

## Introduction to Cabri Junior™

Cabri Junior is a software program from Texas Instruments that can be used on the TI-83+ graphing calculator to investigate geometric concepts. You can draw, construct, perform transformations, compute, and display coordinates with the use of this innovative and user-friendly software. Cabri Junior will be used in this Geometry Module for middle school mathematics as an interactive teaching/learning tool.

The following activities are designed for the novice and provide a foundation on which to build for other explorations. For example, if you can copy a line segment and construct a perpendicular to a line at a point on the line, then you can construct a square or a rectangle. While there is often more than one way to construct geometric figures, opportunities are plentiful for making and validating conjectures in geometry. For more information about the use of Cabri Junior, visit the website [www.education.ti.com](http://www.education.ti.com) and navigate to the Cabri Junior Guidebook for a free download (60 pages).

Before beginning any of the applications, discuss the editing features including the following:

- F1: Undo                                      This enables you to erase what you just did on the screen.
- F5: Hide/Show!objects                  This enables you to hide objects such as construction circles, lines, measures, points, etc.
- F5: Clear!object                            This enables you to clear the object you just drew/constructed.
- F5: Clear!all                                 This will clear the screen of all objects.

### Locate and name a point on the screen.

- Press the APPS key on your TI-83+ graphing calculator with Cabri Junior™ and select the software from the menu. Then press any key to start.
- Press F2 and select **Point-point** and press ENTER.
- Move the cursor using the arrows on your keypad to select a position for a point and press ENTER (figure 1).
- Press F5, select **Alph-num**, and press ENTER.
- Use the arrows on your keypad to move the symbol on the screen next to the point and press ENTER.
- Press ALPHA and then one of the letters in green followed by ENTER. The point is now labeled as shown in figure 2.
- To delete the point only, press F5 and select **Clear-object**. A dark arrow will appear on your screen. Move the arrow until the point starts to blink and press ENTER. Only the point is cleared.
- To clear all objects on your screen, press F5 and select **Clear-all**.

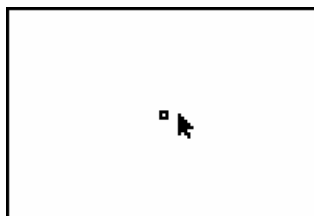


Figure 1

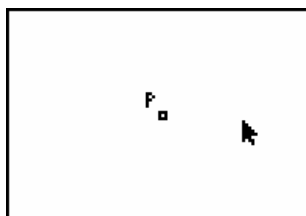


Figure 2

**Draw a segment and label it segment AB.**

- Press F2 and select **Segment** followed by ENTER.
- Move the cursor to a position on the screen and press ENTER.
- Use the arrows to move the cursor away from the first point to a desired length and press ENTER. You have now drawn a segment as shown in figure 1.
- Press F5 and select **Alph-num** followed by ENTER.
- Move the symbol on the screen to the left endpoint and press ENTER.
- Press ALPHA and the key with the green letter A to label this endpoint.
- Press ENTER and follow the same procedure as before to label the other endpoint B as shown in figure 2.

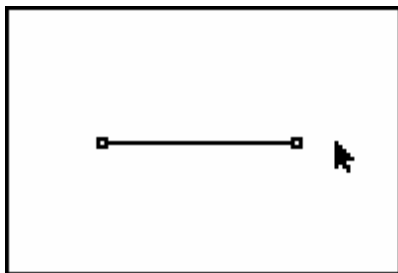


Figure 1

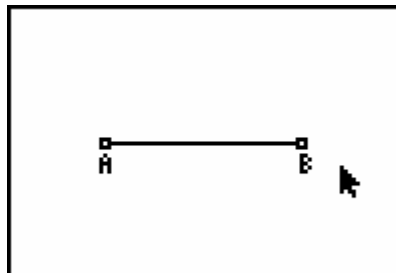


Figure 2

**Model the definition of between or segment addition.**

- Draw a segment and label it segment AB.
- Press F2 and select **Point-on** followed by ENTER.
- Move the cursor to a point between the endpoints of segment AB and label it point C as shown in figure 1.
- Press F5 and select **Measure-D. & Length** followed by ENTER.
- To measure the length of a segment, select one endpoint with the cursor and press ENTER. Then select the other endpoint of the segment and press ENTER. The measure will appear on the screen with the symbol of a “hand”. Use the arrows on your keypad to move the measurement to a desired location and press ENTER.
- To show that  $AC + CB = AB$ , press F5 and select **Calculate** followed by ENTER.
- Move the arrow on the screen to one of the measures and press ENTER followed by the “+” sign. Then move the arrow to the second measure and press ENTER. The sum (5.7) will appear on the screen as shown in figure 2

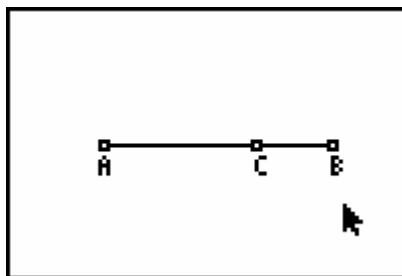


Figure 1

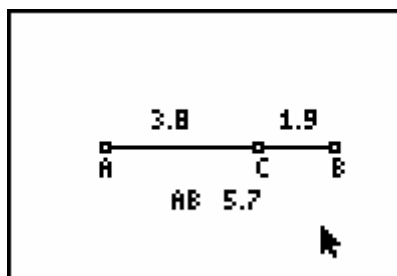


Figure 2

**Construct the perpendicular bisector of a segment.**

- Draw segment AB on your screen as shown in figure 1.
- Press F2 and select **Circle** followed by ENTER.
- Move the cursor to endpoint A and press ENTER. Then use the an arrow key to move the cursor along the segment to a distance greater than half the distance from point A to point B as shown in figure 1. Press ENTER to set the radius.
- Press F3 and select **Compass** followed by ENTER.
- Select endpoint A and the point of intersection of the circle with segment AB followed by ENTER. Then move the cursor to endpoint B and press ENTER. An arc is formed by circle B intersecting circle A in points T and R as shown in figure 2.

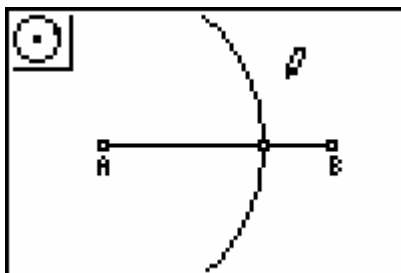


Figure 1

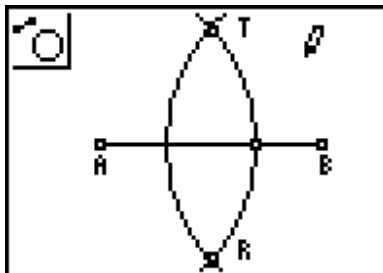


Figure 2

- Press F2 and select **Segment** followed by ENTER. Draw segment RT as shown in figure 3.
- Press F2 and select **Point-intersection** followed by ENTER. Label the point of intersection of segment RT and segment AB, point M (figure 3).
- Press F5 and select **Measure- D. & Length** followed by ENTER. Measure segments AM and MB to verify that point M is the midpoint of segment AB as shown in figure 4.

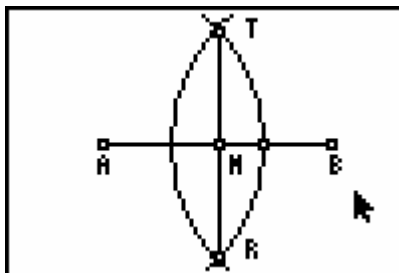


Figure 3

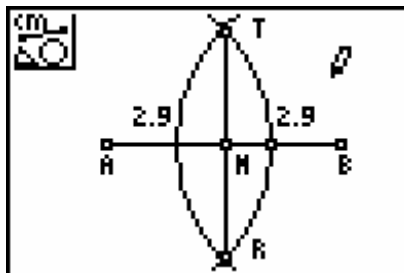
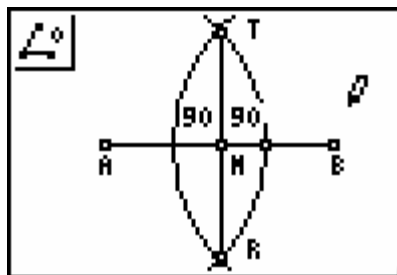


Figure 4

- Press F5 and select **Measure-angle** followed by ENTER. To measure an angle, you need 3 points marked on the angle- point on 1 side, vertex, and point on other side. Next, move the cursor to each of these points (vertex in the middle) and press ENTER after each selection. Measure angle AMT and angle TMB to verify that segment  $TR \perp AB$  as shown in figure 5.



**Draw a triangle and find its perimeter.**

- **Draw a triangle:** Press F2 and select **Triangle** followed by ENTER. You will need to select this method of drawing a triangle if you want to do any transformations with it later. A triangle can be drawn with 3 segments that satisfy “The sum of the lengths of any 2 sides of a triangle must be greater than the length of the third side.”. To use **Triangle**, move the cursor (use arrows) to a point on the screen, press ENTER, move the cursor to a second point, press ENTER, and move to a third position on the screen until the desired shape is formed, and press ENTER. Name the triangle  $\triangle ABC$  (figure 1).

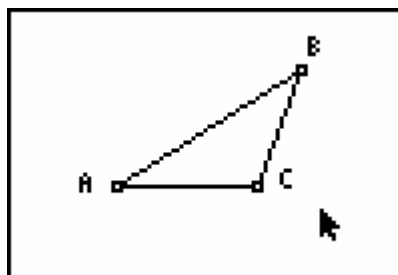


Figure 1

- **Find perimeter:** Press F5 and select **Measure-D. and Length** followed by ENTER.
- Measure the length of each side as shown in figure 2. Refer to “Model the definition of between and segment addition” if needed.
- Press F5 and select calculate. Use the cursor and select the measure of two side lengths followed by “+” and then ENTER. Move the cursor to select this sum displayed on the screen and the length of the third side followed by “+” to get the perimeter as shown in figure 2.

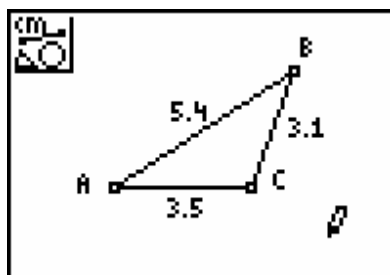


Figure 1

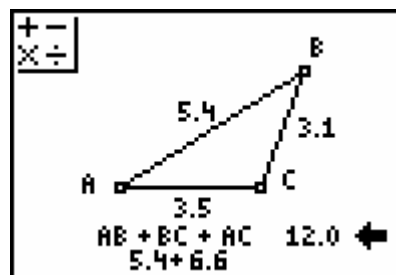


Figure 2

**Construct an angle congruent to a given angle.**

- Press F2 and select **Segment** followed by ENTER. Construct a segment and label its endpoints A and B. Construct a second segment starting at endpoint B of the first segment and label the other endpoint C (figure 1). Construct a third segment and label its endpoints with the letters E and F (figure 1).
- Press F2 and select **Circle** followed by ENTER. Move the cursor to vertex B and press ENTER. Then move the cursor away from point B to draw a circle with a radius that intersects both sides of angle ABC as shown in figure 2.
- Press F2, select **Point-intersection**, and put a point on each point of intersection of circle B with the sides of angle ABC (points G and H) in figure 2.
- Press F3 and select **Compass** followed by ENTER. Move the cursor to point B, press ENTER, and move it a distance equal to the radius of circle B followed by ENTER. Move the circle until the center coincides with point E on segment EF drawing circle E as shown in figure 2.
- Mark a point of intersection of circle E with segment EF and label it L.

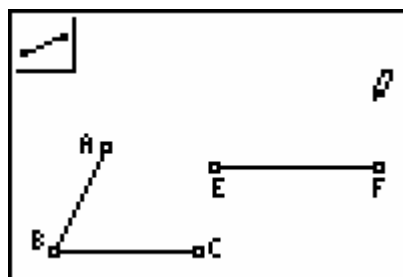


Figure 1

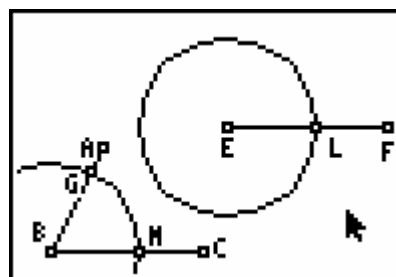


Figure 2

- Select **Compass** followed by ENTER. Select point M on circle B and segment BC as the center of a circle and move the cursor to point G and press ENTER. Move this circle so that its center coincides with point L and press ENTER (figure 3). Mark the point of intersection of circle E and circle L using **Point-intersection**. Label this point T as shown in figure 3.
- Use **Segment** to draw segment ET to complete angle TEF (figure 4).

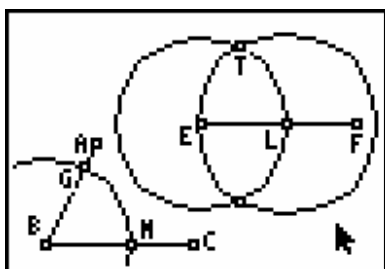


Figure 3

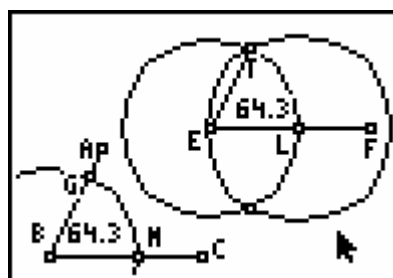


Figure 4

- Press F5 and select **Measure-angle** to measure angle TEF and angle ABC. These measurements verify that the angles are congruent since angles with equal measures are congruent (figure 4).

**Construct a perpendicular to a line from a point not on the line.**

- Press F2 and select **Line** followed by ENTER to draw a line near the bottom of the screen.
- Press F2 and select **Circle**. Position the cursor on point P and move it toward the line until the circle intersects the line in 2 points. Label these points A and B as shown in figure 1.
- Press F2 and select **Circle**. Select point A as the center and draw circle A with a radius greater than half the distance from A to B.
- Press F3 and select **Compass**. Move the cursor to point A and press ENTER. Then move the cursor away from point A to a radius equal to circle A and press ENTER.
- Move the cursor to point B and press ENTER to draw circle B intersecting circle A at point T.
- Press F2 and select **Segment** to draw through the points P and T intersecting the line as shown in figure 2.
- Press F5 and select **Measure-angle** to measure the angle formed by the intersection of the line segment drawn above with the original line. Figure 2 shows the angle formed has a measure of  $90^\circ$ . If two lines intersect to form right angles, then the lines are perpendicular.

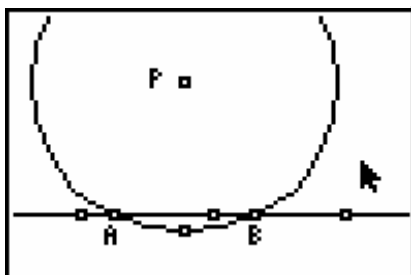


Figure 1

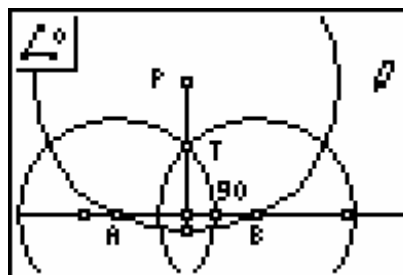


Figure 2

**Construct a line parallel to a given line through a point outside the line.**

- Press F2 and select **Line** to draw a line near the bottom of your calculator screen.
- Press F2 and select **Point-point** and position a point P above the line (figure 1).
- Press F2 and select **Line** to draw a line through point P intersecting the given line as shown in figure 1.
- Use the “copy angle” construction to copy angle 1 at vertex P as shown in figure 2. Use **Measure-angle** to show  $\angle 1 \cong \angle 2$ . Since  $\angle 1$  and  $\angle 2$  are a pair of corresponding angles and  $\angle 1 \cong \angle 2$ , it follows that the two lines are parallel. Congruent triangles by SSS can also be used to prove that  $\angle 1 \cong \angle 2$  using “Radii of the same or congruent circles are congruent.”.

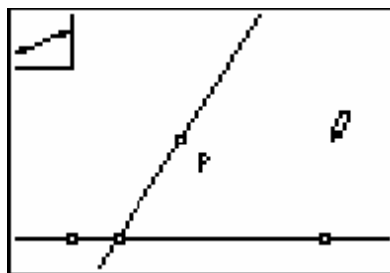


Figure 1

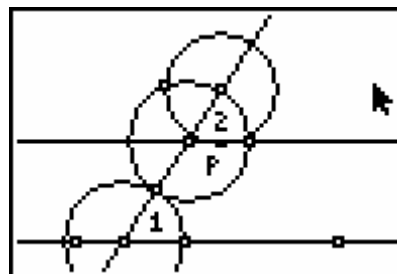


Figure 2

