

## Exercise 1E

$$1 \text{ a } \sqrt{28} = \sqrt{4} \times \sqrt{7} \\ = 2\sqrt{7}$$

$$\text{b } \sqrt{72} = \sqrt{8} \times \sqrt{9} \\ = \sqrt{2} \times \sqrt{4} \times \sqrt{9} \\ = \sqrt{2} \times 2 \times 3 \\ = 6\sqrt{2}$$

$$\text{c } \sqrt{50} = \sqrt{25} \times \sqrt{2} \\ = 5\sqrt{2}$$

$$\text{d } \sqrt{32} = \sqrt{16} \times \sqrt{2} \\ = 4\sqrt{2}$$

$$\text{e } \sqrt{90} = \sqrt{9} \times \sqrt{10} \\ = 3\sqrt{10}$$

$$\text{f } \frac{\sqrt{12}}{2} = \frac{\sqrt{4} \times \sqrt{3}}{2} \\ = \frac{2 \times \sqrt{3}}{2} \\ = \sqrt{3}$$

$$\text{g } \frac{\sqrt{27}}{3} = \frac{\sqrt{9} \times \sqrt{3}}{3} \\ = \frac{3 \times \sqrt{3}}{3} \\ = \sqrt{3}$$

$$\text{h } \sqrt{20} + \sqrt{80} = \sqrt{4}\sqrt{5} + \sqrt{16}\sqrt{5} \\ = 2\sqrt{5} + 4\sqrt{5} \\ = 6\sqrt{5}$$

$$\text{i } \sqrt{200} + \sqrt{18} - \sqrt{72} \\ = \sqrt{100}\sqrt{2} + \sqrt{9}\sqrt{2} - \sqrt{36}\sqrt{2} \\ = 10\sqrt{2} + 3\sqrt{2} - 6\sqrt{2} \\ = 7\sqrt{2}$$

$$\text{j } \sqrt{175} + \sqrt{63} + 2\sqrt{28} \\ = \sqrt{25}\sqrt{7} + \sqrt{9}\sqrt{7} + 2 \times \sqrt{4}\sqrt{7} \\ = 5\sqrt{7} + 3\sqrt{7} + 4\sqrt{7} \\ = 12\sqrt{7}$$

$$\text{k } \sqrt{28} - 2\sqrt{63} + \sqrt{7} = \sqrt{4}\sqrt{7} - 2\sqrt{9}\sqrt{7} + \sqrt{7} \\ = 2\sqrt{7} - 6\sqrt{7} + \sqrt{7} \\ = -3\sqrt{7}$$

$$\text{l } \sqrt{80} - 2\sqrt{20} + 3\sqrt{45} \\ = \sqrt{16}\sqrt{5} - 2\sqrt{4}\sqrt{5} + 3\sqrt{9}\sqrt{5} \\ = 4\sqrt{5} - 4\sqrt{5} + 9\sqrt{5} \\ = 9\sqrt{5}$$

$$\text{m } 3\sqrt{80} - 2\sqrt{20} + 5\sqrt{45} \\ = 3\sqrt{16}\sqrt{5} - 2\sqrt{4}\sqrt{5} + 5\sqrt{9}\sqrt{5} \\ = 12\sqrt{5} - 4\sqrt{5} + 15\sqrt{5} \\ = 23\sqrt{5}$$

$$\text{n } \frac{\sqrt{44}}{\sqrt{11}} = \frac{\sqrt{4}\sqrt{11}}{\sqrt{11}} \\ = 2$$

$$\text{o } \sqrt{12} + 3\sqrt{48} + \sqrt{75} \\ = \sqrt{4}\sqrt{3} + 3\sqrt{16}\sqrt{3} + \sqrt{25}\sqrt{3} \\ = 2\sqrt{3} + 12\sqrt{3} + 5\sqrt{3} \\ = 19\sqrt{3}$$

$$2 \text{ a } \sqrt{3}(2 + \sqrt{3}) = 2\sqrt{3} + \sqrt{3}\sqrt{3} \\ = 2\sqrt{3} + \sqrt{9} \\ = 2\sqrt{3} + 3$$

$$\text{b } \sqrt{5}(3 - \sqrt{3}) = 3\sqrt{5} - \sqrt{3}\sqrt{5} \\ = 3\sqrt{5} - \sqrt{15}$$

$$\text{c } \sqrt{2}(4 - \sqrt{5}) = 4\sqrt{2} - \sqrt{2}\sqrt{5} \\ = 4\sqrt{2} - \sqrt{10}$$

$$\begin{aligned}
 2 \text{ d } (2-\sqrt{2})(3+\sqrt{5}) &= 6+2\sqrt{5}-3\sqrt{2}-\sqrt{2}\sqrt{5} \\
 &= 6+2\sqrt{5}-3\sqrt{2}-\sqrt{10}
 \end{aligned}$$

$$\begin{aligned}
 \text{e } (2-\sqrt{3})(3-\sqrt{7}) &= 6-2\sqrt{7}-3\sqrt{3}+\sqrt{3}\sqrt{7} \\
 &= 6-2\sqrt{7}-3\sqrt{3}+\sqrt{21}
 \end{aligned}$$

$$\begin{aligned}
 \text{f } (4+\sqrt{5})(2+\sqrt{5}) &= 8+4\sqrt{5}+2\sqrt{5}+\sqrt{5}\sqrt{5} \\
 &= 8+6\sqrt{5}+\sqrt{25} \\
 &= 8+6\sqrt{5}+5 \\
 &= 13+6\sqrt{5}
 \end{aligned}$$

$$\begin{aligned}
 \text{g } (5-\sqrt{3})(1-\sqrt{3}) &= 5-5\sqrt{3}-\sqrt{3}+\sqrt{3}\sqrt{3} \\
 &= 5-6\sqrt{3}+\sqrt{9} \\
 &= 5-6\sqrt{3}+3 \\
 &= 8-6\sqrt{3}
 \end{aligned}$$

$$\begin{aligned}
 \text{h } (4+\sqrt{3})(2-\sqrt{3}) &= 8-4\sqrt{3}+2\sqrt{3}-\sqrt{3}\sqrt{3} \\
 &= 8-2\sqrt{3}-\sqrt{9} \\
 &= 8-2\sqrt{3}-3 \\
 &= 5-2\sqrt{3}
 \end{aligned}$$

$$\begin{aligned}
 \text{i } (7-\sqrt{11})(2+\sqrt{11}) &= 14+7\sqrt{11}-2\sqrt{11}-\sqrt{11}\sqrt{11} \\
 &= 14+5\sqrt{11}-\sqrt{121} \\
 &= 14+5\sqrt{11}-11 \\
 &= 3+5\sqrt{11}
 \end{aligned}$$

$$\begin{aligned}
 3 \quad \sqrt{75}-\sqrt{12} &= \sqrt{25}\sqrt{3}-\sqrt{4}\sqrt{3} \\
 &= 5\sqrt{3}-2\sqrt{3} \\
 &= 3\sqrt{3}
 \end{aligned}$$