# Extending the Triangle Midsegment Conjecture

This performance task investigates the relationship between a polygon's diagonals and the polygon formed by connecting the midpoints of its sides. We begin the investigation by considering a quadrilateral.

## Problem 1

Use paper, pencil, and construction and measuring tools
or
appropriate geometry technology to complete this problem.

1. Sketch and label quadrilateral ABCD.
2. Draw all possible diagonals for quadrilateral ABCD. In this case there are two diagonals, $\overline{AC}$ and $\overline{BD}$.
3. Create a polygon (in this case a quadrilateral) by connecting the midpoints of the sides of quadrilateral ABCD.
4. Take appropriate measurements, and write a conjecture that relates the perimeter of the midpoint quadrilateral to the diagonals of the original quadrilateral.
5. Repeat steps 1 – 4 to complete the sketch and take measurements on at least two more quadrilaterals that are different from your original quadrilateral.

   If you are working with a group, you may compare your quadrilateral measurements with measurements found by the other group members.

   If you are using geometry technology, you may drag the vertices of the original quadrilateral to generate new quadrilaterals and sets of measurements.

### Problem 2

In the previous task, Conjecture as Discovery and Proof as Explanation, you discovered and proved the triangle midsegment conjecture:

> The midsegment of a triangle is parallel to one side of the triangle and measures half the length of that side.

Since you have proved this conjecture, you can use it to help prove and explain why other conjectures may or may not be true.

Use the triangle midsegment conjecture to write an explanation of why your quadrilateral conjecture is true. Provide a diagram with your explanation.

### Problem 3

Do you think your conjecture will be true for other polygons besides quadrilaterals? Why or why not?

Sketch, measure, and investigate the relationship between a polygon's diagonals and the polygon formed by connecting the midpoints of its sides. Start with a pentagon, then a hexagon, etc.

### Problem 4

Modify your original conjecture (or write new conjectures) to take into account other polygons besides quadrilaterals.