

Expanding brackets with surds

Starter

1. **(Review of last lesson)** Without a calculator, simplify:

(a) $2\sqrt{54} \times \sqrt{6}$

(b) $2\sqrt{125} - 3\sqrt{80} = -2\sqrt{5}$.

Working: (a) $2\sqrt{54} \times \sqrt{6} = 2\sqrt{9 \times 6} \times \sqrt{6}$
 $= 6\sqrt{6} \times \sqrt{6}$
 $= 6 \times 6$
 $= 36$

(b) $2\sqrt{125} - 3\sqrt{80} = 2\sqrt{25 \times 5} - 3\sqrt{16 \times 5}$
 $= 2\sqrt{25} \times \sqrt{5} - 3\sqrt{16} \times \sqrt{5}$
 $= 10\sqrt{5} - 12\sqrt{5}$
 $= -2\sqrt{5}$

2. **(Review of previous material)** Expand these brackets:

(a) $4x(x^2 + 3y)$

(b) $(3x - 2)(x + 7)$

(c) $(1 + \sqrt{3})(2 - \sqrt{3})$

Working: (a) $4x(x^2 + 3y) = 4x^3 + 12xy$

(b) $(3x - 2)(x + 7) = 3x^2 + 21x - 2x - 14 = 3x^2 + 19x - 14$

(c) $(1 + \sqrt{3})(2 - \sqrt{3}) = 2 - \sqrt{3} + 2\sqrt{3} - 3 = \sqrt{3} - 1$

E.g. 1 Expand and simplify where possible:

(a) $\sqrt{5}(4 - \sqrt{5})$

(b) $\sqrt{2}(5 + 4\sqrt{2})$

(c) $\sqrt{5}(2 + \sqrt{75})$

(d) $\sqrt{2}(\sqrt{32} - \sqrt{8})$

Working: (a) $\sqrt{5}(4 - \sqrt{5}) = 4\sqrt{5} - 5$

(b) $\sqrt{2}(5 + 4\sqrt{2}) = 5\sqrt{2} + 8$

(c) $\sqrt{5}(2 + \sqrt{75}) = \sqrt{5}(2 + \sqrt{25 \times 3}) = \sqrt{5}(2 + 5\sqrt{3}) = 2\sqrt{5} + 5\sqrt{15}$

(d) $\sqrt{2}(\sqrt{32} - \sqrt{8}) = \sqrt{64} - \sqrt{16} = 8 - 4 = 4$

E.g. 2 Expand and simplify where possible:

(a) $(\sqrt{7} + 6)(\sqrt{7} + 9)$

(b) $(\sqrt{2} + 2)(\sqrt{2} - 5)$

(c) $(\sqrt{6} - 2)^2$

(d) $(4 + \sqrt{7})(4 - \sqrt{7})$

Working: (a) $(\sqrt{7} + 6)(\sqrt{7} + 9) = 7 + 9\sqrt{7} + 6\sqrt{7} + 54 = 61 + 15\sqrt{7}$

(b) $(\sqrt{2} + 2)(\sqrt{2} - 5) = 2 - 5\sqrt{2} + 2\sqrt{2} - 10 = -8 - 3\sqrt{2}$

(c) $(\sqrt{6} - 2)^2 = (\sqrt{6} - 2)(\sqrt{6} - 2) = 6 - 2\sqrt{6} - 2\sqrt{6} + 4 = 10 - 4\sqrt{6}$

(d) $(4 + \sqrt{7})(4 - \sqrt{7}) = 16 - 4\sqrt{7} + 4\sqrt{7} - 7 = 9$

Video: [Surds - expanding brackets](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook:

p15 E1.3 Qu 1ace, 2ac, 3, 4ace, 5-6

A*-G class textbook:

p15 E1.3 Qu 1-3

9-1 homework book:

p5 E1.3 Qu 1-8

A*-G homework book:

p4 E1.3 Qu 1-4