

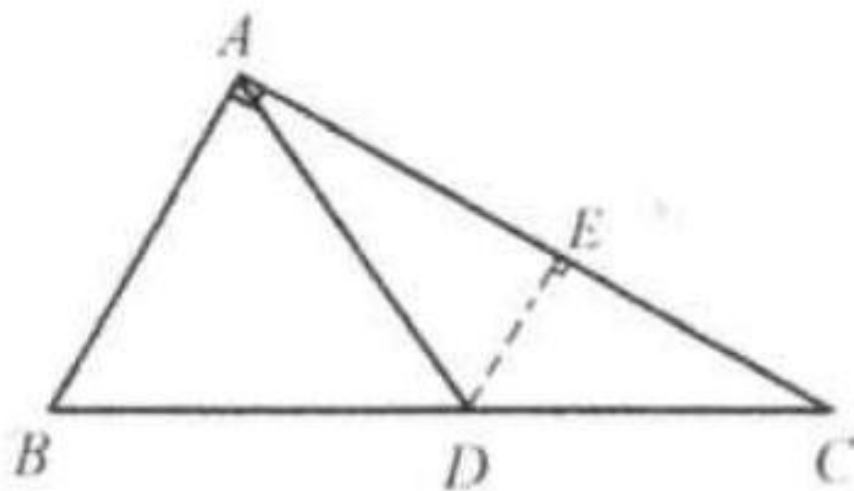
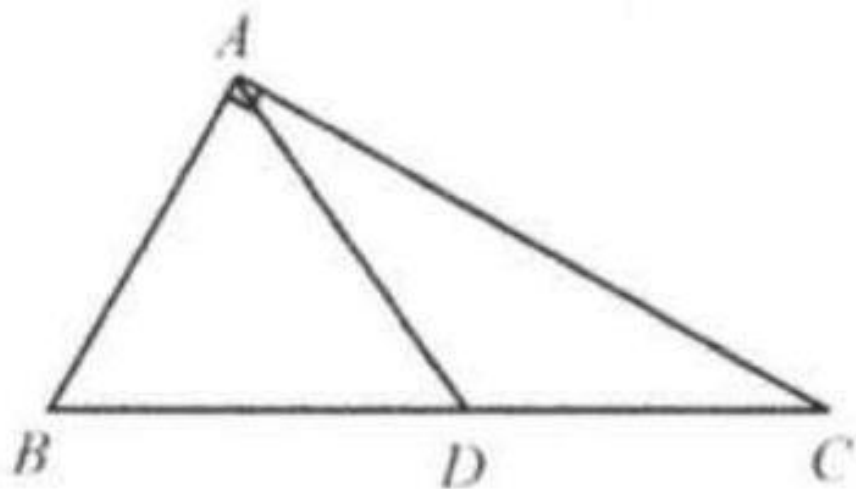
## Example 15

The measures of the sides of a right triangle are 60, 80, and 100. Find the measure of a line segment, drawn from the vertex of the right angle to the hypotenuse, that divides the triangle into two triangles of equal perimeters.

Solution: Let  $AB = 60$ ,  $AC = 80$ , and  $BC = 100$ . If  $\triangle ABD$  is to have the same perimeter as  $\triangle ACD$ , then  $AB + BD$  must equal  $AC + DC$ , since both triangles share  $AD$ ; that is,  $60 + BD = 80 + 100 - BD$ . Therefore,  $BD = 60$  and  $DC = 40$ .

Draw  $DE$  perpendicular to  $AC$ .

Right  $\triangle EDC \sim$  right  $\triangle ABC$ ; therefore,  $\frac{ED}{AB} = \frac{DC}{BC}$ .



By substituting the appropriate values, we have  $\frac{ED}{60} = \frac{40}{100}$ , and  $ED = 24$ .  
 By the Pythagorean Theorem, for  $\triangle EDC$ , we find  $EC = 32$ ; then, by subtraction,  $AE = 48$ . Again, using the Pythagorean Theorem, in  $\triangle AED$ ,  $AD = 24\sqrt{5}$ .