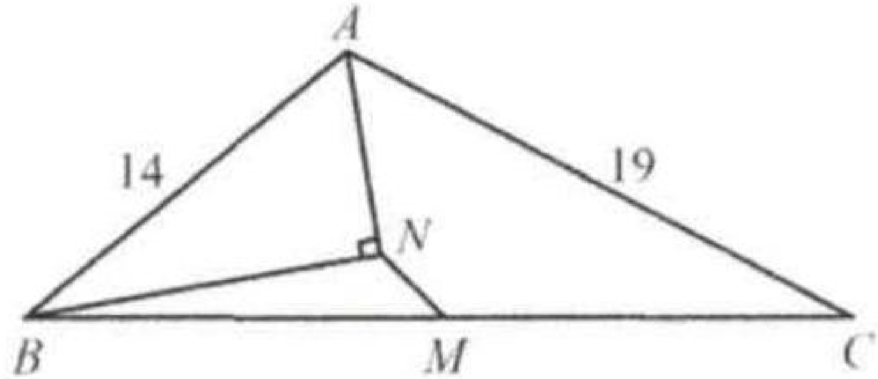
Problem

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

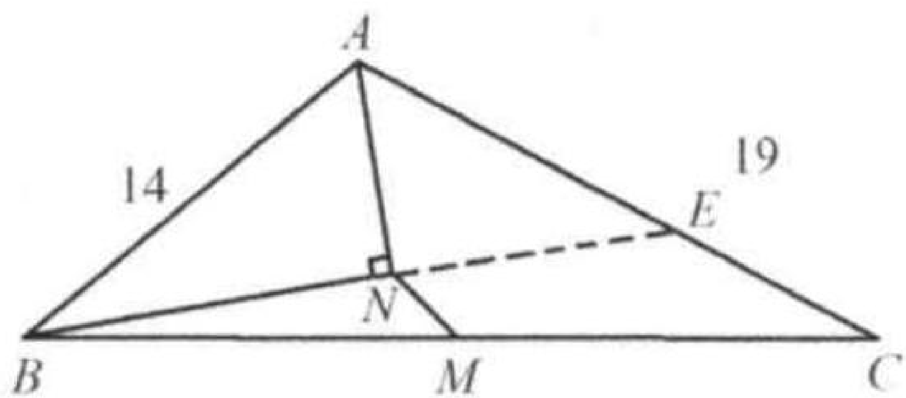
(A) 2
(B) $\frac{5}{2}$
(C) $\frac{5}{2}-\sin\theta$
(D) $\frac{5}{2}-\frac{1}{2}\sin\theta$
(E) $\frac{5}{2}-\frac{1}{2}\sin\left(\frac{\theta}{2}\right)$



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