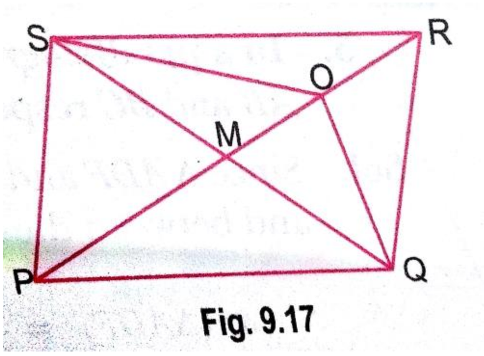
Short Answer Type Questions – II

[3 marks]

Que 1. O is any point on the diagonals PR of parallelogram PQRS. Prove that ar (ΔPSO) = ar (ΔPQO).



Sol. Join SQ. Since diagonals of a parallelogram bisect each other. Therefore, M is the mid-point of PR as well as SQ.

In ΔSOQ, OM is a median

∴ (Δ SOM) = ar (ΔQOM) .....(i)

In ΔSPQ, PM is the median

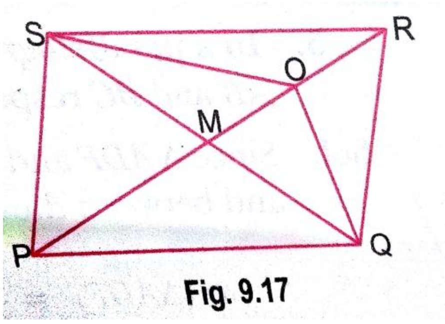
∴ ar (ΔPSM) = ar (ΔPQM) ……(ii)

Adding (i) and (ii), we get

ar (ΔSOM) + ar (ΔPSO) = ar (ΔPQO)

ar (ΔPSO) = ar (ΔPQO)

Que 2. In Fig. 9.18, x and Y are points on the side LN of the triangle LMN such that LX = XY = YN. Through X, a line is drawn parallel to LM to meet MN at Z. Prove that ar (ΔLZY) = ar (□MZYX).



Sol. Since, ΔLXZ and ΔMXY lie on the same base XZ and between the same parallels XZ and LM.

∴ ar (ΔLXZ) = ar (ΔMXZ)

Adding ar (ΔXYZ) to both sides, we get

ar (ΔLXZ) + ar (ΔXYZ) = ar (ΔMXZ) + ar (ΔXYZ)

⇒ ar (ΔLYZ) = ar (□ MZYX)

Que 3. In a triangle ABC, E is the mid-point of median AD. Show that ar (ΔBED) = $\frac{1}{4}$ ar (ΔBED) = $\frac{1}{4}$ ar (ΔABC).

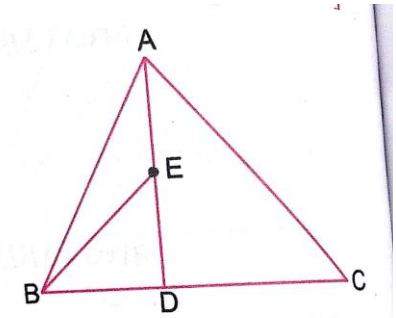


Fig. 9.19

Sol. As median of a triangle divides it into two triangles of equal area and BE and AD are the is a medians of the ΔABD and ΔABC respectively

∴ ar (ΔABD) = ar (ΔADC)

⇒ $ar\ (\Delta BED)\ = \frac{1}{2} ar\ (\Delta ABD)$ …… (i)

And ar (ΔABD) = $\frac{1}{2}$ ar (ΔABC) ……. (ii)

from (i) and (ii), we have

ar (ΔBED) = $\frac{1}{2}\left(\frac{1}{2} ar\ (\Delta ABC)\right) = \frac{1}{4} ar\ (\Delta ABC)$

Que 4. In Fig. 9.20, AP||BQ|| CR. Prove that ar (ΔAQC) = ar (ΔPBR).

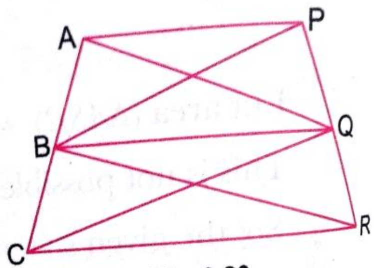


Fig. 9.20

Sol. Since Δ ABQ and ΔPBQ are on the same base BQ and between the same parallels AP and BQ.

∴ ar (Δ ABQ) = Ar (ΔPBQ) …..(i)

Similarly, ΔBCQ and ΔBRQ are on the same base BQ and between the same parallels BQ and CR.

∴ ar (ΔBCQ) = ar (ΔBRQ) …..(ii)

Adding (i) and (ii), we get

ar (ΔABQ) + ar (ΔBCQ) = ar (ΔPBQ) + ar (ΔBRQ)

⇒ ar (ΔAQC) = ar (ΔPBR)

Que 5. In a parallelogram, ABCD, E, F are any two points on the sides AB and BC respectively. Show that ar (ΔADF) = ar (ΔDCE)

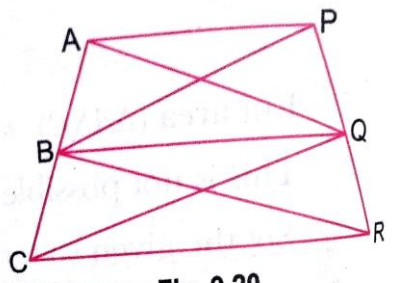


Fig. 9.20

Sol. Since ΔADF and parallelogram ABCD are on the same base AD and between the same parallels AD and BC.

$\therefore\ ar\ (\Delta ADF)\ =\ \frac{1}{2} ar\ (||^{gm}\ ABCD)$ ….. (i)

Also, ΔDCE and $||^{gm}$ ABCD are on the same base DC and between the same parallels DC and AB.

$\therefore$ ar (ΔDCE) = $\frac{1}{2} ar\ (||^{gm}\ ABCD)$ …..(ii)

From (i) and (ii), we get
ar (ΔADF) = ar (ΔDCE)

Que 6. ABCD is a trapezium in which AB || DC. DC is produced to E such that CE = AB, Prove that ar (ΔABD) = (ΔBCE).

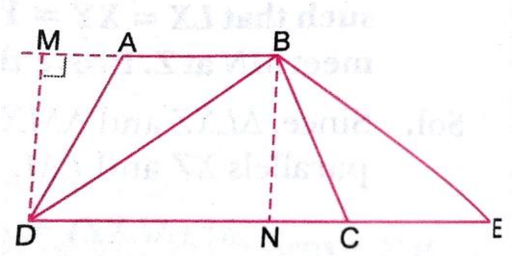


Fig. 9.22

Sol. Produce BA to M Such that DM ⊥ BM and draw BN ⊥ DC.

Now, ar (ΔABD) = $\frac{1}{2}(AB \times DM)$ …..(i)

Ar (ΔBCE) = $\frac{1}{2}$ (CE × BN) …..(ii)

Since, triangle ABD and BCE are between the same parallels, Therefore,
DM = BN …..(iii)
Also, AB = CE (Given) …..(iv)

From (iii) and (iv), we get

$$\frac{1}{2}(AB \times DM) = \frac{1}{2}(CE \times BN)$$

⇒ ar (ΔABD) = ar (ΔBCE) (Using (i) and (ii)

Que 7. In Fig. 9.23, ABCD is a parallelogram in which BC is produced to E such that CE = BC. AE intersects CD at F. If area of ΔBDF = 3 cm^{2}, find the area of parallelogram ABCD.

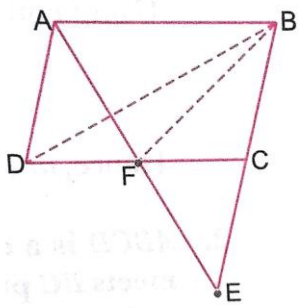


Fig. 9.23

Sol. In ΔADF and ΔECF, we have

$\angle ADF = \angle ECF$ (Alternate interior angles)

AD = CE (∵ AD=BC and =CE)

$\angle DFA = \angle CFE$ (Vertically opposite angles)

∴ $\Delta ADF \cong \Delta ECF$ (AAS congruence criterion)

⇒ $ar(\Delta ADF) = ar(\Delta ECF)$

Also, DF = CF (CPCT)

⇒ BF is the median in ΔBCD

⇒ ar (ΔBCD) = 2 ar (ΔBDF)

⇒ ar (ΔBCD) = 2×3 cm^2 = 6 cm^2

ar(||^{gm} ABCD) = 2 ar (ΔBCD)

2 × 6 cm^2 = 12 cm^2