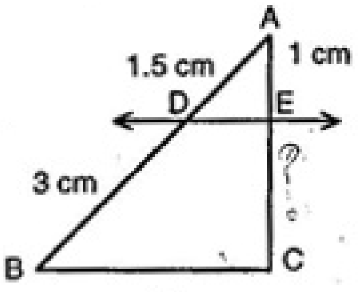
CBSE Class–10 Mathematics

NCERT solution

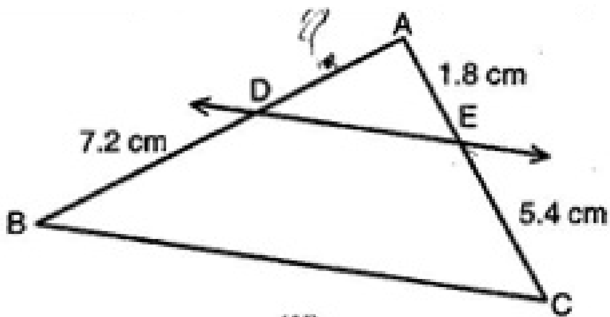
Chapter - 6

Triangles - Exercise 6.2

1. In figure (i) and (ii), DE || BC. Find EC in (i) and AD in (ii).



(i)



(ii)

Ans. (i) Since DE || BC,

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

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

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

$\Rightarrow$ EC = 2 cm

(ii) Since DE || BC,

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

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

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

$\Rightarrow$ EC = 2.4 cm

2. E and F are points on the sides PQ and PR respectively of a $\triangle$PQR. For each of the following cases, state whether EF $\|$ QR:

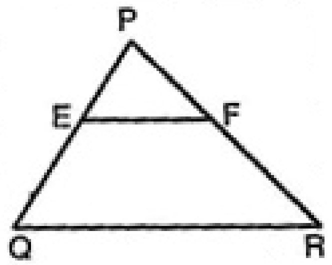
(i) PE = 3.9 cm, EQ = 4 cm, PF = 3.6 cm and FR = 2.4 cm

(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

Ans. (i) Given: PE = 3.9 cm, EQ = 4 cm, PF = 3.6 cm and FR = 2.4 cm

Now, $\frac{PE}{EQ} = \frac{3.9}{4}$ = 0.97 cm



And $\frac{PF}{FR} = \frac{3.6}{2.4}$ = 1.2 cm

$\because \frac{PE}{EQ} \neq \frac{PF}{FR}$

Therefore, EF does not divide the sides PQ and PR of $\triangle$PQR in the same ratio.

$\therefore$ EF is not parallel to QR.

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

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

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

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

Therefore, EF divides the sides PQ and PR of ΔPQR in the same ratio.

$\therefore$ EF is parallel to QR.

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

$\Rightarrow$ EQ = PQ – PE = 1.28 – 0.18 = 1.10 cm

And ER = PR – PF = 2.56 – 0.36 = 2.20 cm

Now, $\frac{PE}{EQ} = \frac{0.18}{1.10} = \frac{18}{110} = \frac{9}{55}$ cm

And $\frac{PF}{FR} = \frac{0.36}{2.20} = \frac{36}{220} = \frac{9}{55}$ cm

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

Therefore, EF divides the sides PQ and PR of ΔPQR in the same ratio.

$\therefore$ EF is parallel to QR.

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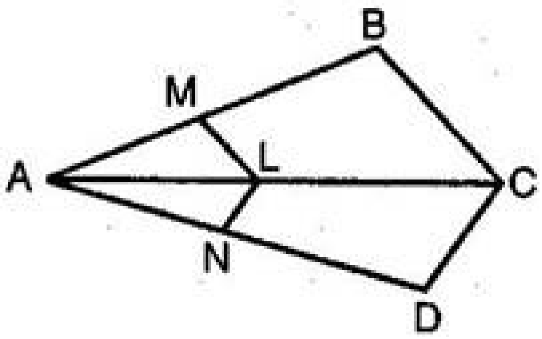
3. In figure, if LM $\parallel$ CB and LN $\parallel$ CD, prove that $\frac{AM}{AB} = \frac{AN}{AD}$.



Ans. In $\triangle$ABC, LM $\|$ CB

$\therefore \dfrac{AM}{AB} = \dfrac{AL}{AC}$ [Basic Proportionality theorem] ....(i)

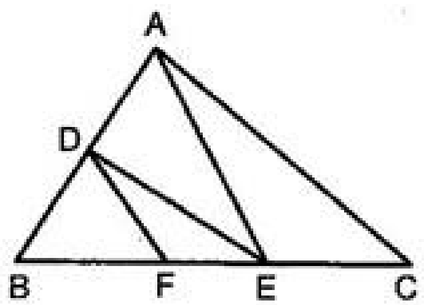
And in $\triangle$ACD, LN $\|$ CD

$\therefore \dfrac{AL}{AC} = \dfrac{AN}{AD}$ [Basic Proportionality theorem] ....(ii)

From eq. (i) and (ii), we have

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

4. In the given figure, DE $\|$ AC and DF $\|$ AE. Prove that $\dfrac{BF}{FE} = \dfrac{BE}{EC}$.



Ans. In $\triangle$BCA, DE $\|$ AC

$\therefore \dfrac{BE}{EC} = \dfrac{BD}{DA}$ [Basic Proportionality theorem] ....(i)

And in $\triangle$BEA, DF $\|$ AE

$\therefore \frac{BE}{FE} = \frac{BD}{DA}$ [Basic Proportionality theorem] ....(ii)

From eq. (i) and (ii), we have

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

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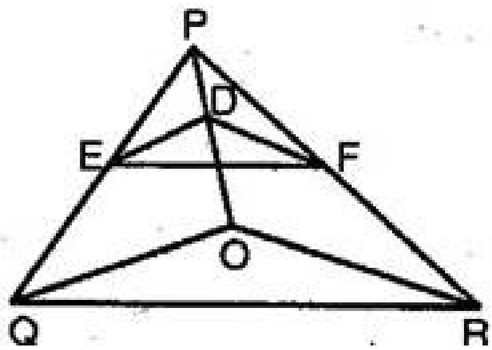
5. In the given figure, DE $\|$ OQ and DF $\|$ OR. Show that EF $\|$ QR.



Ans. In $\triangle$PQO, DE $\|$ OQ

$\therefore \frac{PE}{EQ} = \frac{PD}{DO}$ [Basic Proportionality theorem] ....(i)

And in $\triangle$POR, DF $\|$ OR

$\therefore \frac{PD}{DO} = \frac{PF}{FR}$ [Basic Proportionality theorem] ....(ii)

From eq. (i) and (ii), we have

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

$\therefore$ EF $\|$ QR [By the converse of BPT]

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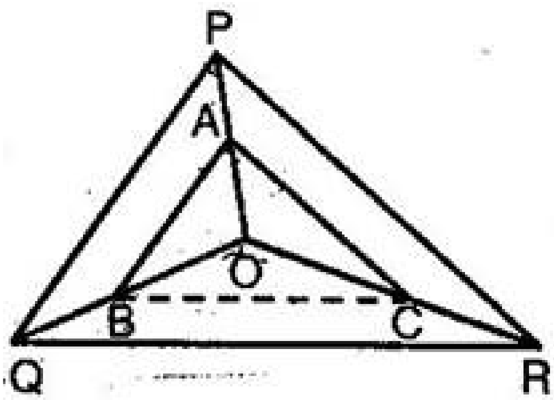
6. In the given figure, A, B, and C are points on OP, OQ and OR respectively such that AB $\|$ PQ and AC $\|$ PR. Show that BC $\|$ QR.



Ans. Given: O is any point in $\triangle$PQR, in which AB $\parallel$ PQ and AC $\parallel$ PR.

To prove: BC $\parallel$ QR

Construction: Join BC.

Proof: In $\triangle$OPQ, AB $\parallel$ PQ

$\therefore \frac{OA}{AP} = \frac{OB}{BQ}$ [Basic Proportionality theorem] ....(i)

And in $\triangle$OPR, AC $\parallel$ PR

$\therefore \frac{OA}{AP} = \frac{OC}{CR}$ [Basic Proportionality theorem] ....(ii)

From eq. (i) and (ii), we have

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

$\because$ In $\triangle$OQR, B and C are points dividing the sides OQ and OR in the same ratio.

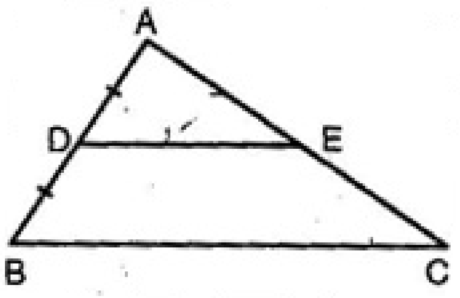
$\therefore$ By the converse of Basic Proportionality theorem,

$\Rightarrow$ BC $\parallel$ QR

7. 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. (Recall that you have proved it in Class IX).

Ans. Given: A triangle ABC, in which D is the midpoint of side AB

and the line DE is drawn parallel to BC, meeting AC at E.



To prove: AE = EC

Proof: Since DE $\parallel$ BC

$\therefore \frac{AD}{DB} = \frac{AE}{EC}$ [Basic Proportionality theorem] ……….(i)

But AD = DB [Given]

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

$\Rightarrow \frac{AE}{EC} = 1$ [From eq. (i)]

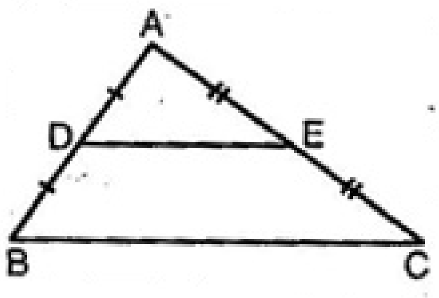
$\Rightarrow$ AE = EC

Hence, E is the midpoint of the third side AC.

8. Using Theorem 6.2, prove that the line joining the midpoints of any two sides of a triangle is parallel to the third side. (Recall that you have done it in Class IX).

Ans. Given: A triangle ABC, in which D and E are the midpoints of

sides AB and AC respectively.



To Prove: DE $||$ BC

Proof: Since D and E are the midpoints of AB and AC

respectively.

$\therefore$ AD = DB and AE = EC

Now, AD = DB

$\Rightarrow \frac{AD}{DB} = 1$ and AE = EC

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

$\therefore \frac{AD}{DB} = \frac{AE}{EC} = 1$

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

Thus, in triangle ABC, D and E are points dividing the sides AB and AC in the same ratio.

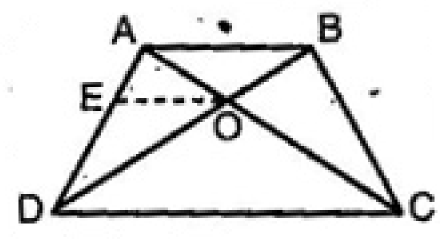
Therefore, by the converse of Basic Proportionality theorem, we have

DE $||$ BC

9. ABCD is a trapezium in which AB $||$ DC and its diagonals intersect each other at the point O. Show that $\frac{AO}{BO} = \frac{CO}{DO}$.

Ans. Given: A trapezium ABCD, in which AB $\|$ DC and its diagonals

AC and BD intersect each other at O.



To Prove: $\frac{AO}{BO} = \frac{CO}{DO}$

Construction: Through O, draw OE $\|$ AB, i.e. OE $\|$ DC.

Proof: In ΔADC, we have OE $\|$ DC

$\therefore \frac{AE}{ED} = \frac{AO}{CO}$ [By Basic Proportionality theorem]……….(i)

Again, in ΔABD, we have OE $\|$ AB[Construction]

$\therefore \frac{ED}{AE} = \frac{DO}{BO}$ [By Basic Proportionality theorem]

$\Rightarrow \frac{AE}{ED} = \frac{BO}{DO}$ ……….(ii)

From eq. (i) and (ii), we get

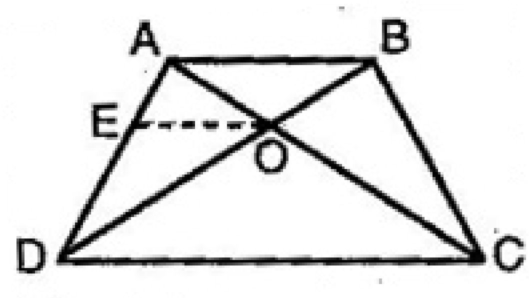
$$\frac{AO}{CO} = \frac{BO}{DO}$$

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

10. The diagonals of a quadrilateral ABCD intersect each other at the point O such that $\frac{AO}{BO} = \frac{CO}{DO}$. Show that ABCD is a trapezium.

Ans. Given: A quadrilateral ABCD, in which its diagonals AC and

BD intersect each other at O such that $\frac{AO}{BO}=\frac{CO}{DO}$, i.e.



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

To Prove: Quadrilateral ABCD is a trapezium.

Construction: Through O, draw OE $\parallel$ AB meeting AD at E.

Proof: In ΔADB, we have OE $\parallel$ AB [By construction]

$\therefore \frac{DE}{EA}=\frac{OD}{BO}$ [By Basic Proportionality theorem]

$\Rightarrow \frac{EA}{DE}=\frac{BO}{DO}$

$\Rightarrow \frac{EA}{DE}=\frac{BO}{DO}=\frac{AO}{CO}$

$\left[\because \frac{AO}{CO}=\frac{BO}{DO}\right]$

$\Rightarrow \frac{EA}{DE}=\frac{AO}{CO}$

Thus in ΔADC, E and O are points dividing the sides AD and AC in the same ratio. Therefore by the converse of Basic Proportionality theorem, we have

EO $\parallel$ DC

But EO $\parallel$ AB[By construction]

$\therefore$ AB $\parallel$ D

$\therefore$ Quadrilateral ABCD is a trapezium