

# Mathematics

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(Chapter – 1) (Number Systems)(Exemplar Problems)

(Class – IX)

## Exercise 1.3

### Question 11:

Find the values of  $a$  and  $b$  in each of the following:

$$(i) \frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a - 6\sqrt{3}$$

$$(ii) \frac{3-\sqrt{5}}{3+2\sqrt{5}} = a\sqrt{5} - \frac{19}{11}$$

$$(iii) \frac{\sqrt{2}+\sqrt{3}}{3\sqrt{2}-2\sqrt{3}} = 2 - b\sqrt{6}$$

$$(iv) \frac{7+\sqrt{5}}{7-\sqrt{5}} - \frac{7-\sqrt{5}}{7+\sqrt{5}} = a + \frac{7}{11}\sqrt{5}b$$

### Answer 11:

$$(i) \frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a - 6\sqrt{3}$$

$$\Rightarrow \frac{5+2\sqrt{3}}{7+4\sqrt{3}} \times \frac{7-4\sqrt{3}}{7-4\sqrt{3}} = a - 6\sqrt{3}$$

$$\Rightarrow \frac{35 - 20\sqrt{3} + 14\sqrt{3} - 8 \times 3}{7^2 - (4\sqrt{3})^2} = a - 6\sqrt{3}$$

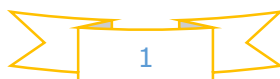
$$\Rightarrow \frac{11 - 6\sqrt{3}}{49 - 48} = a - 6\sqrt{3}$$

$$\Rightarrow 11 - 6\sqrt{3} = a - 6\sqrt{3}$$

$$\Rightarrow a = 11$$

$$(ii) \frac{3-\sqrt{5}}{3+2\sqrt{5}} = a\sqrt{5} - \frac{19}{11}$$

$$\Rightarrow \frac{3-\sqrt{5}}{3+2\sqrt{5}} \times \frac{3-2\sqrt{5}}{3-2\sqrt{5}} = a\sqrt{5} - \frac{19}{11}$$



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(Class – IX)

$$\Rightarrow \frac{9 - 6\sqrt{5} - 3\sqrt{5} + 2 \times 5}{3^2 - (2\sqrt{5})^2} = a\sqrt{5} - \frac{19}{11}$$

$$\Rightarrow \frac{19 - 9\sqrt{5}}{9 - 20} = a\sqrt{5} - \frac{19}{11}$$

$$\Rightarrow \frac{19 - 9\sqrt{5}}{-11} = a\sqrt{5} - \frac{19}{11}$$

$$\Rightarrow \frac{9\sqrt{5} - 19}{11} = a\sqrt{5} - \frac{19}{11}$$

$$\Rightarrow \frac{9}{11}\sqrt{5} - \frac{19}{11} = a\sqrt{5} - \frac{19}{11}$$

$$\Rightarrow a = \frac{9}{11}$$



$$\text{(iii)} \frac{\sqrt{2} + \sqrt{3}}{3\sqrt{2} - 2\sqrt{3}} = 2 - b\sqrt{6}$$

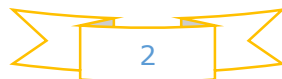
$$\Rightarrow \frac{\sqrt{2} + \sqrt{3}}{3\sqrt{2} - 2\sqrt{3}} \times \frac{3\sqrt{2} + 2\sqrt{3}}{3\sqrt{2} + 2\sqrt{3}} = 2 - b\sqrt{6}$$

$$\Rightarrow \frac{3 \times 2 + 2\sqrt{6} + 3\sqrt{6} + 2 \times 3}{(3\sqrt{2})^2 - (2\sqrt{3})^2} = 2 - b\sqrt{6}$$

$$\Rightarrow \frac{12 + 5\sqrt{6}}{18 - 12} = 2 - b\sqrt{6}$$

$$\Rightarrow \frac{12 + 5\sqrt{6}}{6} = 2 - b\sqrt{6}$$

$$\Rightarrow 2 + \frac{5}{6}\sqrt{6} = 2 - b\sqrt{6}$$



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$$\Rightarrow b = -\frac{5}{6}$$

$$\text{(iv)} \quad \frac{7+\sqrt{5}}{7-\sqrt{5}} - \frac{7-\sqrt{5}}{7+\sqrt{5}} = a + \frac{7}{11}\sqrt{5}b$$

$$\Rightarrow \frac{(7+\sqrt{5})^2 - (7-\sqrt{5})^2}{7^2 - (\sqrt{5})^2} = a + \frac{7}{11}\sqrt{5}b$$

$$\Rightarrow \frac{49 + 5 + 14\sqrt{5} - (49 + 5 - 14\sqrt{5})}{49 - 5} = a + \frac{7}{11}\sqrt{5}b$$

$$\Rightarrow \frac{28\sqrt{5}}{44} = a + \frac{7}{11}\sqrt{5}b$$

$$\Rightarrow 0 + \frac{7}{11}\sqrt{5} = a + \frac{7}{11}\sqrt{5}b$$

$$\Rightarrow a = 0, \quad b = 1$$

