

Exercise 4.5

1. In fig. 4.136, $\Delta ACB \sim \Delta APQ$. If $BC = 8$ cm, $PQ = 4$ cm, $BA = 6.5$ cm and $AP = 2.8$ cm, find CA and AQ .

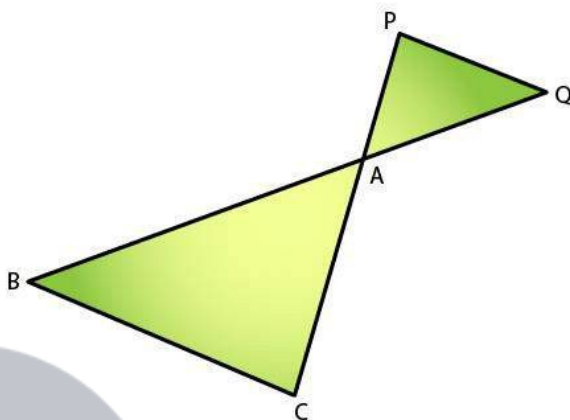
Solution:

Given,

$$\Delta ACB \sim \Delta APQ$$

$$BC = 8 \text{ cm, } PQ = 4 \text{ cm, } BA = 6.5 \text{ cm and } AP = 2.8 \text{ cm}$$

Required to find: CA and AQ



We know that,

$$\Delta ACB \sim \Delta APQ \quad [\text{given}]$$

$$BA / AQ = CA / AP = BC / PQ$$

So,

$$6.5 / AQ = 8 / 4$$

$$AQ = (6.5 \times 4) / 8$$

$$AQ = 3.25 \text{ cm}$$

Similarly, as

$$CA / AP = BC / PQ$$

$$CA / 2.8 = 8 / 4$$

$$CA = 2.8 \times 2$$

$$CA = 5.6 \text{ cm}$$

Hence, $CA = 5.6$ cm and $AQ = 3.25$ cm.

2. In fig.4.137, $AB \parallel QR$, find the length of PB .

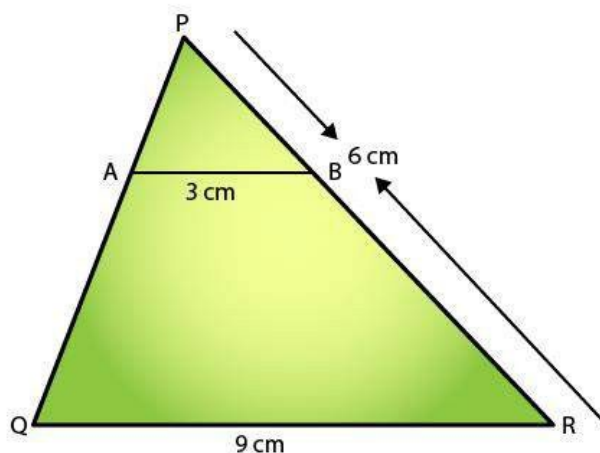
Solution:

Given,

$$\Delta PQR, AB \parallel QR \text{ and}$$

$$AB = 3 \text{ cm, } QR = 9 \text{ cm and } PR = 6 \text{ cm}$$

Required to find: PB



In $\triangle PAB$ and $\triangle PQR$

We have,

$$\angle P = \angle P$$

$$\angle PAB = \angle PQR$$

$$\Rightarrow \triangle PAB \sim \triangle PQR$$

[Common]

[Corresponding angles as $AB \parallel QR$ with PQ as the transversal]

[By AA similarity criteria]

Hence,

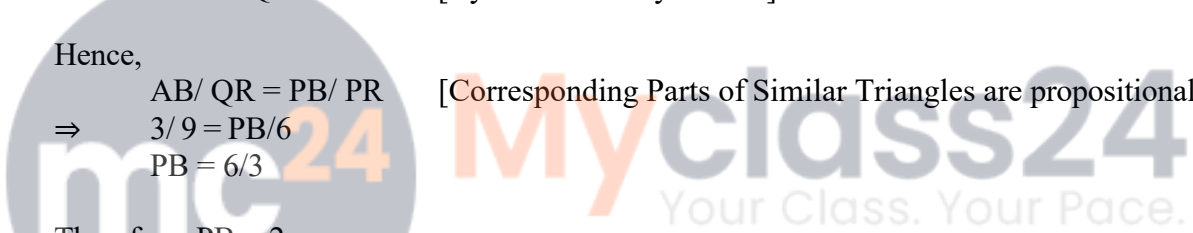
$$\frac{AB}{QR} = \frac{PB}{PR}$$

$$\Rightarrow \frac{3}{9} = \frac{PB}{6}$$

$$PB = \frac{6 \times 3}{9}$$

$$\text{Therefore, } PB = 2 \text{ cm}$$

[Corresponding Parts of Similar Triangles are proportional]



3. In fig. 4.138 given, $XY \parallel BC$. Find the length of XY .

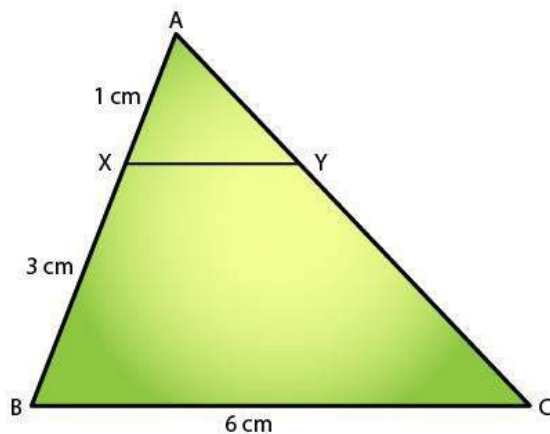
Solution:

Given,

$$XY \parallel BC$$

$$AX = 1 \text{ cm, } XB = 3 \text{ cm and } BC = 6 \text{ cm}$$

Required to find: XY



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In $\triangle AXY$ and $\triangle ABC$

We have,

$$\angle A = \angle A$$

[Common]

$$\angle AXY = \angle ABC$$

[Corresponding angles as $AB \parallel QR$ with PQ as the transversal]

$$\Rightarrow \triangle AXY \sim \triangle ABC$$

[By AA similarity criteria]

Hence,

$$XY/BC = AX/AB \quad [\text{Corresponding Parts of Similar Triangles are proportional}]$$

We know that,

$$(AB = AX + XB = 1 + 3 = 4)$$

$$XY/6 = 1/4$$

$$XY/1 = 6/4$$

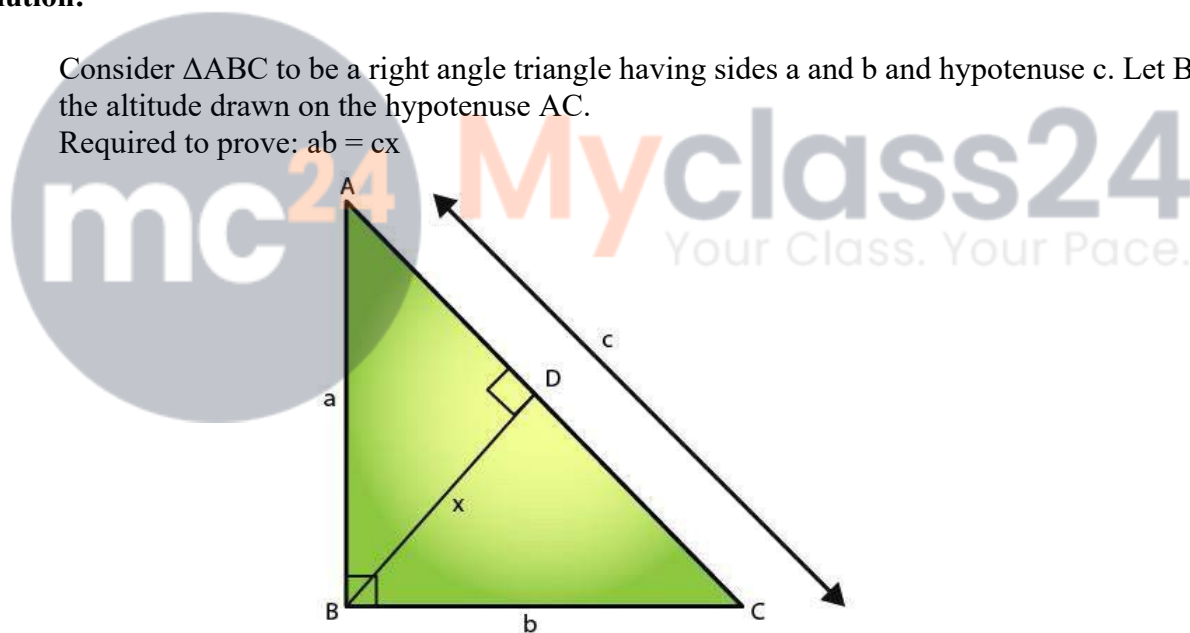
Therefore, $XY = 1.5$ cm

4. In a right-angled triangle with sides a and b and hypotenuse c , the altitude drawn on the hypotenuse is x . Prove that $ab = cx$.

Solution:

Consider $\triangle ABC$ to be a right angle triangle having sides a and b and hypotenuse c . Let BD be the altitude drawn on the hypotenuse AC .

Required to prove: $ab = cx$



We know that,

In $\triangle ACB$ and $\triangle CDB$

$$\angle B = \angle B$$

[Common]

$$\angle ACB = \angle CDB = 90^\circ$$

$$\Rightarrow \triangle ACB \sim \triangle CDB$$

[By AA similarity criteria]

Hence,

$$AB/BD = AC/BC$$

[Corresponding Parts of Similar Triangles are proportional]

$$a/x = c/b$$

$$\Rightarrow xc = ab$$

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Therefore, $ab = cx$

5. In fig. 4.139, $\angle ABC = 90^\circ$ and $BD \perp AC$. If $BD = 8$ cm, and $AD = 4$ cm, find CD .

Solution:

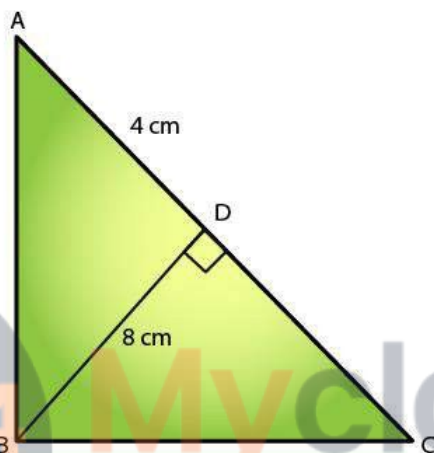
Given,

$\angle ABC = 90^\circ$ and $BD \perp AC$

$BD = 8$ cm

$AD = 4$ cm

Required to find: CD .



We know that,

ABC is a right angled triangle and $BD \perp AC$.

Then, $\triangle DBA \sim \triangle DCB$

[By AA similarity]

$BD/CD = AD/BD$

$BD^2 = AD \times DC$

$(8)^2 = 4 \times DC$

$DC = 64/4 = 16$ cm

Therefore, $CD = 16$ cm

6. In fig.4.140, $\angle ABC = 90^\circ$ and $BD \perp AC$. If $AC = 5.7$ cm, $BD = 3.8$ cm and $CD = 5.4$ cm, Find BC .

Solution:

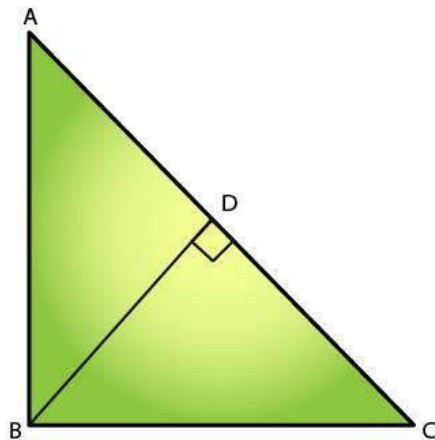
Given:

$BD \perp AC$

$AC = 5.7$ cm, $BD = 3.8$ cm and $CD = 5.4$ cm

$\angle ABC = 90^\circ$

Required to find: BC



We know that,

$$\triangle ABC \sim \triangle BDC \quad [\text{By AA similarity}]$$

$$\angle BCA = \angle DCA = 90^\circ$$

$$\angle ABC = \angle CBD \quad [\text{Common}]$$

Thus,

$$\frac{AB}{BD} = \frac{BC}{CD} \quad [\text{Corresponding Parts of Similar Triangles are proportional}]$$

$$\frac{5.7}{3.8} = \frac{BC}{5.4}$$

$$BC = \frac{(5.7 \times 5.4)}{3.8} = 8.1$$

Therefore, $BC = 8.1$ cm

7. In the fig.4.141 given, $DE \parallel BC$ such that $AE = \frac{1}{4}AC$. If $AB = 6$ cm, find AD .

Solution:

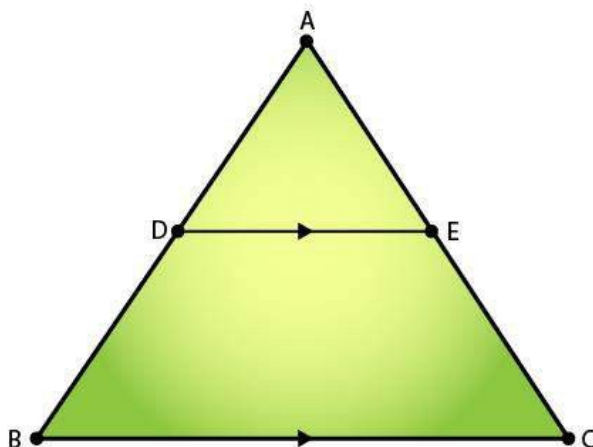
Given:

$$DE \parallel BC$$

$$AE = \frac{1}{4}AC$$

$$AB = 6 \text{ cm.}$$

Required to find: AD .



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In $\triangle ADE$ and $\triangle ABC$

We have,

$$\angle A = \angle A$$

$$\angle ADE = \angle ABC$$

$$\Rightarrow \triangle ADE \sim \triangle ABC$$

[Common]

[Corresponding angles as $AB \parallel QR$ with PQ as the transversal]

[By AA similarity criteria]

Then,

$$\frac{AD}{AB} = \frac{AE}{AC} \quad [\text{Corresponding Parts of Similar Triangles are proportional}]$$

$$\frac{AD}{6} = \frac{1}{4}$$

$$4 \times AD = 6$$

$$AD = \frac{6}{4}$$

Therefore, $AD = 1.5$ cm

8. In the fig.4.142 given, if $AB \perp BC$, $DC \perp BC$, and $DE \perp AC$, prove that $\triangle CED \sim \triangle ABC$

Solution:

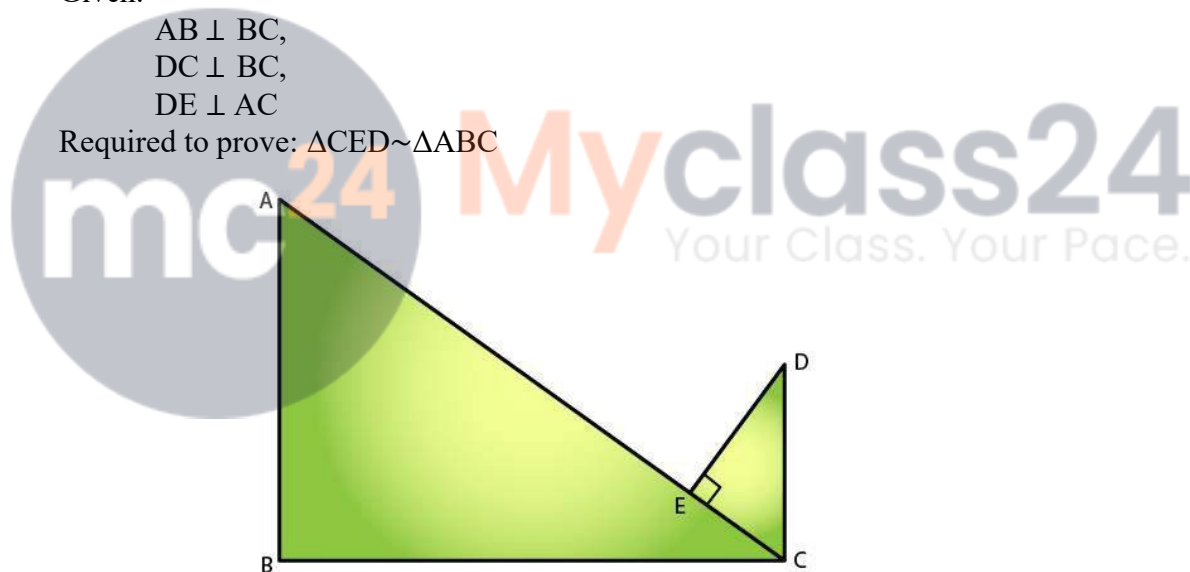
Given:

$$AB \perp BC,$$

$$DC \perp BC,$$

$$DE \perp AC$$

Required to prove: $\triangle CED \sim \triangle ABC$



We know that,

From $\triangle ABC$ and $\triangle CED$

$$\angle B = \angle E = 90^\circ \quad [\text{given}]$$

$$\angle BAC = \angle ECD \quad [\text{alternate angles since, } AB \parallel CD \text{ with } BC \text{ as transversal}]$$

Therefore, $\triangle CED \sim \triangle ABC$ [AA similarity]

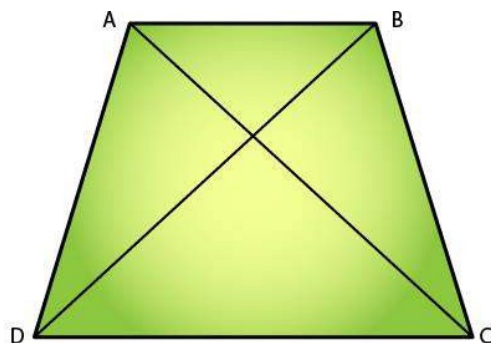
9. Diagonals AC and BD of a trapezium ABCD with $AB \parallel DC$ intersect each other at the point O. Using similarity criterion for two triangles, show that $OA/OC = OB/OD$

Solution:

Given: OC is the point of intersection of AC and BD in the trapezium ABCD, with $AB \parallel DC$.

Required to prove: $OA/OC = OB/OD$

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We know that,

In $\triangle AOB$ and $\triangle COD$

$$\angle AOB = \angle COD$$

[Vertically Opposite Angles]

$$\angle OAB = \angle OCD$$

[Alternate angles]

Then, $\triangle AOB \sim \triangle COD$

Therefore, $OA/OC = OB/OD$

[Corresponding sides are proportional]

10. If $\triangle ABC$ and $\triangle AMP$ are two right triangles, right angled at B and M, respectively such that $\angle MAP = \angle BAC$. Prove that

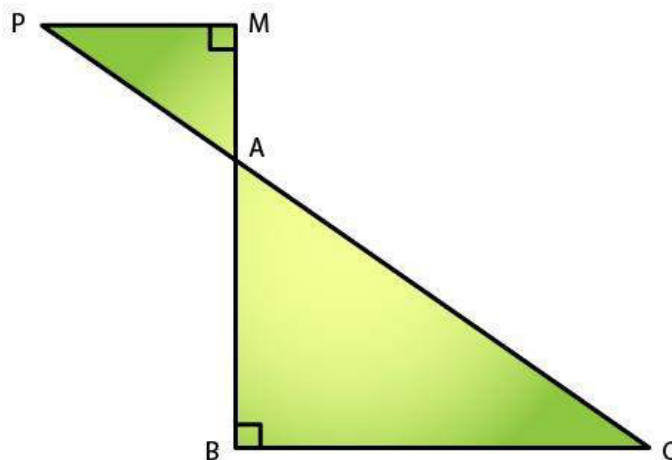
(i) $\triangle ABC \sim \triangle AMP$

(ii) $CA/PA = BC/MP$

Solution:

(i) Given:

$\triangle ABC$ and $\triangle AMP$ are the two right triangles.



We know that,

$$\angle AMP = \angle B = 90^\circ$$

$$\angle MAP = \angle BAC$$

[Vertically Opposite Angles]

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$\Rightarrow \triangle ABC \sim \triangle AMP$ [AA similarity]

(ii) Since, $\triangle ABC \sim \triangle AMP$
 $CA/PA = BC/MP$ [Corresponding sides are proportional]
 Hence proved.

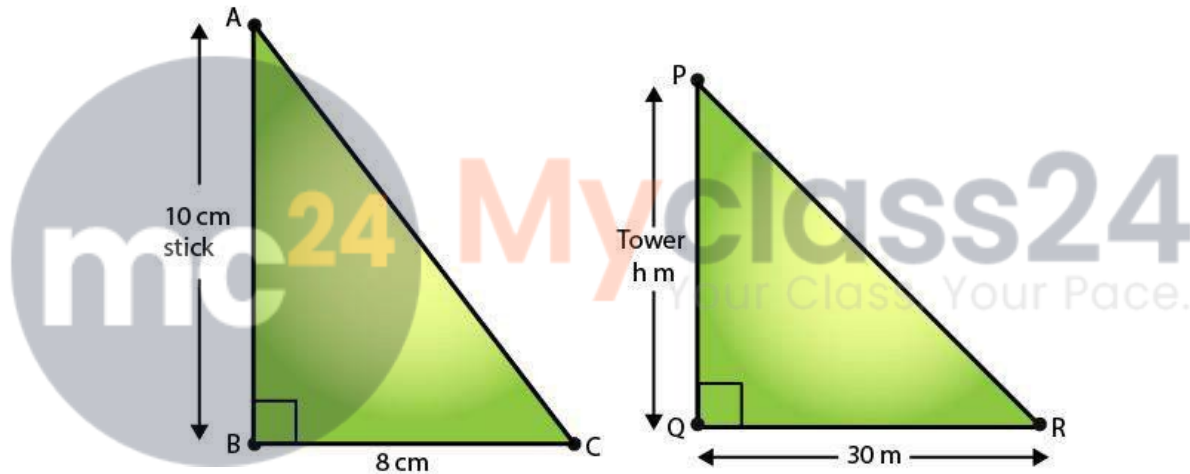
11. A vertical stick 10 cm long casts a shadow 8 cm long. At the same time, a tower casts a shadow 30 m long. Determine the height of the tower.

Solution:

Given:

- Length of stick = 10cm
- Length of the stick's shadow = 8cm
- Length of the tower's shadow = 30m = 3000cm

Required to find: the height of the tower = PQ.



In $\triangle ABC \sim \triangle PQR$
 $\angle ABC = \angle PQR = 90^\circ$
 $\angle ACB = \angle PRQ$ [Angular Elevation of Sun is same for a particular instant of time]
 $\Rightarrow \triangle ABC \sim \triangle PQR$ [By AA similarity]

So, we have

$AB/BC = PQ/QR$ [Corresponding sides are proportional]
 $10/8 = PQ/3000$
 $PQ = (3000 \times 10)/8$
 $PQ = 30000/8$
 $PQ = 3750/100$

Therefore, $PQ = 37.5$ m

12. In fig.4.143, $\angle A = \angle CED$, prove that $\triangle CAB \sim \triangle CED$. Also find the value of x.

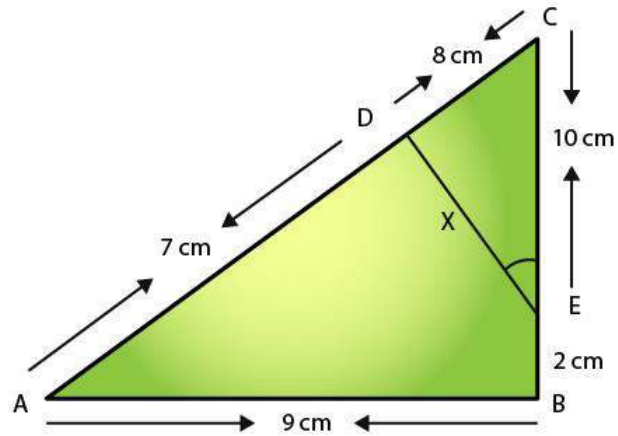
Solution:

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Given:

$$\angle A = \angle CED$$

Required to prove: $\triangle CAB \sim \triangle CED$



In $\triangle CAB \sim \triangle CED$

$$\angle C = \angle C$$

$$\angle A = \angle CED$$

$\Rightarrow \triangle CAB \sim \triangle CED$

Hence, we have

$$CA/CE = AB/ED$$

$$15/10 = 9/x$$

$$x = (9 \times 10)/15$$

Therefore, $x = 6$ cm

[Common]

[Given]

[By AA similarity]

[Corresponding sides are proportional]

