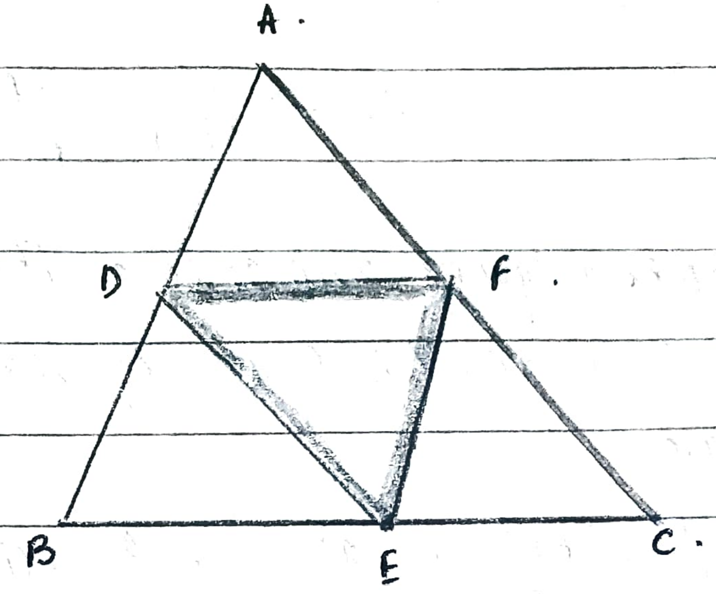
Q5. The given fig. shows a ΔABC, in which D, E and F are the midpoints of sides AB, BC & CA.



$\therefore$ $DF = \frac{1}{2} BC$.

$DE = \frac{1}{2} CA$.

and $EF = \frac{1}{2} AB$.

$\therefore$ $\frac{DF}{BC} = \frac{DE}{CA} = \frac{EF}{AB} = \frac{1}{2}$.

$\Rightarrow$ $\Delta DEF \sim \Delta ABC$.

$$\frac{ar(\Delta DEF)}{ar(\Delta ABC)} = \frac{DE^2}{AC^2}.$$

$$= \left(\frac{DE}{AC}\right)^2 = \left(\frac{1}{2}\right)^2 = \frac{1}{4}.$$

Q6. $\Delta ABC \sim \Delta DEF$.

AP and DQ are medians.

$$\frac{ar\ \Delta ABC}{ar\ \Delta DEF} = \frac{AP^2}{DQ^2}$$

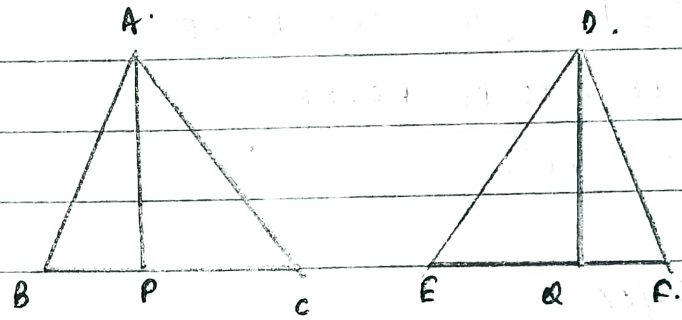
$$\therefore \frac{ar\ \Delta ABC}{ar\ \Delta DEF} = \frac{AB^2}{DE^2}$$

$\Delta ABC \sim \Delta DEF$.

$$\Rightarrow \frac{AB}{DE} = \frac{BC}{EF} = \frac{2BP}{2EQ} = \frac{BP}{EQ}.$$

$$\Rightarrow \frac{AB}{DE} = \frac{BP}{EQ}. \quad (i).$$

$\angle B = \angle E$.



$\therefore \Delta ABP \sim \Delta DEQ$.

$$\therefore \frac{BP}{EQ} = \frac{AP}{DQ}$$

(i) and (ii).

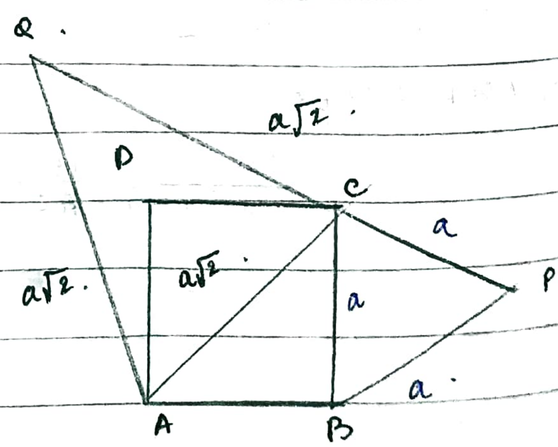
$$\therefore \frac{AB}{DE} = \frac{AP}{DQ}.$$

$$\therefore \frac{ar\ \Delta ABC}{ar\ \Delta DEF.} = \frac{AP^2}{DQ^2}.$$

Q7. Let ABCD be a Square with side a. Then Diagonal $AC = a\sqrt{2}$.
Since, ΔBCP and ΔACQ are equilateral triangles, So they are similar.

$$\therefore \frac{ar(\Delta BCP)}{ar(\Delta ACQ)} = \frac{BC^2}{AC^2} = \frac{a^2}{(a\sqrt{2})^2} = \frac{1}{2} \ldots (i)$$

$\Rightarrow ar(\Delta BCP) = \frac{1}{2} ar\ (\Delta ACQ)$ Hence proved.



Q8. (i) ABC & BDE are 2 equilateral triangles such that D is the mid-point of BC. Ratio of the areas of triangles ABC and BDE is . .

(a) 2 : 1 .
(b) 1 : 2 .
(c) 4 : 1 . (Ans) .
(d) 1 : 4 .

A → Let AB = BC = CA = a .

D is the mid-point of BC. $BD = \frac{1}{2}a$.

$\Delta ABC \sim \Delta BDE$.

$\therefore \frac{ar\,\Delta ABC}{ar\,\Delta BDE} = \frac{AB^2}{BD^2} = \frac{a^2}{(\frac{1}{2}a)^2} = \frac{a^2}{\frac{1}{4}a^2} = \frac{4}{1}$ or 4 : 1 .

(ii) Side of 2 similar triangles are in the ratio 4 : 9 . Areas of these triangles are in the ratio . .

(a) 2 : 3 .
(b) 4 : 9 .
(c) 81 : 16 .
(d) 16 : 81 . (Ans) .

A → Areas of 2 similar triangles are in the ratio of the squares of their corresponding sides .

$\therefore$ Ratio of area of triangle $= \left(\frac{4}{9}\right)^2 = \frac{16}{18}$ or 16 : 81 .