

# Surds Review

Rules:  $\sqrt{a} \times \sqrt{b} = \sqrt{a \times b}$

$$\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$$

WARNING !!

$$\sqrt{a} + \sqrt{b} \neq \sqrt{a+b}$$

$$\sqrt{a} - \sqrt{b} \neq \sqrt{a-b}$$

---

## Simplifying Surds

Ex1  $\sqrt{50} + \sqrt{2}$

$$= \sqrt{25 \times 2} + \sqrt{2}$$
$$= 5\sqrt{2} + \sqrt{2}$$
$$= 6\sqrt{2}$$

1 4 9 16 25 36

Ex2  $\sqrt{12} + \sqrt{27} - \sqrt{48}$

$$\sqrt{4 \times 3} + \sqrt{9 \times 3} - \sqrt{16 \times 3}$$
$$= 2\sqrt{3} + 3\sqrt{3} - 4\sqrt{3}$$
$$= \sqrt{3}$$

---

Exercise Simplify

$$\begin{aligned} 1) \quad \sqrt{5} + \sqrt{20} &= \sqrt{5} + \sqrt{4 \times 5} \\ &= \sqrt{5} + 2\sqrt{5} = 3\sqrt{5} \end{aligned}$$

$$\begin{aligned} 2) \quad \sqrt{28} - \sqrt{7} &= \sqrt{4 \times 7} - \sqrt{7} \\ &= 2\sqrt{7} - \sqrt{7} = \sqrt{7} \end{aligned}$$

$$\begin{aligned} 3) \quad \sqrt{72} - \sqrt{50} &= \sqrt{36 \times 2} - \sqrt{25 \times 2} \\ &= 6\sqrt{2} - 5\sqrt{2} = \sqrt{2} \end{aligned}$$

$$\begin{aligned} 4) \quad \sqrt{12} + \sqrt{300} &= \sqrt{4 \times 3} + \sqrt{100 \times 3} \\ &= 2\sqrt{3} + 10\sqrt{3} = 12\sqrt{3} \end{aligned}$$

---

Expand and Simplify

$$\begin{aligned} 1) \quad (3 + \sqrt{2})(5 - \sqrt{2}) \\ &= 15 + 5\sqrt{2} - 3\sqrt{2} - 2 \\ &= 13 + 2\sqrt{2} \end{aligned}$$

$$\begin{aligned} 2) \quad (4 + 3\sqrt{3})(2 + 5\sqrt{3}) \\ &= 8 + 6\sqrt{3} + 20\sqrt{3} + 45 \\ &= 53 + 26\sqrt{3} \end{aligned}$$

$$\begin{aligned} 3 \times \sqrt{3} \times 5 \times \sqrt{3} \\ &= 3 \times 5 \times 3 \\ &= 45 \end{aligned}$$

---

## Exercise

$$\begin{aligned} 1) \quad & (5 + \sqrt{5})(2 + \sqrt{5}) \\ & = 10 + 2\sqrt{5} + 5\sqrt{5} + 5 \\ & = 15 + 7\sqrt{5} \end{aligned}$$

$$\begin{aligned} 2) \quad & (4 - \sqrt{2})(3 + \sqrt{2}) \\ & = 12 - 3\sqrt{2} + 4\sqrt{2} - 2 \\ & = 10 + \sqrt{2} \end{aligned}$$

$$\begin{aligned} 3) \quad & (4 - \sqrt{3})(2 + 5\sqrt{3}) \\ & = 8 - 2\sqrt{3} + 20\sqrt{3} - 15 \\ & = -7 + 18\sqrt{3} \end{aligned}$$

---

## Rationalising Denominators

$$\begin{aligned} 1) \quad \text{Simplify } \frac{12}{\sqrt{3}} &= \frac{12}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \\ &= \frac{12\sqrt{3}}{3} = 4\sqrt{3} \end{aligned}$$

$$2) \quad \frac{15}{\sqrt{7}} = \frac{15}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{15\sqrt{7}}{7}$$

---

## Exercise

$$1) \quad \frac{10}{\sqrt{5}} = \frac{10}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{10\sqrt{5}}{5} = 2\sqrt{5}$$

$$2) \quad \frac{14}{\sqrt{2}} = \frac{14}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{14\sqrt{2}}{2} = 7\sqrt{2}$$

$$\text{Ex 3} \quad \frac{7}{4-\sqrt{3}} \quad a^2 - b^2 = (a+b)(a-b)$$

$$= \frac{7}{4-\sqrt{3}} \times \frac{4+\sqrt{3}}{4+\sqrt{3}} = \frac{7(4+\sqrt{3})}{4^2 - \sqrt{3}^2}$$

$$= \frac{28 + 7\sqrt{3}}{16 - 3}$$

$$= \frac{28 + 7\sqrt{3}}{13}$$