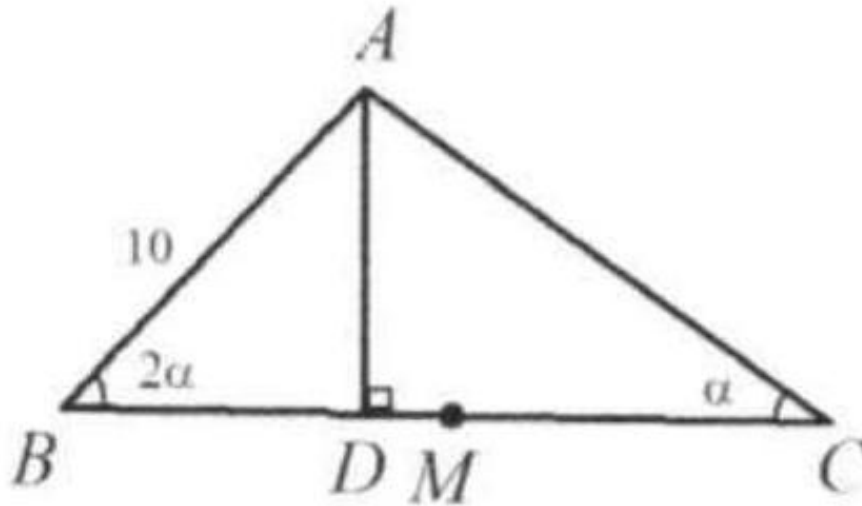


## Problem 9

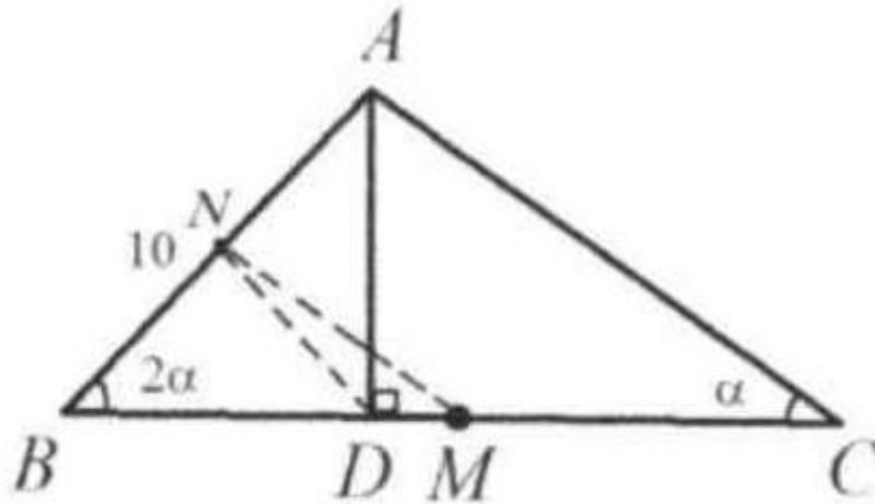
### Problem

In  $\triangle ABC$ ,  $\angle B = 2\angle C$ .  $AD \perp BC$ .  $M$  is the midpoint of  $BC$ .  $AB$  is 10 cm .  
Find the length of  $MD$ .



### Solution

5 cm . Take  $N$ , the midpoint of  $AB$ . Connect  $DN, MN$ .  $DN$  is the median of right triangle  $ABD$ . So  $DN = \frac{1}{2}AB = 10/2 = 5$ ,  $\angle NDB = \angle B = 2\alpha$ .



$MN$  is the midline of  $\triangle BAC$ . So  $MN \parallel AC$ . Thus

$$\angle NMB = \angle NMD = \angle C = \alpha.$$

We know that  $\angle NDB$  is the exterior angle of  $\triangle NDM$ . So

$$\angle NDB = \angle MND + \angle NMD = \angle MND + \alpha, \text{ or}$$

$$\angle MND + \alpha = 2\alpha \Rightarrow \angle MND = \alpha.$$

$\triangle NMD$  is an isosceles triangle with  $ND = MD = 5$ .