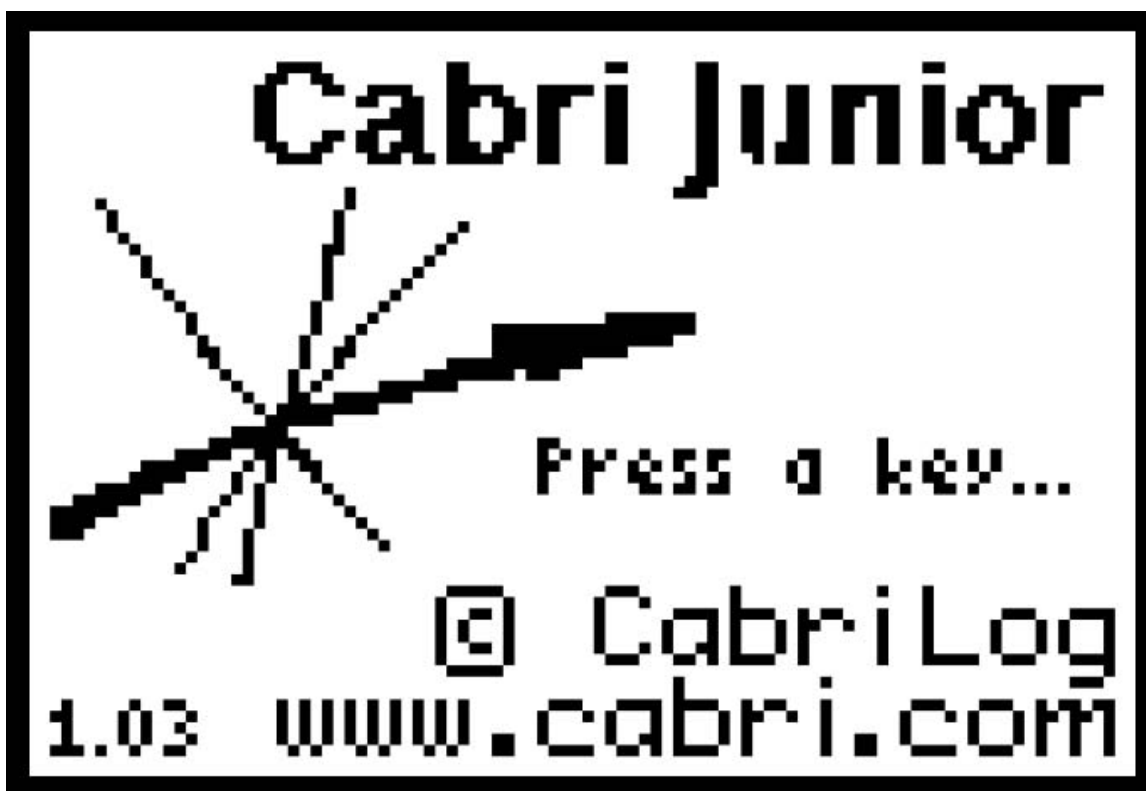


Dynamic Geometry: Basic Constructions

A Sixty-Minute Presentation

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

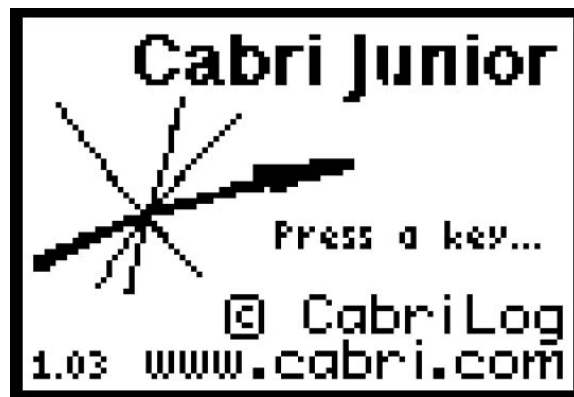


Dynamic Geometry: Basic Constructions

- Open Cabri® Jr. by first pressing the **APPS** key. (The APPLICATIONS listed on your calculator may be different from those listed below.)



- Select **CabriJr** from the **APPS** menu by using the down arrow to highlight it and then pressing ENTER. You may also enter the corresponding program number, which is 3 in the listing shown above but may be different on your calculator.



- Press any key to display the graphing screen.

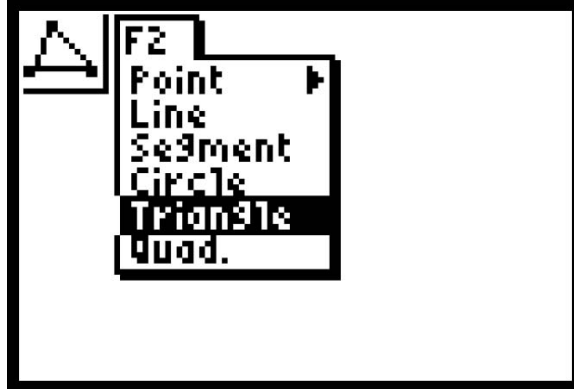
The function keys, **F1** through **F5** will display one of the basic menus. Whenever a menu item is mentioned, its corresponding function key will be written with parentheses for your reference.

This activity will investigate the perpendicular bisectors of a triangle.

Exploration 1: Create a Triangle

- Create a triangle by selecting the **Triangle** tool (**F2**) and pressing **ENTER**.

The icon appearing in the left hand corner of the screen shows the tool you have selected.



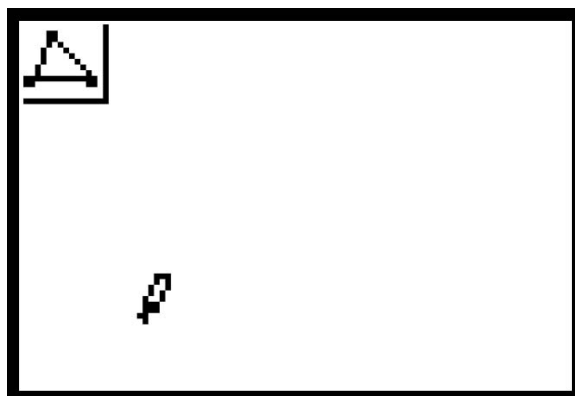
After **ENTER** is pressed the menu disappears leaving the tool active ready to be used.



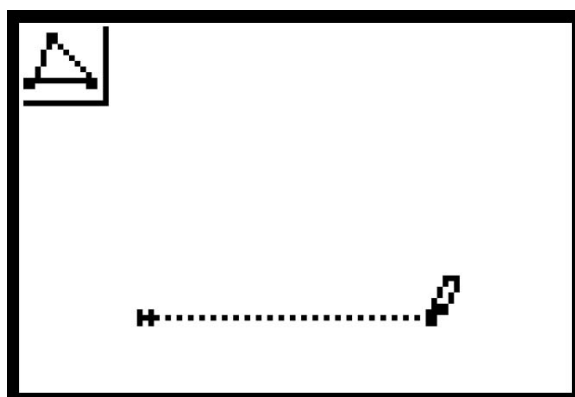
Notice the triangle in the upper left hand corner that indicates which tool is currently engaged.

Many tools have special cursors. When the triangle tool is engaged, the cursor is a pen, as shown above. The pen is a construction tool for drawing an object. The cursor is a pen at places where a point can be created.

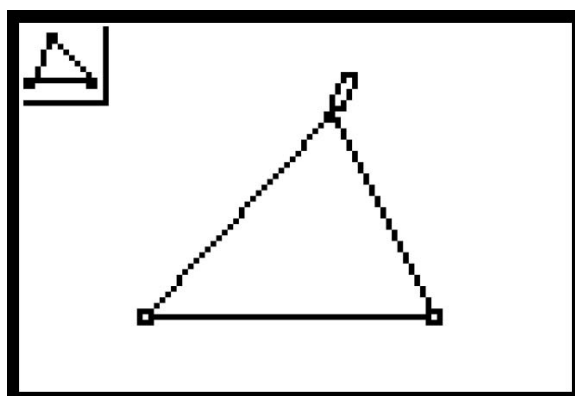
- Move the pen to the lower left side of the screen and press **ENTER** to place the first vertex of the triangle on the screen.



- Press the right arrow to move the pen to the right side of the screen. A dotted segment is formed.
- Press **ENTER** to create the second vertex of the triangle.

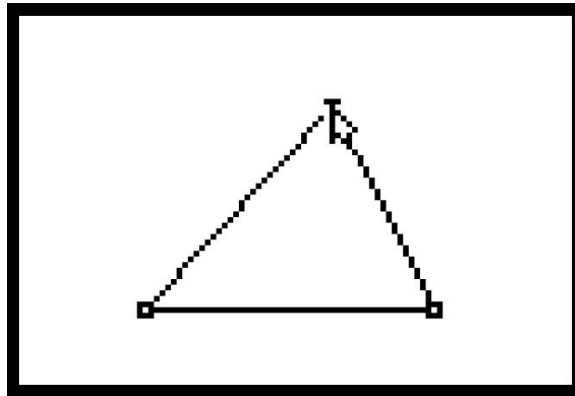


- Move the pen up, then left to place the third vertex of the triangle. Try to make an acute scalene triangle.
- Press **ENTER** to create the point. The dotted lines turn solid.



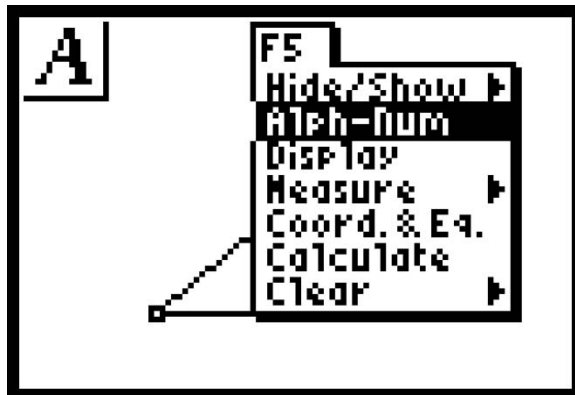
- Press the **CLEAR** key to disengage the triangle tool and show the pointer arrow.

If the pointer arrow is hollow when close to an object, then the object is moveable. If the pointer arrow is solid, then the object is not moveable.

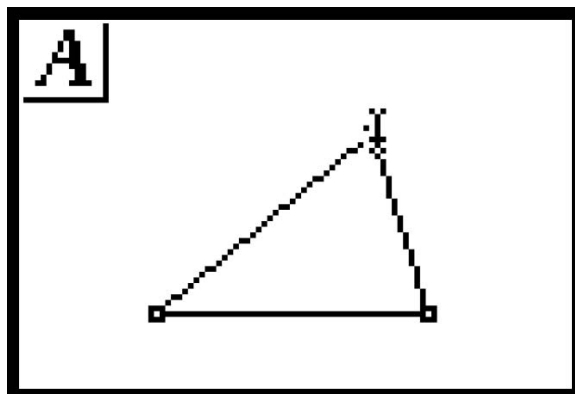


Label the Vertices

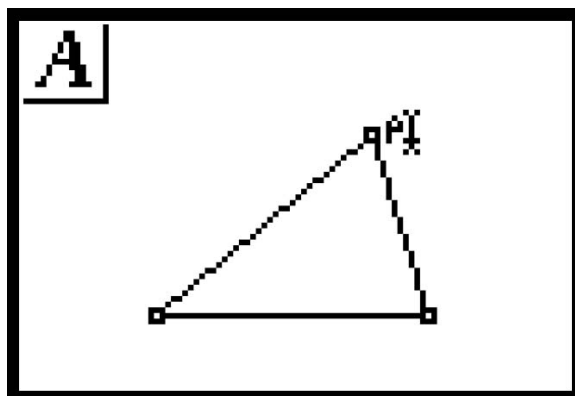
- Select the **Alph-Num** tool (F5).



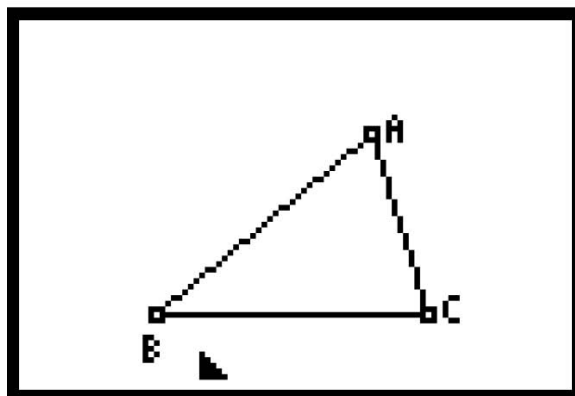
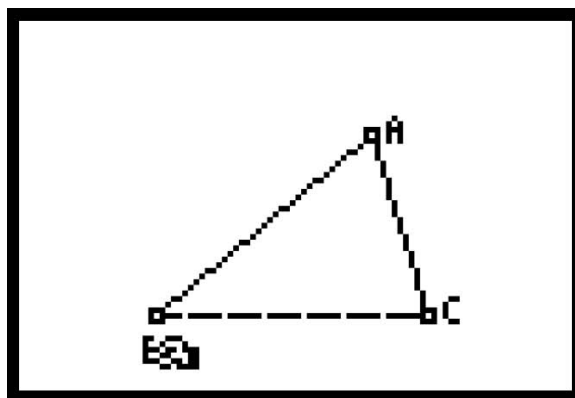
- Press **ENTER** to get the label cursor, which is the I-beam insertion character. The label cursor only appears when label cursor is near a point.



- Press **ENTER**, then press **A** to label the point.
- Press **ENTER** again to set the label.



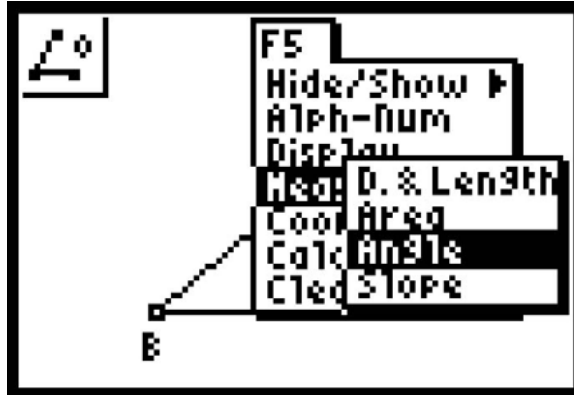
- Repeat the same process labeling the other points **B** and **C**. Use the pointer arrow to drag labels if they need to be moved.
- Press **CLEAR**.



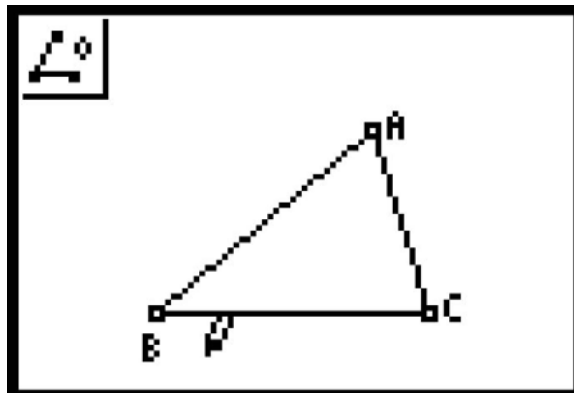
Angles are denoted in the same way that angles are named; the second point chosen is the vertex of the angle. For example, in the figure above $\angle ABC$ could be measured by choosing point **A**, then point **B**, then point **C** or by first choosing point **C**, then **B**, then **A**. The angle whose vertex is the middle point is the angle that is measured.

Calculate the Measures of the Angles

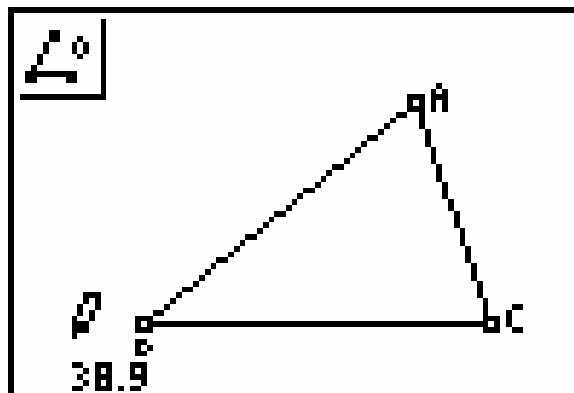
- Select **Measure (F5)**, display the submenu and select the **Angle** tool.



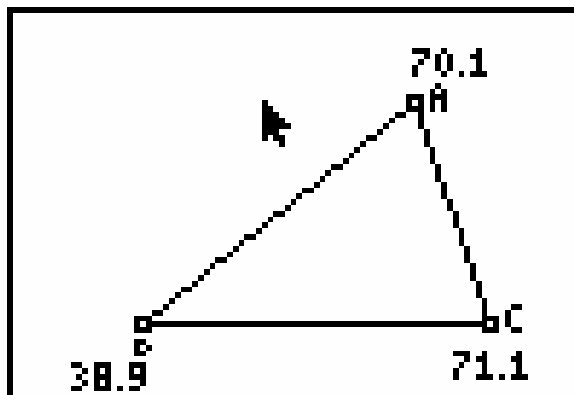
- Press **ENTER** to activate the **Measure Angle** tool. The pointer arrow turns into a pen. Note the angle with the degree sign in the upper left hand corner of the screen.



- Measure $\angle ABC$ by selecting each point and pressing **ENTER**. Notice that each vertex will flash when it is selected.
- Move the angle measurement down and back to the left so it will be in a better position. Press **ENTER** to set the number into position on the screen.

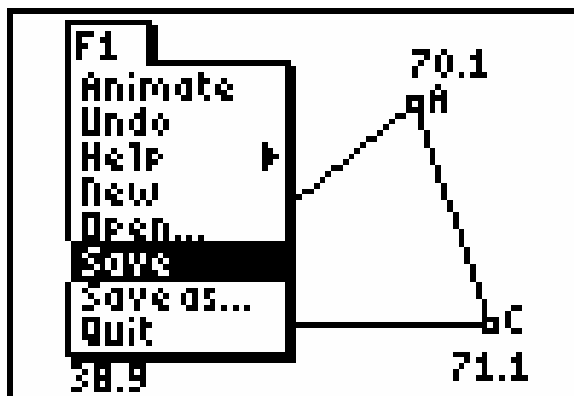


- Repeat the angle measure process for the other two angles of the triangle.



Save the Figure


- Save this Cabri Jr. file for future use by selecting either the **Save** or **Save as** option (F1).



- Press **ENTER** and type a name for the file such as “BASICON.” (This figure is used later in this activity and in another activity.)



- Press the **ENTER** to save the figure to memory.

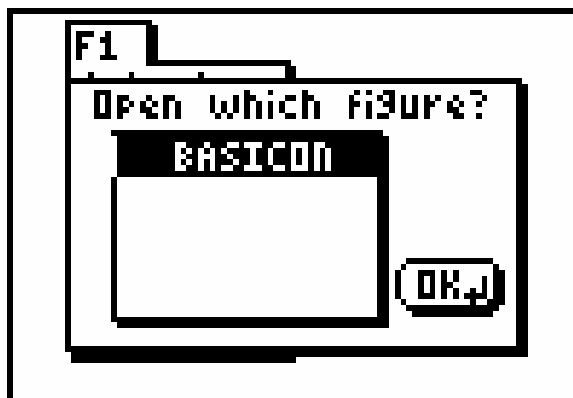
The  to highlight **Cancel** and then press **ENTER** to exit the **Save** or **Save As** command.

Exploration 2: Perpendicular Bisectors of the Sides of a Triangle

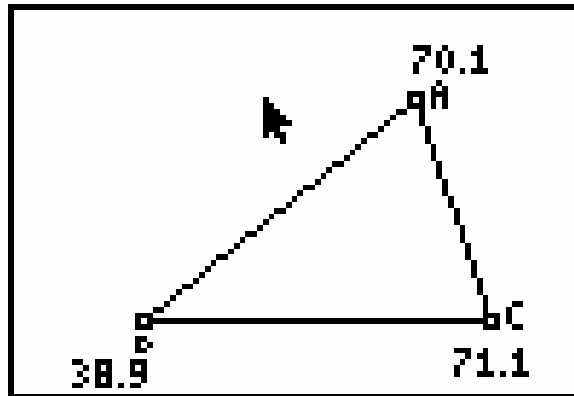
- If the figure BASICON is not open, select the **Open** tool (**F1**).



- Press **ENTER** and select the file BASICON.

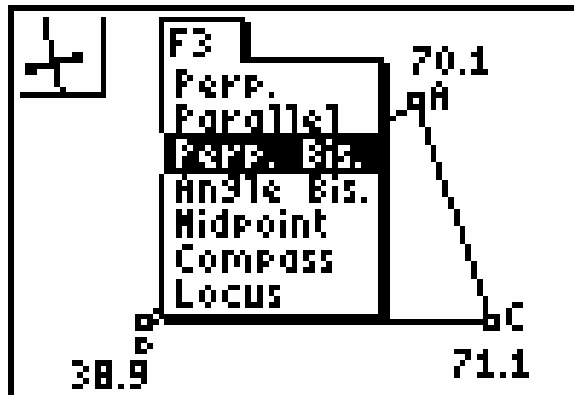


- Press **ENTER** to open the file.

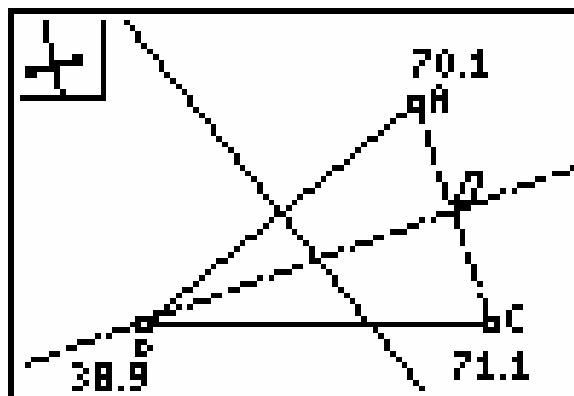


Create three perpendicular bisectors, one on each of the sides of the triangle.

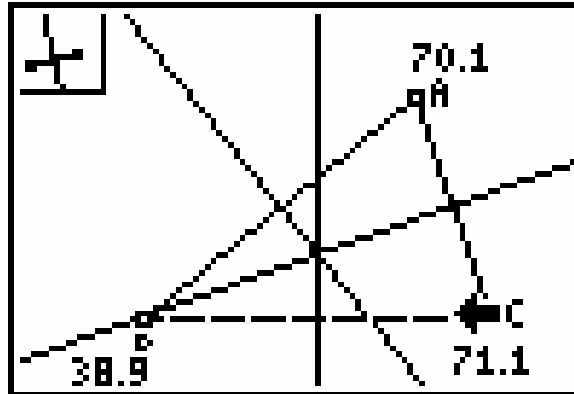
- Select **Perp. Bis.(F3)**



- Press **ENTER**. The pen reappears.
- Move it near a side of the triangle until it is selected and then press **ENTER**. A black horizontal arrow is now the cursor.
- Press **ENTER** and a perpendicular bisector is drawn and the pen reappears again.
- Move it to another side and press **ENTER**.

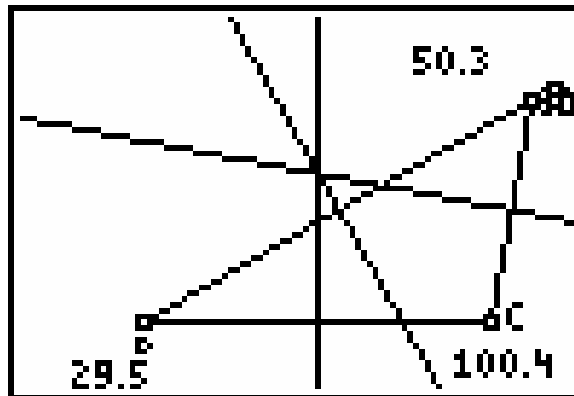


- Move the cursor to the third side and press **ENTER**, then **CLEAR**.



Exploration 3: The Point of Intersection of the Perpendicular Bisectors

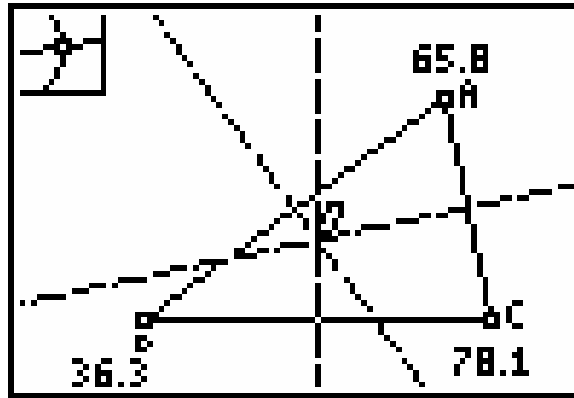
- Move the cursor until vertex **A** is selected.
- Press the **ALPHA** key to activate the dragging hand and use the arrow keys to move vertex **A** around the screen.
(Vertex **B** or **C** should also be moved in this investigation.)



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

Exploration 4: The Position of the Intersection of the Perpendicular Bisectors

- Move the cursor near the intersection point of the three perpendicular bisectors.
- Select **Point (F2)**, then **Intersection** (All three lines should be flashing).

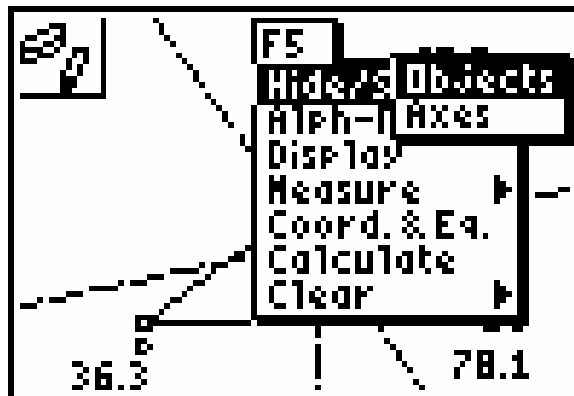


- Press **ENTER** to construct the point of intersection of the three perpendicular bisectors and then press **CLEAR** to disengage the tool.

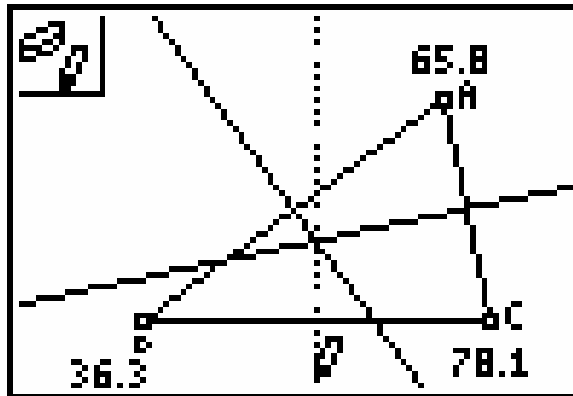
You have placed a point on the intersection of the three lines.

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

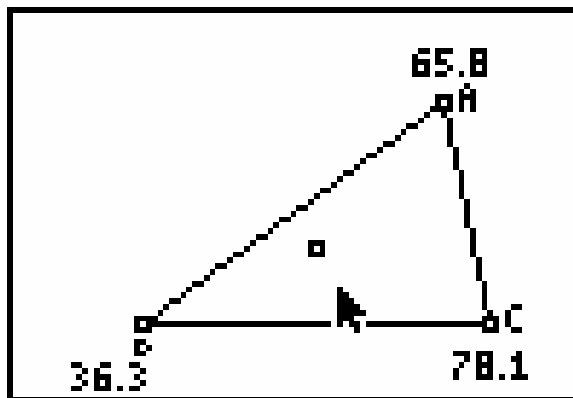
- Select **Hide/Show (F5)**, then **Objects**.



- Press **ENTER** and move the cursor so that it is pointing to a perpendicular bisector. The eraser is displayed and the line is flashing.
- Press **ENTER** and the line changes to dotted.

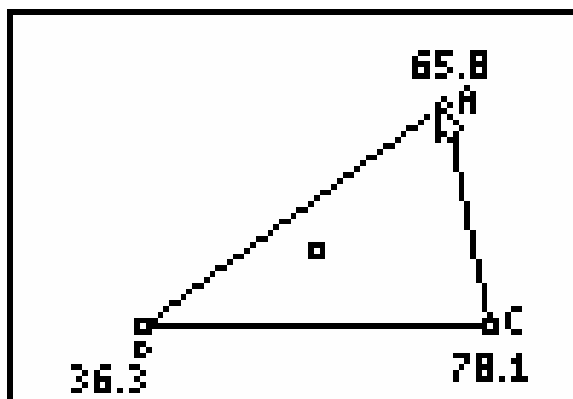


- Move the cursor to each of the other two lines and hide them by pressing **ENTER** while each is selected.
- Press **CLEAR**. All three are now hidden.

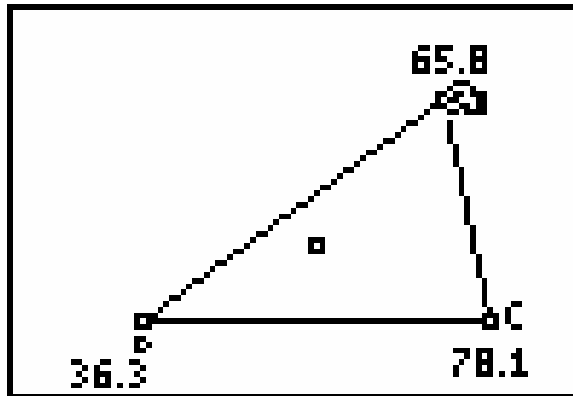


Make a conjecture about the position of the intersection of the perpendicular bisectors of the triangle when all angles are acute.

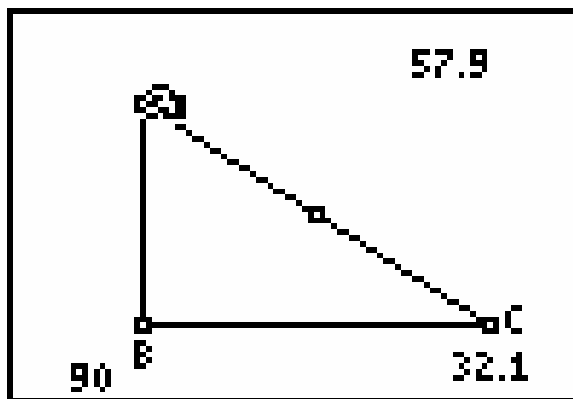
- Move the arrow to A. The black arrow will turn transparent when you get near A.



- Press the **ALPHA** key to select A for dragging.

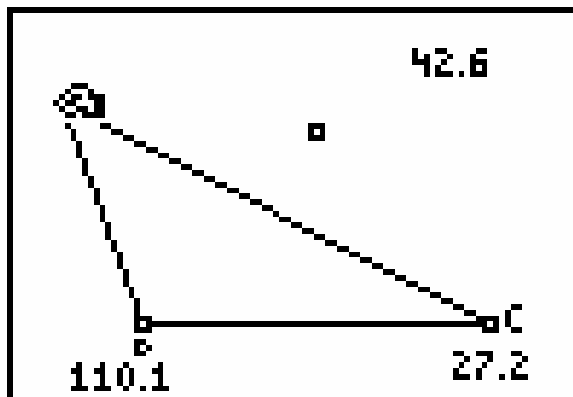


- Move the cursor so that angle **B** is 90° .



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

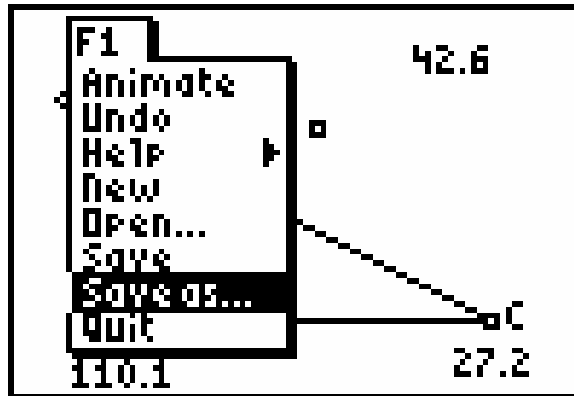
- Move the cursor so that angle **B** is obtuse.



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

Save the Figure

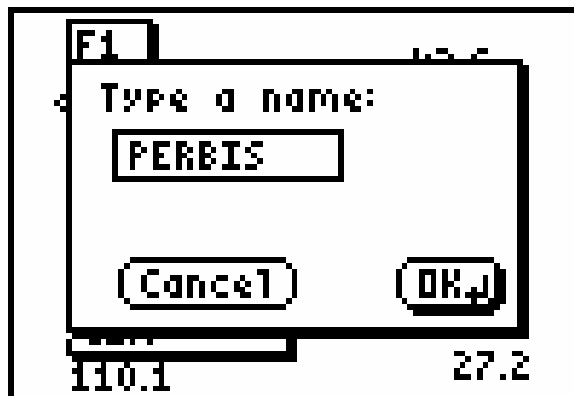
- Select **Save As (F1)**.



- Press **ENTER**. Use the \odot key to delete any text shown.



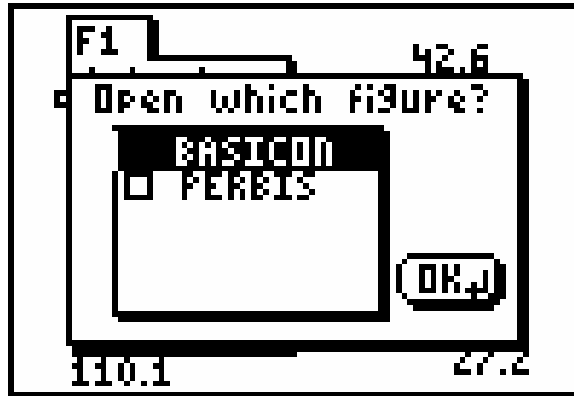
- Enter the name **PERBIS**.



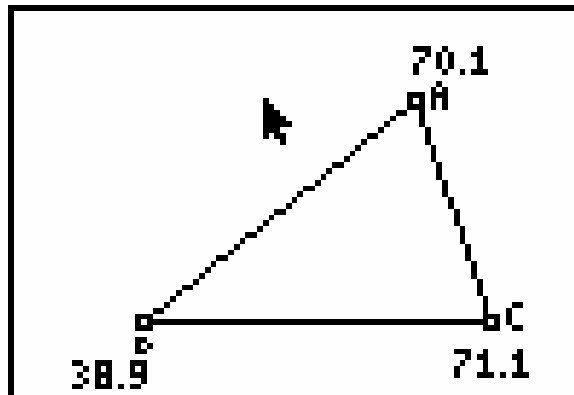
- Press **ENTER** to save the figure.

Exploration 5: The sum of the measures of the angles of a triangle

- Select **Open** (F1) and press **ENTER**.

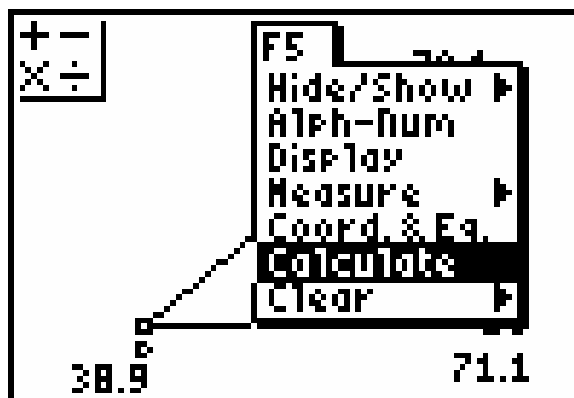


- Select **BASICON** if it is not already selected and press **ENTER**.

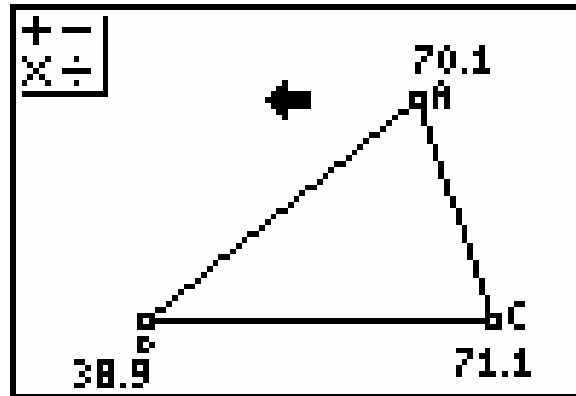


Calculate the sum of the angle measures of the triangle.

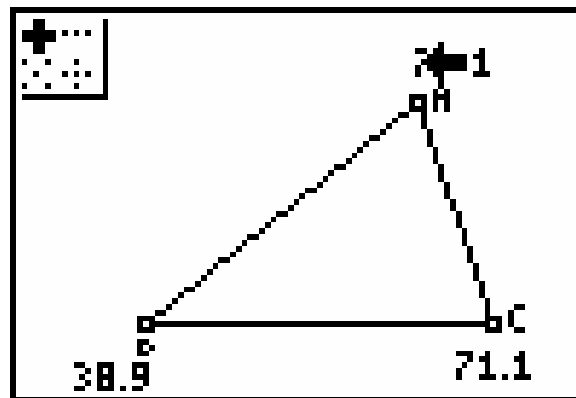
- Select **Calculate** (F5).



- Press **ENTER**.

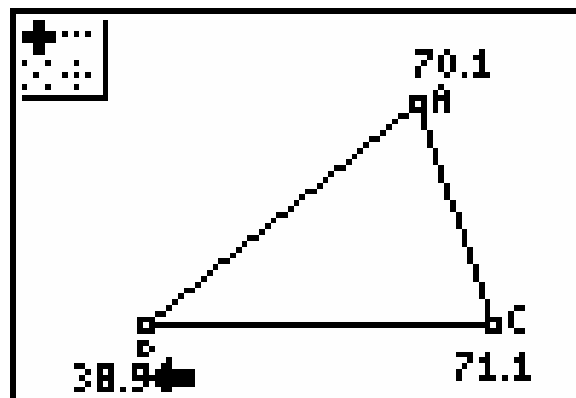


- Move the black arrow to select the measure at **A**. The black arrow is horizontal and the number is flashing.
- Press **ENTER**, then press +. The + sign is highlighted in the upper left box.

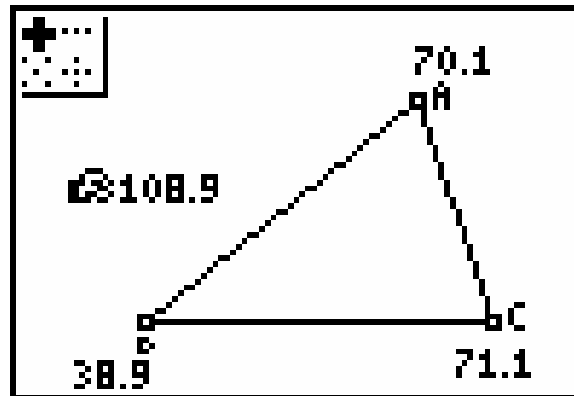


You can only add two numbers at a time.

- Move the cursor to the measure at **B**. When selected, it will flash along with the measure at **A**.



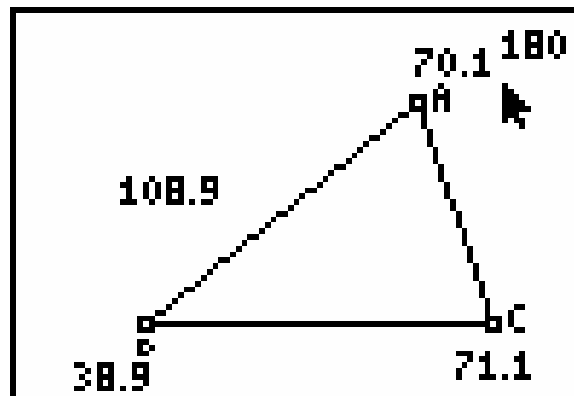
- Press **ENTER**. The sum of the measures appears with the hand attached.
- Move it to an open space between **A** and **B**.



- Press **CLEAR** and move the cursor so the sum is selected.
- Press **ENTER** then move the cursor to the measure of **C** and press **ENTER**. (You do not have to press the + sign again.)

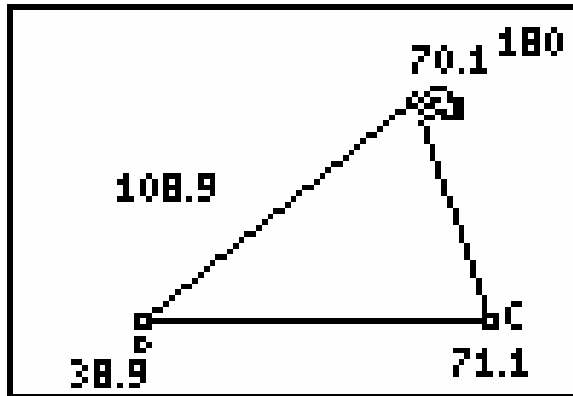
The sum of 180 appears with the hand attached.

- Move 180 to the upper right hand corner of the screen.
- Press **CLEAR**. Press **CLEAR** again to escape from **CALCULATE** mode.

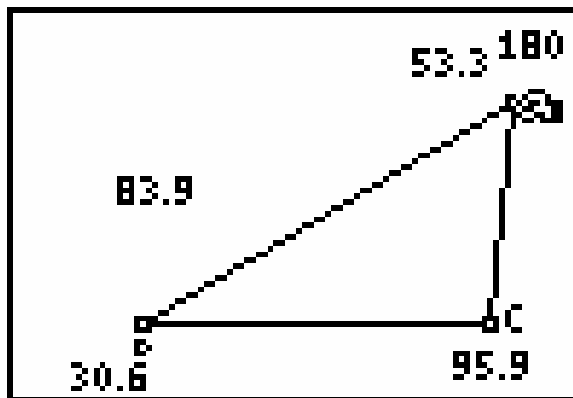


The sum is 180. Due to rounding, the sum of the measures shown on the screen may not be exactly 180.

- Move the cursor to **A** and press **ALPHA**.



- Move the vertex **A** and observe the measure of the three angles, the sum of the measures of $\angle A$ and $\angle B$, the sum of the three angles.
- Move **A** again and not the same measures.



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