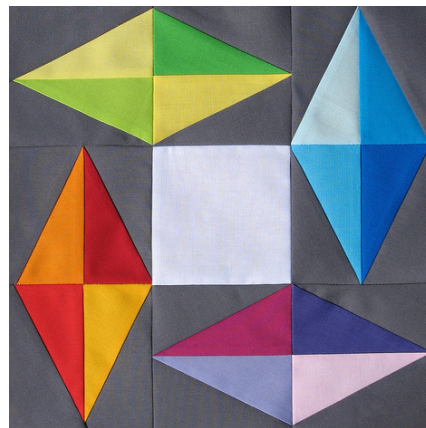


5.6 Parallelogram Conjectures and Proof

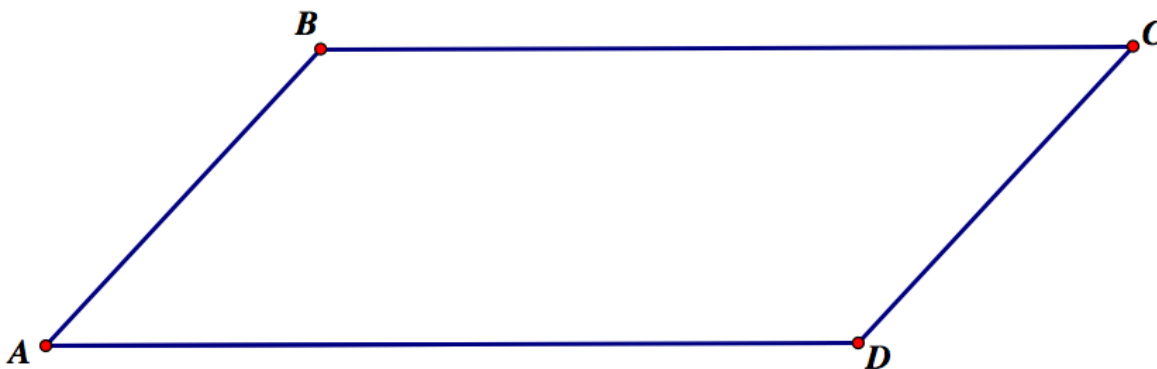
A Solidify Understanding Task

In Mathematics I you made conjectures about properties of parallelograms based on identifying lines of symmetry and rotational symmetry for various types of parallelograms. Now that we have additional knowledge about the angles formed when parallel lines are cut by a transversal, and we have criteria for convincing ourselves that two triangles are congruent, we can more formally prove some of the things we have noticed about parallelograms.



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1. Explain how you would locate the center of rotation for the following parallelogram. What convinces you that the point you have located is the center of rotation?



2. If you haven't already, draw one or both of the diagonals in the above parallelogram. Use this diagram to prove this statement: *opposite sides of a parallelogram are congruent*
3. Use this diagram to prove this statement: *opposite angles of a parallelogram are congruent*
4. Use this diagram to prove this statement: *the diagonals of a parallelogram bisect each other*



The statements we have proved above extend our knowledge of properties of all parallelograms: not only are the opposite sides parallel, they are also congruent; opposite angles are congruent; and the diagonals of a parallelogram bisect each other. A parallelogram has 180° rotational symmetry around the point of intersection of the diagonals—the center of rotation for the parallelogram.

If we have a quadrilateral that has some of these properties, can we convince ourselves that the quadrilateral is a parallelogram? How many of these properties do we need to know before we can conclude that a quadrilateral is a parallelogram?

5. Consider the following statements. If you think the statement is true, create a diagram and write a convincing argument to prove the statement.
 - a. If opposite sides and angles of a quadrilateral are congruent, the quadrilateral is a parallelogram.
 - b. If opposite sides of a quadrilateral are congruent, the quadrilateral is a parallelogram.
 - c. If opposite angles of a quadrilateral are congruent, the quadrilateral is a parallelogram.
 - d. If the diagonals of a quadrilateral bisect each other, the quadrilateral is a parallelogram.

