



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 $\frac{1}{\sqrt{2}} + \frac{1}{4} = \frac{1 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} + \frac{1}{4}$
 $= \frac{\sqrt{2}}{2} + \frac{1}{4}$
 $= \frac{2\sqrt{2}}{4} + \frac{1}{4}$
 $= \frac{1 + 2\sqrt{2}}{4}$
 7 $\frac{2}{1 - \frac{1}{\sqrt{2}}} = \frac{2}{\frac{\sqrt{2} - 1}{\sqrt{2}}}$
 $= \frac{2}{\frac{\sqrt{2} - 1}{\sqrt{2}}}$
 $= \frac{2\sqrt{2}}{\sqrt{2} - 1}$
 $= \frac{2\sqrt{2}}{\sqrt{2} - 1} \times \frac{\sqrt{2} + 1}{\sqrt{2} + 1}$
 $= \frac{4 + 2\sqrt{2}}{2 - 1}$
 $= 4 + 2\sqrt{2}$

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

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^{-28} 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