

Exercise 1E

Question 10:

Consider the given equation

$$\frac{\sqrt{3} + 1}{\sqrt{3} - 1} = a + b\sqrt{3}$$

For rationalising the denominator of a number, we multiply its numerator and denominator by its rationalising factor.

If a and b are integers, then $(a+\sqrt{b})$ and $(a-\sqrt{b})$ are rationalising factor of each other,

$$(a+\sqrt{b}) \text{ and } (a-\sqrt{b}) \text{ are rationalising factor of each other as } (a+\sqrt{b})(a-\sqrt{b}) = (a^2-b), \text{ which is rational.}$$
 Let us rationalise the denominator of the Left hand side.
$$\Rightarrow \frac{\sqrt{3}+1}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1} = a+b\sqrt{3}$$

$$\Rightarrow \frac{\left(\sqrt{3}\right)^2+2\left(\sqrt{3}\right)\left(1\right)+\left(1\right)^2}{\left(\sqrt{3}\right)^2-\left(1\right)^2} = a+b\sqrt{3}$$

$$\Rightarrow \frac{3+2\sqrt{3}+1}{3-1} = a+b\sqrt{3}$$

$$\Rightarrow \frac{2\left(2+\sqrt{3}\right)}{2} = a+b\sqrt{3}$$

$$\Rightarrow \frac{2+\sqrt{3}}{3} = a+b\sqrt{3}$$

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Question 11:

Consider the given equation
$$\frac{3 + \sqrt{2}}{3 - \sqrt{2}} = a + b\sqrt{2}$$

For rationalising the denominator of a number, we multiply its numerator and denominator by its rationalising factor.

If a and b are integers, then $(a+\sqrt{b})$ and $(a-\sqrt{b})$ are rationalising factor of each other,

as
$$(a+\sqrt{b})$$
 and $(a-\sqrt{b})$ are radionalising factor of each other as $(a+\sqrt{b})(a-\sqrt{b}) = (a^2-b)$, which is rational.
Let us rationalise the denominator of the Left hand side.

$$\Rightarrow \frac{3+\sqrt{2}}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}} = a+b\sqrt{2}$$

$$\Rightarrow \frac{(3+\sqrt{2})^2}{(3)^2-(\sqrt{2})^2} = a+b\sqrt{2}$$

$$\Rightarrow \frac{(3)^2+2(3)(\sqrt{2})+(\sqrt{2})^2}{9-2} = a+b\sqrt{2}$$

$$\Rightarrow \frac{11+6\sqrt{2}}{7} = a+b\sqrt{2}$$

$$\Rightarrow \frac{11}{7}+\frac{6\sqrt{2}}{7} = a+b\sqrt{2}$$

$$\therefore a = \frac{11}{7} \text{ and } b = \frac{6}{7}.$$

*********** END ********