

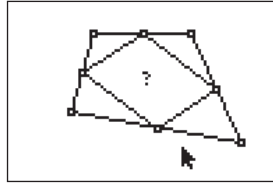
Investigating Segments in a Quadrilateral

Approximate
Total Time:
30 minutes

ACTIVITY OVERVIEW:

In this activity we will

- Draw a quadrilateral
- Find the midpoints of the sides
- Draw segments to join the midpoints of adjacent sides
- Explore characteristics of the shape formed



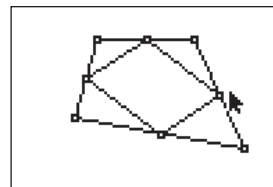
What are the properties of the shape formed by connecting the midpoints of adjacent sides of a quadrilateral? How can we use our knowledge of geometry, along with the tools of CabriJr, to support our conjectures about the shape?

NCTM Geometry Standard: Analyze characteristics and properties of 2- and 3-dimensional geometric shapes and develop mathematical arguments about geometric relationships.



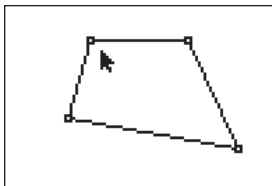
1

Press **[APPS]**. Move down to the CabriJr APP and press **[ENTER]**. Press **[Y=]** for the F1 menu and select **New**. (If asked to **Save changes?** press **[←]** **[ENTER]** to choose "No.")



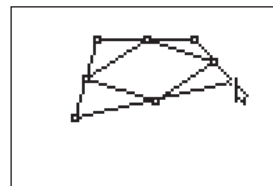
5

With the same midpoint flashing, press **[ENTER]** to begin a new segment. Move the pencil until the midpoint of the next side is flashing and press **[ENTER]**. Press **[ENTER]** again with that same midpoint flashing and move to the fourth midpoint and press **[ENTER]**. For the last segment, press **[ENTER]** with the fourth midpoint flashing. Move to the original midpoint and press **[ENTER]**. Press **[CLEAR]** to turn off the midpoint tool.



2

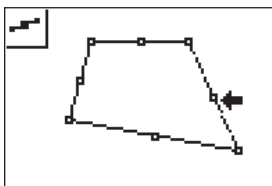
Press **[WINDOW]** for F2, move down to **Quad.** and press **[ENTER]**. Move to the location of a vertex and press **[ENTER]**. Move to the second vertex and press **[ENTER]**. Move to the third vertex and press **[ENTER]**. Move to the fourth vertex and press **[ENTER]**. Press **[CLEAR]** to exit the quadrilateral drawing tool.



6

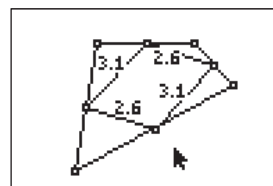
What appears to be true about the quadrilateral formed by connecting the midpoints?

Move the arrow to a vertex of the original quadrilateral. When the point is flashing, press **[ALPHA]**. Grab the vertex and move it to change the shape of the original quadrilateral. Observe changes in the quadrilateral formed by the midpoints.



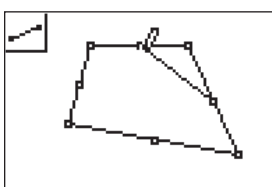
3

Press **[ZOOM]** for the F3 menu, move down to **Midpoint** and press **[ENTER]**. Move the arrow until a side of the quadrilateral is flashing and press **[ENTER]**. Move until another side of the quadrilateral is flashing and press **[ENTER]**. Move until a third side of the quadrilateral is flashing and press **[ENTER]**. Move until the fourth side of the quadrilateral is flashing and press **[ENTER]**.



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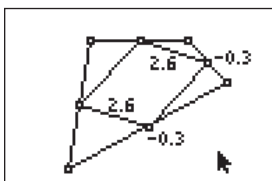
The quadrilateral formed by joining the midpoints appears to be a parallelogram. We can test this conjecture by showing that *both pairs of opposite sides are congruent*. Press **[GRAPH]** to use the **Measure** and **D. & Length** tool from the F5 menu. Move the pencil until one side of the figure is flashing and press **[ENTER]**. Repeat to find the measurements for the remaining sides of the quadrilateral.



4

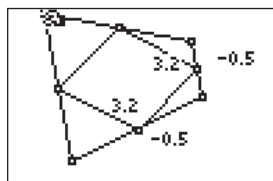
To draw the segments joining the midpoints of adjacent sides, press **[WINDOW]**, move to **Segment** and press **[ENTER]**. Move the pencil until one midpoint is flashing and press **[ENTER]**. Move the pencil until the midpoint of an adjacent side is flashing and press **[ENTER]**.

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We can also test the conjecture by showing that *one pair of opposite sides is parallel and congruent*. In the previous step we showed opposite sides congruent, so now we must test their slopes. Press **[GRAPH]** for F5 and move to **Measure** then right and down to **Slope**. Press **[ENTER]**. Move the pencil until one side of the figure is flashing and press **[ENTER]**. Repeat to find the slope of the opposite side of the quadrilateral. Press **[CLEAR]** to exit the **Slope** tool.



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Test this conjecture on other quadrilaterals by moving to a vertex of the original quadrilateral. When the vertex point is flashing, pressing **[ALPHA]**, change the position of the vertex, and observe the changes in the measurements of the segments and the slopes.



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To exit the APP, press **[Y=]** for the F1 menu. Move to **Quit**, then press **[ENTER]**. (Or you can press **[2nd] [MODE]** for **[QUIT]**.)