



Exercise 1E

Question 12:

Consider the given equation

$$\frac{5 - \sqrt{6}}{5 + \sqrt{6}} = a - b\sqrt{6}$$

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 $(a + \sqrt{b})(a - \sqrt{b}) = (a^2 - b)$, which is rational.

Let us rationalise the denominator of the Left hand side.

$$\begin{aligned} \Rightarrow \frac{5 - \sqrt{6}}{5 + \sqrt{6}} \times \frac{5 - \sqrt{6}}{5 - \sqrt{6}} &= a - b\sqrt{6} \\ \Rightarrow \frac{(5 - \sqrt{6})^2}{(5)^2 - (\sqrt{6})^2} &= a - b\sqrt{6} \\ \Rightarrow \frac{(5)^2 - 2(5)(\sqrt{6}) + (\sqrt{6})^2}{25 - 6} &= a - b\sqrt{6} \\ \Rightarrow \frac{25 - 10\sqrt{6} + 6}{19} &= a - b\sqrt{6} \\ \Rightarrow \frac{31 - 10\sqrt{6}}{19} &= a - b\sqrt{6} \\ \Rightarrow \frac{31}{19} - \frac{10\sqrt{6}}{19} &= a - b\sqrt{6} \\ \therefore a = \frac{31}{19} \text{ and } b = \frac{10}{19}. \end{aligned}$$

Question 13:

Consider the given equation

$$\frac{5 + 2\sqrt{3}}{7 + 4\sqrt{3}} = a - b\sqrt{3}$$

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

If a and b are integers and x is a natural number, then $(a+b\sqrt{x})$ and $(a-b\sqrt{x})$ are rationalising factor of each other, as $(a+b\sqrt{x})(a-b\sqrt{x}) = (a^2 - b^2x)$, which is rational.

Let us rationalise the denominator of the Left hand side.

$$\begin{aligned} &\Rightarrow \frac{5 + 2\sqrt{3}}{7 + 4\sqrt{3}} \times \frac{7 - 4\sqrt{3}}{7 - 4\sqrt{3}} = a - b\sqrt{3} \\ &\Rightarrow \frac{(5 + 2\sqrt{3})(7 - 4\sqrt{3})}{(7)^2 - (4\sqrt{3})^2} = a - b\sqrt{3} \\ &\Rightarrow \frac{5(7 - 4\sqrt{3}) + 2\sqrt{3}(7 - 4\sqrt{3})}{49 - 48} = a - b\sqrt{3} \\ &\Rightarrow 35 - 20\sqrt{3} + 14\sqrt{3} - 24 = a - b\sqrt{3} \\ &\Rightarrow 11 - 6\sqrt{3} = a - b\sqrt{3} \\ &\therefore a = 11 \text{ and } b = 6. \end{aligned}$$

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