



Triangles Ex 4.6 Q21

Answer :

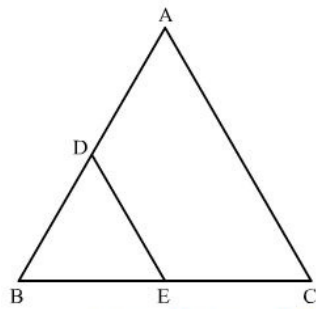
Given: In $\triangle ABC$ and $\triangle BDE$ are equilateral triangles. D is the midpoint of BC.

To find: $\frac{\text{Ar}(\triangle ABC)}{\text{Ar}(\triangle BDE)}$

In $\triangle ABC$ and $\triangle BDE$

$\triangle ABC \sim \triangle BDE$ (AA criterion of similarity, all angles of equilateral triangle are equal)

Since D is the midpoint of BC, $BD : DC = 1$.



We know that the ratio of areas of two similar triangles is equal to the ratio of squares of their corresponding sides.

Let $DC = x$, and $BD = x$

Therefore $BC = BD + DC = 2x$

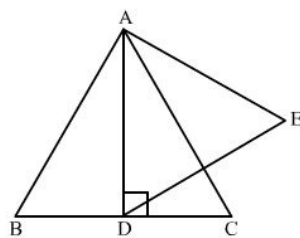
Hence

$$\begin{aligned}\frac{Ar(\Delta ABC)}{Ar(\Delta BDE)} &= \frac{BC^2}{BD^2} \\ &= \frac{(BD+DC)^2}{(BD)^2} \\ &= \frac{(1x+1x)^2}{(1x)^2} \\ &= \frac{(2x)^2}{(1x)^2}\end{aligned}$$

$$\boxed{\frac{Ar(\Delta ABC)}{Ar(\Delta BDE)} = \frac{4}{1}}$$

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Answer :



We have an equilateral triangle ΔABC in which AD is altitude. An equilateral triangle ΔADE is drawn using AD as base. We have to prove that, $\frac{ar(\Delta ADE)}{ar(\Delta ABC)} = \frac{3}{4}$

Since the two triangles are equilateral, the two triangles will be similar also.

$\Delta ADE \sim \Delta ABC$

We know that according to the theorem, the ratio of areas of two similar triangles is equal to the ratio of the squares of any two corresponding sides.

$$\frac{ar(\Delta ADE)}{ar(\Delta ABC)} = \left(\frac{AD}{AB}\right)^2 \dots\dots (1)$$

Now $\triangle ABC$ is an equilateral triangle. So,

$$\angle B = 60^\circ.$$

Therefore,

$$\sin \angle B = \frac{AD}{AB}$$

$$\text{So, } \frac{AD}{AB} = \frac{\sqrt{3}}{2}$$

We will now use this in equation (1). So,

$$\begin{aligned} \frac{ar(\triangle ADE)}{ar(\triangle ABC)} &= \left(\frac{AD}{AB} \right)^2 \\ &= \left(\frac{\sqrt{3}}{2} \right)^2 \\ &= \boxed{\frac{3}{4}} \end{aligned}$$

Hence, proved.

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