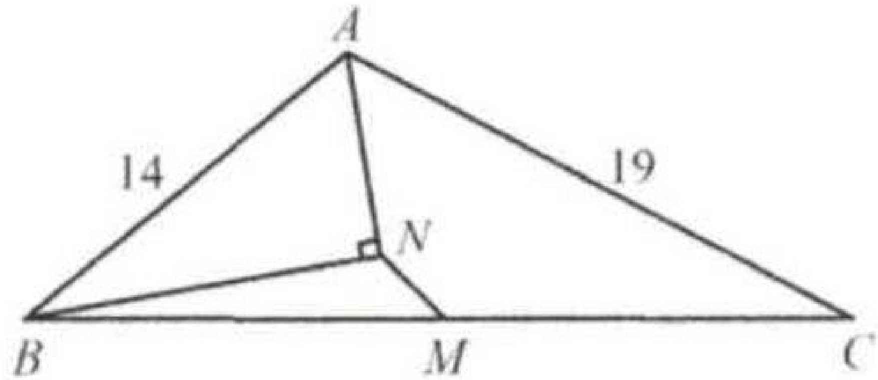
# Problem 2

## Problem

(AMC) In $\triangle ABC, M$ is the midpoint of side $BC, AN$ bisects $\angle BAC$, $BN \perp AN$ and $\theta$ is the measure of $\angle BAC$. If sides $AB$ and $AC$ have lengths 14 and 19 , respectively, then length $MN$ equals

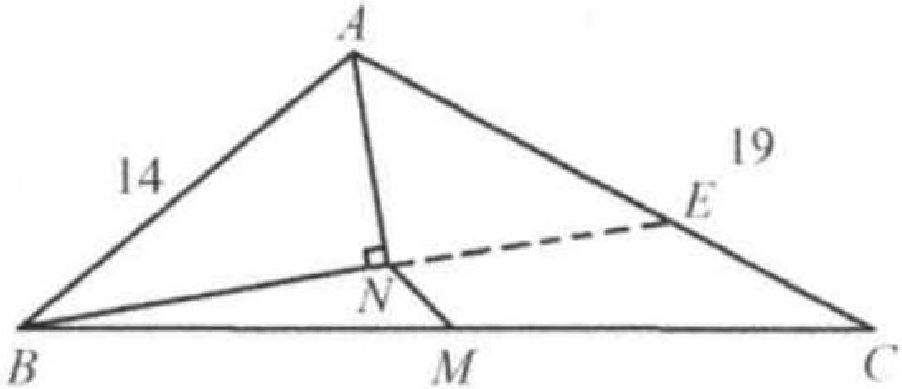
(A) 2
(B) $\frac{5}{2}$
(C) $\frac{5}{2}-\sin\theta$
(D) $\frac{5}{2}-\frac{1}{2}\sin\theta$
(E) $\frac{5}{2}-\frac{1}{2}\sin\left(\frac{\theta}{2}\right)$




## Solution

(B). In the adjoining figure, $BN$ is extended past $N$ and meets $AC$ at $E$. Triangle $BNA$ is congruent to $\triangle ENA$, since $\angle BAN = \angle EAN, AN = AN$ and $\angle ANB = \angle ANE = 90°$.

Therefore $N$ is the midpoint of $BE$, and $AB = AE = 14$. Thus $EC = 5$. Since $MN$ is the line joining the midpoints of sides $BC$ and $BE$ of $\triangle CBE$, its length




is $\frac{1}{2}EC = \frac{5}{2}$.