

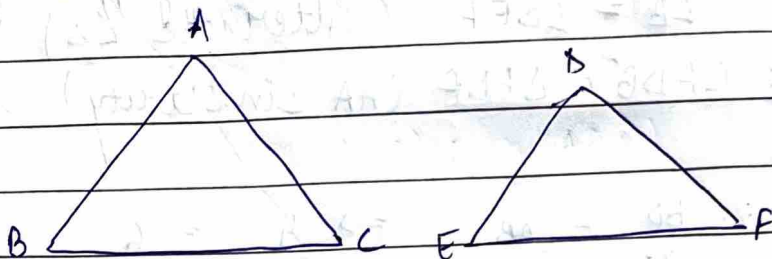
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Ch-7 Exercise 7.6

Q.1



$$\triangle ABC \sim \triangle DEF \text{ (given)}$$

$$(i) \text{ ar}(ABC) = 16 \text{ cm}^2$$

$$\text{ar}(DEF) = 25 \text{ cm}^2$$

$$BC = 2.3$$

$$\frac{\text{ar}(ABC)}{\text{ar}(DEF)} = \frac{BC^2}{EF^2} \quad (\text{area theorem})$$

$$\frac{16}{25} = \frac{2.3^2}{EF^2}$$

$$\sqrt{\frac{16}{25}} = \frac{2.3}{EF}$$

$$\frac{4}{5} = \frac{2.3}{EF}$$

$$EF = \frac{2.3 \times 5}{4}$$

$$EF = 2.875 \text{ cm}$$

$$\boxed{EF = 2.875 \text{ cm}}$$

$$(iii) AC = 19 \text{ cm}$$

$$DF = 8 \text{ cm}$$

$$\frac{\text{area}(ABC)}{\text{area}(DEF)} = \frac{AC^2}{DF^2} \quad (\text{area theorem})$$

$$= \frac{19^2}{8^2} = \frac{361}{64}$$

$$= \frac{19^2}{8^2} = \frac{361}{64}$$

$$\therefore \text{area (ABC)} : \text{area (DEF)} = \boxed{36 : 49}$$

(N) $AB = 1.2 \text{ cm}$

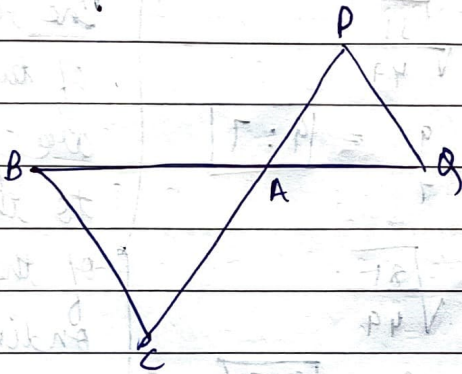
$DE = 1.4 \text{ cm}$

$$\frac{\text{area (ABC)}}{\text{area (DEF)}} = \frac{AB^2}{DE^2} \quad (\text{Area theorem})$$

$$= \frac{1.2^2}{1.4^2} = \frac{1.44}{1.96} = \frac{144}{196} = \frac{36}{49}$$

$$\therefore \text{area (ABC)} : \text{area (DEF)} = \boxed{36 : 49}$$

Q.2



Given - $\triangle ACB \sim \triangle APQ$

$BC = 10 \text{ cm}$, $PQ = 5 \text{ cm}$, $BA = 6.5 \text{ cm}$ & $AP = 2.8 \text{ cm}$

To find - (i) CA & AQ

(ii) $\text{ar (ACB)} : \text{area (APQ)}$

Solution - (i) $\triangle ACB \sim \triangle APQ$ (given)

$$\therefore \frac{BC}{PQ} = \frac{AB}{AQ} = \frac{AC}{AP} \quad (\text{CPST})$$

$$\Rightarrow \frac{10}{5} = \frac{6.5}{AQ} = \frac{AC}{2.8}$$

$$\Rightarrow \frac{10}{5} = \frac{6.5}{AQ}$$

$$\Rightarrow \frac{AQ}{6.5} = \frac{5}{10}$$

$$\Rightarrow \boxed{AQ = 3.25 \text{ cm}}$$

$$\Rightarrow \frac{10}{5} = \frac{AC}{2.8}$$

$$\Rightarrow AC = 2.8 \times 2$$

$$\Rightarrow \boxed{AC = 5.6 \text{ cm}}$$

$$(ii) \triangle ACB \sim \triangle APQ \text{ (given)}$$

$$\therefore \frac{\text{ar}(\triangle ACB)}{\text{ar}(\triangle APQ)} = \frac{BC^2}{PQ^2} \quad (\text{Area theorem})$$

$$= \frac{(10)^2}{(5)^2} = \frac{100}{25} = \frac{4}{1}$$

$$\therefore \text{ar}(\triangle ACB) : \text{ar}(\triangle APQ) = \boxed{4:1}$$

Q.3

$$\text{ar}(\Delta_1) = 81 \text{ cm}^2$$

$$\text{ar}(\Delta_2) = 49 \text{ cm}^2$$

$$\begin{aligned} \text{Ratio in their altitudes} &= \sqrt{\frac{81}{49}} \\ &= \frac{9}{7} = \boxed{9:7} \end{aligned}$$

$$\begin{aligned} \text{Ratio in their medians} &= \sqrt{\frac{81}{49}} \\ &= \frac{9}{7} = \boxed{9:7} \end{aligned}$$

The ratio of areas of two similar Δ s are proportion to the square of their corresponding altitudes & corresponding medians.

Q.5

$$\text{ar}(\Delta_1) = 25 \text{ cm}^2$$

$$\text{ar}(\Delta_2) = 36 \text{ cm}^2$$

$$\text{Altitude}(\Delta_1) = 2.4 \text{ cm}$$

$$\text{Let the altitude}(\Delta_2) \text{ be } x$$

$$\therefore \frac{\text{ar}(\Delta_1)}{\text{ar}(\Delta_2)} = \frac{\text{altitude}(\Delta_1)^2}{\text{altitude}(\Delta_2)^2} \quad (\text{Area of } \Delta \text{ \& altitude/median theorem})$$

$$\frac{25}{36} = \frac{2.4^2}{x^2}$$

$$\sqrt{\frac{25}{36}} = \frac{2.4}{x}$$

$$\frac{5}{6} = \frac{2.4}{x}$$

$$x = \frac{2.4 \times 6}{5} = \frac{14.4}{5}$$

$$\boxed{x = 2.88 \text{ cm}}$$

Q.6

Altitude (Δ_1) = 6 cmAltitude (Δ_2) = 9 cm

$$\therefore \frac{\text{ar}(\Delta_1)}{\text{ar}(\Delta_2)} = \frac{[\text{altitude}(\Delta_1)]^2}{[\text{altitude}(\Delta_2)]^2} \quad \left(\begin{array}{l} \text{Area of } \Delta \text{ \& altitude /} \\ \text{median theorem} \end{array} \right)$$

$$= \frac{(6)^2}{(9)^2} = \frac{36}{81} = \frac{4}{9}$$

$$\therefore \text{ar}(\Delta_1) : \text{ar}(\Delta_2) = [4 : 9]$$

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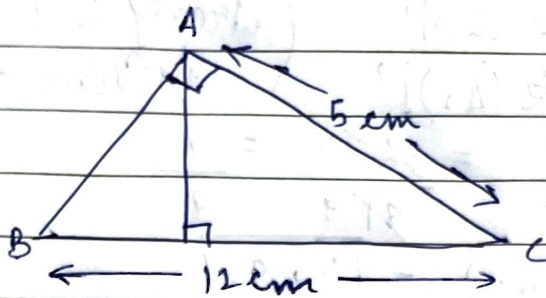
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Ch-7

Exercise 7.6

Q.7



- Given -
- $\angle A = 90^\circ$
 - $AN \perp BC$
 - $BC = 12 \text{ cm}$, $AC = 5 \text{ cm}$

To find - $\text{ar}(\triangle ANC) : \text{ar}(\triangle ABC)$

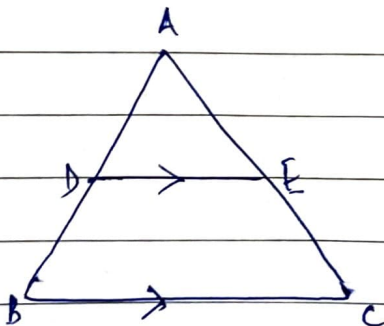
Solution - In $\triangle ANC$ & $\triangle ABC$,
 $\angle ANC = \angle BAC$ (90° each)
 $\angle C = \angle C$ (Common)
 $\therefore \triangle ANC \sim \triangle ABC$ (AA criteria)

$$\therefore \frac{\text{ar}(\triangle ANC)}{\text{ar}(\triangle ABC)} = \frac{AC^2}{BC^2} \quad (\text{Area theorem})$$

$$= \frac{(5)^2}{(12)^2} = \frac{25}{144}$$

$$\therefore \text{ar}(\triangle ANC) : \text{ar}(\triangle ABC) = \boxed{25 : 144}$$

Q.8





In $\triangle ABC$,

$DE \parallel BC$

In $\triangle ADE$ & $\triangle ABC$

$\left. \begin{array}{l} \angle ADE = \angle ABC \\ \angle AED = \angle ACB \end{array} \right\} \text{Corresponding } \angle s$

$\therefore \triangle ADE \sim \triangle ABC$

(i) $DE = 4 \text{ cm}$, $BC = 6 \text{ cm}$, $\text{ar}(\triangle ADE) = 16 \text{ cm}^2$

As, $\triangle ADE \sim \triangle ABC$,

$\therefore \frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle ABC)} = \frac{DE^2}{BC^2}$ } Area theorem

$$\Rightarrow \frac{16}{\text{ar}(\triangle ABC)} = \frac{4^2}{6^2}$$

$$\Rightarrow \text{ar}(\triangle ABC) = \frac{16 \times 36}{16}$$

$$\Rightarrow \boxed{\text{ar}(\triangle ABC) = 36 \text{ cm}^2}$$

(ii) $DE : BC = 3 : 5$

As, $\triangle ADE \sim \triangle ABC$,

$\therefore \frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle ABC)} = \frac{3^2}{5^2} = \frac{9}{25}$ } Area theorem

$$\Rightarrow 25 [\text{ar}(\triangle ADE)] = 9 [\text{ar}(\triangle ABC)]$$

$$\Rightarrow 25 [\text{ar}(\triangle ADE)] = 9 [\text{ar}(\triangle ADE) + \text{ar}(\triangle BDE)]$$

$$\Rightarrow 25 [\text{ar}(\triangle ADE)] = 9 [\text{ar}(\triangle ADE)] + 9 [\text{ar}(\triangle BDE)]$$

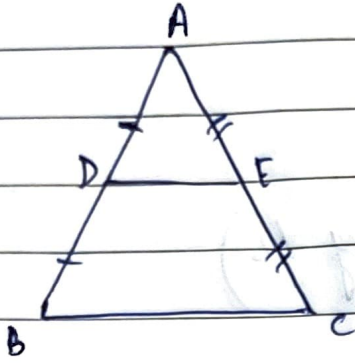
$$\Rightarrow 25 [\text{ar}(\triangle ADE)] - 9 [\text{ar}(\triangle ADE)] = 9 [\text{ar}(\triangle BDE)]$$

$$\Rightarrow 16 [\text{ar}(\triangle ADE)] = 9 [\text{ar}(\triangle BDE)]$$

$$\Rightarrow \frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle BDE)} = \frac{9}{16}$$

$$\Rightarrow \text{ar}(\triangle ADE) : \text{ar}(\triangle BDE) = \boxed{9 : 16}$$

Q.9



In $\triangle ABC$,

D & E are midpoints of $\triangle ABC$ (given)

$\therefore DE \parallel BC$ and $DE = \frac{1}{2}BC$ (Mid point theorem)

In $\triangle ADE$ & $\triangle ABC$

$$\angle ADE = \angle ABC$$

$$\angle AED = \angle ACB$$

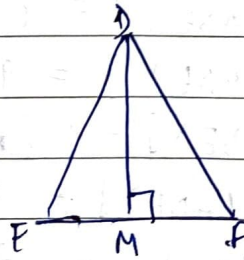
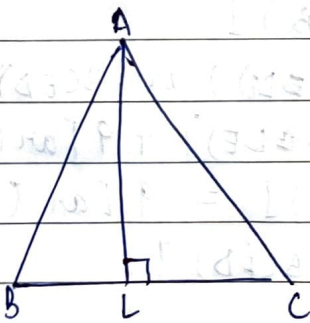
} Corresponding $\angle$ s

$\therefore \triangle ADE \sim \triangle ABC$ (AA similarity)

$$\begin{aligned} \therefore \frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle ABC)} &= \frac{DE^2}{BC^2} = \frac{\left(\frac{1}{2}BC\right)^2}{BC^2} \quad (\text{Area theorem}) \\ &= \frac{1 \cdot BC^2}{4 BC^2} = \frac{1}{4} \end{aligned}$$

$$\therefore \text{ar}(\triangle ADE) : \text{ar}(\triangle ABC) = \boxed{1 : 4}$$

Q.10



$\triangle ABC \sim \triangle DEF$

$$\text{ar}(\triangle ABC) = 100 \text{ cm}^2$$

$$\text{ar}(\triangle DEF) = 49 \text{ cm}^2$$

$$AL = 5 \text{ cm}$$

} given

$$\therefore \frac{\text{ar}(\triangle ABC)}{\text{ar}(\triangle DEF)} = \frac{AL^2}{DM^2}$$

$$\frac{100}{49} = \frac{5^2}{DM^2}$$

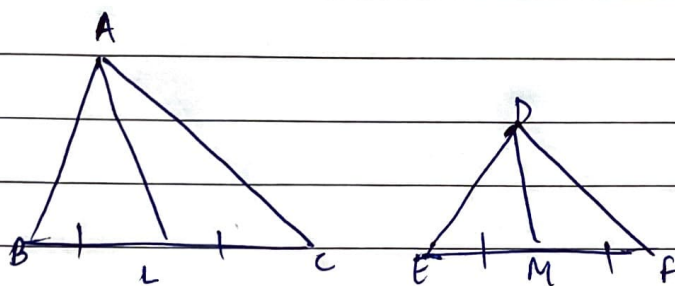
$$\sqrt{\frac{100}{49}} = \frac{5}{DM}$$

$$\frac{10}{7} = \frac{5}{DM}$$

$$DM = \frac{7 \times 5}{10}$$

$$\boxed{DM = 3.5 \text{ cm}}$$

} Area of similar Δ s and median/altitude theorem



$$\triangle ABC \sim \triangle DEF$$

$$\text{ar}(\triangle ABC) = 121 \text{ cm}^2$$

$$\text{ar}(\triangle DEF) = 64 \text{ cm}^2$$

$$AL = 12.1 \text{ cm}$$

} given

$$\therefore \frac{\text{ar}(\triangle ABC)}{\text{ar}(\triangle DEF)} = \frac{AL^2}{DM^2}$$

$$\sqrt{\frac{121}{64}} = \frac{12.1}{DM}$$

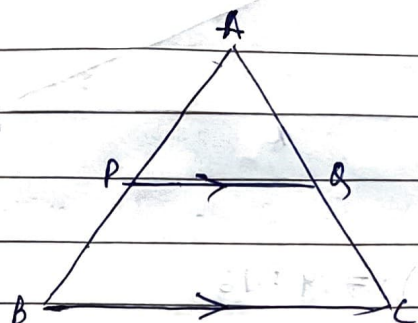
$$DM = \frac{12.1 \times 8}{11}$$

$$\boxed{DM = 8.8 \text{ cm}}$$

} Area of similar Δ s and median/altitude theorem

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Triangles
Exercise 7.6



Given - $\bullet PQ \parallel BC$
 $\bullet \text{ar}(\triangle APQ) = \text{ar}(\triangle PQC)$

To find - $\frac{BP}{AB}$

Solution - In $\triangle APQ$ & $\triangle ABC$,
 $\angle APQ = \angle ABC$ } Corresponding $\angle$ s
 $\angle AQP = \angle ACB$ } $PQ \parallel BC$
 $\therefore \triangle APQ \sim \triangle ABC$ (AA similarity)

$$\therefore \frac{\text{ar}(\triangle APQ)}{\text{ar}(\triangle ABC)} = \frac{AP^2}{AB^2} \quad (\text{Area theorem})$$

$$\Rightarrow \frac{1}{2} = \frac{AP^2}{AB^2}$$

$$\Rightarrow \frac{AB^2}{AP^2} = \frac{2}{1}$$

$$\Rightarrow \frac{AB}{AP} = \sqrt{2}$$

$$\Rightarrow AB = \sqrt{2} AP$$

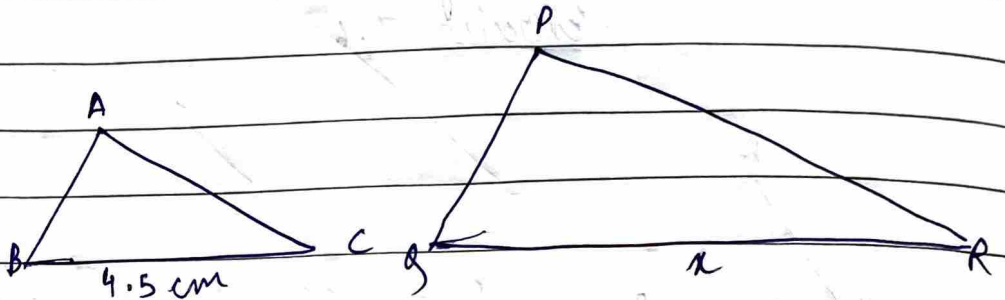
$$\Rightarrow \sqrt{2} AP = AP + PB$$

$$\Rightarrow \sqrt{2} AP - AP = PB$$

$$\Rightarrow \sqrt{2} AP - AP (\sqrt{2} - 1) = PB$$

$$\therefore \frac{BP}{AP} = \frac{\sqrt{2}-1}{1}$$

Q. 14



- Given -
- $\triangle ABC \sim \triangle PQR$
 - $ar(\triangle ABC) : ar(\triangle PQR) = 9 : 16$
 - $BC = 4.5 \text{ cm}$

To find - QR

Solution - As $\triangle ABC \sim \triangle PQR$,

$$\therefore \frac{ar(\triangle ABC)}{ar(\triangle PQR)} = \frac{BC^2}{QR^2} \quad (\text{Area theorem})$$

$$\Rightarrow \frac{9}{16} = \frac{(4.5)^2}{x^2}$$

$$\Rightarrow \frac{(3)^2}{(4)^2} = \frac{(4.5)^2}{x^2}$$

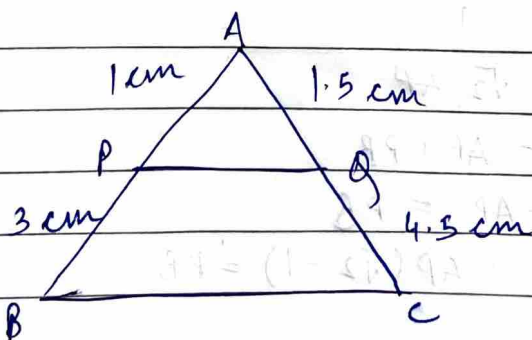
$$\Rightarrow \frac{3}{4} = \frac{4.5}{x}$$

$$\Rightarrow x = \frac{4.5 \times 4}{3}$$

$$\Rightarrow \boxed{x = 6 \text{ cm}}$$

$$\therefore QR = \boxed{6 \text{ cm}}$$

Q. 15



Given - $AP = 1 \text{ cm}$, $PB = 3 \text{ cm}$, $AQ = 1.5 \text{ cm}$, $QC = 4.5 \text{ cm}$
 To prove - $\text{ar}(\triangle APQ) = \frac{1}{16} \text{ar}(\triangle ABC)$

Proof - In $\triangle ABC$,

$$\frac{AP}{PB} = \frac{1}{3} \quad \text{--- (1)}$$

$$\frac{AQ}{QC} = \frac{1.5}{4.5} = \frac{1}{3} \quad \text{--- (2)}$$

From (1) & (2)

$$\frac{AP}{PB} = \frac{AQ}{QC} \quad (\text{By converse of BPT})$$

$$\therefore PQ \parallel BC \quad \text{--- (3)}$$

In $\triangle APQ$ & $\triangle ABC$

$$\angle APQ = \angle ABC$$

$$\angle AQP = \angle ACB$$

} Corresponding $\angle$ s,
 $PQ \parallel BC$

$$\therefore \triangle APQ \sim \triangle ABC \quad (\text{AA similarity})$$

$$\therefore \frac{\text{ar}(\triangle APQ)}{\text{ar}(\triangle ABC)} = \frac{AP^2}{AB^2} \quad (\text{Area theorem})$$

$$\Rightarrow \frac{\text{ar}(\triangle APQ)}{\text{ar}(\triangle ABC)} = \frac{AP^2}{(AP+PB)^2}$$

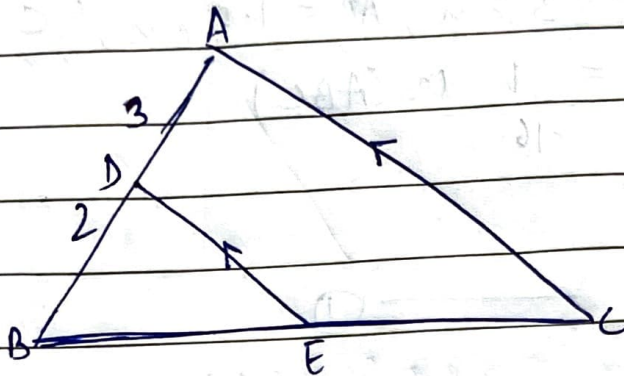
$$\Rightarrow \frac{\text{ar}(\triangle APQ)}{\text{ar}(\triangle ABC)} = \frac{1^2}{(1+3)^2}$$

$$\Rightarrow \frac{\text{ar}(\triangle APQ)}{\text{ar}(\triangle ABC)} = \frac{1}{16}$$

$$\Rightarrow \boxed{\frac{\text{ar}(\triangle APQ)}{\text{ar}(\triangle ABC)} = \frac{1}{16}}$$

Hence, proved

Q.16



Given - $\bullet AD : AB = 3 : 5$
 $\bullet DE \parallel AC$

Find - $ar(ABC) : ar(DBE)$

Solution - In $\triangle ABC$ & $\triangle DBE$,
 $\angle BCA = \angle BED$ } Corresponding $\angle$ s
 $\angle BAC = \angle BDE$ } $DE \parallel AC$
 $\therefore \triangle ABC \sim \triangle DBE$ (AA similarity)

$$\therefore \frac{ar(ABC)}{ar(DBE)} = \frac{AB^2}{BD^2} \quad (\text{Area theorem})$$

$$= \frac{(AD+BD)^2}{BD^2} = \frac{(3+2)^2}{2^2}$$

$$= \frac{5^2}{4} = \frac{25}{4}$$

$$\therefore ar(ABC) : ar(DBE) = \boxed{25 : 4}$$

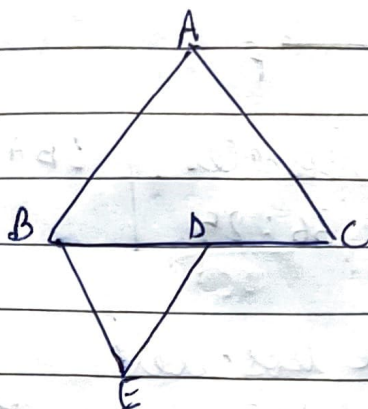
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Ch-7

Exercise 7.6

Given - $\triangle ABC$ & $\triangle BDE$ are equilateral Δ s.
 • D is the midpoint of BC.

To find - $ar(ABC) : ar(BDE)$

Solution - As D is the midpoint of BC,
 $\therefore BD = \frac{1}{2} BC$

$$ar(ABC) = \frac{\sqrt{3}}{4} (\text{side})^2$$

$$= \frac{\sqrt{3}}{4} BC^2 \quad \text{--- (1)}$$

$$ar(BDE) = \frac{\sqrt{3}}{4} (\text{side})^2$$

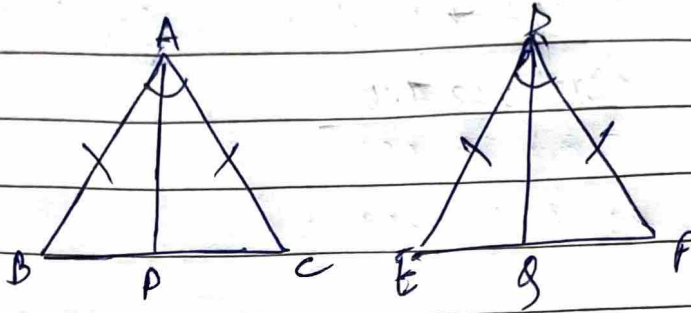
$$= \frac{\sqrt{3}}{4} \left(\frac{1}{2} BC \right)^2 = \frac{\sqrt{3}}{4} \times \frac{1}{4} BC^2$$

$$= \frac{\sqrt{3}}{16} BC^2 \quad \text{--- (2)}$$

$$\therefore \frac{ar(ABC)}{ar(BDE)} = \frac{\sqrt{3}/4 BC^2}{\sqrt{3}/16 BC^2} = \frac{4}{1}$$

$$\therefore ar(ABC) : ar(BDE) = \boxed{4 : 1}$$

Q. 19



Given - ΔABC & ΔDEF are isosceles. $\angle BAC = \angle EDF$
 $\text{ar}(\Delta ABC) : \text{ar}(\Delta DEF) = 36 : 25$

To find - $AD : DG$

Solution - ΔABC & ΔDEF are isosceles.
 $\therefore \angle ABC = \angle ACB$
 $\angle DEF = \angle DFE$ } Base $\angle$ s are equal
 $\therefore \Delta ABC \sim \Delta DEF$

$$\frac{\text{ar}(\Delta ABC)}{\text{ar}(\Delta DEF)} = \frac{36}{25} \quad \text{--- (1)}$$

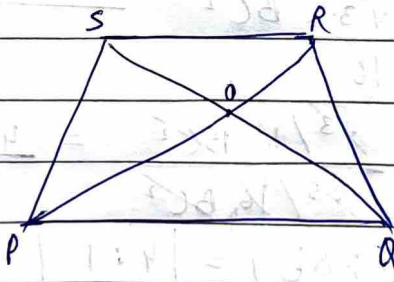
$$\frac{\text{ar}(\Delta ABC)}{\text{ar}(\Delta DEF)} = \frac{AD^2}{DG^2} \quad \left(\begin{array}{l} \text{Altitude \& area of} \\ \text{similar } \Delta \text{ s theorem} \end{array} \right)$$

$$\therefore \frac{36}{25} = \frac{AD^2}{DG^2}$$

$$\frac{AD}{DG} = \sqrt{\frac{36}{25}} = \frac{6}{5}$$

$$\therefore AD : DG = \boxed{6 : 5}$$

Q. 18



Given - $PQRS$ is a trapezium
 $PQ \parallel RS$, $PQ = 3RS$

To find - $\text{ar}(\triangle POQ) : \text{ar}(\triangle ROS)$

Solution - $PQ = 3RS$
 $\Rightarrow \frac{PQ}{RS} = 3$ — (1)

In $\triangle POQ$ & $\triangle ROS$,

$\angle OPQ = \angle ORS$ } Alternate $\angle$ s,

$\angle OQP = \angle OSR$ } $PQ \parallel RS$

$\therefore \triangle POQ \sim \triangle ROS$ (AA similarity)

$\therefore \frac{\text{ar}(\triangle POQ)}{\text{ar}(\triangle ROS)} = \frac{PQ^2}{RS^2}$ (Area theorem)

$\frac{9}{1} = \frac{3^2}{1^2}$ (from (1))

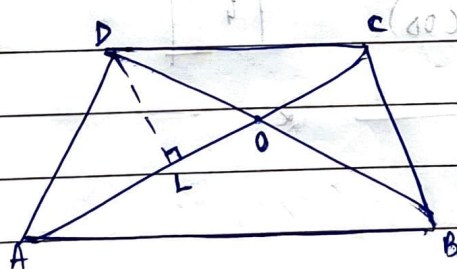
$\frac{9}{1} = \frac{9}{1}$

$\frac{9}{1} = \frac{9}{1}$

$\frac{9}{1} = \frac{9}{1}$

$\therefore \text{ar}(\triangle POQ) : \text{ar}(\triangle ROS) = 9 : 1$

Q.21



Given - $\bullet$ ABCD is a trapezium

$\bullet$ $AB \parallel CD$

$\bullet$ AC & BD bisect at O

Prove - (i) $\triangle AOB \sim \triangle COD$

To find - (ii) If $OA = 6$ cm, $OC = 8$ cm, find

(a) $\frac{\text{ar}(\triangle AOB)}{\text{ar}(\triangle COD)}$ (b) $\frac{\text{ar}(\triangle AOD)}{\text{ar}(\triangle COB)}$

Proof & Sol -

Cons - Draw $DL \perp AC$ from D.

Proof & Sol - (i) In $\triangle AOB$ & $\triangle COD$

$$\begin{aligned} \angle OAB &= \angle OCD \\ \angle OBA &= \angle ODC \end{aligned} \quad \left. \begin{array}{l} \text{Alternate } \angle s \\ \end{array} \right\} AB \parallel CD$$

$$\therefore \triangle AOB \sim \triangle COD \text{ (AA Similarity)}$$

(ii) $OA = 6 \text{ cm}$, $OC = 8 \text{ cm}$

$$(a) \frac{\text{ar}(\triangle AOB)}{\text{ar}(\triangle COD)} = \frac{OA^2}{OC^2} \quad (\text{Area theorem})$$

$$= \frac{6^2}{8^2} = \frac{36}{64} = \frac{9}{16}$$

$$\therefore \frac{\text{ar}(\triangle AOB)}{\text{ar}(\triangle COD)} = \boxed{\frac{9}{16}}$$

$$(b) \frac{\text{ar}(\triangle AOB)}{\text{ar}(\triangle COD)} = \frac{\frac{1}{2} \times AO \times DP}{\frac{1}{2} \times CO \times DP}$$

$$= \frac{AO}{CO} = \frac{6}{8} = \frac{3}{4}$$

$$\therefore \frac{\text{ar}(\triangle AOB)}{\text{ar}(\triangle COD)} = \boxed{\frac{3}{4}}$$