



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

$$7 \frac{2}{1 - \frac{1}{\sqrt{2}}} = \frac{2}{\frac{\sqrt{2} - 1}{\sqrt{2}}}$$

$$= \frac{2}{\frac{\sqrt{2} - 1}{\sqrt{2}}}$$

$$= \frac{2\sqrt{2}}{\sqrt{2} - 1}$$

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

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

$$= 4 + 2\sqrt{2}$$

$$8 \frac{3}{\sqrt{3}} + \sqrt{75} + (\sqrt{2} \times \sqrt{6}) = \frac{3\sqrt{3}}{3} + \sqrt{3 \times 25} + \sqrt{12}$$

$$= \sqrt{3} + 5\sqrt{3} + \sqrt{3 \times 4}$$

$$= \sqrt{3} + 5\sqrt{3} + 2\sqrt{3}$$

$$= 8\sqrt{3}$$

### Standard form

- 1 a  $2.55 \times 10^{-3}$  b  $1.006 \times 10^{10}$  c  $8.9 \times 10^{-8}$   
 2 a  $6 \times 10^{14}$  c  $2 \times 10^2$  e  $9 \times 10^{-3}$   
 b  $1.1 \times 10^6$  d  $1 \times 10^{-2}$   
 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  $\frac{66}{90} = \frac{66}{90} \times 100 = 73.3\%$  (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  $1.99 \times 10^{-23}$  g (to 3 s.f.) b  $1.99 \times 10^{-26}$  kg (to 3 s.f.)  
 5  $7.20 \times 10^{-26}$  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  $7 \times 10^{-5}$   
 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  $5 \times 10^{-28}$  kg  
 b This will be an underestimate, as the mass of one electron has been rounded down.

### Upper and lower bounds

- 1  $2.335 \leq m < 2.345$  kg  
 2 a i 2.472 ii 2.451  
 b 2.5 (to 2 s.f.), because the upper and lower bounds are equal at 2s.f.  
 3 34