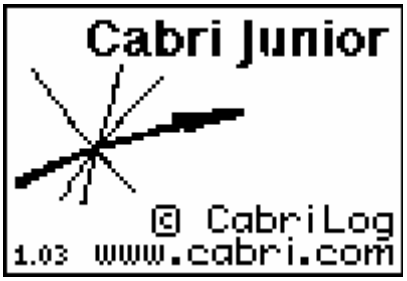
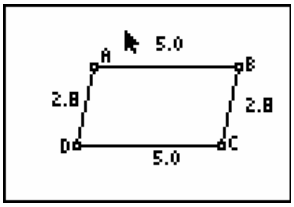
Tests for Parallelograms

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.

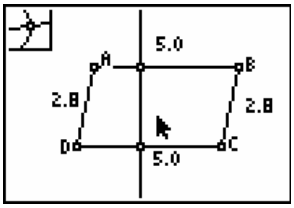


To begin the program, press any key. If a drawing comes up on the screen, press the o key (note the F1 above and to the right of the key – this program uses F1, F2, F3, F4, F5 names instead of the regular key names) and arrow down to NEW. It will ask you if you would like to save the changes. Press the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

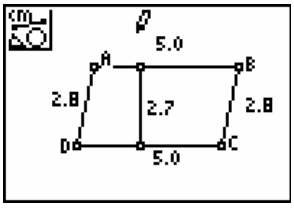
A parallelogram is a quadrilateral where opposite sides are parallel. One way to look at this is to say that the distance between opposite sides is always the same, where the distance refers to the length of a line segment which is perpendicular to opposite sides. To test this, start with a parallelogram.



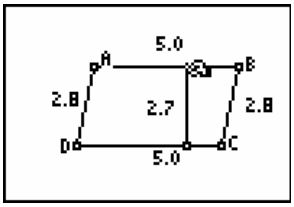
Place a point on side AB. Construct a perpendicular to AB and find the point of intersection of this line with side CD.



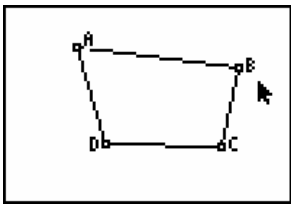
Hide the perpendicular line and construct a line segment connecting the two points. Measure the length of this line segment.



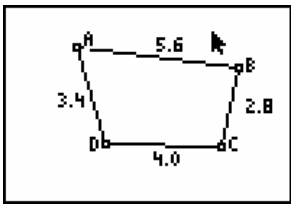
If you drag the point on AB, the line segment should remain the same length. Test the perpendicular distance for the other pair of sides as well. You may have to construct lines through AD and BC in order to test this.



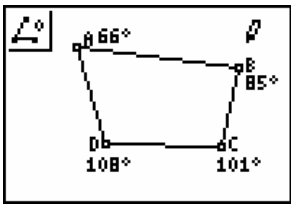
There are several other tests that you can apply to a quadrilateral to determine if it is a parallelogram or not. We will look at four such tests which are the converse statements of properties that we looked at in Activity 14. To begin construct a quadrilateral that has no sides that appear to be congruent or parallel.



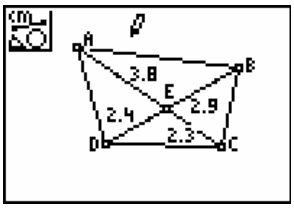
Test 1: If the opposite sides are congruent then the quadrilateral is a parallelogram.
Measure the sides of the quadrilateral. Drag a vertex (or vertices) until the opposite pairs of sides are congruent. Use the perpendicular distance test to confirm that the resulting figure is a parallelogram.

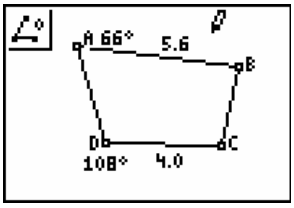


Test 2: If the opposite angles are congruent then the quadrilateral is a parallelogram.
Measure the angles of the quadrilateral. Drag a vertex (or vertices) until the opposite pairs of angles are congruent. Use the perpendicular distance test to confirm that the resulting figure is a parallelogram.



Test 3: If the diagonals bisect each other, then the quadrilateral is a parallelogram.
Construct the diagonals and the point of intersection at E. Construct line segments AE, BE, CE and DE. Measure the lengths of these segments. Drag a vertex (or vertices) until the diagonals bisect each other. Use the perpendicular distance test to confirm that the resulting figure is a parallelogram.





Test 4: If one pair of opposite sides is both parallel and congruent, then the quadrilateral is a parallelogram. Measure one pair of opposite sides, say AB and CD. To determine if the sides are parallel, measure angle CDA and angle DAB. Sides AB and CD are parallel if these two angles are supplementary. Drag a vertex (or vertices) until the sides AB and CD are congruent and angle CDA and angle DAB are supplementary. Use the perpendicular distance test to confirm that the resulting figure is a parallelogram.