RD SHARMA
Solutions
Class 10 Maths
Chapter 4
Ex 4.2

Q.1: In a ΔΔ ABC, D and E are points on the sides AB and AC respectively such that DE ∥ ∥ BC.

1.) If AD = 6 cm, DB = 9 cm and AE = 8 cm, Find AC.

2.) If ADDB=34 $\frac{AD}{DB} = \frac{3}{4}$ and AC = 15 cm, Find AE.

3.) If ADDB=23 $\frac{AD}{DB} = \frac{2}{3}$ and AC = 18 cm, Find AE.

4.) If AD = 4 cm, AE = 8 cm, DB = x – 4 cm and EC = 3x – 19, find x.

5.) If AD = 8 cm, AB = 12 cm and AE = 12 cm, find CE.

6.) If AD = 4 cm, DB = 4.5 cm and AE = 8 cm, find AC.

7.) If AD = 2 cm, AB = 6 cm and AC = 9 cm, find AE.

8.) If ADBD=45 $\frac{AD}{BD} = \frac{4}{5}$ and EC = 2.5 cm, Find AE.

9.) If AD = x cm, DB = x – 2 cm, AE = x + 2 cm, and EC = x – 1 cm, find the value of x.

10.) If AD = 8x – 7 cm, DB = 5x – 3 cm, AE = 4x – 3 cm, and EC = (3x – 1) cm, Find the value of x.

11.) If AD = 4x – 3, AE = 8x – 7, BD = 3x – 1, and CE = 5x – 3, find the value of x.

12.) If AD = 2.5 cm, BD = 3.0 cm, and AE = 3.75 cm, find the length of AC.

Sol:

1) It is given that ΔΔ ABC AND DE ∥∥ BC

We have to find AC,

Since, AD = 6 cm,

DB = 9 cm and AE = 15 cm.

AB = 15 cm.

So, ADBD=AECE $\frac{AD}{BD} = \frac{AE}{CE}$ (using Thales Theorem)

Then, 69=8x $\frac{6}{9} = \frac{8}{x}$

6x = 72 cm

x = 72/6 cm

x = 12 cm

Hence, **AC = 12 + 8 = 20.**

2) It is given that ADBD=34 $\frac{AD}{BD} = \frac{3}{4}$ and AC = 15 cm

We have to find out AE,

Let, AE = x

So, ADBD=AECE $\frac{AD}{BD} = \frac{AE}{CE}$ (using Thales Theorem)

Then, 34=x15–x $\frac{3}{4} = \frac{x}{15-x}$

45 – 3x = 4x

-3x – 4x = – 45

7x = 45

x = 45/7

x = 6.43 cm

3) It is given that ADBD=23 $\frac{AD}{BD} = \frac{2}{3}$ and AC = 18 cm

We have to find out AE,

Let, AE = x and CE = 18 – x

So, ADBD=AECE $\frac{AD}{BD} = \frac{AE}{CE}$ (using Thales Theorem)

Then, 23=x18–x $\frac{2}{3} = \frac{x}{18-x}$

3x = 36 – 2x

5x = 36 cm

X = 36/5 cm

X = 7.2 cm

Hence**, AE = 7.2 cm**

4) It is given that AD = 4 cm, AE = 8 cm, DB = x – 4 and EC = 3x – 19

We have to find x,

So, ADBD=AECE $\frac{AD}{BD} = \frac{AE}{CE}$ (using Thales Theorem)

Then, 4x–4=83x–19 $\frac{4}{x-4} = \frac{8}{3x-19}$

4(3x – 19) = 8(x – 4)

12x – 76 = 8(x – 4)

12x – 8x = – 32 + 76

4x = 44 cm

X = 11 cm

5) It is given that AD = 8 cm, AB = 12 cm, and AE = 12 cm.

We have to find CE,

So, ADBD=AECE $\frac{AD}{BD} = \frac{AE}{CE}$ (using Thales Theorem)

Then, 84=12CE $\frac{8}{4} = \frac{12}{CE}$

8CE = 4 X 12 cm

CE = (4 X 12)/8 cm

CE = 48/8 cm

CE = 6 cm

6) It is given that AD = 4 cm, DB = 4.5 cm, AE = 8 cm

We have to find out AC

So, ADBD=AECE $\frac{AD}{BD} = \frac{AE}{CE}$ (using Thales Theorem)

Then, 44.5=8AC $\frac{4}{4.5} = \frac{8}{AC}$

AC=4.5×84 $AC = \frac{4.5 \times 8}{4}$ cm

AC = 9 cm

7) It is given that AD = 2 cm, AB = 6 cm, and AC = 9 cm

We have to find out AE

DB = 6 – 2 = 4 cm

So, ADBD=AECE $\frac{AD}{BD} = \frac{AE}{CE}$ (using Thales Theorem)

Then, 24=x9–x $\frac{2}{4} = \frac{x}{9-x}$

4x = 18 – 2x

6x = 18

X = 3 cm

8) It is given that ADBD=45 $\frac{AD}{BD} = \frac{4}{5}$ and EC = 2.5 cm

We have to find out AE

So, ADBD=AECE $\frac{AD}{BD} = \frac{AE}{CE}$ (using Thales Theorem)

Then, 45=AE2.5 $\frac{4}{5} = \frac{AE}{2.5}$

AE = 4×2.55 $\frac{4\times2.5}{5}$ = 2 cm

9) It is given that AD = x, DB = x – 2, AE = x + 2 and EC = x – 1

We have to find the value of x

So, ADBD=AECE $\frac{AD}{BD} = \frac{AE}{CE}$ (using Thales Theorem)

Then, xx–2=x+2x–1 $\frac{x}{x-2} = \frac{x+2}{x-1}$

X(x – 1) = (x – 2)(x + 2)

$x^2 - x - x^2 + 4 = 0$

x =4

10) It is given that AD = 8x – 7, DB = 5x – 3, AER = 4x – 3 and EC = 3x -1

We have to find the value of x

So, ADBD=AECE $\frac{AD}{BD} = \frac{AE}{CE}$ (using Thales Theorem)

Then, 8x–75x–3=4x–33x–1 $\frac{8x-7}{5x-3} = \frac{4x-3}{3x-1}$

(8x – 7)(3x – 1) = (5x – 3)(4x – 3)

$24x^2 - 29x + 7 = 20x^2 - 27x + 9$

$4x^2 - 2x - 2 = 0$

$2(2x^2 – x – 1) = 0$

$2x^2 – x – 1 = 0$

$2x^2 – 2x + x – 1 = 0$

$2x(x – 1) + 1(x – 1) = 0$

$(x – 1)(2x + 1) = 0$

X = 1 or x = -1/2

Since the side of triangle can never be negative

Therefore, x = 1.

11) It is given that AD = 4x – 3, BD = 3x – 1, AE = 8x – 7 and EC = 5x – 3

For finding the value of x

So, ADBD = AECE $\frac{AD}{BD} = \frac{AE}{CE}$ (using Thales Theorem)

Then, 4x–33x–1 = 8x–75x–3 $\frac{4x-3}{3x-1} = \frac{8x-7}{5x-3}$

$(4x – 3)(5x – 3) = (3x – 1)(8x – 7)$

$4x(5x – 3) -3(5x – 3) = 3x(8x – 7) -1(8x – 7)$

$20x^2 – 12x – 15x + 9 = 24x^2 – 29x + 7$

$20x^2 -27x + 9 = 24^2 -29x + 7$

Then,

$-4x^2 + 2x + 2 = 0$

$4x^2 – 2x – 2 = 0$

$4x^2 – 4x + 2x – 2 = 0$

$4x(x – 1) + 2(x – 1) = 0$

$(4x + 2)(x – 1) = 0$

X = 1 or x = -2/4

Since, side of triangle can never be negative

Therefore x = 1

12) It is given that, AD = 2.5 cm, AE = 3.75 cm and BD = 3 cm

So, ADBD = AECE $\frac{AD}{BD} = \frac{AE}{CE}$ (using Thales Theorem)

Then, 2.53 = 3.75CE $\frac{2.5}{3} = \frac{3.75}{CE}$

2.5CE = 3.75 x 3

CE = 3.75×32.5 $CE = \frac{3.75 \times 3}{2.5}$ CE = 11.252.5 $CE = \frac{11.25}{2.5}$

CE = 4.5

Now, AC = 3.75 + 4.5

AC = 8.25 cm.

Q.2) In a ΔΔ ABC, D and E are points on the sides AB and AC respectively. For each of the following cases show that DE ∥$\parallel$BC.

1.) AB = 12 cm, AD = 8 cm, AE = 12 cm, and AC = 18 cm.

2.) AB = 5.6 cm, AD = 1.4 cm, AC = 7.2 cm, and AE = 1.8 cm.

3.) AB = 10.8 cm, BD = 4.5 cm, AC = 4.8 cm, and AE = 2.8 cm.

4.) AD = 5.7 cm, BD = 9.5 cm, AE = 3.3 cm, and EC = 5.5 cm.

Sol:

1) It is given that D and R are the points on sides AB and AC.

We have to find that DE ∥$\parallel$ BC.

Acc. To Thales Theorem,

ADDB = AECE $\frac{AD}{DB} = \frac{AE}{CE}$ 84 = 126 $\frac{8}{4} = \frac{12}{6}$

2 = 2 (LHS = RHS)

Hence, DE ∥$\parallel$ BC.

2) It is given that D and E are the points on sides AB and AC

We need to prove that DE ∥$\parallel$ BC

Acc. To Thales Theorem,

ADDB=AECE $\frac{AD}{DB} = \frac{AE}{CE}$ 1.44.2=1.85.4 $\frac{1.4}{4.2} = \frac{1.8}{5.4}$

13=13 $\frac{1}{3} = \frac{1}{3}$ (RHS)

Hence, DE ‖|| BC.

3) It is given that D and E are the points on sides AB and AC.

We need to prove DE ‖|| BC.

Acc. To Thales Theorem,

ADDB=AECE $\frac{AD}{DB} = \frac{AE}{CE}$

AD = AB – DB = 10.8 – 4.5 = 6.3

And,

EC = AC – AE = 4.8 – 2.8 = 2

Now,

6.34.5=2.82.0 $\frac{6.3}{4.5} = \frac{2.8}{2.0}$

Hence, DE ‖|| BC.

4) It is given that D and E are the points on sides AB and Ac.

We need to prove that DE ‖|| BC.

Acc. To Thales Theorem,

ADDB=AECE $\frac{AD}{DB} = \frac{AE}{CE}$ 5.79.5=3.35.5 $\frac{5.7}{9.5} = \frac{3.3}{5.5}$

35=35 $\frac{3}{5} = \frac{3}{5}$ (LHS = RHS)

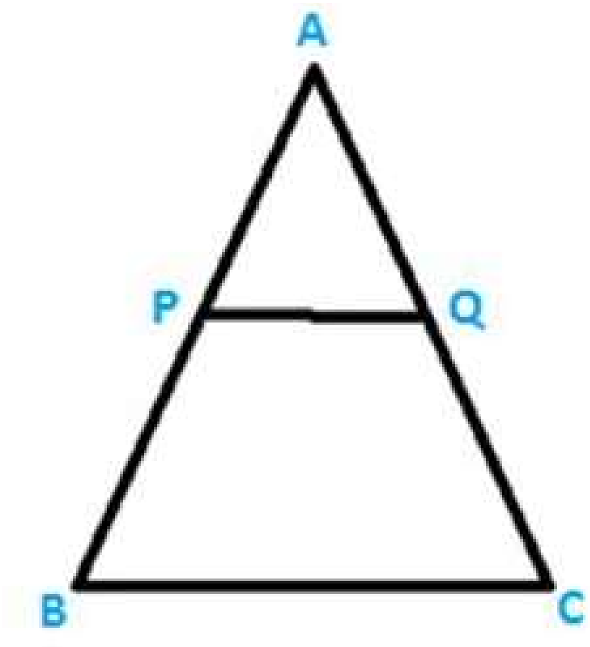
Hence, DE ‖|| BC.

Q.3) In a ΔΔ ABC, P and Q are the points on sides AB and AC respectively, such that PQ ‖ || BC. If AP = 2.4 cm, AQ = 2 cm, QC = 3 cm, and BC = 6 cm, Find AB and PQ.

Sol:

It is given that AP = 2.4 cm, AQ = 2 cm, QC = 3 cm, and BC = 6 cm.

We need to find AB and PQ.



Using Thales Theorem,

APPB=AQQC $\frac{AP}{PB} = \frac{AQ}{QC}$ 2.4PB=23 $\frac{2.4}{PB} = \frac{2}{3}$

2PB = 2.4 x 3 cm

PB=2.4×32 $PB = \frac{2.4\times3}{2}$ cm

PB = 3.6 cm

Now, AB = AP + PB

AB = 2.4 + 3.6

AB = 6 cm

Since, PQ ∥∥ BC, AB is transversal, then,

ΔΔ APQ = ΔΔ ABC (by corresponding angles)

Since, PQ ∥∥ BC, AC is transversal, then,

ΔΔ APQ = ΔΔ ABC (by corresponding angles)

In Δ ABQ and Δ ABC,

$\angle APQ = \angle ABC \quad \angle AQP = \angle ACB$

Therefore, Δ APQ = Δ ABC (angle angle similarity)

Since, the corresponding sides of similar triangles are proportional,

Therefore, $\frac{AP}{AB} = \frac{PQ}{BC} = \frac{AQ}{AC}$

$\frac{AP}{AB} = \frac{PQ}{BC} \quad \frac{2.4}{6} = \frac{PQ}{6}$

Therefore, PQ = 2.4 cm.

Q.4) In a Δ ABC, D and E are points on AB and AC respectively, such that DE $\parallel$ BC. If AD = 2.4 cm, AE = 3.2 cm, DE = 2 cm, and BC = 5 cm. Find BD and CE.

Sol: It is given that AD = 2.4 cm, AE = 3.2 cm, DE = 2 cm and BE = 5 cm.

We need to find BD and CE.

Since, DE $\parallel$ BC, AB is transversal, then,

$\angle APQ = \angle ABC$

Since, DE $\parallel$ BC, AC is transversal, then,

$\angle AED = \angle ACB$

In Δ ADE and Δ ABC,

$\angle ADE = \angle ABC \quad \angle AED = \angle ACB$

So, Δ ADE = Δ ABC (angle angle similarity)

Since, the corresponding sides of similar triangles are proportional, then,

Therefore, $\frac{AD}{AB} = \frac{AE}{AC} = \frac{DE}{BC}$

$\frac{AD}{AB} = \frac{DE}{BC} \quad \frac{2.4}{2.4+DB} = \frac{2}{5}$

2.4 + DB = 6

DB = 6 – 2.4

DB = 3.6 cm

Similarly, AEAC=DEBC $\frac{AE}{AC} = \frac{DE}{BC}$

3.23.2+EC=25 $\frac{3.2}{3.2+EC} = \frac{2}{5}$

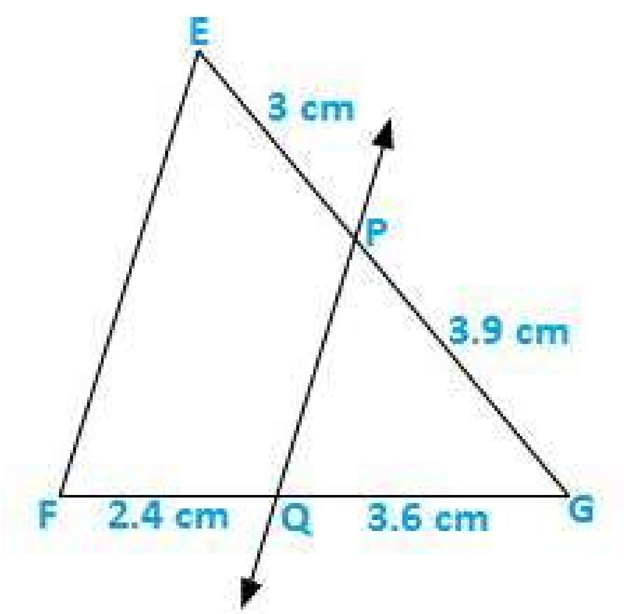
3.2 + EC = 8

EC = 8 – 3.2

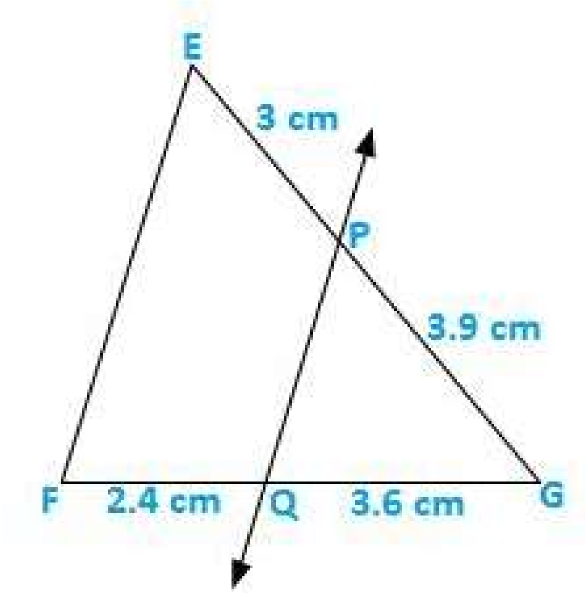
EC = 4.8 cm

Therefore, BD = 3.6 cm and CE = 4.8 cm.

Q.5) In figure given below, state PQ ||| EF.



Sol:



It is given that EP = 3 cm, PG = 3.9 cm, FQ = 3.6 cm and QG = 2.4 cm

We have to check that PQ ∥∥ EF or not.

Acc. to Thales Theorem,

PGGE=GQFQ $\frac{PG}{GE} = \frac{GQ}{FQ}$

Now,

3.93≠3.62.4 $\frac{3.9}{3} \neq \frac{3.6}{2.4}$

As we can see it is not prortional.

So, PQ is not parallel to EF.

Q.6) M and N are the points on the sides PQ and PR respectively, of a ΔΔ PQR. For each of the following cases, state whether MN ∥∥ QR.

(i) PM = 4 cm, QM = 4.5 cm, PN = 4 cm, NR = 4.5 cm.

(ii) PQ = 1.28 cm, PR = 2.56 cm, PM = 0.16 cm, PN = 0.32 cm.

Sol:

(i) It is given that PM = 4 cm, QM = 4.5 cm, PN = 4 cm, and NR = 4.5 cm.

We have to check that MN ∥|| QR or not.

Acc. to Thales Theorem,

PMQM=PNNR $\frac{PM}{QM} = \frac{PN}{NR}$ 44.5=44.5 $\frac{4}{4.5} = \frac{4}{4.5}$

Hence, MN ∥|| QR.

(ii) It is given that PQ = 1.28 cm, PR = 2.56 cm, PM = 0.16 cm, and PN = 0.32 cm.

We have to check that MN ∥|| QR or not.

Acc. to Thales Theorem,

PMQM=PNNR $\frac{PM}{QM} = \frac{PN}{NR}$

Now,

PMMQ=0.161.12 $\frac{PM}{MQ} = \frac{0.16}{1.12}$ = 1/7

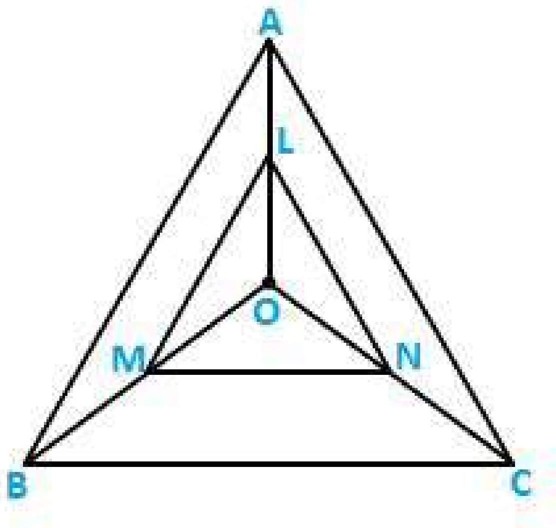
PNNR=0.322.24 $\frac{PN}{NR} = \frac{0.32}{2.24}$ = 1/7

Since,

0.161.12=0.322.24 $\frac{0.16}{1.12} = \frac{0.32}{2.24}$

Hence, MN ∥|| QR.

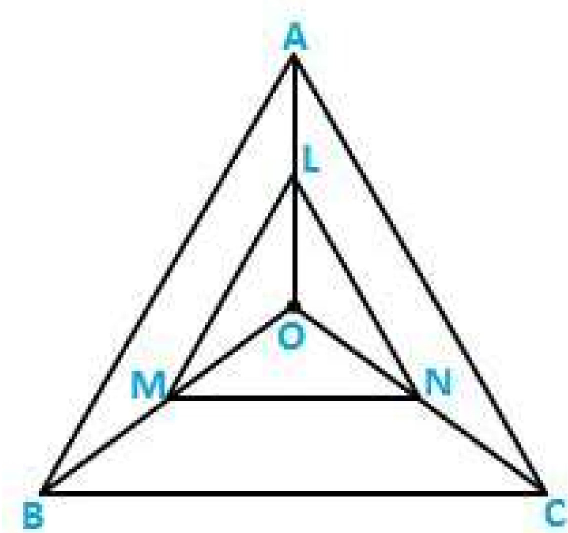
Q.7) In three line segments OA, OB, and OC, points L, M, N respectively are so chosen that LM ∥|| AB and MN ∥|| BC but neither of L, M, and N nor A, B, C are collinear. Show that LN ∥|| AC.



Sol:

In Δ OAB, Since, LM $\parallel$ AB,

Then, $\frac{OL}{LA} = \frac{OM}{MB}$ (using BPT)



In Δ OBC, Since, MN $\parallel$ BC,

Then, $\frac{OM}{MB} = \frac{ON}{NC}$ (using BPT)

Therefore, $\frac{ON}{NC} = \frac{OM}{MB}$

From the above equations,

We get, OLLA=ONNC $\frac{OL}{LA} = \frac{ON}{NC}$

In a ΔΔ OCA,

OLLA=ONNC $\frac{OL}{LA} = \frac{ON}{NC}$

LN ∥∥ AC (by converse BPT)

Q.8) If D and E are the points on sides AB and AC respectively of a ΔΔ ABC such that DE ∥ ∥ BC and BD = CE. Prove that ΔΔ ABC is isosceles.

Sol:

It is given that in ΔΔ ABC, DE ∥∥ BC and BD = CE.

We need to prove that ΔΔ ABC is isosceles.

Acc. to Thales Theorem,

ADBD=AEEC $\frac{AD}{BD} = \frac{AE}{EC}$

AD = AE

Now, BD = CE and AD = AE.

So, AD + BD = AE + CE.

Therefore, AB = AC.

Therefore, ΔΔ ABC is isosceles.