measure:Angle** tool by pressing **F5**, highlighting **Measure**, displaying the submenu by using the right arrow key, and highlighting **Angle**.



- Press **ENTER** to activate the **Measure:Angle** tool.



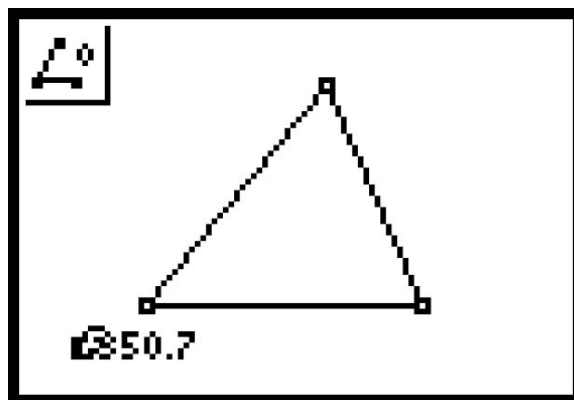
The transparent arrow turns into a **Pen**. Note the angle with the degree sign in the upper left hand corner of the screen.

Measure the left vertex. The left vertex will be the middle point for the measurement of the left vertex.

- Move the cursor the top vertex and press **ENTER** to select the top vertex as the first point. The point will briefly flash.
- Cursor down to the vertex on the left until the point blinks. If the lower segment is dotted, you have not gone over far enough.
- Press **ENTER** to select the second vertex. The point flashes.
- Move the cursor to the right to select the third vertex and press **ENTER**.

The measure is moved near to corresponding vertex with the hand attached. The hand is attached so you can move the measure to a desirable position by using the arrow keys.

- Move the measure of the angle down and back to the left so it will be in a better position.
- Press **CLEAR** to disengage the dragging tool to place the measure and return to **Measure:Angle** tool. The cursor turns back into a **Pen**.

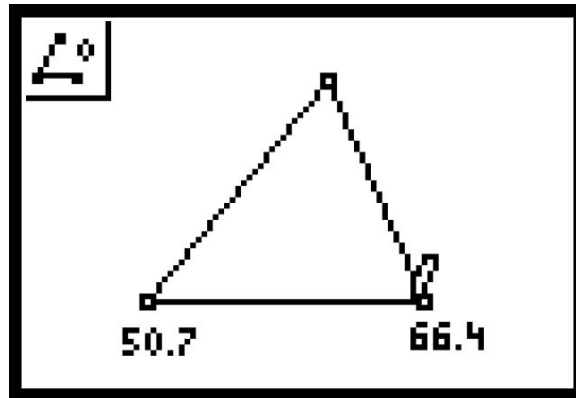


Measure the right vertex's angle.

- Move the **Pen** to the left vertex. Press **ENTER**. It flashes.
- Move to the right vertex, then press **ENTER**.
- Move to the top vertex, then press **ENTER**.

You have measured the angle at the right. Its measure appears near the corresponding vertex with a hand attached.

- Move it down a little. Press **CLEAR**.



Measure the top vertex's angle.

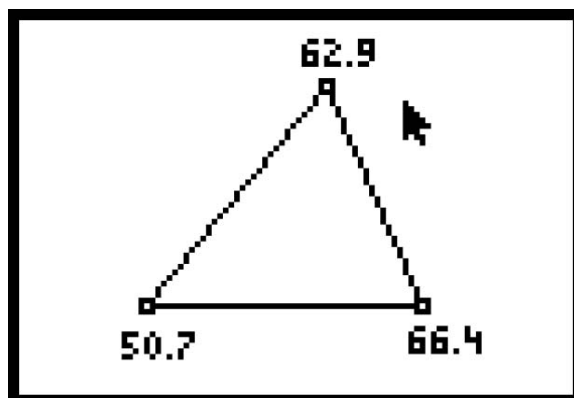
- Select the right vertex.
- Select the top vertex. Press **ENTER**.
- Select left vertex.

The measure is near the corresponding vertex with the hand attached.

- Move it up a little. Press **CLEAR**.

The top measure is established and displayed.

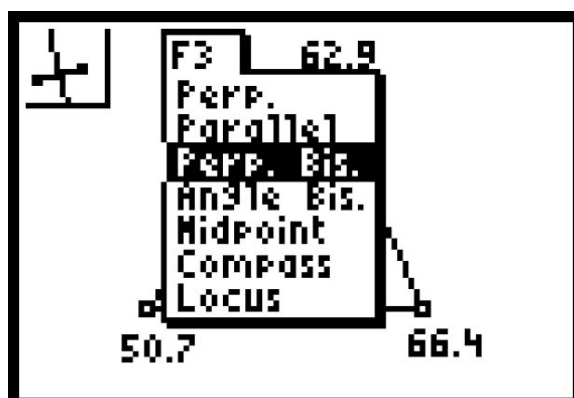
- Move the measure above the vertex.
- Disengage the **Measure:Angle** tool by pressing **Clear** and getting an **Solid Arrow** cursor.
- Move the **Arrow** away from the upper vertex.



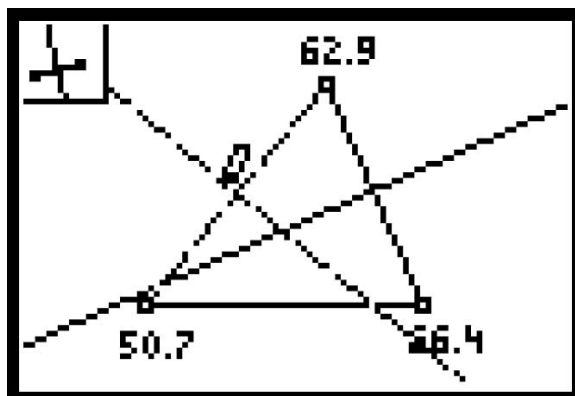
Perpendicular Bisectors

Create the three perpendicular bisectors on the three sides of the triangle.

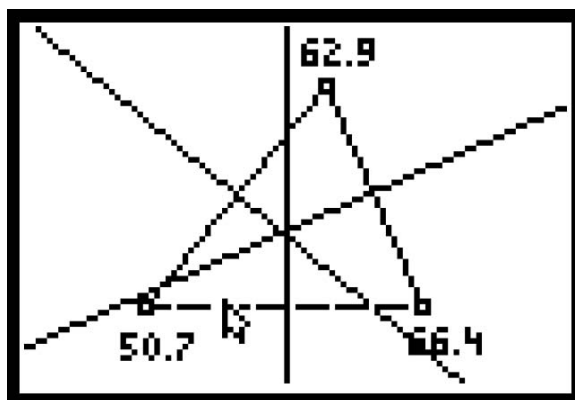
- Select **Perp. Bis. (F3)**.



- Press **ENTER**. The pen reappears.
- Move it near a segment that forms a side of the triangle and press **ENTER**. You will see a black horizontal arrow and the segment will shimmer.
- Press **ENTER** and a perpendicular bisector is drawn.
- Move the cursor (which will become a **Pen** again when it leaves the area near the first segment) to another side.
- When the second side is selected (it shimmers), press **ENTER** to create the segments perpendicular bisector.



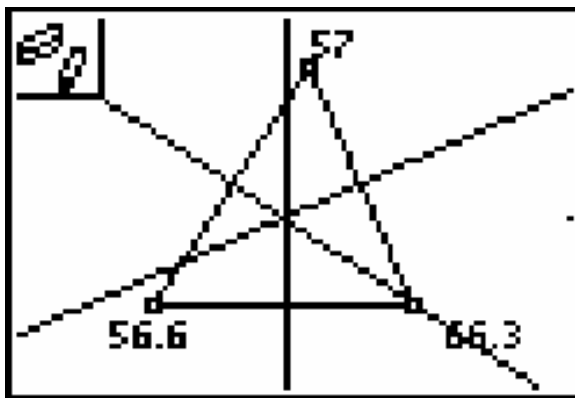
- Move the cursor to the third side and press **ENTER**.
- Press **CLEAR** to disengage the perpendicular bisector tool.



Make a conjecture about the intersection of the perpendicular bisectors of the sides of a triangle.

Move the triangle.

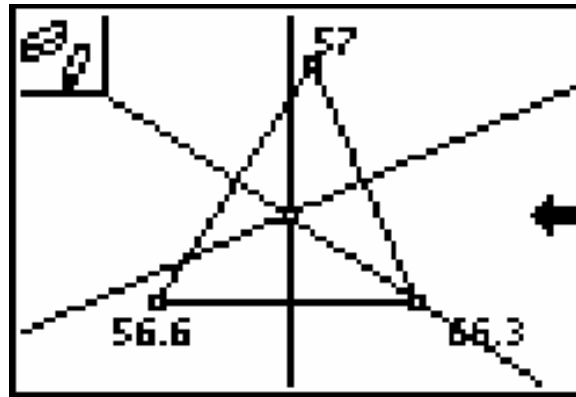
- Move the cursor to the top vertex.
- Press **ALPHA**, then move the vertex with the **Arrow Keys**.



- Press **CLEAR** to disengage the dragging tool.

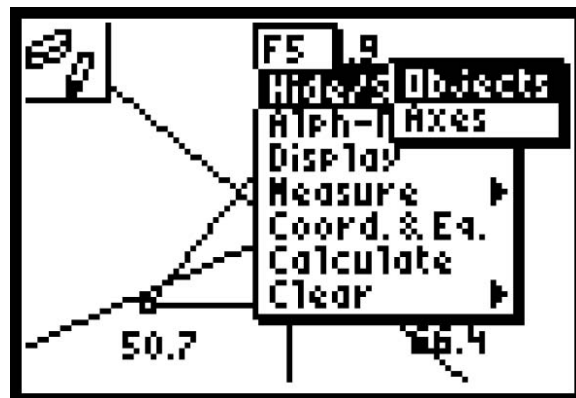
Create a point where the three perpendicular bisector intersect.

- Move the cursor near the intersection point of the three perpendicular bisectors.
- Select **Point:Intersection (F2)** (All 3 lines should be flashing).
- Press **ENTER** to create the point.
- Press **CLEAR** to disengage the **Point:Intersection** tool.



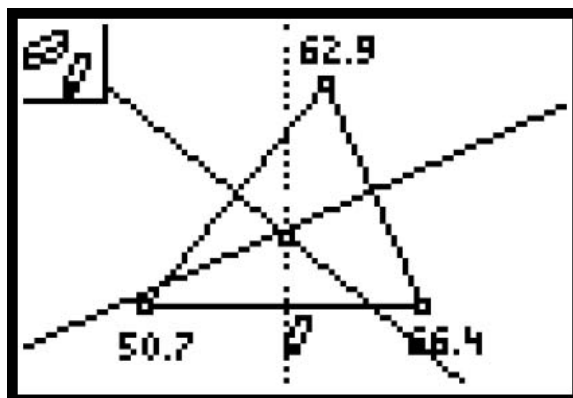
Now hide the three perpendicular bisectors and leave only the intersection point.

- Select **Hide/Show (F5)**, then choose **Objects**.

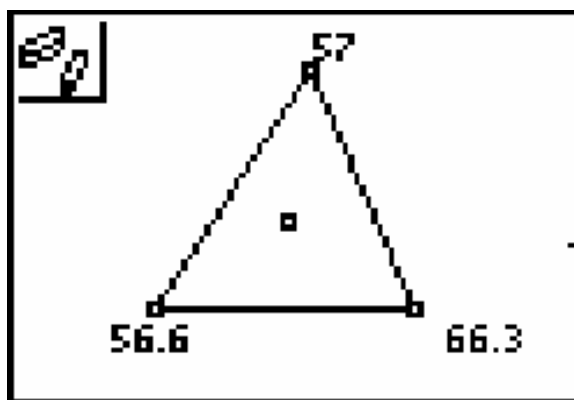


- Press **ENTER** to engage the **Hide/Show:Objects** tool. The eraser cursor is displayed.
- Move the cursor so it is pointing to the last line drawn. The eraser is displayed and the line is flashing.
- Press **ENTER** to hide the line.

The line changes to dotted until the cursor is moved away from the object.

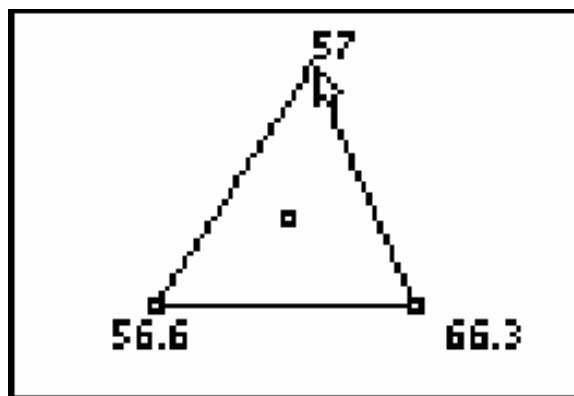


- Move the cursor to the other two lines and press **ENTER**.
- Press **CLEAR**.
- Move the cursor away from the lines and all three are now hidden.



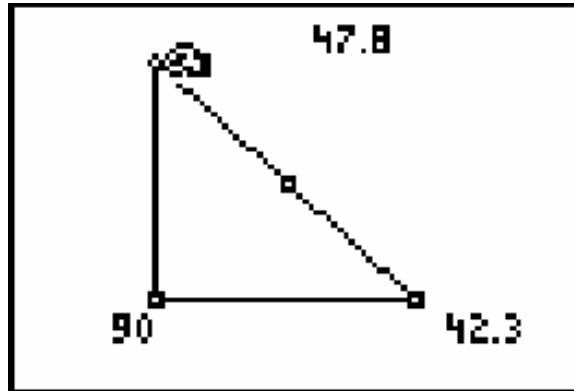
Make a conjecture about the position of the point of intersection of the perpendicular bisectors of the triangle when all angles are acute.

- Move the arrow to the top vertex. The black arrow will turn transparent when you get near the vertex and the point will blink.

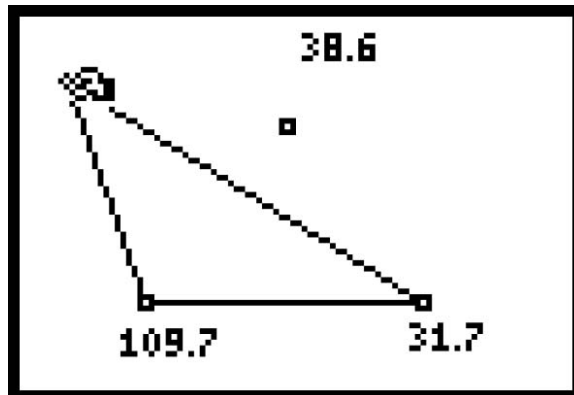


- Press the **ALPHA** key and drag the top vertex until the bottom left angle is 90° .

Make a conjecture about the intersection of the perpendicular bisectors of a triangle when the triangle is right.



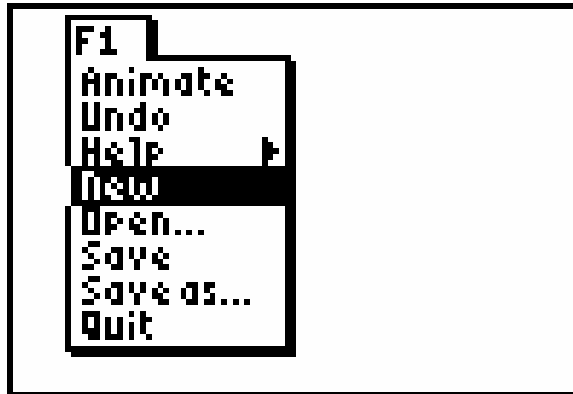
- Move the cursor so that the left angle is obtuse.



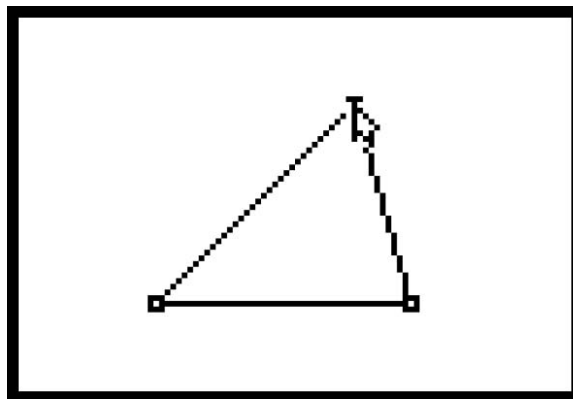
Make a conjecture about the intersection of the perpendicular bisectors of the sides of the triangle in this case.

Exploration 2: The sum of the measures of the angles of a triangle.

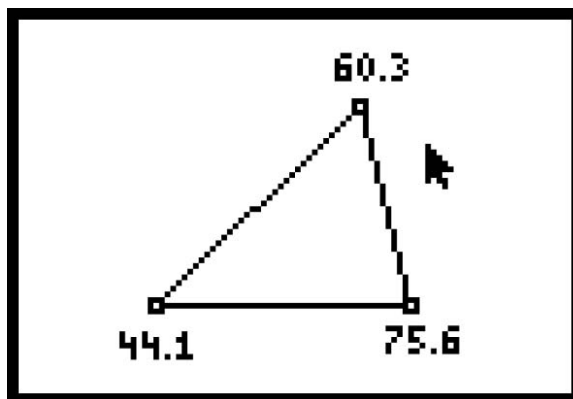
- Open a new Cabri window by selecting **New (F1)**.



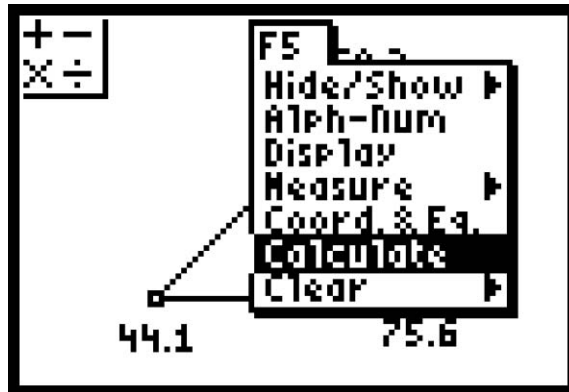
- Draw a triangle and then press **CLEAR** after the triangle is drawn.



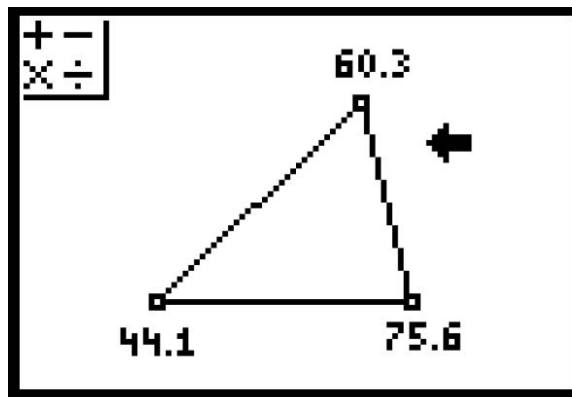
- Use **Measure:Angle** to display the measure of each of the three angles.



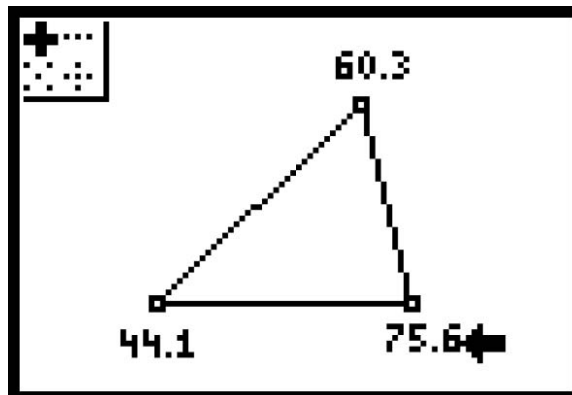
- Select the **Calculate** tool (F5).



- Press **ENTER** to select the tool.



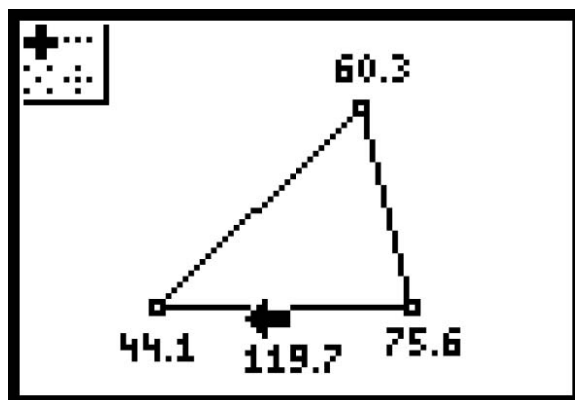
- Move the **Black Arrow** to the right bottom number.
- When the **Black Arrow** is horizontal and the number is flashing, press **ENTER**.
- Press \leftarrow (The + sign is highlighted in the upper left box).



- Move the cursor to left bottom number and press **ENTER**.

The sum appears near the left vertex with a hand attached.

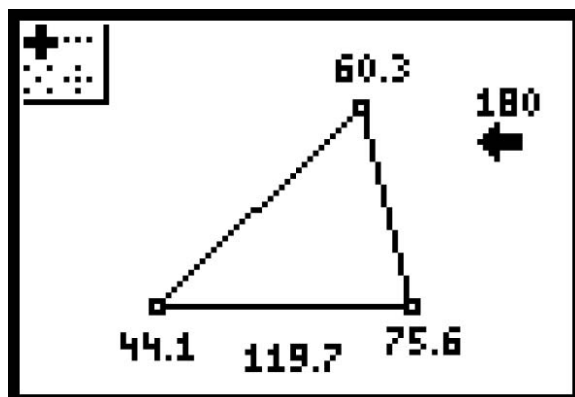
- Move the number to the right and press **CLEAR**.



- Move the cursor until the sum is flashing and press **ENTER**.
- Move the cursor to the number at the top vertex until it flashes and press **ENTER**.

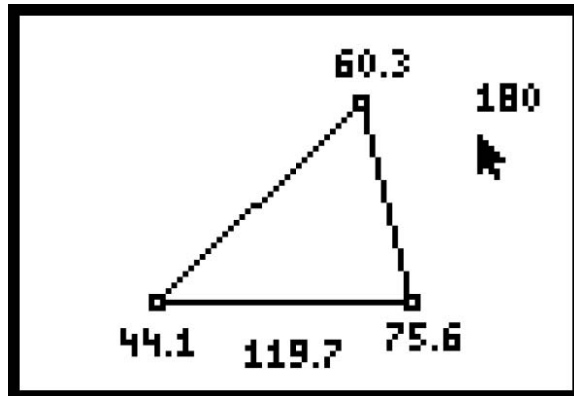
The sum appears near the vertex with the hand attached.

- Move up to a clear area and press **CLEAR**.

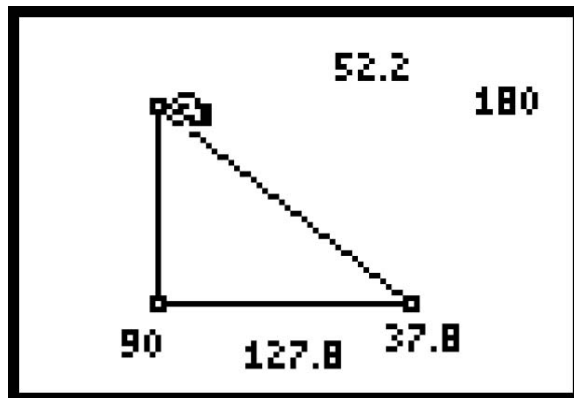


The sum is 180. Due to rounding the sum of the numbers showing on the screen may not be exactly 180 but it should be close.

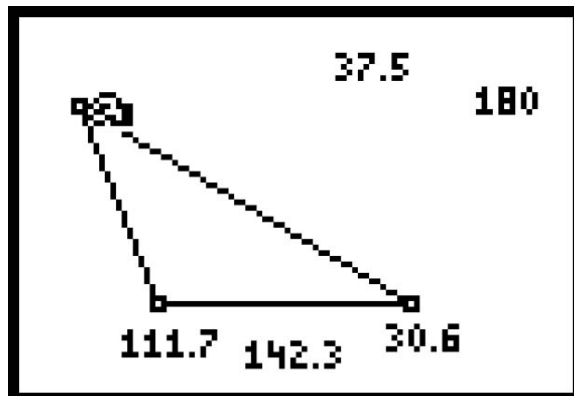
- Press **CLEAR** again and the **Black Arrow** should appear.



- Move the cursor over to the top vertex and press **ALPHA**. The hand appears.
- Move the vertex and observe what happens to the sum.



- Move the vertex again.



Make a conjecture about the sum of the angles of a triangle.