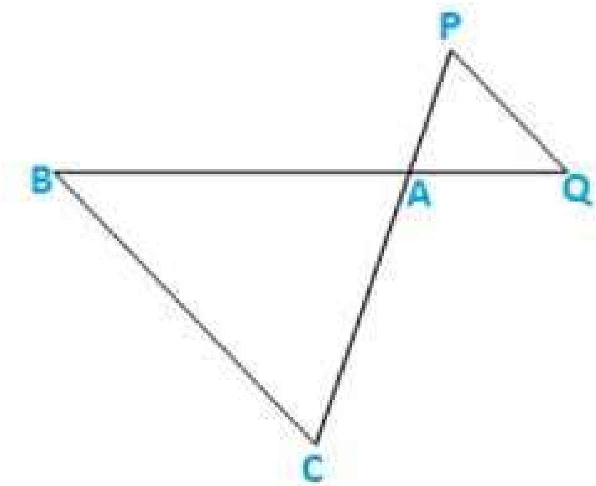
Q1: In fig. given below $\Delta ACB \sim \Delta APQ$. If BC = 8 cm, PQ = 4 cm, BA = 6.5 cm, and AP = 2.8 cm find CA and AQ.



Sol: Given,

$\Delta ACB \sim \Delta APQ$

BC = 8 cm, PQ = 4 cm, BA = 6.5 cm, and AP = 2.8 cm

We need to find CA and AQ

Since, $\Delta ACB \sim \Delta APQ$

$\frac{BA}{AQ} = \frac{CA}{AP} = \frac{BC}{PQ}$

Therefore, $\frac{6.5}{AQ} = \frac{8}{4}$

AQ = $\frac{6.5x4}{8}$

AQ = 3.25 cm

Similarly, $\frac{CA}{AP} = \frac{BC}{PQ}$

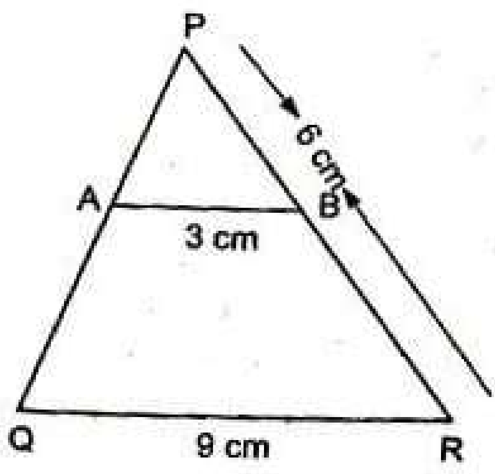
$\frac{CA}{2.8} = \frac{8}{4}$

CA = 2.8 x 2

CA = 5.6 cm

Therefore, **CA = 5.6 cm and AQ = 3.25 cm.**

Q2: In fig. given, $AB \parallel QR$, find the length of PB.



Sol: Given,

$AB \parallel PB$

AB = 3 cm, QR = 9 cm and PR = 6 cm

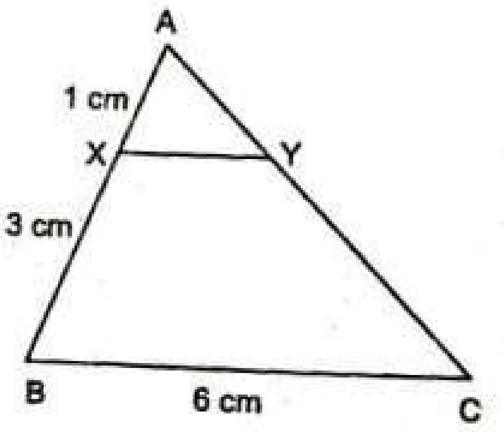
We need to find out PB,

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

i.e., $\frac{3}{9} = \frac{PB}{6}$

PB = 2 cm

Q3.) In fig. given, $XY \parallel BC$. Find the length of XY.



Sol: Given,

XY ∥BC $XY \parallel BC$

AX = 1 cm, XB = 3 cm, and BC = 6 cm

We need to find XY,

Since, ΔAXY ~ΔABC $\Delta AXY \sim \Delta ABC$

XY BC = AXAB $\frac{XY}{BC} = \frac{AX}{AB}$ (AB = AX + XB = 4)

XY 6 = 14 $\frac{XY}{6} = \frac{1}{4}$ XY 1 = 64 $\frac{XY}{1} = \frac{6}{4}$

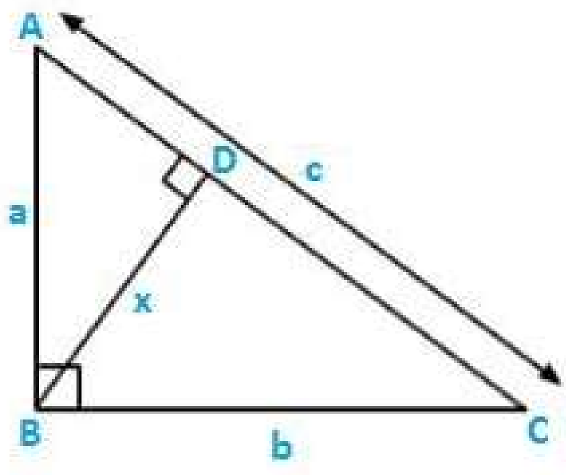
XY = 1.5 cm

Q4: 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.

Sol:

Let the ΔABC ΔABC be a right angle triangle having sides a and b and hypotenuse c. BD is the altitude drawn on the hypotenuse AC

We need to prove ab = cx



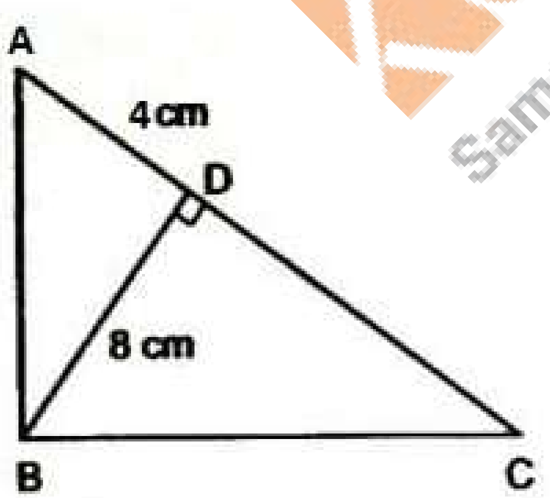
Since, the altitude is perpendicular on the hypotenuse, both the triangles are similar

ABBD = ACBC $\frac{AB}{BD} = \frac{AC}{BC}$ ax = cb $\frac{a}{x} = \frac{c}{b}$

xc = ab

∴ ab = cx

Q5) In fig. given, ∠ABC$\angle ABC$ = 90 and BD⊥AC$BD \perp AC$. If BD = 8 cm, and AD = 4 cm, find CD.



Sol:

Given,

$\angle ABC = 90$ and $BD \perp AC$
When , BD = 8 cm, AD = 4 cm, we need to find CD.

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

So, $\Delta DBA \sim \Delta DCB$ (A-A similarity)

$\frac{BD}{CD} = \frac{AD}{BD}$

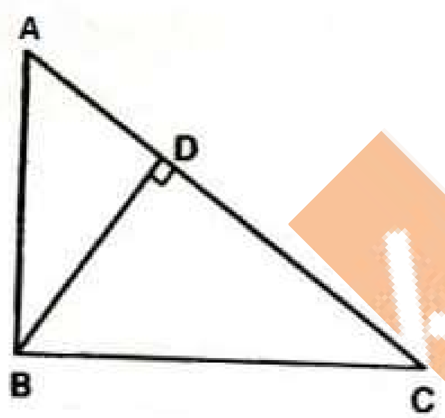
BD^2 = AD x DC

$(8)^2$ = 4 x DC

DC = 64/4 = 16 cm

∴ CD = 16 cm

Q6) In fig. given, $\angle ABC = 90$ and $BD \perp AC$. If AC = 5.7 cm, BD = 3.8 cm and CD = 5.4 cm, Find BC.



Sol:

Given: $BD \perp AC$. AC = 5.7 cm, BD = 3.8 cm and CD = 5.4 cm, and $\angle ABC = 90$.

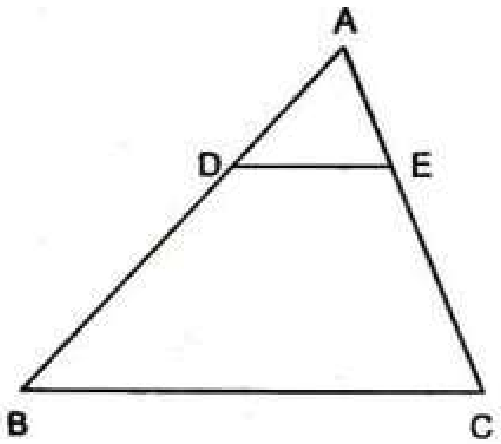
We need to find BC,

Since, $\Delta ABC \sim \Delta BDC$

$\frac{AB}{BD} = \frac{BC}{CD}$ $\frac{5.7}{3.8} = \frac{BC}{5.4}$ $\frac{BC}{1} = \frac{5.7 x 5.4}{3.8}$

BC = 8.1 cm

Q7) In the fig. given, DE∥BC$DE \parallel BC$ such that AE = (1/4)AC. If AB = 6 cm, find AD.



Sol:

Given, DE∥BC$DE \parallel BC$ and AE = (1/4)AC and AB = 6 cm.

We need to find AD.
Since, ΔADE~ΔABC$\Delta ADE \sim \Delta ABC$

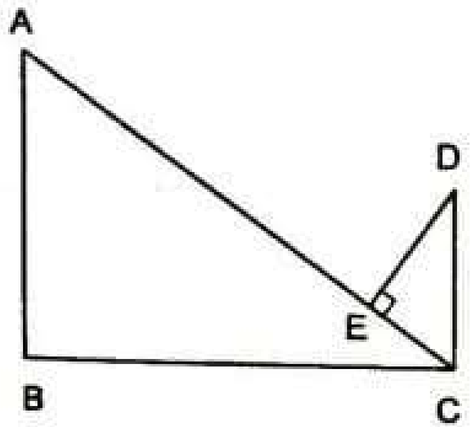
ADAB=AEAC $\frac{AD}{AB} = \frac{AE}{AC}$ AD6=14 $\frac{AD}{6} = \frac{1}{4}$

4 x AD = 6

AD = 6/4

AD = 1.5 cm

Q.8) In the fig. given, if AB⊥BC$AB \perp BC$, DC⊥BC$DC \perp BC$, and DE⊥AC$DE \perp AC$, prove that ΔCED~ΔABC$\Delta CED \sim \Delta ABC$



Sol:

Given, $AB \perp BC$, $DC \perp BC$, and $DE \perp AC$

We need to prove that $\Delta CED \sim \Delta ABC$

Now,

In Δ ABC and Δ CED

$\angle B$ = $\angle E$ = 90 (given)

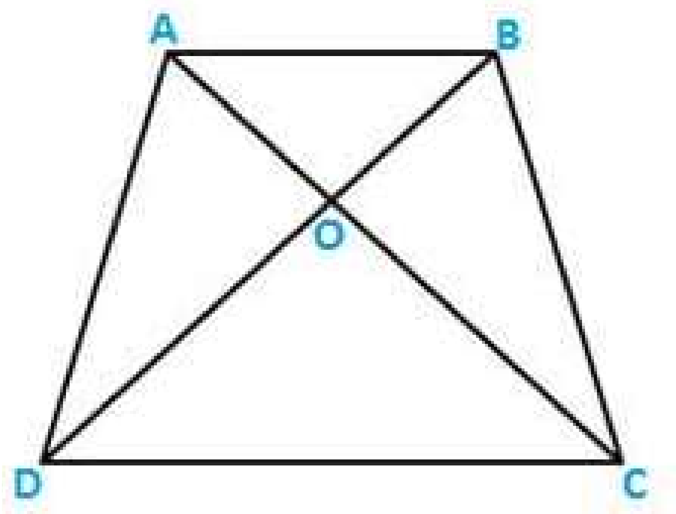
$\angle A$ = $\angle ECD$ (alternate angles)

So, $\mathbf{\Delta CED \sim \Delta ABC}$ (A-A similarity)

Q.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 $\frac{OA}{OC} = \frac{OB}{OD}$

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

We need to prove $\frac{OA}{OC} = \frac{OB}{OD}$



Now, in Δ AOB and Δ COD

$\angle AOB = \angle COD$ (VOA)

$\angle OAB = \angle OCD$ (alternate angles)

Therefore, $\Delta AOB \sim \Delta COD$

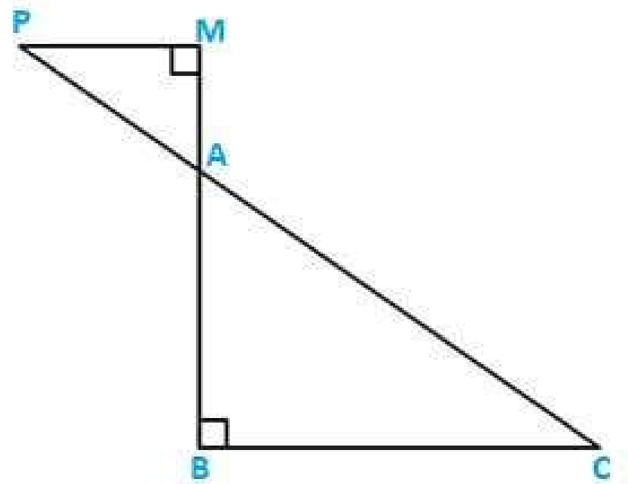
Therefore, $\frac{OA}{OC} = \frac{OB}{OD}$ (corresponding sides are proportional)

Q.10) If Δ ABC and Δ AMP are two right angled triangles, at angle B and M, repec. Such that $\angle MAP = \angle BAC$. Prove that :

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

(ii) $\frac{CA}{PA} = \frac{BC}{MP}$

Sol:



(i) Given $\Delta\Delta$ ABC and $\Delta\Delta$ AMP are the two right angled triangle.

$\angle MAP \angle MAP$ = $\angle BAC \angle BAC$ (given)

$\angle AMP \angle AMP$ = $\angle B \angle B$ = 90

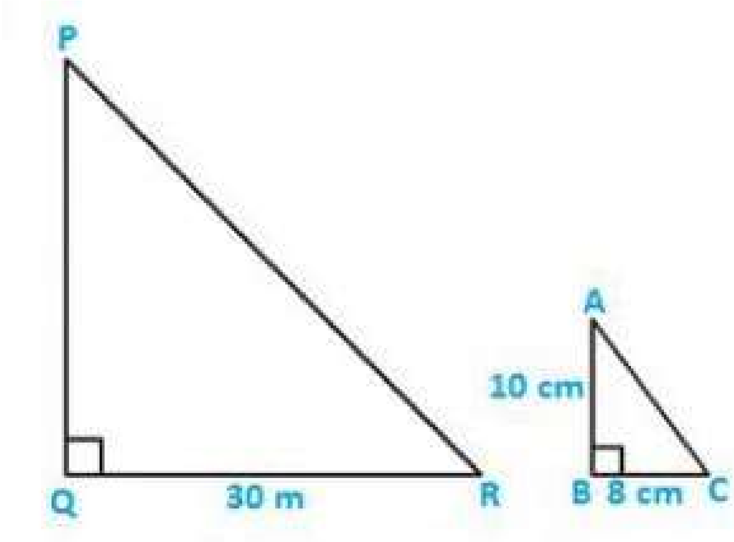
$\mathbf{\Delta ABC \sim \Delta AMP}\ \Delta ABC \sim \Delta AMP$ (A-A similarity)

(ii) $\Delta\Delta$ ABC – $\Delta\Delta$ AMP

So, **CAPA=BCMP** $\frac{CA}{PA} = \frac{BC}{MP}$ (corresponding sides are proportional)

Q.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.

Soln.: We need to find the height of PQ.



Now, $\Delta ABC \sim \Delta PQR$ (A-A similarity)

$\frac{AB}{BC} = \frac{PQ}{QR}$ $\frac{10}{8} = \frac{PQ}{3000}$

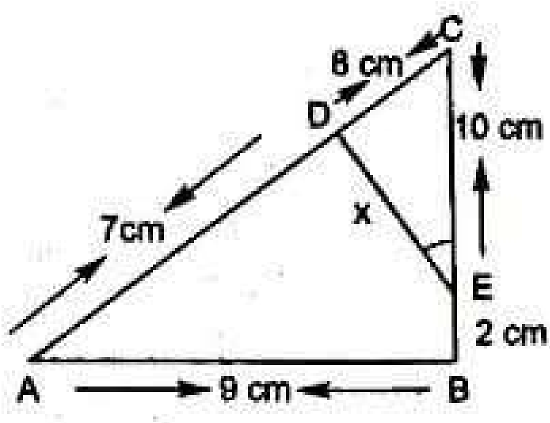
PQ = $\frac{3000 \times 10}{8}$

PQ = $\frac{30000}{8}$

PQ = $\frac{3750}{100}$

PQ = 37.5 m

Q.12) in fig. given, $\angle A = \angle CED$, prove that $\Delta CAB \sim \Delta CED$. Also find the value of x.



Sol:

Comparing $\Delta \text{and} CAB \Delta CED$

$\frac{CA}{CE} = \frac{AB}{ED}$ (similar triangles have corresponding sides in the same proportions)

$\frac{15}{10} = \frac{9}{x}$ $\frac{x}{1} = \frac{9x10}{15}$

x = 6 cm

Q13) The perimeters of two similar triangles are 25 cm and 15 cm, respect. If one side of the first triangle is 9 cm, what is the corresponding side of the other triangle?

Sol:

Given perimeter of two similar triangles are 25 cm, 15 cm and one side 9 cm

We need to find the other side.

Let the corresponding side of other triangle be x cm

Since ratio of perimeter = ratio of corresponding side

$\frac{25}{15} = \frac{9}{x}$

25 x X = 9 x 15

X = 135/25

X = 5.4 cm

Q14) In $\Delta ABC \text{and} \Delta DEF$, it is being given that AB = 5 cm, BC = 4 cm, CA = 4.2 cm, DE = 10 cm, EF = 8 cm, and FD = 8.4 cm. If $AL \perp BC$, $DM \perp EF$, find AL : Dm.

Sol:

Given AB = 5 cm, BC = 4 cm, CA = 4.2 cm, DE = 10 cm, EF = 8 cm, and FD = 8.4 cm

We need to find AL : DM

Since, both triangles are similar,

$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = \frac{1}{2}$

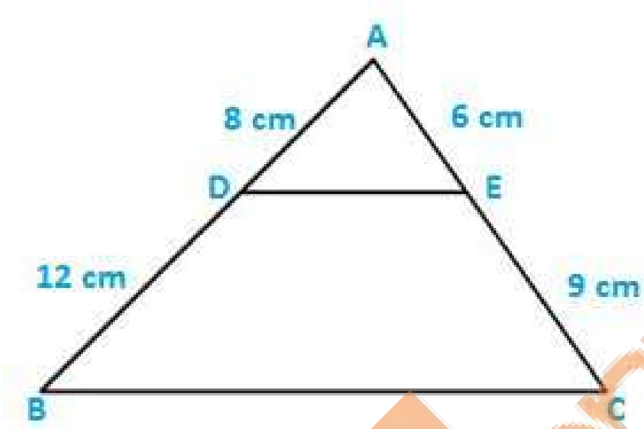
Here, we use the result that in similar triangle the ratio of corresponding altitude is same as the ratio of the corresponding sides.

Therefore, **AL : DM = 1 : 2**

Q.15) D and E are the points on the sides AB and AC respectively, of a ΔABCΔABC such that AD = 8 cm, DB = 12 cm, AE = 6 cm, and CE = 9 cm. Prove that BC = 5/2 DE.

Sol: Given AD = 8 cm, AE = 6 cm, and CE = 9 cm

We need to prove that,



Since, ADAB = AEAC = 25 $\frac{AD}{AB} = \frac{AE}{AC} = \frac{2}{5}$

Also, ΔADE~ΔABC$\Delta ADE \sim \Delta ABC$ (SAS similarity)

BCDE = ABAD $\frac{BC}{DE} = \frac{AB}{AD}$

BCDE = 1(ADAB) $\frac{BC}{DE} = \frac{1}{(\frac{AD}{AB})}$ (ADAB = 25 $\frac{AD}{AB} = \frac{2}{5}$)

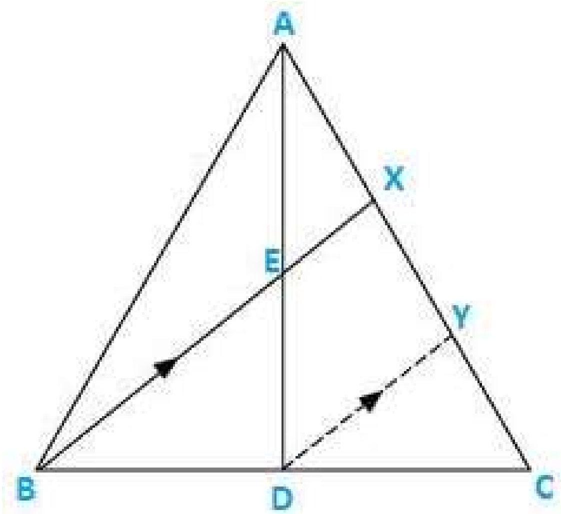
BCDE = 52 $\frac{BC}{DE} = \frac{5}{2}$

BC = 5/2 DE

Q.16) D is the midpoint of side BC of a ΔABCΔABC . AD is bisected at the point E and BE produced cuts AC at the point X. Prove that BE: EX = 3 : 1

Soln.: ABC is a triangle in which D is the midpoint of BC, E is the midpoint of AD. BE produced meets AC at X.

We need to prove BE: EX = 3 : 1



In ΔΔ BCX and ΔΔ DCY

∠∠CBX = ΔΔ CBY (corresponding angles)

∠∠CXB = ΔΔ CYD (corresponding angles)

ΔBCX~ΔDCY $\Delta BCX \sim \Delta DCY$ (angle-angle similarity)

We know that corresponding sides of similar sides of similar triangles are proportional

Thus, BCDC = BXDY = CXCY $\frac{BC}{DC} = \frac{BX}{DY} = \frac{CX}{CY}$

BXDY = BCDC $\frac{BX}{DY} = \frac{BC}{DC}$

BXDY = 2DCDC $\frac{BX}{DY} = \frac{2DC}{DC}$ (As D is the midpoint of BC)

BXDY = 21 $\frac{BX}{DY} = \frac{2}{1}$ ….(i)

In ΔΔ AEX and ΔΔ ADY,

∠∠AEX = ΔΔ ADY (corresponding angles)

∠∠AXE = ΔΔ AYD (corresponding angles)

ΔΔ AEX – ΔΔ ADY (angle-angle similarity)

We know that corresponding sides of similar sides of similar triangles are proportional

Thus, AEAD = EXDY = AXAY $\frac{AE}{AD} = \frac{EX}{DY} = \frac{AX}{AY}$

EXDY = AEAD $\frac{EX}{DY} = \frac{AE}{AD}$

EXDY = AE2AE $\frac{EX}{DY} = \frac{AE}{2AE}$ (As D is the midpoint of BC)

EXDY = 12 $\frac{EX}{DY} = \frac{1}{2} \ldots$(ii)

Dividing eqn. (i) by eqn. (ii)

BXEX = 41 $\frac{BX}{EX} = \frac{4}{1}$

BX = 4EX

BE + EX = 4EX

BE = 3EX

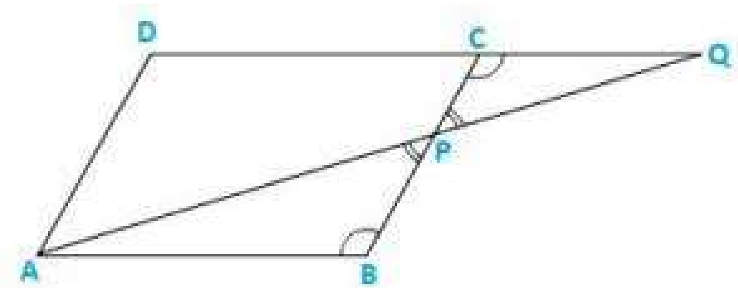
BE : EX = 3:1

Q.17) ABCD is a parallelogram and APQ is a straight line meeting BC at P and DC produced at Q. Prove that the rectangle obtained by BP and DQ is equal to the rectangle contained by AB and BC.

Sol:

ABCD is a parallelogram and APQ is a straight line meeting BC at P and DC produced at Q.

We need to prove, the rectangle obtained by BP and DQ is equal to the rectangle contained by AB and BC. We need to prove that BP x DQ = AB x BC



In ΔΔ ABP and ΔΔ QCP,

∠∠ABP = ΔΔ QCP (alternate angles as AB DC)

∠∠BPA = ΔΔ QPC   (VOA)

ΔABP∼ΔQCP $\Delta ABP \sim \Delta QCP$ ΔΔ   (AA similarity)

We know that corresponding sides of similar triangles are proportional

Thus, AEAD=EXDY=AXAY $\frac{AE}{AD} = \frac{EX}{DY} = \frac{AX}{AY}$

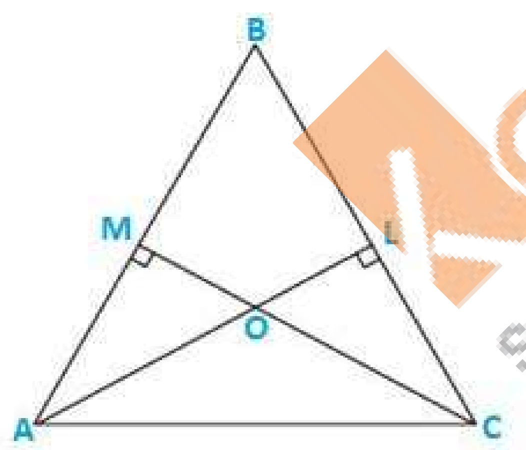
EXDY=AEAD $\frac{EX}{DY} = \frac{AE}{AD}$

Q.18) In ΔABC ΔABC , AL and CM are the perpendiculars from the vertices A and C to BC and AB respect. If Al and CM intersec at O, prove that:

(i) ΔOMA∼ΔOLC $\Delta OMA \sim \Delta OLC$

(ii) OAOC=OMOL $\frac{OA}{OC} = \frac{OM}{OL}$

Sol:



(i) in ΔΔ OMA and ΔΔ OLC,

∠∠AOM = ∠∠COL (VOA)

∠∠OMA = ∠∠OLC (90 each)

ΔOMA∼ΔOLC $\Delta OMA \sim \Delta OLC$ (A-A similarity)

(ii) Since, $\Delta OMA \sim \Delta OLC$ by A-A similarity, then

$\frac{OM}{OL} = \frac{OA}{OC} = \frac{MA}{LC}$ (corresponding sides of similar triangles are proportional)

$\frac{OA}{OC} = \frac{OM}{OL}$

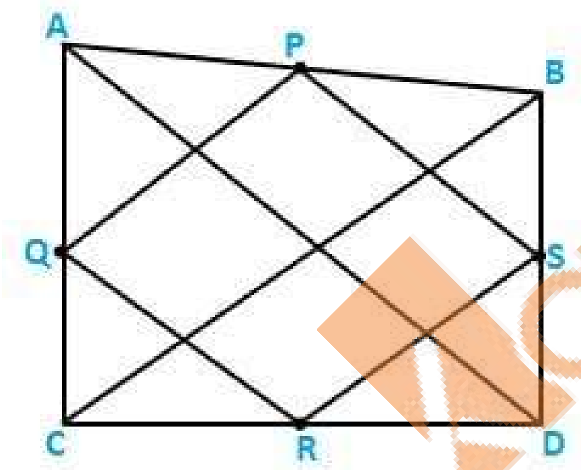
Q.19) ABCD is a quadrilateral in which AD = BC. If P,Q,R, S be the midpoints of AB, AC, CD and BD respect. Show that PQRS is a rhombus.

Soln.:

Given, ABCD is a quadrilateral in which AD = BC and P, Q, R, S are the mid points of AB, AC, CD, BD, respectively.

To prove,

PQRS is a rhombus



Proof,

In Δ ABC, P and Q are the mid points of the sides B and AC respectively

By the midpoint theorem, we get,

$PQ \parallel BC$, PQ = 1/2 BC.

In Δ ADC, Q and R are the mid points of the sides AC and DC respectively

By the mid point theorem, we get,

$QR \parallel AD$ and QR = 1/2 AD = 1/2 BC (AD = BC)

In Δ BCD,

By the mid point theorem, we get,

$RS \parallel BC$ and RS = 1/2 AD = 1/2 BC (AD = BC)

From above eqns.

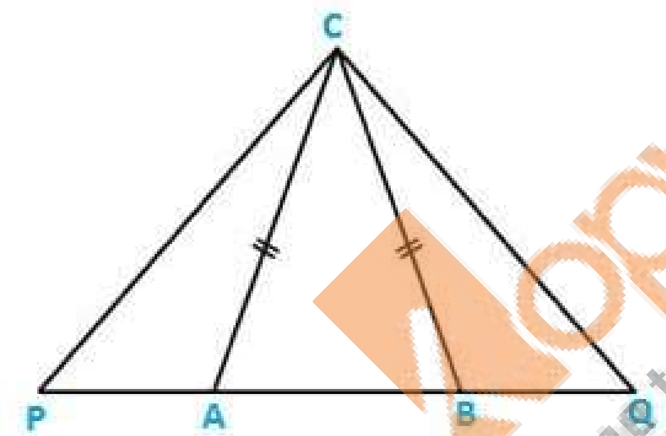
PQ = QR = RS

Thus, PQRS is a rhombus.

Q.20) In an isosceles ΔABC, the base AB is produced both ways to P and Q such that AP x BQ = AC^2. Prove that $\Delta APC \sim \Delta BCQ$.

Sol: Given Δ ABC is isosceles and AP x BQ = AC^2

We need to prove that $\Delta APC \sim \Delta BCQ$.



Given Δ ABC is an isosceles triangle AC = BC.

Now, AP x BQ = AC^2 (given)

AP x BQ = AC x AC

$\frac{AP}{AC} = \frac{AC}{BQ}$ $\frac{AP}{AC} = \frac{BC}{BQ}$

Also, $\angle$CAB = $\angle$CBA (equal sides have angles opposite to them)

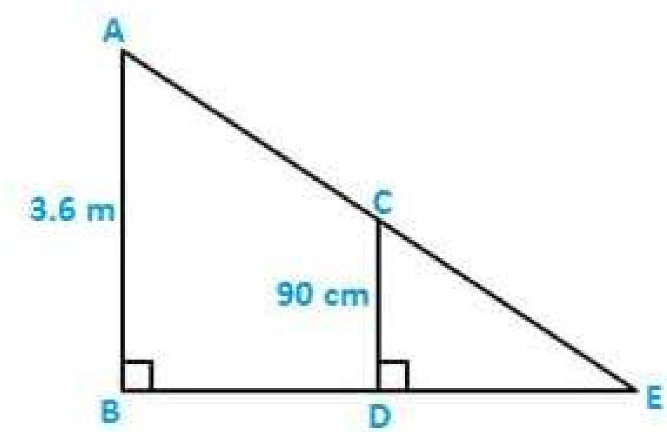
180 – CAP = 180 – CBQ

$\angle$CAP = $\angle$CBQ

Hence, $\Delta APC \sim \Delta BCQ$ (SAS similarity)

Q.21) A girl of height 90 cm is walking away from the base of a lamp post at a speed of 1.2 m/sec. If the lamp is 3.6m above the ground, find the length of her shadow after 4 seconds.

Soln.: Given, girl's height = 90 cm, speed = 1.2m/sec and height of lamp = 3.6 m



We need to find the length of her shadow after 4 sec.

Let, AB be the lamp post and CD be the girl

Suppose DE is the length of her shadow

Let, DE = x

and BD = 1.2 x 4

BD = 4.8 m

Now, in Δ ABE and Δ CDE we have,

$\angle B = \angle D$

$\angle E = \angle E$

So, by A-A similarity criterion,

$\Delta ABE \sim \Delta CDE$ $\frac{BE}{DE} = \frac{AB}{CD}$

$\frac{4.8+x}{x} = \frac{3.6}{0.9}$ = 4

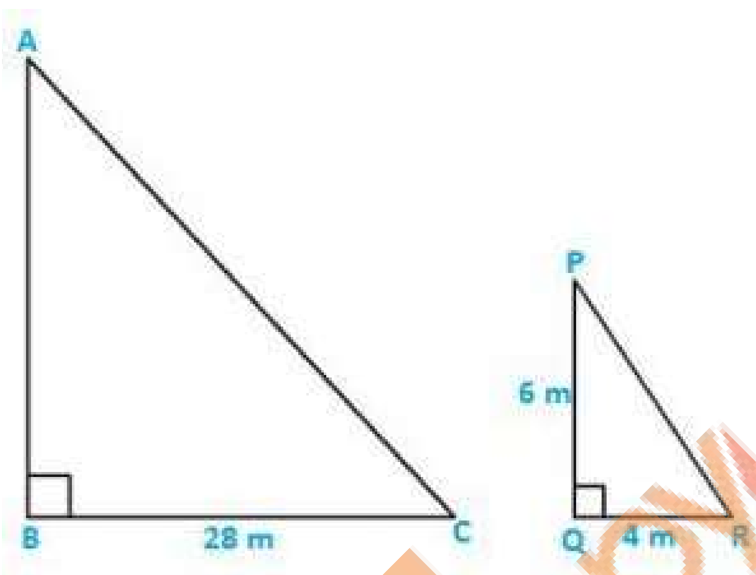
3x = 4.8

x = 1.6

hence, the length of her shadow after 4 sec. Is 1.6 m

Q.22) A vertical stick of length 6m casts a shadow 4m long on the ground and at the same time a tower casts a shadow 28m long. Find the height of the tower.

Soln.: Given length of vertical stick = 6m



We need to find the height of the tower

Suppose AB is the height of the tower and BC is its shadow.

Now, $\Delta ABC \sim \Delta PCR$ (B = Q and A = P)

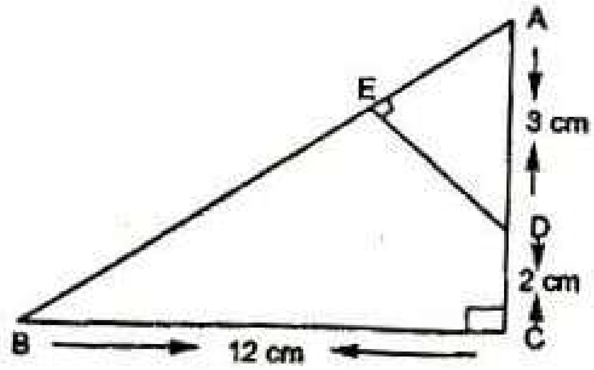
$\frac{AB}{BC} = \frac{PQ}{QR}$ $\frac{AB}{28} = \frac{6}{4}$

AB = (28 x 6)/4

AB = 42m

Hence, the height of tower is 42m.

Q.23) In the fig. given, Δ ABC is a right angled triangle at C and $DE \perp AB$. Prove that $\Delta ABC \sim \Delta ADE$.



Sol:

Given ΔΔ ACB is right angled triangle and C = 90

We need to prove that ΔABC~ΔADE$\Delta ABC \sim \Delta ADE$ and find the length of AE and DE.

ΔABC~ΔADE$\Delta ABC \sim \Delta ADE$

∠∠A = ∠∠A (common angle)

∠∠C = ∠∠E (90)

So, by A-A similarity criterion, we have

In ΔABC~ΔADE$\Delta ABC \sim \Delta ADE$

ABAD=BCDE=ACAE $\frac{AB}{AD} = \frac{BC}{DE} = \frac{AC}{AE}$ 133=12DE=5AE $\frac{13}{3} = \frac{12}{DE} = \frac{5}{AE}$

Since, $AB^2 = AC^2 + BC^2$

$= 5^2 + 12^2$

$= 13^2$

∴ DE = 36/13 cm

and AE = 15/13 cm

Q.25) In fig. given, we have AB∥CD∥EF$AB \parallel CD \parallel EF$. If AB = 6 cm, CD = x cm, EF = 10 cm, BD = 4 cm, and DE = y cm. Calculate the values of x and y.

14

Sol: Given AB CD EF.

AB = 6 cm, CD = x cm, and EF = 10 cm.

We need to calculate the values of x and y

In ΔΔ ADB and ΔΔ DEF,

∠∠ADB = ∠∠EDF (VOA)

∠∠ABD = ∠∠DEF (alt. Interior angles)

EFAB = OEOB $\frac{EF}{AB} = \frac{OE}{OB}$ 106 = y4 $\frac{10}{6} = \frac{y}{4}$

Y = 40/6

Y = 6.67 cm

Similarly, in ΔΔ ABE , we have

OCAB = OEOB $\frac{OC}{AB} = \frac{OE}{OB}$ 46.7 = x6 $\frac{4}{6.7} = \frac{x}{6}$

6.7 x X = 6 x 4

X = 24/6.7

X = 3.75 cm

Therefore, x = 3.75 cm and y = 6.67 cm