Answers

Test 1

(pages 4–5)

1–3 Start with the Matilda who has read 7 books. Matilda has read $\frac{1}{2}$ of the books Sophia has read, so Sophia has read 7 × 2 = 14 books.

14 is $\frac{1}{4}$ of the books that Evie has read, so Evie has read 14 × 4 = 56 books.

This is $\frac{2}{3}$ of the number of books Daisy has read, so Daisy has read 56 × 3 ÷ 2 = 84 books.

1 Daisy: 84 books

2 Sophia: 14 books

3 161 books read by all the girls (7 + 14 + 56 + 84 = 161)

4 57 (50 ÷ 2 = 25; 25 – 6 = 19; 19 × 3 = 57)

5 162 (120 ÷ 2 = 60; 60 – 6 = 54; 54 × 3 = 162)

6 3 (14 ÷ 2 = 7; 7 – 6 = 1; 1 × 3 = 3)

7 50 pupils (5 + 10 + 6 + 11 + 3 + 4 + 3 + 8 = 50)

8 $\frac{4}{25}$ (8 children out of 50 children went to Spain; $\frac{8}{50}$. When working with fractions, remember to give your answer in its simplest form. $\frac{8}{50}$ is equivalent to $\frac{4}{25}$)

9 54% (Add up the numbers of pupils going to England, Scotland and Wales: 11 + 6 + 10 = 27 pupils. There is a total of 50 pupils. $\frac{27}{50}$ went to England, Scotland or Wales. To find a percentage, you need the denominator to be 100; here you can double the numerator and denominator to find the equivalent fraction $\frac{54}{100}$. Once you have a fraction with 100 as the denominator, you have the percentage. $\frac{54}{100}$ = 54%)

10–11 The scale of 1 : 150 000 means that 1 cm on the map represents 150 000 cm in reality. Dividing 150 000 cm by 100 (to make 1500 metres) and then by 1000 (to make 1.5 km), makes it easier to solve these problems. 1 cm is equivalent to 1.5 km.

You can now scale up or down using this information: if 1 cm is equivalent to 1.5 km then 2 cm is equivalent to 3 km, 4 cm is equivalent to 6 km, etc. You can also work this in reverse: if 1.5 km is equivalent to 1 cm, then 3 km is equivalent to 2 cm and 6 km is equivalent to 4 cm.

10 4 cm (If 1.5 km is represented by 1 cm, then 6 km is represented by 4 cm (6 km ÷ 1.5 km = 4))

11 9 km (If 1 cm is equivalent to 1.5 km, then 6 cm is equivalent to 9 km (1.5 km × 6 = 9 km))

Test 2

(pages 6–7)

1 c (I get the 13:40 bus from the market, get off at 13:58 at the church. The next bus to the bus station leaves at 14:18, getting to the bus station at 14:40)

2 e (Buses 4 and 5 would both get me there on time, but Bus 5 leaves at the later time of 14:45 and gets to the beach at 15:20)

3 d (Buses 1 and 4 would both take 1 hour and 10 minutes. Buses 2 and 5 do not visit the shops. Therefore Buses 3 and 6 take the shortest time, which is 30 minutes)

4 a (Bus 6 reaches the bus station at 15:40, so this is the bus I caught from the shops. Bus 6 left the shops at 15:10. I spent 1 hour and 20 minutes at the shops so I must have arrived 1 hour 20 minutes earlier. 15:10 minus 1 hour is 14:10, minus 20 minutes is 13:50. Bus 1 arrived at the shops at 13:50)

5 d (Bus 1 takes 1 hour and 20 minutes to travel from the market to the bus station. If bus 7 leaves the market at 15:35 it will reach the bus station at 15:35 plus 1 hour 20 minutes, which is 16:55)

6–8 A table like this can be useful for this type of question:

Fruit juice	Water	Total drink
1	5	6
2	10	12
3	15	18
4	20	24
5	25	30
6	30	36
7	35	42

For every 1 litre of fruit juice Jasmine needs 5 litres of water. This makes 6 litres of drink (1 litre of fruit juice + 5 litres of water).

There are 140 competitors and each glass holds 300 ml, so Jasmine needs to make 42 000 ml of drink (140 competitors × 300 ml). Divide 42 000 by 1000 to convert from millilitres to litres (there are 1000 ml in 1 litre); 42 000 ÷ 1000 = 42 litres of drink needed in total. To find out how much fruit juice and water is needed, divide 42 litres by 6 litres; 42 ÷ 6 = 7. This means that Jasmine needs 7 × 1 litre = 7 litres of fruit juice and 7 × 5 litres = 35 litres of water.

6 **c** (300 ml × 140 competitors = 42 000 ml or 42 litres)

7 **d** (7 × 5 litres = 35 litres)

8 **c** (7 × 1 litre = 7 litres)

9 **e** (Surface area means the area of the six faces: the top and bottom, the left side and the right side, the front and the back. To cover the surface area of the box, Solomon needs (35 cm × 28 cm × 2) + (28 cm × 12 cm × 2) + (35 cm × 12 cm × 2) = 3472 cm^2. Note: If Solomon were going to *wrap* the box up, he would need more paper. This is because wrapping a present would require sufficient paper to fold over and stick together)

10 **c** (Volume means multiplying the three dimensions together; 35 cm × 28 cm × 12 cm = 11 760 cm^3)

Test 3

(pages 8–9)

1–3 It takes 13 teachers 2.5 hours to write the reports so 13 × 2.5 = 32.5 total teacher hours to write all of the reports. To find a time per report, divide the total time (32.5 hours = 1950 minutes) by the 390 pupils; 1950 ÷ 390 = 5 minutes per report.

1 **c** (5 minutes is the time taken by each teacher to write one report)

2 **d** (1950 minutes ÷ 10 teachers = 195 minutes, or 3 hours 15 minutes)

3 **e** (1950 minutes ÷ 6 teachers = 325 minutes or 5 hours 25 minutes)

4 £6.20 (Two drawing pads cost £8. Four paints cost 4 × £1.45 = £5.80. Four paints and two drawing pads cost £5.80 + £8 = £13.80. The amount of change received is £20 – £13.80 which equals £6.20)

5 £2.07 (He gets 15% off £13.80; 10% of £13.80 is £1.38; 5% of £13.80 is half of 10% = £0.69; extra change = £1.38 + £0.69 = £2.07)

6 £12.66 (£1.45 × 2 for two paints + £3.50 × 2 for two packs of pencils + £4.99 for one drawing pad = £14.89; 10% of £14.89 = £1.489; 5% of £14.89 = £0.7445; 15% of £14.89 = £2.2335; £14.89 – £2.2335 = £12.6565 (rounds to £12.66))

7 4 coins (£10 – £3.50 = £6.50. The smallest number of coins that can be used to make £6.50 is 4: 50p + £2 + £2 + £2)

8–9 Use the equations $3a + 2p = 630$ and $2a + 3p = 620$ to represent the problem. There are two terms in each equation, a (mass of one apple), p (mass of one pear). To make the a term the same in both equations, multiply the first equation by 2 and the second equation by 3: $6a + 4p = 1260$ $6a + 9p = 1860$

Next, subtract one equation from the other to eliminate the a terms. $9p - 4p = 5p$ and $1860 - 1260 = 600$ so $5p = 600$, which gives $p = 600 \div 5 = 120$. Looking back to what p represents: one pear has a mass of 120 g.

Next, replace the value for the mass of a pear in the first equation to find the mass of the apples: $3a + 240 = 630$ so $3a = 630 - 240 = 390$, which gives $a = 390 \div 3 = 130$. This means that one apple has a mass of 130 g.

8 130 g

9 120 g (As a check, from the question: the difference between the mass of an apple and the mass of one pear is 10 g. 130 g – 120 g = 10 g (correct))

10 **d** (120 gingerbread people divided by 3 gives a third that have a white iced mouth; 120 ÷ 3 = 40)

11 **b** (120 gingerbread people divided by 2 gives a half of the people that have currant eyes and then divided by 5 gives the number that have currant eyes AND a liquorice nose; 120 ÷ 2 ÷ 5 = 12)

12 a (120 gingerbread people divided by 2 then divided by 3 then divided by 5 gives the number of gingerbread people that have currant eyes AND a white iced mouth AND a liquorice nose; 120 ÷ 2 ÷ 3 ÷ 5 = 4)

Test 4

(pages 10–11)

1 c (The only month when the amount of money rises steeply over one month is August)

2 d (The only month when the amount of money falls steeply is October)

3 d (From the graph, Alfie withdrew £100; his dad gave him £80; £100 + £80 = £180 which is 90% of full price; 10% = £180 ÷ 9 = £20, so the full price is £200)

4 17p (£13.60 ÷ 80 cakes = 17p so Evie needs to sell the cakes at 17p to recoup her costs)

5 £18.40 (40p × 80 cakes = £32; £32 – £13.60 = £18.40 so Evie makes £18.40 profit)

6 20% (Evie sells 16 out of 80 cakes. 80 ÷ 16 = 5; this means that $\frac{1}{5}$ of the cakes are sold to one person and $\frac{1}{5}$ is 20%. To check, find 10% (80 ÷ 10 = 8) and double to find 20% (8 × 2 = 16))

7 b (As group B is playing every 5 seconds and group A is playing every 2 seconds, they play together every 10 seconds. Divide the total performance time of 180 seconds by 10 seconds to find the number of times that both groups play together after the start, 18 times, then add on one for the beat at the start of the sequence = 19)

8 c (As group C is playing every 7 seconds and group A is playing every 2 seconds, they will play together every 14 seconds. Divide the total performance time of 180 seconds by 14 seconds to find the time that both groups play together after the start, 12.86 times (rounds down to 12, as we add whole beats only), then add on one for the beat at the start of the sequence = 13)

9 a (As groups A, B and C are all playing together every 70 seconds (2 × 5 × 7), divide the total performance time of 180 seconds by 70 seconds to find how many times they all play together, 2.57 times (rounds down to 2 times), then add on one for the beat at the start of the sequence = 3)

10 c (Groups A, B and C are all playing together every 70 seconds. Divide the performance time of 300 seconds (5 × 60 seconds = 300 seconds) by 70 to find how many times they all play together, 4.29 (rounds down to 4 times), then add on one for the beat at the start of the sequence = 5)

Test 5

(pages 12–13)

1–3 20% of 180 children = 36 children (10% = 18 so 20% = 36) so 36 children have red hair. 180 children – 36 children = 144 children. The ratio between fair hair and dark hair is 1 : 2 so there are 3 parts; 144 ÷ 3 = 48 so 48 children have fair hair and 96 children (2 × 48) have dark hair.

1 e

2 b

3 d

4–5 See chart below. Start by listing numbers that can be quartered with whole number answers, i.e. multiples of 4.

First number	4	8	12	16	20	24	28	32
When quartered	1	2	3	4	5	6	7	8
Added together	5	10	15	20	**25**	30	35	40
Multiplied together	**4**	**16**	**36**	**64**	**100**	**144**	**196**	**256**

4 Look for square numbers, which are in bold.

Example: 20 and 5 (20 + 5 = 25 and 20 × 5 = 100); 25 and 100 are both square numbers which seems to prove Dara's trick.

5 Example: 16 and 4 (16 + 4 = 20 and 16 × 4 = 64); 64 is a square number but 20 is not which disproves Dara's trick.

6 **c** (To find the median, write the heights in order and choose the middle value: 12 13 17 20 25 28 32; 20 cm is the middle value)

7 **b** (To find the mean height of the books, add up the heights and then divide by the number of books; 17 + 13 + 28 + 20 + 32 + 12 + 25 = 147 cm; 147 cm ÷ 7 = 21 cm)

8 **a** (To find the range, subtract the shortest height from the tallest height; 32 cm – 12 cm = 20 cm)

9 105 cm^2 (The area of each triangle is (5 cm × 7 cm) ÷ 2; there are six of these triangles, so the area of the bottom panel = 6 × (5 cm × 7 cm) ÷ 2 = 105 cm^2)

10 320 cm^3 (The volume is 10 cm × 8 cm × 4 cm = 320 cm^3)

11 £5.67 (Beth needs 15 ml of black paint + 30 ml of gold paint = 45 ml of paint. If it costs 63p for every 5 ml and 45 ml ÷ 5 ml = 9 the paint costs her 9 × 63p = £5.67)

12 18 seconds (The drone takes 3 s to fly 2 m; 12 m ÷ 2 m = 6 so the drone will take 6 times longer to fly 12 m; 3 s × 6 = 18 s)

Test 6

(pages 14–15)

1 **c** (10% of 35 is 3.5, so 20% is 7 miles)

2 **d** (Total distance = 35 miles + 40 miles = 75 miles; she has driven 50 miles; $\frac{50}{75} = \frac{2}{3}$)

3 4 m (The area of a rectangle is $L \times W = 48\,m^2$; 48 m^2 ÷ 12 m = 4 m)

4 96 m^3 (The volume of a cuboid is $L \times W \times D$ = 12 m × 4 m × 2 m = 96 m^3)

5 64 plants (The perimeter of the pond = 12 m + 12 m + 4 m + 4 m = 32 m. Each plant is 0.5 m apart so 32 m ÷ 0.5 = 64 plants)

6 **d** (If 82 rupees are worth £1 then 82 × 100 = 8200 rupees)

7 **c** (246 dollars ÷ 1.23 = £200)

8 **c** (200 ÷ 1.12 = £178.57)

9–11 Add up the parts of the ratio 2 + 3 + 6 = 11; then divide 11 into 143 seeds to find 13. Finally, multiply each of the parts by 13 to find out how many seeds each girl has.

9 **b** (13 × 2 = 26 seeds)

10 **c** (13 × 3 = 39 seeds)

11 **d** (13 × 6 = 78 seeds)

Test 7

(pages 16–17)

1 £10.02 (Two games cost £24.99 × 2 = £49.98; £60 – £49.98 = £10.02 change)

2 £63.72 (Three games cost £24.99 × 3 = £74.97; Harry bought three games so he receives 15% off. 10% of £74.97 = £7.497; 5% of £74.97 is half of 10% = £3.7485 so 15% = £11.2455; £74.97 – £11.2455 = £63.7245 which rounds to £63.72)

3 £19.99 (Mr Hoskins pays for only 8 games as he gets 2 games free. 8 × £24.99 = £199.92 so the cost per grandchild is £199.92 ÷ 10 = £19.992 which rounds to £19.99)

4 **d** (3 eggs make 12 cakes, 36 ÷ 12 = 3 so she uses 3 times as many eggs to make 36 cakes; 3 eggs × 3 = 9 eggs)

5 **c** (175 g flour makes 12 cakes, 72 ÷ 12 = 6 so she uses 6 times as much flour to make 72 cakes; 175 g × 6 = 1050 g of flour)

6 **c** (150 g sugar makes 12 cakes; 150 ÷ 3 × 2 = 100 g so she can make 12 cakes ÷ 3 × 2 = 8 cakes)

7 Hashmee (Hashmee: 96 pages ÷ 3 = 32 so $\frac{1}{3}$ of the book is 32 pages. Henry: 25% is a quarter so he has read 96 pages ÷ 4 = 24 pages. Harry: 96 pages – 65 pages left = 31 pages read)

8 29 (To find the mean number of pages read by the children, add up the number of pages and then divide by the number of children; 32 + 24 + 31 = 87; 87 ÷ 3 = 29)

9 **d** (If 15 pupils made up 30% of the year group, then 15 ÷ 3 gives 10% of the year group; multiplying this by ten gives 100% of the year group; 15 ÷ 3 × 10 = 50 pupils)

10 **d** (If 24 pupils made up 40% of the year group, then 24 ÷ 4 gives 10% of the year group; multiplying this by ten gives 100% of the year group; 24 ÷ 4 × 10 = 60 pupils)

11 **e** (If 20 pupils made up 25% of the year group, then 20 × 4 gives 100% of the year group; 20 × 4 = 80 pupils)

12 **d** (If 18 pupils made up 15% of the year group, then 18 ÷ 3 gives 5% of the year group; multiplying this by 2 gives 10% then multiplying by 10 again gives 100% of the year group; 18 ÷ 3 × 2 × 10 = 120 pupils)

Test 8

(pages 18–19)

1 160 children (If 40 children = 25% then 100% = 40 children × 4 = 160 children)

2 48 children (160 children = 100% so 10% is 16 children. 30% is 16 children × 3 = 48 children)

3 16 children (10% is 16 children, so 20% is 16 children × 2 = 32 children; 48 – 32 = 16 children)

4–5 1 cm on the map is equivalent to 250 000 cm in reality. Dividing 250 000 cm by 100 then by 1000 gives how many kilometres are represented by 1 cm. 250 000 cm = 2500 m = 2.5 km. Every 1 cm on the map represents 2.5 km in reality.

4 17.5 km (If 1 cm is equivalent to 2.5 km, then 7 cm is equivalent to 17.5 km (7 × 2.5 km = 17.5 km))

5 9.6 cm (If 2.5 km is equivalent to 1 cm, then 24 km is equivalent to 9.6 cm (24 km ÷ 2.5 km = 9.6))

6 **a** $(n - 8)$

7 **b** $(m + 13)$

8 **c** $(m + n + p) \div 3$

9–12 Add up the parts in the ratio to find the total number of parts; 1 + 2 + 3 + 4 = 10. Then divide 10 into 2500 books to find the value of one part; 2500 ÷ 10 = 250. Finally, multiply 250 by each of the parts in the ratio.

9 250 books (Year 3 have 250 × 1 = 250 books)

10 300 books (Year 4 have 250 × 2 = 500 books; 60% are paperback; 10% = 500 ÷ 10 = 50; 60% = 50 × 6 = 300)

11 525 books (Year 5 have 250 × 3 = 750 books; 70% are fiction; 10% = 750 ÷ 10 = 75; 70% = 75 × 7 = 525)

12 120 books (Year 6 have 250 × 4 = 1000 books; 40% are hardback; 10% = 1000 ÷ 10 = 100; 40% = 100 × 4 = 400; 30% of these are factual; 10% of 400 = 40; 30% = 40 × 3 = 120)

Test 9

(pages 20–21)

1–2 Work out how much a kilogram of flour costs for each size of bag. 5 kg bag costs £3.40 so 1 kg costs £3.40 ÷ 5 = 68p

1 kg bag costs £1.80

750 g bag costs £1.40 so 1 kg costs £1.40 ÷ 3 × 4 = £1.87 (rounded)

500 g bag costs 95p so 1 kg costs 95p × 2 = £1.90

1 5 kg bag costs the least per kilogram (68p)

2 500 g bag costs the most per kilogram (£1.90)

3 **b** (115 – 65 = 50)

4 **b** ($\frac{100}{500}$ = 20%)

5 **e** ($\frac{140}{500} = \frac{7}{25}$)

6 89 (The first number plus the second number makes the third number, the second number plus the third number makes the fourth number, and so on; 1 + 2 = 3, 2 + 3 = 5, etc.)

7 56 (The difference increases by one each time; +0, +1, +2, +3, +4, etc.)

8 42 (Alternating multiples of 6 with multiples of 7; 6, 7, 12, 14, 18, 21, 24, 28, 30, 35, 36, 42, **42**)

9–10 To make the m term the same in both equations, multiply the first equation by 4 and the second equation by 3:

$12m + 16b = 4000$ g and $12m + 15b = 3840$ g

Next, subtract one equation from the other to eliminate the m terms. This gives $b = 160$ g.

Next, replace the mass of each metal block b in the first equation to find the mass of the magnets: $3m + (4 \times 160\text{ g}) = 1000$ g; 4 × 160 g = 640 g so take this from 1000 g to find the mass of three magnets; 1000 g – 640 g = 360 g. $3m = 360$ g so each magnet has a mass of 360 g ÷ 3 = 120 g.

9 **a**

10 **c**

Test 10

(pages 22–23)

1 20% ($\frac{30}{150} = \frac{10}{50} = \frac{1}{5} = 20\%$)

2 $\frac{3}{10}$ ($\frac{45}{150} = \frac{9}{30} = \frac{3}{10}$)

3 **c** (Mo buys 33 cases (£20 ÷ 60p = 33.33 which rounds to 33. If Mo sells the 33 cases for £1 each he will have 33 × £1 = £33. He needs to take off the £20 that he spent in buying the cases (£33 – £20 = £13). Mo will have a maximum profit of £13.

4 **d** (120 phone cases cost him 120 × 60p = £72 so £72 cost price is covered when Mo sells 72 cases)

5 **d** (200 phone cases cost him 200 × 60p = £120; 200 cases ÷ 4 = 50 sets. He sells these for £3 each so takes £150. The maximum profit Mo can make selling the cases in sets of four is £150 – £120 = £30)

6–8 The scale means that 1 cm on the map represents 640 000 cm in reality. This is the same as 1 cm representing 6400 m or 1 cm representing 6.4 km.

6 0.25 cm (If 6.4 km is represented by 1 cm on the map, then 1.6 km is represented by 0.25 cm on the map (1.6 ÷ 6.4 = 0.25))

7 153.6 km (If 1 cm is equivalent to 6.4 km, then 24 cm is equivalent to 153.6 km (6.4 km × 24 = 153.6 km))

8 675 km (If 450 km is $\frac{2}{3}$, divide by 2 then multiply by 3 to find 100% of the journey; 450 ÷ 2 = 225; 225 × 3 = 675 km)

9 **c** (To find the mean of the scores, add up the scores and then divide by the number of scores; 17 + 18 + 20 + 16 + 19 = 90; 90 ÷ 5 = 18)

10 **b** (To find the median, order the scores: 16, 17, **18**, 19, 20 then select the middle score of 18, which is Fred)

11 **d** (The range is the largest score minus the smallest score; 20 – 16 = 4)

Test 11

(pages 24–25)

1 Thursday (There were the least sales on Thursday)

2 Saturday (There were the most sales on Saturday)

3 71 (12 + 10 + 10 + 3 + 8 + 14 + 14 = 71 cups of tea)

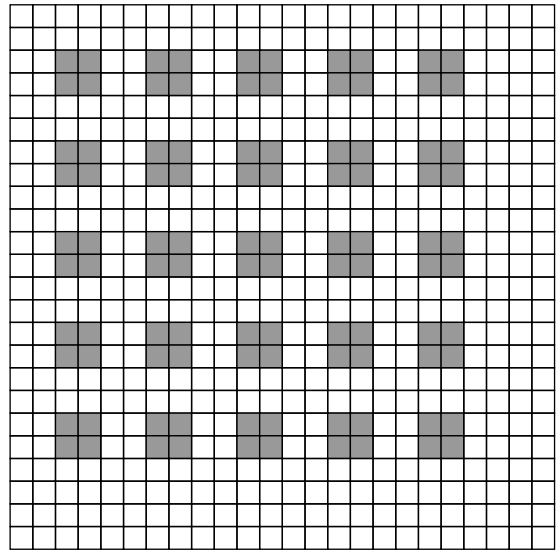
4–6 Divide 184 pupils plus 8 teachers (192 people) by 56 people that each coach can carry; 192 ÷ 56 = 3.428; this must be rounded up to a whole number of coaches so no people are left behind, making 4 coaches in total. Each coach costs £175; £175 × 4 = £700; museum entry for 192 people = 192 × £1.75 = £336; total costs = £700 + £336 = £1036

4 4

5 £1036

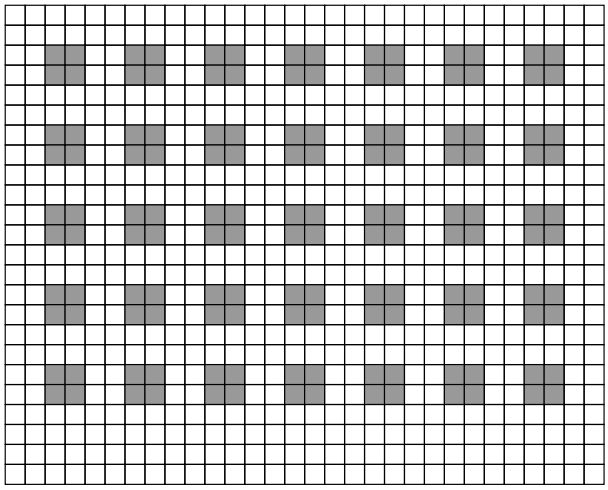
6 £5.40 (£1036 ÷ 192 = £5.40 each when rounded to the nearest pence)

7 **a** (Each table and its chairs need an area of 2 m × 2 m and we need a walkway of 2 m in each direction. We can place 5 tables across and 5 tables down. 5 × 5 tables is a total of 25 tables)



8 **c** (Each table and its chairs need an area of 2 m × 2 m and we need a walkway of 2 m in each direction. We can place 5 tables down, but as we have an extra 6 metres width, we

can fit 7 tables across. 5 × 7 tables is a total of 35 tables)



Test 12

(pages 26–27)

1–3 For one model Jas needs 1 head, 1 body, 3 eyes and 5 legs.

Jas can only make as many models as the maximum number of items that he needs divided into the number of items he has.

1 4 models (Jas has 20 each of head, body, eyes and legs; 20 legs ÷ 5 legs per model = 4 models)

2 6 models (Jas has 31 legs so 31 legs ÷ 5 legs per model = 6 r 1 so 6 whole models)

3 16 heads, 16 bodies, 48 eyes, 80 legs (Multiply each part in the ratio by 16)

4–6 A probability outcomes table is the best way of working these options out. If Alice has two 1–6 dice, these are the options she can score:

	1	**2**	**3**	**4**	**5**	**6**
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

4 **a** (30 single-digit outcomes ÷ 36 total outcomes = $\frac{30}{36} = \frac{5}{6}$)

5 **d** (15 prime number outcomes ÷ 36 total outcomes = $\frac{15}{36} = \frac{5}{12}$)

6 **e** (7 square number outcomes ÷ 36 total outcomes = $\frac{7}{36}$)

7 **d** (If she takes 6 minutes to walk $\frac{3}{5}$ of the way then $\frac{1}{5}$ of the way takes 6 minutes ÷ 3 = 2 minutes; so the whole walk takes 2 minutes × 5 = 10 minutes)

8 **b** (5 km per hour = 5000 m in 60 minutes so she walks 5000 m ÷ 60 minutes = 83.3 metres per minute; 83.3 metres per minute × 10 minutes = 833 m)

9 **e** (Beth walks for 10 minutes a day each way, which is 10 × 2 = 20 minutes per day and 20 × 6 = 120 minutes at the end of 6 days. There are 60 minutes in 1 hour, so 120 minutes = 2 hours. Beth walks 5 kilometres per hour so in 2 hours she walks 10 kilometres. Alternatively, Beth walks from home to the library 6 times, and back from the library to home 6 times, so multiply the answer to Q8 by 12 (833 m × 12 = 9996 m), divide by 1000 to convert to kilometres (9.996 km), then round to the nearest kilometre (10 km))

10 **e** (There are 64 packs × 25 boxes × 2 pallets = 3200 packs of soap)

11 **b** (£1024 costs ÷ £2.50 per pack = 409.60 so Jet needs to sell 410 packs of soap before he makes a profit)

12 **d** (If Jet sells all 3200 packs of soap for £2.50, he makes £3200 × £2.50 = £8000. However, he must subtract the cost of the soap, which is £1024. This leaves him with a maximum profit of £6976)

13 **b** (Divide 3200 packs of soap by 3 to find out how many sets of three Jet can sell: 3200 ÷ 3 = 1066.67, which is 1066 whole sets. Selling these 1066 sets of soap at £5 each = 1066 × £5 = £5330. Finally, take away the cost of the soap to find the maximum profit Jet can make; £5330 – £1024 = £4306)

Test 13

(pages 28–29)

1 13:50 (The 13:50 bus from the station will get to the shops for 14:08)

2 14:23 (The 464 bus gets to the market at 13:58. The next bus to stop at the market gets to the shops at 14:23)

3 10 minutes (14:13 – 14:23)

4–6 The three children start with 60 stickers each (180 ÷ 3 = 60).

4 **d** (Michael gives away $\frac{1}{4}$ (60 – 15 = 45). He gains 12 so has 57)

5 **d** (Brooke gives away 30% (60 – 18 = 42). She gains 15 so has 57)

6 **b** (Stanley gives away 20% (60 – 12 = 48). He gains 18 so has 66)

7 £172 000 (4 rounds down)

8 £172 500 (9 rounds up)

9 £170 000 (2 rounds down)

10 £200 000 (7 rounds up)

11 7 and 12 (7 + 12 = 19, 7 × 12 = 84)

12 4 and 11 (4 + 11 = 15, 4 × 11 = 44)

13 3 and 13 (3 + 13 = 16, 3 × 13 = 39)

14 5 and 6 (5 + 6 = 11, 5 × 6 = 30)

Test 14

(pages 30–31)

1 48 °C (Difference = 39 – –9 = 39 + 9 = 48)

2 33 °C (39 + 32 + 28 = 99; 99 ÷ 3 = 33)

3 –2 °C (–9 + –2 + 5 = –6; –6 ÷ 3 = –2)

4 41 °C (Difference = 32 – –9 = 32 + 9 = 41; Baghdad is 32 degrees warmer than 0 °C and Anchorage is 9 degrees below 0 °C, which is a total of 41 degrees different)

5 80p (2 days × 10p per day = 20p for each book; 20p × 4 = 80p)

6 70p (7 days × 10p per day = 70p)

7 £5.80 (14 days × 10p per day = £1.40 for each book; £1.40 × 3 = £4.20; her change is £10 – £4.20 = £5.80)

8 **c** (2 shirts at £25 each = 2 × £25 = £50; 10% of £50 is £5 so 30% of £50 is £15; £50 – £15 = £35)

9 **d** (£50 – £32.50 = £17.50; £17.50 ÷ £50 = £35 ÷ £100 = 35%)

10 1258 cm² (The area of the sail is (38 cm × 18 cm) ÷ 2 = 342 cm². The area of the material is 40 cm × 40 cm = 1600 cm². The total amount of material left over is 1600 cm² – 342 cm² = 1258 cm²)

11 5 holes (18 cm is the same as 180 mm. 180 mm ÷ 36 mm = 5 holes)

12 75 mm or 7.5 cm (37.5 cm is the same as 375 mm. 375 mm ÷ 5 holes = 75 mm of thread)

Test 15

(pages 32–33)

1 33 (Programme 2: (3 + 8) × 3 = 33)

2 68 (Programme 3: 12 × 4 + 20 = 68)

3 57 (Programme 1: 15 × 3 + 12 = 57)

4 18:08 (5:56 p.m. + 12 min = 6:08 p.m. which is 18:08 in 24-hour time)

5 18:11 (Add 3 minutes because Philip's watch is fast)

6 18:39 (On Philip's watch, he gets home at 18:11 + 20 min + 8 min = 18:39)

7–8 The map scale means that 1 cm on the map represents 45 000 cm in reality. Dividing 45 000 cm by 100 (to make 450 metres) then by 1000 (to make 0.45 km) makes it easier to solve these problems. 1 cm is equivalent to 0.45 km.

7 2.25 km (If 1 cm is equivalent to 0.45 km, then 5 cm is equivalent to 2.25 km (0.45 km × 5 = 2.25 km))

8 13.33 cm (If 0.45 km is represented by 1 cm, then 6 km is represented by 13.33 cm (6 km ÷ 0.45 km = 13.33 cm))

9 **c** (To find the mean height of the rabbits, add up the heights and then divide by the number of rabbits; 35 cm ÷ 5 = 7 cm)

10 **d** (To find the mean mass of the rabbits, add up the masses and then divide by the number of rabbits; 405 g ÷ 5 = 81 g)

11 **b** (To find the range of the masses, subtract the lowest mass from the highest mass; 110 g – 45 g = 65 g)

12 **c** (To find the range of the heights, subtract the shortest height from the tallest height; 9 cm – 5 cm = 4 cm)

Test 16

(pages 34–35)

1 **e** (Adding 10% of the outstanding amount each day that the money is owing gives, 4th Dec: £20 + £2 = £22; 5th Dec: £22 + £2.20 = £24.20; 6th Dec: £24.20 + £2.42 = £26.62)

2 **d** (Adding 10% of the outstanding amount each day that the money is owing gives, Sun: £10 + £1 = £11; Mon: £11 + £1.10 = £12.10; Tue: £12.10 + £1.21 = £13.31)

3 **c** (£9.68 ÷ 110 × 100 = £8.80; £8.80 ÷ 110 × 100 = £8)

4 **c** (720 ÷ 5 × 3 = 432)

5 **b** (720 – 432 = 288; 288 ÷ 2 evenings = 144 pieces per night)

6 **c** (144 pieces ÷ 2.5 = 57.6, or 288 ÷ 5 = 57.6, which rounds up to 58)

7 1.85 m² ((0.75 m × 0.6 m × 2) + (0.6 m × 0.35 m × 2) + (0.75 m × 0.35 m × 2) = 0.9 m + 0.42 m + 0.525 m = 1.845 m; this rounds to 1.85 m². Also accept 18 450 cm²)

8 Yes, Merry does have enough paper. Merry has paper that is 300 cm × 100 cm. Working out the overall area is not helpful as the paper has to fit the shape of the box. The quick way of solving this is to round up each measurement to the nearest 50 cm. That gives us measurements of 100 cm × 50 cm × 100 cm. We can fit 3 × 100 cm across the length of the paper and 1 × 100 cm along the width of the paper so yes, Merry does have enough paper.

9 0.1575 m³ (To find the volume, multiply the three dimensions together (75 cm × 60 cm × 35 cm = 157 500 cm³) and then convert to m³ by dividing by 1 000 000 (157 500 ÷ 1 000 000 = 0.1575 m³). Alternatively, convert the measurement into metres first and then multiply (0.75 × 0.6 × 0.35 = 0.1575 m³))

10 £32 (Add up the £10, £8 and £14)

11 £27.20 (10% of £32 is £3.20. Halve this to find 5%. Add the two values together to make 15%; £3.20 + £1.60 = £4.80; cost after discount = £32 – £4.80 = £27.20)

12 £12.80 (£40 – £27.20 = £12.80)

Test 17

(pages 36–37)

1 **e** (The highest point of the graph is 18 km)

2 **b** (The flat part of the graph at 18 km is from 10:30 to 11:30 which is 1 hour)

3 **d** (The distance does not change from 13:00 to 13:30)

4 **d** (Austin has 70 counters altogether. $\frac{14}{70} = \frac{7}{35} = \frac{1}{5} = \frac{2}{10} = 20\%$)

5 **c** (27 + 12 = 39 so probability of white or blue = $\frac{39}{70}$)

6 £22 (£12 + £10 = £22 with the £5 book free)

7 £20.25 (Total cost = £27; 25% is $\frac{1}{4}$ so $\frac{1}{4}$ of £27 is £6.75; £27 – £6.75 = £20.25)

8 £19.75 (£40 – £20.25 = £19.75)

9–12 Begin with the four shapes that are the same. The four dark grey boxes have a total mass of 344 g so dividing this by four gives the mass of one box: 344 ÷ 4 = 86 g. Next, solve the top-left set by taking 86 g from 737 g and then dividing the answer by three to find mass of the pale grey cylinders: 737 g – 86 g = 651 g; 651 g ÷ 3 = 217 g. Next, use the same process for solving the bottom-left set to find the mass of the white cylinders: 447 g – 86 g – 217 g = 144 g; 144 g ÷ 2 = 72 g. Finally, solve the top-right set to find the mass of the dark grey cylinders: 450 g – 72 g – 72 g = 306 g. 306 g ÷ 2 = 153 g.

9 217 g

10 86 g

11 72 g

12 153 g

13 132 g (To find the mean, add up the four masses and then divide the answer by four: 528 ÷ 4 = 132 g)

Test 18

(pages 38, 59)

1 66 m² ((15 m × 4 m) + (3 m × 4 m ÷ 2) = 60 m² + 6 m² = 66 m²)

2 10 times larger (60 m² ÷ 6 m² = 10)

3 £231.12 (The cost of the stones is £263.90 (145 × £1.82). There is a 20% discount to subtract (10% of £263.90 is £26.39, so 20% is £26.39 × 2 = £52.78). After the discount the cost is therefore £263.90 – £52.78 = £211.12. Mrs Basley doesn't spend over £275 so she has to add on £20 for delivery. £211.12 + £20 = £231.12)

4 **c** (To find the mean mass of the dogs, add up the masses and then divide by the number of dogs; 32 kg + 60 kg + 16 kg + 48 kg + 4 kg = 160 kg; 160 kg ÷ 5 = 32 kg)

5 **a** (Twinkle's mass is the middle value)

6–8 Begin with the known number: 13 toffees. Then express $\frac{2}{5}$ as a percentage; $\frac{2}{5}$ = 40%. Next, add together the percentages; 25% + 30% + 40% = 95% so the 13 toffees are 5% of the total number of sweets.

10% of the sweets = 13 × 2 = 26; total number of sweets = 100% of the sweets = 26 × 10 = 260

6 65 sweets are fizzy fruits (260 sweets ÷ 100 × 25 = 65; OR: 25% = 5 × 5% so 25% of the sweets = 5 × 13 = 65)

7 104 sweets are candy canes (260 sweets ÷ 100 × 40 = 104; OR: 40% = 8 × 5% so 40% of the sweets = 8 × 13 = 104)

8 78 sweets are mints (260 sweets ÷ 100 × 30 = 78; OR: 30% = 6 × 5% so 30% of the sweets = 6 × 13 = 78)

9 **d** (Danni has 84 balls of black wool ÷ 3 balls = 28. Danni needs 3 balls to make 10 sheep so 28 × 10 = 280 sheep)

10 **b** (Danni needs 5 balls of brown wool to make 10 dogs so $2\frac{1}{2}$ balls of brown wool would make 5 dogs. 25 dogs ÷ 5 dogs = 5 so she needs 5 × $2\frac{1}{2}$ = $12\frac{1}{2}$ balls of brown wool)

11 **a** (Danni needs $\frac{1}{4}$ of a ball of black wool to make 10 polar bears so to make 40 polar bears she needs $\frac{1}{4}$ × 4 = 1 ball of black wool)

12 **d** (Danni needs 8 balls of white wool to make 10 polar bears. She has 50 balls of white wool, 50 ÷ 8 = 6.25; multiply this by 10 as each proportion makes 10 polar bears; 6.25 × 10 = 62.5 polar bears which rounds down to 62 as she cannot make half a polar bear)

Test 19

(pages 60–61)

1 No, Michael is incorrect because in Year 6 the boys read more books than the girls.

2 Yes, Jodie is correct because there are more books read in Years 5 and 6 (60 books) than in Years 3 and 4 (47 books).

3 4.5 (Year 3 = (10 + 12) ÷ 2 = 11; Year 4 = (12 + 13) ÷ 2 = 12.5; Year 5 = (14 + 15) ÷ 2 = 14.5; Year 6 = (16 + 15) ÷ 2 = 15.5; 15.5 – 11 = 4.5)

4 **d** (In the formula $2p + 8 = s$ replace p with 12 guests; (2 × 12) + 8 = size of cake; 24 + 8 = 32 cm^3)

5 **c** (In the formula $2p + 8 = s$ replace p with 85 guests; (2 × 85) + 8 = size of cake; 170 + 8 = 178 cm^3)

6 **d** (In the formula $2p + 8 = s$ replace s with 420 cm^3; (2 × p) + 8 = 420; 420 – 8 = 412; 412 ÷ 2 = 206 guests)

7 64 (The cube numbers with two digits are 27 and 64; 64 is the number that is also a square)

8 368 and 360 (First divide the number in two: 728 ÷ 2 = 364; then, to make a difference of 8, add 4 to one number and subtract 4 from the other: 364 + 4 = 368; 364 – 4 = 360)

9 92 (13 × 3 = 39; 39 + 7 = 46; 46 × 2 = 92)

10 140 (21 × 3 = 63; 63 + 7 = 70; 70 × 2 = 140)

11 218 (34 × 3 = 102; 102 + 7 = 109; 109 × 2 = 218)

Test 20

(pages 62–63)

1 **e** (Ingredients are for 50 cheese sticks so she needs to increase the butter in proportion to make 175 cheese sticks. 50 cheese sticks ÷ 2 = 25 sticks. 175 ÷ 25 = 7 so she needs 150 g ÷ 2 × 7 = 525 g butter)

2 **a** (200 g of cheese makes 50 cheese sticks, but Mrs Cherry only has 40 g. 200 g ÷ 40 g = 5, so she can only make $\frac{1}{5}$ of 50 cheese sticks. $\frac{1}{5}$ of 50 = 10 cheese sticks)

3 70 000 cm^3 (Volume = 40 cm × 35 cm × 50 cm = 70 000 cm^3)

4 10 300 cm^2 (Surface area = (40 cm × 35 cm × 2) + (40 cm × 50 cm × 2) + (35 cm × 50 cm × 2) = 10 300 cm^2)

5 Yes, Juliet does have enough paper. (Juliet has paper that is 200 cm × 150 cm. Working out the area is not helpful as the paper has to fit the shape of the box. The quick way of solving this is to round up each measurement to 50 cm. You can then fit four 50 cm by 50 cm squares along the length and three 50 cm by 50 cm

squares along the width, so Juliet does have enough paper)

6 **c** (658 flyers ÷ 14 roads = 47 houses per road)

7 **a** (120 flyers in 60 minutes = 2 flyers per minute)

8 **b** (658 flyers ÷ 2 flyers per minute = 329 minutes or 5 h 29 min)

9 **c** (Yanick is paid £1 (1p × 100) for the first 100 flyers, £2 (2p × 100) for the second 100, £3 (3p × 100) for the third 100, £4 (4p × 100) for the fourth 100, £5 (5p × 100) for the fifth 100 and £6 (6p × 100) for the sixth 100; £1 + £2 + £3 + £4 + £5 + £6 = £21. He is paid 7p per flyer for the remaining 58 flyers (7p × 58 = £4.06). £21 + £4.06 = £25.06)

10 30 000 (20 pencils × 125 boxes × 12 cartons × 1 pallet = 30 000 pencils)

11 3334 (£900 ÷ 27p = 90 000 ÷ 27 = 3333.3 recurring, so 3334 pencils need to be sold to break even)

12 £7200 (30 000 × 27p = £8100; £8100 – £900 = £7200)

13 £6900 (15 000 × 27p = £4050; 15 000 × 25p = £3750; £4050 + £3750 = £7800; £7800 – £900 = £6900)

Test 21

(pages 64–65)

1–2 For every 66 ml of paint, Rosalind needs to add 33 ml × 5 of water. This gives 66 ml + 165 ml = 231 ml of mixed paint.

Every tube of paint is 33 ml. A ratio table like this can be helpful in questions like these.

1 495 ml of water (6 × 33 ml = 198 ml of paint; 198 is 2 parts; the water is 5 parts; 198 ÷ 2 × 5 = 495 ml of water)

2 400 ml of paint (1 litre of water is 5 parts; 1 part = 1000 ml ÷ 5 = 200 ml; the paint is 2 parts; 200 ml × 2 = 400 ml)

3 **c** (The 'Dairy' sector is less than half of the size of the 'Meat, fish and vegetarian alternatives' sector so we know that the answer cannot be **d** or **e**. The 'Dairy' sector is not as small as a quarter of the 'Meat, fish and vegetarian alternatives' sector so we know the answer cannot be **a** or **b**. The sector is a little smaller than half of the 'Meat, fish and vegetarian alternatives' sector so we know that **c** is the correct answer)

4 **d** (The 'Vegetables, salad and fruit' sector is slightly less than half of the pie chart (50%) and more than a third (33%) so it must be 45%)

5 **c** (The 'Meat, fish and vegetarian alternatives' sector is a quarter of the pie chart = 90°)

6 £21.85 (three cake tins = £18; icing kit = £5; £18 + £5 = £23; 5% off when you spend £20; 10% is £2.30, so 5% is £1.15; £23 – £1.15 = £21.85)

7 £54.40 (four towels = £32, travel case = £36, £32 + £36 = £68; 20% off when you spend £60; 10% is £6.80, so 20% is £13.60; £68 – £13.60 = £54.40)

8 £13.20 (one kettle at £24 + one toaster at £28 = £52; 10% off when you spend £40; £52 – £5.20 = £46.80; £60 – £46.80 = £13.20 change)

Number of parts (tubes) of paint	Amount of paint in ml	Number of parts of water	Amount of water in ml	Number of parts of mixed paint	Amount of mixed paint in ml
2	66	5	165	7	231
4	132	10	330	14	462
6	198	15	495	21	693
8	264	20	660	28	924
10	330	25	825	35	1155

9–10 Multiply the first equation by 3 then subtract the second equation to eliminate c: $15c + 9b =$ £9.75; $15c + 1b =$ £4.55

$8b =$ £9.75 – £4.55 = £5.20 so price of each book $b =$ £5.20 ÷ 8 = 65p

Next, replace the cost of the book in the second equation to find the cost of a crayon, c: $15c$ + 65p = £4.55

Finally, subtract 65p from each side: $15c =$ £3.90 so one crayon costs £3.90 ÷ 15 = 26p)

9 65p

10 26p

11–13 To solve this type of question it is easiest to begin with what you know. Sushi is about to start nursery, so she must be 1, 2, 3 or 4. Ben is 3 years older than Sushi, so he must be 4, 5, 6 or 7. Reuben is 5 years older than Ben, so he must be 9, 10, 11 or 12. Reuben is $\frac{1}{4}$ of his mother's age, so multiply his possible ages by 4 to find out his mother's possible ages: 36, 40, 44 or 48. The father is 5 years older than the mother, so he must be 41, 45, 49 or 53.

Ben is $\frac{1}{9}$ of his father's age, so multiply Ben's possible ages (4, 5, 6, 7) by 9 and see if the answers match his father's possible ages (41, 45, 49, 53). 4 × 9 = 36 (not a match); 5 × 9 = 45 (a match); 6 × 9 = 54 (not a match); 7 × 9 = 63 (not a match). As there is only one match, you now know everyone's age. Their father is 45, their mother is 40, Reuben is 10, Ben is 5 and Sushi is 2.

11 10

12 45

13 2

Test 22

(pages 66–67)

1 b (To find the mean mass of the gem stones, add up the masses and then divide by the number of stones; 28 + 47 + 63 + 15 + 104 + 20 + 83 = 360; 360 ÷ 7 = 51.43 g which rounds to 51 g)

2 e (To find the range of the masses, subtract the lightest mass from the heaviest mass; 104 g – 15 g = 89 g)

3 8 350 000 km (When rounding 8 354 612 km to the nearest ten thousand, you need to look at the value of the number in the thousands column. This is 4 so round down)

4 978 674 729 221 (978 675 642 000 – 912 779 = 978 674 729 221)

5 12 800 000 km (When rounding 12 788 314 km to the nearest hundred thousand, you need to look at the value of the number in the ten thousands column. This is 8 so round up)

6 e (The area of the square car park is 750 m × 750 m = 562 500 m^2)

7 d (Each side of the car park is 0.75 km which is the same as 750 m. The width of each car park space is 2.7 m; 750 m ÷ 2.7 m = 277.78 which rounds down to 277 whole car parking spaces in each row. The length of each car parking space is 12.2 m; 750 m ÷ 12.2 m = 61.475 which rounds down to 61 whole car parking spaces in each column. Total number of car parking spaces = 277 × 61 = 16 897)

8 c (16 897 ÷ 100 × 85 = 14 362.45, which rounds to 14 362)

9 b (220 mini monsters ÷ 4 = 55, so 55 mini monsters have a green ribbon in their hair. 55 mini monsters ÷ 5 = 11, so 11 mini monsters have a green ribbon in their hair AND have a silver antenna)

10 a (220 mini monsters ÷ 5 = 44, so 44 mini monsters have a silver antenna. 44 mini monsters ÷ 9 = 4.89; cannot have a part of a monster so this rounds down to 4 monsters having a silver antenna AND a purple curly tail)

11 e (220 mini monsters ÷ 4 = 55, so 55 mini monsters have a green ribbon in their hair. 55 mini monsters ÷ 5 = 11, so 11 mini monsters have a green ribbon in their hair AND have a silver antenna. 11 ÷ 9 = 1.22; cannot have a part of a monster so 1 monster has a green ribbon in its hair AND a silver antenna AND a purple curly tail)

Test 23

(pages 68–69)

1 a (If 57 is $\frac{3}{4}$ of the queue, then $\frac{1}{4}$ of the queue = 57 ÷ 3 = 19; the whole queue = 19 × 4 = 76)

2 d (If 24 minutes = 20% then 100% = 24 × 5 = 120 minutes)

3 **b** (18:10 – 17:40 = 30 minutes; 120 minutes ÷ 30 minutes = 4; 100 ÷ 4 = 25%)

4 24, 36, 48 (12 × 2 red beads = 24; 12 × 3 white beads = 36 beads; 12 × 4 striped beads = 48)

5 No, Samuel does not have enough beads to make 35 monsters. (35 × 2 red beads = 70; 35 × 3 white beads = 105 beads; 35 × 4 = 140 striped beads. Samuel has enough red beads and white beads, but he does not have enough striped beads)

6 £202.80 (Work out the cost of one monster: (2 × 13p) + (3 × 17p) + (4 × 23p) = 26p + 51p + 92p = £1.69; cost of 120 monsters = 120 × £1.69 = £202.80)

7–8 Start by creating two equations where x = mass of one onion in grams and p = mass of one parsnip in grams.

$5x + p = 680$ and $x + 4p = 440$

Then multiply the first equation by 4 to make the p term the same in both equations.

$(5x + p = 680) \times 4 = 20x + 4p = 2720$

Next, subtract one equation from the other to eliminate the p terms.

$20x + 4p = 2720$

$-\ x + 4p = 440$

so $19x \quad = 2280$

Next, divide by 19 to find the mass of one onion: $x = 2280 \div 19 = 120$ (g)

Finally, replace the mass of onions at 120 g each to find the mass of each parsnip:

$(5 \times 120) + p = 680$

$600 + p = 680$

680 – 600 = 80 so the mass of one parsnip is 80 g

7 **c**

8 **b**

9 9 and 3 (9 squared is 81 and 3 cubed is 27)

10 7 and 4 (7 squared is 49 and 4 cubed is 64)

11 8 and 2 (8 squared is 64 and 2 cubed is (0)8)

12 6 and 1 (6 squared is 36 and 1 cubed is (0)1)

Test 24

(pages 70–71)

1–3 Work out the possible numbers first:

Square numbers less than 40 (1, 4, 9, 16, 25, 36)

All of the number must be even (4, 16, 36)

Cube numbers less than 40 (1, 8, 27)

All of the numbers must be even (8)

Now we are looking for the ratio 1 : 2 : 3 so we can look at the following combinations:

4 : 8 : 12 – this is a possible answer as 4 is a square number and 8 is a cube number.

8 : 16 : 24 – this isn't a possible answer as the total comes to 48 and we need a total number of less than 40.

1 4

2 8

3 12

4–5 The scale means that 1 cm on the map represents 80 000 cm in reality. This is the same as 1 cm representing 800 m or 1 cm representing 0.8 km.

4 **d** (If 1 cm is equivalent to 0.8 km, then 1.6 km is represented by 2 cm on the map (1.6 km ÷ 0.8 km = 2 cm))

5 **b** (If 1 cm is equivalent to 800 m, then 0.75 cm is equivalent to 600 m (800 m ÷ 4 × 3 = 600 m))

6 **e** (Rings £9.02 profit; necklaces £3.40 profit; bracelets £7.20 profit; hair clips loss of 73p; brooches £42.33 profit; so brooches made the most profit)

7 **b** (Necklaces made a 40% profit: £8.50 ÷ 100 × 40 = £3.40)

8 **b** (£0.73 is one tenth of £7.30, so loss = 10%)

9 2592 (24 packets × 36 boxes × 3 pallets = 2592 packets of batteries)

10 1080 (£648 per pallet × 3 pallets = £1944; Mr Ramsay sells a packet of batteries for £1.80; £1944 ÷ £1.80 = 1080 so Mr Ramsay has to sell 1080 packets of batteries before he is able to make a profit)

11 £2721.60 (If he sells 2592 packets of batteries at £1.80, he gets £4665.60; taking off the cost of £1944, the total profit possible is £2721.60; OR: once he has covered his costs, the money he makes from the remaining batteries is all profit: 2592 – 1080 = 1512; 1512 × £1.80 = £2721.60)

12 £36.72 (24 packets costing £1.80 each = £43.20; discount is 15%; 10% = £4.32, so 5% = £2.16, so total discount = £4.32 + £2.16 = £6.48; customer pays £43.20 – £6.48 = £36.72)

Test 25

(pages 72–73)

1 **c** (Cost of order = 2 × £4.75 + £8.99 + £3.75 = £22.24)

2 **e** (Cost of order = £4.75 + £8.99 + £2.20 + £3.75 = £19.69;

Mr Walker pays with £20 so his change = £20 – £19.69 = 31p)

3 **b** (Cost of order = 2 × (£4.75 + £8.99) + £3.75 = £31.23;

Janice pays with £40 so her change = £40 – £31.23 = £8.77)

4–5 For these questions, a grid is an easy way of tracking movements.

4 **b**

5 **e**

6 13 minutes

7 40 °C

8 11 minutes (20 minutes – 9 minutes = 11 minutes)

Test 26

(pages 74–75)

1 4 and 6 (4 + 6 = 10; 4 × 6 = 24)

2 7 and 8 (7 + 8 = 15; 7 × 8 = 56)

3 9 and 2 (9 + 2 = 11; 9 × 2 = 18)

4 300 cm (350 cm – 50 cm = 300 cm)

5 175 cm (To work out the median, first put the heights in order: 50, 75, 150, **150**, **200**, 300, 300, 350; there are two middle values, so median = (150 cm + 200 cm) ÷ 2 = 175 cm)

6 **c** (If 1 mile = 1.6 km, then 100 miles = 160 km)

7 **a** (68 miles ÷ 100 miles = 68%; 100% – 68% = 32%)

8 **c** (105 minutes ÷ 68 miles = 1.54 minutes per mile; 100 miles × 1.54 minutes per mile = 154 minutes; 12:30 p.m. + 154 minutes = 3:04 p.m.)

9–11 The scale 1 : 720 000 means that 1 cm represents 720 000 cm. This is the same as 1 cm representing 7200 m or 1 cm representing 7.2 km.

9 **b** (If 7.2 km is represented by 1 cm on the map, then 3.6 km is represented by 0.5 cm on the map)

10 **c** (If 1 cm on the map is equivalent to 7.2 km, 0.5 cm on the map is equivalent to 7.2 km ÷ 2 = 3.6 km; so 1.5 cm on the map is equivalent to 7.2 km + 3.6 cm = 10.8 km)

11 **a** (Take the total of 10.8 km, then divide it into thirds = 3.6 km)

12 **c** (If 7.2 km is represented by 1 cm on the map, then 108 km is represented by 108 ÷ 7.2 = 15 cm)

Test 27

(pages 76–77)

1 80 pupils (If 30% of Year 4 = 24 pupils, then 8 pupils = 10% so 100% = 8 pupils × 10 = 80 pupils)

2 45 pupils (If $\frac{3}{5}$ = 27 pupils, then 9 pupils = $\frac{1}{5}$ so the total number of pupils = 9 pupils × 5 = 45 pupils)

3 209 pupils (If $\frac{1}{4}$ of year 6 = 21 pupils, then 21 × 4 = 84 pupils. 80 pupils in Year 4 + 45 pupils in Year 5 + 84 pupils in Year 6 = 209 pupils)

4–6 Garden centre buys 4 fountains × 5 boxes × 6 cartons × 2 pallets = 240 fountains. They pay for 2 pallets at £2700 per pallet = £5400

4 **d** (To cover their costs they must sell £5400 ÷ £75 = 72 fountains)

5 **d** (£75 × 240 fountains = £18 000; total profit = £18 000 – £5400 = £12 600)

6 **c** (Sale price at 10% off = £75 ÷ 100 × 90 = £67.50; total money taken = £75 × 120 fountains + £67.50 × 120 fountains = £9000 + £8100 = £17 100; profit = £17 100 – £5400 = £11 700)

7 **a** (120 stickers ÷ 5 = 24)

8 **b** (120 stickers ÷ 5 = 24; 24 ÷ 4 = 6)

9 **b** (To find the profit, take the 'cost to make' from the 'price sold'; for the Spaceman figure, profit = £30.50 – £8.94 = £21.56)

10 **d** (Profit = price sold for – cost to make; this difference is greatest for the Skater figure)

11 **e** (Multiply the 'cost to make' by 3 to find a selling price with a 200% profit; for the Zombie figure, £7.25 × 3 = £21.75)

Test 28

(pages 78–79)

1 **b** (2 cm × 2 cm × 2 cm = 8 cm^3)

2 **d** (2 cm × 2 cm × 6 faces = 24 cm^2)

3 **a** (2 × 2 × 2 = 8 cm^3; 4 × 4 × 4 = 64 cm^3; $\frac{8}{64} = \frac{1}{8}$)

4 **d** (64 cm^3 – 8 cm^3 = 56 cm^3)

5–6 For this scale, 1 cm on the pattern represents 4 cm in reality.

5 16 cm (If 4 cm in reality is represented by 1 cm on the pattern, then 64 cm is represented by 16 cm on the pattern (64 cm ÷ 4 = 16 cm))

6 84 cm (If 1 cm on the pattern is equivalent to 4 cm in reality, then 21 cm on the pattern is equivalent to 84 cm in reality (21 cm × 4 = 84 cm))

7 6 cm (If 4 cm in reality is represented by 1 cm on the pattern, then 24 cm is represented by 6 cm on the pattern (24 cm ÷ 4 = 6 cm))

8 £45.74 (Sam has 3 letters so cost = £2.25 × 3 + £38.99 = £45.74)

9 £7.51 (Betina has 6 letters so cost = £2.25 × 6 + £38.99 = £52.49;

change = £60 – £52.49 = £7.51)

10 No (Fitzgerald has 10 letters so cost = £2.25 × 10 + £38.99 = £61.49; OR: 4 more letters than Betina would cost £2.25 × 4 = £9 which is more than the change Betina received)

11 **c** (To find the mean length of the snails, add up the lengths and divide by the number of snails; 90 cm ÷ 5 = 18 cm)

12 **e** (Take away the difference between the length and the height of each snail. Eric has the smallest difference, 9 cm)

13 **d** (Range = longest length – shortest length = 20 cm – 16 cm = 4 cm)

Test 29

(pages 80–81)

1 105.1 m (car and space behind = 430 cm + 50 cm = 480 cm; 480 cm × 22 cars = 10 560 cm; the 50 cm space **after** the last car is not included in the measurement of cars so length of line = 10 560 – 50 = 10 510 cm or 105.1 m)

2 £423 500 (22 cars × £19 250 = £423 500)

3 2.5 kg

4 160 cm (42 kg ÷ 7 days = 6 kg per day)

5 232.5 kg (2 metres corresponds to 7.5 kg food per day; 31 days × 7.5 kg = 232.5 kg)

6 **a** (It does not matter whether you travel east or north first of all as the result will be the same)

7 **c** (The vets' lies south-east from the doctors')

8 **c** (The office lies north-west from the café)

Test 30

(pages 82–83)

1–3 For these questions, start with the 3 grey triangles: 561 g ÷ 3 = 187 g

Next, look at the 2 black circles and the grey triangle: 657 g – 187 g = 470 g so each black circle weighs 470 g ÷ 2 = 235 g

Next, replace the circle to find the mass of the diamond: 493 g – 235 g = 258 g; 258 g ÷ 2 = 129 g

1 129 g

2 235 g

3 187 g

4 **c** (If I am in 9th place with three others, the four of us take up places 9, 10, 11 and 12; 52 – 12 = 40)

5 **d** (Schwartz came 9th, alongside 3 other cars who crossed the finishing line at exactly the same time. So 3 cars came equal to Schwartz and 8 cars did better; 3 + 8 = 11. There were 52 cars in total, so $\frac{11}{52}$ came equal or better than Schwartz)

6–7 Start by working out the cost of 5 tins at each shop.

Shop 1: £14 × 5 tins = £70

Shop 2: £16 × 5 tins = £80; 15% of £80 = £12; £80 – £12 = £68

Shop 3: £20 × 4 tins = £80 + 1 tin free

6 **b**

7 **e**

8 **d** (Work out the cost of 6 tins at each shop. Shop 1: 6 × £14 = £84; Shop 2: 6 × £16 = £96, taking 15% off gives £96 – £14.40 = £81.60; Shop 3: 2 × (£20 × 2) + 2 tins free = £80; when there are 2 tins free Shop 3 becomes the cheapest deal)

9 **b**

10 **e**

11 **b**

PUZZLE ANSWERS

Puzzle 1

(page 84)

a 0.6508 + 0.3492 = **1**

b 2^2 = **4**

c The 4th prime number is **7**

d $2\frac{3}{4} \div \frac{1}{4}$ = **11**

e 50 × 0.28 = **14**

f 39.26 ÷ 392.6 = **10**

g $14\frac{3}{8} + 2\frac{10}{16}$ = **17**

h 4328 × 0 = **0**

The word revealed is 'Hello'.

10	12	8	0	15	9	6	5	3	11	19	14	20	2	6	19	20	16
4	2	13	17	16	5	2	9	15	17	5	7	6	16	9	3	15	12
17	15	5	11	2	3	13	5	2	10	8	17	2	3	2	13	6	2
1	11	14	4	13	1	17	4	16	4	2	1	2	17	17	0	10	11
0	4	10	7	8	10	6	4	2	1	9	4	16	11	16	18	5	10
11	3	9	1	2	0	1	14	13	14	3	7	12	14	9	2	13	4
14	12	2	14	6	7	8	5	6	7	16	10	3	14	15	12	9	7
4	5	8	7	3	11	3	7	12	10	2	4	13	11	3	8	2	14
17	3	6	10	12	14	14	10	5	4	6	4	5	4	11	7	14	10

Puzzle 2

(page 85)

1 384 (There are 32 rows × 8 seats × 2 sides of the aisle. 32 × 8 × 2 = 512 seats. If 512 seats are 100%, then 50% is 512 ÷ 2 = 256; 25% is 256 ÷ 2 = 128; so 75% = 256 + 128 = 384 (OR 75% = 100% – 25%; 512 – 128 = 384)

2 There are **20** red roses, **32** white roses and **20** lilies. (Start with what you know: carnations are 10% of the bouquet and there are 8 of them. If 8 = 10%, then 100% of bouquet = 8 × 10 = 80 flowers.

Red roses are 25%: 80 ÷ 4 = 20

White roses are $\frac{2}{5} = \frac{4}{10}$: 80 ÷ 10 × 4 = 32

Lilies make up the rest: 8 + 20 + 32 = 60 so there are 20 lilies)

3 66 (The first person shakes hands with 11 people. The second person shakes hands with 10 people as they have already shaken hands with the first person. The third person shakes hands with 9 people as they have already shaken hands with the first and second person. This pattern follows so the calculation is 11 + 10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 66)

4 36 litres of sparkling water (250 ml × 168 glasses = 42 000 ml = 42 litres; the ratio 1 : 6 has 7 parts so one part = 42 litres ÷ 7 = 6 litres; sparkling water is 6 parts of the drink, so need 6 × 6 litres = 36 litres)

5 30 000 cm^3 (30 cm × 30 cm × 6 cm = 5400 cm^3; 40 cm × 40 cm × 6 cm = 9600 cm^3; 50 cm × 50 cm × 6 cm = 15 000 cm^3; 5400 cm^3 + 9600 cm^3 15 000 cm^3 = 30 000 cm^3)

Puzzle 3

(page 86)

The ratio of sheep is 3 : 1 : 7 and there is a total of 132 sheep.

The number of parts = 3 + 1 + 7 = 11 so one part = 132 sheep ÷ 11 = 12 sheep. This means that there are 36, 12 and 84 sheep in Fields 1, 2 and 3.

1 There are 36 sheep in Field 1.

2 There are 12 sheep in Field 2.

3 There are 84 sheep in Field 3.

4 There are 22 white, male sheep. ($\frac{2}{3}$ of the sheep are white; 132 ÷ 3 × 2 = 88; $\frac{1}{4}$ of the sheep are male; 88 ÷ 4 = 22 sheep that are white and male)

5 There are 33 black, female sheep. ($\frac{1}{3}$ of the sheep are black; 132 ÷ 3 = 44; $\frac{3}{4}$ of the sheep are female; 44 ÷ 4 × 3 = 33 sheep that are black and female)

6 Field 1 = 20, Field 2 = 40, Field 3 = 60. (Add together the ratios (1 + 2 + 3 = 6) and divide this number into the total number of lambs (120 ÷ 6 = 20). Then multiply this number with each of the ratios above. Field 1 has 20 lambs added (20 × 1); Field 2 has 40 lambs added (20 × 2) and Field 3 has 60 lambs added (20 × 3)).

Puzzle 4

(page 87)

Position	Country	Score
1st	Sweden	84
2nd	Iceland	76
3rd	Portugal	68
4th	France	65
5th	Italy	60
6th	England	56
7th	Spain	53
8th	Germany	40
9th	Poland	27
10th	Greece	19

Puzzle 5

(page 88)

Other examples are possible as long as each diagonal, row and column add up to the magic number.

8	1	6
3	5	7
4	9	2

13	12	17
18	14	10
11	16	15

–1	–2	3
4	0	–4
–3	2	1

Puzzle 6

(page 89)

Other pairs are possible as several fractions are equivalent to $\frac{1}{2}$, for example.

Fractions that add up to $\frac{2}{3}$:

$(\frac{1}{3} + \frac{2}{6})$ $(\frac{3}{9} + \frac{4}{12})$ $(\frac{1}{12} + \frac{7}{12})$

Fractions that add up to $\frac{5}{6}$:

$(\frac{4}{6} + \frac{1}{6})$ $(\frac{2}{12} + \frac{2}{3})$ $(\frac{5}{12} + \frac{5}{12})$

Fractions that add up to $\frac{7}{8}$:

$(\frac{1}{2} + \frac{3}{8})$ $(\frac{5}{8} + \frac{3}{12})$ $(\frac{1}{8} + \frac{3}{4})$

Fractions that add up to 1 whole:

$(\frac{6}{12} + \frac{2}{4})$ $(\frac{3}{6} + \frac{4}{8})$ $(\frac{8}{9} + \frac{1}{9})$

Fractions that add up to $1\frac{1}{2}$:

$(\frac{10}{12} + \frac{8}{12})$ $(\frac{6}{8} + \frac{9}{12})$ $(\frac{6}{9} + \frac{5}{6})$

Puzzle 7

(page 90)

Pyramid 1 – the operation is addition.

	3.10	
1.74		1.36
0.91	0.83	0.53

Pyramid 2 – the operation is multiplication.

	5472	
76		72
19	4	18

Pyramid 3 – the operation is multiplication.

	$\frac{12}{800}$ or $\frac{3}{200}$	
$\frac{6}{40}$		$\frac{2}{20}$
$\frac{3}{8}$	$\frac{2}{5}$	$\frac{1}{4}$

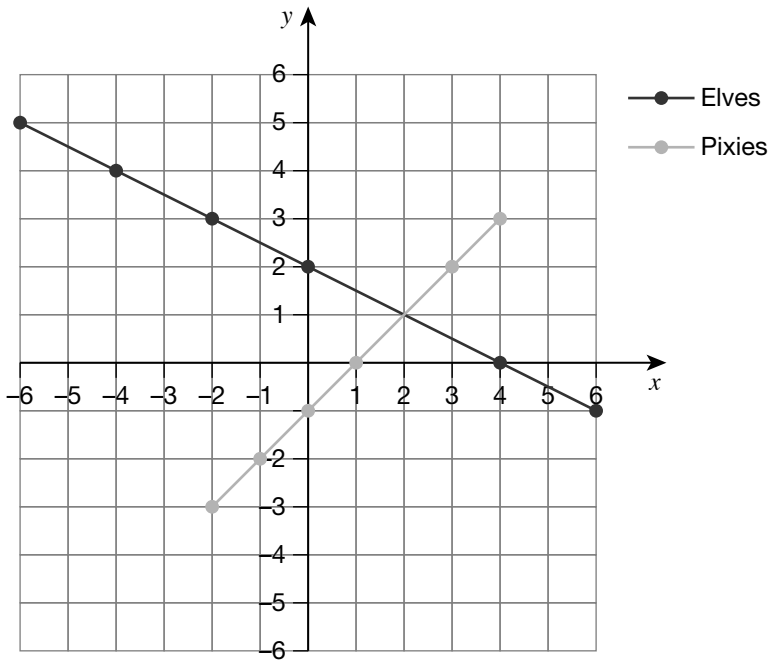
Pyramid 4 – the operation is addition.

	$1\frac{1}{9}$	
$\frac{2}{3}$		$\frac{4}{9}$
$\frac{1}{3}$	$\frac{2}{6}$	$\frac{1}{9}$

Puzzle 8

(page 91)

1



2

Elves	Coordinates	Pixies	Coordinates
Hefty	(–6, 5)	Hilby	(4, 3)
Nodkin	(–4, 4)	Lefty	(3, 2)
Hippy	(–2, 3)	Mully	(1, 0)
Russ	(0, 2)	Dippy	(0, –1)
Gully	(4, 0)	Bilbo	(–1, –2)
Muss	(6, –1)	Toggle	(–2, –3)

3 Bodkin and Boggle live at (2, 1)

Puzzle 9

(page 92)

To solve these riddles, use a process of elimination.

Two-digit square numbers are: 16, 25, 36, 49, 64, 81

The first digit is larger than the second: ~~16~~, ~~25~~, ~~36~~, ~~49~~, 64, 81

I am an even number: ~~16~~, ~~25~~, ~~36~~, ~~49~~, 64, ~~81~~

I must be 64.

Three-digit cube numbers are: 125, 216, 343, 512, 729

I am an odd number: 125, ~~216~~, 343, ~~512~~, 729

My first digit is 1: 125, ~~216~~, ~~343~~, ~~512~~, ~~729~~

I must be 125.

Two-digit prime numbers are: 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97

My two digits add up to 16: ~~11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73,~~ 79, ~~83, 89,~~ 97

My first digit is smaller than my second.

I must be 79.

Puzzle 10

(page 93)

Task 1

 = £3.20  = £2.75  = £4.40

£1.65 (£4.40 – £2.75 = £1.65)

Task 2

8:45 (8:10 + 8 minutes = 8:18; 8:18 + 24 minutes = 8:42; 8:42 + 3 minutes = 8:45)

Task 3

1.86 kg (4.32 kg = 4320 g; add up the biscuits, coffee, marmalade and flour (2460 g) and subtract this from the total mass of the shopping (4320 – 2460 = 1860 g or 1.86 kg))