CLASS 10 · MATHEMATICS · CHAPTER 6

Triangles - Exercise 6.2

Exercise 6.2 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

basic proportionality theorem · numerical geometry

In Figure 6.17 (i) and (ii), DE ∥ BC. Find EC in (i) and AD in (ii).

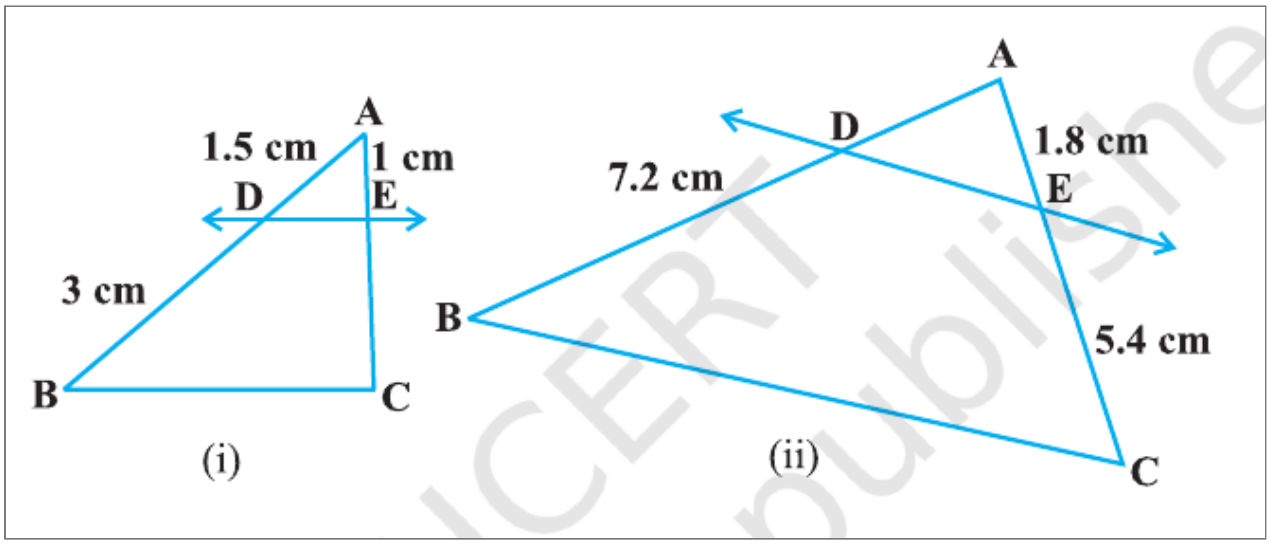


Figure 6-17 from the supplied NCERT chapter.

Solution

GIVEN:

In each diagram, DE is parallel to BC and the labelled segment lengths are known.

TO FIND:

EC in part (i) and AD in part (ii).

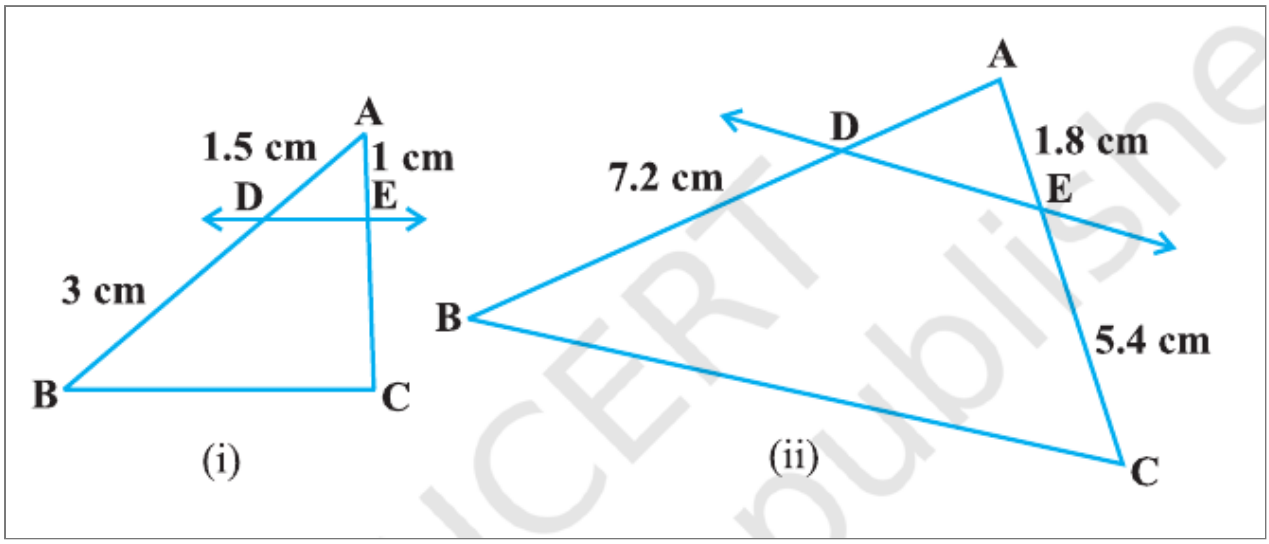


Figure 6-17 from the supplied NCERT chapter.

SOLUTION:

(i) In △ABC, DE ∥ BC. By BPT:

$$\frac{AD}{DB} = \frac{AE}{EC}$$

Substituting AD = 1.5 cm, DB = 3 cm and AE = 1 cm:

$$\frac{1.5}{3} = \frac{1}{EC}$$

$$\frac{1}{2} = \frac{1}{EC}$$

$$EC = 2 \text{ cm}$$

(ii) Again, by BPT:

$$\frac{AD}{DB} = \frac{AE}{EC}$$

Substituting DB = 7.2 cm, AE = 1.8 cm and EC = 5.4 cm:

$$\frac{AD}{7.2} = \frac{1.8}{5.4}$$

$$\frac{AD}{7.2} = \frac{1}{3}$$

$$AD = \frac{7.2}{3} = 2.4\ \text{cm}$$

Final answer

(i) EC = 2 cm; (ii) AD = 2.4 cm.

QUESTION

Question 2

converse of BPT · parallel lines · ratios

E and F are points on sides PQ and PR respectively of △PQR. State whether EF ∥ QR in each case:

(i) PE = 3.9 cm, EQ = 3 cm, PF = 3.6 cm and FR = 2.4 cm

(ii) PE = 4 cm, QE = 4.5 cm, PF = 8 cm and RF = 9 cm

(iii) PQ = 1.28 cm, PR = 2.56 cm, PE = 0.18 cm and PF = 0.36 cm

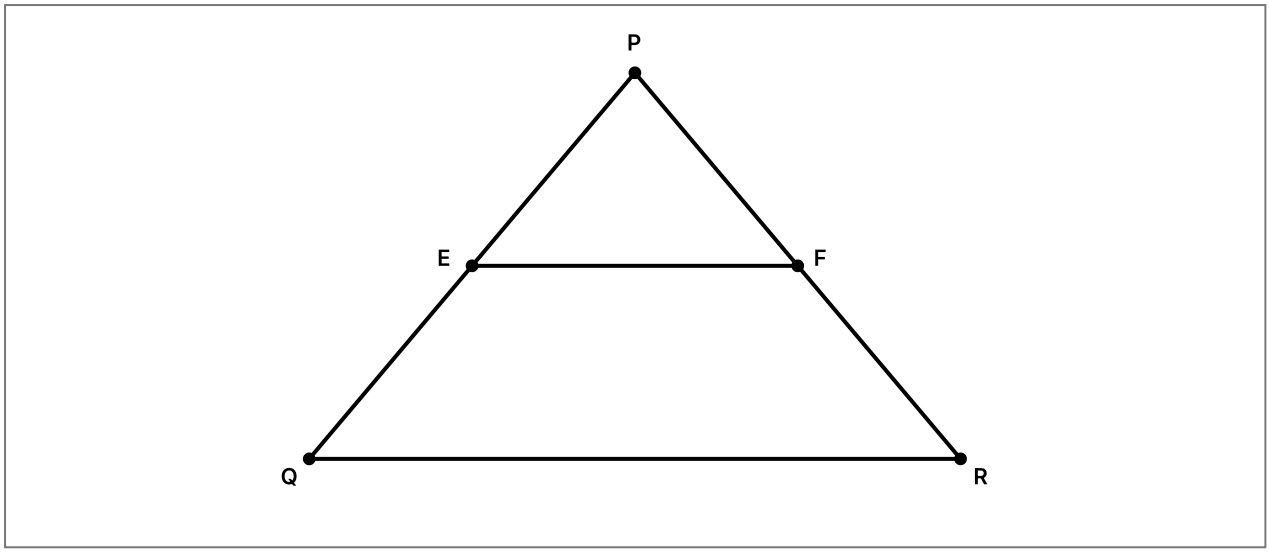
Solution

GIVEN:

E lies on PQ and F lies on PR in triangle PQR; three different sets of segment lengths are supplied.

TO ANSWER:

For each part, determine whether EF is parallel to QR.



Converse of the Basic Proportionality Theorem — solution sketch (not to scale).

SOLUTION:

By the converse of BPT, EF ∥ QR when:

$$\frac{PE}{EQ} = \frac{PF}{FR}$$

(i)

$$\frac{PE}{EQ} = \frac{3.9}{3} = 1.3$$

$$\frac{PF}{FR} = \frac{3.6}{2.4} = 1.5$$

The ratios are unequal. Therefore, EF is not parallel to QR.

(ii)

$$\frac{PE}{EQ} = \frac{4}{4.5} = \frac{8}{9}$$

$$\frac{PF}{FR} = \frac{8}{9}$$

The ratios are equal. Therefore, EF ∥ QR.

(iii)

$$EQ = PQ - PE = 1.28 - 0.18 = 1.10 \text{ cm}$$

$$FR = PR - PF = 2.56 - 0.36 = 2.20 \text{ cm}$$

$$\frac{PE}{EQ} = \frac{0.18}{1.10} = \frac{9}{55}$$

$$\frac{PF}{FR} = \frac{0.36}{2.20} = \frac{9}{55}$$

The ratios are equal. Therefore, EF ∥ QR.

Final answer

(i) No; (ii) Yes; (iii) Yes.

QUESTION

Question 3

basic proportionality theorem · parallel lines · proof

In Figure 6.18, LM ∥ CB and LN ∥ CD. Prove that AM/AB = AN/AD.

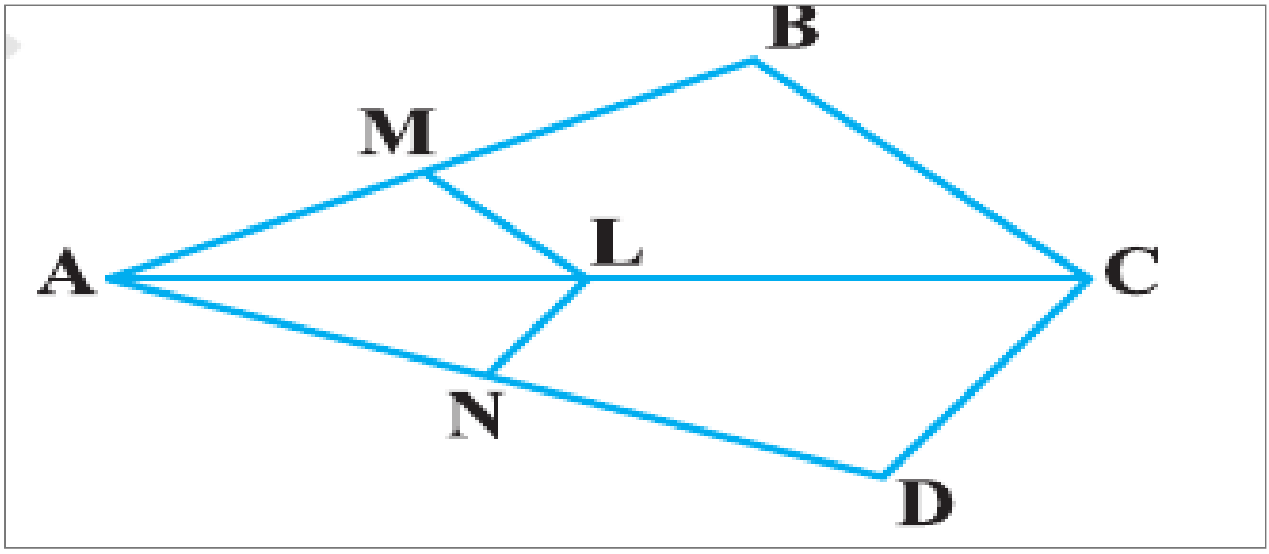


Figure 6-18 from the supplied NCERT chapter.

Solution

GIVEN:

LM is parallel to CB and LN is parallel to CD in Figure 6.18.

TO PROVE:

AM/AB = AN/AD.

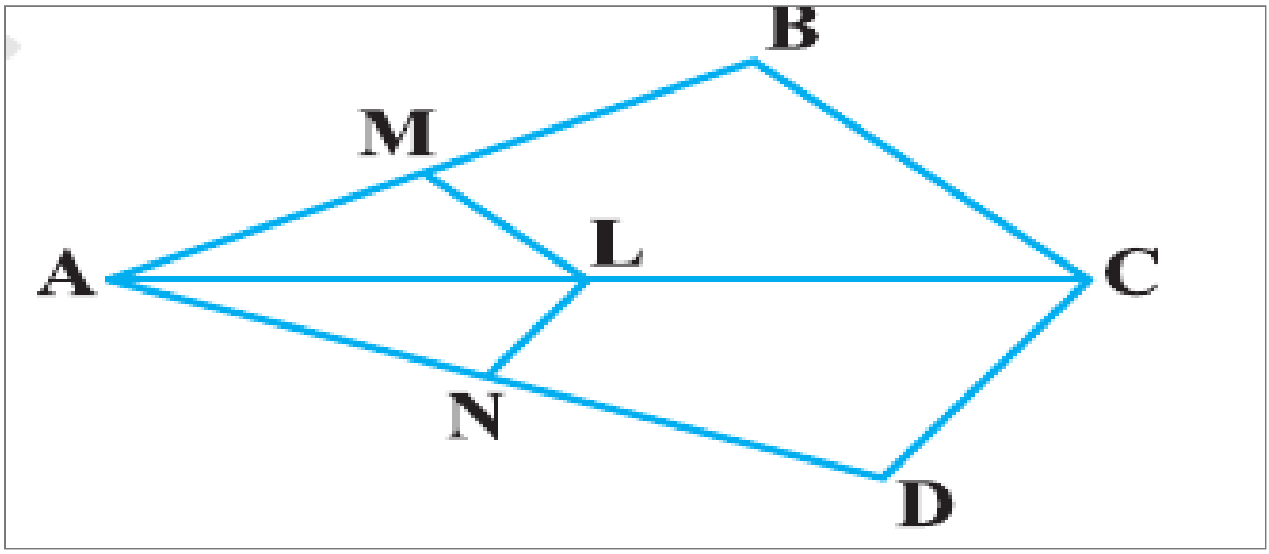


Figure 6-18 from the supplied NCERT chapter.

PROOF:

In △ABC, LM ∥ CB. By Example 1 (the BPT result using whole sides):

$$\frac{AM}{AB} = \frac{AL}{AC} \qquad \ldots(1)$$

In △ADC, LN ∥ CD. By the same result:

$$\frac{AN}{AD} = \frac{AL}{AC} \qquad \ldots(2)$$

The right-hand sides of (1) and (2) are equal.

Therefore:

$$\frac{AM}{AB} = \frac{AN}{AD}$$

Final answer

Therefore, AM/AB = AN/AD.

QUESTION

Question 4

basic proportionality theorem · parallel lines · proof

In Figure 6.19, DE ∥ AC and DF ∥ AE. Prove that BF/FE = BE/EC.

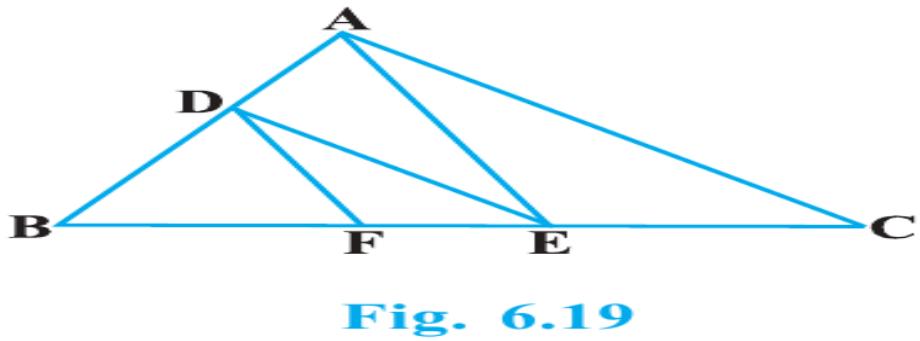


Fig. 6.19

Figure 6-19 from the supplied NCERT chapter.

Solution

GIVEN:

DE is parallel to AC and DF is parallel to AE in Figure 6.19.

TO PROVE:

BF/FE = BE/EC.

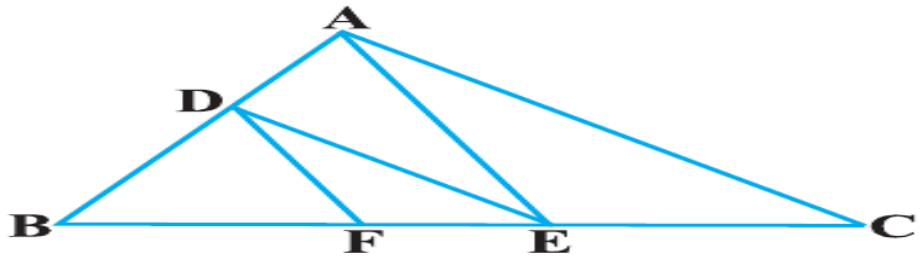


Fig. 6.19

Figure 6-19 from the supplied NCERT chapter.

PROOF:

In △BAE, DF ∥ AE. By BPT:

$$\frac{BD}{DA} = \frac{BF}{FE} \quad \ldots(1)$$

In △BAC, DE ∥ AC. By BPT:

$$\frac{BD}{DA} = \frac{BE}{EC} \quad \ldots(2)$$

The left-hand sides of (1) and (2) are equal.

Therefore:

$$\frac{BF}{FE} = \frac{BE}{EC}$$

Final answer

Therefore, BF/FE = BE/EC.

QUESTION

Question 5

basic proportionality theorem · converse of BPT · proof

In Figure 6.20, DE ∥ OQ and DF ∥ OR. Show that EF ∥ QR.

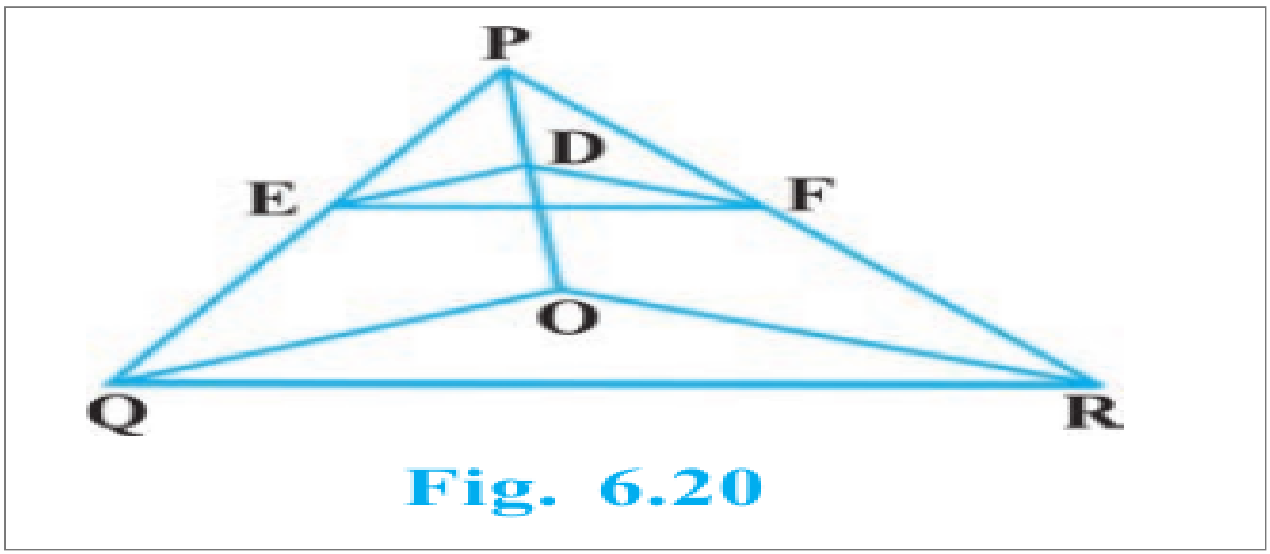


Figure 6-20 from the supplied NCERT chapter.

Solution

GIVEN:

DE is parallel to OQ and DF is parallel to OR in Figure 6.20.

TO PROVE:

EF is parallel to QR.

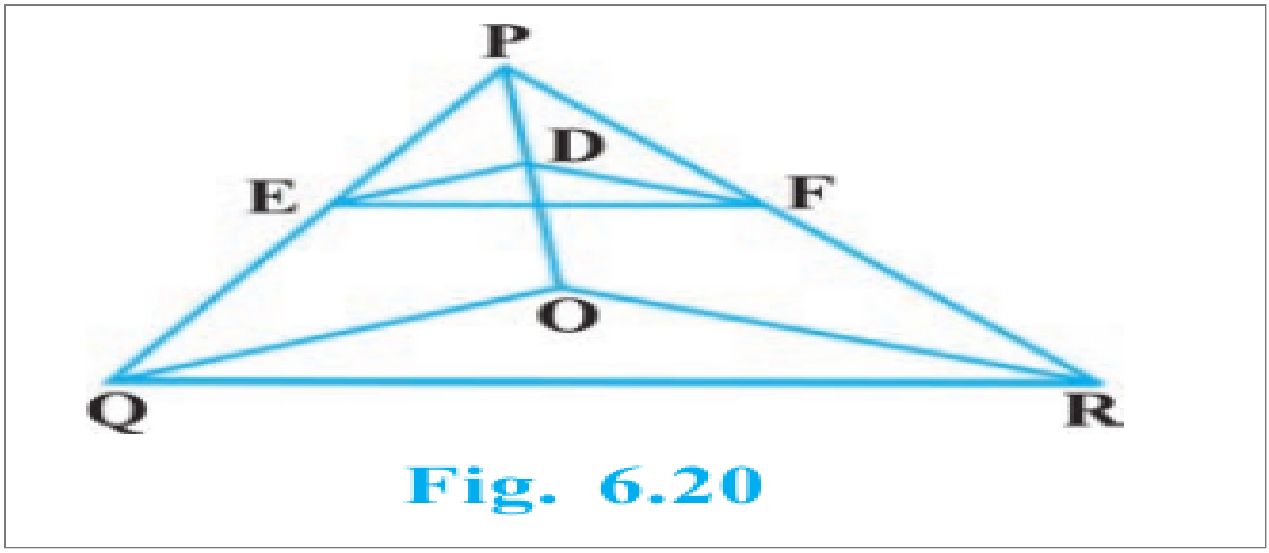


Figure 6-20 from the supplied NCERT chapter.

PROOF:

In △POQ, DE ∥ OQ. By BPT:

$$\frac{PE}{EQ} = \frac{PD}{DO} \quad \ldots(1)$$

In △POR, DF ∥ OR. By BPT:

$$\frac{PF}{FR} = \frac{PD}{DO} \quad \ldots(2)$$

From (1) and (2):

$$\frac{PE}{EQ} = \frac{PF}{FR}$$

Thus E and F divide sides PQ and PR in the same ratio.

Therefore, EF ∥ QR by the converse of BPT.

Final answer

Therefore, EF ∥ QR.

QUESTION

Question 6

basic proportionality theorem · converse of BPT · proof

In Figure 6.21, A, B and C are points on OP, OQ and OR respectively such that AB ∥ PQ and AC ∥ PR. Show that BC ∥ QR.

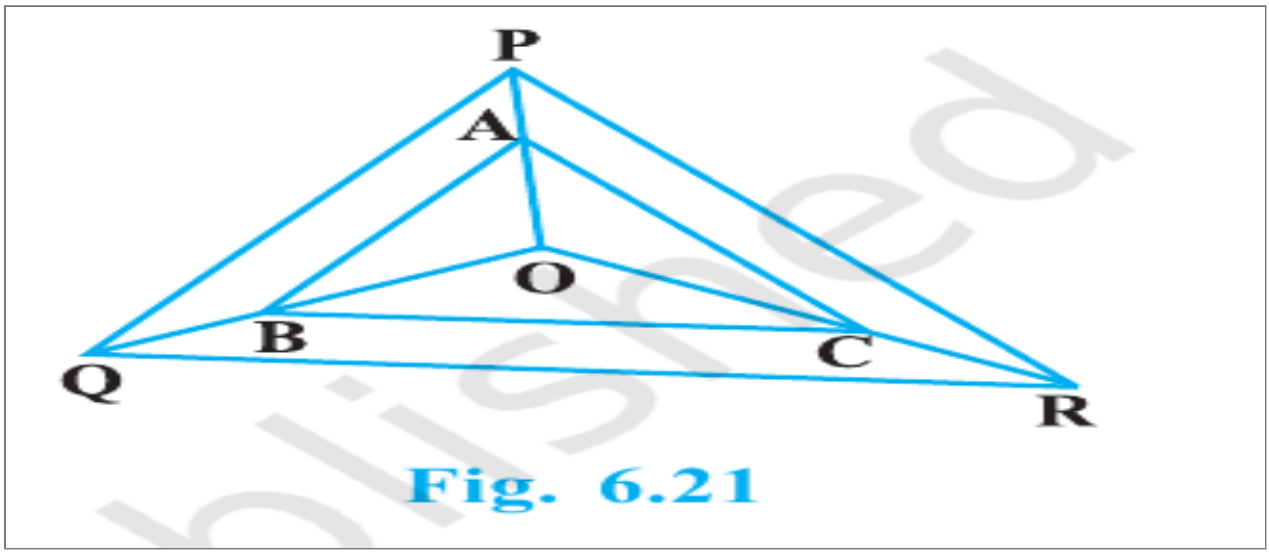


Figure 6-21 from the supplied NCERT chapter.

Solution

GIVEN:

A, B and C lie on OP, OQ and OR; AB is parallel to PQ and AC is parallel to PR.

TO PROVE:

BC is parallel to QR.

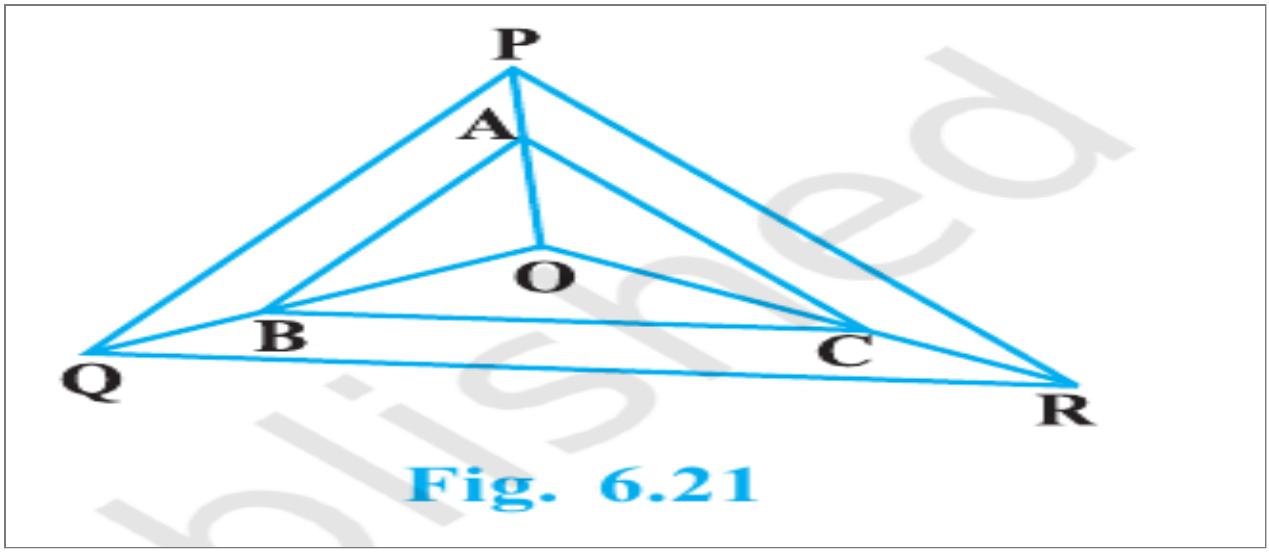


Figure 6-21 from the supplied NCERT chapter.

PROOF:

In $\triangle OPQ$, AB ∥ PQ. By BPT:

$$\frac{OA}{AP} = \frac{OB}{BQ} \quad \ldots(1)$$

In $\triangle OPR$, AC ∥ PR. By BPT:

$$\frac{OA}{AP} = \frac{OC}{CR} \quad \ldots(2)$$

From (1) and (2):

$$\frac{OB}{BQ} = \frac{OC}{CR}$$

Therefore B and C divide OQ and OR in the same ratio.

Hence BC ∥ QR by the converse of BPT.

Final answer

Therefore, BC ∥ QR.

QUESTION

Question 7

basic proportionality theorem · midpoint theorem · proof

Using Theorem 6.1, prove that a line drawn through the midpoint of one side of a triangle parallel to another side bisects the third side.

Solution

GIVEN:

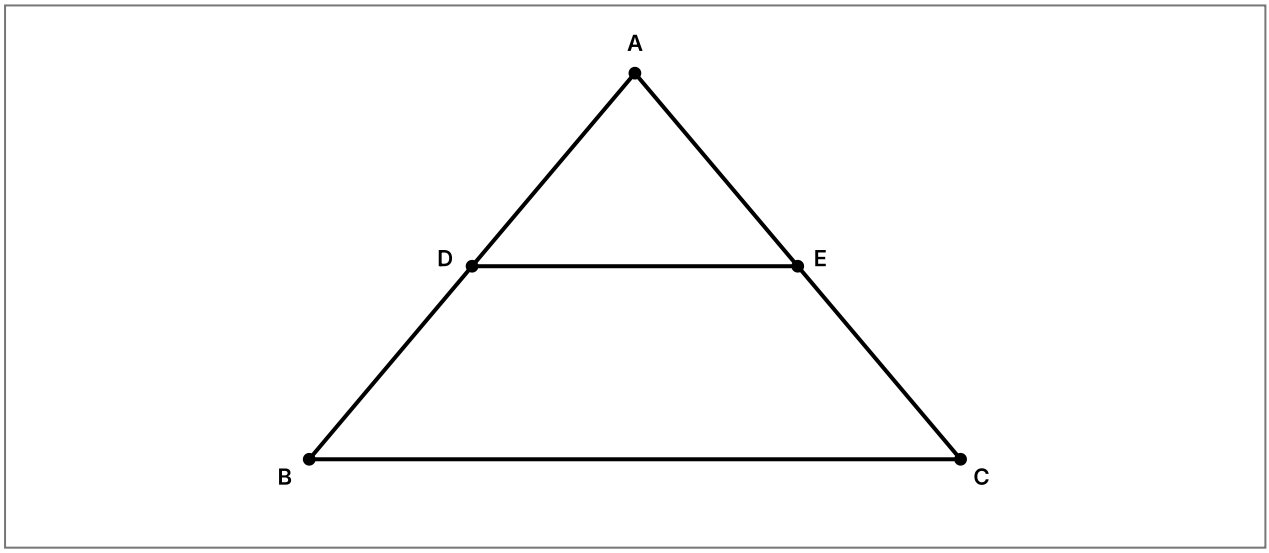
D is the midpoint of AB in triangle ABC.

TO PROVE:

A line through D parallel to BC bisects AC.

CONSTRUCTION:

Draw DE parallel to BC, meeting AC at E.



Midpoint theorem construction — solution sketch (not to scale).

PROOF:

Since D is the midpoint of AB, AD = DB. Therefore:

$$\frac{AD}{DB} = 1$$

Because DE ∥ BC, BPT gives:

$$\frac{AD}{DB} = \frac{AE}{EC}$$

Therefore:

$$\frac{AE}{EC} = 1$$

$$AE = EC$$

Hence E is the midpoint of AC, and the parallel line bisects the third side.

Final answer

The line parallel to one side bisects the third side.

QUESTION

Question 8

converse of BPT · midpoint theorem · proof

Using Theorem 6.2, prove that the line joining the midpoints of any two sides of a triangle is parallel to the third side.

Solution

GIVEN:

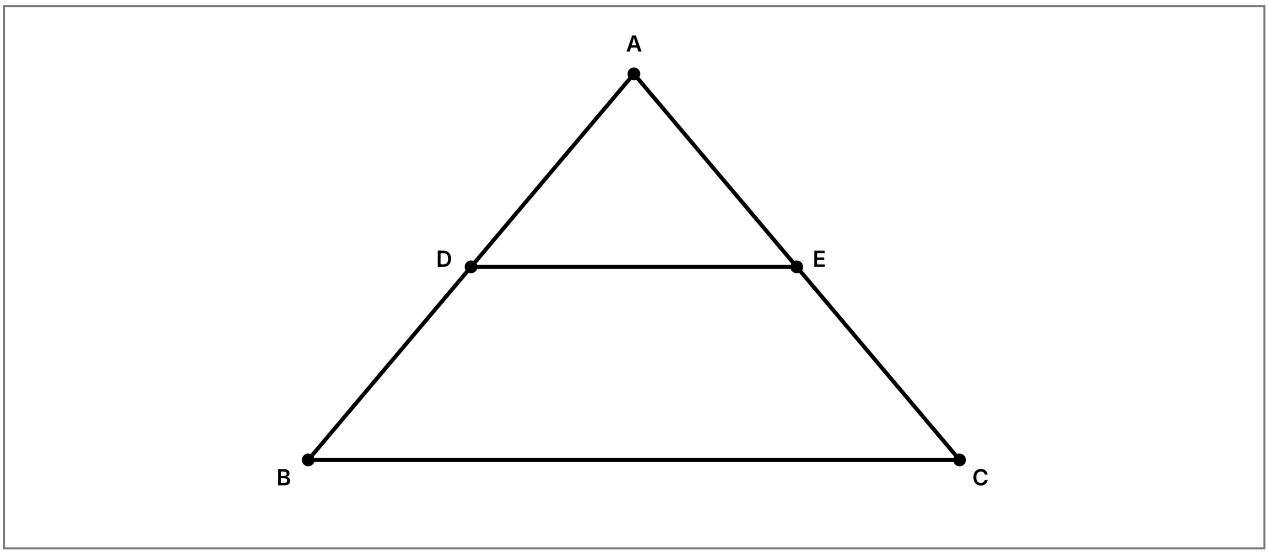
D and E are the midpoints of AB and AC in triangle ABC.

TO PROVE:

DE is parallel to BC.

CONSTRUCTION:

Join the midpoints D and E.



Midpoint theorem construction — solution sketch (not to scale).

PROOF:

Since D is the midpoint of AB, AD = DB. Therefore:

$$\frac{AD}{DB} = 1$$

Since E is the midpoint of AC, AE = EC. Therefore:

$$\frac{AE}{EC} = 1$$

Thus:

$$\frac{AD}{DB} = \frac{AE}{EC}$$

Therefore, DE ∥ BC by the converse of BPT.

Final answer

The segment joining the two midpoints is parallel to the third side.

QUESTION

Question 9

AA similarity · trapezium · diagonals · proof

ABCD is a trapezium in which AB ∥ DC, and its diagonals intersect at O. Show that AO/BO = CO/DO.

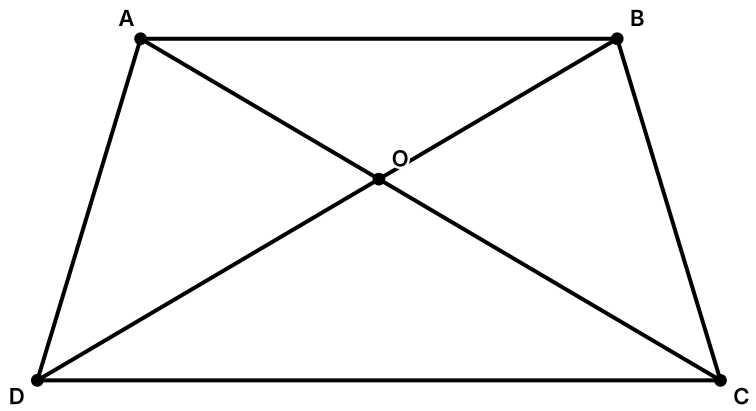
Solution

GIVEN:

ABCD is a trapezium, AB is parallel to DC, and diagonals AC and BD meet at O.

TO PROVE:

AO/BO = CO/DO.



Trapezium with intersecting diagonals — solution sketch (not to scale).

PROOF:

Consider △AOB and △COD.

$$\angle AOB = \angle COD$$

Vertically opposite angles.

$$\angle ABO = \angle CDO$$

Alternate interior angles, since AB is parallel to DC and BD is a transversal.

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

Corresponding sides are proportional:

$$\frac{AO}{CO} = \frac{BO}{DO}$$

Rearranging:

$$\frac{AO}{BO} = \frac{CO}{DO}$$

Final answer

Therefore, AO/BO = CO/DO.

QUESTION

Question 10

SAS similarity · trapezium · converse · proof

The diagonals of quadrilateral ABCD intersect at O such that AO/BO = CO/DO. Show that ABCD is a trapezium.

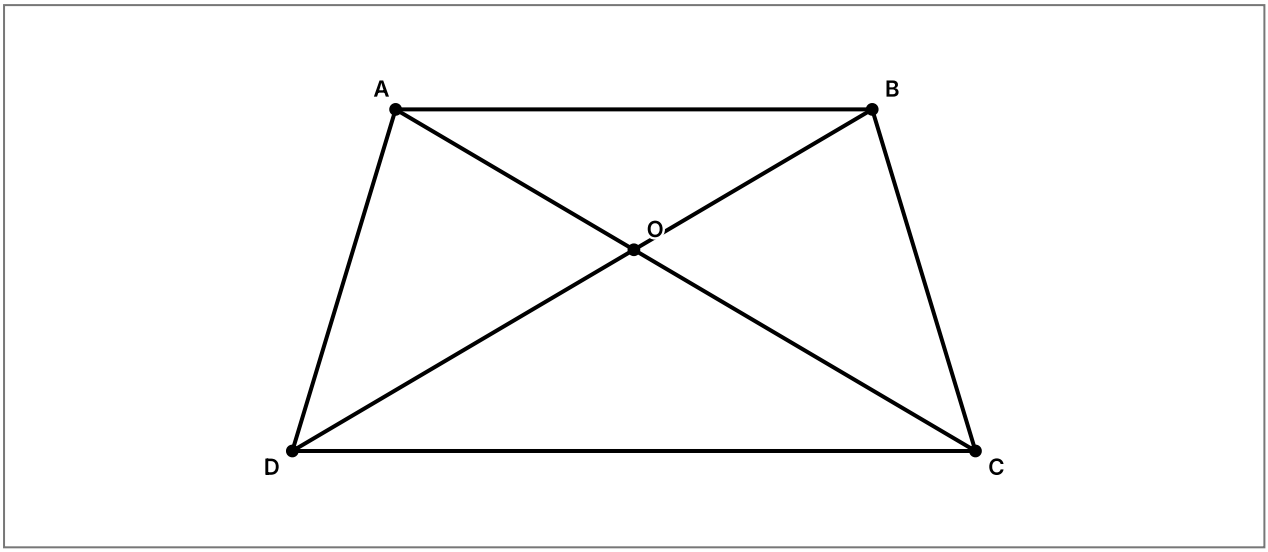
Solution

GIVEN:

Diagonals AC and BD of quadrilateral ABCD meet at O and AO/BO = CO/DO.

TO PROVE:

AB is parallel to DC, so ABCD is a trapezium.



Trapezium with intersecting diagonals — solution sketch (not to scale).

PROOF:

$$\frac{AO}{BO} = \frac{CO}{DO}$$

Cross multiplying:

$$AO \times DO = BO \times CO$$

Dividing by CO × DO:

$$\frac{AO}{CO} = \frac{BO}{DO} \qquad ...(1)$$

Also, ∠AOB = ∠COD because they are vertically opposite angles. ...(2)

From (1) and (2), △AOB ~ △COD by SAS similarity, with A ↔ C and B ↔ D.

Therefore, ∠ABO = ∠CDO as corresponding angles.

These are alternate interior angles on transversal BD, so AB ∥ DC.

Hence ABCD has one pair of opposite sides parallel and is a trapezium.

Final answer

Therefore, AB ∥ DC and ABCD is a trapezium.