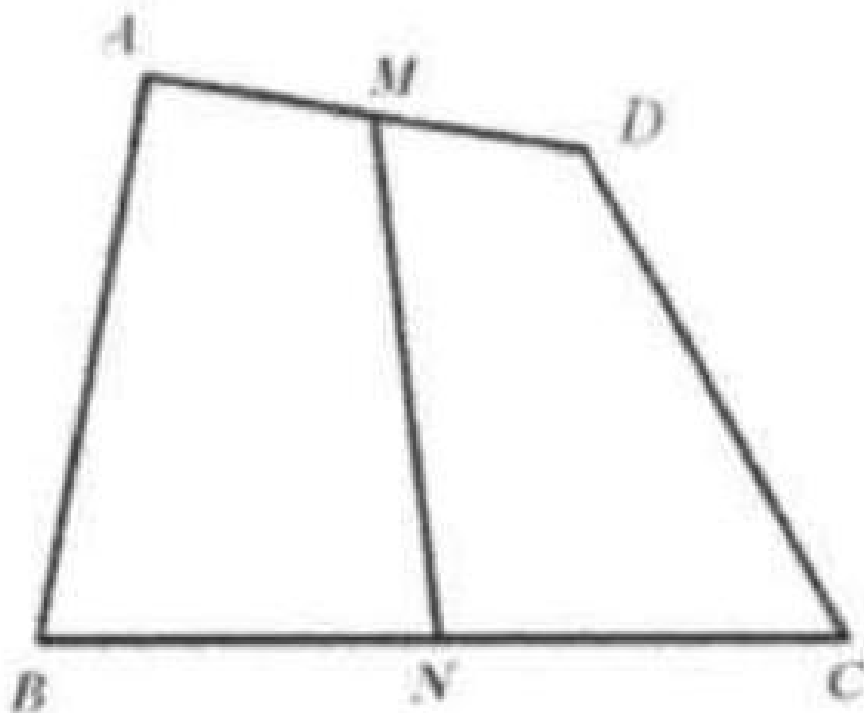# Example 6

$ABCD$ is a convex quadrilateral. $AB = CD \neq AD$. M and N are midpoints of AD, BC, respectively. Connect MN. Which one of the following is true?

(A) $AB = MN$

(B) $AB > MN$

(C) $AB < MN$

(D) All could be true.

Solution: (B).

Connect AC. Take P, the midpoint of AC. Connect PA, PN. Since M and P are midpoints of AD, AC, respectively, by Theorem 2.1,
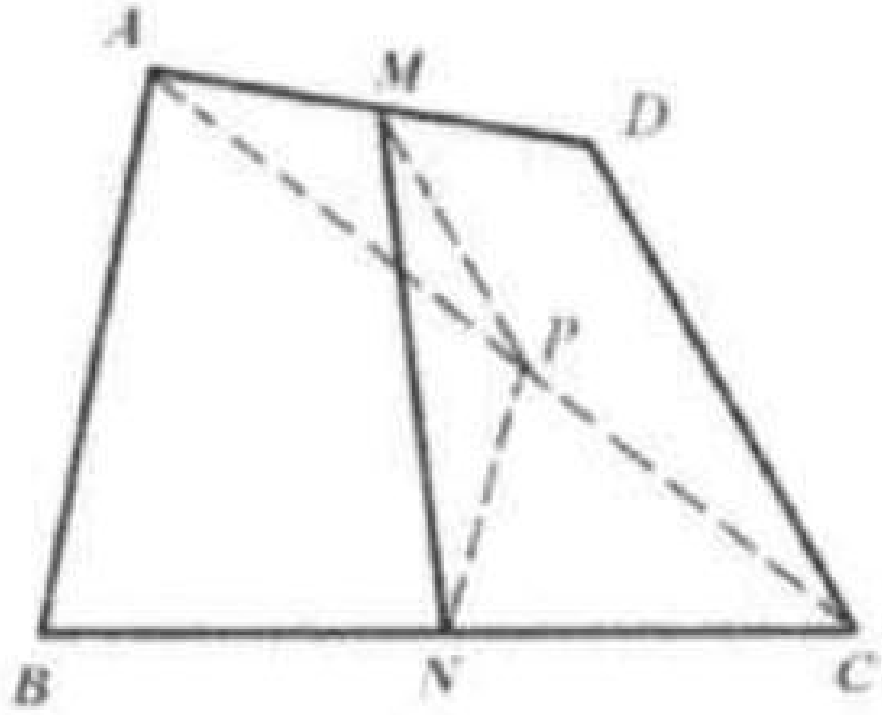
$$MP = \frac{1}{2}DC$$

1

Since N and P are midpoints of BC, AC, respectively, by Theorem 2.1,

$$NP = \frac{1}{2}AB$$

$$(1) + (2) : MP + NP = \frac{1}{2}DC + \frac{1}{2}AB$$

We know that $AB = CD$.

(3) can be written as $MP + NP = AB$
By the triangle inequality theorem, $MP + NP > MN$.
Thus $AB > MN$