



Number

Integers, decimals and symbols

- 1 $\frac{1}{0.01}$ 0.1 $(0.1)^2$ $\frac{1}{1000}$ $(-1)^3$
 2 **a** 35 **b** 0.01285 **c** -270 **d** 40
 3 **a** 4644 **b** 4644 **c** 86 **d** 540
 4 **a** $12.56 \times 3.45 = 0.1256 \times 345$
b $(-8)^2 > -64$ **c** $6 - 12 = 8 - 14$
d $(-7) \times (0) < (-7) \times (-3)$

Addition, subtraction, multiplication and division

- 1 **a** 76.765 **b** 201.646 **c** 91.33 **d** 10.564
 2 **a** 1176 **c** 44.62 **e** 27
b 2166 **d** 0.6572 **f** 63
 3 **a** 1156 **b** 7.5 **c** 5.76

Using fractions

- 1 $\frac{2}{5} = \frac{16}{40} = \frac{30}{75} = \frac{50}{125}$
 2 **a** $5\frac{1}{3}$ **b** $9\frac{7}{13}$
 3 **a** $7\frac{1}{12}$ **b** $7\frac{1}{2}$ **c** $2\frac{9}{20}$
 4 $\frac{5}{56}$ 5 $\frac{1}{2}$ $\frac{7}{12}$ $\frac{2}{3}$ $\frac{3}{4}$ $\frac{7}{8}$

Different types of number

- 1 **a** 7 **b** 49 **c** 2 **d** 6 **e** 6
 2 **a** $3^2 \times 7 \times 11$ **b** 63 **c** 10395
 3 441 4 5 minutes

Listing strategies

- 1 210 seconds 3 1100 students
 2 5 friends 4 15 pairs

The order of operations in calculations

- 1 **a** Ravi has worked out the expression from left to right, instead of using BIDMAS. He should have performed the division and multiplication before the addition.
b Correct answer: 40
 2 **a** 122 **b** -3 **c** 40
 3 **a** 6 **b** 14 **c** 8

Indices

- 1 **a** 10^6 **b** 10^8 **c** 10^6 **d** 10^3
 2 **a** 1 **b** $\frac{1}{9}$ **c** 2 **d** 7
 3 **a** $\frac{3}{2}$ **b** 16 **c** $\frac{1}{6}$ **d** 64
 4 $x = 1.5$

Surds

- 1 **a** 5 **b** 30 **c** 18
 2 $\frac{5\sqrt{3}}{4}$
 3 $(2 + \sqrt{3})(2 - \sqrt{3}) = 4 - 2\sqrt{3} + 2\sqrt{3} - 3 = 1$
 4 $a = 30$
 5 $-\sqrt{5} - 7$
 6 $\frac{1}{\sqrt{2}} + \frac{1}{4} = \frac{1 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} + \frac{1}{4}$ 7 $\frac{2}{1 - \frac{1}{\sqrt{2}}} = \frac{2}{\frac{\sqrt{2} - 1}{\sqrt{2}}}$
 $= \frac{\sqrt{2}}{2} + \frac{1}{4}$ $= \frac{2}{\sqrt{2} - 1}$
 $= \frac{2\sqrt{2}}{4} + \frac{1}{4}$ $= \frac{2\sqrt{2}}{\sqrt{2} - 1}$
 $= \frac{1 + 2\sqrt{2}}{4}$ $= \frac{2\sqrt{2}}{\sqrt{2} - 1} \times \frac{\sqrt{2} + 1}{\sqrt{2} + 1}$
 $= \frac{4 + 2\sqrt{2}}{2 - 1}$
 $= 4 + 2\sqrt{2}$

$$\begin{aligned} 8 \quad \frac{3}{\sqrt{3}} + \sqrt{75} + (\sqrt{2} \times \sqrt{6}) &= \frac{3\sqrt{3}}{3} + \sqrt{3 \times 25} + \sqrt{12} \\ &= \sqrt{3} + 5\sqrt{3} + \sqrt{3 \times 4} \\ &= \sqrt{3} + 5\sqrt{3} + 2\sqrt{3} \\ &= 8\sqrt{3} \end{aligned}$$

Standard form

- 1 **a** 2.55×10^{-3} **b** 1.006×10^{10} **c** 8.9×10^{-8}
 2 **a** 6×10^{14} **c** 2×10^2 **e** 9×10^{-3}
b 1.1×10^6 **d** 1×10^{-2}
 3 2680 4 $a = 3.3$

Converting between fractions and decimals

- 1 **a** 0.55 **b** 0.375
 2 **a** terminating **b** recurring **c** recurring
 3 Let $x = 0.40\dot{2} = 0.402402402\dots$
 $1000x = 402.402402\dots$
 $1000x - x = 402.402402\dots - 0.402402402\dots$
 $999x = 402$
 $x = \frac{402}{999} = \frac{134}{333}$
 Hence $0.40\dot{2} = \frac{134}{333}$

4 $\frac{323}{495}$

Converting between fractions and percentages

- 1 **a** $\frac{7}{20}$ **b** $\frac{7}{100}$ **c** $\frac{19}{25}$ **d** $\frac{1}{8}$
 2 **a** 20% **b** 68% **c** 250% **d** 17.5%
 3 53.33% (to 2 d.p.)
 4 $\frac{66}{90} = \frac{66}{90} = 73.3\%$ (to 1 d.p.)
 Jake did better in chemistry.

Fractions and percentages as operators

- 1 £34.79 4 **a** £14400 5 $\frac{14}{33}$
 2 48 **b** £320
 3 7040

Standard measurement units

- 1 175000cm 2 17
 3 1286 (to nearest whole number)
 4 **a** 1.99×10^{-23} g (to 3 s.f.) **b** 1.99×10^{-26} kg (to 3 s.f.)
 5 7.20×10^{-26} g (to 3 s.f.)

Rounding numbers

- 1 **a** 35 **c** 0 **e** 2
b 101 **d** 0
 2 **a** 34.88 **b** 34.877
 3 **a** 12800 **b** 0.011 **c** 7×10^{-5}
 4 **a** -0.00993 **b** 34.4 **c** 12300

Estimation

- 1 200 3 0.16 5 10.6
 2 **a** 236.2298627 4 5 6 4
b 240
 7 **a** 5×10^{-26} kg
b This will be an underestimate, as the mass of one electron has been rounded down.

Upper and lower bounds

- 1 $2.335 \leq l < 2.345$ kg
 2 **a** **i** 2.472 **ii** 2.451 **b** 2.5 (to 2 s.f.)
 3 34