

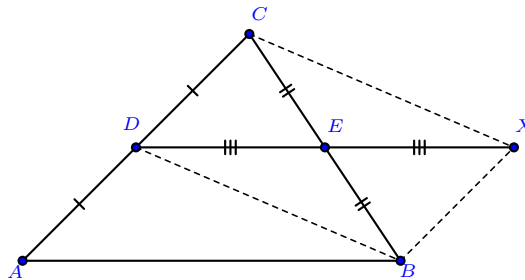
# Midsegment Theorem

*Proofs updated.*

**Theorem 1.** *Midsegment Theorem: The segment joining the midpoints of two sides of a triangle is parallel to and half the length of the third side.*

**Note:** In preparation for the midsegment theorem, the class proved several useful theorems about parallelograms.

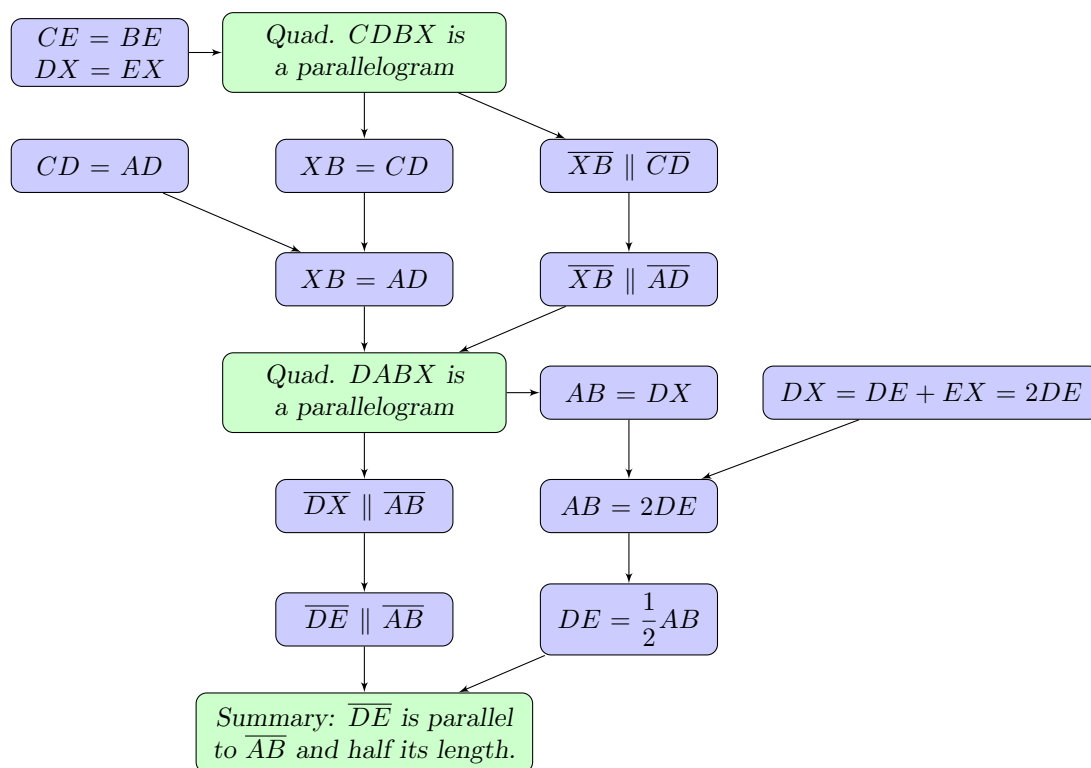
**Problem 1** To prove the midsegment theorem for  $\triangle ABC$  with midpoints  $D$  and  $E$  of sides  $AC$  and  $BC$ , respectively, Mitch extended  $\overline{DE}$  to a point  $X$  such that  $EX = DE$ , as shown in the marked figure. Then he added dotted lines to the figure to show parallelograms.



Mitch organized his reasoning in the following flow chart:

*Fix note: The flowchart omits reasons to reduce clutter. The most significant steps are green whereas the details are blue.*

# Midsegment Theorem



In the proof above, which theorem may Mitch use to conclude that quadrilateral CDBX a parallelogram?

**Multiple Choice:**

- (a) If a pair of sides of a quadrilateral are congruent and parallel, then it is a parallelogram.
- (b) If the diagonals of a quadrilateral bisect each other, then it is a parallelogram. ✓
- (c) If opposite sides of a quadrilateral are congruent, then it is a parallelogram.
- (d) If opposite angles of a quadrilateral are congruent, then it is a parallelogram.
- (e) The Pythagorean Theorem.
- (f) None of these.

In the proof above, which theorem may Mitch use to conclude that quadrilateral DABX a parallelogram?

**Multiple Choice:**

- (a) *If one pair of sides of a quadrilateral are congruent and parallel, then the quadrilateral is a parallelogram. ✓*
  - (b) *If the diagonals of a quadrilateral bisect each other, then it is a parallelogram.*
  - (c) *If opposite sides of a quadrilateral are congruent, then it is a parallelogram.*
  - (d) *If opposite angles of a quadrilateral are congruent, then it is a parallelogram.*
  - (e) *The Pythagorean Theorem.*
  - (f) *None of these.*
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