

Unit I2: Decimals

Lesson 1: Adding and subtracting decimals (I)

→ pages 6–8

- 0.9
 - 0.9
 - 0.7
 - 1.0
- $0.9 - 0.5 = 0.4$
 - $0.9 - 0.2 = 0.7$
- $0.8 = 0.1 + 0.7$
 Check parts on other models total 0.8.
- 0.8
 - 0.8
 - 0.3
 - 0.4
 - 0.6
 - 0.5
 - 0.9
 - 0.6
- 1 (or 1.0)
 - 0.4
 - 0.9
 - 0.8
 - 0.5
 - 0.8
- -
 -
 -
- Answers will vary for pairs of ▲ and ◆; for example:
 ▲ = 0.4 ◆ = 0.1
 ▲ = 0.5 ◆ = 0.2
 ▲ = 0.6 ◆ = 0.3
 ▲ = 0.7 ◆ = 0.4
 ▲ = 0.8 ◆ = 0.5
 ▲ = 0.9 ◆ = 0.6
 ▲ = 0.46 ◆ = 0.16
 ▲ = 0.55 ◆ = 0.25
- Arrangements will vary; for example:

Reflect

Emma ignored the place value of the digits and added the tenths and ones together, she needs to add the tenths and tenths and the ones and ones, i.e.

O	.	Tth
0	.	4
1	.	0

$$0.4 + 1 = 1.4$$

Lesson 2: Adding and subtracting decimals (2)

→ pages 9–11

- $0.36 + 0.22 = 0.58$

O	.	Tth	Hth
0	.	3	6
+		2	2
		5	8
 - $0.25 + 0.47 = 0.72$

O	.	Tth	Hth
0	.	2	5
+		4	7
		7	2
 - $0.55 + 0.31 = 0.86$

O	.	Tth	Hth
0	.	5	5
+		3	1
		8	6
 - $0.38 + 0.38 = 0.76$

O	.	Tth	Hth
0	.	3	8
+		3	8
		7	6

- Kate has put the 5 from 0.05 in the wrong column (tenths instead of hundredths). The correct answer is:

O	.	Tth	Hth
0	.	0	5
+		1	2
		1	7

- $0.65 - 0.34 \text{ km} = 0.31 \text{ km}$

O	.	Tth	Hth
0	.	6	5
-		3	4
		3	1

- $0.92 - 0.58 = 0.34$

O	.	Tth	Hth
0	.	9	2
-		5	8
		3	4

b) $0.49 - 0.19 = 0.30$

	O	.	Tth	Hth
	0	.	4	9
-	0	.	1	9
	0	.	3	0

c) $0.71 - 0.24 = 0.47$

	O	.	Tth	Hth
	0	.	7	1
-	0	.	2	4
	0	.	4	7

d) $0.60 - 0.45 = 0.15$

	O	.	Tth	Hth
	0	.	6	0
-	0	.	4	5
	0	.	1	5

5. a) 0.32 b) 1.02 c) 0.19

6. $0.15 + 0.57 = 0.72$ or $0.72 - 0.15 = 0.57$

7. a) Calculations will vary but total should be 0.99; for example:

	O	.	Tth	Hth
	0	.	8	7
+	0	.	1	2
	0	.	9	9

b) For decimals with 2 dp:

	O	.	Tth	Hth
	0	.	9	8
-	0	.	1	2
	0	.	8	6

Alternatively, accept 3 dp:

	O	.	Tth	Hth	Thth
	0	.	9	8	7
-	0	.	1		
	0	.	8	8	7

Reflect

If Alex works out $37 + 59 = 96$, then she can use this to work out the answer to $0.37 + 0.59$ as follows:

$$0.37 + 0.59 = 37 \text{ hundredths} + 59 \text{ hundredths} = 96 \text{ hundredths} = 0.96$$

Lesson 3: Adding and subtracting decimals (3)

→ pages 12–14

1. a) $0.8 + 0.2 = 1$

b) $0.69 + 0.31 = 1$

2. Pieces matched:

$0.88 \text{ m} \rightarrow 0.12 \text{ m}$

$0.766 \text{ m} \rightarrow 0.234 \text{ m}$

$0.9 \text{ m} \rightarrow 0.1 \text{ m}$

3. $0.84 + 0.26 = 1.1$, not 1. Lexi's mistake is that she forgot about the exchange from the hundredths to the tenths. To make 1, Lexi must add 0.74, so 7 tenths counters and 4 hundredths counters.

4. a) i) 0.62

ii) 0.616

iii) 0.62

b) $0.38 + 0.62 = 1$

$1 - 0.62 = 0.38$

$0.62 + 0.38 = 1$

$1 - 0.38 = 0.62$

5. a) $0.3 + 0.7 = 1$

b) $0.71 + 0.29 = 1$

c) $0.95 + 0.05 = 1$

d) $0.90 + 0.1 = 1$

e) $0.213 + 0.787 = 0.912$

f) $0.912 + 0.088 = 1$

g) $1 - 0.24 = 0.76$

h) $1 - 0.93 = 0.07$

i) $1 - 0.235 = 0.765$

6. a) $0.4 + 0.6 = 1$

$0.04 + 0.96 = 1$

$0.004 + 0.996 = 1$

b) $0.4 + 0.6 = 1$

$0.40 + 0.6 = 1$

$0.400 + 0.6 = 1$

7. a) Answers will vary; for example:

	O	.	Tth	Hth	Thth
	0	.	4	1	3
+	0	.	5	8	7
	1	.	0	0	0

b) Answers will vary; for example:

	O	.	Tth	Hth	Thth
	0	.	1	5	7
+	0	.	8	4	3
	1	.	0	0	0

	O	.	Tth	Hth	Thth
	0	.	8	1	5
+	0	.	1	8	5
	1	.	0	0	0

Same: The digits in the tenths and hundredths column total 9 and the digits in the thousandths column total 10.

Different: Digits in calculation vary and their positions vary between calculations.

Reflect

Yes, $0.207 + 0.793$ does equal 1.

Explanations may vary; for example:

3 thousandths + 7 thousandths = 10 thousandths which is the same as 1 hundredth. Adding this to the 9 hundredths gives 10 hundredths, which is the same as 1 tenth. Adding this to the 2 tenths and the 7 tenths gives 10 tenths, which equals 1.

Lesson 4: Adding and subtracting decimals (4)

→ pages 15–17

- 1 a) $0.37 + 0.82 = 1.19$

	O	.	Tth	Hth
	0	.	3	7
+	0	.	8	2
	1	.	1	9

- b) $0.675 + 0.721 = 1.396$

	O	.	Tth	Hth	Thth
	0	.	6	7	5
+	0	.	7	2	1
	1	.	3	9	6

- c) $0.56 + 0.78 = 1.34$

	O	.	Tth	Hth
	0	.	5	6
+	0	.	7	8
	1	.	3	4

- d) $0.7 + 0.7 = 1.4$

	O	.	Tth
	0	.	7
+	0	.	7
	1	.	4

- e) $0.82 + 0.78 = 1.6$

	O	.	Tth	Hth
	0	.	8	2
+	0	.	7	8
	1	.	6	0

2. Calculations matched to answers:

$0.23 + 0.84 \rightarrow 1.07$

$0.76 + 0.52 \rightarrow 1.28$

$1 + 0.17 \rightarrow 1.17$

$0.74 + 0.63 \rightarrow 1.37$

$0.54 + 0.85 \rightarrow 1.39$

3. The ruler and eraser cost £1.54 altogether.

4. Yes, he ran 1.25 km on Thursday compared to 1.026 km on Monday to Wednesday.

5. a)
- | | O | . | Tth | Hth |
|---|---|---|-----|-----|
| | 0 | . | 4 | 3 |
| + | 0 | . | 6 | 7 |
| | 1 | . | 1 | 0 |

- b)
- | | O | . | Tth | Hth |
|---|---|---|-----|-----|
| | 0 | . | 7 | 8 |
| + | 0 | . | 5 | 9 |
| | 1 | . | 3 | 7 |

- c)
- | | O | . | Tth | Hth | Thth |
|---|---|---|-----|-----|------|
| | 0 | . | 7 | 3 | 2 |
| + | 0 | . | 7 | 8 | 1 |
| | 1 | . | 5 | 1 | 3 |

6. a) $0.51 + 0.63 < 0.51 + 0.73$
b) $0.7 + 0.4 = 0.71 + 0.39$

Reflect

$0.5 + 0.6 = 5 \text{ tenths} + 6 \text{ tenths} = 11 \text{ tenths}$

Jamie needs to exchange 10 tenths for one whole to make 1.1. So, the correct answer is:

$0.5 + 0.6 = 1.1$

Lesson 5: Adding and subtracting decimals (5)

→ pages 18–20

1. a)
- | | T | O | . | Tth | Hth |
|---|---|---|---|-----|-----|
| | | 6 | . | 5 | 0 |
| + | | 4 | . | 3 | 1 |
| | 1 | 0 | . | 8 | 1 |

The total cost is £10.81.

- b)
- | | O | . | Tth | Hth |
|---|---|---|-----|-----|
| | 5 | . | 7 | 6 |
| + | 3 | . | 7 | 9 |
| | 9 | . | 5 | 5 |

The total cost is £9.55.

2. a) $2.3 + 4.6 = 6.9$

	O	.	Tth
	2	.	3
+	4	.	6
	6	.	9

- b) $3.5 + 5.8 = 9.3$

	O	.	Tth
	3	.	5
+	5	.	8
	9	.	3

- c) $1.98 + 0.77 = 2.75$

	O	.	Tth	Hth
	1	.	9	8
+	0	.	7	7
	2	.	7	5

3. a) $0.502 + 4.165 > 3.258 + 0.875$

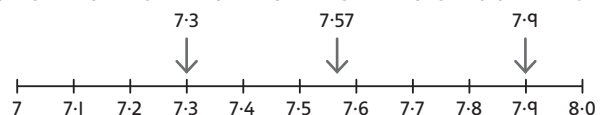
- b) $8.62 + 6.18 > 2.63 + 1.71 + 3.26$

4. Zac has not aligned the decimal points, so the digits of 11.2 are in the wrong columns for their value.

	T	O	.	Tth	Hth
	1	1	.	2	0
+		3	.	6	9
	1	4	.	8	9

The correct answer is £14.89.

5. $4.5 + 2.8 = 7.3$ $2.75 + 4.82 = 7.57$ $1.823 + 6.077 = 7.9$



	Theatre	Cinema	Zoo	Circus
Cost for 1 adult and 2 children	£49	£26.33	£44.90	£34.20

They can afford to do any of the activities.

Reflect

Explanations will vary but children should mention adding together digits with the same value (or in the same column). Children should also explain the need to exchange 10 hundredths for 1 tenth.

	O	.	Tth	Hth
	4	.	5	3
+	3	.	7	8
	8	.	3	1

Lesson 6: Adding and subtracting decimals (6)

→ pages 21–23

1. a)
$$\begin{array}{r} \text{O} \quad . \quad \text{Tth} \quad \text{Hth} \\ 2 \quad . \quad 4 \quad 5 \\ - 1 \quad . \quad 0 \quad 5 \\ \hline 1 \quad . \quad 4 \quad 0 \end{array}$$

The loaf of bread costs £1.49.

b) Danny gets £0.16 change.

2. a) $5.4 - 3.2 = 2.2$

$$\begin{array}{r} \text{O} \quad . \quad \text{Tth} \\ 5 \quad . \quad 4 \\ - 3 \quad . \quad 2 \\ \hline 2 \quad . \quad 2 \end{array}$$

b) $7.26 - 4.83 = 2.43$

$$\begin{array}{r} \text{O} \quad . \quad \text{Tth} \quad \text{Hth} \\ 7 \quad . \quad 2 \quad 6 \\ - 4 \quad . \quad 8 \quad 3 \\ \hline 2 \quad . \quad 4 \quad 3 \end{array}$$

c) $2.661 - 0.625 = 2.036$

$$\begin{array}{r} \text{O} \quad . \quad \text{Tth} \quad \text{Hth} \quad \text{Thth} \\ 2 \quad . \quad 6 \quad 6 \quad 1 \\ - 0 \quad . \quad 6 \quad 2 \quad 5 \\ \hline 2 \quad . \quad 0 \quad 3 \quad 6 \end{array}$$

3. a) 7.07 b) 8.6

4. Kate has incorrectly subtracted 9 from 0 in the hundredths column without making an exchange.

$$\begin{array}{r} \text{O} \quad . \quad \text{Tth} \quad \text{Hth} \\ 5 \quad . \quad 2 \quad 0 \\ - 0 \quad . \quad 5 \quad 9 \\ \hline 5 \quad . \quad 6 \quad 1 \end{array}$$

5. Holly has 5.8 km left to walk.

6. a) 2.28 b) 4.98

7. The different between A and C is 57.07 greater than between B and C.

Reflect

Answers will vary; for example:

Same: Both calculations involve subtracting from 5.8; both answers will be decimals with 1 decimal place; both answers are smaller than 3 ...

Different: If completed using columnar method, a) will not involve exchange but b) will.

Methods will vary; children could use the column method, partitioning or counting up to find the difference. Encourage children to explain why each chosen method is a sensible one for the particular calculation.

Lesson 7: Adding and subtracting decimals (7)

→ pages 24–26

1. Bella's plane flew 1.61 m further than Ebo's plane.

$$\begin{array}{r} \text{O} \quad . \quad \text{Tth} \quad \text{Hth} \\ 1 \quad . \quad 6 \quad 1 \\ - 0 \quad . \quad 7 \quad 0 \\ \hline 1 \quad . \quad 6 \quad 1 \end{array}$$

2. a) $3.62 + 4.8 = 8.42$

$$\begin{array}{r} \text{O} \quad . \quad \text{Tth} \quad \text{Hth} \\ 3 \quad . \quad 6 \quad 2 \\ + 4 \quad . \quad 8 \quad 0 \\ \hline 8 \quad . \quad 4 \quad 2 \end{array}$$

b) $1.96 - 1.258 = 0.702$

$$\begin{array}{r} \text{O} \quad . \quad \text{Tth} \quad \text{Hth} \quad \text{Thth} \\ 1 \quad . \quad 9 \quad 6 \quad 0 \\ - 1 \quad . \quad 2 \quad 5 \quad 8 \\ \hline 0 \quad . \quad 7 \quad 0 \quad 2 \end{array}$$

3. a) 38.34 b) 11.372

4. a) 5.03 b) 114.75

5. Zac has incorrectly written the 7 in 3.7 into the hundredths column rather than the tenths column. The correct answer is $53.49 - 3.7 = 49.79$.

$$\begin{array}{r} \text{T} \quad \text{O} \quad . \quad \text{Tth} \quad \text{Hth} \\ 4 \quad 9 \quad . \quad 7 \quad 9 \\ - 3 \quad . \quad 7 \quad 0 \\ \hline 4 \quad 9 \quad . \quad 7 \quad 9 \end{array}$$

6. Danny's statement is always true; for example:

$5.8 - 3.71 = 2.09$

$7.6 - 4.82 = 2.78$

$2.3 - 0.51 = 1.79$

7. $16.1 - 4.125 = 11.975$

The difference between A and B is 11.975.

8. $19.7 + 18.15 = 37.85$

$19.7 + 21.25 = 40.95$

Sum = 37.85 or 40.95

Reflect

Answers will vary but should include:

Ensure that the digits go in the correct columns; ensure the decimal points are aligned; use exchange; where columns are empty, insert a zero as a place holder.

Lesson 8: Adding and subtracting decimals (8)

→ pages 27–29

- 7.37
 - Answers will vary; for example:
Ebo could use a mental method, number line or column addition.
- $12 + 2.72 = 14.72$
 $3 + 11.72 = 14.72$
 $5 + 5 + 4.72 = 14.72$
 $5 + 9.72 = 14.72$
 $0.72 + 14 = 14.72$
 $14.7 + 0.02 = 14.72$
- $7 - 3.8 = 3.2$

O	.	Tth
6	7	0
-	3	8
	3	2
 - $12 - 4.35 = 7.65$

T	O	.	Tth	Hth
1	2	.	0	0
-		4	3	5
	7	.	6	5
- $8 - 2.807 =$
 $7.999 - 2.806 = 5.193$
 - $12 - 4.91 =$
 $11.99 - 4.90 = 7.09$
 - $16 - 1.8 =$
 $15.99 - 1.79 = 14.20$
- The total cost is £16.92.
 - There is 281.3 ml of sun cream left.
- 3.45
 - 25.725
 - 10.67
 - 14.4
 - 450.85
 - 475.513
- There is 9,250 ml more milk than lemonade.
- 0.08
 - 9.52

Reflect

Number lines drawn may vary, but children should show that the difference between 2.4 and 7 is the same as the difference between 2.3 and 6.9.

Lesson 9: Decimal sequences

→ pages 30–32

- 4.6, 4.7, 4.8, 4.9, 5, 5.1, 5.2
 - 11.5, 11.9, 12.3, 12.7, 13.1, 13.5, 13.9, 14.3
 - 15.75, 15.7, 15.65, 15.6, 15.55, 15.5, 15.45
- -
- Kate is counting up 0.3 or 3 tenths each time. When she gets to 12 tenths, she has incorrectly said that this is 0.12.
12 tenths = 1 whole and 2 tenths = 1.2
The sequence should be: 0, 0.3, 0.6, 0.9, 1.2, 1.5.
- 10.9; True
 - 39.69; False
 - 0; False
 - 0.88; True
- 12.49, 12.51, 12.53
 - 18.01
- 0.21, 0.42, 0.63, 0.84, 1.05, 1.26, 1.47
Rule: add 0.21
 - 11.3, 11.7, 12.1, 12.5, 12.9, 13.3, 13.7
Rule: add 0.4
 - 7.68, 7.61, 7.54, 7.47, 7.40, 7.33, 7.26
Rule: subtract 0.07

Round	1	2	3	4	5	6
Distance travelled in round (km)	0.8	1.6	2.4	3.2	4.0	4.8
Total distance travelled so far (km)	0.8	2.4	4.8	8	12	16.8

Reflect

Answers will vary depending on sequence chosen; for example:

0, 0.6, 1.2, 1.8, 2.4, 3.0, 3.6

Rule: add on 0.6 each time

4.9, 4.2, 3.5, 2.8, 2.1, 1.4, 0.7, 0

Rule: subtract 0.7 each time

Lesson 10: Problem solving – decimals

→ pages 33–35

- 98.775 kg
 - 55.38 m
 - £1.28
- Toshi drives 33.15 km in total.
- The mass of the grape is 2.55 g.
- 0.21 and 0.99 circled.
- 98.889
- £7.70

Reflect

Answers will vary; for example:

Lucy the dog has a mass of 54.47 kg and Deano the dog has a mass of 44.305 kg. What is their total mass? (98.775 kg)

Lesson 11: Problem solving – decimals (2)

→ pages 36–38

- The total cost of the three items is £18.04.
- £12.48
- 14.98 litres
- $3.578 + 8.655 - 2.233 = 10$
- 3.4 m
- 0.02
- Richard has: $£100 - £1.20 = £98.80$
Kate has: $£98.80 - £36.98 = £61.82$
She had: $£61.82 + £24.78$ (stationery) = £86.60
 $£98.80 - £86.60 = £12.20$
So, Richard has saved £12.20 more than her.

Reflect

Answers will vary; for example:

Holly is baking. She has a 5 kg bag of flour. She uses 1.1 kg of flour making cup cakes and then 690 g of flour making pancakes. How much flour has she left?

Lesson 12: Multiplying decimals by 10 decimals (1)

→ pages 39–41

- a) 24 b) 1.3
- a) 13 (place value grid shows 13)
b) 13.5 (place value grid shows 13.5)
c) 135 (place value grid shows 135)
d) 1.35 (place value grid shows 1.35)
- Olivia has added a 0 at the end; however, putting a 0 into the hundredths column does not change the value of the number so does not multiply it by 10. The correct answer is obtained by moving the digits one column to the left to get 148.
- Lines drawn to match calculations to answers:
 $0.003 \times 10 \rightarrow 0.03$
 $3.53 \times 10 \rightarrow 35.3$
 $0.03 \times 10 \rightarrow 0.3$
 $10 \times 0.353 \rightarrow 3.53$
 $0.3 \times 10 \rightarrow 3$
 $10 \times 3.003 \rightarrow 30.03$
 $0.0353 \times 10 \rightarrow 0.353$

- a) $5.8 \times 10 = 58$
b) $5.82 \times 10 = 58.2$
c) $24.9 \times 10 = 249$
d) $1.09 \times 10 = 10.9$
e) $21.08 \times 10 = 210.8$
f) $0.198 \times 10 = 1.98$
g) $10 \times 21.08 = 210.8$
h) $0.019 \times 10 = 0.19$
i) $30.9 = 3.09 \times 10$
j) $0.04 \times 10 = 0.4$
k) $30.99 = 3.099 \times 10$
l) $0.004 \times 10 = 0.04$
m) $309.9 = 30.99 \times 10$
n) $0.040 \times 10 = 0.4$

- a) $125 \times 10 = 1,250$ so Luis is not correct. He needs to use the inverse operation to find the missing number. The inverse of multiplication is division, so the missing number is $12.5 \div 10 = 1.25$.
($1.25 \times 10 = 12.5$)
b) $1.5 \times 10 = 15$
 $2.5 \times 10 = 25$
 $0.92 \times 10 = 9.2$
 $10 \times 1.52 = 15.2$
 $0.173 \times 10 = 1.73$
 $1.73 \times 10 = 17.3$

- Mo has travelled 3 m further than Lexi.

Reflect

Explanations will vary; for example:

When a number is multiplied by 10, the digits do not change and their order does not change. However, each digit moves one place to the left in the place value grid to make its value 10 times greater; for example:

$$1.1 \times 10 = 11$$

Lesson 13: Multiplying decimals by 10, 100 and 1,000

→ pages 42–44

- a) 79
790
7,900

Th	H	T	O	.	Tth	Hth
			7	.	9	
		7	9	.		
	7	9	0	.		
7	9	0	0	.		

- b) 21.9
219
2,190

Th	H	T	O	.	Tth	Hth
			2	.	1	9
		2	1	.	9	
	2	1	9	.		
2	1	9	0	.		

c) 84

Th	H	T	O	•	Tth	Hth
			0	•	8	4
		8	4	•		

d) 700

Th	H	T	O	•	Tth	Hth
			0	•	7	
	7	0	0	•		

e) 5

Th	H	T	O	•	Tth	Hth
				•	0	5
			5	•		

f) 1,700

Th	H	T	O	•	Tth	Hth
			1	•	7	
1	7	0	0	•		

2. a) 40
4
0.4
40
b) 170
1,700
170
- c) 9.12
0.912
0.00912
0.0912
d) 100
100
10
1,000

3. a) 335 litres b) 20 m

Number	0.1207	0.0036	0.38	0.07691	0.012
$\times 1,000$	120.7	3.6	380	76.91	12
$\times 100$	12.07	0.36	38	7.691	1.2

5. a) In any order:
 $6.8 \times 10 = 68$
 $0.68 \times 100 = 68$
 $0.068 \times 1,000 = 68$
b) Answers will vary; for example:
 $6.8 \times 10 = 0.68 \times 100$
 $0.68 \times 10 = 0.068 \times 100$
 $6.8 \times 100 = 0.68 \times 1,000$

Reflect

- Multiplying by 100 is the same as multiplying by 10 and 10 again.
- Multiplying by 1,000 is the same as multiplying by 10 and 10 and 10 again.

When demonstrating how to use a place value grid to multiply by 100 and 1,000, check that children recognise that the digits stay the same but move 2 places ($\times 100$) and 3 places ($\times 1,000$) to the left with 0s being inserted as place holders in any empty spaces in the place value grid.

Lesson 14: Dividing decimals by 10

→ pages 45–47

- 0.12
- a) 0.45 c) 4.5
b) 0.045 d) 0.452
- 0.231 in each section of bar model.
 $2.31 \div 10 = 0.231$
- The mass of one apple is 0.28 kg.
- a) 60.3 d) 10 g) 0.35
b) 16.03 e) 0.8 h) 87.19
c) 1.631 f) 0.3978 i) 389.5
- Max has correctly divided 35 by 10 to get the answer of 3.5, but since this is money, he needs to put the answer to 2 decimal places by writing 0 in the hundredths column, i.e. £3.50.
- a) 100 ml of lemonade costs £0.18.
b) 200 g of cocoa costs £2.40.
Explanations may vary; for example:
1 kg = 1,000 g
So, 100 g of cocoa costs:
 $£12 \div 10 = £1.20$
Therefore, 200 g of cocoa costs:
 $2 \times £1.20 = £2.40$
- Toshi uses 0.025 kg of hot chocolate powder in each cup.

Reflect

Answers will vary; children should recognise that the digits stay the same but move 1 place to the right with 0s being inserted as place holders in any empty spaces in the place value grid.

Lesson 15: Dividing decimals by 10, 100 and 1,000

→ pages 48–50

1. a) 0.23

H	T	O	•	Tth	Hth	Thth
	2	3	•	0		
		0	•	2	3	

b) 0.145

H	T	O	•	Tth	Hth	Thth
1	4	5	•			
		0	•	1	4	5

c) 0.052

H	T	O	•	Tth	Hth	Thth
		5	•	2		
		0	•	0	5	2

d) 0.013

H	T	O	•	Tth	Hth	Thth
	1	3	•			
		0	•	0	1	3

2. Bella is correct. Explanations may vary, but most likely explanation is to divide each tenth of the grid into 10 equal pieces and to note that the whole grid is now divided into 100 equal pieces.

3. a) True

b) True

c) False, $53 \div 100 = 0.53$

d) True

e) False, $8.7 \div 100 = 0.087$

f) False, $9.1 \div 1,000 = 0.0091$

4. Calculations matched:

$$0.8 \div 100 \rightarrow 8 \div 1,000$$

$$0.18 \div 100 \rightarrow 1.8 \div 1,000$$

$$10.8 \div 100 \rightarrow 108 \div 1,000$$

$$0.108 \div 10 \rightarrow 1.08 \div 100$$

5. a) 10

b) 1.2

100

12

1,000

120

6. Jamie saved £1.06 more each day.

7. ■ = 0.98

▲ = 0.00098

★ = 0.00061

● = 0.0061

Reflect

Yes, Reena is correct. Explanations may vary; for example:

$$0.351 \div 10 = 0.0351$$

$$3.51 \div 100 = 0.0351$$

$$35.1 \div 1,000 = 0.0351$$

All three of these calculations are equal.

End of unit check

→ pages 51–53

My journal

1. a)

	T	O	•	Tth	Hth
\times	1	1	•	9	9
–		4	•	3	4
		7	•	6	5

	T	O	•	Tth	Hth
\times	1	1	•	9	9
–		4	•	3	5
		7	•	6	5

It is easier to do the calculation $11.99 - 4.34$ than $12 - 4.35$.

Max could also count on from 4.35 to 12.00.

b) Common mistakes are: putting the digits in the wrong column, not using zero as a place holder when needed, and misaligning the decimal points.

2. Answers will vary, but should include that all involve addition with decimals but with different number of decimal places and in the last two calculations the need to exchange when using column addition.

Power play

Answers will vary; for example:

2	$\div 100$	$\div 10$	$\times 100$	$\times 10$	$\div 100$
$\div 1,000$	$\times 100$	$\times 10$	$\div 10$	$\times 100$	$\times 10$
$\times 10$	$\div 100$	$\times 10$	$\div 10$	$\times 100$	$\div 1,000$
$\times 100$	$\div 10$	$\times 1,000$	$\times 100$	$\times 10$	0.002

2	$\div 100$	$\div 10$	$\times 100$	$\times 10$	$\div 100$
$\div 1,000$	$\times 100$	$\times 10$	$\div 10$	$\times 100$	$\times 10$
$\times 10$	$\div 100$	$\times 10$	$\div 10$	$\times 100$	$\div 1,000$
$\times 100$	$\div 10$	$\times 1,000$	$\times 100$	$\times 10$	2

Unit 13: Geometry – properties of shapes (I)

Lesson 1: Measuring angles in degrees

→ pages 54–56

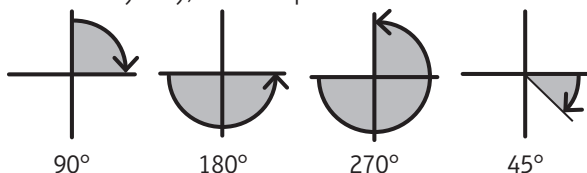
- Diagrams ticked: 2nd and 4th
 - Diagrams ticked: 1st, 3rd and 6th
 - 360° clockwise
 - 180° anticlockwise
 - 180° anticlockwise
 - 90° clockwise
 - 270° clockwise
 - 360° clockwise

Starts facing	Turns	Now facing
whirlpool	90° clockwise	island
harbour	180° clockwise	island
island	270° anticlockwise	rocks
island	360°	island
island	270° clockwise	whirlpool

- 180° clockwise or anticlockwise
 - 90° clockwise or 270° anticlockwise
 - 45° clockwise or 315° anticlockwise
 - 135° anticlockwise or 225° clockwise
- Answers will vary; for example:
 - 1 □ and 5 △
 - 2 □ and 3 △
 Fewest button pushes: 3 □ and 1 △

Reflect

Answers may vary; for example:



Lesson 2: Measuring with a protractor (I)

→ pages 57–59

- 50°
 - 25°
 - 80°
 - 42°
- Allow 2° either side:
 - 70°
 - 55°
 - 62°
 - 44°

- Each angle = 60°
 - Top = 45°
Bottom left = 60° Bottom right = 75°
- Richard has read the wrong scale; he needs to use the inner scale, starting on the right-hand side. The angle is acute and is 60°.
 - Emma has not aligned the zero line of the protractor with one of the lines of the angle. The angle is 50°.
- Allow 2° either side:
 - 80°
 - 61°
 - 28°

Reflect

Explanations may vary; for example:

Make sure the zero line of the protractor lines up with one of the angle lines. Then line up the centre mark with the exact point of the angle and follow the scale from the zero mark to the completed turn. Finally, read the angle from the scale.

Lesson 3: Measuring with a protractor (2)

→ pages 60–62

- Ticked: b) and c)
- Allow 2° either side:
 - 135°
 - 127°
 - 115°
 - 130°
- d c a b
- Allow 2° either side:
 - All three angles = 135°
 - 152°
- Allow 5° either side:

Turns clockwise from:	Angle of turn
A to F	140°
F to I	140°
I to B	115°
B to G	120°
G to I	125°

Reflect

Answers will vary; for example:

Since the angle is obtuse you should read the scale where the value is greater than 90°.

Use the scale where 0° is matched up to the other line.

Lesson 4: Drawing lines and angles accurately

→ pages 63–65

1. Check drawn angles.
2. Check drawn angles.
3. The missing length is 9.5 cm (allow 0.2 cm either way).
The missing angles are 50° and 50° .
4. Check that the triangles are drawn with angles of 45° , 60° and 75° .
All sides are different lengths.
5. Check that equilateral triangles are drawn with 3 angles of 60° and sides of 3 cm.

Reflect

Answers will vary. Look for angles that are accurately drawn at 45° and children drawing angles at different orientations.

Lesson 5: Calculating angles on a straight line

→ pages 66–68

1. a) I predict a is 130° because $180 - 50 = 130$.
b) I predict b is 60° because $180 - 120 = 60$.
2. a) 140° c) 80°
b) 35° d) 141°
3. a) a (45°) and h (135°) or b (145°) and g (35°)
b) c (20°) and d (100°) and f (60°) or a (45°) and d (100°) and g (35°)
4. a) 5° b) 30°
5. $? = 50^\circ$ (a = 20° , b = 50° , c = 40°)

Reflect

Aki has correctly recognised that a right angle is 90° and $45 + 45 = 90$. However, the angle of a straight line is 180° , so to calculate the missing angle he needs to find $180 - 145 = 35$. The missing angle is 35° .

Lesson 6: Calculating angles around a point

→ pages 69–71

- 1 a) $360^\circ - 180^\circ = 180^\circ$
b) $360^\circ - 270^\circ = 90^\circ$
c) $360^\circ - 120^\circ = 240^\circ$

2. a) Angle a is 90° .
b) Angle b is 60° .
c) Angle c is 120° .
d) Angle d is 200° .
3. a) Children should draw an angle of 250° .
b) Children should draw an angle of 350° .
4. Max turned 105° .
5. $4 \times 90 = 360$
An obtuse angle is greater than 90° so 4 obtuse angles together would turn further than 360° , or a full turn. The circle therefore cannot be split into four obtuse angles.
6. a) 72° ($360 \div 5 = 72$)
b) 36° ($180 \div 5 = 36$)
c) 18° ($90 \div 5 = 18$)
d) Explanations may vary; for example:
The size of the angles is halved each time so the answers are halved.

Reflect

Answers will vary.

$360 - 110 = 250$, so the other 2 angles must add up to 250° together; for example:

120° and 130° ; 100° and 150° ; etc.

Lesson 7: Calculating lengths and angles in shapes

→ pages 72–74

1. Angles clockwise around shape from top left:
A: 90° , 90° , 45° , 135°
B: 90° , 45° , 45°
C: 45° , 90° , 45°
D: 45° , 45° , 90°
E: 90° , 90° , 90° , 90°
2. a) 75 mm
150 mm
 45°
b) 75 mm
150 mm
 135°
c) 150 mm
 270°
3. a = 105° b = 53° c = 107°
4. a = 120° b = 300° c = 60°

Reflect

Answers will vary; for example:

It is usually easier and quicker to use angle facts and calculate missing angles rather than measure them. Sometimes it is necessary to measure one angle to find other angles.



End of unit check

→ pages 75–77

My journal

1. a) a, b and g ($a = 15^\circ, b = 90^\circ$ and $g = 255^\circ$,
so: $15 + 90 + 255 = 360^\circ$)
b) a, b, c and f ($a = 15^\circ, b = 90^\circ, c = 45^\circ$ and $f = 30^\circ$,
so: $15 + 90 + 45 + 30 = 180^\circ$)
2. $a = 70^\circ$ $b = 20^\circ$
Answers may vary but children should notice that
 $a + b = 90^\circ$.

Power puzzle

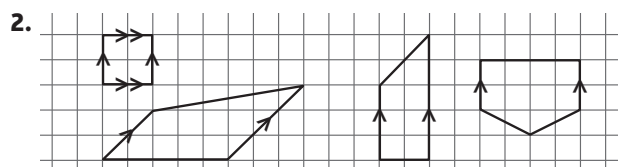
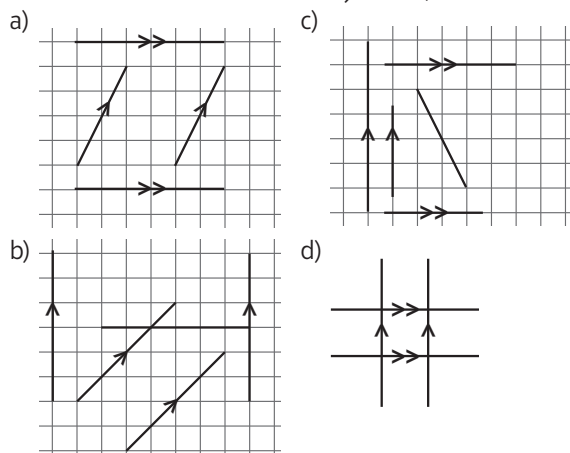
Star should be drawn in space provided.

Unit 14: Geometry – properties of shapes (2)

Lesson 1: Recognising and drawing parallel lines

→ pages 78–80

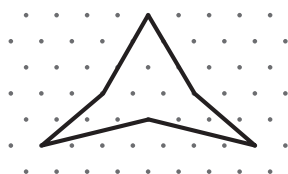
1. Pairs of parallel sides labelled as shown (single/double arrows can be either way round)



3. Answers will vary. Check lines drawn are parallel.

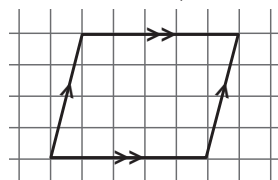
4. FE is parallel to AD and BC.
BF would be parallel to CD.
No. EC is not parallel to any lines in the shape.

5. a) BE is parallel to CD and AF.
b) CA is parallel to DF.
BC is parallel to AD and FE
c) Answers will vary; for example:



Reflect

Answers will vary; for example: parallelogram



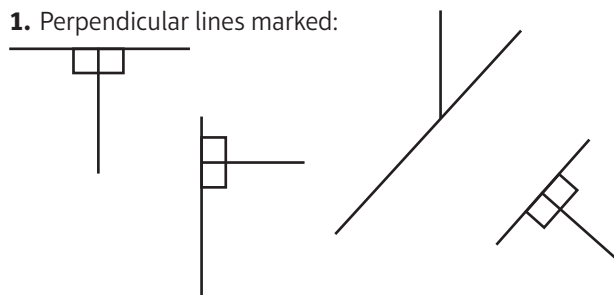
Explanations will vary; for example:

You can make sure that lines are parallel by using the grid lines. The parallel sides marked with one arrow both move 4 squares up for every 1 square across, which means that they are parallel.

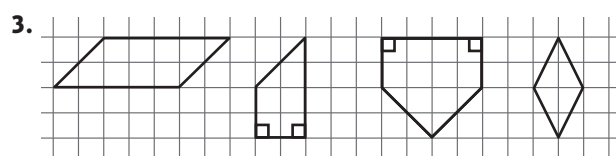
Lesson 2: Recognising and drawing perpendicular lines

→ pages 81–83

1. Perpendicular lines marked:

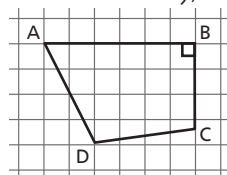


2. Check children have drawn perpendicular lines.

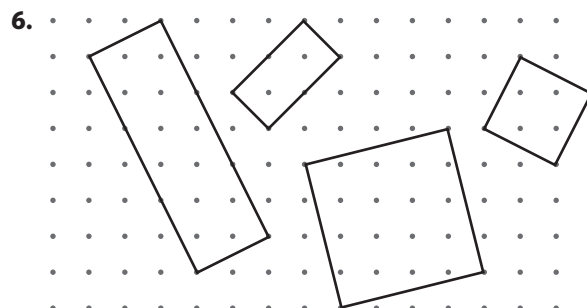


4. a) False; the angle between the two lines is clearly smaller than 90°
b) False; the angle between the two lines is clearly greater than 90°
c) True; EF is perpendicular to AF
d) False, CD is perpendicular to DE

5. Answers will vary; for example:



AB is perpendicular to BC



Reflect

Explanations may vary; for example:

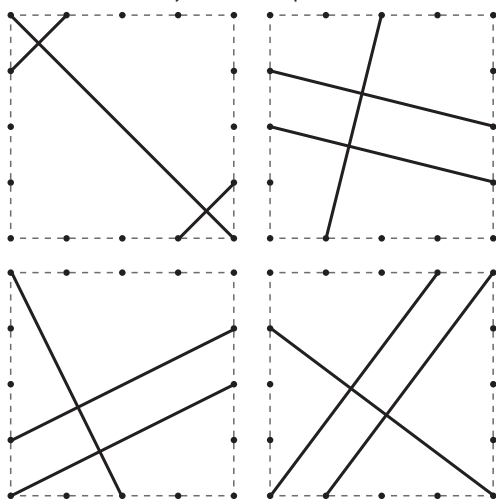
Parallel lines never cross over and always stay the same distances apart. Perpendicular lines meet at right angles, i.e. 90° .

Lesson 3: Reasoning about parallel and perpendicular lines

→ pages 84–86

- Angle $a = 135^\circ$
Angle $b = 45^\circ$
Angle $c = 135^\circ$
Angle $d = 45^\circ$
 - The two diagonal lines are parallel.
They both cross the horizontal line at angles of 135° and 45° .
- Answers will vary but the line should cross both parallel lines at the same angle.
- square
 - rhombus
 - kite
 - rectangle
- Diagonals do not cross at right angles.
 - Diagonals do not cross at right angles.
 - Diagonals do not cross at right angles.
 - Diagonals do not cross at right angles.

- Answers will vary; for example:



Reflect

Answers will vary; for example:

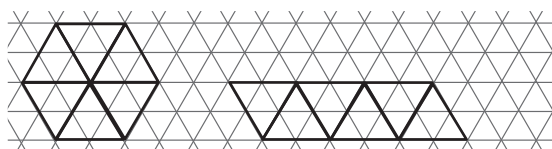
Fold the paper in half so that vertical edges match exactly. Open it up again and now fold the paper in half so that horizontal edges match exactly. The two fold lines are perpendicular.

Look for children demonstrating an understanding that perpendicular means at right angles.

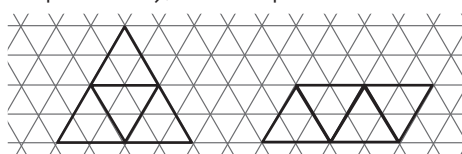
Lesson 4: Regular and irregular polygons

→ pages 87–89

- Shapes and descriptions joined:
Angles different, sides same → rhombus
Angles same, sides different → rectangle
Angles same, sides same → square
Angles different, sides different → parallelogram
Circled: square (only regular quadrilateral)
- irregular irregular regular irregular
- This is not a regular shape because the sides are not all the same length.
- C and F
 - C, E and F
- Regular shape will be regular hexagon; irregular shape will vary; for example:



- Regular shape will be equilateral triangle; irregular shape will vary; for example:

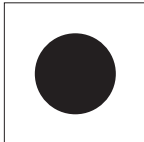




Reflect

A shape is irregular if the sides are not all the same length or if the angles are not all the same.

Lesson 5: Reasoning about 3D shapes

→ pages 90–92

- 
 - 
 - 
- Circled: 1st and 3rd
 - Circled: 1st and 2nd
- They could be looking at shape D.
- Equilateral triangle (drawn)
 - Equilateral triangle (drawn)
 - Equilateral triangle (drawn)
- Drawings of
 - circle
 - rectangle
 - rectangle
 - rectangle

Reflect

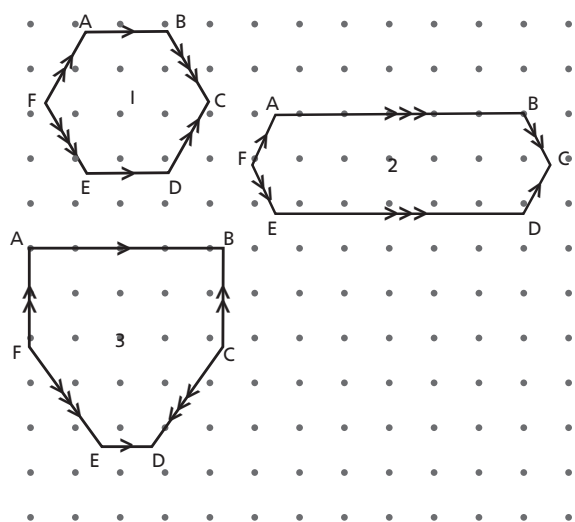
Views can be rectangles or triangles.

End of unit check

→ pages 93–95

My journal

- Answers and diagrams will vary; check that perpendicular lines are at 90° and parallel lines are equidistance apart.
Explanation should include using a protractor to perpendicular lines are at 90° and parallel lines stay the same distance apart.
- Answers will vary; for example:



Shape 1: parallel lines: AB and DE; BC and EF; CD and AF. No perpendicular lines.

Shape 2: parallel lines: AB and DE; BC and EF; CD and AF. No perpendicular lines.

Shape 3: parallel lines: AB and DE; AF and BC.
Perpendicular lines: AF and AB; AB and BC.

Power puzzle

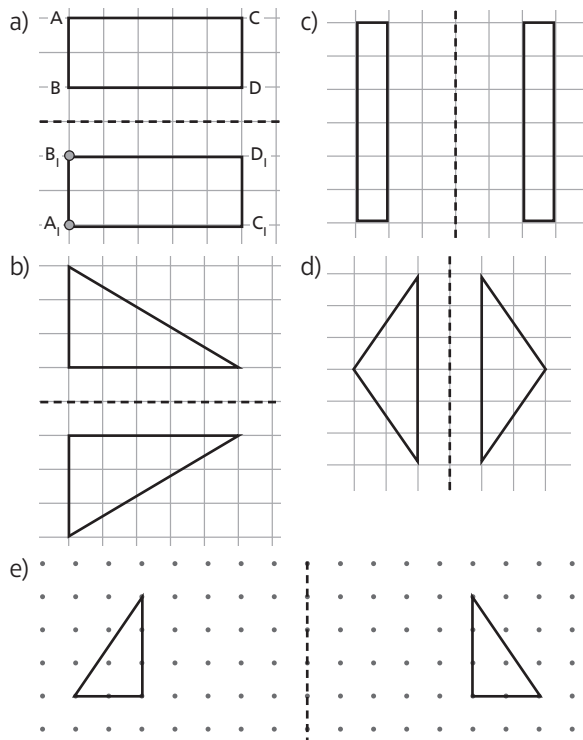
Note: angles of diagonals should be 45° and right angles should be 90° . Sides of squares should be the same length.

Unit 15: Geometry – position and direction

Lesson 1: Reflection

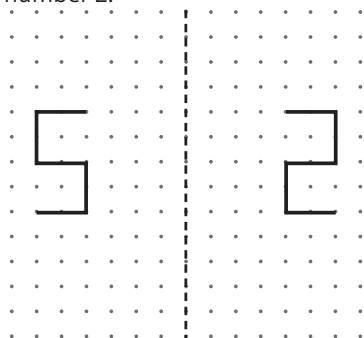
→ pages 96–98

1. Reflections drawn:

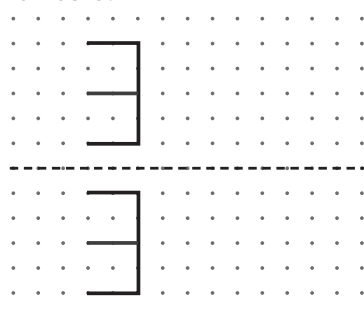


2. Predictions may vary; for example:

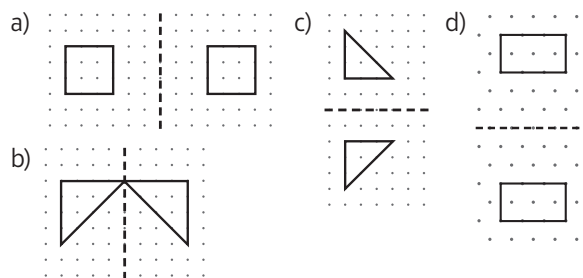
a) I predict that the reflected shape will look like the number 2.



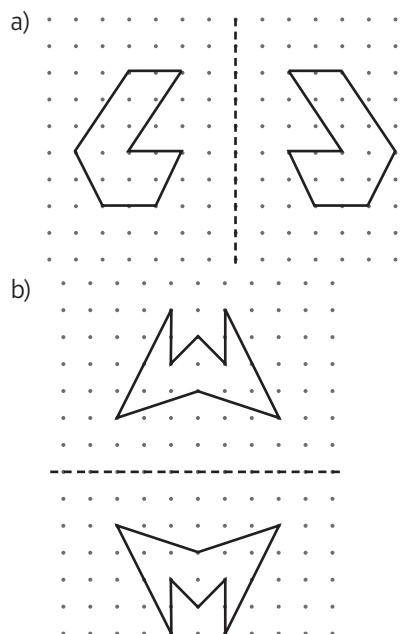
b) I predict that the reflected shape will look like the number 3.



3. Mirror lines drawn:



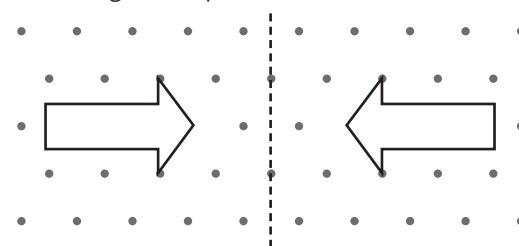
4. Reflections drawn:



Reflect

Explanations may vary; for example:

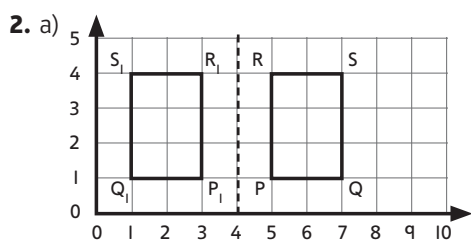
The size of the arrow stays the same but the arrow is reflected so that it is pointing to the right. The tip of the new shape is the same distance from the reflection line as the original shape.



Lesson 2: Reflection with coordinates

→ pages 99–101

1. A (1,5) → A₁ (1,7)
- B (3,7) → B₁ (3,5)
- C (4,4) → C₁ (4,8)
- D (8,9) → D₁ (8,3)
- E (11,2) → E₁ (11,10)
- F (12,8) → F₁ (12,4)



- b) $P_1(3,1)$
 $Q_1(1,1)$
 $R_1(3,4)$
 $S_1(1,4)$

3. $A_1(2,4)$
 $B_1(5,2)$
 $C_1(8,0)$

4. $J_1(5,3)$
 $K_1(5,0)$
 $L_1(8,3)$
 $M_1(8,0)$

5. $P_1(25,75)$
 $Q_1(15,75)$
 $R_1(15,30)$

6.

Point	Inside original square	Inside reflected square	Outside both squares
(23,21)			✓
(25,5)		✓	
(29,5)			✓
(27,17)	✓		
(20,7)			✓
(10,10)			✓

Reflect

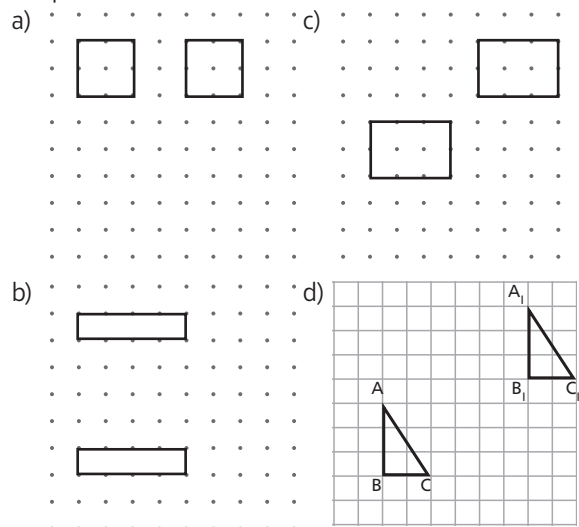
Answers will vary but should include calculating the distance from the mirror line to the point and using this to work out the value of the new coordinates, noting which coordinates will change and which ones will stay the same. For example:

Reflecting T in the horizontal line gives the new coordinate $T_1(9,2)$ and reflecting T in the vertical line gives $T_2(3,8)$.

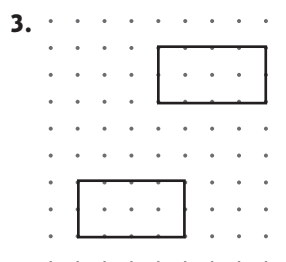
Lesson 3: Translation

→ pages 102–104

1. Shapes translated:



2. 5 right, 1 up



4. Isla is correct since the shape has moved in two directions (up and to the right), so is a translation. There is no mirror line which would reflect the two rectangles onto each other.

5. A: 8 right
 B: 4 left

6. A, B and C: 6 right, 2 down
 D: 6 right, 2 up

Reflect

5 left and 4 up.

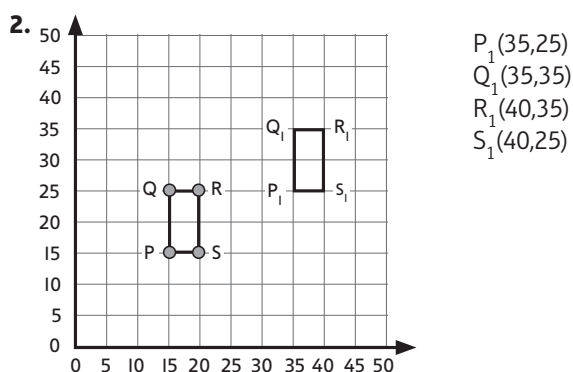
Lesson 4: Translation with coordinates

→ pages 105–107

1. a)

Translation	Position of Point A	Position of Point B	Position of Point C
Starting position	(1,1)	(5,3)	(11,6)
3 right	(4,1)	(8,3)	(14,6)
4 left	(0,1)	(4,3)	(10,6)
8 up	(0,9)	(4,11)	(10,14)
2 down	(0,7)	(4,9)	(10,12)
5 right, 4 down	(5,3)	(9,5)	(15,8)
Ending position	(4,10)	(8,12)	(14,15)

b) 3 right, 9 up



3. Order may vary:

Solution 1	Solution 2	Solution 3
Translation: 6 right, 2 up	Translation: 1 up	Translation: 1 left, 4 down
Vertices are: (10,6) (16,7) (17,12)	Vertices are: (4,5) (10,6) (11,11)	Vertices are: (3,0) (9,1) (10,6)

4. Before reflection in the mirror line, the right-angled vertex must have had coordinates (16,20). Its original coordinates were (5,5) so the translation is 11 right, 15 up.

Reflect

Methods may vary; for example:

Method 1: Take each vertex and work out where it would move to when translated by counting squares from its original position.

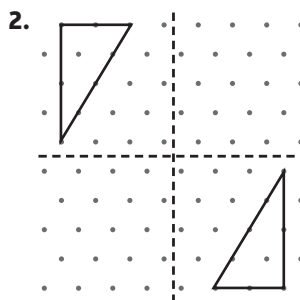
Method 2: Find the coordinates of each vertex and add/subtract from each coordinate depending on the direction and distance of the translation to find their new positions.

End of unit check

→ pages 108–110

My journal

1. A(53,25)
B(67,25)
C(77,25)
D(82,13)
E(72,13)



Power puzzle

Answers will vary; look for children recognising that the size of the image does not change but reflecting a shape twice will produce the original shape.

Unit I6: Measure – converting units

Lesson 1: Metric units (I)

→ pages 111–113

1. a) To convert metres into kilometres, divide by 1,000.
 $162,000 \text{ m} \div 1,000 = 162 \text{ km}$
London → Birmingham = 162 km
b) To convert kilometres into metres, \times by 1,000.
 $50 \text{ km} \times 1,000 = 50,000 \text{ m}$
Manchester → Liverpool = 50,000 m
c) Glasgow → Edinburgh = 67.1 km
2. Letters written into circles:
A and D → $\div 1,000$
B and C → $\times 1,000$
3. a) $12 \text{ kg} = 12,000 \text{ g}$
b) $8,000 \text{ g} = 8 \text{ kg}$
c) $6,500 \text{ g} = 6 \text{ kg and } 500 \text{ g}$
d) $3.4 \text{ kg} = 3,400 \text{ g}$
e) $10 \text{ kg } 200 \text{ g} = 10,200 \text{ g}$
 $10 \text{ kg } 200 \text{ g} = 10.2 \text{ kg}$
f) $4 \text{ kg } 3,000 \text{ g} = 7,000 \text{ g}$
 $4 \text{ kg } 3,000 \text{ g} = 7 \text{ kg}$
4. To convert from kilograms to grams Kate needs to multiply by 1,000. Her mistake is that she has divided instead of multiplied.
 $27.5 \text{ kg} = 27,500 \text{ g}$
5. Possible distances: 04.5 km, 05.4 km, 40.5 km or 50.4 km
Answers in metres: 4,500 m, 5,400 m, 40,500 m, 50,400 m
6. 2 bags: $18,000 \text{ g} = 18 \text{ kg}$ and $8,000 \text{ g} = 8 \text{ kg}$
Explanations will vary; for example:
Masses that are multiples of 1,000 g are a whole number of kilograms.

Reflect

Explanations may vary; for example:

To convert grams into kilograms divide by 1,000.

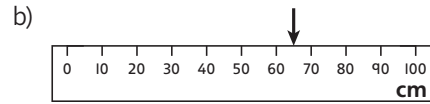
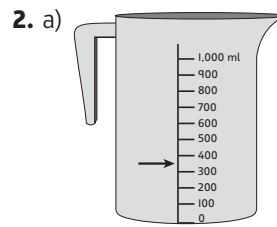
$$12,500 \div 1,000 = 12.5$$

$$\text{So, } 12,500 \text{ g} = 12.5 \text{ kg}$$

Lesson 2: Metric units (2)

→ pages 114–116

1. a) To convert mm into cm, divide by 10.
 $30 \text{ mm} \div 10 = 3 \text{ cm}$
The blade of grass is 3 cm long.
b) To convert litres into millilitres, multiply by 1,000.
 $1.2 \text{ l} \times 1,000 = 1,200 \text{ ml}$
The bottle holds 1,200 ml.



3. Lines drawn to join strategy and task:
 $\div 10 \rightarrow$ Measure the width of a stamp in mm and convert it into cm.
 $\times 10 \rightarrow$ Change the height of a flower (in cm) into mm.
 $\div 1,000 \rightarrow$ Convert an amount of water from millilitres into litres.
 $\times 1,000 \rightarrow$ Convert the mass of a bag of sand (in kg) into g.
 $\div 100 \rightarrow$ Write a length in cm as m.
 $\times 100 \rightarrow$ Convert the height of a building (in m) into cm.
4. a) $4,000 \text{ ml} = 4 \text{ l}$
b) $15 \text{ l} = 15,000 \text{ ml}$
c) $7.2 \text{ l} = 7 \text{ l and } 200 \text{ ml}$
d) $1,600 \text{ ml} = 1.6 \text{ l}$
e) $12 \text{ l } 500 \text{ ml} = 12,500 \text{ ml}$
 $12 \text{ l } 500 \text{ ml} = 12.5 \text{ l}$
f) $9 \text{ l } 2,500 \text{ ml} = 11,500 \text{ ml}$
 $9 \text{ l } 2,500 \text{ ml} = 11.5 \text{ l}$
5. To convert from centimetres to millimetres you multiply by 10, so Mo is correct since his measurement (in millimetres) is 10 times Lee's (measured in centimetres).

First cup	Second cup	Third cup	Total
C	C	A	0.5 l
A	B	B	0.25 l
C	B	B	0.35 l
C	A	B	0.375 l

Reflect

Danny is wrong. Explanations may vary; for example:

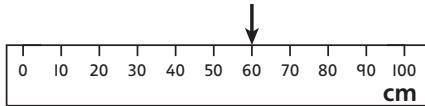
It is true that 10 mm is equal to 1 cm but Danny needs to multiply by 10 to convert cm into mm, rather than dividing. So, $5.6 \text{ cm} = 56 \text{ mm}$.

Lesson 3: Metric units (3)

→ pages 117–119

1. a) $7,200 \text{ ml} + 1,000 \text{ ml} = 8,200 \text{ ml}$
b) $6.2 \text{ kg} + 2000 \text{ g}$
 $= 6,200 \text{ g} + 2,000 \text{ g} = 8,200 \text{ g}$
c) In each of these examples, I converted the numbers by multiplying by 1,000.

2. 60 centimetres are left.



3. a) $800\text{ g} + \frac{1}{2}\text{ kg}$ $800\text{ g} + \frac{1}{2}\text{ kg}$
 $= 800\text{ g} + 500\text{ g}$ $= 0.8\text{ kg} + 0.5\text{ kg}$
 $= 1,300\text{ g}$ $= 1.3\text{ kg}$
 b) $10.5\text{ cm} - 62\text{ mm}$ $10.5\text{ cm} - 62\text{ mm}$
 $= 10.5\text{ cm} - 6.2\text{ cm}$ $= 105\text{ mm} - 62\text{ mm}$
 $= 4.3\text{ cm}$ $= 43\text{ mm}$

4. C, B, A, D

5. a) $1.1\text{ litres} = 1,100\text{ ml}$
 $1,100\text{ ml} - 300\text{ ml} = 800\text{ ml}$
 Richard has 800 ml of squash left.
 b) Each glass has 200 ml of squash.

Reflect

Explanations may vary; for example:

First convert 0.6 km to m by multiplying by 1,000.
 $0.6 \times 1,000 = 600$
 $250\text{ m} + 600\text{ m} = 850\text{ m}$

Lesson 4: Metric units (4)

→ pages 120–122

1. a) $10\text{ mm} = 1\text{ cm}$
 To convert from mm to cm, divide by 10.
 b) $100\text{ cm} = 1\text{ m}$
 $1,000\text{ m} = 1\text{ km}$
 $100 \times 1,000 = 100,000$
 To convert from cm to km, \div by 100,000.
 To convert from km to cm, \times by 100,000.
2. a) The mouse's tail is 14.2 cm long.
 Check that children have drawn tails that are 14.2 cm long.
 b) $40,000\text{ cm} = 400\text{ m} = 0.4\text{ km}$
3. Lexi, Reena, Ebo, Max
4. a) Danny has treated the length of the ribbon as if it was 2 cm. The length of 2 m needs to be converted to cm ($2 \times 100 = 200\text{ cm}$) so that the length and width are in the same units before carrying out his calculation.
 b) The perimeter is $406\text{ cm} = 4.06\text{ m}$.
5. a)
 b) The cola will travel 7,582 cm.
 c) $310\text{ mm} = 31\text{ cm}$
 So, any person who is less than 31 cm in width can walk down it, but it would be very narrow.

Reflect

Answers will vary; for example:

There are 10 mm in 1 cm.

There are 100 cm in 1 m.

There are 1,000 ml in 1 l / There are 1,000 g in 1 kg /

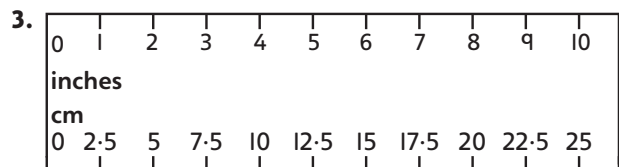
There are 1,000 mm in 1 m / There are 1,000 m in 1 km.

Lesson 5: Imperial units of length

→ pages 123–125

1. a) Circled: 10 inch pizza
 Park 100 yards
 Amal 6 feet 2 inches
 b) 1 inch is approximately $2\frac{1}{2}\text{ cm}$.
 1 foot is equal to 12 inches.
 1 yard is equal to 3 feet.

2. $4 \times 12 = 48$
 The snake is 48 inches long.



4. a) a 48 inch chimpanzee
 $(3\frac{1}{2}\text{ ft} = 36 + 6 = 42\text{ inches or } 48\text{ inches} = 4\text{ ft})$
 b) 21 foot patio
 $(6\text{ yards} = 6 \times 3 = 18\text{ ft or } 21\text{ ft} = 21 \div 3 = 7\text{ yards})$
5. $20\text{ yards} = 20 \times 90\text{ cm} = 1,800\text{ cm} = 18\text{ m}$
 $100\text{ yards} = 100 \times 90\text{ cm} = 9,000\text{ cm} = 90\text{ m}$
 20 yards is about 18 m. 100 yards is about 90 m.

6.

12 inches	12 inches	12 inches	12 inches	7 in
1 foot	1 foot	1 foot	1 foot	7 in

 $= 4\text{ ft } 7\text{ in}$
 $= 1\text{ yd } 1\text{ ft } 7\text{ in}$

7. a) Jamie is confusing yards and feet; she means 2 yards which is 6 feet.
 b) Answers will vary. Check that children have correctly converted between centimetres and feet and inches.

Reflect

Answers will vary; for example:

Imperial units were used in the UK until they were replaced by metric. However they are still used, for example road distances, driving speeds and TV sizes.

Imperial units include inches, feet and yards.

Metric conversion involves multiplying by 10, 100 and 1,000 which can be easier than converting between imperial units.

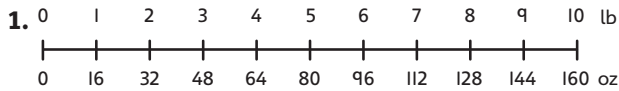
12 inches = 1 foot

1 yard = 3 feet

1 inch = 2.5 cm (roughly)

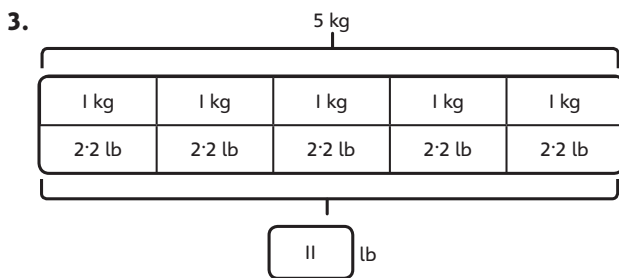
Lesson 6: Imperial units of mass

→ pages 126–128



- a) 3 lb = 48 oz e) 3 lb 3 oz = 51 oz
b) 7 lb = 112 oz f) $\frac{1}{2}$ lb = 8 oz
c) 5 lb = 80 oz g) $\frac{1}{4}$ lb = 4 oz
d) 8 lb 2 oz = 130 oz h) 4.5 lb = 72 oz

2. a) 17 lb b) 17 lb = 272 oz



4. $3\frac{1}{2}$ lb is about 1.575 kg.
Explanations may vary; for example:
 $3\frac{1}{2} \times 450 = 1,350 + 225 = 1,575$
So, $3\frac{1}{2}$ lb is about 1,575 g, which is 1.575 kg.
5. a) Coloured measurements: T = 4,500 g, O = 4.5 kg, N = 160 oz
b) The imperial unit is ton.
6. a) The giant octopus has a mass of 100 lb.
b) 2.2 lb is about 1 kg, so 9.9 lb is about 4.5 kg. This means 100 lb is close to 45 kg.
The giant octopus has a mass of approximately 45 kg.

Reflect

Methods may vary; for example:

1 lb = 2.2 kg (approximately)

So: 14 lb = 14×2 kg + 14×0.2 kg = 30.8 kg (approximately)

Lesson 7: Imperial units of capacity

→ pages 129–131

1.

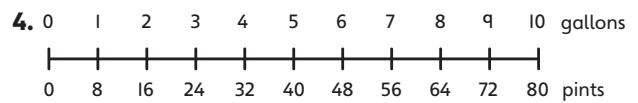
1 pt	2 pt	3 pt	4 pt	5 pt	6 pt	7 pt	8 pt
570 ml	1,140 ml	1,710 ml	2,280 ml	2,850 ml	3,420 ml	3,990 ml	4,560 ml

2. a) 5 pints = 2,850 ml e) 3 litres 420 ml = 6 pints
b) 8 pints = 4,560 ml f) 7 pints = 3.99 litres
c) 3 pints = 1,710 ml g) $\frac{1}{2}$ pint = 285 millilitres
d) 1 litre 140 ml = 2 pints

3. Circled: $4\frac{1}{2}$ litres.

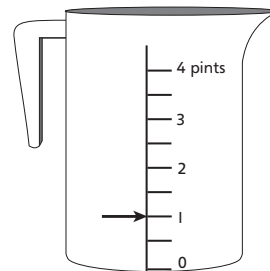
Explanations may vary; for example:

1 gallon = 8 pints = 4,560 ml = 4.56 l, which rounds to $4\frac{1}{2}$ litres to the nearest $\frac{1}{2}$ litre.



Pond C contains the most water.

5. The jug contains $3\frac{1}{2}$ pints
= 1.995 litres approximately
(accept close answer; for example: 2 litres)
6. Line drawn on jug at (or just over) 1 pint:



7. a) 1 gallon = 8 pints = 8×570 ml = 4.56 l (approximately)
So, 1 gallon costs £5 at petrol station A but only £4.56 at petrol station B.
Petrol station B is cheaper.
b) She saves £4.40 ($10 \times £0.44$)

Reflect

1 pint is approximately 570 ml so 2 pints is about 1,140 ml. So, you could buy 1 litre if you don't need exactly 2 pints of milk. If you need at least 2 pints then you will need to buy 2 litres and you will have some left over.

Lesson 8: Converting units of time

→ pages 132–134

1. a)

310 minutes					
60 mins	60 mins	60 mins	60 mins	60 mins	10 mins

The rail journey is 5 hours 10 minutes.

b)

195 s			
60 s	60 s	60 s	15 s

The pop song is 3 minutes 15 seconds.

2. 2 hours 7 minutes = 127 minutes
137 minutes = 2 hours 17 minutes
Escape from Planet Zarg is longer.
3. No, Ambika is not correct. 0.25 of an hour is a quarter of an hour, which is $60 \text{ minutes} \div 4 = 15 \text{ minutes}$.
So, 4.25 hours is 4 hours 15 minutes.
4. Bella, Lee, Mo, Kate

Name	Kate	Lee	Bella	Mo
Length of holidays	43 days	40 days	39 days	41 days

5. a) hours $\rightarrow \times 60 \rightarrow \times 60 \rightarrow$ seconds
days $\rightarrow \times 24 \rightarrow \times 60 \rightarrow$ minutes
days $\rightarrow \div 7 \rightarrow$ weeks
b) leap year $\rightarrow \times 366 \rightarrow \times 24 \rightarrow \times 60 \rightarrow$ minutes

Reflect

30 months = 2 years and 6 months

Descriptions may vary; for example:

Divide 30 by 12 to give 2 years and leave the remainder (5) as months.

Lesson 9: Timetables

→ pages 135–137

1. a) There are 8 rows in the timetable. Each row shows a different stop.
There are 6 columns. Each column shows a different coach.
The times in the timetable are 24-hour times.
- b) It arrives at 08:45.
- c) It left at 12:50.
- d) At 14:15 Coach D arrives at Luton Airport. Its next stop is Hertford North Station. It takes 45 minutes to get there and it arrives at 15:00.
2. a) She is on the train for 40 minutes.
- b) He will wait 1 hour and 54 minutes.

c)

Grantham	13:15
Rauceby	–
Sleaford	13:41
Boston	14:09
Thorpe Culvert	14:31
Wainfleet	14:35
Havenhouse	14:39
Skegness	14:49

3.

	Bus 1	Bus 2
Hall Lane	07:40	14:48
Chapman Avenue	07:53	15:01
Wildshed Road	08:01	15:09
Station Road	08:10	15:18
Moorfield Academy	08:27	15:35

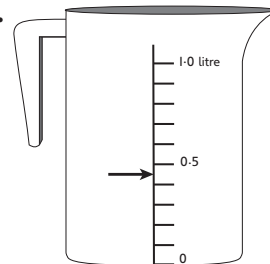
Reflect

Answers will vary but should include the fact that using 24-hour times makes it very clear if the time is in the morning or afternoon, which may be useful to avoid arriving at the wrong time.

Lesson 10: Problem solving – measure

→ pages 138–140

1. 2.7 kg is 2,700 grams.
2. The frog has jumped 1.35 metres.
- 3.



4. They have 160 grams each.
5. £1.50 = 90 cm
10 cm costs £0.16
100 cm = 1 m = £1.67
Shop A is cheaper
6. 2.8 kg = 2,800
2,800 g – 800 g = 2,000 g
2,000 g ÷ 5 = 400 g
One football has a mass of 400 g.
7. 1.25 m = 125 cm
125 cm – 80 cm = 45 cm
45 cm ÷ 3 = 15 cm
The length of each space is 15 cm (or 0.15 m).

**Reflect**

Explanations may vary; for example:

$$1 \text{ m} = 100 \text{ cm}$$

$$2.5 \text{ cm} = 1 \text{ inch}$$

$$100 \div 2.5 = 40$$

So, she needs to measure 40 inches of string.

End of unit check

→ pages 141–142

My journal

1. a) 1.2 litres = 1,200 millilitres
I know this because there are 1,000 ml in 1 l.
To convert, multiply by 1,000.
- b) 490 minutes = 8 hours 10 minutes
I know this because there are 60 minutes in 1 hour.
To convert divide by 60 and write the remainder as minutes.
- c) 60 inches = 1.5 metres
There are 2.5 cm in 1 inch and 100 cm in 1 m.
To convert inches to centimetres multiply by 2.5
and then to convert cm to m divide by 100.

Power play

Look for children demonstrating fluency with 24 hour times, using timetables and adding or subtracting with time.

Unit 17: Measure – volume and capacity

Lesson 1: What is volume?

→ pages 143–145

- 6
 - 6
 - 6
 - 20
 - 12
 - 9 (accept 10 or 11 as some cubes could be obscured)
- Shapes matched to volume:
Top row left to right: 8 12 6
Bottom row left to right: 8 8 16 12
- Richard is not correct. 6 unit cubes are visible but, in order for the tower of 2 cubes that can be seen to be attached to the shape, there must be another cube below them which cannot be seen. This means the shape has a volume of 7 unit cubes.

4.

Shape	Volume
Shape A	5 unit cubes
Shape B	14 unit cubes
Shape C	30 unit cubes

Explanations may vary; for example:

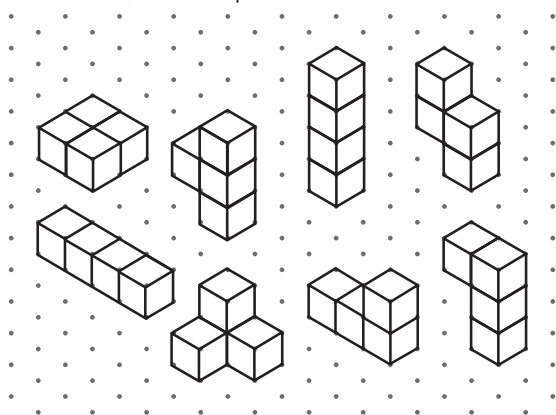
The shapes increase by a layer each time and each layer contains the next square number of cubes, i.e.

$$\text{Shape A} = 1^2 + 2^2 = 5$$

$$\text{Shape B} = \text{Shape A} (1^2 + 2^2) + 3^2 = 14$$

$$\text{Shape C} = \text{Shape B} (1^2 + 2^2 + 3^2) + 4^2 = 30$$

- Copies of cubes drawn accurately, i.e. $1 \times 1 \times 1$ cube and $2 \times 2 \times 2$ cube.
- Answers will vary. Check each shaped drawn contains 4 unit cubes; for example:



Reflect

Explanations may vary; for example:

Volume is the amount of space that an object fills. It can be measured in unit cubes.

Lesson 2: Comparing volumes

→ pages 146–148

- Ticked: 2nd shape
 - Ticked: 2nd shape
 - Ticked: 1st shape
 - It is often not necessary to count all cubes as you can count the number in one row and use multiplication.
- A, B, C, D
- Bella, Max, Amelia
- 2 cubes added to shape A.
- I predict that Emma has made the shape with the greatest volume because $4 \times 2 \times 2 = 16$.
Look for children making a tower 15 cubes tall and a cuboid with dimensions $4 \times 2 \times 2$.

Reflect

Volume can be measured in unit cubes and so if two shapes are made from the same number of unit cubes then they have the same volume, however, the cubes can be arranged differently to make different shapes.

Lesson 3: Estimating volume

→ pages 149–151

- 14
 - 14
- Answers will vary; look for children recognising that the pencil is circular in cross section and has a point, so using the cubes to estimate the volume is likely to produce an overestimate of the volume (assuming the diameter of the pencil is equal to the side of the cube).
- Ticked: half sphere (hemisphere)
 - Ebo can use the estimate for the half sphere and double this to find an estimate for the sphere.
- No; the orange is likely to have the greatest volume since it is wider and deeper than the carrot. This means it is likely to fill more space than the carrot so will have a larger volume.
- Answers will vary greatly depending on sizes of objects, based on using 1 cm^3 cubes; for example:
Glue stick
28 unit cubes
Ball
100 unit cubes
Hockey stick
350 unit cubes
- Answers will vary. Check suggestions are reasonable.



Reflect

Answers will vary; for example:

Build a rough model of hand using unit cubes or draw around it on squared centimetre paper, count the number of squares and then multiply this by the approximate depth of the hand.

Power puzzle

Answers will vary, depending on size of classroom.

Tip: encourage children to draw a plan of the classroom and calculate how many footballs will fit into the length, width and height, and then multiply the number of footballs in these dimensions together.

Lesson 4: Estimating capacity

→ pages 152–154

1. a) 750 ml b) 70 l
2. Circled: watering can, pond/lake, bath tub
3. A, C, E, B, D (accept C, A, E, B, D as it not clear what sort of bottle is shown in A).
4. Answers will vary slightly; for example:
 - a) 3,000 ml
 - b) 1,300 ml
 - c) 2,500 ml
5. The water poured out is $\frac{1}{5}$ of a bottle which equals 400 ml. Thus the capacity of one full bottle is:
 $5 \times 400 = 2,000$ ml
 The capacity of one full bottle is 2,000 ml.
6. Jug A contains 500 ml. $\frac{1}{4}$ of this is poured out, which is 125 ml. This is equal to $\frac{1}{10}$ of jug B, so jug B holds:
 $10 \times 125 = 1,250$ ml

Reflect

Explanations may vary; for example:

Volume is the amount of space that an object fills.

Capacity describes how much a container can hold.

End of unit check

→ pages 155–156

My journal

1. Method 1: Count the cubes individually (18).
 Method 2: Calculate the cubes in the different layers and then add these together:

$$3 \times 3 = 9$$

$$2 \times 3 = 6$$

$$1 \times 3 = 3$$

$$9 + 6 + 3 = 18$$