CLASS 10 · MATHEMATICS · CHAPTER 6

Triangles - Exercise 6.3

Exercise 6.3 with independently verified solutions.

CHAPTER	RESOURCE	SOURCE
Triangles	NCERT Exercises	NCERT Mathematics, Reprint 2026-27

PART 1

Verified NCERT questions and solutions

Verified NCERT questions and solutions

Solutions are checked independently and follow the supplied NCERT chapter edition.

QUESTION

Question 1

AAA similarity · SSS similarity · SAS similarity · classification

State which pairs of triangles in Figure 6.34 are similar. Give the similarity criterion and write each similar pair in symbolic form.

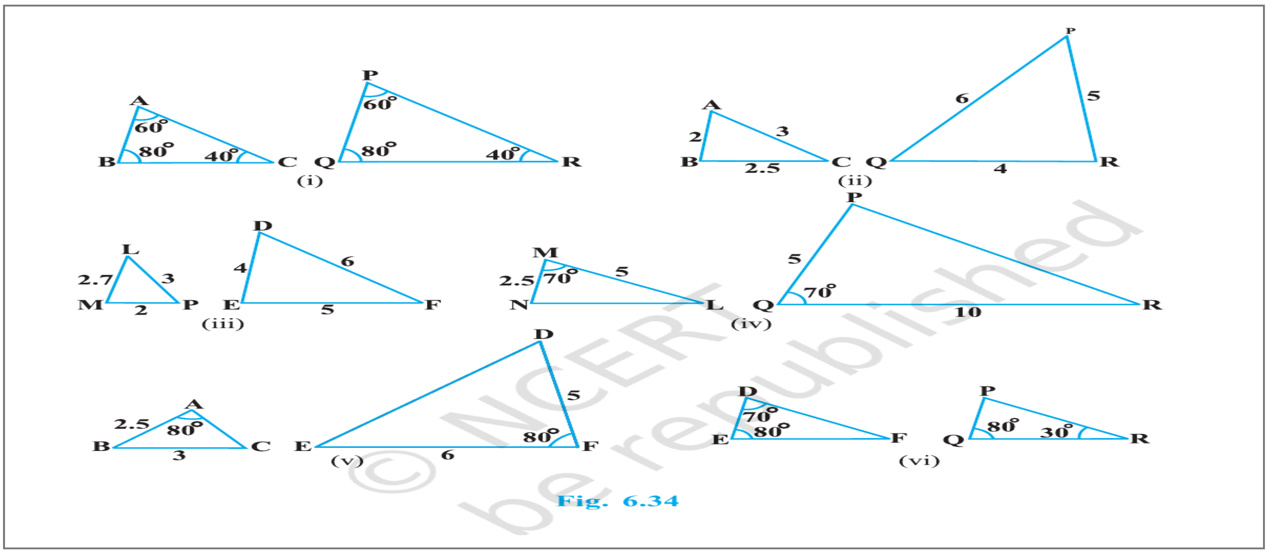

Figure 6-34 from the supplied NCERT chapter.

Solution

Board-exam working:

(i)

$$\angle A = \angle P = 60^\circ$$

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

$$\angle C = \angle R = 40^\circ$$

Therefore, △ABC ~ △PQR by AAA similarity.

(ii)

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

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

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

All three corresponding side ratios are equal. Therefore, △ABC ∼ △QRP by SSS similarity.

(iii)

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

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

$$\frac{ML}{EF} = \frac{2.7}{5} \neq \frac{1}{2}$$

All three corresponding side ratios are not equal. Therefore, the triangles are not similar.

(iv)

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

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

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

The included angles are equal and the surrounding sides are proportional. Therefore, △MNL ~ △QPR by SAS similarity.

(v)

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

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

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

The included angles are equal and the surrounding sides are proportional. Therefore, △ABC ~ △DFE by SAS similarity.

(vi)

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

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

$$\angle F = \angle R = 30^\circ$$

Therefore, △DEF ~ △PQR by AAA similarity.

Final answer

Similar pairs: (i), (ii), (iv), (v) and (vi). Pair (iii) is not similar.

QUESTION

Question 2

similar triangles · angles · parallel lines

In Figure 6.35, $\triangle ODC \sim \triangle OBA$, $\angle BOC = 125°$ and $\angle CDO = 70°$. Find $\angle DOC$, $\angle DCO$ and $\angle OAB$.

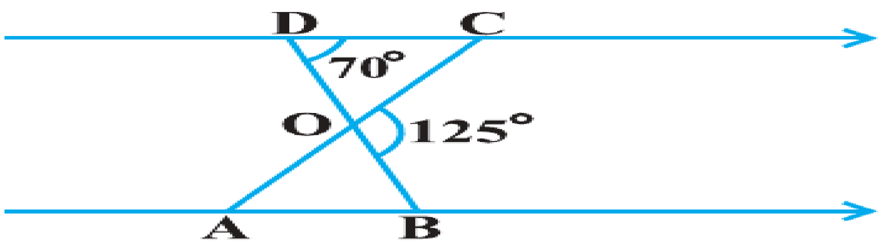

Fig. 6.35

Figure 6-35 from the supplied NCERT chapter.

Solution

Board-exam working:

$\angle DOC$ and $\angle BOC$ form a linear pair.

$$\angle DOC = 180^\circ - 125^\circ = 55^\circ$$

In $\triangle ODC$, by the angle-sum property:

$$\angle DCO = 180^\circ - \angle DOC - \angle CDO$$

$$\angle DCO = 180^\circ - 55^\circ - 70^\circ = 55^\circ$$

Given $\triangle ODC \sim \triangle OBA$, the correspondence is $O \leftrightarrow O$, $D \leftrightarrow B$ and $C \leftrightarrow A$.

Therefore, as corresponding angles:

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

Final answer

∠DOC = 55°, ∠DCO = 55°, and ∠OAB = 55°.

QUESTION

Question 3

AA similarity · trapezium · diagonals · proof

Diagonals AC and BD of trapezium ABCD, with AB ∥ DC, intersect at O. Using a similarity criterion, show that OA/OC = OB/OD.

Solution

Board-exam working:

Consider △AOB and △COD.

∠AOB = ∠COD because they are vertically opposite angles.

∠ABO = ∠CDO because AB ∥ DC and BD is a transversal.

Therefore, △AOB ~ △COD by AA similarity, with A ↔ C, O ↔ O and B ↔ D.

Hence corresponding sides are proportional:

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

Final answer

Therefore, OA/OC = OB/OD.

QUESTION

Question 4

SAS similarity · isosceles triangle · proof

In Figure 6.36, QR/QS = QT/PR and ∠1 = ∠2. Show that △PQS ~ △TQR.

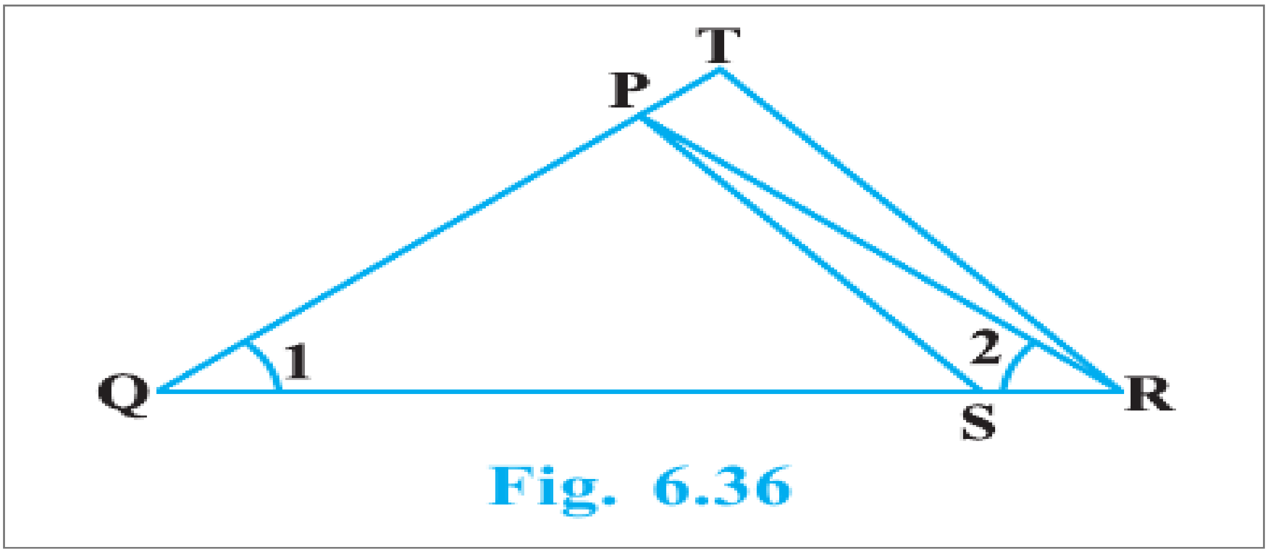

Figure 6-36 from the supplied NCERT chapter.

Solution

Board-exam working:

In △PQR, ∠1 = ∠2 is given. Therefore, the sides opposite these equal angles are equal: PR = PQ.

Substitute PR = PQ in the given proportion:

$$\frac{QR}{QS} = \frac{QT}{PR} = \frac{QT}{PQ}$$

Taking reciprocals:

$$\frac{QS}{QR} = \frac{PQ}{QT} \qquad ...(1)$$

Since P lies on QT and S lies on QR, ∠PQS = ∠TQR. ...(2)

From (1) and (2), the sides including the equal angle are proportional.

Therefore, $\triangle PQS \sim \triangle TQR$ by SAS similarity, with $P \leftrightarrow T$, $Q \leftrightarrow Q$ and $S \leftrightarrow R$.

Final answer

Therefore, $\triangle PQS \sim \triangle TQR$.

QUESTION

Question 5

AA similarity · proof

S and T are points on sides PR and QR of $\triangle PQR$ such that $\angle P = \angle RTS$. Show that $\triangle RPQ \sim \triangle RTS$.

Solution

Board-exam working:

Given $\angle RPQ = \angle RTS$.

Since S lies on PR and T lies on QR, rays RS and RP are collinear and rays RT and RQ are collinear.

Therefore, $\angle PRQ = \angle TRS$.

Thus two corresponding angles are equal, with $R \leftrightarrow R$, $P \leftrightarrow T$ and $Q \leftrightarrow S$.

Hence $\triangle RPQ \sim \triangle RTS$ by AA similarity.

Final answer

Therefore, $\triangle RPQ \sim \triangle RTS$.

QUESTION

Question 6

SAS similarity · congruent triangles · proof

In Figure 6.37, if $\triangle ABE \cong \triangle ACD$, show that $\triangle ADE \sim \triangle ABC$.

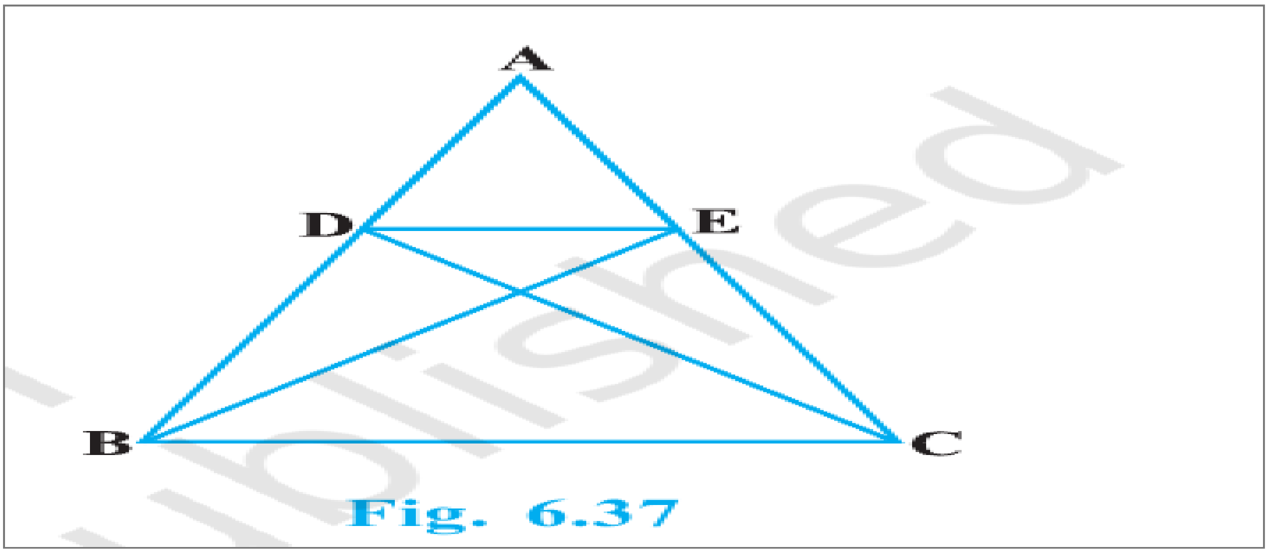

Figure 6-37 from the supplied NCERT chapter.

Solution

Board-exam working:

Given $\triangle ABE \cong \triangle ACD$.

By corresponding parts of congruent triangles:

$$AB = AC, \qquad AE = AD$$

Therefore:

$$\frac{AD}{AB} = \frac{AE}{AC} \qquad ...(1)$$

Also, because AD lies on AB and AE lies on AC:

$$\angle DAE = \angle BAC \qquad ...(2)$$

The two pairs of sides including the common angle are proportional.

Hence $\triangle ADE \sim \triangle ABC$ by SAS similarity, with $A \leftrightarrow A$, $D \leftrightarrow B$ and $E \leftrightarrow C$.

Final answer

Therefore, $\triangle ADE \sim \triangle ABC$.

QUESTION

Question 7

AA similarity · altitudes · proof

In Figure 6.38, altitudes AD and CE of $\triangle ABC$ intersect at P. Show that:

(i) $\triangle AEP \sim \triangle CDP$

(ii) $\triangle ABD \sim \triangle CBE$

(iii) $\triangle AEP \sim \triangle ADB$

(iv) $\triangle PDC \sim \triangle BEC$

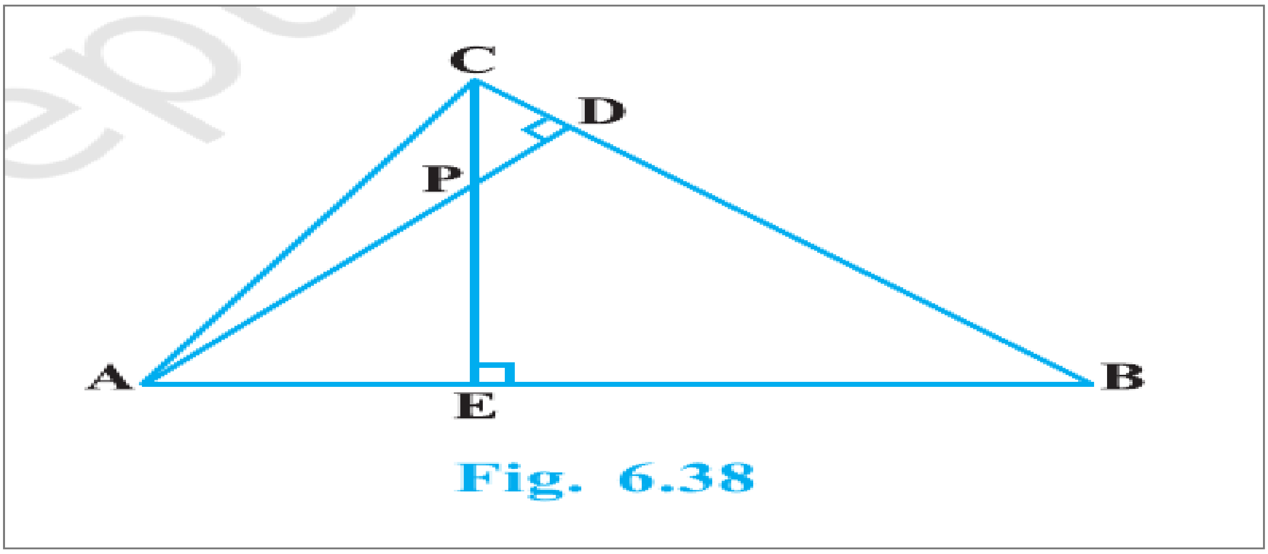

Figure 6-38 from the supplied NCERT chapter.

Solution

Board-exam working:

Since AD and CE are altitudes, AD ⊥ BC and CE ⊥ AB.

(i)

$$\angle AEP = \angle CDP = 90^\circ$$

$$\angle APE = \angle CPD$$

The second pair is vertically opposite. Therefore, △AEP ~ △CDP by AA similarity.

(ii)

$$\angle ADB = \angle CEB = 90^\circ$$

$$\angle ABD = \angle CBE$$

Here BD lies on BC and BE lies on BA. Therefore, △ABD ~ △CBE by AA similarity.

(iii)

$$\angle AEP = \angle ADB = 90^\circ$$

The angle between AD and CE equals the angle between their perpendiculars BC and AB. Hence:

$$\angle APE = \angle ABD$$

Therefore, △AEP ~ △ADB by AA similarity.

(iv)

$$\angle PDC = \angle BEC = 90^\circ$$

$$\angle PCD = \angle BCE$$

Here PC and CE are the same line, while CD and CB are the same line. Therefore, △PDC ~ △BEC by AA similarity.

Final answer

All four required pairs are similar by AA similarity.

QUESTION

Question 8

AA similarity · parallelogram · proof

E is a point on side AD produced of parallelogram ABCD, and BE intersects CD at F. Show that $\triangle ABE \sim \triangle CFB$.

Solution

Board-exam working:

In parallelogram ABCD, $AB \parallel CD$ and $AD \parallel BC$.

Since F lies on CD, $CF \parallel AB$. Since E lies on AD produced, $AE \parallel CB$.

Therefore, $\angle ABE = \angle CFB$ because $AB \parallel CF$ and BE is a transversal.

Also, $\angle BAE = \angle FCB$ because $AB \parallel CF$ and $AE \parallel CB$.

Hence $\triangle ABE \sim \triangle CFB$ by AA similarity, with $A \leftrightarrow C$, $B \leftrightarrow F$ and $E \leftrightarrow B$.

Final answer

Therefore, $\triangle ABE \sim \triangle CFB$.

QUESTION

Question 9

AA similarity · right triangles · proof

In Figure 6.39, ABC and AMP are right triangles, right-angled at B and M respectively. Prove that:

(i) △ABC ~ △AMP

(ii) CA/PA = BC/MP

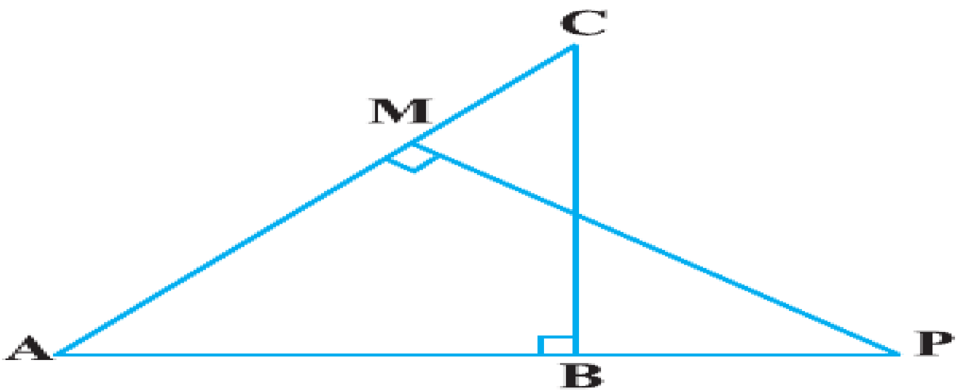

Fig. 6.39

Figure 6-39 from the supplied NCERT chapter.

Solution

Board-exam working:

(i)

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

$$\angle BAC = \angle MAP$$

The second pair is equal because BA and AP are the same straight line, while AC and AM are the same straight line.

Therefore, △ABC ~ △AMP by AA similarity, with A ↔ A, B ↔ M and C ↔ P.

(ii) Corresponding sides of similar triangles are proportional.

Here CA corresponds to PA and BC corresponds to MP. Therefore:

$$\frac{CA}{PA} = \frac{BC}{MP}$$

Final answer

(i) $\triangle ABC \sim \triangle AMP$; (ii) $CA/PA = BC/MP$.

QUESTION

Question 10

AA similarity · angle bisectors · proof

CD and GH are respectively the bisectors of $\angle ACB$ and $\angle EGF$, with D on AB and H on FE. If $\triangle ABC \sim \triangle FEG$, show that:

(i) $CD/GH = AC/FG$

(ii) $\triangle DCB \sim \triangle HGE$

(iii) $\triangle DCA \sim \triangle HGF$

Solution

Board-exam working:

Given $\triangle ABC \sim \triangle FEG$, the correspondence is $A \leftrightarrow F$, $B \leftrightarrow E$ and $C \leftrightarrow G$.

$$\angle A = \angle F, \quad \angle B = \angle E, \quad \angle C = \angle G$$

$$\frac{AC}{FG} = \frac{BC}{EG} \qquad ...(1)$$

Since CD and GH bisect equal angles C and G:

$$\angle DCB = \angle HGE$$

$$\angle DCA = \angle HGF$$

(ii)

$$\angle DBC = \angle HEG$$

This follows because ∠B = ∠E. Therefore, △DCB ~ △HGE by AA similarity.

From this similarity:

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

Combining this with (1):

$$\frac{CD}{GH} = \frac{AC}{FG}$$

This proves part (i).

(iii)

$$\angle DCA = \angle HGF$$

$$\angle DAC = \angle HFG$$

The second pair is equal because ∠A = ∠F. Therefore, △DCA ~ △HGF by AA similarity.

Final answer

(i) CD/GH = AC/FG; (ii) △DCB ~ △HGE; (iii) △DCA ~ △HGF.

QUESTION

Question 11

AA similarity · isosceles triangle · perpendicular lines · proof

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In Figure 6.40, E is on side CB produced of isosceles $\triangle ABC$ with $AB = AC$. If $AD \perp BC$ and $EF \perp AC$, prove that $\triangle ABD \sim \triangle ECF$.

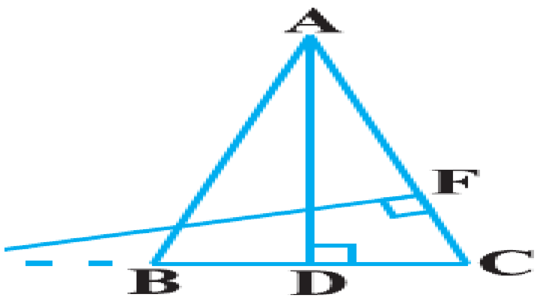

Fig. 6.40

Figure 6-40 from the supplied NCERT chapter.

Solution

Board-exam working:

Since $AD \perp BC$ and $EF \perp AC$, $\angle ADB = \angle EFC = 90°$.

Because $AB = AC$, the base angles of isosceles $\triangle ABC$ are equal: $\angle ABC = \angle BCA$.

D lies on BC, so $\angle ABD = \angle ABC$. E, B, D and C are collinear and F lies on AC, so $\angle ECF = \angle BCA$.

Therefore, $\angle ABD = \angle ECF$.

Hence $\triangle ABD \sim \triangle ECF$ by AA similarity, with $A \leftrightarrow E$, $B \leftrightarrow C$ and $D \leftrightarrow F$.

Final answer

Therefore, $\triangle ABD \sim \triangle ECF$.

QUESTION

Question 12

SSS similarity · SAS similarity · medians · proof

Sides AB and BC and median AD of $\triangle ABC$ are respectively proportional to sides PQ and QR and median PM of $\triangle PQR$. Show that $\triangle ABC \sim \triangle PQR$.

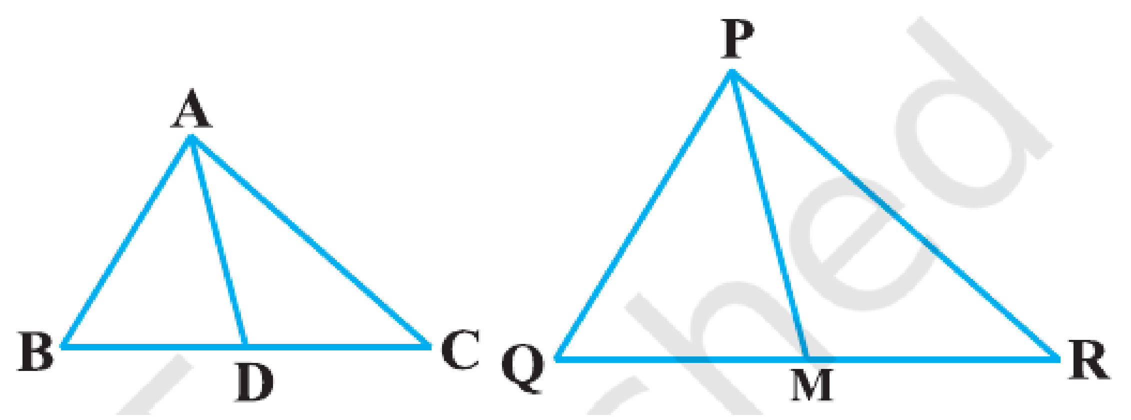

Figure 6-41 from the supplied NCERT chapter.

Solution

Board-exam working:

Let the common proportionality ratio be k:

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AD}{PM} = k$$

Since AD and PM are medians:

$$BD = \frac{BC}{2}, \qquad QM = \frac{QR}{2}$$

Therefore:

$$\frac{BD}{QM} = \frac{BC}{QR} = k$$

Thus, in △ABD and △PQM:

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

Therefore, △ABD ~ △PQM by SSS similarity, so ∠ABD = ∠PQM.

Because D lies on BC and M lies on QR, ∠ABD = ∠ABC and ∠PQM = ∠PQR. Hence ∠ABC = ∠PQR.

Also:

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

The included angles are equal. Therefore, △ABC ~ △PQR by SAS similarity.

Final answer

Therefore, △ABC ~ △PQR.

QUESTION

Question 13

AA similarity · geometric mean · proof

D is a point on side BC of △ABC such that ∠ADC = ∠BAC. Show that $CA^2 = CB \times CD$.

Solution

Board-exam working:

Consider △ADC and △BAC.

∠ADC = ∠BAC is given.

Since D lies on BC, ∠ACD = ∠BCA.

Therefore, △ADC ~ △BAC by AA similarity, with A ↔ B, D ↔ A and C ↔ C.

Corresponding sides give:

$$\frac{DC}{AC} = \frac{AC}{BC}$$

Cross multiplying:

$$AC^2 = BC \times DC$$

Final answer

Therefore, $CA^2 = CB \times CD$.

QUESTION

Question 14

SSS similarity · medians · Apollonius theorem · proof

Sides AB and AC and median AD of △ABC are respectively proportional to sides PQ and PR and median PM of △PQR. Show that △ABC ~ △PQR.

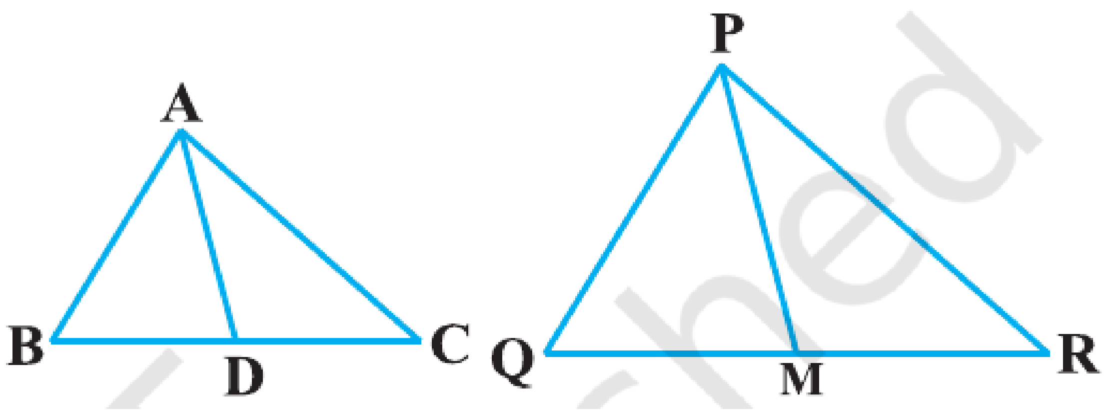

Figure 6-41 from the supplied NCERT chapter.

Solution

Board-exam working:

Let the common proportionality ratio be k:

$$\frac{AB}{PQ} = \frac{AC}{PR} = \frac{AD}{PM} = k$$

Therefore:

$$AB = kPQ, \qquad AC = kPR, \qquad AD = kPM$$

By Apollonius' theorem in △ABC:

$$BC^2 = 2AB^2 + 2AC^2 - 4AD^2$$

Substituting the proportional lengths:

$$BC^2 = k^2(2PQ^2 + 2PR^2 - 4PM^2) \qquad ...(1)$$

By Apollonius' theorem in △PQR:

$$QR^2 = 2PQ^2 + 2PR^2 - 4PM^2 \qquad ...(2)$$

From (1) and (2):

$$BC^2 = k^2QR^2$$

Since side lengths are positive:

$$\frac{BC}{QR} = k$$

Therefore:

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

Hence △ABC ~ △PQR by SSS similarity, with A ↔ P, B ↔ Q and C ↔ R.

Final answer

Therefore, △ABC ~ △PQR.

QUESTION

Question 15

AA similarity · shadows · application

A vertical pole 6 m long casts a 4 m shadow. At the same time, a tower casts a 28 m shadow. Find the height of the tower.

Solution

Board-exam working:

Let the height of the tower be h metres.

The pole and tower are vertical, so each forms a right triangle with the ground.

Because the observations are at the same time, the sun's rays make the same angle with the ground. Therefore, the two triangles are similar by AA.

Corresponding height-to-shadow ratios are equal:

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

Cross multiplying:

$$4h = 28 \times 6$$

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

$$h = 7 \times 6 = 42 \text{ m}$$

Final answer

The tower is 42 m high.

QUESTION

Question 16

SAS similarity · medians · proof

AD and PM are medians of △ABC and △PQR respectively, where △ABC ~ △PQR. Prove that AB/PQ = AD/PM.

Solution

Board-exam working:

Given △ABC ~ △PQR, with A ↔ P, B ↔ Q and C ↔ R. Therefore:

$$\frac{AB}{PQ} = \frac{BC}{QR} \qquad ...(1)$$

$$\angle ABC = \angle PQR$$

Since AD and PM are medians:

$$BD = \frac{BC}{2}, \qquad QM = \frac{QR}{2}$$

Hence:

$$\frac{BD}{QM} = \frac{BC/2}{QR/2}$$

$$\frac{BD}{QM} = \frac{BC}{QR} = \frac{AB}{PQ} \qquad ...(2)$$

Also, ∠ABD = ∠PQM because D lies on BC, M lies on QR, and ∠ABC = ∠PQR.

From (2) and the included equal angle, △ABD ~ △PQM by SAS similarity.

Therefore, corresponding sides give:

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

Final answer

Therefore, AB/PQ = AD/PM.