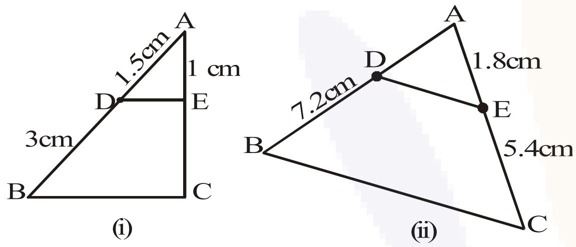
Class X : MATH
Chapter - 6 : Triangles
Questions & Answers - Exercise : 6.2 - NCERT Book

Q1. In figure, (i) and (ii), DE || BC. Find EC in (i) and AD in (ii).



Sol. (i) In figure, (i) DE || BC (Given)

$\Rightarrow \frac{AD}{DB} = \frac{AE}{EC}$ (By Basic Proportionality Theorem)

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

{∵ AD = 1.5 cm, DB = 3 cm and AE = 1 cm}

$\Rightarrow$ EC $= \frac{3}{1.5}$ = 2 cm

(ii) In fig. (ii) $DE \| BC$ (given)

So, $\frac{AD}{BD} = \frac{AE}{CE} \Rightarrow \frac{AD}{7.2} = \frac{1.8}{5.4}$

{∵ BD = 7.2, AE = 1.8 cm and CE = 5.4 cm}

AD = 2.4 cm

Q2. E and F are points on the sides PQ and PR respectively of a ΔPQR. For each of the following cases, State whether EF || QR :

(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.

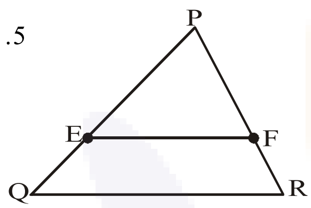
Sol. (i) In figure,

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

$$\frac{PF}{FR} = \frac{3.6}{2.4} = \frac{3}{2} = 1.5$$

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

$\Rightarrow$ EF is not || QR



(ii) In figure,

$$\frac{PE}{EQ} = \frac{4}{4.5} = \frac{8}{9} \text{ and } \frac{PF}{FR} = \frac{8}{9}$$

$$\Rightarrow \frac{PE}{EQ} = \frac{PF}{FR} \Rightarrow EF \parallel QR$$

(iii) In figure,

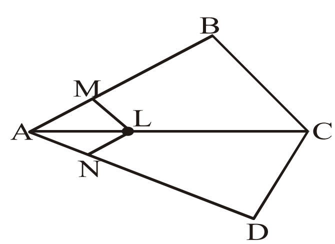
$$\frac{PE}{QE} = \frac{0.18}{PQ - PE} = \frac{0.18}{1.28 - 0.18} = \frac{0.18}{1.10}$$

$$= \frac{18}{110} = \frac{9}{55} = \frac{PF}{FR} = \frac{0.36}{PR - PF}$$

$$= \frac{0.36}{2.56 - 0.36} = \frac{0.36}{2.20} = \frac{9}{55} = \frac{PE}{QE} = \frac{PF}{FR}$$

$\therefore$ $EF \parallel QR$ (By converse of Basic Proportionality Theorem)

Q3. In figure, if LM || CB and LN || CD, prove that $\frac{AM}{AB} = \frac{AN}{AD}$.



Sol. In ΔACB (see figure), LM || CB (Given)

$\Rightarrow \frac{AM}{MB} = \frac{AL}{LC}$ ...(1)

(Basic Proportionality Theorem)

In ΔACD (see figure), LN || CD (Given)

$\Rightarrow \frac{AN}{ND} = \frac{AL}{LC}$ ...(2)

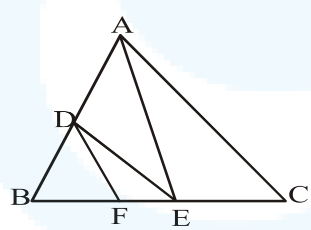
(Basic Proportionality Theorem)

From (1) and (2), we get

$$\frac{AM}{MB} = \frac{AN}{ND}$$

$$\Rightarrow \frac{AM}{AM+MB} = \frac{AN}{AN+ND} \Rightarrow \frac{AM}{AB} = \frac{AN}{AD}$$

Q4. In figure, DE || AC and DF || AE. Prove that $\frac{BF}{FE} = \frac{BE}{EC}$.



Sol. In ΔABE,

$DF \| AE$ (Given)

$\frac{BD}{DA} = \frac{BF}{FE}$ ...(i) (Basic Proportionality Theorem)

In ΔABC,

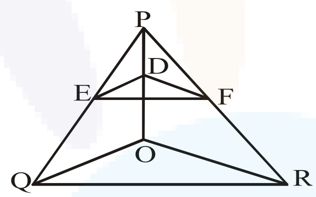
$DE \| AC$ (Given)

$\frac{BD}{DA} = \frac{BE}{EC}$ ......(ii) (Basic Proportionality Theorem)

From (i) and (ii), we get

$\frac{BF}{FE} = \frac{BE}{EC}$ Hence proved.

Q5. In figure, DE || OQ and DF || OR. Show that EF || QR.



Sol. In figure, DE || OQ and DF || OR, then by Basic Proportionality Theorem,

We have $\frac{PE}{EQ} = \frac{PD}{DO}$ ...(1)

and $\frac{PF}{FR} = \frac{PD}{DO}$ ...(2)

From (1) and (2), $\frac{PE}{EQ} = \frac{PF}{FR}$

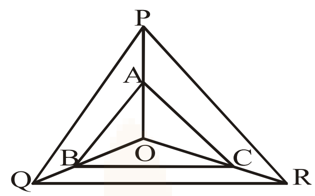
Now, in ΔPQR, we have proved that

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

EF || QR

(By converse of Basic Proportionality Theorem)

Q6. In figure, A, B and C are points on OP, OQ and OR respectively such that AB || PQ and AC || PR. Show that BC || QR.



Sol. In ΔPOQ,

$AB \parallel PQ$ (given)

$\frac{OB}{BQ} = \frac{OA}{AP}$ ...(i) (Basic Proportionality Theorem)

In ΔPOR,

$AC \parallel PR$ (given)

$\frac{OA}{AP} = \frac{OC}{CR}$ ...(ii) (Basic Proportionality Theorem)

From (i) and (ii), we get

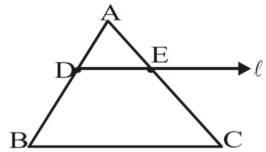
$\frac{OB}{BQ} = \frac{OC}{CR}$

$\therefore$ By converse of Basic Proportionality Theorem,

$BC \parallel QR$

Q7. Using Theorem 6.1, prove that a line drawn through the mid-point of one side of a triangle parallel to another side bisects the third side.

Sol. In ΔABC, D is mid point of AB (see figure)



i.e., $\frac{AD}{DB} = 1$ ...(1)

Straight line $\ell \parallel BC$.

Line ℓ is drawn through D and it meets AC at E.

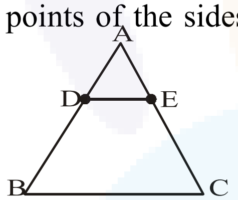
By Basic Proportionality Theorem

$$\frac{AD}{DB} = \frac{AE}{EC} \Rightarrow \frac{AE}{EC} = 1 \text{ [From (1)]}$$

$\Rightarrow$ AE = EC $\Rightarrow$ E is mid point of AC.

Q8. Using Theorem 6.2, prove that the line joining the mid-points of any two sides of a triangle is parallel to the third side.

Sol. In ΔABC, D and E are mid points of the sides AB and AC respectively.



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

and $\frac{AE}{EC} = 1$ (see figure)

$$\Rightarrow \frac{AD}{DB} = \frac{AE}{EC} \Rightarrow DE \parallel BC$$

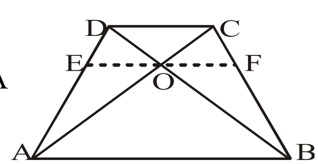
(By Converse of Basic Proportionality Theorem)

Q9. ABCD is a trapezium in which AB $\parallel$ DC and its diagonals intersect each other at the point O. Show that $\frac{AO}{BO} = \frac{CO}{DO}$.

Sol. We draw EOF $\parallel$ AB(also $\parallel$ CD) (see figure)

In ΔACD, OE $\parallel$ CD

$$\Rightarrow \frac{AE}{ED} = \frac{AO}{OC} \quad ...(1)$$



In ΔABD, OE $\parallel$ BA

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

$$\Rightarrow \frac{AE}{ED} = \frac{OB}{OD} \quad ...(2)$$

From (1) and (2)

$$\frac{AO}{OC} = \frac{OB}{OD},$$

i.e., $\frac{AO}{BO} = \frac{CO}{DO}$.

Q10. 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.

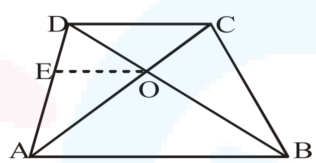
Sol. In figure $\frac{AO}{BO} = \frac{CO}{DO}$

$\Rightarrow \frac{AO}{OC} = \frac{BO}{OD}$ ...(1) (given)

Through O, we draw

OE || BA

OE meets AD at E.



From ΔDAB,

EO || AB

$\Rightarrow \frac{DE}{EA} = \frac{DO}{OB}$ (by Basic Proportionality Theorem)

$\Rightarrow \frac{AE}{ED} = \frac{BO}{OD}$ ...(2)

From (1) and (2),

$\frac{AO}{OC} = \frac{AE}{ED} \quad \Rightarrow$ OE || CD

(by converse of basic proportionality theorem)

Now, we have BA || OE

and OE || CD

$\Rightarrow$ AB || CD

$\Rightarrow$ Quadrilateral ABCD is a trapezium.