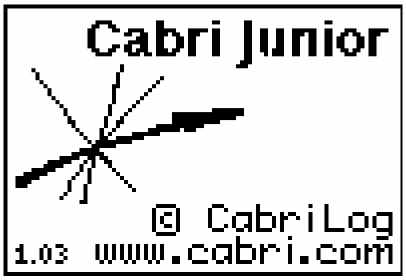
Properties of Parallelograms

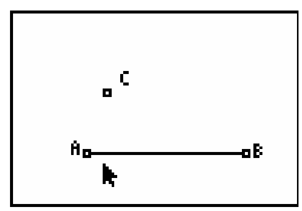
First, turn on your TI-84 and press the APPS key. Arrow down until you see Cabri Jr and press ⊆. You should now see this introduction screen.



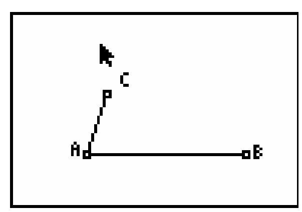
To begin the program, press any key. If a drawing comes up on the screen, press the o key (note the F1 above and to the right of the key – this program uses F1, F2, F3, F4, F5 names instead of the regular key names) and arrow down to NEW. It will ask you if you would like to save the changes. Press the ψ key and then enter to not save the changes.

There are several properties of parallelograms that can be explored. But first, we need to learn to construct a parallelogram.

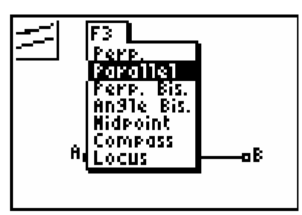
Start with a line segment and a point above the line segment.



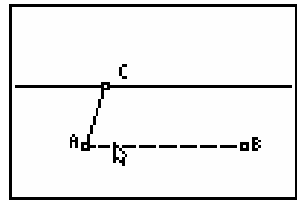
Connect A and C.



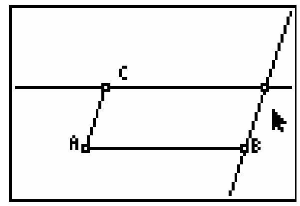
Press ¯ and select the Parallel option.



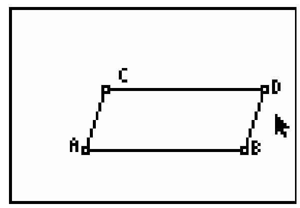
Select point C and line segment AB. The order that you use does not matter. Try it one way for this step and the other way for the next step. Observe both ways to observe what happens for each approach.



Repeat the process by highlighting point B and line segment AC. You will now have intersecting parallel lines. Construct the point of intersection.

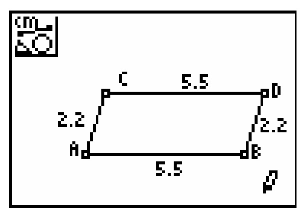


Label the point of intersection as “D”. You should now have a quadrilateral that appears to be a parallelogram. How would you test this to see if it is a parallelogram?

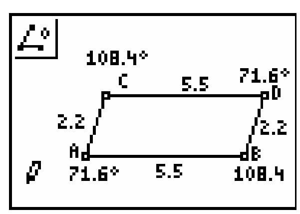


Now, let’s look at some of the properties of a parallelogram. Three in particular can be investigated quickly.

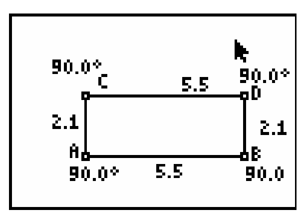
Property 1: The opposite sides of a parallelogram are congruent. Test your construction by dragging either of points A, B or C.



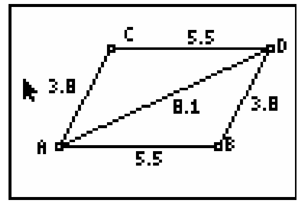
Property 2: The opposite angles of a parallelogram are congruent. Drag a point to test this property. What do you notice about consecutive angles?



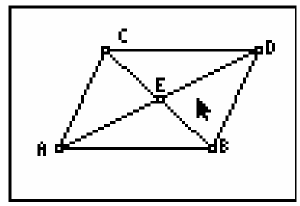
Propetry 3: If one angle of a quadrilateral is equal to 90°, then all four angles are equal to 90°. Explain how this property follows from the properties in the diagram above?



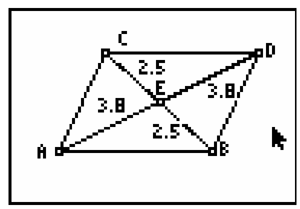
Property 4: A diagonal of a parallelogram splits the figure into two congruent triangles. Earlier, you looked at three different methods of proving triangles congruent. Which of these methods is demonstrated in the figure to the right? Can you prove that triangle ACD is congruent to triangle DBA using the other two methods?



Property 5: The diagonals of a parallelogram bisect each other. Construct the two diagonals and their point of intersection at E.



In order to measure the smaller lengths, you will need to construct line segments AE, BE, CE and DE.



Drag any of points A, B or C to test this property. Will the diagonals ever bisect each other at right angles? What do you notice about opposite triangles on either side of point E? Is it possible for all four of these triangles to be congruent? What properties will the parallelogram have in order for this to occur?