

## Rationalising the denominator

### Starter

1. **(Review of last lesson)** Expand and simplify where possible:

(a)  $(2 + 4\sqrt{6})(5 - 3\sqrt{6})$

(b)  $(2\sqrt{5} + 7)^2$

**Working:** (a)  $(2 + 4\sqrt{6})(5 - 3\sqrt{6}) = 10 - 6\sqrt{6} + 20\sqrt{6} - 4 \times 3 \times 6$   
 $= 14\sqrt{6} - 62$   
 $= 2(7\sqrt{6} - 31)$

(b)  $(2\sqrt{5} + 7)^2 = (2\sqrt{5} + 7)(2\sqrt{5} + 7)$   
 $= 4 \times 5 + 14\sqrt{5} + 14\sqrt{5} + 49$   
 $= 69 + 28\sqrt{5}$

2. State the value of: (a)  $6 \times \frac{4}{4}$  (b)  $53 \times \frac{187}{187}$  (c)  $k \times \frac{a}{a}$

**Working:** (a)  $6 \times \frac{4}{4} = 6$

(b)  $53 \times \frac{187}{187} = 53$

(c)  $k \times \frac{a}{a} = k$

3. State the value of: (a)  $\sqrt{7} \times \sqrt{7}$  (b)  $\sqrt{56} \times \sqrt{56}$  (c)  $\sqrt{k} \times \sqrt{k}$

**Working:** (a)  $\sqrt{7} \times \sqrt{7} = 7$

(b)  $\sqrt{56} \times \sqrt{56} = 56$

(c)  $\sqrt{k} \times \sqrt{k} = k$

**E.g. 1** Rationalise and simplify these surds:

(a)  $\frac{1}{\sqrt{7}}$

(b)  $\frac{3\sqrt{5}}{\sqrt{3}}$

(c)  $\frac{3}{4\sqrt{2}}$

(d)  $\frac{\sqrt{5}}{4\sqrt{10}}$

(e)  $\frac{9 + \sqrt{5}}{\sqrt{13}}$

(f)  $\frac{7 - \sqrt{2}}{3\sqrt{6}}$

**Working:**

(a)  $\frac{1}{\sqrt{7}} = \frac{1}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{\sqrt{7}}{7}$

(b)  $\frac{3\sqrt{5}}{\sqrt{3}} = \frac{3\sqrt{5}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{3\sqrt{15}}{3} = \sqrt{15}$

(c)  $\frac{3}{4\sqrt{2}} = \frac{3}{4\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{3\sqrt{2}}{4 \times 2} = \frac{3\sqrt{2}}{8}$

(d)  $\frac{\sqrt{5}}{4\sqrt{10}} = \frac{\sqrt{5}}{4\sqrt{10}} \times \frac{\sqrt{10}}{\sqrt{10}} = \frac{\sqrt{50}}{40} = \frac{\sqrt{25 \times 2}}{40} = \frac{5\sqrt{2}}{40} = \frac{\sqrt{2}}{8}$

(e)  $\frac{9 + \sqrt{5}}{\sqrt{13}} = \frac{9 + \sqrt{5}}{\sqrt{13}} \times \frac{\sqrt{13}}{\sqrt{13}} = \frac{9\sqrt{13} + \sqrt{65}}{13}$

(f)  $\frac{7 - \sqrt{2}}{3\sqrt{6}} = \frac{7 - \sqrt{2}}{3\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{7\sqrt{6} - \sqrt{12}}{3 \times 6} = \frac{7\sqrt{6} - 2\sqrt{3}}{18}$

**Video:** [Surds - rationalising denominators](#)

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

**Exercise**

9-1 class textbook:

p16 E1.4 Qu 1-4, 5a-i, k, l, 7, 9

A\*-G class textbook:

p15 E1.3 Qu 4-6, 8a-i, k, l, 9, 10

9-1 homework book:

p6 E1.4 Qu 1, 3a-k, 4-8

A\*-G homework book:

p4 E1.3 Qu 1-5, 6a-k