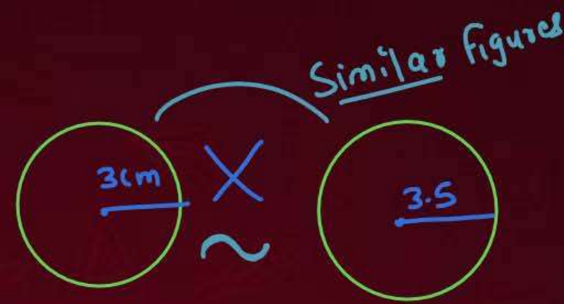
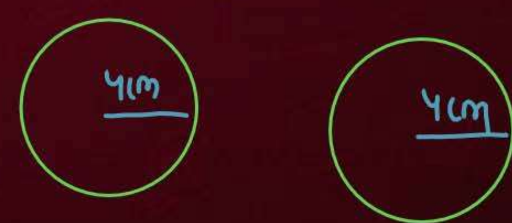
Similar Figures



$\cong$

- ✓ Congruent figures : Two figures are said to be congruent, if they have same shape and size
- ✓ Similar figures : two figures are said to be similar, if they have same shape but need not to be of same size
- ✓ Note : all congruent figures are similar but all similar figures are need not to be congruent



Similar Figures

Closed figures madeup of straight

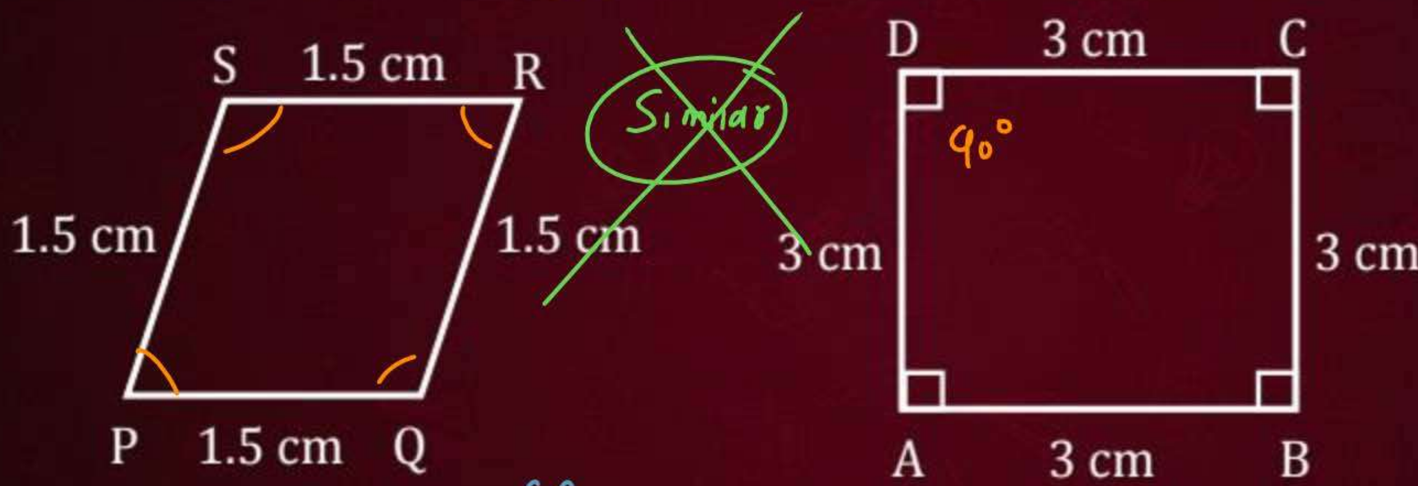
Two polygons of the same number of sides are similar, if

(i) Their corresponding angles are equal and

(ii) Their corresponding sides are in the same ratio (or proportion).

QUESTION

State whether the following quadrilaterals are similar or not



$\angle S \neq \angle D$
$\angle R \neq \angle C$
$\angle Q \neq \angle B$
$\angle P \neq \angle A$

$\frac{SR}{DC} = \frac{1.5}{3} = \frac{1}{2}$ $\quad$ $\frac{PQ}{AB} = \frac{1.5}{3} = \frac{1}{2}$

$\frac{RQ}{CB} = \frac{1.5}{3} = \frac{1}{2}$ $\quad$ $\frac{SP}{DA} = \frac{1.5}{3} = \frac{1}{2}$

BPT Theorem

$$\frac{\text{ar of } \Delta AQP}{\text{ar of } \Delta BPQ} = \frac{AP}{BP} \quad \text{— (iii)}$$

$$\frac{\text{ar } \Delta AQP}{\text{ar } \Delta PQC} = \frac{AQ}{QC} \rightarrow \text{vi}$$

from (iii), (vi) and vii we get $\rightarrow \boxed{\frac{AP}{BP} = \frac{AQ}{QC}}$ H.P

If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

Given: $\boxed{PQ \parallel BC}$

To prove: $\frac{AP}{PB} = \frac{AQ}{QC}$

ar of $\Delta AQP = \frac{1}{2} \times AP \times QR$ — (i)

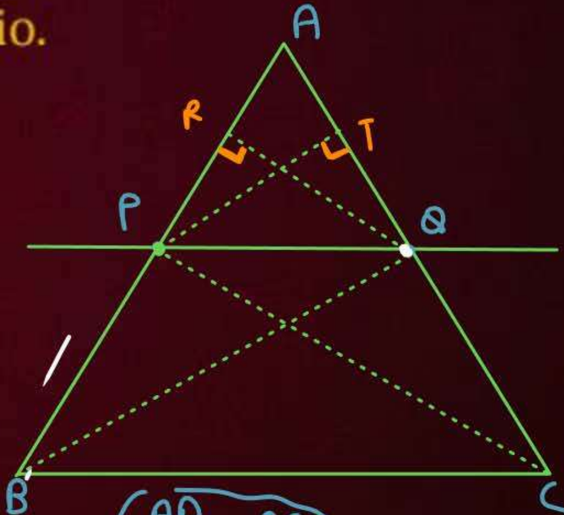
ar of $\Delta BPQ = \frac{1}{2} \times BP \times QR$ — (ii)

Construction: Draw $QR \perp AP$ and $PT \perp AQ$

Join BQ and PC

ar of $\Delta AQP = \frac{1}{2} \times AQ \times PT$ — (iv)

ar of $\Delta PQC = \frac{1}{2} \times QC \times PT$ — (v)



Proof:

$\boxed{\text{ar } \Delta BPQ = \text{ar } \Delta PQC} \rightarrow$ (vii)

Δ BPQ and Δ PQC are on the same base and between same parallel line then their area are equal.

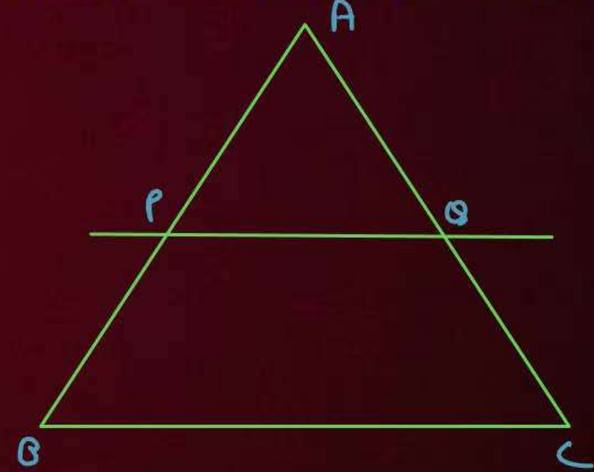
If $PQ \parallel BC$ $\frac{AP}{BP} = \frac{AQ}{QC}$

Converse of BPT

If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side

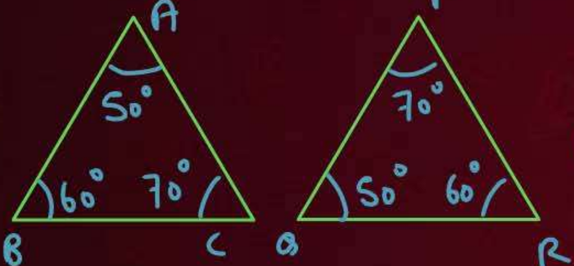
if $\frac{AP}{PB} = \frac{AQ}{QC}$

then $PQ \parallel BC$



Criteria for similarity of triangles

(i) AAA



$\angle A = \angle Q = 50^\circ$

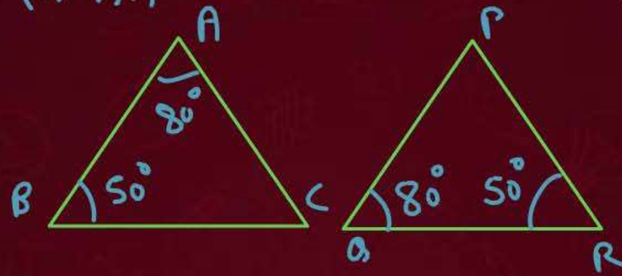
$\angle B = \angle R = 60^\circ$

$\angle C = \angle P = 70^\circ$

By using AAA

$\boxed{\Delta ABC \sim \Delta QRP}$

(ii) AA



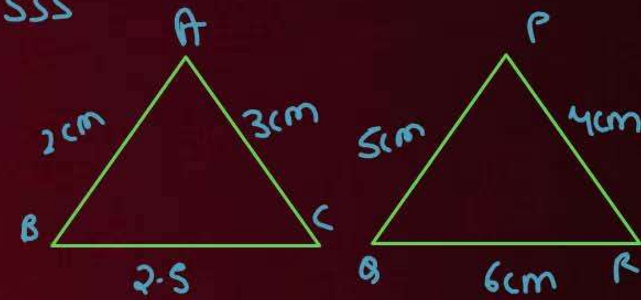
$\angle A = \angle Q$

$\angle B = \angle R$

By using AA

$\boxed{\Delta ABC \sim \Delta QRP}$

(iii) SSS



$\frac{AB}{PR} = \frac{1}{2}, \quad \frac{AC}{QR} = \frac{1}{2}, \quad \frac{BC}{PQ} = \frac{1}{2}$

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

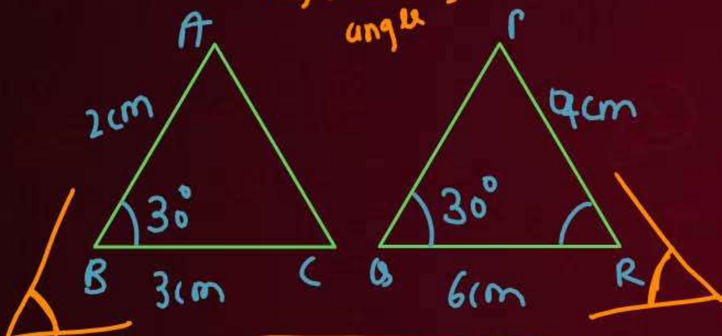
By using SSS

$\Delta ABC \sim \Delta PQR$ ✓

Criteria for similarity of triangles

SAS

including angle



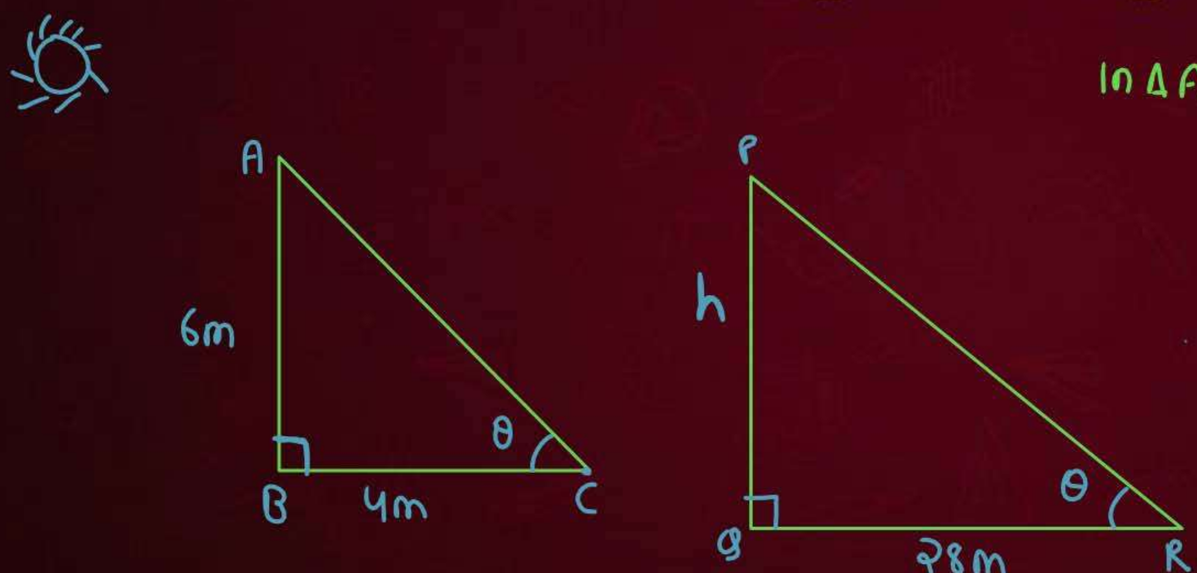
$$\boxed{\frac{AB}{PR} = \frac{1}{2}, \quad \frac{BC}{QR} = \frac{1}{2}}$$

$\angle B = \angle R$

By using ASA $\triangle ABC \sim \triangle PQR$

QUESTION

A vertical pole 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.



In ΔABC and ΔPQR

$\angle B = \angle Q \rightarrow$ each 90°

$\angle C = \angle R \rightarrow$ {Sun's elevation}

By AA $\Delta ABC \sim \Delta PQR$

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

$$\frac{6}{h} = \frac{\cancel{4}^{1}}{\cancel{28}_{7}}$$

$$\boxed{h = 42m}$$