

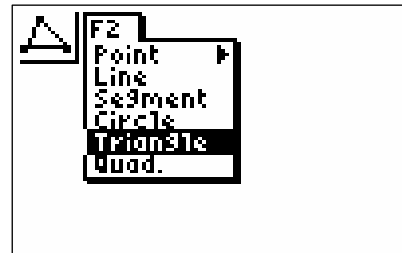
7.4 Investigate: What are the properties of the midpoints of the sides of a triangle?

Principles of Mathematics 9

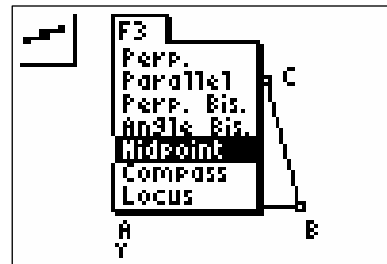
Method 3: Use a Graphing Calculator

1. Start the Cabri® Jr. application. Clear any previous drawing from the screen.

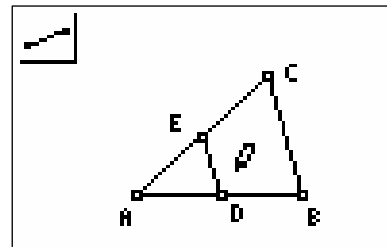
2. To draw a triangle, press **WINDOW** to display the **F2** menu and select **Triangle**. Move the pencil cursor to where you want the first vertex and press **ENTER**. Position the other two vertices in the same way. To label the vertices, press **GRAPH** to display the **F5** menu and select **Alpha-Num**. Move the cursor near a vertex, press **ENTER** **ALPHA** and then the key for the letter you want. Press **ENTER** to anchor the label.



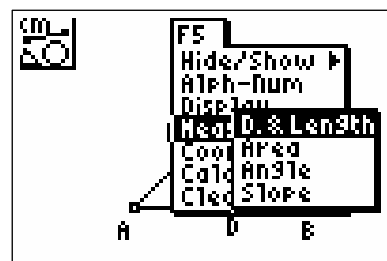
3. To construct a midpoint, press **ZOOM** to display the **F3** menu and select **Midpoint**. Move the cursor onto side AB of your triangle, and press **ENTER**. Move the cursor to side AC and press **ENTER** again. Label the two midpoints D and E.



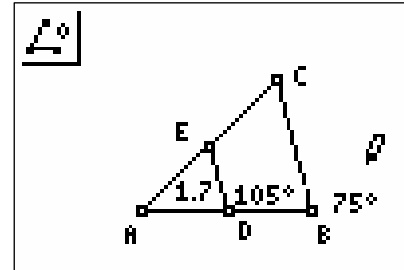
4. Press **WINDOW** to display the **F2** menu and select **Segment**. Move the cursor to one of the midpoints and press **ENTER**. Then, move the cursor to the other midpoint and press **ENTER** again.



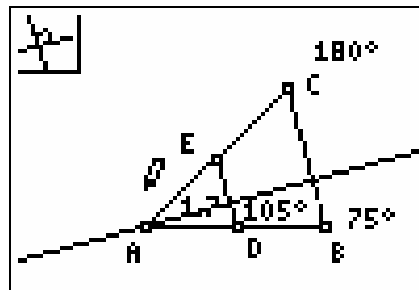
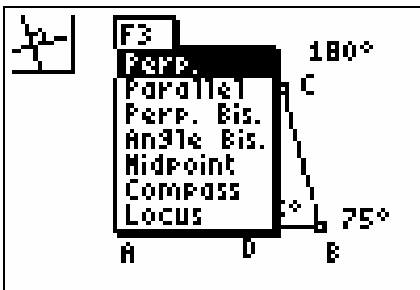
5. To measure the length of DE, press **GRAPH** to display the **F5** menu. Select **Measure**, press **▶**, and select **D.&Length**. Move the cursor to segment DE and press **ENTER**. Move the measurement to a convenient location and press **ENTER** again. Then, move the cursor to side BC and measure its length. How are the lengths of DE and BC related?



6. If the co-interior angles formed by a transversal and two line segments are supplementary, the segments are parallel. Press **GRAPH** to display the **F5** menu; then, press **▶** and select **Angle**. Measure $\angle EDB$ by selecting points E, D, and B, in that order. Move the measurement to a convenient location and press **ENTER**. Use the same method to measure $\angle DBC$. To find the sum of the two angles, select **Calculate** from the **F5** menu. Then, select each angle measure by moving the cursor to it and pressing **ENTER**. To display the sum of the angles, press **+**. Is DE parallel to BC?



7. Press **ZOOM** to display the **F3** menu and select **Perp.**. Move the cursor to side BC, and press **ENTER**. Then, move the cursor to vertex A and press **ENTER** again. Press **WINDOW** to display the **F2** menu and select **Point**. Press **▶** and select **Intersection**. Move the cursor to the intersection of DE and the perpendicular; then, press **ENTER**.



8. Use the measure function to compare the height of $\triangle ADE$ to the height of $\triangle ABC$.
9. Compare the height of $\triangle ADE$ to the height of quadrilateral BCED.
10. Press **ALPHA**; then, use the cursor keys to drag vertex A to various new locations. Watch the length and angle measures as you move the vertex. Do any of the length ratios change? Does the sum of $\angle EDB$ and $\angle DBC$ remain constant? Try dragging vertices B and C around the screen as well.
11. **Reflect** What properties does the line joining the midpoints of two sides of a triangle have?