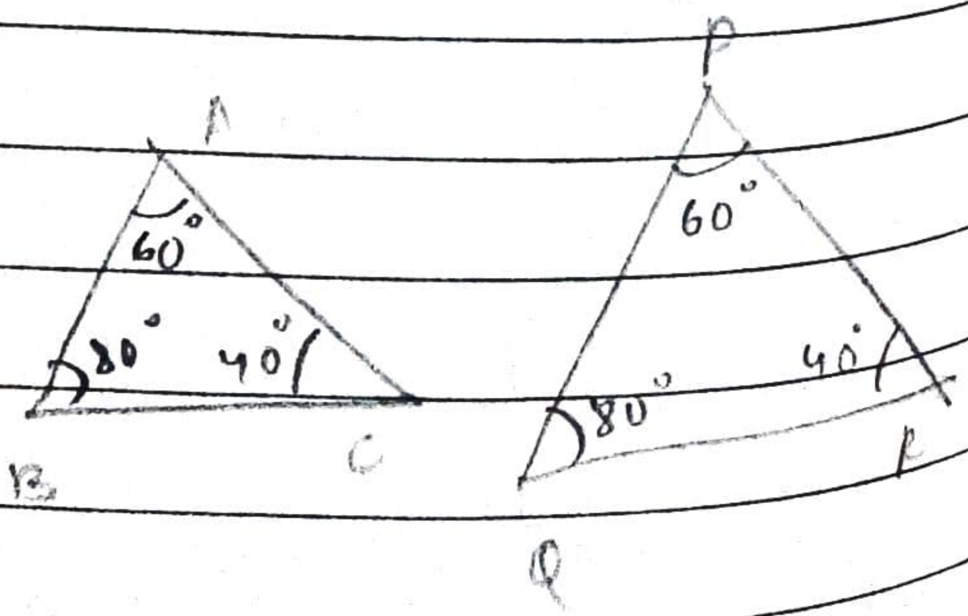
Ex - 6.3

1. i) In ΔABC and ΔPQR,

$\angle A = \angle P$ (each 60°)

$\angle B = \angle Q$ (each 80°)

$\angle C = \angle R$ (each 40°)



$\therefore$ $\Delta ABC \sim \Delta PQR$ (AAA)

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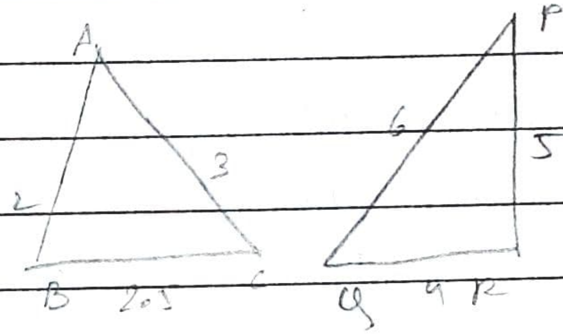
ii) In ΔABC & ΔPQR,



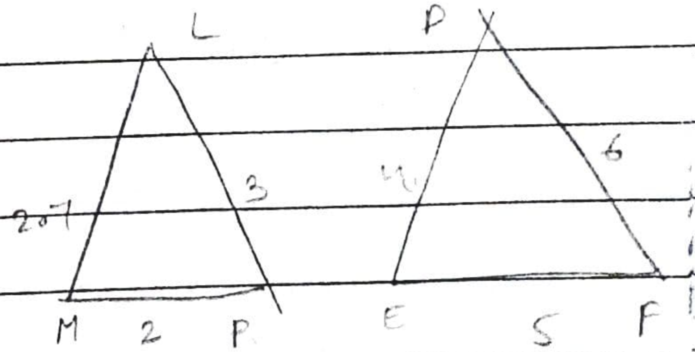
$\frac{BC}{PR} = \frac{2.5}{5} = \frac{1}{2}$

$\frac{AC}{PQ} = \frac{3}{6} = \frac{1}{2}$

$\frac{AB}{QR} = \frac{2}{4} = \frac{1}{2}$

$\therefore$ $\Delta ABC \sim \Delta PQR$ (SSS)

iii) In ΔLMP & ΔEFD,



$\frac{LM}{EF} = \frac{2.7}{5}$

$\frac{LP}{DF} = \frac{3}{6} = \frac{1}{2}$

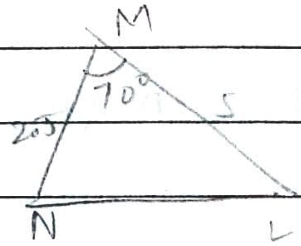
$\frac{MP}{DE} = \frac{2}{4} = \frac{1}{2}$

$\therefore$ $\Delta LMP \nsim \Delta EFD$

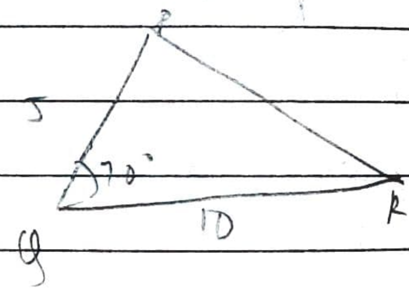
$\Longrightarrow$

iv) In ΔMNL & ΔPQR,

$\frac{MN}{PQ} = \frac{2.5}{5} = \frac{1}{2}$



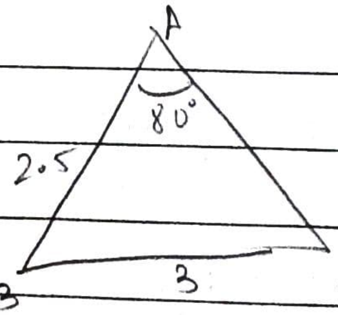
$\frac{ML}{QR} = \frac{5}{10} = \frac{1}{2}$



$\angle M = \angle Q = 70^\circ$

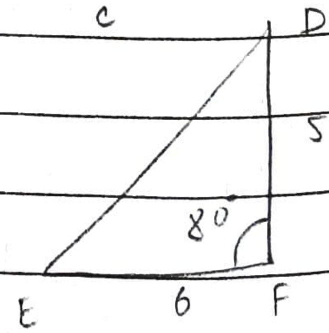
$\therefore \Delta NML \sim \Delta PQR$ (SAS)

v) In ΔABC & ΔDEF,



$\frac{AB}{DF} = \frac{2.5}{5} = \frac{1}{2}$

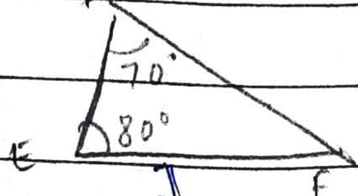
$\frac{BC}{EF} = \frac{3}{6} = \frac{1}{2}$



$\angle A = \angle F = 80^\circ$

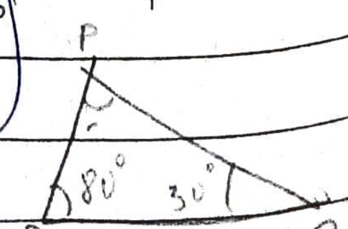
$\therefore \Delta ABC \nsim \Delta DEF$

vi) In ΔDEF & ΔPQR



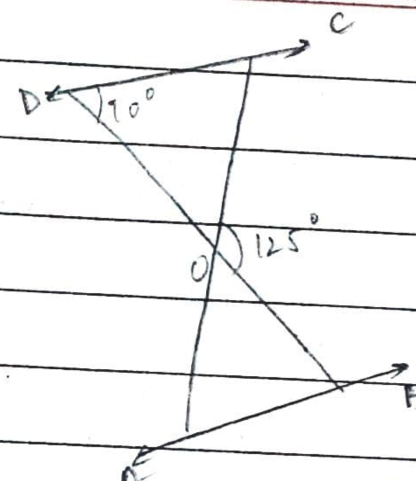
$\angle E = \angle Q = 80^\circ$

$\angle F = \angle R = 30^\circ$ $\left[\because \angle F = 180^\circ - (80+70)^\circ = 30^\circ\right]$



$\therefore \Delta DEF \sim \Delta PQR$ (AA)

2. $\angle DOC + 125^\circ = 180^\circ$ (Linear pair)



$\Rightarrow \angle DOC = 180^\circ - 125^\circ$

$= 55^\circ$

in $\triangle DOC$,

$\angle DCO + \angle ODC + \angle DOC = 180^\circ$ (angle sum property)

$\Rightarrow \angle DCO + 70^\circ + 55^\circ = 180^\circ$

$\Rightarrow \angle DCO = 180^\circ - 125^\circ$

$\Rightarrow \angle DCO = 55^\circ$

In $\triangle ODC$ & $\triangle OBA$

$\triangle ODC \sim \triangle OBA$ (given)

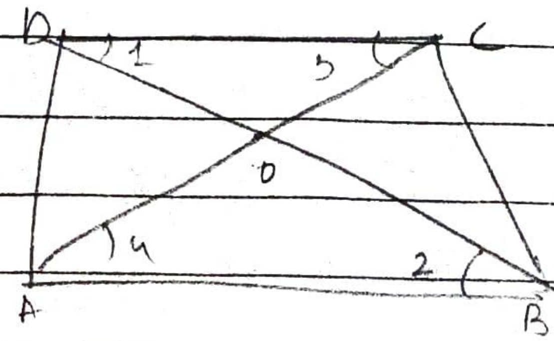
$\therefore \angle OAB = \angle OCD = 55^\circ$

$\angle DOC = 55^\circ$, $\angle DCO = 55^\circ$ and $\angle OAB = 55^\circ$

3. Given

Diagonals AC and BD intersect at O.

$AB \parallel DC$



To prove

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

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Proof

In ΔAOB and ΔCOD

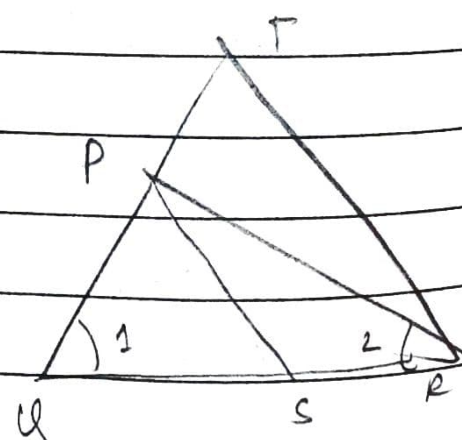
$\angle 1 = \angle 2$ (Alternate $\angle s$)

$\angle 3 = \angle 4$ (Alternate $\angle s$)

$\therefore \Delta AOB \sim \Delta COD$ (AA)

$\Rightarrow \dfrac{OA}{OC} = \dfrac{OB}{OD}$ (Corresponding sides of similar Δs)

4. from figure,



$\angle 1 = \angle 2$

$\therefore PQ = PR$ (Sides opposite to equal angles are equal)

In ΔPQR & ΔTQR,

$\Rightarrow \dfrac{QR}{QS} = \dfrac{QT}{PR}$

$\Rightarrow \dfrac{QR}{QS} = \dfrac{QT}{PR}$ ($\because PQ = PR$ proved above)

~~ΔPQR~~ $\angle PQS = \angle TQR = \angle 1$

$\therefore \Delta PQS \sim \Delta TQR$ (SAS)

Hence proved

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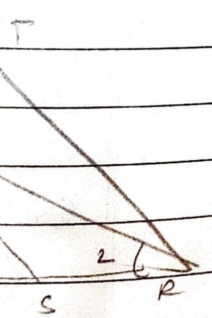
ilas Δs)



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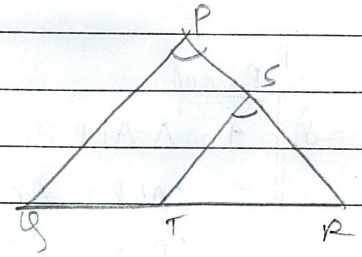
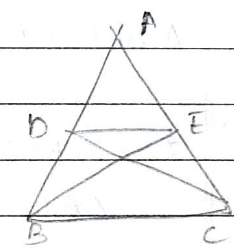


5. In ΔRPQ & ΔRTS,

$\angle P = \angle RTS$ (given)

$\angle R = \angle R$ (common)

$\therefore \Delta RPQ \sim \Delta RTS$ (AA)



6. $\Delta ABE \cong \Delta ACD$, (given)

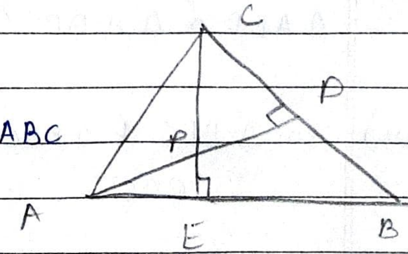
$AB = AC$ (By CPCT)

and $AE = AD$ (By CPCT)

$\therefore \dfrac{AB}{AC} = \dfrac{AD}{AE} = \dfrac{1}{1}$

and $\angle DAE = \angle BAC$ (common)

$\therefore \Delta ADE \sim \Delta ABC$ (SAS)



7. Given

AD & CE are altitudes of ΔABC

To prove

i) $\Delta AEP \sim \Delta CDP$

ii) $\Delta ABD \sim \Delta CBE$

iii) $\Delta AEP \sim \Delta ADB$

iv) $\Delta PDC \sim \Delta BEC$

Proof

i) In ΔAEP & ΔCDP

$\angle AEP = \angle CDP$ (each 90°)

$\angle APE = \angle CPD$ (V.O.A)

$\therefore \Delta AEP \sim \Delta CDP$ (AA)

ii) In ΔABD and ΔCBE,

$\angle ADB = \angle CEB$ (each 90°)

$\angle ABD = \angle CBE$ (common)

$\therefore \Delta ABD \sim \Delta CBE$ (AA)

iii) In ΔAEP & ΔADB,

$\angle AEP = \angle ADB$ (each 90°)

$\angle A = \angle A$ (common)

$\therefore \Delta AEP \sim \Delta ADB$ (AA)

iv) In ΔPDC & ΔBEC,

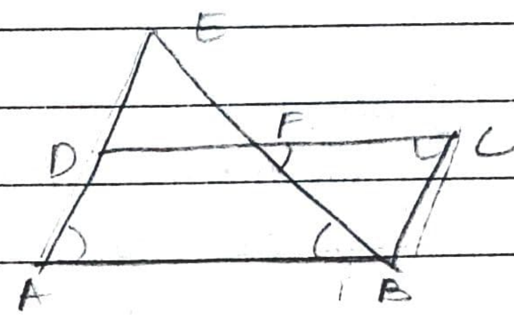
$\angle PDC = \angle BEC$ (each 90°)

$\angle PCD = \angle BCE$ (common)

$\therefore \Delta PDC \sim \Delta BEC$ (AA)

=>

8. Given
ABCD is a llgm in which E is a point on AD produced and BE intersects CD at F.

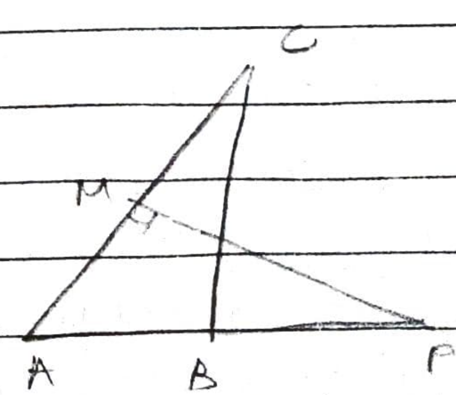


To prove
$\Delta ABE \sim \Delta CFB$

Proof
In llgm ABCD,
$\angle A = \angle C$ —— (1) (opp. opposite angles)

In Δ ABE and Δ CFB,
$\angle EAB = \angle BCF$ (Proved above)
and $\angle ABE = \angle BFC$ (Alternate angles)
$\therefore$ $\Delta ABE \sim \Delta CFB$ (AA)

9. Given
ABC and AMP are two right triangles. $\angle B = \angle M = 90°$.



To prove
i) $\Delta ABC \sim \Delta AMP$
ii) $\frac{CA}{PA} = \frac{BC}{MP}$

Proof

i) In ΔABC & ΔAMP,

$\angle B = \angle AMP$ (each $90°$)

$\angle A = \angle A$ (common)

$\therefore \Delta ABC \sim \Delta AMP$ (AA)

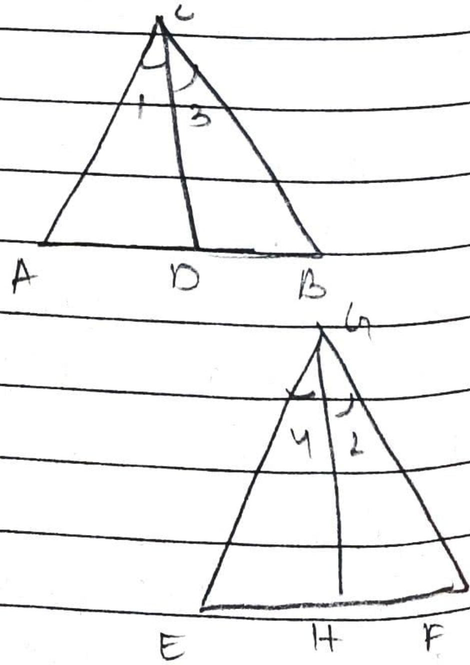
ii) $\Delta ABC \sim \Delta AMP$ (proved above)

$\Rightarrow \dfrac{CA}{PA} = \dfrac{CB}{PM}$ (Ratio of corresponding sides of similar triangles.)

10. Given

CD & GH are bisectors of $\angle C$ & $\angle G$.

$\Delta ABC \sim \Delta FEG$.



To prove

i) $\dfrac{CD}{GH} = \dfrac{AC}{FG}$

ii) $\Delta DCB \sim \Delta HGE$

iii) $\Delta DCA \sim \Delta HGF$

$\longrightarrow$

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Proof

$\Delta ABC \sim \Delta FEG$ (given)

$\Rightarrow \angle A = \angle F$

$\angle B = \angle E$

$\angle C = \angle G$

and $\dfrac{AB}{FE} = \dfrac{BC}{EG} = \dfrac{AC}{FG}$

i) In ΔACD and ΔFGH,

$\angle A = \angle F$ (given)

$\angle 1 = \angle 2$ $\left(\frac{1}{2} C = \frac{1}{2} G\right)$

$\therefore \Delta ACD \sim \Delta FGH$ (AA)

$\Rightarrow \dfrac{CD}{GH} = \dfrac{AC}{FG}$ (corresponding sides of similar triangles)

ii) $\dfrac{CD}{GH} = \dfrac{AC}{FG}$ (Proved above)

But $\dfrac{AC}{FG} = \dfrac{BC}{EG}$

$\therefore \dfrac{CD}{GH} = \dfrac{BC}{EG}$

In ΔDCB and ΔHGE

$\angle 3 = \angle 4$ $\left(\frac{1}{2}\angle C = \frac{1}{2}\angle G\right)$

$\frac{CD}{GH} = \frac{BC}{EG}$

$\therefore$ $\Delta DCB \sim \Delta HGE$ (SAS)

iii) In ΔDCA & ΔHGF;

$\angle 1 = \angle 2$ (Bisector)

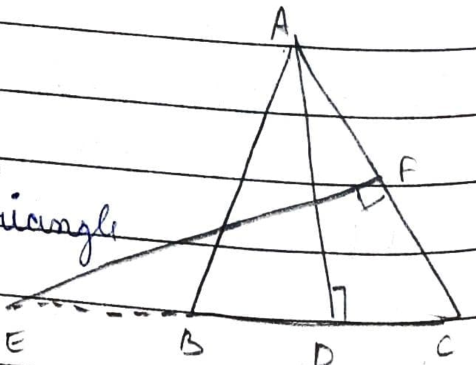
$\frac{CD}{GH} = \frac{AC}{FG}$ (As proved)

$\Rightarrow$ $\Delta DCA \sim \Delta HGF$ (SAS)

11. Given

ΔABC is an isosceles triangle

$AB = AC$



To prove

$\Delta ABD \sim \Delta ECF$

Proof

$AB = AC$

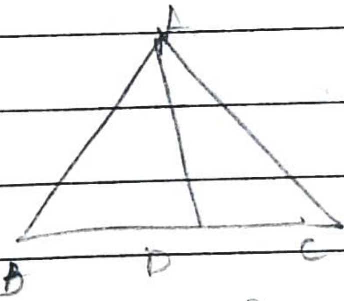
$\Rightarrow \angle ABC = \angle ACB$ (angles opposite to equal sides are equal)

In ΔABD and ΔECF,

$\angle ABD = \angle ECF$ (Proved above)

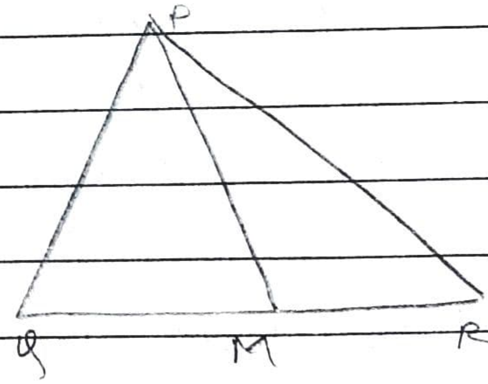
$\angle ADB = \angle EFC$ ($90°$)

$\therefore \Delta ABD \sim \Delta ECF$ (AA)



12. In ΔABC & ΔPQR,

$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AD}{PM}$ (given)



$\Rightarrow \frac{AB}{PQ} = \frac{\frac{1}{2} BC}{\frac{1}{2} QR} = \frac{AD}{PM}$

$\Rightarrow \frac{AB}{PQ} = \frac{BD}{QM} = \frac{AD}{PM}$

$\Rightarrow \Delta ABD \sim \Delta PQM$ (SSS)

$\angle B = \angle Q$ (corresponding angles of similar triangles)

In ΔABC & ΔPQR,

$\frac{AB}{PQ} = \frac{BC}{QR}$ (given)

$\angle B = \angle Q$ (Proved above)

$\therefore \Delta ABC \sim \Delta PQR$ (SAS)

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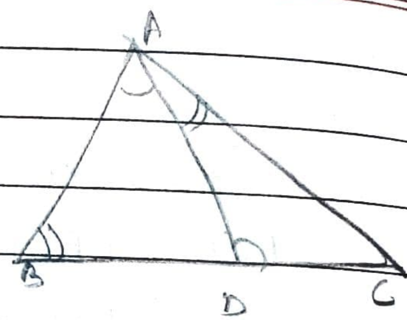


13. $\angle ADC = \angle BAC$ (given)

In $\triangle ABC$ & $\triangle DAC$,

$\angle C = \angle C$ (common)

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

$\therefore$ $\triangle ABC \sim \triangle DAC$ (AA)

Their corresponding sides are proportional

$\therefore$ $\frac{CA}{CD} = \frac{CB}{CA}$

$\Rightarrow$ $CA^2 = CB \times CD$ (Hence, proved)

14. To prove

$\triangle ABC \sim \triangle PQR$

Constructn

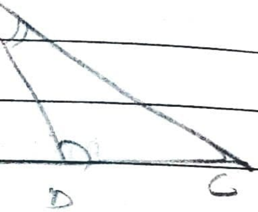
Draw $DE \parallel AC$ and $MS \parallel PR$

Proof

In $\triangle ABC$, D is the mid point of BC (given $DE \parallel AC$)

$\therefore$ E is the mid paint of BC (converse of MPT)

$\Rightarrow$ $DE = \frac{1}{2} AC$



onal

...n DE || AC)

MPT)

similarly, $SM = \frac{1}{2} PR$

Now, $\frac{AB}{PQ} = \frac{AC}{PR} = \frac{AD}{PM}$ (given)

$\Rightarrow \frac{2AE}{2PS} = \frac{2DE}{2SM} = \frac{AD}{PM}$

$\Rightarrow \frac{AE}{PS} = \frac{DE}{SM} = \frac{AD}{PM}$

$\therefore \Delta ADE \sim \Delta PMS$ (SSS)

$\angle 1 = \angle 3$

and $\angle 2 = \angle 4$

$\angle 1 + \angle 2 = \angle 3 + \angle 4$

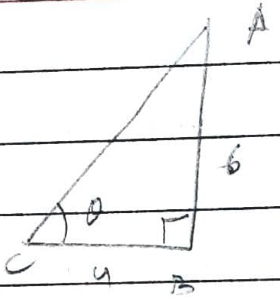
$\Rightarrow \angle A = \angle P.$

Now, in ΔABC & ΔPQR,

$\frac{AB}{PQ} = \frac{AC}{PR}$ (given)

$\angle A = \angle P$ (Proved above)

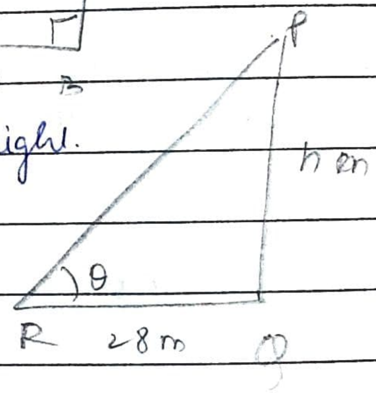
$\therefore \Delta ABC \sim \Delta PQR$ (SAS)

15. Let AB be the pole  16.

BC be its shadow

In ΔPQR, PQ be tower of h height.

and QR be its shadow



~~$\Delta ABC \sim \Delta PQR$ (given)~~ (AA)

~~$\angle A$~~

In ΔABC & ΔPQR,

$$\angle ACB = \angle PRQ = \theta$$

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

$\therefore$ $\Delta ABC \sim \Delta PQR$ (AA)

$$\Rightarrow \frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$$

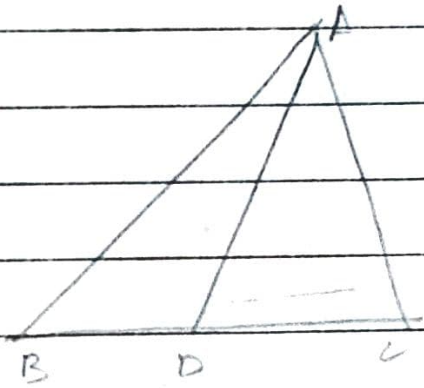
$$\Rightarrow \frac{BC}{QR} = \frac{AC}{PR}$$

$$\Rightarrow \frac{4}{28} = \frac{6}{h}$$

$$\Rightarrow h = \frac{6 \times 28}{4} = 42\,m$$

$\therefore$ height of tower = 42 m

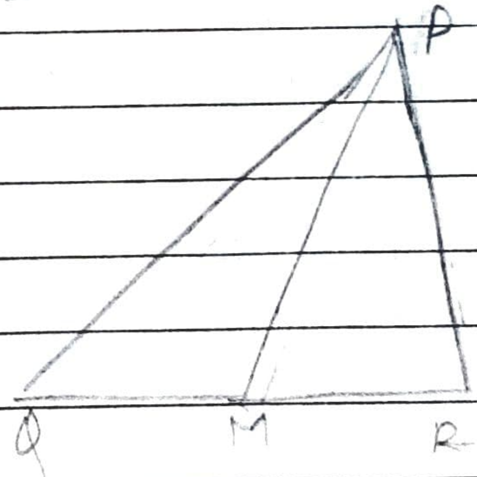
16. $\Delta ABC \sim \Delta PQR$ (given)



To prove

$$\frac{AB}{PQ} = \frac{AD}{PM}$$

Proof



$\Delta ABC \sim \Delta PQR$ (given)

$\Rightarrow \angle ABC = \angle PQR$

$$\frac{AB}{PQ} = \frac{BC}{QR}$$

$$\Rightarrow \frac{AB}{PQ} = \frac{\frac{1}{2}BC}{\frac{1}{2}QR}$$

$$\Rightarrow \frac{AB}{PQ} = \frac{BD}{QM}$$

In ΔABD & ΔPQM

$\frac{AB}{PQ} = \frac{BD}{QM}$ (as proved)

$\angle B = \angle Q$

$\therefore \Delta ABD \sim \Delta PQM$

$\frac{AB}{PQ} = \frac{AD}{PM}$ (Corresponding sides of similar triangles)