WJEC GCSE **FOUNDATION**

MATHEMATICS AND NUMERACY

Answers

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MADE FOR **WALES**

Section 1: Number

Chapter 1.1 Numbers and rounding

Now try these (p 6)

1. **(a)** one thousand, five hundred and five
   (b) fifteen thousand and twenty-five
   (c) forty-five thousand and twelve
   (d) two hundred and thirty-five thousand, eight hundred and ninety-one
   (e) three million, five hundred and sixty thousand and nine
   (f) two million, one hundred thousand and fifty
2. **(a)** 3501
   (b) 7019
   (c) 40 891
   (d) 105 210
   (e) 5 050 010
3. **(a)** 168
   (b) one hundred and sixty-eight

Now try these (p 7)

1. **(a)** –4 **(e)** –3
   (b) –10 **(f)** –6
   (c) 6 **(g)** –17
   (d) –6 **(h)** –4
2. 35.2 °C – (–23.3 °C) = 58.5 °C
3. **(a)** –27 **(d)** –48
   (b) –42 **(e)** –54
   (c) –21 **(f)** 96
4. **(a)** 7 **(d)** 6
   (b) –9 **(e)** –32
   (c) –7 **(f)** 8

Now try these (p 8–9)

1. **(a)** 1 **(c)** 3
   (b) 1 **(d)** 14
2. **(a)** **(i)** 1250 **(ii)** 1300
   (b) **(i)** 180 **(ii)** 200
   (c) **(i)** 150 **(ii)** 100
   (d) **(i)** 10 **(ii)** 0
3. **(a)** 372 000
   (b) 370 000
   (c) 400 000
4. **(a)** Monday: 460
   Tuesday: 510
   Wednesday: 610
   Thursday: 770
   Friday: 900
   Saturday: 1040
   Sunday: 1490
   (b) Monday: 500
   Tuesday: 500

Wednesday: 600

Thursday: 800

Friday: 900

Saturday: 1000

Sunday: 1500

Now try these (p 10)

1. **(a)** 0.6 **(e)** 1.64

(b) 0.03 **(f)** 664.3

(c) 0.786 **(g)** 23.755

(d) 10.78 **(h)** 63.24

2. **(a)** incorrect, 0.000

(b) correct

(c) correct

(d) correct

(e) incorrect, 0.005

3. **(a)** 10 **(e)** 1

(b) 100 **(f)** 34.8

(c) 0.79 **(g)** 16 800

(d) 12.8 **(h)** 77

4. **(a)** 0.005 **(e)** 0.1

(b) 0.0066 **(f)** 0.35

(c) 0.09 **(g)** 0.988

(d) 0.001 **(h)** 0.0011

Now try these (p 11)

1. **(a)** $0.4 \times 46 = 18.4$ = maximum 18 cattle

(b) $0.8 \times 46 = 36.8$ = maximum 36 cattle

2. **(a)** $1000 \div 30 = 33.33333... \approx 34$ (rounded up to account for the leftover apples)

(b) $1000 \div 60 = 16.66666... \approx 17$ (rounded up to account for the leftover apples)

Now try these (p 12)

1. **(a)** $27 \times 19 \approx 30 \times 20 = 600$

(b) $102 \times 17 \approx 100 \times 20 = 2000$

(c) $45 \times 55 \approx 50 \times 60 = 3000$

(d) $72 \times 89 \approx 70 \times 90 = 6300$

(e) $13 \times 909 \approx 10 \times 900 = 9000$

(f) $13 \times 999 \approx 10 \times 1000 = 10\,000$

2. **(a)** $3.45 \times 7.60 \approx 3 \times 8 = 24$

(b) $45 \times 89 \approx 50 \times 90 = 4500$

(c) $123 \times 117 \approx 120 \times 120 = 14\,400$

(d) $23.4 \div 4.8 \approx 20 \div 5 = 4$

(e) $83.9 \div 3.99 \approx 84 \div 4.0 = 21$

(f) $75.3 \div 4.96 \approx 75 \div 5.0 = 15$

3. $\approx \frac{2400}{60}$, as the numbers have been rounded the least.

4. **(a)** $\sqrt{26} \approx \sqrt{25} = 5$

(b) $6.3^2 \approx 6^2 = 36$

(c) $\sqrt{148} \approx \sqrt{144} = 12$

(d) $3.5 \div 7.1 \approx 3.5 \div 7 = 0.5$

(e) $\frac{20}{2.4+1.4} \approx \frac{20}{2.5+1.5} = \frac{20}{4} = 5$

(f) $\frac{\sqrt{48}}{6.5} \approx \frac{\sqrt{49}}{7} = \frac{7}{7} = 1$

Now try these (p 13)

1. **(a)** $3.45 + 2.78 + 0.09 \approx 3 + 3 + 0$
$= 6$ **Answer B**

(b) $12.56 - 1.87 - 0.45 \approx 13 - 2 - 0.5$
$= 10.5$ **Answer C**

(c) $120 \div 0.45 \approx 100 \div 0.5$
$= 200$ **Answer B**
Note: student may also use
$120 \div 0.5 = 240$ to arrive at the same answer

(d) $0.01 \times 0.15 \times 109 \approx 0.01 \times 0.2 \times 100$
$= 0.2$ **Answer B**

(e) $(0.12 + 300) \times 0.53 \approx (0 + 300) \times 0.53$
$= 159$ **Answer A**
Note: student may also use
$300 \times 0.5 = 150$ to arrive at the same answer

(f) $6.07 + (3.67 \times 0.1) \approx 6 + (4 \times 0.1)$
$= 6.4 \approx 6$ **Answer A**

(g) $20.75 \div 6.98 \div 2.1 \approx 21 \div 7 \div 2 = 3 \div 2$
$= 1.5$ **Answer A**

(h) $0.01 \times 145 \times 35 \approx 0.01 \times 100 \times 40$
$= 40$ **Answer A**

(i) $6.5 \times 0.3 \times 0.01 \approx 7 \times 0.3 \times 0.01 = 0.021$
≈ 0.02 **Answer B**

(j) $65 \div (0.15 \times 1050) \approx 70 \div (0.2 \times 1000) =$
$70 \div 20 = 3.5 \approx 4$ **Answer C**

2. $(301 + 479) \times 8 \approx (300 + 500) \times 8 = 6400$
Bryn is incorrect by a factor of 10 so has probably multiplied by 80 instead of 8.

Chapter 1.2 Properties of numbers

Now try these (p 14)

1. **(a)** 49 **(d)** 84

(b) 68 **(e)** 5

(c) 9 **(f)** 16

2. 5

3. **(a)** 62.50 **(b)** 166.50

(c) 1.78

Now try these (p 17)

1. **(a)** $56 = 2 \times 2 \times 2 \times 7 = 2^3 \times 7$

(b) $160 = 2 \times 2 \times 2 \times 2 \times 2 \times 5 = 2^5 \times 5$

(c) $120 = 2 \times 2 \times 2 \times 3 \times 5 = 2^3 \times 3 \times 5$

(d) $1000 = 2 \times 2 \times 2 \times 5 \times 5 \times 5 = 2^3 \times 5^3$

2. $850 = 2 \times 5 \times 5 \times 17 = 2 \times 5^2 \times 17$

3. $122 = 2 \times 61$, $244 = 2 \times 2 \times 61 = 2^2 \times 61$
Since 244 is double 122, their expressions as prime factors are the same, except 244 has an extra 2

Now try these (p 18)

1. **(a)** $900 = 2 \times 2 \times 3 \times 3 \times 5 \times 5 = 2^2 \times 3^2 \times 5^2$

(b) Yes, since when you multiply square numbers together, the answer will always be a square number.

(c) $\sqrt{900} = \sqrt{2^2 \times 3^2 \times 5^2} = 2 \times 3 \times 5 = 30$

2. **(a)** $480 = 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 5$
$= 2^5 \times 3 \times 5$

(b) 480 is not a square number as its prime factors are not in even powers.

3. **(a)** No, one of the prime factors does not have an even power in index form.

(b) Yes

(c) Yes

(d) No, one of the prime factors does not have an even power in index form.

4. 2 because $2^3 \times 2 = 2^4$ and then both terms in the number will have even powers and are

therefore square numbers.

5. 3 because this is the smallest of the prime factors.

6. $\sqrt{3\times3\times5\times5\times7\times7} = \sqrt{3^2\times5^2\times7^2}$
$= 3\times5\times7 = 105$

Now try these (p 20)

1. **(a)** 1, 2, 4, 8, 16, 32

   (b) 1, 2, 4, 8, 10, 20, 40, 80

   (c) 8

2. Highest common factor = 5, lowest common multiple = 140

3. **(a)** $45 = 3^2\times5$

   (b) $78 = 2\times3\times13$

   (c) LCM $= 2\times3\times3\times5\times13 = 1170$

   (d) $90 = 2\times3^2\times5$, $156 = 78 = 2^2\times3\times13$
   LCM $= 2\times2\times3\times3\times5\times13 = 2340$
   The numbers have doubled, and so has their lowest common multiple.

4. **(a)** 29, 37 **(c)** 45

   (b) 45 **(d)** 26

5. Start with the list of square numbers whose doubles are between 1 and 100 to account for "giving a square number when halved":
1, 4, 9, 16, 25, 36, 49
If half a number has a factor of 7, so does the original number, so the square number we need is 49 and therefore the number that meets all of the criteria is **98**

Now try these (p 21)

1. **(a)** $\frac{1}{2}$ **(d)** 1000

   (b) 2 **(e)** 2

   (c) 4 **(f)** 8

2. $0.5^2 = 0.25 = \frac{1}{4}$ so $\frac{1}{0.5^2}$ = the reciprocal of $\frac{1}{4} = 4$

3. The reciprocal of $3.5 = \frac{1}{3.5} = \frac{2}{7}$

4. The reciprocal of $2\frac{1}{2}$ = the reciprocal of $\frac{5}{2}$
$= \frac{2}{5}$

5. The reciprocal of $100 = \frac{1}{100} = 0.01$

Chapter 1.3 Indices

Now try these (p 23)

1. **(a)** 2^6 **(c)** 17^3

   (b) 5^5 **(d)** 3^6

2. **(a)** 2^6 **(f)** 7^{15}

   (b) 7^2 **(g)** 8^5

   (c) 4^5 **(h)** 2^{24}

   (d) 7^7 **(i)** 5^{25}

   (e) 2^6 **(j)** 6^{24}

3. **(a)** x^9 **(f)** y^8

   (b) x^3 **(g)** x^8

   (c) c^6 **(h)** a^6

   (d) g^9 **(i)** q^4

   (e) p^4 **(j)** m^{-7}

4. **(a)** $a^1 = a$ **(b)** y^5

5. **(a)** $8\times4 = 32$ **(d)** $3^3 = 27$

   (b) $4^2 = 16$ **(e)** $18^2 = 324$

   (c) $4^3 = 48$ **(f)** $2^6 = 64$

6. $7^8\times7^{28} = 7^{36}$
$7^{36}\div7^6 = 7^{30}$

7. $3^{17}\times3^2 = 3^{19}$
$3^{19}\div3^5 = 3^{14}$

8. $5^{27} \div 5^{16} = 5^{11}$
$5^{17} \div 5^{11} = 5^{6}$

9. **(a)** $3^2 = 9$ and $2^2 = 4$, so
$3^2 \times (2^2)^2 = 9 \times 4^2 = 9 \times 16 = 144$

(b) $5^{30} \times 5^4 = 5^{34}$
$5^{34} \div 5^{32} = 5^2 = 25$

(c) $4^{10} \times 4^{10} = 4^{20}$
$4^{20} \div 4^{18} = 4^2 = 16$

(d) $(3^2)^3 = 9^3 = 729$

10. $9 = 3^2$ and $27 = 3^3$, so
$(9^3)^2 \div 27 = ((3^2)^3)^2 \div 3^3 = 3^{12} \div 3^3 = 3^9$

11. $4 = 2^2$, so
$(4^5)^3 \div 4^7 = ((2^2)^5)^3 \div (2^2)^7 = 2^{30} \div 2^{14} = 2^{16}$

12. $(x^5 \times x^3)^2 = (x^8)^2 = x^{16}$, so
$(x^5 \times x^3)^2 \div x^{10} = x^{16} \div x^{10} = x^6$

13. $(x^9 \div x^4)^2 = (x^5)^2 = x^{10}$, so
$(x^9 \div x^4)^2 \div x^{10} = x^{10} \div x^{10} = x^0 = 1$

Chapter 1.4 Fractions, decimals, percentages and ratios

Now try these (pp 25–26)

1. **(a)** $\frac{1}{2}$ and $\frac{4}{8}$

(b) $\frac{24}{36}$ and $\frac{2}{3}$

(c) $\frac{3}{8}$ and $\frac{9}{24}$

2. **(a)** $\frac{4}{5}$ **(d)** $\frac{31}{35}$

(b) $\frac{2}{7}$ **(e)** $\frac{10}{11}$

(c) $\frac{5}{7}$ **(f)** $\frac{36}{107}$

3. **(a)** $\frac{3}{8} = \frac{\boxed{15}}{40} = \frac{\boxed{12}}{32} = \frac{9}{\boxed{24}}$

(b) $\frac{20}{30} = \frac{\boxed{10}}{15} = \frac{4}{\boxed{6}} = \frac{2}{\boxed{3}}$

(c) $\frac{15}{120} = \frac{\boxed{5}}{40} = \frac{3}{\boxed{24}} = \frac{30}{\boxed{240}}$

4. **(a)** $\frac{0.5}{2} = \frac{5}{20} = \frac{1}{4}$

(b) $\frac{44.5}{50} = \frac{445}{500} = \frac{89}{100}$

(c) $\frac{32.5}{40} = \frac{325}{400} = \frac{13}{16}$

Now try these (p 27)

1. **(a)** $\frac{18}{5}$

(b) $1\frac{5}{3}$

(c) $\frac{1}{4}$

2. **(a)** $4\frac{4}{15}$ **(c)** $6\frac{1}{2}$

(b) $10\frac{1}{3}$ **(d)** $2\frac{13}{16}$

3. **(a)** $\frac{8}{3}$ **(c)** $\frac{47}{6}$

(b) $\frac{23}{5}$ **(d)** $\frac{139}{11}$

4. $\frac{21}{2}$

5. $5\frac{3}{8}$

Now try these (p 28)

1. Ash's score on the Welsh test is $\frac{3}{4}$, which is equivalent to $\frac{15}{20}$ which is less than $\frac{16}{20}$, so Ash got the higher score in the French test.

2. (a) $\frac{5}{16}+\frac{7}{16}=\frac{12}{16}=\frac{3}{4}$

(b) $\frac{2}{5}+\frac{1}{3}=\frac{6}{15}+\frac{5}{15}=\frac{11}{15}$

(c) $1\frac{3}{4}+2\frac{3}{5}=3+\frac{3}{4}+\frac{3}{5}=3+\frac{15}{20}+\frac{12}{20}$

$=3+\frac{27}{20}=3+1\frac{7}{20}=4\frac{7}{20}$

(d) $\frac{2}{5}-\frac{1}{3}=\frac{6}{15}-\frac{5}{15}=\frac{1}{15}$

(e) $\frac{5}{7}-\frac{3}{8}=\frac{40}{56}-\frac{21}{56}=\frac{19}{56}$

(f) $2\frac{3}{4}-1\frac{1}{3}=1+\frac{3}{4}-\frac{1}{3}=1+\frac{9}{12}-\frac{4}{12}=1\frac{5}{12}$

Now try these (pp 29–30)

1. (a) $\frac{27}{40}$

(b) $16\div\frac{4}{5}=16\times\frac{5}{4}=\frac{16\times5}{4}=\frac{80}{4}=20$

(c) $24\times\frac{8}{15}=\frac{24\times8}{15}=\frac{192}{15}=\frac{64}{5}=12\frac{4}{5}$

(d) $\frac{4}{5}\div8=\frac{4}{5\times8}=\frac{4}{40}=\frac{1}{10}$

(e) $\frac{3}{25}\div3^2=\frac{3}{25}\div9=\frac{3}{25\times9}=\frac{3}{225}=\frac{1}{75}$

(f) $\frac{1}{2}\times\frac{2}{3}\times\frac{3}{4}=\frac{1\times2\times3}{2\times3\times4}=\frac{6}{24}=\frac{1}{4}$

2. $1-\left(\frac{1}{3}\right)^2=1-\frac{1}{9}=\frac{8}{9}$

3. 477×3

(Sam's number is) 1431

4. $\frac{2}{5}\times\frac{7}{4}\times\frac{3}{13}=\frac{2\times7\times3}{5\times4\times13}=\frac{42}{260}=\frac{21}{130}$

5. $\left(\frac{2}{6}\times\frac{3}{6}\right)\div3=\frac{6}{36}\div3=\frac{2}{36}=\frac{1}{18}$

Now try these (p 30)

1. (a) $\frac{1}{8}$ of $240=30$

(b) $\frac{2}{9}$ of £108 = £24

(c) $\frac{4}{10}$ of 1010 m = 404 m

(d) $\frac{13}{20}$ of 2400 ml = 1560 ml

(e) $\frac{3}{5}$ of 145 g = 87 g

(f) $\frac{7}{8}$ of 32 km = 28 km

2. $\frac{3}{8}$ of 1 km = $\frac{3}{8}$ of 1000 m

= 375 m

3. $\frac{3}{4}$ of 26.2 miles = 19.65 miles

Now try these (pp 32–33)

1. (a) 20% of 240 = (240 ÷ 100) × 20 = 48

(b) 15% of 190 = (190 ÷ 100) × 15 = 28.5

(c) 72% of 55 = (55 ÷ 100) × 72 = 39.6

(d) 32.5% of 150 = (150 ÷ 100) × 32.5

= 48.75

2. (a) $\frac{125\text{ g}}{12\text{ kg}}\times100=\frac{125\text{ g}}{12\,000\text{ g}}\times100$

$=\frac{125}{12\,000}\times100=\frac{1.041\dot{6}}{100}\times100$

= 1.04% (to 2 d.p.)

(b) $\frac{14}{60}\times100=\frac{23.\dot{3}}{100}\times100=23.\dot{3}\%$

(c) $\frac{35\text{ minutes}}{2\text{ hours }20\text{ minutes}}=\frac{35\text{ minutes}}{140\text{ minutes}}$

$=\frac{1}{4}=25\%$

3. 100% – 20% = 80%

80% of £450 = £360 left to pay.

£360 ÷ 12 months = £30 each month.

Now try these (p 35)

1. $\frac{440-400}{400}\times100=\frac{40}{400}\times100=10\%$ increase

2. $\frac{1100000-600000}{600000}\times 100=\frac{500000}{600000}\times 100$

$=\frac{83.\dot{3}}{100}\times 100=83.3\%$ increase (1 d.p.)

3. $\frac{25000-8000}{25000}\times 100=\frac{17000}{25000}\times 100$

$=\frac{68}{100}\times 100=68\%$ decrease

4. $\frac{8000-4500}{4500}\times 100=\frac{3500}{4500}\times 100=\frac{77.\dot{7}}{100}\times 100$

$=77.8\%$ increase (1 d.p.)

5.

Cost before	Cost after	% change
£2	£3	50% increase
£12.50	£17.45	39.6% increase
£109	£117	7.3% increase (to 1 d.p.)
£10 000	£12 075	20.75% increase
£750 000	£1.2 million	60% increase

6. $\frac{1050-1020}{1050}=\frac{30}{1050}=\frac{1}{35}$

7. $\frac{36500-10090}{36500}=\frac{26410}{36500}=\frac{2641}{3650}$

8. **(a)** 10% of 8000 = 800, so 8800 after 2023
10% of 8800 = 880, so 9680 after 2024
10% of 9680 = 968, so 10 648 after 2025

(b) $\frac{10\,468-8000}{8000}=\frac{2468}{8000}=\frac{617}{2000}$

9. **(a)** $\frac{68-52}{52}=\frac{16}{52}=\frac{4}{13}$

(a) $\frac{83-61}{61}=\frac{22}{61}$

Now try these (p 37)

1. **(a)** 125 cm × 1.17 = 146.25 cm

(b) £55 × 1.06 = £58.30

(c) $400 × 1.085 = $434

(d) £15 000 × 1.046 = £15 690

(e) £15 000 × 1.0578 = £15 867

(f) 12.5 km × 1.821 = 22.7625 km

2. **(a)** 25 m × 0.94 = 23.5 m

(b) £340 × 0.91 = £309.40

(c) 30 m × 0.87 = 26.1 m

(d) £34 000 × 0.855 = £29 070

(e) 5 km × 0.903 = 4.515 km

(f) 1750 m × 0.875 = 1531.25 m

3. £27 000 × 0.83 = £22 410

4. 145 000 × 1.095 = 158 775

5. £1 200 000 × 0.07 = £84 000

6. £150 × 1.1 = £165
£165 × 0.95 = £156.75

7. $450\times\frac{4}{3}=\frac{450\times 4}{3}=\frac{1800}{3}=600$ ml

Now try these (p 38)

1. A: 400×0.92^3

2. **(a)** £30 000 × 1.048^2 = £32 949.12

(b) £30 000 × 1.048^4 – £30 000
= £32 949.12

3. **(a)** £2000 × 1.057^3 = £2361.86

(b) £2000 × 1.057^5 = £2638.79

4. 2 m × 1.2^3 = 3.456 m^2

5. **(a)** £27 000 × 0.78 = £21 060

(b) £21 060 × 0.85^4 = £10 993.45
£27 000 – £10 993.45 = £16 006.55

Now try these (p 40)

1. 0.13, 0.225, 0.25, 0.3, 0.33
2. 0.03, 0.3, 0.303, 0.33, 0.333
3. $\frac{7}{10}$, 0.7001, 70.1%, 0.71, $\frac{71}{10}$
4. $\frac{2}{3} = 66.\dot{6}\%$, $\frac{3}{4} = 75\%$, $\frac{7}{8} = 87.5\%$, $\frac{1}{2} = 50\%$, $\frac{7}{12} = 58.\dot{3}\%$

   So the fractions in ascending order are:

   $\frac{1}{2}, \frac{7}{12}, \frac{2}{3}, \frac{3}{4}, \frac{7}{8}$
5. 89%, $\frac{3}{4}$, 70%, $\frac{2}{3}$, 0.65

Now try these (pp 41–42)

1. **(a)** 3 : 4 **(e)** 1 : 4
   (b) 16 : 3 **(f)** 2 : 5
   (c) 4 : 5 : 9 **(g)** 10 : 1
   (d) 1 : 10 **(h)** 4 : 5
2. **(a)** 4 : 1 **(d)** 1 : 5
   (b) 5 : 12 **(e)** 5 : 2
   (c) 3 : 1

Now try these (p 43)

1. £8 and £10
2. **(a)** 1500 ml = 1.5 l
   (b) $33.\dot{3}$ ml
3. 85 : 110 = 17 : 22
4. 400 : 1100 = 4 : 11 = 1 : 2.75
5. **(a)** If 10 counters is the difference between the two colours, this is one part, and there are 5 parts in total so the number of counters is 5 × 10 = 50 counters.
   (b) 30 : 20 :10 = 3 : 2 : 1

Chapter 1.5 Calculations

Now try these (p 45)

1. **(a)** 3 **(c)** 1
   (b) 6 **(d)** $5\frac{1}{2}$ or $\frac{11}{2}$
2. **(a)** 9 **(b)** 6

Now try these (p 46)

1. **(a)** 6 **(e)** 125
   (b) 12 **(f)** 2
   (c) 5 **(g)** 12
   (d) 20 **(h)** 35
2. **(a)** 5.75 **(c)** 10 080
   (b) 5001.142805 **(d)** 5.21

Now try these (p 48)

1. **(a)** 782 **(g)** 477.66
   (b) 2.9 **(h)** 10.2
   (c) 19.16 **(i)** 1697
   (d) 33 **(j)** 0.07
   (e) 787 **(k)** 0.369
   (f) 16.74 **(l)** 3.61

Now try these (p 51)

1. **(a)** 45 000 **(g)** 290
   (b) 1000 **(h)** 52 000
   (c) 5313 **(i)** 11.76
   (d) 15 228 **(j)** 0.078
   (e) 7303 **(k)** 0.006
   (f) 24.29 **(l)** 0.3654

2. **(a)** 10

(b) 4

(c) 500

(d) 500

(e) 8

(f) 7.5

(g) $22\frac{1}{3} = 22.\dot{3}$

(h) $14\frac{2}{9} = 14.\dot{2}$

(i) 110

(j) 124

(k) 208.76

(l) 210.03 (to 2 d.p.)

Chapter 1.6 Accuracy in rounding

Now try these (p 52)

1. **(a)** No

(b) 150.5 cm

(c) Yes, as the smallest possible width of the gap is 152.5 cm and the greatest possible width of the bookcase is 150.5 cm

2. **(a)** 54.5 mm

(b) The screw *could* fit, as the greatest possible depth of the hole is 5.5 cm and the shortest possible length of the screw is 5.45 mm.

(c) No, as the greatest possible length of the first screw is 55.5 mm, which is shorter than 56 mm.

Now try these (p 53)

1. **(a)** length: 30.5 m, width: 14.05 m

(b) length: 5.45 m, width: 2.45 m

2. **(a)** largest: 5.55 cm, smallest: 5.45 cm

(b) 111.5 ÷ 5.45 = 20.458
so, the maximum is 20

(c) The shelf could be shorter, e.g. 110.5 cm and the cubes could be wider, e.g. 5.55 cm

This would mean that only 19 blocks would fit.

Chapter 1.7 Presenting information

Now try these (p 56)

1.

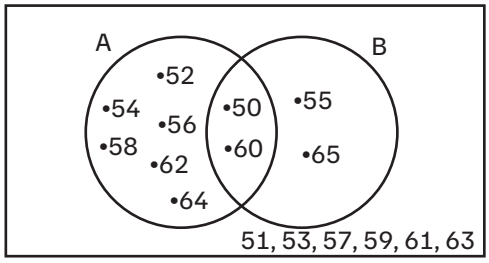
	Walk	Cycle	Bus	Total
Year 10	40	10	30	80
Year 11	20	35	65	120
Total	60	45	95	200

2. **(a)** highest: 15 points
lowest: 7.5 points

(b) 46% (to the nearest %)

Now try these (p 59)

1.



2. **(a)** 3 **(b)** 5 **(c)** 19 **(d)** 12

Now try these (pp 61–63)

1. **(a)** Aqsha **(b)** 21 hours **(c)** 5 hours

2. Tuesday 13th, Wednesday 14th or Thursday 15th

3. 12th or 15th August

4.

	Art	Music	Drama	Total
Year 10	72	63	38	173
Year 11	62	84	41	187
Total	134	147	79	360

5. **(a)**

	Music	Sport	Gaming	Total
Glasses	68	69	97	234
No glasses	54	79	63	196
Total	122	148	160	430

(b) More students who wear glasses prefer gaming than those who don't.
(Accept any other suitable answer)

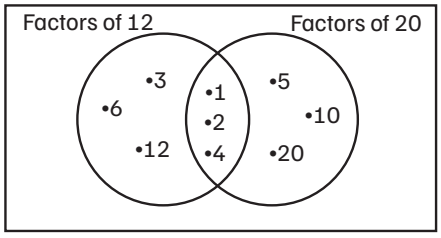
6. **(a)** 160 **(b)** 260 **(c)** 80 **(d)** 140

7.

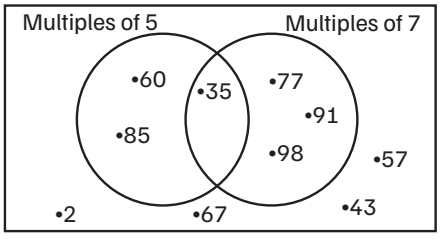
Sport	Number of children
Football	⊕⊕
Rugby	⊕◖
Basketball	⊕◿
Tennis	◓

Key: ⊕ = 20 children

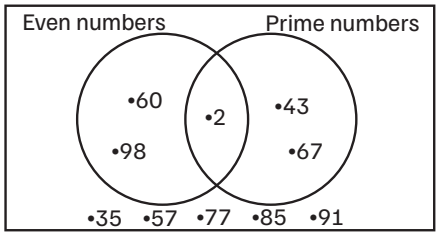
8.



9. **(a)**

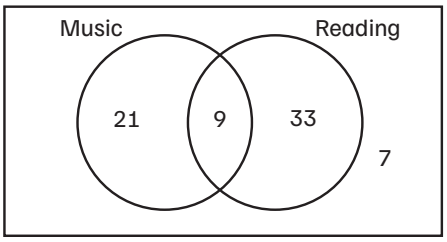


(b)



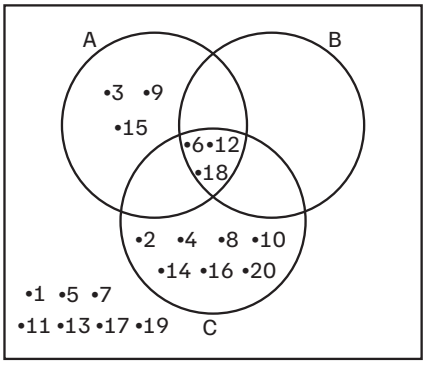
10. **(a)** 34 **(b)** 60 **(c)** 6 **(d)** 9

11. **(a)**



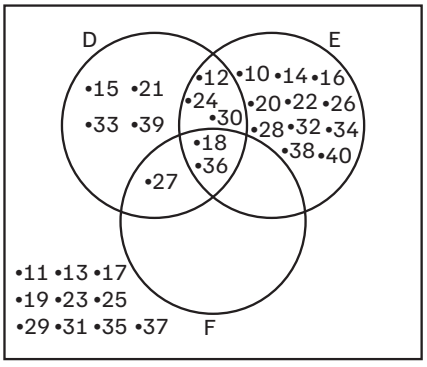
(b) 33 – 21 = 12

12. **(a)**



(b) Every even multiple of 3 is also a multiple of 6, and every multiple of 6 is also an even multiple of 3

13. **(a)**



(b) All multiples of 9 have a digit sum of 9, and all multiples of 9 are also multiples of 3

14. **(a)** 11:50

(b) 2 hours 30 minutes

15. Either Wednesday 4th–Friday 6th February or Wednesday 11th–Friday 13th February.

Chapter 1.8 Money

Now try these (p 65)

1. £12.80

2. £488.40

3. £578.50 – (13 × 40) = £58.50
   £58.50 ÷ (13 × 1.5) = 3 hours of overtime

Now try these (p 67)

1. **(a)** (£37 000 – £10 000) × 0.22 = £5940

   (b) £37 000 – £5940 = £31 060

   (c) (£37 000 – £10 000) × 0.08 = £2160
   Total deductions = £5940 + £2160
   = £8100
   Salary = £37 000 – £8100
   = £28 900

2. **(a)** (£62 000 – £49 000) × 0.42 = £5460

   (b) Amount paid at basic rate:
   £12 659.38 – £5460 = £7199.38

   £7199.38 is 20% of income taxed at basic rate, so 100% is 5 × £7199.38 = £35 996.90

   So, personal allowance
   = £49 000 – £35 996.90 = £13 003.10

   (c) Sosha's salary = £64 500

   Amount paid at basic rate:
   £7199.38

   Amount paid at higher rate:
   (£64 500 – £49 000) × 0.42 = £6510

   Total paid = £7199.38 + £6510
   = £13 709.38

3. **(a)** £56 000 – £12 000 = £44 000
   £44 000 × 0.07 = £3080

   (b) £56 000 – £10 000 – £3080 = £42 920

   (c) New income = £61 000

   0% is paid on the first £12 000

   7% is paid on the next

   £59 000 – £12 000 = £47 000

   So £47 000 × 0.07 = £3290

   2% is paid on the next

   £61 000 – £59 000 = £2000

   So £2000 × 0.02 = £400

   So Zichen pays £3290 + £400 = £3690 in National Insurance, which is £3690 – £3080 = £510 more than the previous year.

Now try these (p 69)

1. Product A: 70p per 100 ml
   Product B: 64p per 100 ml
   Product C: 67p per 100 ml
   So Product B is the best buy.

2. Regular can: 50p per 100 g
   Snack can: 43.333p per 100 g
   Family can: 43.373p per 100 g
   So the snack can is the best value for money.

3. Small: £2.75 per 100 ml
   Medium: £2.35 per 100 ml
   Large: £1.58 per 100 ml
   So the large size is the best buy.

4. Sample bar: £4.50 per 100 g
   Snack bar: £4.00 per 100 g
   Regular bar: £2.53 per 100 g
   Sharer bar: £2.64 per 100 g
   Celebration bar: £2.00 per 100 g
   So the celebration bar is the best buy.

Now try these (p 71)

1. £2700 + £450 = £3150
   £3150 + £208 = £3358
   £3358 – £890 – £105 – £206 – £108 – £190 = £1859

Now try these (pp 73–74)

1. $710 \times £0.22 = £156.20$

$£156.20 + £55 = £211.20$

$£211.20 \times 1.05 = £221.76$

2. **(a)** £400 **(c)** 1600 kWh

(b) £352

3. $(£7.50 \times 4) + (£9 \times 8) = £102$

4. **(a)** 201 units

(b) £413.26

(c) $£1.508 \times 201 = £303.11$

(d) $£14 + £65 + £413.26 + £303.11$
$= £795.37$

Now try these (p 75)

1. $£2000 + (5.6\% \text{ of } 2000) \times 3 = £2336$

2. $£9780 \times 1.045^8 = £13\,908.14$

3. $£25\,000 \times 1.078^{20} = £112\,283.31$

So interest earned $= £112\,283.31 - £25\,000$
$= £87\,283.31$

4. After 3 years, Ahmed owes

$£6594.63 - £2500 = £4094.63$

$£4094.63 \times 1.032^2 = £4360.88$

Revision round up (p 79)

1. **(a)** 257 **(d)** $8 \times 3 - 5 = 19$

(b) 27 **(e)** **(i)** 21

(c) £356 **(ii)** 288

2. 15% of £600 = £90

$\frac{1}{4}$ of £380 = £95

$\frac{1}{4}$ of £380 is the larger amount.

3. **(a)** 0.24 **(c)** 49

(b) 8.84 **(d)** $\frac{9}{24} = \frac{3}{8}$

4. **(a)** **(i)** −12°C, −4°C, 0°C, 2°C

(ii) Thursday

(iii) Wednesday

(b) **(i)** 664 000

(ii) 660 000

5. Lowest common multiple of $2 \times 5 \times 7 \times 8$ or 560 seen or implied

Table completed correctly, or sight of correct number of boxes in working, e.g.

Knives	40 boxes
Forks	35 boxes
Spoons	56 boxes

6. **(a)** $4.19455... \approx 4.2$ to 2 significant figures.

(b) $£2.925 \approx £2.93$ to 2 decimal places

7. $£20\,000 \times 1.025^3 = £21\,537.81$

8. **(a)** $125 \times 2 \times 30 = 7.5$ kg of food

$7.5 = \frac{1}{2}$ of 15 kg so $\frac{1}{2}$ of £48 = £24.

(b) From the working above, the dog will eat the entire bag of dog food in 60 days.

Section 2: Algebra

Chapter 2.1 Introduction to algebraic expressions

Now try these (p 83)

1. **(a)** Expression
   (b) Equation
   (c) Equation
   (d) Expression
   (e) Expression
   (f) Formula

Now try these (p 85)

1. **(a)** $a + 2$
   (b) $a - 3$
   (c) $b - 5$
2. **(a)** $\frac{x}{y}$
   (b) $\frac{x - 5}{y - 30}$

Now try these (p 86)

1. **(a)** 28 **(c)** 46
   (b) 0.25 **(d)** 28
2. −14
3. **(a)** 1 **(d)** −4
   (b) 2 **(e)** 1
   (c) 4 **(f)** −0.25
4. 2
5. **(a)** −1 **(e)** −15
   (b) 108 **(f)** 3
   (c) 1 **(g)** 5
   (d) 2 **(h)** 0
6. **(a)** 4 **(c)** 0
   (b) −6 **(d)** 1
7. −9 + 12.8 = 3.8

Now try these (p 88)

1. **(a)** $3x + 15$ **(f)** $-x + y$
   (b) $8x + 12$ **(g)** $-56x - 8y$
   (c) $4x + 28$ **(h)** $-8x + 4y$
   (d) $3x + 12y - 15$ **(i)** $3x^2 - 18x$
   (e) $10a + 5b - 5c$ **(j)** $-2x + 6$
2. **(a)** $8x - 16y - 3x + 12y$
   $5x - 4y$
   (b) $15x + 10y - x + 7y$
   $14x + 17y$
   (c) $28x + 40y - 2x - 3y$
   $26x + 37y$
3. $7x^2 + 4x - 6x^2 + 15x - 6$
   $x^2 + 19x - 6$

Now try these (p 90)

1. **(a)** $2(2a + 3b)$ **(e)** $6(3a - 2b)$
   (b) $4(a + 3b)$ **(f)** $x(y - x)$
   (c) $2(4a + 3b)$ **(g)** $6x(2x - 1)$
   (d) $2(6a + 4b + 1)$ **(h)** $8x^2y(y + 3)$

2. (a) $2(3a + b - 6c)$

(b) $5(9a + 5b - 2c)$

(c) $4b(3a + 1)$

(d) $ab(a - 1)$

(e) $3xy(5x - 4)$

(f) $14x^2y(y + 5)$

(g) $z(x^3y + 1)$

(h) $5x^2(3x + 1)$

Now try these (p 92)

1. (a) x^7
   (b) a
   (c) $4x^4$
   (d) $12x^{10}$
   (e) y^4
   (f) $3x^3$
   (g) b^6
   (h) $16c^8$

2. (a) $4x$
   (b) $\frac{3}{z}$
   (c) $6y$
   (d) $4x$
   (e) $3xy^2$
   (f) $3z^2$
   (g) $\frac{7c}{2ad}$
   (h) $\frac{5y^2z}{x}$

Now try these (p 93)

1. (a) $l = \frac{A}{w}$
   (b) $w = \frac{A}{l}$

2. $r^2 = \frac{A}{\pi}$

   $r = \sqrt{\frac{A}{\pi}}$

3. (a) $x = \frac{y - 2}{3}$

(b) $10x^3 = 5y - 5$

$x^3 = \frac{y - 1}{2}$

$x = \sqrt[3]{\frac{y - 1}{2}}$

(c) $2y - 3 = x$

(d) $7y - 7 = 21x$

$x = \frac{y - 1}{3}$

(e) $10y - 5 = x^2$

$x = \sqrt{10y - 5}$

(f) $5y = 15x^2 + 105$

$15x^2 = 5y - 105$

$x = \sqrt{\frac{1}{3}y - 7}$

Chapter 2.2 Solving equations and inequalities

Now try these (p 96)

1. (a) $x = 14$
   (b) $x = 10$
   (c) $x = 4$
   (d) $x = 4$
   (e) $x = -4$
   (f) $x = 3.5$
   (g) $x = 35$
   (h) $x = 21$
   (i) $x = 0.5$
   (j) $x = 0.6$
   (k) $x = 5.5$
   (l) $x = 0.5$

2. (a) $x = \frac{5}{3}$
   (b) $x = 4$
   (c) $x = 15$
   (d) $x = 40$
   (e) $x = 31$
   (f) $x = 6$
   (g) $x = \frac{5}{3}$
   (h) $x = 7$

3. let x = width and $(x + 5)$ = length

perimeter = $2x + 2(x + 5) = 38$

$4x + 10 = 38$

$4x = 28$

$x = 7$ m

So, width = 7 m and length = 12 m

Now try these (pp 97–98)

1. **(a)** $3x - 6 = 15$

$3x = 21$

$x = 7$

(b) $5x + 30 = 35$

$5x = 5$

$x = 1$

(c) $5x + 35 = 35$

$5x = 0$

$x = 0$

(d) $9x - 12 = 15$

$9x = 27$

$x = 3$

(e) $15x - 5 = 35$

$15x = 40$

$x = \frac{8}{3}$

(f) $28x + 35 = -35$

$28x = -70$

$x = -\frac{5}{2}$

2. $5x - 15 - 3x - 3 = 0$

$2x = 17$

$x = \frac{17}{2}$

3. $2x - 8 - \frac{7}{2}x - 21 = 5$

$-\frac{3}{2}x = 34$

$x = -\frac{68}{3}$

4. **(a)** When expanding the brackets, Ceri multiplied −3 by −3 and got −9, not 9

(b) $x = -6$

5. $A = \frac{1}{2}bh$

$36 = \frac{1}{2} \times (x - 5) \times 6$

$36 = 3x - 15$

$51 = 3x$

$x = 17$

Now try these (p 99)

1. **(a)** $a < 10$

(b) $b \geq 7.5$

(c) $cd < 8.25$

(d) $\frac{e}{f} \leq 4$

2. **(a)** $p \geq 10$

$p \leq 20$

(b) $10 \leq p \leq 20$

Now try these (p 101)

1. **(a)** $3x > 9$

$x > 3$

(b) $x - 2 > 2$

$x > 4x$

(c) $x - 7 < 3$

$x < 10$

(d) $x + 5 \leq -21$

$x \leq -26$

(e) $-3x < -12$

$x > 4$

(f) $2x \geq 28$

$x \geq 14$

(g) $x - 10 < 28$

$x < 38$

(h) $2x \leq 9$

$x \leq 4.5$

(i) $x - 5 \geq 0$

$x \geq 5$

(j) $-2x \leq 0$

$x \geq 0$

(k) $x - 21 \geq 0$

$x \geq 21$

(l) $x + 5 < 180$

$x < 175$

Now try these (p 103)

1. when $x = 1$, $1 - 1 - 2 = -2$

when $x = 2$, $8 - 2 - 2 = 4$

As 0 is in between –2 and 4, there must be a solution between 1 and 2

2. when $x = 0$, $0 - 0 + 1 = 1$

when $x = 0.2$, $9(0.2)^3 - 9(0.2) + 1 = -0.728$

As 0 is in between 1 and –0.728, there must be a solution between 0 and 0.2

3. $x = 5$

4. 1.6

5. 0.34

Chapter 2.3 Sequences

Now try these (p 106)

1. **(a)** 9, 11, 13, 15, 17

(b) 207

(c) 107 + 307 = 414

2. **(a)** 6, 17, 34, 57, 86

(b) No. The second difference is 6, which means you need to add 6 to the amount you added to the previous term to find the next term.

Now try these (p 107)

1. **(a)** Subtract 3 from the previous term to find the next term.

(b) $-3n + 16$

(c) $-3(100) + 16 = -300 + 16 = -284$

2. **(a)** $3n - 2$

(b) $19 - 4n$

(c) $23n + 77$

3. **(a)** 10n – 13

(b) 300 – 13 = 287

4. **(a)** $4n - 10$

(b) $80 - 10 = 70$

(c) All terms in the sequence are even so Jerome is correct, although his reasoning is incorrect. All terms in the sequence are even, regardless of whether n is even.

(d) No. Every term in the sequence is formed by mutliplying n by 4 (even) and subtracting 10 (even), so every term will be even.

5. **(a)** $6n - 2$

(b) $6n - 2 = 64$

$6n = 66$

$n = 11$

6. **(a)** **(i)** –1, 9, 27, 53, 87

(ii) 4, 6, 6, 4, 0

(iii) 7, 28, 63, 112, 175

(iv) 2, 6, 14, 26, 42

(b) The sequences are non-linear.

7. **(a)** $2n + 3$

(b) $2n + 4$

8. **(a)** 18, 16, 14, 12, 10

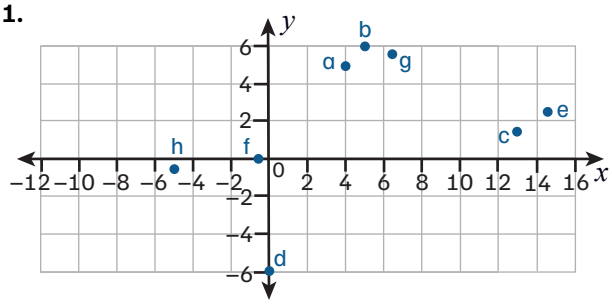
(b) $20 - 2n = 8$
$12 = 2n$
$n = 6$

(c) $20 - 2n < 0$
$20 < 2n$
$n > 10$
So, the first negative value in the sequence is the 11th term, which is
$20 - 2(11) = 20 - 22 = -2$

Chapter 2.4 Coordinates and graphs

Now try these (pp 108–109)

1.



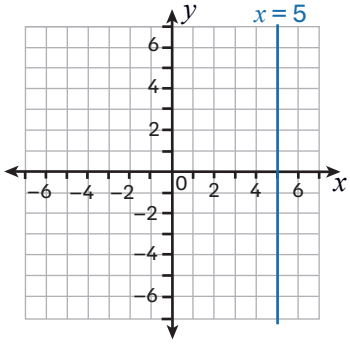
2. **(a)** $P = (6, 4)$

(b) $Q = (2, -4)$

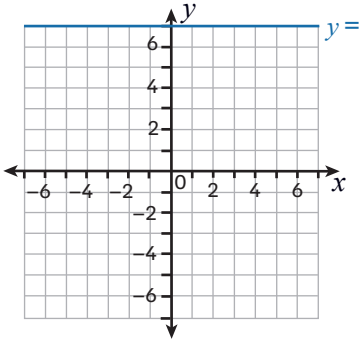
(c) $R = (-10, 0)$

Now try these (p 110)

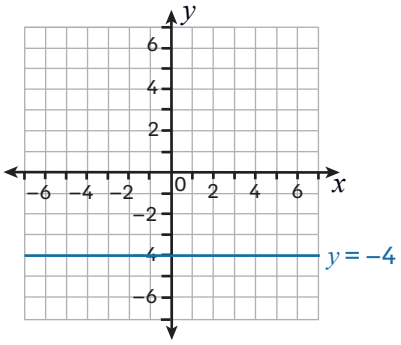
1. **(a)**



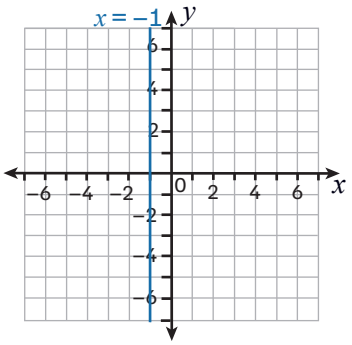
(b)



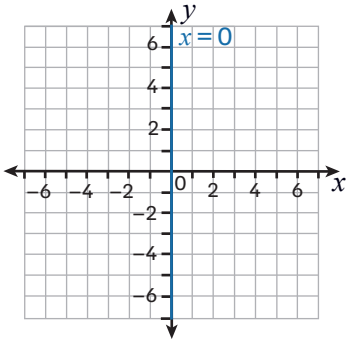
(c)



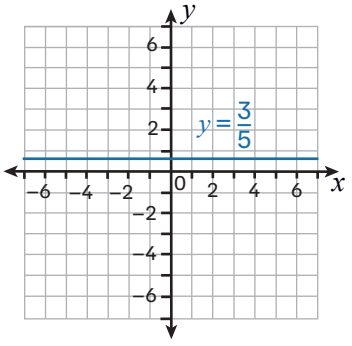
(d)



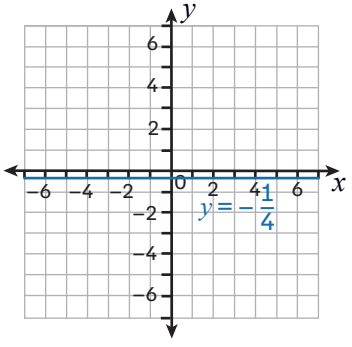
(e)



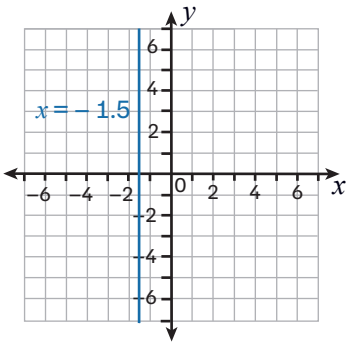
(f)



(g)



(h)



2. *A* $x = 4$

B $y = 2$

C $x = -3$

D $x = 6.5$

E $y = -4.5$

Now try these (p 111)

1. **(a)** Yes **(e)** No

(b) No **(f)** Yes

(c) No **(g)** Yes

(d) Yes **(h)** Yes

2. **(a)** $m = 3$ $c = 1$

(b) $m = -2$ $c = 2$

(c) $m = \frac{1}{2}$ $c = 6$

(d) $m = 2$ $c = 4$

(e) $m = 1$ $c = -4$

(f) $m = -1$ $c = 5$

(g) $m = 1$ $c = 6$

(h) $m = \frac{2}{5}$ $c = -2$

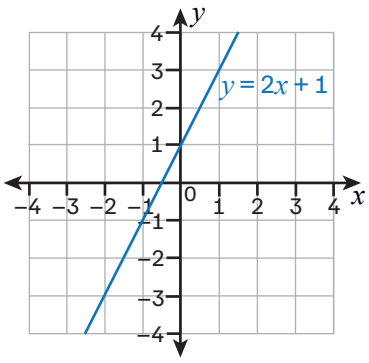
Now try these (p 114)

1. **(a)** 1 **(c)** 4

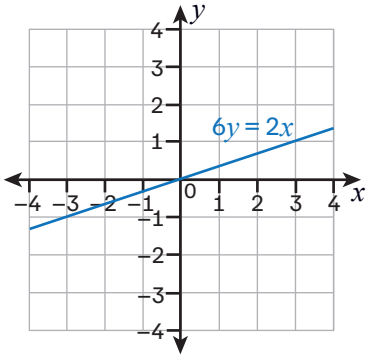
(b) –2 **(d)** –2

Now try these (p 115)

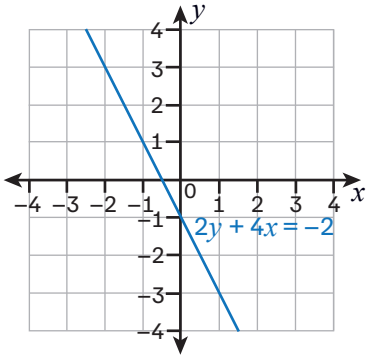
1. **(a)**



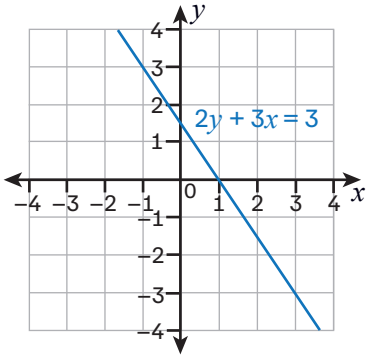
(b)



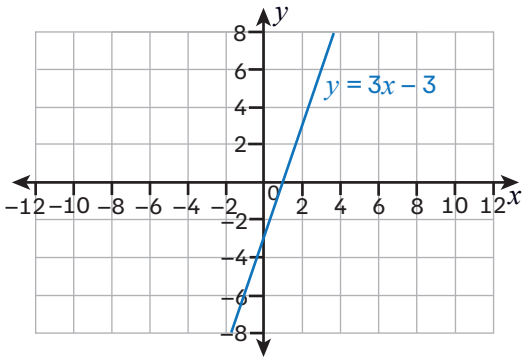
(c)



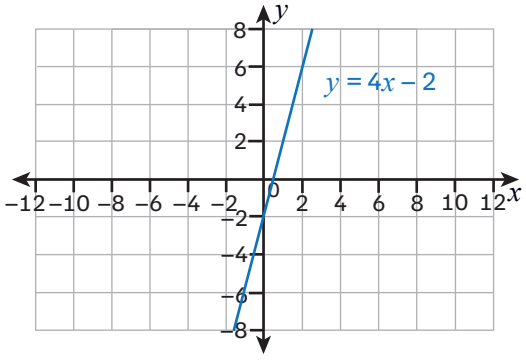
(d)



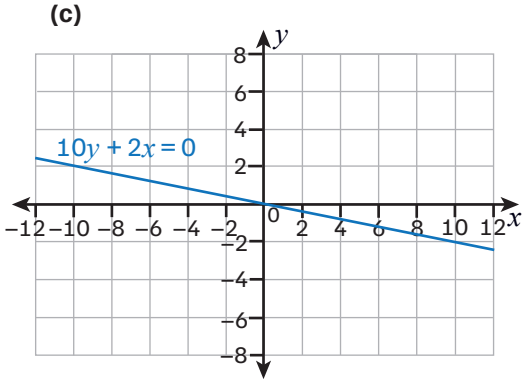
2. (a)



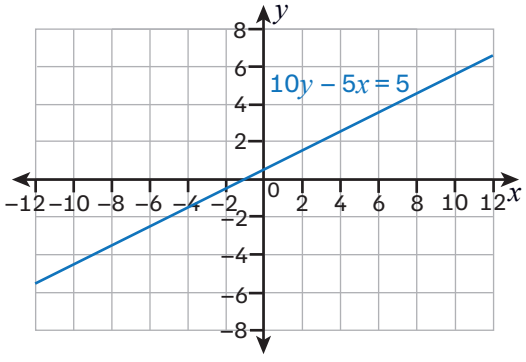
(b)



(c)



(d)

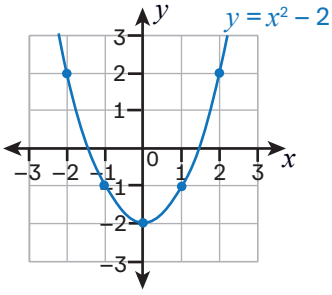


Now try these (p 116)

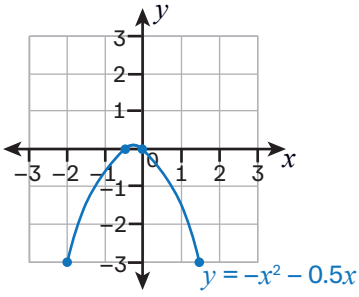
1. (a) ∪ (c) ∩

(b) ∩ (d) ∩

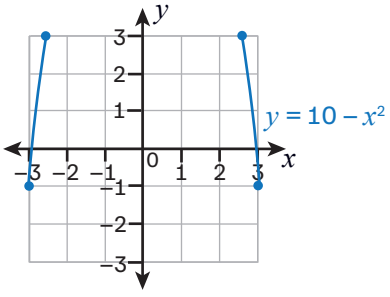
2. (a)



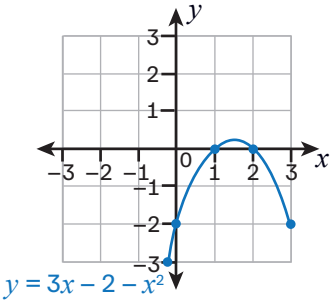
(b)



(c)



(d)



Now try these (p 117)

1. **(a)** No intersection

(b) $x^2 + 6x - 4 = 0$

Intersections at (−6.6, 5) and (0.6, 5)

(c) No intersection

(d) Intersections at (−7.1, 0.5) and (0.1, 0.5)

(e) Intersections at (1.1, 10) and (−1.1, 10)

(f) Intersections at (0, 0) and (1, 1)

Chapter 2.5 Real-life graphs

Now try these (pp 119–120)

1. **(a)** £13

(b) €9

2. **(a)** 16 inches

(b) 100 centimetres

Now try these (p 121)

1. **(a)** £25 per hour

(b) £25

(c) £275

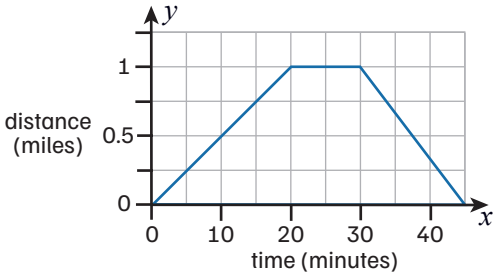
2. **(a)** approximately £52.50

(b) £0.50

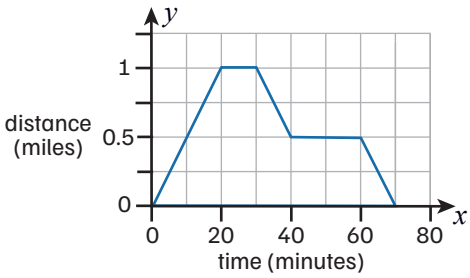
(c) $y = 0.5x + 35$

Now try these (p 123)

1. **(a)**



(b)



2. **(a)** B and E

(b) D

(c) C, 60 m/min or 1 m/s

Revision round up (p 125)

1. $-2x$

2. **(a)** (0, −4)

(b) For example, (−2, 0) and (2, 0)

(c) *Positive. The graph is* U-shaped.

3. $\frac{x+3}{y} = 3$, as it can be rearranged to be in the form $y = mx + c$ $(y = \frac{x}{3} + 1)$

4. $x + x - 23 + x - 23 - 5 > 100$ or equivalent

$x > 151\,3$ or $x > 501\,3$ or $x > 50.3(...)$

(Youngest Rhodri could be) 51 (years-old)

5. **(a)** 3 km

(b) 8:20 pm

(c) The distance from home initially increases after leaving his friend's house.

(d) 9 kilometres per hour

6. **(a)** (0, −3)

(b) $\frac{4}{3}$

(c) 4

Section 3: Geometry and measures

Chapter 3.1 Properties of angles and shapes

Now try these (pp 130–131)

1. **(a)** rhombus

   (b) regular hexagon

   (c) isosceles triangle

   (d) rectangle or parallelogram

   (e) regular pentagon

   (f) equilateral triangle

2. rectangle: 2 pairs

   square: 4 equal, 4 total; all 90°

   rhombus: 2 pairs

   parallelogram: 2 equal pairs, 4 total; 2 equal pairs; 2 pairs

   isosceles triangle: 2 equal, 3 total; none

Now try these (p 132)

1. **(a)** $\frac{360°}{5} = 72°$

   (b) $180° - 72° = 108°$

   (c) $5 \times 108° = 540°$

2. $180° - 162° = 18°$ (interior angle)

   $\frac{360°}{18°} = 20$ sides

3. **(a)** $\angle PQR = 108°$

   $x = (180° - 108°) \div 2 = 72° \div 2 = 36°$

   (angles in triangle add to 180°, triangle is isosceles)

   (b) trapezium

   (c) $y = 108° - 36° = 72°$

Now try these (p 133)

1. **(a)** circumference

   (b) diameter

   (c) radius

   (d) chord

2. A: (minor) sector

   B: (minor) segment

Now try these (p 135)

1. cube: 12 edges; 8 vertices

   cuboid: 6 faces; 12 edges; 8 vertices

   sphere: 1 face, 0 edges

   square-based pyramid: 5 faces; 5 vertices

   cone: 2 faces; 1 edge; 1 vertex

2. **(a)** (from counting) 7 vertices

   (b) (from counting) 7 faces

   (c) $7 + 7 = 2 + E$

   $E = 14 - 2 = 12$

   (d) 8 faces, 12 vertices, 18 edges

Chapter 3.2 Using mathematical equipment

Now try these (p 140)

1. Check constructions using a protractor.
2. Check construction using a ruler.

3. Check construction using a ruler.

4. Check construction using a ruler and a protractor.

5. **(a)** Check construction using a ruler and a protractor. The 80° angle should be at vertex *Z*.

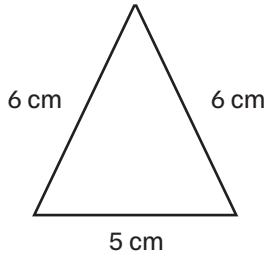
   (b) Check construction using a ruler and a protractor. The 100° angle should be at vertex *Z*.

6. Check constructions using a ruler and a protractor. The angles either side of the bisector should both equal 90°.

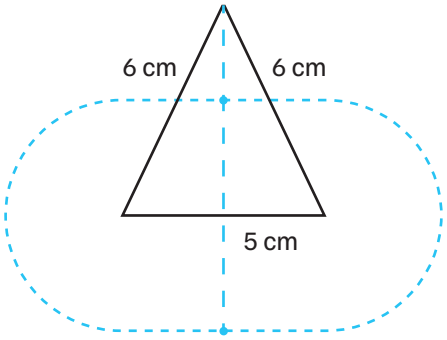
7. Check constructions using a protractor. The angles either side of the bisector should be the same.

Now try these (p 141)

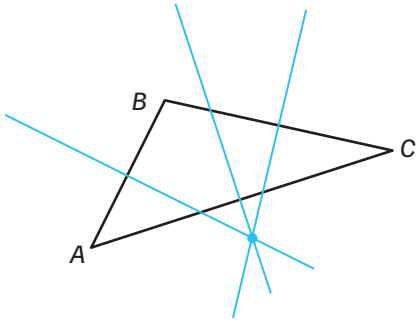
1. **(a)**



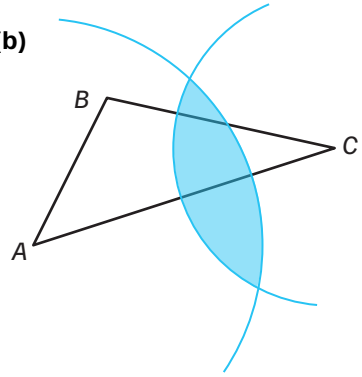
(b)



2. **(a)**



(b)



Chapter 3.3 Maps, scales, bearings and 2-D drawings

Now try these (p 143)

1. 66 km = 66 000 m = 6 600 000 cm

   $\frac{6600000}{500000} = 13.2$ cm

2. **(a)** 1 cm : 20 000 cm or 1 : 20 000

   (b) 12.5 km ÷ 2 km = 6.25

   6.25 × 10 = 62.5 cm

3. 12 cm × 50 000 = 600 000 cm

   600 000 cm = 6000 m = 6 km

4. 50 km = 50 000 m = 5 000 000 cm

   2 cm : 5 000 000 cm = 1 cm : 2 500 000 cm

   = 1 : 2 500 000

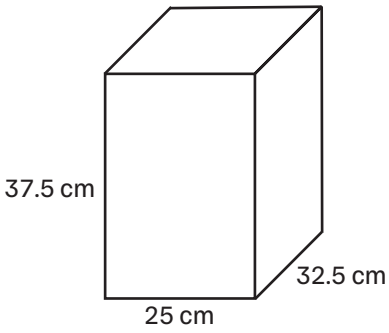
5. **(a)** length = $\frac{60}{5} = 12$ cm

   height = $\frac{40}{5} = 8$ cm

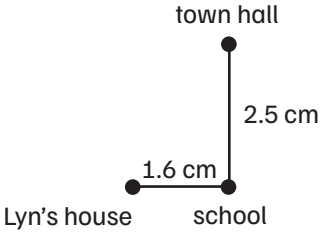
   (b) $\frac{60}{7} = 8.57$

   12 – 8.57 = 3.43 cm (to 2 d.p.)

6.



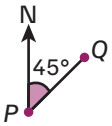
7.



Now try these (pp 145–146)

1. **(a)** 040° **(c)** 230°
(b) 110° **(d)** 330°

2. **(a)**



(b) 180° + 45° = 225°

3. 012°

4. 360° – 325° = 35°
180° – 35° = 145°

5. **(a)** 360° – 138° = 222°
(b) 180° – 73° = 107°
180° + 107° = 287°
(c) 180° – 138° = 042°

Now try these (p 149)

1. **(a)** cuboid
$A = 2(4 \times 3) + 2(3 \times 0.5) + 2(4 \times 0.5)$
$= 31 \text{ cm}^2$

(b) triangular prism
$A = (6 \times 12) + 2(5 \times 12) + 2(\frac{1}{2} \times 4 \times 6)$
$= 216 \text{ cm}^2$

(c) cylinder
$A = (125.7 \times 61.3) + 2(\pi \times 20^2)$
$= 10\,218.68 \text{ m}^2$

(d) square-based pyramid
$A = (2.3 \times 2.3) + 4(\frac{1}{2} \times 2.3 \times 2.95)$
$= 32.43 \text{ mm}^2$

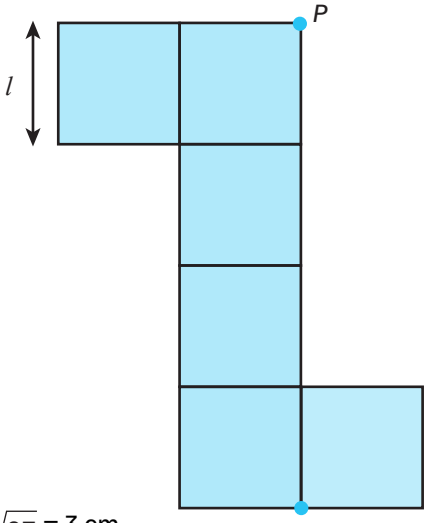
2. hexagonal prism

3. **(a)** cuboid

(b) $8 \times 3 \times 3 = 72 \text{ cm}^3$

(c) $A = 4(8 \times 3) + 2(3 \times 3) = 114 \text{ cm}^2$

4. **(a)**



(b) $\sqrt[3]{27} = 3$ cm

(c) $6 \times 3 \times 3 = 54 \text{ cm}^2$

Chapter 3.4 Angle properties and facts

Now try these (pp 150–151)

1. **(a)** $x = 180° - 40° = 140°$

(b) $x = 95°$

(c) $x = 360° - 140° - 110° = 110°$

(d) $x = 360° - 90° - 55° = 215°$

(e) $x = 360° - 30° = 330°$

(f) $x = 88°$

(g) $x = 180° - 157° = 23°$

(h) $x = 180° - 165° = 15°$

2. **(a)** $x = 70°$

opposite angles at a point are equal

(b) $x = 110°$

it is a corresponding angle to the angle adjacent to the 70° angle

OR

co-interior angles add up to 180°

3. $x = 180° - 110° = 70°$

$y = 180° - 115° = 65°$

$z = 180° - 70° - 65° = 45°$

Now try these (p 153)

1. **(a)** $x = 360° - 78° - 64° - 62° = 156°$

(b) $x = 360° - 108° - 101° - 51° = 100°$

(c) $x = (180° - 63° \times 2) = 54°$

(d) $x = 360° - 81° - 12° - 7° = 260°$

(e) $x = 136°$

(f) $x = 180° - (180° - 90° - 32°) = 122°$

(g) $x = \frac{360° - (2 \times 128.5°)}{2} = 51.5°$

(h) $x = \frac{360° - (2 \times 41°)}{2} = 139°$

2. **(a)** $x = \frac{360° - (2 \times 75°)}{2} = 105°$

(b) $x = 90°$

(c) $x = 360° - (2 \times 94°) - 15° = 157°$

(d) $x = \frac{360° - 146° - 89°}{2} = 62.5°$

3. $\frac{360° - (2 \times 99°)}{2} = 81°$ (both angles)

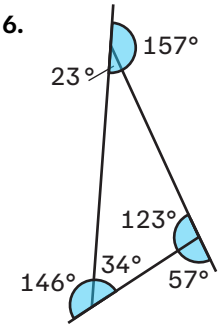
4. **(a)** right-angled triangle

(b) $180° - 90° - 60° = 30°$

(c) 90°

5. 70° and 110°

6.



7. Kites have one pair of equal angles, so:

$360° - 30° - 145° = 185°$

$185° \div 2 = 92.5°$

Chapter 3.5 Units and measure

Now try these (p 156)

1. **(a)** 3 hours and 14 minutes

(b) $(60 \times 3) + 14 = 194$ minutes

(c) 2:56 p.m.

2. **(a)** $(60 \times 4) + 12 = 252$ minutes

(b) $252 \times 60 = 15\,120$ seconds

3. 14:55 (2:55 p.m.)

4. **(a)** 32 minutes

(b) $\frac{32}{60}$ or $\frac{8}{15}$ of an hour

(c) Cecile leaves school at 16:45, which is 08:45 Canadian time.

So, they are at school at the same time for 13 minutes a day.

Now try these (pp 157–158)

1. 86 yards × 0.91 = 78.26 m

100 yards × 0.91 = 91 m

(175 feet ÷ 3) × 0.91 = 53.08 m

(532 feet ÷ 3) × 0.91 = 161.37 m

Therefore, 100 yards is closest to 100 m.

2. 0.35 × 28 = 9.8 grams

3. **(a)** 12 gallons × 8 = 96 pints

$\frac{96}{1.76}$ = 54.55 litres (to 2 d.p)

(b) £1.24 × 54.55 litres = £67.64

4. **(a)** 5.6 km

(a) 24 km, so 15 miles

5. 1 mile = $\frac{8}{5}$ km so 258 miles = 412.8 km

6. Owain is 74 inches tall, so about 185 cm.

Ali is 71 inches tall, so about 178 cm.

7. $200 \times \frac{1}{2.2} = 90.91$ kg

Now try these (p 161)

1. 250 m

2. 800 kg

3. 7.5 l

4. speed = $\frac{\text{distance}}{\text{time}} = \frac{1000}{125} = 8$ m/s

5. **(a)** population density = $\frac{\text{total population}}{\text{total area}}$

$= \frac{3187000}{20779} = 153$ people per km^2

(b) $\frac{20779}{14000000} = 0.00148$ km^2

(c) An internet search shows that a standard rugby pitch is 100 m long and 70 m wide.

This gives an area of 0.007 km^2, which is nearly 7 times larger than the answer to (b). So, the newspaper's claim appears to be false.

6. **(a)** speed = $\frac{\text{distance}}{\text{time}} = \frac{42 \text{ km}}{1.5 \text{ hours}}$

= 28 km/h

(b) 28 ÷ 1.6 = 17.5 mph

(c) James left at 07:20 UK time and arrived at 11:35 UK time, so the entire journey took 4 hours and 15 minutes.

Total distance = 35 + 42 + 83 = 160 km

speed = $\frac{\text{distance}}{\text{time}} = \frac{160 \text{ km}}{4.25 \text{ hours}}$

= 37.65 km/h (to 1 d.p.)

7. rate of flow = $\frac{\text{volume}}{\text{time}} = \frac{400000 \text{ l}}{36 \text{ hours}}$

$= \frac{400000 \text{ l}}{129600 \text{ seconds}}$

= 3.09 litres per second (2 d.p.)

8. volume of cube = 2 cm × 2 cm × 2 cm

= 8 cm^3

mass = density × volume

mass = 22.6 g/cm^3 × 8 cm^3 = 180.8 g

Chapter 3.6 Perimeter, area and volume

Now try these (p 162)

1. **(a)** 4 × 3 cm = 12 cm

(b) (2 × 16 m) + (2 × 8 m) = 48 m

(c) 0.3 m = 30 cm

(2 × 50 cm) + (2 × 30 cm) = 160 cm

(d) (2 × 1 cm) + (4 × 0.5 cm) = 4 cm

Now try these (p 165)

1. **(a)** $A = 5^2 = 25$ cm^2

$P = 4 \times 5 = 20$ cm

(b) $A = (7.5 \times 4) - (3 \times 1) = 27$ cm^2

$P = 7.5 + 4 + 4.5 + 1 + 3 + 3 = 23$ cm

(c) $A = \frac{1}{2} \times 22 \times 15 = 165\ m^2$

$P = 22 + 15 + 26.6 = 63.6\ m$

(d) $A = 12.3^2 = 151.29\ m^2$

$P = 4 \times 12.3 = 49.2\ m$

(e) $A = 5 \times 4 = 20\ cm^2$

$P = (2 \times 5) + (2 \times 6) = 22\ cm$

(f) $A = 12 \times 9 = 108\ cm^2$

$P = (2 \times 12) + (2 \times 8) = 40\ cm$

(g) $A = (12 \times 9) + (3 \times 2) = 114\ m^2$

$P = 12 + 10 + 9 + 2.5 + 3 + 2.5 + 10$

$= 49\ m$

(h) $A = \frac{1}{2}(2 + 8) \times 7 = 35\ cm^2$

$P = 8 + 7.6 + 2 + 7.6 = 25.2\ cm$

2. **(a)** trapezium

(b) perimeter $= 1.8 + 1.5 + 3.5 + 2.3$

$= 9.1\ cm$

area $= \frac{1}{2}(1.8 + 3.5) \times 1.5 = 3.975\ cm^2$

3. perimeter $= 13 + 6 + 3 + (6 - 3) + (13 - 3) + 3$

$= 38\ cm$

area $= (6 \times 3) + (10 \times 3) = 48\ cm^2$

4. area of square $= 10^2 = 100\ cm^2$

area of small triangle $= \frac{1}{2} \times 2 \times 4 = 4\ cm^2$

area of large triangle $= \frac{1}{2} \times 8 \times 8 = 32\ cm^2$

shaded area $= 100 - 32 - 4 = 64\ cm^2$

$= 64.0\%$

5. **(a)** Evidence of square counting (Number of squares =) 33

(Total area $= 33 \times 2.25 =$) 74(.25) (m^2)

(b) 74.25×0.94 or 74.25×94

(£) 69.80

Now try these (p 166)

All answers given to 2 decimal places.

1. **(a)** $C = \pi \times 6.5 = 20.42\ mm$

$A = \pi \times 3.25^2 = 33.18\ mm^2$

(b) $P = (\frac{1}{2} \times \pi \times 3) + (3 \times 3)$

$= 13.71$

$A = (\frac{1}{2} \times \pi \times (1.5)^2) + 3^2$

$= 12.53\ m^2$

(c) $C = \pi \times 10 = 31.42\ cm$

$A = \pi \times 5^2 = 78.54\ cm^2$

(d) $P = (\frac{1}{2} \times \pi \times 1.8) + (2 \times 0.35) + 1.8$

$= 5.33\ m$

$A = (\frac{1}{2} \times \pi \times 0.9^2) + (1.8 \times 0.35)$

$= 1.90\ m^2$

(e) $C = \pi \times 4 = 12.57\ cm$

$A = \pi \times 2^2 = 12.57\ cm^2$

(f) $C = (\frac{1}{2} \times \pi \times 5) + 5 = 12.85\ cm$

$A = \frac{1}{2}(\pi \times 2.5^2) = 9.82\ cm^2$

(g) $C = (\frac{1}{2} \times \pi \times 7.1) + 7.1$

$= 18.25\ mm$

$A = \frac{1}{2}(\pi \times 3.55^2) = 19.80\ cm^2$

(h) P (top) $= (\frac{1}{2} \times \pi \times 108) + (108 - 62)$

$= (54\pi + 46)\ m$

P (bottom) $= (\frac{1}{2} \times \pi \times 62)$

$= 31\pi\ m$

total **perimeter** $= (54\pi + 46) + 31\pi$

$= 313.04\ m$

A (top) $= \frac{1}{2}(\pi \times 54^2)$

$= 1458\pi\ m^2$

A (bottom) $= \frac{1}{2}(\pi \times 31^2)$

$= 480.5\pi\ m^2$

total **area** $= 1458\pi + 480.5$

$= 5060.94\ m^2$

2. P (left) $= (\frac{1}{2} \times \pi \times 35) = 17.5\pi\ cm$

P (middle) $= (2 \times 34) + (35 - 20) = 83\ cm$

P (right) $= (\frac{1}{2} \times \pi \times 20) = 10\pi\ cm$

total **perimeter** $= 17.5\pi + 83 + 10\pi$

$= 169.39\ cm$

A (left) = $(\frac{1}{2} \times \pi \times 17.5^2) = 153.125\pi$ cm^2

A (middle) = $(34 \times 35) = 1190$ cm^2

A (right) = $(\frac{1}{2} \times \pi \times 10^2) = 50\pi$ cm^2

total **area** = $153.125\pi + 1190 + 50\pi$

$= 1828.14$ cm^2

Now try these (p 169)

1. **(a)** $A = (\frac{1}{2} \times 4 \times 3) + (6 \times 4) = 30$ cm^2

(b) V = cross-sectional area × length

$= 30 \times 7 = 210$ cm^3

2. $A = 2(40 \text{ cm} \times 55 \text{ cm}) + 4(80 \text{ cm} \times 55 \text{ cm})$

$= 22\,000$ cm^2 or 2.2 m^2

$V = 55 \text{ cm} \times 40 \text{ cm} \times 80 \text{ cm}$

$= 176\,000$ cm^3 or 0.176 m^3

3. V (large) = $(\pi \times 5^2 \times 30) = 750\pi$ cm^3

V (small) = $(\pi \times 3^2 \times 30) = 270\pi$ cm^3

total **volume** = $750\pi - 270\pi$

$= 1507.96$ cm^2

Chapter 3.7 Pythagoras' theorem

Now try these (p 171)

1. **(a)** $a^2 + b^2 = c^2$

$12^2 + 9^2 = c^2$

$225 = c^2$

$\sqrt{225} = c$

$15 = c$

So, missing side = 15 cm

(b) $a^2 + b^2 = c^2$

$24^2 + b^2 = 26^2$

$576 + b^2 = 676$

$b^2 = 676 - 576$

$b^2 = 100$

$b = 10$

So, missing side = 10 cm

(c) $a^2 + b^2 = c^2$

$7^2 + b^2 = 25^2$

$49 + b^2 = 625$

$b^2 = 625 - 49$

$b^2 = 576$

$b = 24$

So, missing side = 24 cm

2. $a^2 + b^2 = c^2$

$4^2 + b^2 = 10^2$

$16 + b^2 = 100$

$b^2 = 100 - 16$

$b^2 = 84$

$b = 9.17$

So, perpendicular height = 9.17 cm (to 2 d.p.)

3. $10^2 + 6^2 = 136$

$\sqrt{136} = 11.66$ cm

4. **(a)** $8^2 + 6^2 = 100$

$\sqrt{100} = 10$ cm

yes, this triangle is right-angled

(b) $2^2 + 1.5^2 = 6.25$

$\sqrt{6.25} = 2.5$ cm

yes, this triangle is right-angled

(c) $4^2 + 6^2 = 36$

$\sqrt{52} = 7.21$ cm

no, this triangle is not right-angled

Chapter 3.8 Position, symmetry and transformations

Now try these (p 173)

1. **(a)** $\left(\frac{4+6}{2}, \frac{2+8}{2}\right) = (5, 5)$

(b) $\left(\frac{1+3}{2}, \frac{2+4}{2}\right) = (2, 3)$

(c) $\left(\frac{7+-3}{2}, \frac{1+0}{2}\right) = (2, 0.5)$

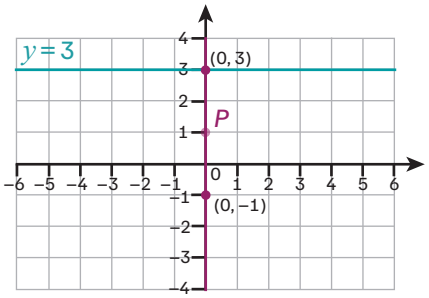
(d) $\left(\frac{-2.5+-7}{2}, \frac{5-10}{2}\right) = (-4.75, 7.5)$

(e) $\left(\frac{10+-20}{2}, \frac{1+5}{2}\right) = (-5, 3)$

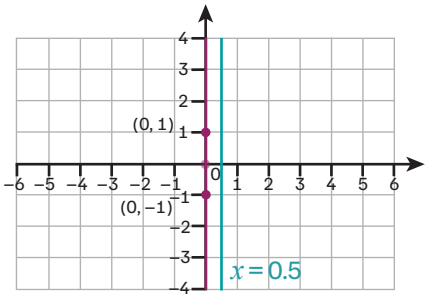
2. (0, –2)

Now try these (p 175)

1.



2.

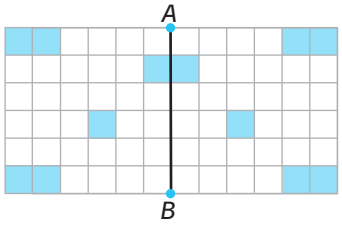


Now try these (p 177)

1. **(a) E, K, T, W**

(b) H, X

2.



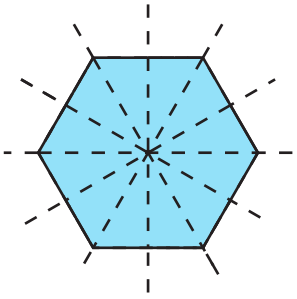
3. **(a)** hexagon

Note: this is not a regular hexagon as the horizontal sides are 2 squares long but the diagonal sides are longer. This is because the diagonal of any square is longer than its side lengths.

(b) 2 lines of symmetry

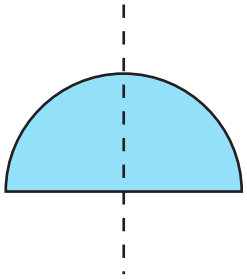
(c) 2

4. **(a)** Order of rotational symmetry = 6

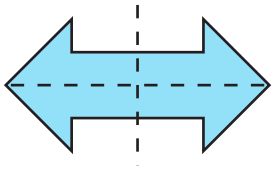


(b) No lines of symmetry. Order of rotational symmetry = 2

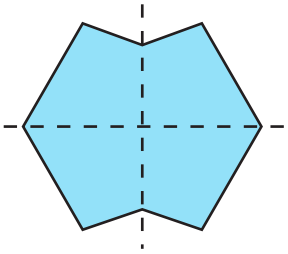
(c) Order of rotational symmetry = 1



(d) Order of rotational symmetry = 2

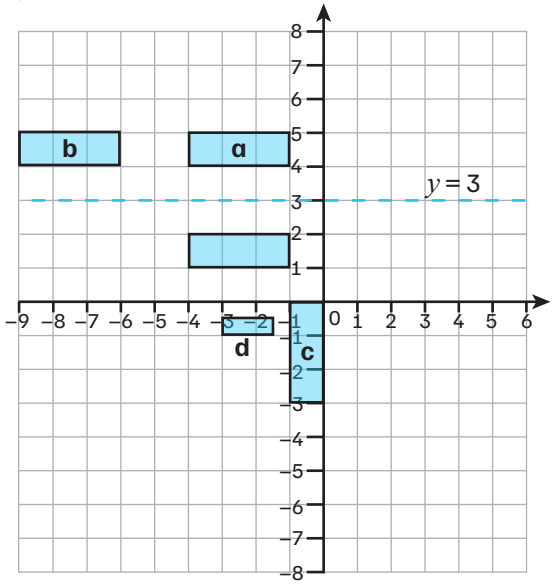


(e) Order of rotational symmetry = 2



Now try these (p 183)

1.



2. rotation of 180°, centre (0, 2)

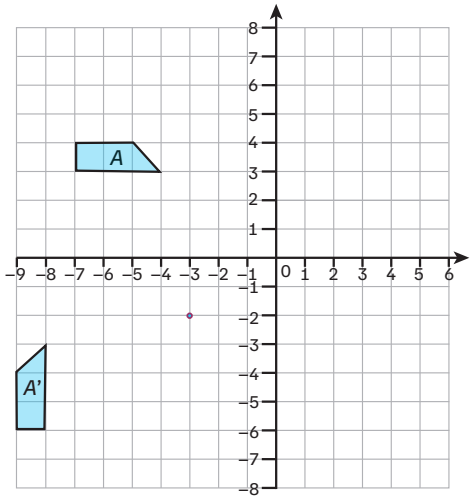
3. **(a)** translation of 10 squares right and 1 square down

(b) rotation of 180°, centre (3, 1)

(c) enlargement of scale factor 2, centre (3, 3)

(d) translation of 2 squares right and 5 squares down, reflection in the line $x = -3$ (Accept any suitable answers.)

(e)



Chapter 3.9 Congruency and similarity

Now try these (p 185)

1. A and F
B and J
C and H
E and G

2. smaller triangle: 24 – 8 – 6 = 10 cm

larger triangle: 24 – 10 – 6 = 8 cm

yes, they are congruent

3. Yes, the quadrilaterals can be congruent, since the missing angles in A must add to 180°, so could both be 90°, while the missing angles in B must also add to 180°, so could be 95° and 85°.

4. **(a)** $\frac{5}{2} = 2.5$

(b) $\frac{2}{5} = 0.4$

5. Yes, interior angles of a triangle add up to 180°, meaning the missing angle of the smaller triangle is 15° and the missing angle of the larger triangle is 75°, therefore both triangles have the same interior angles and are similar.

6. Each side of the larger quadrilateral is 1.5 times larger than the corresponding side in the smaller quadrilateral.

7. **(a)** The triangles are similar because each side of the larger triangle is exactly 1.5 times bigger than the corresponding side of the smaller triangle.

(b) $w = 180° - 75° - 30° = 75°$

(c) The triangles are isoceles, so angle w must be the same as the 75° angle.

8. **(a)** The triangles are not congruent or similar because their corresponding angles are not equal (triangle 1 has angles 60°, 70° and 50°, triangle 2 has angles 70°, 30° and 80°).

(b) The triangles are not congruent or similar because their corresponding angles are not equal (triangle 1 has angles 45°, 65° and 70°, triangle 2 has angles 65°, 25° and 90°).

(c) The quadrilaterals could be similar, as three of the sides in quadrilateral 2 are twice as long as the corresponding sides in quadrilateral 1

However, it is impossible to be sure they are similar without knowing the final side lengths or interior angles.

Revision round up (p 187)

1. $a = 42°$

$b = 65°$

$c = 180° - 65° = 115°$

2. **(a)** true **(c)** true **(e)** true

(b) false **(d)** true **(f)** false

3. **(a)** cube

(b) hexagonal prism

(c) triangular prism

(d) cylinder

4. 4 cm : 8m = 4 cm : 800 cm

4 : 800 = 1 : 200

5. Check construction using ruler and protractor.

6. $A = \frac{1}{2} \times \text{base} \times \text{height}$

$24 = \frac{1}{2} \times QP \times 6$

$24 = 3 \times QP$

$QP = 8$ cm

Then, use Pythagoras' theorem to find QR:

$QR^2 = 6^2 + 8^2$

$QR^2 = 36 + 64$

$QR^2 = 100$

$QR = \sqrt{100}$

$= 10$ cm

7. (Volume of cylinder =) $\pi \times 2.32 \times 5$

$= 83(.095....)$

or 26.45π (cm^3)

(Density of metal =) $423.1 \times 83(.095....)$

Accept an answer between 5 and 5.1 (g/cm^3)

Alternative method:

(Density of metal =) $423.1 \div \pi \times 2.32 \times 5$

Accept an answer between 5 and 5.1 (g/cm^3)

8. 14:02 or 2:02 p.m.

9. scale factor = $\frac{2}{3}$

$x = 12 \text{ cm} \times \frac{2}{3} = 8$ cm

10. 270°

Section 4: Statistics and probability

Chapter 4.1 Data handling cycle – collecting data

Now try these (p 193)

1. **(a)** 1400

(b) For example:

The age of the students sampled.

How far away from the school the sampled students live.

(Accept any other suitable answer)

2. **(a)** Jonah should consider whether he can investigate everyone at the school (which would involve recording how long it takes each student to finish their homework and how many classes they have missed).

He would also need to consider whether he assesses the completion time of just one homework for one subject, or multiple.

A smaller sample size might be useful, such as a random group of students from each year group.

(Accept any other suitable answer)

(b) Jonah should consider sample size, the sample representation (i.e. whether all years and abilities are represented), and the method of data collection (i.e. will students complete the homework at home and measure the time taken or will they complete it in class?).

(Accept any other suitable answer)

Now try these (p 195)

1. **(a)** Students in Year 7 and 8 have likely taken fewer tests than older students.

(b) If they have already bought an item, their in-store experience is likely to have been positive.

(Accept any other suitable answer)

(c) People using social media are probably already regular users of the internet.

(Accept any other suitable answer)

2. **(a)** "How does our milk brand compare to others on the market?"

(Accept any other suitable answer)

(b) "How often do you clean your fish tank?"

(Accept any other suitable answer)

(c) "How would you rate your experience with our staff?"

(Accept any other suitable answer)

(d) "How could our products be improved?"

(Accept any other suitable answer)

Now try these (p 198)

1.

Mark p%	Tally	Frequency
$30 \leq p < 40$	|	1
$40 \leq p < 50$	|||	3
$50 \leq p < 60$	|||	3
$60 \leq p < 70$	|	1
$70 \leq p < 80$	|||	3
$80 \leq p < 90$	|||	3
$90 \leq p < 100$	|	1

2.

Colour	Tally	Frequency
Red	||	2
Grey	~~||||~~ |	6
Black	|||	3
White	||	2
Blue	|	1
Yellow	|	1

Now try these (p 201)

1. **(a)** The missing number is:

$50 - 4 - 12 - 20 - 5 = 9$

(b) Quantitive continuous data

(c)

t minutes	Frequency
$10 \leq t < 20$	4
$20 \leq t < 30$	12
$30 \leq t < 35$	15
$35 \leq t < 40$	5
$40 \leq t < 50$	9
$50 \leq t < 60$	5

2. **(a)**

height h cm	Frequency
$100 \leq h < 150$	3
$150 \leq h < 200$	8
$200 \leq h < 250$	9
$250 \leq h < 300$	3
$300 \leq h < 350$	3
$350 \leq h < 400$	4

Note: the tree with a height of 400 cm does not fall into any of these categories.

(b) For example:

Advantage: grouping data makes it easier to spot patterns, such as the most and least common height.

Disadvantage: Doesn't give exact values so doesn't give an idea of where each height lies within each class interval.

(Accept any other suitable answer)

3. **(a)** Qualitative

(b) Quantitative continuous

(c) Qualitative

(d) Qualitative

(e) Quantitative discrete

(f) Quantitative continuous

(g) Quantitative discrete

(h) Quantitative continuous

(i) Qualitative

4. **(a)** For example, the colour of someone's shoes.

(b) For example, number of pencils in a pencil case.

(c) For example, the height of classmates.

5. **(a)**

Age y years	Frequency
$0 \leq y < 10$	8
$10 \leq y < 20$	10
$20 \leq y < 30$	7
$30 \leq y < 40$	2
$40 \leq y < 50$	2
$50 \leq y < 60$	1

(b)

Age y years	Frequency
$0 \leq y < 5$	3
$5 \leq y < 10$	5
$10 \leq y < 15$	5
$15 \leq y < 20$	5
$20 \leq y < 40$	9
$40 \leq y < 60$	3

Accept different class intervals.

Chapter 4.2 Data handling cycle - results

Now try these (pp 203-204)

1. Ordered list: 1, 1, 1, 3, 3, 3, 4, 5, 6

Mean = $(1 + 1 + 3 + 5 + 1 + 3 + 3 + 6 + 4) \div 9$
$= 3$

Median = 3

Mode = 1 and 3

2. Ordered list = 1, 1, 1, 1, 2, 4, 5, 7, 10, 10, 10, 10, 10, 10, 10

(a) Mean = 6.13 (to 2 d.p.)

Median = 7

Mode = 10

(b) The mode would be best for advertising the restaurant because it is the highest.

3. Ordered list = 0, 0, 0, 0, 0, 1, 2, 2, 3, 20

(a) Mean: 2.8

Median: 0.5

Mode: 0

(b) The median best represents the data because most of the households have 3 or fewer pets. The mean has been skewed by the unusually high number of pets in the last house.

4. Ordered list = 1, 2, 2, 2, 2, 4, 4, 4, 5, 5, 7, 8

(a) 46

(b) Mean = 3.83 (to 2 d.p.)
Median = 4
Mode = 2

5. Group A total score = 25 × 45 = 1125

Group B total score = 30 × 50 = 1500

Total score of both groups = 1125 + 1500
= 2625

Total number of students in both groups
= 25 + 30 = 55

Mean of combined groups
= 2625 ÷ 55 = 47.7272... = 47.73 (to 2 d.p.)

Now try these (p 206)

1. **(a)**

Number of people	Tally	Frequency	$f \times x$
0	III	3	0
1	II	2	2
2	𝍸 III	8	16
3	II	2	6
4	III	3	12
5	II	2	10
6	IIII	4	24

(b) Mean = (0 + 2 + 16 + 6 + 12 + 10 + 24) ÷ (3 + 2 + 8 + 2 + 3 + 2 + 4)
= 70 ÷ 24
= 2.92 (2 d.p.)
Median = 2
Mode = 2

Now try these (pp 208-209)

1. There are many possible answers.

For example: 3, 5, 5, 5, 7

To have a mean of 5, the numbers must add to 25

To have a mode of 5, the numbers must have more 5s than any other number

To have a median of 5, the middle value must be 5 when the numbers have been ordered.

2. **A:** False. The median is the centre value and there is only one centre value.

B: False. If there is an even number of values the median is the midpoint of the middle two values.

C: True.

D: True.

E: False. As the mean is calculated by adding the values and dividing by how many there are, it does not matter what order the numbers are in.

3. sum of all values = 4 × 9 = 36
missing number = 36 – 3 – 7 – 10 = 16

4. Ordered list = 2, 2, 4, 5, 8, 10, 13

(a) Mode = 2

(b) Median = 5

(c) Mean = 44 ÷ 7 = 6.285714...
= 6.3 to 1 d.p.

(d) These statistics show that there is a lot of variation in the number of texts Luca receives. The mean is higher than the median, suggesting Luca received a high number of texts on some days. The mode is lower than the median, suggesting Luca usually doesn't receive many texts.

5. **(a)**

Weight (w kg)	Mid-point (x)	Frequency (f)	Total weight ($f \times x$)
$60 \leq w < 70$	65	3	195
$70 \leq w < 80$	75	2	150
$80 \leq w < 90$	85	5	425
$90 \leq w < 100$	95	8	760
$100 \leq w < 110$	105	4	420

(b) There are 22 values, so the median is between the 11th and the 12th values.

This falls within the class $90 \leq w < 100$

(c) $90 \leq w < 100$

(d) total $f \times x = 1950$

total $f = 22$

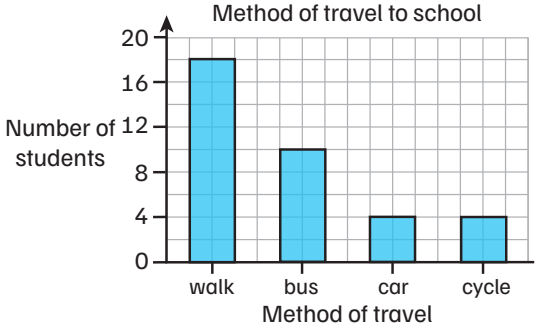
estimated mean $= 1950 \div 22$

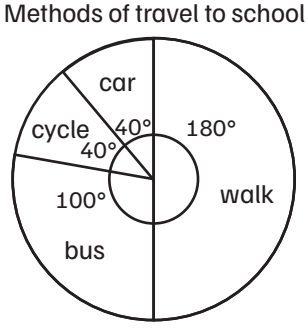
$= 88.6363...$

$= 88.64$ kg (to 2 d.p.)

Now try these (pp 214)

1. Note: scales may differ but should show the same information.



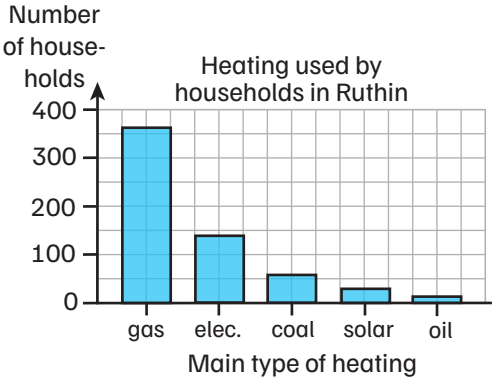


2. **(a)** Tegid could be correct because there could be the same number of students attending chess and badminton clubs

This would mean that the portion of Year 10 students who play chess represents more people than the portion of Year 10 students who play badminton.

(b) Tegid could be incorrect because there could be more students that play badminton than chess, meaning the Year 10 portion who play chess could represent fewer students than the smaller Year 10 portion who play badminton.

3.



4. **(a)** $144 \div 24 = 6$ sandwiches

(b) $6 \times 3 = 18$ sandwiches

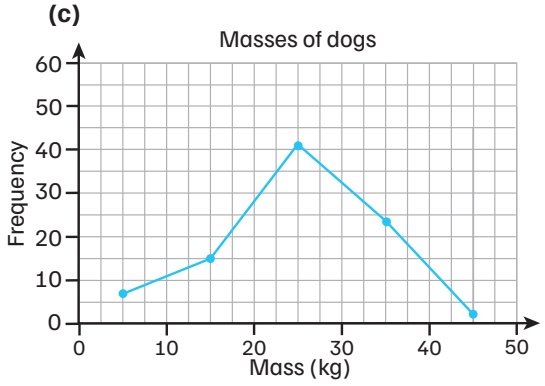
Now try these (p 216)

1. **(a)**

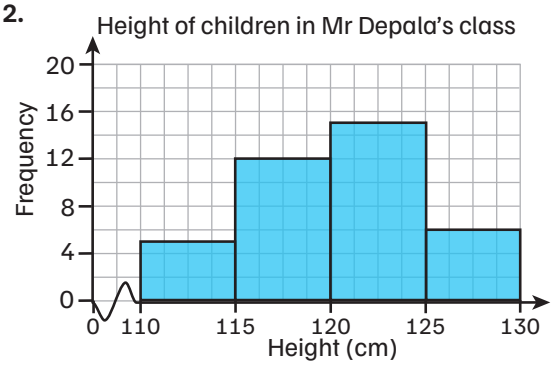
Mass (m kg)	Mid-point	Frequency
$0 \leq m < 10$	5	7
$10 \leq m < 20$	15	15
$20 \leq m < 30$	25	41
$30 \leq m < 40$	35	24
$40 \leq m < 50$	45	2

(b) $20 \leq m < 30$

(c)

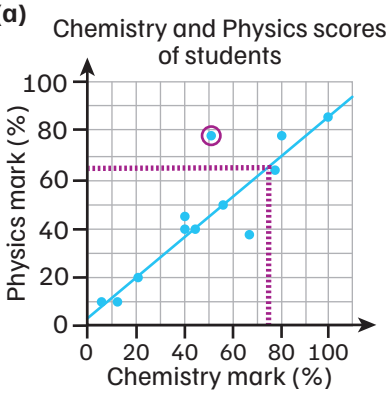


2.



Now try these (p 218)

1. **(a)**



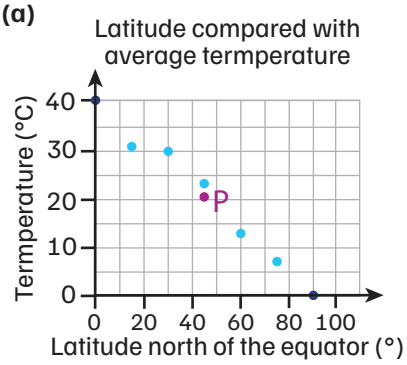
(b) The anomaly is circled in purple.

(c) Weak positive correlation.

(d) Line of best fit is drawn.

Using this line, you can predict that a student with a score of 65% in Physics likely scored 74% in Chemistry.

2. **(a)**



(b) Point *P* has coordinates (45, 20.7) and is labelled above.

(c) There is a strong negative correlation between the latitude north of the equator and temperature.

So, the average temperature decreases moving north from the Equator.

Chapter 4.3 Probability of single events

Now try these (pp 221-222)

1. **(a)** Likely **(d)** Even chance

(b) Likely **(e)** Unlikely

(c) Likely **(f)** Certain

2. 0.5

3. **(a)** $P(\text{red}) = \frac{3}{8}$

(b) P(blue) = 0.625

(c) P(black) = 0%

4. **(a)** 25

(b) $3x + 2 + x + 1 + 6 = 25$

$4x + 9 = 25$

$4x = 16$

$x = 4$

Number of red counters $= 3x + 2$

$= 12 + 2$

$= 14$

Now try these (p 224-225)

1.

Colour	Red	Yellow	Green	Blue
Relative frequency	0.35	0.25	0.15	0.25

2. **(a)**

Number	1	2	3	4
Frequency	8	5	4	3
Relative frequency	0.40	0.25	0.20	0.15

(b)

Number	1	2	3	4
Expected frequency	780	720	810	690

(c) The results from part (a) suggest the spinner is unfair because the relative frequencies are quite different to each other and imply that landing on a 1 is much more likely than landing on a 4

(d) The results from part (b) suggest the spinner is fair because the relative frequencies are more similar to each other.

Chapter 4.4 Probability of multiple events

Now try these (p 227)

1. **(a)** There are three possible prime numbers (2, 3, and 5), so the probability is $\frac{3}{6} = \frac{1}{2}$

(b) $\frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$

2. **(a)** Christopher will only order one main meal, meaning he cannot order pasta and pizza at the same time.

(b) $\frac{2}{5} + \frac{1}{4} = \frac{8}{20} + \frac{5}{20} = \frac{13}{20}$

Now try these (p 230)

1.

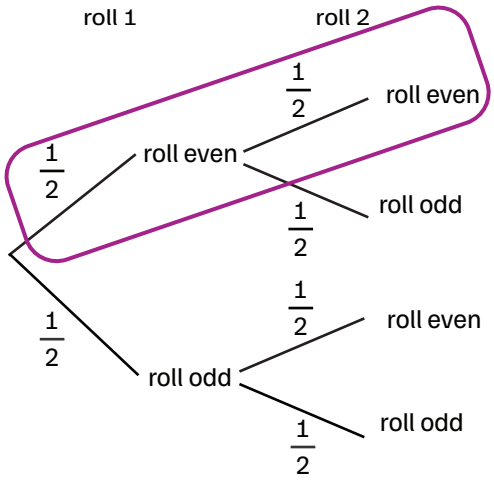
	1	2	3	4	5	6
heads	1h	2h	3h	4h	5h	6h
tails	1t	2t	3t	4t	5t	6t

2. **(i)** $\frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$

(ii) $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$

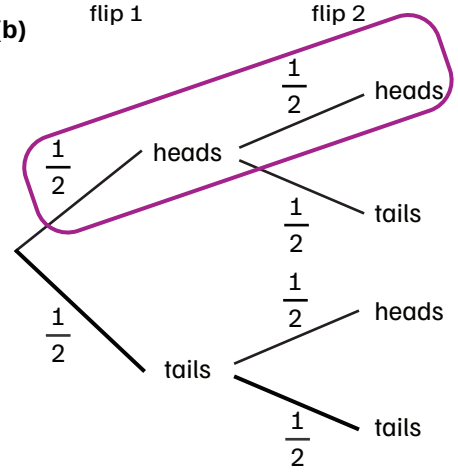
(iii) 0 (it is impossible for the spinner to land on yellow).

3. **(a)**



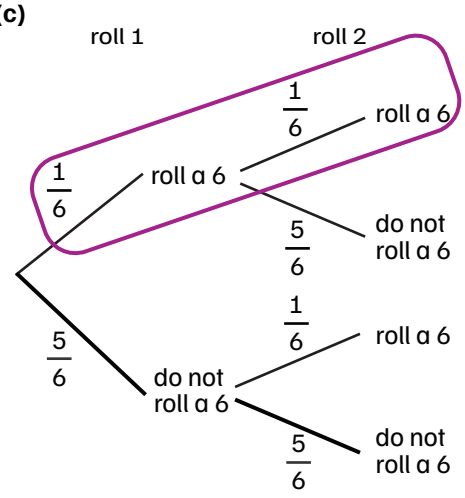
True. The probability of rolling an even number is $\frac{1}{2}$, so the probability of rolling an even number twice is $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$.

(b)



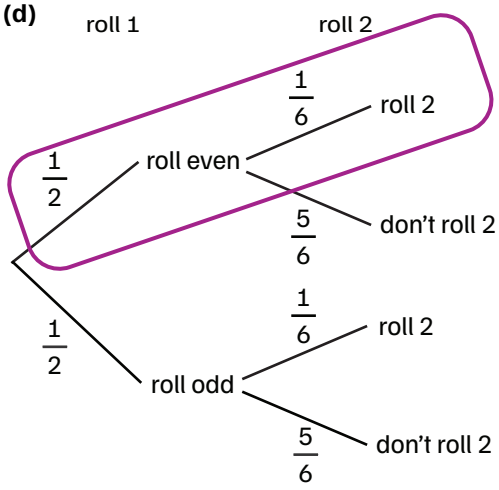
False. The probability of landing on heads twice is $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

(c)



True. The probability of rolling a fair dice twice and landing on 6 both times is $\frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$.

(d)



False. The probability of rolling an even number is $\frac{1}{2}$ and the probability of rolling a 2 is $\frac{1}{6}$, so the probability of rolling an even number then a 2 is $\frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$

Now try these (p 233)

1. **(a)** 42

(b) 18

(c) 8

(d) $\frac{18}{42} = \frac{3}{7}$

2. **(a)** 40 students total, so $\frac{14}{40} = \frac{7}{20}$

(b) $\frac{15}{40} = \frac{3}{8}$

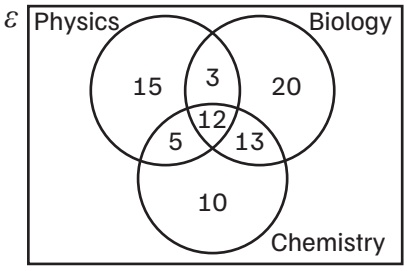
3. For example:

The diagram is not labelled.

Only 16 students are recorded as having dogs.

There are 31 students on the Venn diagram.

4.



Note that 5 students take Chemistry and Physics only, 3 students take Physics and Biology only (15 overall take Physics and Biology) and 13 students take Chemistry and Biology only (25 overall take Chemistry and Biology).

Revision round up (p 235)

1. First 10 prime numbers: 2, 3, 5, 7, 11, 13, 17, 19, 23 and 29

$2 + 3 + 5 + 7 + 11 + 13 + 17 + 19 + 23 + 29 = 129$

So, the mean is 12.9

2. **(a)** Accept any four cards where three of the cards are labelled '8'.

(b) Accept any four cards where none of the cards are labelled with an even number.

3. For example:

Remove the word "satisfied" from the question. A more neutral survey might ask "How did you find your stay on a scale of 1–5?"

(Accept any appropriate answer)

4. **(a)** 60 is a fairly small sample size and none of the values are more than 2 away from 10, so it is possible that these variable frequencies are due to chance rather than bias.

(b) $\frac{12}{60} = 0.2$

(c) $100 \times 0.2 = 20$

5. **(a)** Bars drawn correctly.

Frequencies of 11 for Bus and 1 for Train.

(b) (i) 0.2 0.9 1.4 1.7 2.1 2.1 2.8

(Median =) 1.7 (km)

(ii) (Range =) 2.6 (km)

(iii) $2.1 + 1.7 + 0.9 + 1.4 + 2.1 + 2.8 + 0.2$

$(= 11.2) \div 7$

(Mean =) 1.6 (km)

(iv) Indication that 'The mean will decrease' AND Valid reason e.g. 0.4 is less than the mean of 1.6

Revision practice questions

Number

Non-calc (pp 236–237)

1. **(a)** 169

(b) 9

(c) 10

(d) 23

(e) 50

2. **(a)** 10, 60, 350, 1100

(b) 0, 100, 300, 1100

(c) 40

(d) One thousand and ninety-nine

3. 4 603 000 000

4. Spelling selected, with sight of $\frac{14}{20}$ AND $\frac{15}{20}$

OR 70% AND 75%

OR 0.7(0) AND 0.75

OR two correct calculations for a common amount.

5. **(a)** True

(b) True

(c) True

(d) False

(e) True

6. **(a)** x^5

(b) x^3

(c) x^6

7. **(a)** $\approx \frac{2 \times 400}{80} \approx \frac{800}{80} \approx 10$

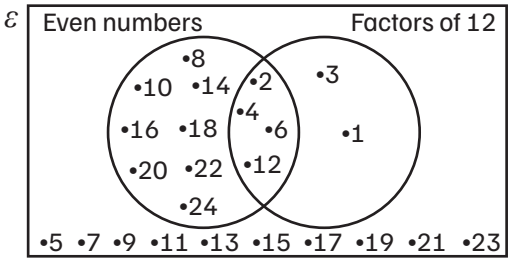
(b) **(i)** 2964

(ii) 29.64

(iii) 456

(iv) 6.5

8.



Calculator (pp 237–238)

1. **(a)** One thousand two hundred

(b) Zero point zero zero eight seven

(c) Two hundred thousand

(d) Two million five hundred and one thousand seven hundred and eighteen

2. 0.94

3. **(a)** 45 × £11.44 = £514.80 a week

(b) 45 × £12.21 = £549.45 a week

(c) % increase $= \frac{\text{increase}}{\text{original}} \times 100$

$= \frac{(549.45 - 514.80)}{514.80} \times 100$

= 6.7% to 1 d.p.

4. 6 × 31 + 3 × 36

(186 + 108)

(£)294

(434 – 294 =)

(£)140

140 ÷ 28

5 (nights)

5. **(a)** (Wages) (£)750

(Balance after rent) (£)525

(Balance after sale of bike) (£)820

(Council tax) (£)114.35

(b) 4930

6. **(a)** 73 931

(b) 74 000

(c) Area of the pitch = 130 × 89 = 11 570 m^2

Playable area of pitch = $\frac{9480}{11570} \times 100$

= 80.9% (to 1 d.p.)

(d) Cement in one mixer = 12 × 2.4

= 28.8 tonnes

No. of cement mixers needed = $\frac{40000}{28.8}$

= 1388.88...

Round up to 1389 mixers needed.

7. $\frac{385}{5+6} \times 5$ (÷4) or $\frac{385}{5+6} \times 6$ (÷4)

(Sian will save) (£) 43.75

AND (Kim will save) (£) 52.5(0)

8. (Electricity cost is)

660 × 0.29 or 660 × 29

= (£) 191.4(0) or 19140 (p)

(Standing charge + electricity is)

(£) 236.4(0) or 23640 (p)

(Total bill including VAT is)

1.05 × 236.4(0) or 1.05 × 23640

= (£) 248.22 or 24822 (p)

Algebra

Non-calc (pp 239–240)

1. $-6y$

2. $x < 5$

3. $4x - 24$

4. **(a)** (–2, –4)

(b) No indicated with suitable reason e.g.

'the y coordinate is always double the x coordinate'

'it would go through (5,10)'

'it would go through (6,12)'

5. **(a)** $5x$

(b) $48y$

(c) 22

6. **(a)** 3, 5, 7, 9

(b) She is correct. $2n$ is always an even number as it has 2 as a factor. Adding 1 to an even number always gives an odd number.

7. Wales = 6

Rest of GB = 18

Rest of world = 8

8. $13d - 5d = -31 + 9$

$8d = -40$

$d = -5$

9. **(a)** $3(a - 4)$

(b) $2x(2x - 1)$

(c) $3a(2a + 3b)$

10. **(a)** t

(b) $32w^5$

(c) $\frac{3x}{y}$

(d) $100a^4b^4$

11. **(a)** 3

(b) $\frac{3}{4}$

(c) 1

(d) $\frac{9}{16}$

12. **(a)** $(x - 5)(x + 2) = 0$

so $x = 5$ or $x = -2$

(b) $(3x - 4)(3x - 4)$

$= 9x^2 - 12x - 12x + 16$

$= 9x^2 - 24x + 16$

13. **(a)** 2

(b) $2y = 4x - 12$ and $y - 2x + 8 = 0$

Calculator (pp 240–241)

1. **(a)** (2, 5)

(b) (0, −2)

(c) 3

2. **(a)** Angles in a triangle add up to 180°.

$8x + 7x + 3x = 180$

$18x = 180$

$x = 10°$

(b) The largest angle is 80°

3. $(5x - 3)(2x + 1) = 10x^2 + 5x - 6x - 3$

$= 10x^2 - x - 3$

4. $8x^2 - 72 = 8(x^2 - 9)$

$= 8(x + 3)(x - 3)$

5. $\frac{x^2 + 5x + 6}{4x + 8} = \frac{(x + 3)(x + 2)}{4(x + 2)} = \frac{x + 3}{4}$

6. Squaring both sides gives $y^2 = 2x$

So, $x = \frac{y^2}{2}$

7. **(a)** $x = \frac{3}{y}$

(b) $x = 2y - 3$

(c) $x = \frac{y - 1}{2}$

8. **(a)** Expression

(b) Equation

(c) Expression

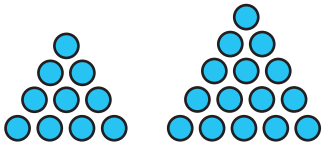
(d) Equation

(e) Equation

(f) Formula

(g) Formula

9. **(a)** **(i)**



(ii) 21

(b) $7n - 5$

10. **(a)** $2x + 4y$

(b) $3a + 3b$

(c) $5x$

(d) $5ab + 2a$

(e) $7x^3 + x^2$

11. **(a)** 2

(b) 36

(c) −12

(d) 9

(e) 21

12. Output $= \frac{x + 6}{5}$

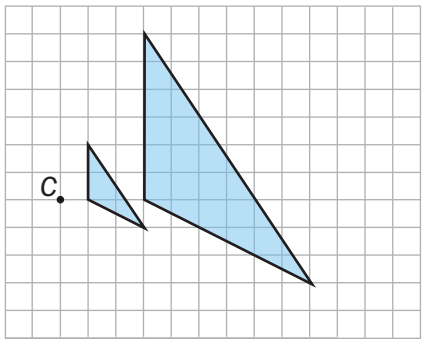
Geometry and measure

Non-calculator (pp 241–242)

1. **(a)** Equilateral triangle (and) rhombus

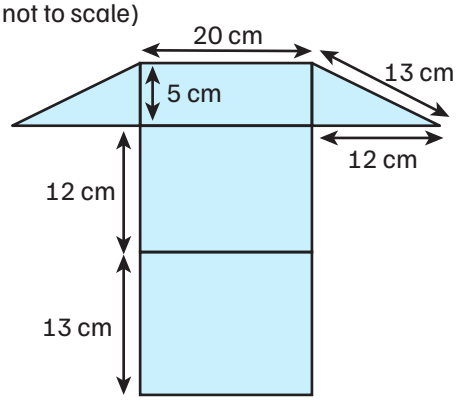
(b) Rectangle

2.



3. **(a)**

(not to scale)



(b) $A = (13 \times 20) + (12 \times 20) + (5 \times 20) + 2(\frac{1}{2} \times 12 \times 5)$

$= 630 \text{ cm}^2$

(c) V = cross-sectional area × length

$= (\frac{1}{2} \times 5 \times 12) \times 20$

$= 600 \text{ cm}^3$

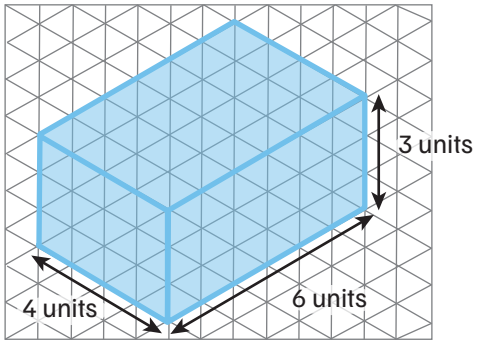
4. segment

5. **(a)** exterior angle $= \frac{360}{5} = 72°$

(b) one interior angle $= 180° - 72° - 108°$

sum of interior angles $= 108° \times 5 = 540°$

6.



7. **(a)** (4, 4)

(b) (−1.5, 1)

(c) 30 cm²

8. **(a)** Rotation of 90° clockwise about the origin

(b) Rotation of 180° about the origin

(c) Translation of 7 units down

Calculator (pp 242–243)

1. (Volume of flowerbed =) $\frac{1}{2} \times (380 + 165) \times 213 \times 30$

$= 1741(.275)$ (litres)

2. C (and) G

3. 21:14

4. **(a)** $60 \times 60 = 3600$ seconds

(b) 3 minutes 57 seconds

(c) 1 kg = 2.2 lbs so 1 lb = 0.4545... kg

16 lbs = 7.3 kg to 2 s.f.

5. **(a)** Triangle BCD is isosceles so the base angles are equal.

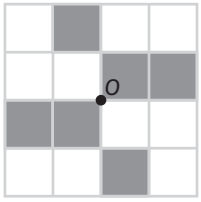
sum of base angles $= 180° - 30° = 150°$

Angle $x = \frac{150°}{2} = 75°$

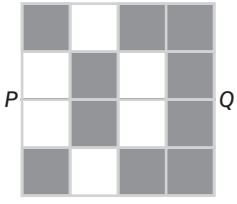
(b) Angle $ABC = 360° - (245° + 75°) = 40°$ (angles on a point add to 360°)

$y = 180° - (40° + 90°) = 50°$ (angles in a triangle add to 180°)

6.



7.



8. Area of square $= 6 \times 6 = 36 \text{ cm}^2$

Area of semicircles $= 2 \times (\frac{1}{2} \times \pi \times r^2)$

$= 28.2743... \text{ cm}^2$

Area of shaded region $= 36 \text{ cm}^2 - 28.2743$

$= 7.73 \text{ cm}^2$ to 2 d.p.

9. Scale factor connecting P to $Q = \frac{2}{3}$

$x = 9\text{ cm} \times \frac{2}{3} = 6\text{ cm}$

10. 10:00 + 10 hours = 20:00 or 8:00 p.m.

Statistics and probability

Non-calculator (p 243)

1. **(a)** $9 \times 4 = 36$

(b) 2 10 11 13

2. **(a)**

36	**72**
28	**56**
20	**40**
12	**24**
4	**8**

(b) $\frac{11}{20}$ or equivalent

3. $P(6) = \frac{1}{6}$

$P(\text{heads}) = \frac{1}{2}$

$P(6 \text{ and heads}) = \frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$

So, Ioan is wrong.

4. **(a)** P(yellow) = 1 – 0.3 – 0.1 – 0.4 = 0.2

(b) Red

(c) 40 balls represent 0.4 of the total, so 10 balls must represent 0.1 of the total.

Therefore, there must be $10 \times 10 = 100$ balls.

Calculator (p 244)

1. **(a)** unlikely

(b) impossible

2. **(a)** Angle 40° (or 11.1…%)

2340 (million) × 40 ÷ 360 or equivalent

(or 2340 (million) × 11.1… ÷ 100)

(£) 260 (million)

(b) 280 000

(c) Any one of:

- $\frac{2400 - 2184}{2400}$ (× 100 = 9%)
- 0.09 × 2400 (= 216)
- 0.91 × 2400 (= 2184)
- 100 × 2184 ÷ [100 – 9] (= 2400)
- 2184 ÷ 2400 (× 100) (= 0.91 or 91%)

'Yes' indicated or implied AND any one of:

- ($\frac{2400 - 2184}{2400}$ × 100 =) 9%
- (2400 – 216 =) 2184
  OR (2184 + 216 =) 2400
- (0.91 × 2400 =) 2184
- (100 × 2184 ÷ [100 – 9] =) 2400
- (100% – 91% =) 9%

3. **(a)** Any 2 of the following statements e.g.

'No time frame e.g. per day, per week etc',

'Groups are not continuous e.g. no group for 1.5 hours',

'No group if you exercise for more than 7 hours'

(b) A criticism regarding e.g.

'(Not representative of Year 11 as a whole as) most GCSE PE pupils will do more than 2.5 hours of exercise each week', or

'(Not representative of Year 11 as a whole as) not many of these pupils will do less than 2.5 hours of exercise each week', or

'Most GCSE PE pupils are likely to do more exercise than Yr 11 pupils in general'

4. Sight of 190

(Total number of calls = 22 + 48 + 62 + 34 + 14 + 10)

Sight of any of the following:

- (80% of 190 =) 152 (calls)
  AND (less than 30 seconds =) 132 (calls)
- (20% of 190 =) 38 (calls)
  AND (more than 30 seconds =) 58 (calls)
- (132 calls = $\frac{132}{190}$ ×100= 69.4(7..)%
- (58 calls = $\frac{58}{190}$ ×100= 30.5(2..)%

Conclusion 'No'.

5. **(a)** A

(b) D

(c) A and D

(d) B and C

6. **(a)** The population would be all the members of the youth club.

(b) For example:

To save time

To save money / resources

To make data collection easier

To make data processing / analysis easier

7. **(a)**

		Spinner A			
		1	2	3	4
Spinner B	1	1	2	3	4
	2	2	4	6	8
	3	3	6	9	12

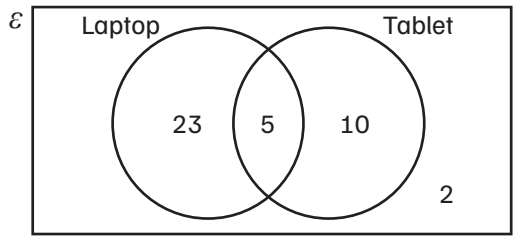
(b) There are two scores that are equal to or above 9

P(prize) = $\frac{2}{12} = \frac{1}{6}$

(c) $\frac{1}{6} \times 120 = 20$

So, a prize would be won 20 times.

8. **(a)**



(b) P(laptop) = $\frac{28}{40} = \frac{7}{10}$