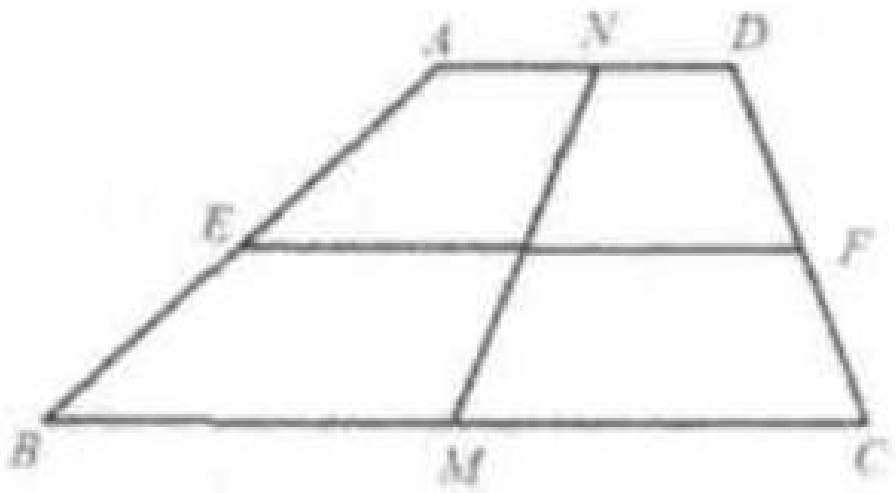
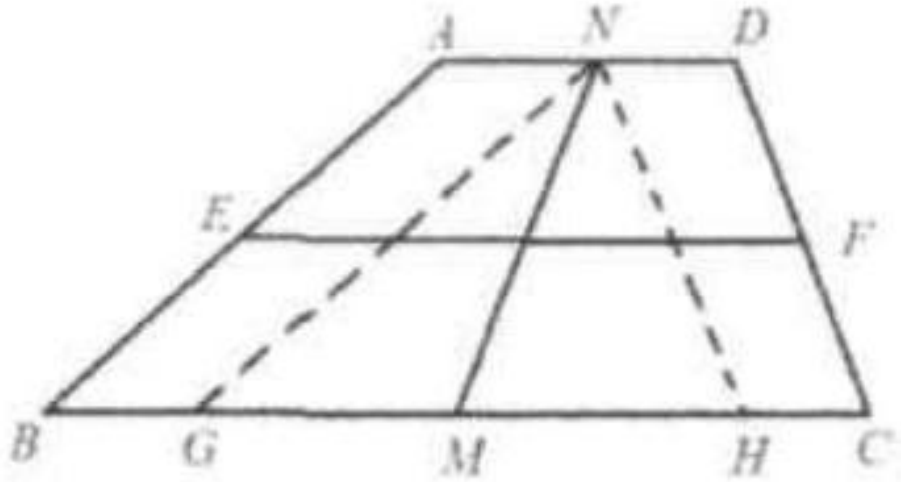
Example 13

(1997 China Middle School Math Contest) In trapezoid $ABCD, \angle B = 30°, \angle C = 60°$. Find EF if $BC = 7, MN = 3$. E, M, F, N are the midpoint of AB, BC, CD, DA, respectively.

(A) 4
(B) $4\frac{1}{2}$ (C) 5
(D) 6



Solution: (A).
Draw $NG//AB$ to meet BC at $G, NH//DC$ to meet BC at H.
So both $ABGN$ and $DCHN$ are parallelograms.
Since $\angle B + \angle C = 90°, \angle NGH + \angle NHG = 90°$.



Since $BG = AN = ND = HC, BM = MC$. So $GM = MH$.
In right triangle $GNH, GH = 2MN = 6$.
So $AD = BC - GH = 1$.
Thus $EF = \frac{1}{2}(AD + BC) = 4$.
The answer is (A).