

Section 1: Surds

Solutions to Exercise level 2

$$1. \quad (i) \quad \sqrt{6} \times \sqrt{27} = \sqrt{3} \times \sqrt{2} \times \sqrt{9} \times \sqrt{3} = \sqrt{2} \times 3 \times 3 = 9\sqrt{2}$$

$$(ii) \quad \sqrt{12} \times \sqrt{15} = \sqrt{4} \times \sqrt{3} \times \sqrt{3} \times \sqrt{5} = 2 \times 3 \times \sqrt{5} = 6\sqrt{5}$$

$$(iii) \quad \sqrt{10} \times \sqrt{24} \times \sqrt{15} = \sqrt{5} \times \sqrt{2} \times \sqrt{4} \times \sqrt{3} \times \sqrt{2} \times \sqrt{3} \times \sqrt{5} \\ = 5 \times 2 \times 2 \times 3 \\ = 60$$

$$2. \quad (i) \quad (\sqrt{2} + 2\sqrt{3})(5\sqrt{2} - \sqrt{3}) = 5 \times 2 - \sqrt{2}\sqrt{3} + 10\sqrt{3}\sqrt{2} - 2 \times 3 \\ = 10 - \sqrt{6} + 10\sqrt{6} - 6 \\ = 4 + 9\sqrt{6}$$

$$(ii) \quad (\sqrt{7} + \sqrt{2})(\sqrt{7} - \sqrt{2}) = 7 - \sqrt{7}\sqrt{2} + \sqrt{2}\sqrt{7} - 2 \\ = 5$$

$$(iii) \quad (\sqrt{2} - \sqrt{8})^2 = 2 - 2\sqrt{2} \cdot \sqrt{8} + 8 \\ = 2 - 8 + 8 \\ = 2$$

$$(iv) \quad (3 + \sqrt{3})(3 - \sqrt{3}) = 3^2 - (\sqrt{3})^2 \\ = 9 - 3 \\ = 6$$

$$(v) \quad (1 + 2\sqrt{3} - \sqrt{5})^2 = (1 + 2\sqrt{3} - \sqrt{5})(1 + 2\sqrt{3} - \sqrt{5}) \\ = (1 + 2\sqrt{3} - \sqrt{5}) + (2\sqrt{3} + 4(3) - 2\sqrt{3}\sqrt{5}) + (-\sqrt{5} - 2\sqrt{3}\sqrt{5} + 5) \\ = 18 + 4\sqrt{3} - 2\sqrt{5} - 4\sqrt{3}\sqrt{5} \\ = 2(9 + 2\sqrt{3} - \sqrt{5} - 2\sqrt{3}\sqrt{5})$$

Edexcel AS Maths Surds and indices 1 Exercise solutions

$$\begin{aligned} 3. \quad (i) \quad \frac{1-\sqrt{3}}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}} &= \frac{(1-\sqrt{3})(2+\sqrt{3})}{(2-\sqrt{3})(2+\sqrt{3})} \\ &= \frac{2+\sqrt{3}-2\sqrt{3}-3}{4-3} \\ &= \frac{-1-\sqrt{3}}{1} \\ &= -1-\sqrt{3} \end{aligned}$$

$$\begin{aligned} (ii) \quad \frac{1+2\sqrt{5}}{3-\sqrt{5}} \times \frac{3+\sqrt{5}}{3+\sqrt{5}} &= \frac{(1+2\sqrt{5})(3+\sqrt{5})}{(3-\sqrt{5})(3+\sqrt{5})} \\ &= \frac{3+\sqrt{5}+6\sqrt{5}+2 \times 5}{9-5} \\ &= \frac{13+7\sqrt{5}}{4} \end{aligned}$$

$$\begin{aligned} (iii) \quad \frac{1+\sqrt{2}}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}} &= \frac{(1+\sqrt{2})(\sqrt{3}-\sqrt{2})}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})} \\ &= \frac{\sqrt{3}-\sqrt{2}+\sqrt{6}-2}{3-2} \\ &= \sqrt{3}-\sqrt{2}+\sqrt{6}-2 \end{aligned}$$

$$\begin{aligned} (iv) \quad \frac{\sqrt{6}+\sqrt{3}}{\sqrt{6}-\sqrt{3}} \times \frac{\sqrt{6}+\sqrt{3}}{\sqrt{6}+\sqrt{3}} &= \frac{(\sqrt{6}+\sqrt{3})(\sqrt{6}+\sqrt{3})}{(\sqrt{6}-\sqrt{3})(\sqrt{6}+\sqrt{3})} \\ &= \frac{6+\sqrt{18}+\sqrt{18}+3}{6-3} \\ &= \frac{9+2\sqrt{18}}{3} \\ &= \frac{9+6\sqrt{2}}{3} = 3+2\sqrt{2} \end{aligned}$$

$$\begin{aligned} 4. \quad (i) \quad \frac{2}{\sqrt{7}} + \frac{3}{\sqrt{2}} &= \frac{2\sqrt{7}}{7} + \frac{3\sqrt{2}}{2} \\ &= \frac{4\sqrt{7}+21\sqrt{2}}{14} \end{aligned}$$

Edexcel AS Maths Surds and indices 1 Exercise solutions

$$\begin{aligned} \text{(ii)} \quad \frac{1}{3-\sqrt{2}} + \frac{2}{2-\sqrt{3}} &= \frac{3+\sqrt{2}}{9-2} + \frac{2(2+\sqrt{3})}{4-3} \\ &= \frac{3+\sqrt{2}+28+14\sqrt{3}}{7} \\ &= \frac{31+\sqrt{2}+14\sqrt{3}}{7} \end{aligned}$$

$$\begin{aligned} \text{(iii)} \quad \frac{3}{\sqrt{x}} - \frac{\sqrt{x}}{4} &= \frac{12-x}{4\sqrt{x}} \\ &= \frac{\sqrt{x}(12-x)}{4x} \end{aligned}$$

$$\begin{aligned} \text{(iv)} \quad \frac{1}{x+\sqrt{y}} + \frac{1}{x-\sqrt{y}} &= \frac{x-\sqrt{y}}{x^2-y} + \frac{x+\sqrt{y}}{x^2-y} \\ &= \frac{2x}{x^2-y} \end{aligned}$$