

**MAT 515: Geometry for Teachers**  
Problem Set 8

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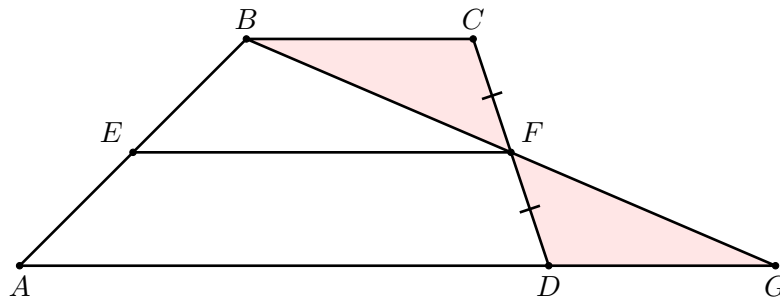
Let us recall **the midline theorem of a triangle**: the line segment connecting the midpoints of two sides of a triangle is parallel to the third side, and is congruent to a half of it.

A quadrilateral which has two opposite sides parallel and the other two opposite sides non-parallel is called a **trapezoid**. The parallel sides of a trapezoid are called its **bases**, and the non-parallel sides its **lateral sides** (or **legs**). The line segment connecting the midpoints of the lateral sides of a trapezoid is called its **midline**.

**Problem 1.** (8 points)

Prove the **midline theorem of a trapezoid**: the midline of a trapezoid is parallel to the bases and is congruent to their semisum.

*Hint.* Suppose  $ABCD$  is a trapezoid and  $AD$  and  $BC$  are its bases. Let  $F$  be the midpoint. Extend  $BF$  towards the line  $AD$ , and use the midline theorem of an appropriate triangle:



**Problem 2.** (7 points) Prove that the midpoints of the sides of any quadrilateral are vertices of a parallelogram.

*Hint:* use the midline theorem.

**Due Date:** Wednesday October 30.