Dynamic Geometry

Cabri-junior for the TI-83+ (New)

An “APPS” Program

Press the any Key to get the graphing window.

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

Y= is F1
WINDOW is F2
ZOOM is F3
TRACE is F4
GRAPH is F5
Pull Down Menus

F1

F2

F3

F4
Getting Started

Making Conjectures

Problem: Investigate relationships about perpendicular bisectors of the sides of any triangle.

Press the **APPS** key. (The APPS listed on your calculator may be different from those listed below.)
Press 3 or corresponding number or cursor down to Select **Cabri-Jr** from the **APPS** menu.

![APPS menu](image)

Press any key. (One of the basic graphic screens will come up.

![Basic graphic screen](image)

Press CLEAR. The screen with the axis or the screen without the axis should appear.

- **Black Arrow Pointer** – The pointer becomes a black arrow when coming close to an existing object that can be an input of a construction.
Hide/Show Axes – Select F5

Move cursor to hilite **Hide/Show** (at the top).

Note: Even though the menu items do not list numbers, they are numbered starting with the top item as 1. **Clear** on the menu is 7. **Hide/Show, Measure, & Clear** contain a right arrow, >. That indicates there is a sub-menu item available. Touch the right arrow on your calculator to see the sub-menu.
**Objects** is highlighted this case. Down arrow & press ENTER (or press 2) so **Axes** is selected. The axes are hidden and you have a blank screen containing the black arrow. Or if the screen did not have axes showing in the first place, then the screen with the axes would be displayed. In this case, we want to start with the axes not showing.

In order to investigate the perpendicular bisectors of a triangle, draw a triangle. Press F2 and select **Triangle** then ENTER (or press 5).

Note the triangle in the upper left hand corner. The pointer has changed from a black arrow to a pen. Move the pen to the lower left side of the screen to draw a triangle. Press ENTER to place the 1st vertex of the triangle on the screen. The point flashes, even though it is hard to see. The **Pen Pointer** is a construction tool for drawing an object. The pen pointer stays a pen pointer at places where a point can be created.
Press the right arrow to move the pen to the right side of the screen. A dotted segment is formed. Then press **ENTER** to create the 2\textsuperscript{nd} point in the triangle. It flashes.

Move the pen up, then left to place the 3\textsuperscript{rd} point of the triangle. Try to make an acute scalene triangle. Press **ENTER** to set the point. The dotted lines turn “solid”.

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Press the **CLEAR** key to escape from the triangle pen mode.

![Diagram of a triangle with a transparent arrow indicating a moveable object.](image)

Note: The pen turned into a transparent arrow. It indicates a moveable object (points, labels, lines, segments, circles, measures, coordinated, equations).

We are going to be interested in the angle measures as we change the shape of the triangle in order to investigate what happens to perpendicular bisectors in different types of triangles.

We will calculate angle measures. You must select three vertices to measure an angle. The angle determined by the middle vertex is the angle that is measured.

Press **F5**, cursor down to **Measure**, right arrow over and select **angle**.

![Keyboard screen showing Measure options: angle, area, slope, length.](image)

Press **ENTER**.
The transparent arrow turns into a pen. Note the angle with the degree sign in the upper left hand corner of the screen. Press **ENTER** to select the top vertex. Cursor down to the vertex on the left (you could go to the right or at the top), then press **ENTER** to select the 2nd vertex. The point flashes. If the lower segment is dotted, you have not gone over far enough. Move the cursor to the right to select the 3rd vertex. 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.

Move the number down and back to the left so it will be in a better position. Press CLEAR.

Press **CLEAR** and the hand turns back into a pen. 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. It’s measure appears near the corresponding vertex with a hand attached. Move it down a little. Press CLEAR.
Start with the right vertex to calculate the measure of the top angle. Press \textbf{ENTER}. Move cursor to top vertex. Press \textbf{ENTER}. Move cursor to left vertex. Press \textbf{ENTER}. The measure is near the corresponding vertex with the hand attached. Move it up a little. Press \textbf{CLEAR}. The top measure is established. Press \textbf{CLEAR} to get an Arrow Pointer. Move the Arrow away from the number.

Now create 3 perpendicular bisectors on the three sides of the triangle.

Press F3. Cursor down to \textbf{Perp. Bis.}. 

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Press ENTER. The pen reappears. Move it near a segment and press ENTER. You will see a black horizontal arrow. 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.
Move the cursor to any vertex (For this problem, move it to the top vertex). Press the alpha key, then move the vertex with the arrow keys.

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

Move the cursor near the intersection point of the three perpendicular bisectors. Select F2, then Point, then Intersection (All 3 lines should be flashing). Press ENTER, then CLEAR. You have places a point on the intersection of the three lines.

![Image](image.png)

We are now going to hide the three perpendicular bisectors and leave only the intersection point.

Select F5, Hide/Show, then Objects.

![Image](image.png)

Press ENTER. Move the cursor so it is pointing to the last line drawn. The eraser is displayed and the line is flashing. Press ENTER. The line changes to dotted.
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.

Move the arrow to the top vertex. The black arrow will turn transparent when you get near the vertex. Make a conjecture about the intersection of the perpendicular bisectors of the triangle when all angles are acute.

Press the ALPHA key. The hand will attach itself to the vertex.
Move the cursor so that 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.
Draw a new triangle.

Investigate the sum of the measures of the angles of a triangle.

Select F2, draw a triangle. Press CLEAR after the triangle is drawn. (See instructions on previous example.)

Select F3 Measure, then Angle to measure the three angles.

Press F5, cursor down to Calculate.
Press ENTER.

Move the black arrow to the right bottom number. The black arrow is horizontal and the number is flashing. Press ENTER, then press + (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. Press CLEAR.
Move the cursor until the sum is flashing. Press **ENTER**. Move the cursor to the number at the top vertex until it flashes. Press **ENTER**. The sum appears near the vertex with the hand attached. Move up to a clear area. Press **CLEAR**.

The sum is 180. Due to rounding the sum of the numbers showing on the screen may not be 180,

Press **CLEAR** again and the black arrow appears.
Move the cursor over to the top vertex and press **ALPHA**. The hand appears. Now move the vertex to see what happens to the sum.

![Diagram](image)

Move it again.

![Diagram](image)

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