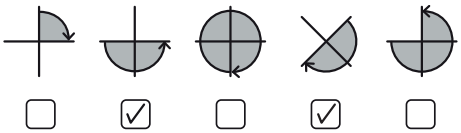
Unit I2 – Geometry – properties of shapes

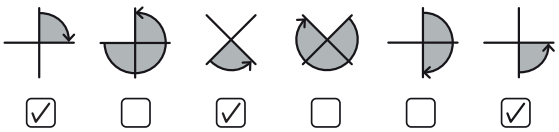
I Understand and use degrees

➜ pages 6-8

1. a)



b)



c) i)

360 ° clockwise

iii)

180 ° anticlockwise

v)

270 ° clockwise

ii)

180 ° anticlockwise

iv)

90 ° clockwise

vi)

360 ° clockwise

2.

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

3. a) **180°** clockwise or anticlockwise

b) **90°** clockwise

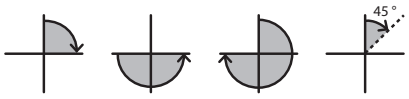
c) **45°** clockwise

d) **135°** anticlockwise

4. Triangular × 7
Square × 1 + triangular × 5
Square × 2 + triangular × 3
Square × 3 + triangular × 1

Reflect

Children should accurately draw the following diagrams:



2 Measure acute angles

➜ pages 9-11

1. a) **50°**
b) **25°**
c) **80°**
d) **42°**

2. a) **70°**
b) **55°**
c) **65°**
d) **45°**

3. a) All angles measure **60°**.
b) **60°**, **75°**, **45°**

4. Richard has read the wrong scale. It should be 60°.
Emma has not placed the protractor correctly.
The base line of the protractor should be on one of the lines forming the angle.

5. The lines can be extended.

a) **80°**

b) **60°**

c) **30°**

Reflect

Various responses are possible but children should mention how to place the protractor correctly and accurately and which scale is the correct one to read.

3 Measure angles up to I80°

➜ pages 12-14

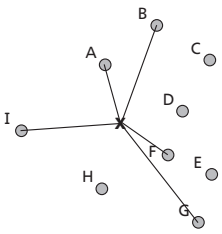
1. Children should tick b) and c).

2. a) 135°
b) 125°
c) 115°
d) 125°

3. d, c, a, b

4. a) All angles measure **135°**.
b) **155°**

5.



Turns clockwise from:	Angle of turn
A to F	145°
F to I	140°
I to B	115°
B to G	120°
G to I	125°

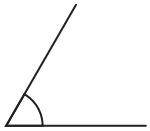
Reflect

Children's responses should reflect that an obtuse angle is > 180°, so read the scale that shows this and the base line of the angle is 0°, so read the scale which starts at 0°.

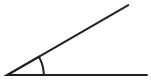
4 Draw lines and angles accurately

➜ pages 15-17

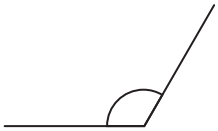
1. a)



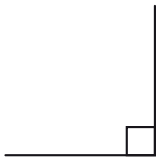
c)



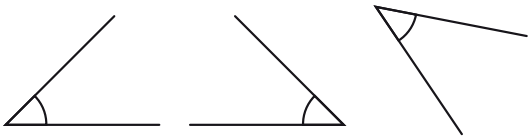
b)



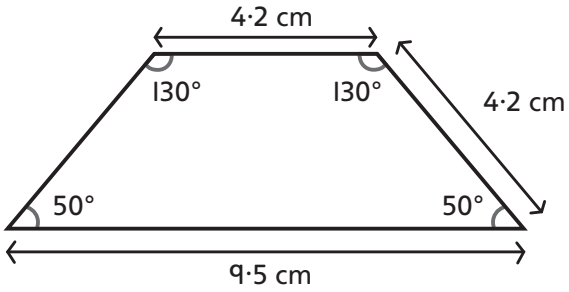
d)



2. Children should draw three accurate 45° angles, for example:

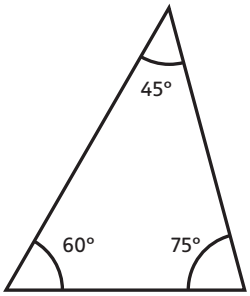


3.



The missing length is **9·5** cm.
The missing angles are **50°** and **50°**.

4.



The sides are not all the same length.

Reflect

Various responses are possible, such as: reading the wrong scale and not placing the protractor correctly or accurately over the angle.

5 Calculate angles around a point

➜ pages 18-20

1. a) 360° – **180°** = **180°**
b) 360° – **270°** = **90°**
c) 360° – **120°** = **240°**

2. a) Angle a is **90°**.
b) Angle b is **60°**.
c) Angle c is **120°**.
d) Angle d is **200°**.

3. a)

b)

4. Max turned **105°**.

5. An obtuse angle is more than 90° so the sum of four obtuse angles will be more than 360°.
The sum of angles around a point is exactly 360°.

6. a) **72°**
b) **18°**

Reflect

The sum of the other two angles is 250°.
For example, 100° and 150° or 200° and 50°.

6 Calculate angles on a straight line

➜ pages 21-23

1. a) I predict a is **130°** because 180 – **50** = **130**.
b) I predict a is **60°** because 180 – **120** = **60**.

2. a) **140°**
b) **35°**
c) **80°**
d) **141°**

3. a) a and h; b and g
b) d, c and f

4. a) **5°**
b) **30°**

5. ? = **50°** (a = 20°, b = 50°, c = 40°)

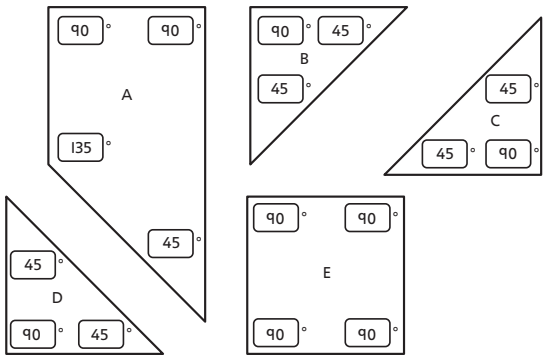
Reflect

Angles on a straight line add to 180°, so the missing angle is 180° – 145° = **35°**.

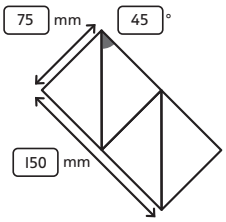
7 Lengths and angles in shapes

→ pages 24-26

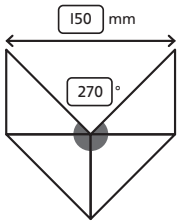
1.



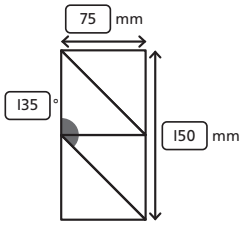
2. a)



c)



b)



3. a = **105°** b = **53°** c = **107°**

4. a = **120°** b = **300°** c = **60°**

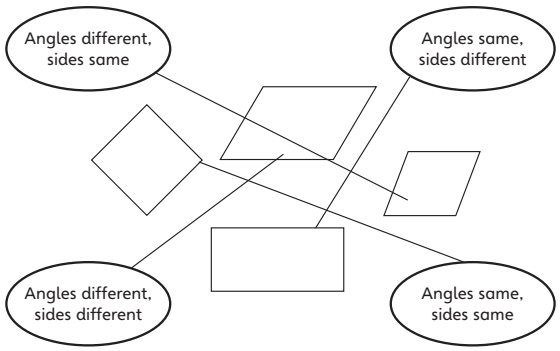
Reflect

Agree. It is often more accurate to calculate using angle facts rather than measuring angles, as it is easy to be one or two degrees out when measuring.

8 Regular and irregular polygons

→ pages 27-29

1.



2. irregular irregular regular irregular

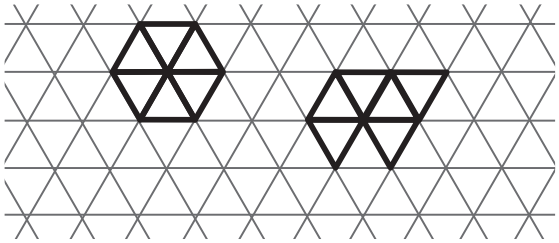
3. This is not a regular hexagon because the sides are not all the same length.

4. a) C and F join to make a regular shape (square).

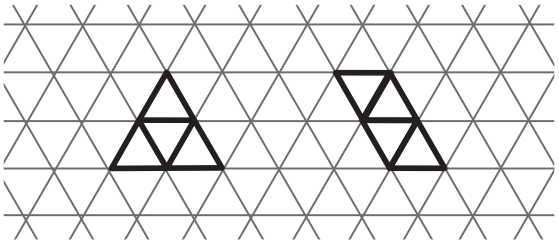
b) C, E and F

Note that A and D do not form a regular shape because D's dimensions are formed on diagonals so are slightly larger than 1 square.

5. a) Various answers are possible, for example:



b) Various answers are possible, for example:



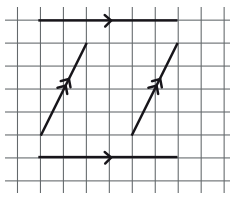
Reflect

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

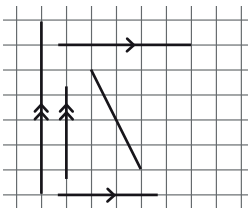
9 Parallel lines

→ pages 30-32

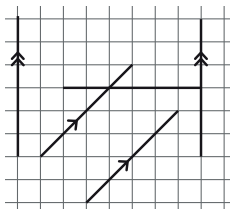
1. a)



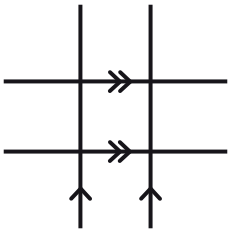
c)



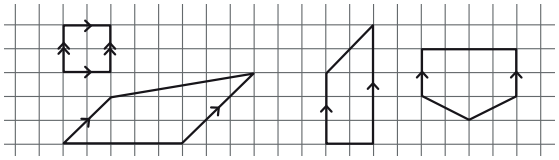
b)



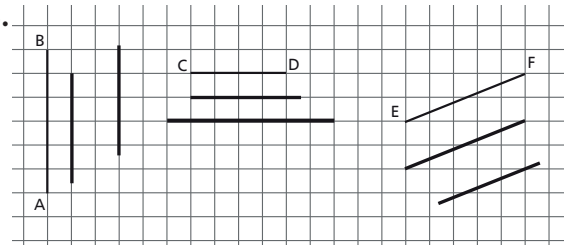
d)



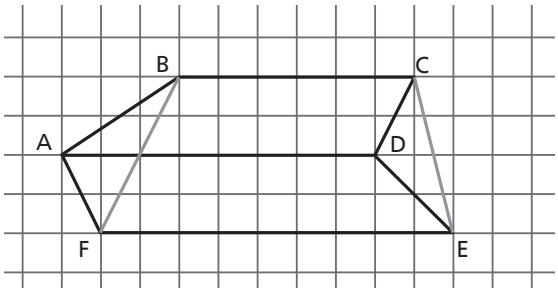
2.



3.



4.



FE is parallel to **AD** and **BC**.
BF is parallel to **CD**.
EC is not parallel to any other lines in the shape.

5. a) BE is parallel to **CD** and **AF**.
CA is parallel to **DF**.
BC is parallel to **EF** and **AD**.

b) Children should draw any 6-sided figure with no parallel sides.

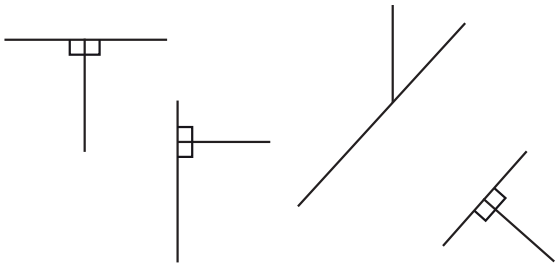
Reflect

Children should accurately draw a shape with 2 pairs of parallel sides, correctly marking the parallel sides with arrows and double arrows. They should refer to using the grid lines to make sure the sides are parallel.

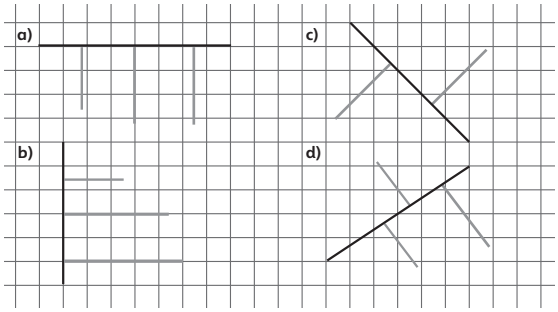
10 Perpendicular lines

➜ pages 33-35

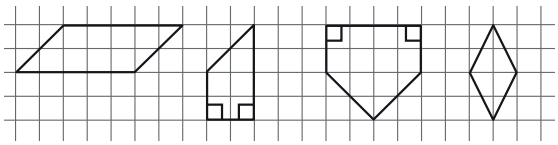
1.



2. Various lines are possible, for example:

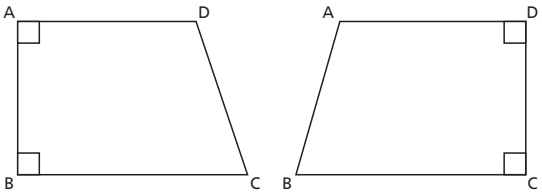


3.

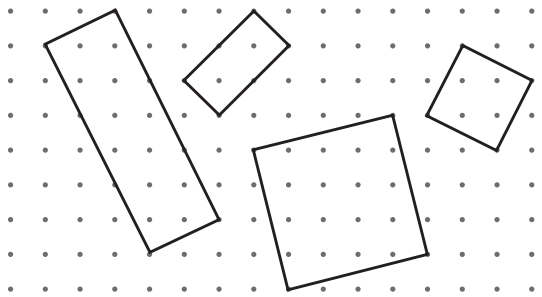


4. a) False Angle between them < 90°.
b) False Angle between them > 90°.
c) True Angle between AF and EF = 90°.
d) False DE is perpendicular to CD.

5. Children should draw either shape:



6.



Reflect

Children's answers will vary but look for:

Parallel lines are straight lines with the same distance between them, so that they will never meet

Perpendicular lines are lines that are at right angles to each other.

Children may draw diagrams to illustrate.

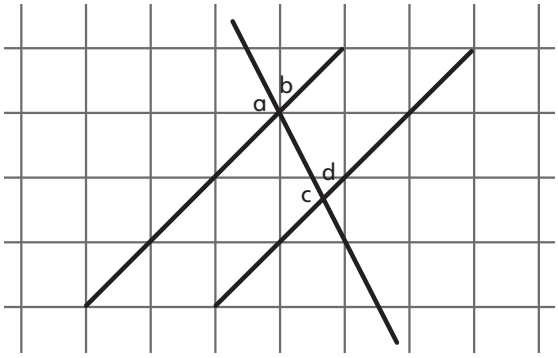
11 Investigate lines

➜ pages 36-38

1. a) a = **135°** c = **135°**
b = **45°** d = **45°**

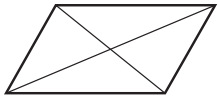
b) The two diagonal lines are **parallel lines**.
They both cross the horizontal line at angles of **135°** and **45°**.

2. Children should draw a line across. The angles should sum to 180° and be the same on both lines.
a + b = c + d = 180°
a = c b = d



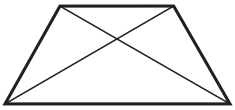
3. a) square
b) rhombus
c) kite
d) rectangle

4. a)



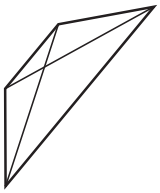
60°/120°

c)



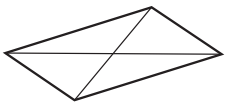
60°/120°

b)



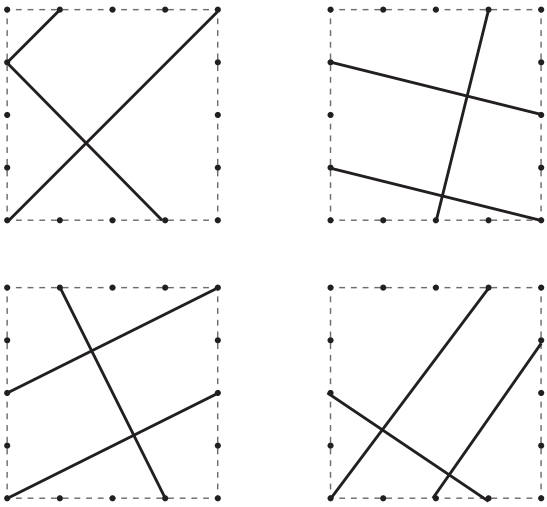
40°/140°

d)



45°/135°

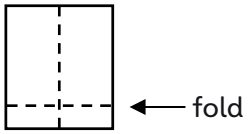
5. There are various solutions, for example:



Reflect

Children should mention matching the edges carefully when folding, so that the edges are parallel to each other.

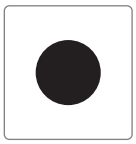
The folds will then be perpendicular to the other edges.



I2 3D shapes

→ pages 39-41

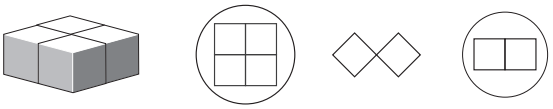
1. a)



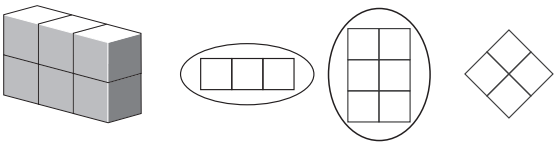
b)

c)

2. a)



b)



3. They could be looking at shape D.

4. a)

b)

c)

5. a)

b)

c)

d)

Reflect

Children should accurately draw diagrams to reflect a triangular face and rectangular faces.

End of unit check

➜ pages 42-44

My journal

1. a) $b + c + d = 360°$

b) $b + c + f = 180°$

$a + b + e + f = 180°$

2. a = **70°** b = **20°**

$a + b = 90°$

The two triangles are exactly the same.

Power puzzle

Children should draw the star accurately to a slightly smaller scale than the diagram.

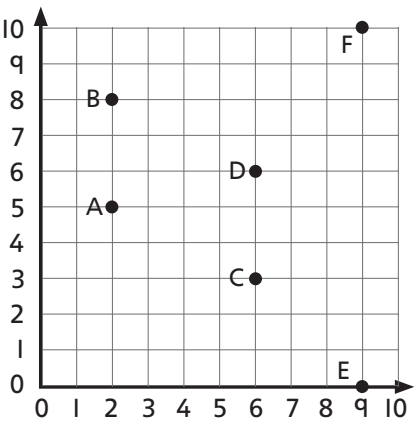
Unit 13 – Geometry – position and direction

1 Read and plot coordinates

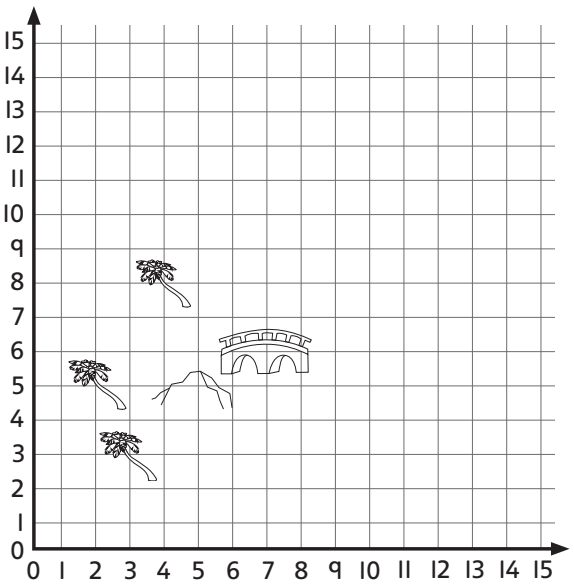
→ pages 45–47

1. A(**3,1**)
B(**1,5**)
C(**6.5,4**)
D(**8,8**)
C is between the grid lines on the *x*-axis.

2.



3. Children draw their own map, so that the places shown are within the map.
The volcano can be marked anywhere, the ship should be in the sea.



4. a) (**0,10**), (**2,8**), (**4,6**), (**6,4**), (**8,2**), (**10,0**)
b) Children should notice:
All the points lie in a straight line.
All the coordinate pairs sum to 10.
The *x*-coordinate goes up in 2s and *y*-coordinate goes down in 2s.

Reflect

Children's answers will depend on what they have been taught, such as: 'along the corridor, up the stairs'.

2 Problem solving with coordinates

→ pages 48–50

1. (2,1) (5,1) (2,6) (5,6)

2. (2,5) and **(4,5)** or **(2,1)** and **(4,1)**

3. (1,0) (3,0) (3,6) (5,6)

4. (**25**,60) (75,**60**) **(75,40)**

5. (60,30) (90,20)

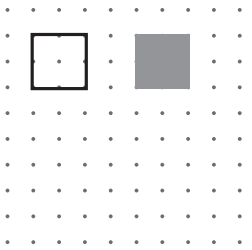
Reflect

Children's answers will depend on how they label the grid and their quadrilateral drawn.

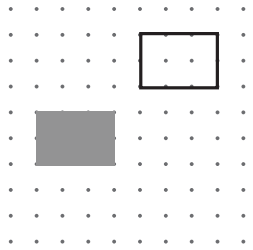
3 Translate shapes

→ pages 51–53

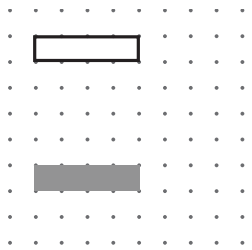
1. a) 4 right



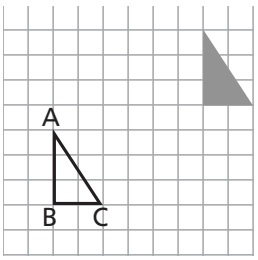
c) 4 left, 3 down



b) 5 down

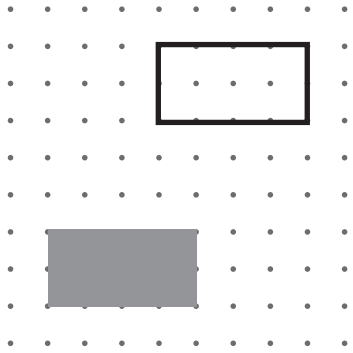


d) 6 right, 4 up



2. 5 right, **1 up**

3.



4. Isla is correct. It has been translated 5 right 1 up.
A reflection would be on the horizontal line.

5. A: 8 right
B: 4 left

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

Reflect

5 left, 4 up

4 Translate points

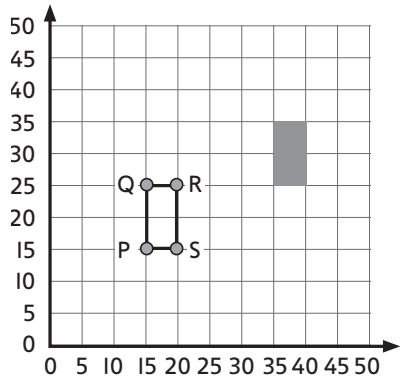
→ pages 54–56

1. a) Use the translation between the last two entries in the first column, 1 left, 7 up, to complete the other columns.

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) Translation: **3 right, 9 up**

2. P_1**(35,25)**
Q_1**(35,35)**
R_1**(40,35)**
S_1**(40,25)**



3.

6 right, 2 up	**1 up**	**1 left, 4 down**
(10,6)	(10,6)	(10,6)
(16,7)	**(4,5)**	**(3,0)**
(17,12)	**(11,11)**	**(9,1)**

4. 11 right, 15 up

Reflect

Children should mention using the coordinates (4,4), (6,4) and (5,7) or remembering to move each point exactly the same distance up and down.

To move right add to the first part of the coordinate (the *x*-coordinate).

To move left subtract from the first part of the coordinate (the *x*-coordinate).

To move up add to the second part of the coordinate (the *y*-coordinate).

To move down subtract from the second part of the coordinate (the *y*-coordinate).

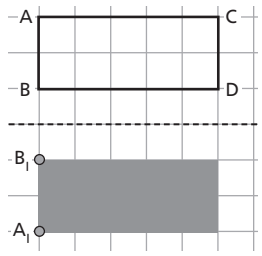
To remain on the grid, the triangle can be moved up to 4 left or right, 3 up or 4 down.

Children could give an example: moving 4 left, 2 up gives new coordinates of (4 – 4, 4 + 2), (6 – 4, 4 + 2) and (5 – 4, 7 + 2) which are (0,6), (2,6) and (1,9).

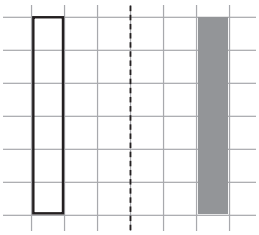
5 Reflection

→ pages 57–59

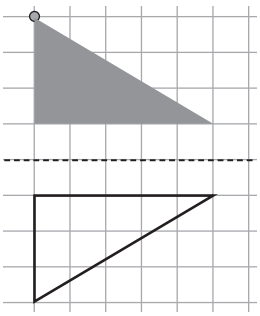
1. a)



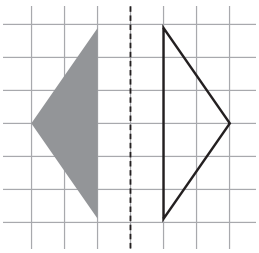
c)



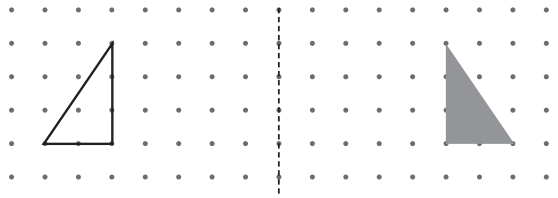
b)



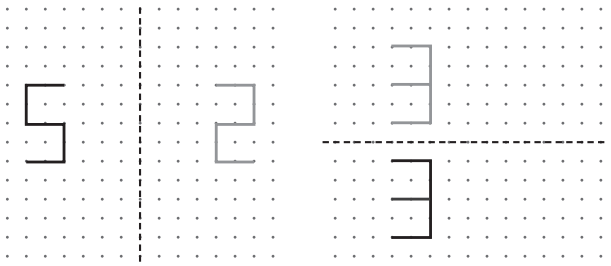
d)



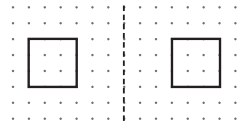
e)



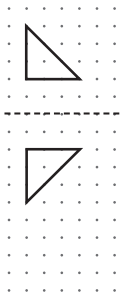
2. Children's predictions may vary. They may realise that the reflection of the 5 will look like a 2, for example, and that the reflected E will look the same.



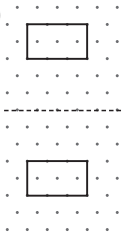
3. a)



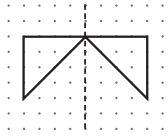
c)



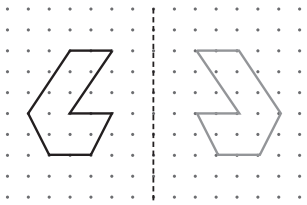
d)



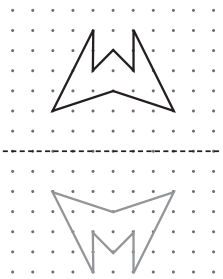
b)



4. a)



b)



Reflect

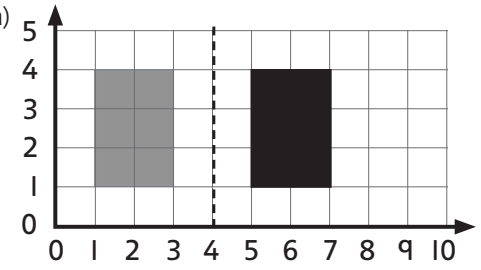
The arrow will be facing in the opposite direction but at the same level and distance away from the mirror line.

6 Reflection in horizontal and vertical lines

→ pages 60–62

1. A(1,5) A_1**(1,7)**
B**(3,7)** B_1**(3,5)**
C**(4,4)** C_1**(4,8)**
D**(8,9)** D_1**(8,3)**
E**(11,2)** E_1**(11,10)**
F**(12,8)** F_1**(12,4)**

2. a)

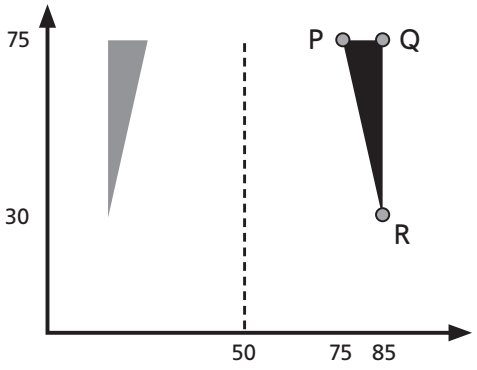


b) P_1**(1,1)**, Q_1**(1,3)**, R_1**(1,4)**, S_1**(3,4)**

3. A_1**(4,2)** 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

In the vertical mirror line, the second part of the coordinate (*y*-coordinate) stays the same.

In the horizontal mirror line, the first part of the coordinate (*x*-coordinate) stays the same.

The distance between (9,8) and both mirror lines is 3 squares, so subtract 3 from each mirror line.

In the vertical mirror line the reflected point is (6 – 3, 8) = (3,8).

In the horizontal mirror line the reflected point is (9, 5 – 3) = (9,2).

End of unit check

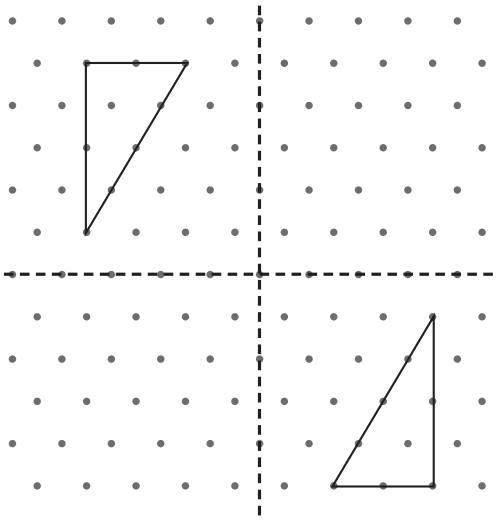
→ pages 63–65

My journal

1. A(53,25)
B(67,25)
C(77,25)
D(82,13)
E(78,13)

Notes:
The width of the parallelogram is 10.
The height of the parallelogram is the same in the reflected shape, so the *y*-coordinate stays the same.

2.



Power puzzle

No answers required. Children draw their own designs.

Unit 14 – Decimals

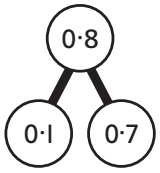
1 Add and subtract decimals within 1 (1)

➜ pages 66–68

1. a) **0·9**
b) **0·8**
c) **0·7**
d) **1**

2. a) **0·9** – **0·5** = **0·4** m
b) **0·9** – **0·2** = **0·7** m

3.



The other part-whole models can be completed in various ways. The digits must add to 8.
For example:
Two part: 0·2 and 0·6, 0·3 and 0·5, 0·4 and 0·4
Three part:
0·1, 0·2 and 0·5 0·1, 0·3 and 0·4
0·2, 0·3 and 0·3 0·4, 0·2, 0·2 and so on

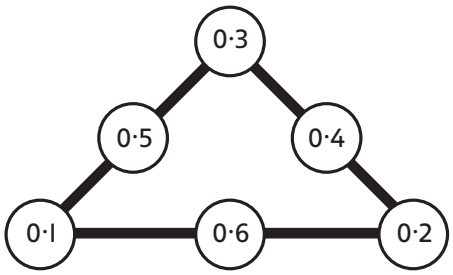
4. a) 0·3 + 0·5 = **0·8**
b) 0·7 + 0·1 = **0·8**
c) 0·2 + **0.3** = 0·5
d) 0·5 – 0·1 = **0·4**
e) 0·8 – 0·2 = **0·6**
f) 0·7 – **0·5** = 0·2
g) 0·4 + 0·3 + 0·2 = **0·9**
h) 0·7 + 0·2 – 0·3 = **0·6**
i) 0·9 – 0·1 + 0·2 = **1**
j) 0·5 – 0·2 – 0·3 = **0**

5. a) 0·3 + 0·7 = **1**
b) 0·6 + **0·4** = 1
c) **0·9** + 0·1 = 1
d) 1 – 0·2 = **0·8**
e) 1 – 0·5 = **0·5**
f) 1 – **0·8** = 0·2

6. a) 0·5 in the middle and 0·8 at the top.
b) 0·3 in the middle, 0·4 on the left of the bottom row and 0·2 on the right of the bottom row.
c) 0·7 in the middle row, 0·1 in the centre of the bottom row and 0·6 on the right of the bottom row.

7. Several answers are possible:
0·9 and 0·6 0·8 and 0·5 0·7 and 0·4
0·6 and 0·3 0·5 and 0·2 0·4 and 0·1

8.



All solutions will have 0·4, 0·5 and 0·6 in the middle of the rows.

Reflect

Emma has ignored the value of each digit.
0·4 + 1 = 4 tenths + 1 one = 1·4

2 Add and subtract decimals within 1 (2)

➜ pages 69–71

1. a) 0·58 c) 0·86
b) 0·69 d) 0·68

2. 0·39

3. a) 0·41 c) 0·51
b) 0·3 d) 0·04

4. 0·31 km

5. 0·32

6. a) 0·25 kg + 0·25 kg
b) 0·3 kg + 0·7 kg
0·25 kg + 0·3 kg + 0·45 kg

Reflect

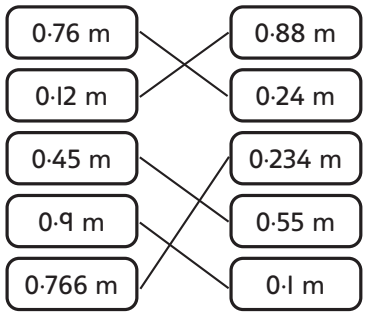
32 + 16 = 48 so 32 tenths + 16 tenths = 48 tenths = 0·48

3 Complements to 1

➜ pages 72–74

1. a) **0·2** b) **0·31**

2.



3. Lexi has one too many tenths, because she has forgotten that ten hundredths make one of the tenths, so she needs to add 7 tenths and 4 hundredths counters.

4. a) i) **0·7** ii) **0·62** iii) **0·616**
b) 0·38 + **0·62** = 1 **0·62** + **0·38** = 1
1 – **0·38** = **0·62** **1** – **0·62** = **0·38**

5. a) 0·8 + **0·2** = 1
b) 0·71 + **0·29** = 1
c) **0·95** + 0·05 = 1
d) 0·90 + **0·10** = 1
e) **0·22** + 0·78 = 1
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. 0·57 + 0·43 = 1
0·53 + 0·47 = 1
0·15 + 0·85 = 1
0·87 + 0·13 = 1
0·83 + 0·17 = 1
The tenths add to 9, the hundredths add to 10.

Reflect

Yes, 0·207 + 0·793 = 1. The tenths and hundredths add to 9, the thousandths add to 10.

4 Add and subtract decimals across I

→ pages 75–77

1. a) **1·2**
b) **1·5**
c) **2·4**
d) **0·4**

2. a) 6 + 7 = **13**
0·6 + 0·7 = **1·3**
0·06 + 0·07 = **0·13**
0·006 + 0·007 = **0·013**
b) 15 – 9 = **6**
1·5 – 0·9 = **0·6**
0·15 – 0·09 = **0·06**

3. a) **1·8**
b) **4·4**
c) **13·9**

4. a) 0·6 + **0·7** = 1·3
b) 1·2 + **0·8** = 2
c) 2·5 + **0·9** = 3·4
d) 0·18 + **0·08** = 0·26
e) 1·1 – **0·2** = 0·9
f) 3·5 – **0·6** = 2·9
g) 6·7 – **1·3** = 5·4
h) **0·54** – 0·06 = 0·48

5. 1·8 + 1·8 = **3·6**
3·7 – 1·9 = **1·8**
0·7 + 0·2 + 0·6 = **1·5**
0·28 + 0·35 = **0·63**
0.99 + 0·99 = **1·98**

Reflect

Use the fact that 15 + 7 = 22 and 15 – 7 = 8

15 tenths + 7 tenths = 22 tenths = 2·2

15 tenths – 7 tenths = 8 tenths = 0·8

5 Add decimals with the same number of decimal places

→ pages 78–80

1. a) 1·19
b) 1·6
c) 1·34
d) 1·4
e) 1·396
f) 4·73

2. a) **£10·81**
b) £9·55

3. a) 6·9
b) 9·3
c) 2·75

4. a) 0·502 + 4·165 **>** 3·258 + 0·875
b) 8·62 + 6·18 **>** 8·63 + 2·71 + 3·26

5. Zac has not lined the digits up correctly. The scarf is £11·20 not £1·12.
The first digit 1 should be in the tens column, the second digit 1 in the ones column and the 2 in the tenths column, with a zero as a placeholder in the hundredths column.

6. They could do any of the activities.
They could afford to go to both the circus and the cinema.

Reflect

Children should explain or show how to use column addition.

4·53 + 3·78 = 8·31

6 Subtract decimals with the same number of decimal places

→ pages 81–83

1. a) 4·2 – 1·7 = 2·5
b) 2·54 – 1·05 = 1·49
c) 8·5 – 3·9 = 4·6
d) 7·26 – 4·83 = 2·43
e) 2·661 – 0·625 = 2·036
f) 16·31 – 5·72 = 10·59

2. a) 7·56 – 0·49 = **7·07**
b) 12·52 – 3·92 = **8·6**
c) 3·005 – 1·486 = **1·519**

3. She has calculated 9 – 0 not 0 – 9. She also needs to exchange 1 tenth for 10 hundredths.

4. She has 5·8 km still to walk.

5. a) 3·21 + **2·28** = 5·49
b) 12·99 = **4·98** + 5·32 + 2·69

6. The difference between A and C is **57·07** greater than the difference between B and C.

Reflect

Both subtractions begin with 5·8 and both involve a one-digit number with 1 decimal place.

5·8 – 3·2 will be greater than 5·8 – 3·9.

Both could be solved mentally using a whole number equivalent.

With column subtraction, 5·8 – 3·2 can be solved using simple place value, whereas 5·8 – 3·9 needs an exchange.

7 Add decimals with a different number of decimal places

→ pages 84–86

1. a) 3·01 b) 1·164

2. a) 8·42 b) 3·218

3. a) 38·34 b) 11·372

4. a) 28·77 b) 122·652

5. Zac has written the 7 in the wrong column. It should be under the 4 in the tenths column.
57·19 is the correct answer.

6. Always true. For example: 6·5(0) + 2·39 = 8·89;
0 + any number = that number.

7. A + B = 4·125 + 16·1 = 20·225

8. a) 3 + 0·45 = **3·45**
b) 17 + 8·725 = **25·725**
c) 3·67 kg + 7 kg = **10·67** kg
d) 2 + 9 + 3·4 = **14·4**
e) 380 m + 70·85 m = **450·85** m
f) 28·513 + 48 + 399 = **475·513**

Reflect

Children should mention lining up the digits in their correct place value when using column addition and using zeros as placeholders.

8 Subtract decimals with a different number of decimal places

→ pages 87–89

1. a) 3·2 d) 1·465
b) 0·55 e) 0·305
c) 8·45 f) 4·824

2. a) 5·193
b) 7·09
c) 14·2

3. a) The cap costs **£1·08** more than the suncream.
b) There is **281·3** ml of suncream left.

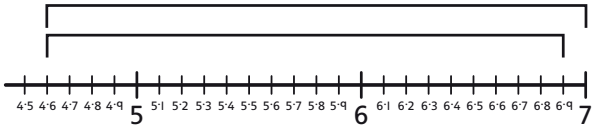
4. There is **9·25** l more milk than lemonade.

5. **37·85**
19·7 – 1·55 = 18·15
19·7 + 18·15 = 37·85

40·95
19·7 + 1·55 = 21·25
19·7 + 21·25 = 10·95

Reflect

A number line shows that the answer to 7 – 2·4 is the same as the answer to 6·9 – 2·3.



9 Problem solving with decimals (I)

→ pages 90–92

1. a) **98·775** kg
b) **55·38** m
c) £**1·28**

2. Toshi drives **33·15** km in total.

3. The mass of the grape is **4·55** g.

4. 0·21 and 0·99

5. **98·889**

6. £7·70

Reflect

Bar model a) Children write questions relating to adding 54·47 kg and 44·305 kg.

Bar model b) Children write questions relating to subtracting 24·98 m from 80·36 m.

10 Problem solving with decimals (2)

→ pages 93–95

1. The total cost is £**18·04**.

2. £7·81 change

3. 14·98 litres

4. **8·655** + **3·578** – **2·233** = 10

5. 3·4 m

6. 0·02
9·2 – 4·59 = 4·61
4·61 – 4·59 = 0·02

7. £12·20

Reflect

Children write a word problem with the answer 3·21 kg.

11 Decimal sequences

→ pages 96–98

1. a) 4·6, 4·7, 4·8, **4·9**, **5**, **5·1**, **5·2**
b) 11·5, 11·9, **12·3**, 12·7, **13·1**, 13·5, **19·9**, **14·3**
c) **15·75**, **15·7**, 15·65, 15·6, 15·55, **15·5**, **15·45**

2. a) 0·76, 0·77, **0·78**, **0·79**, **0·8(0)**, **0·81**, **0·82**, **0·83**
b) 5·615, 5·620, **5·625**, 5·630, **5·635**, **5·640**, 5·645, **5·650**

3. The counts goes up 3 tenths each time.
12 tenths is 1·2, not 0·12, and 15 tenths is 1·5.

4. a) 10·1, 10·3, 10·5, 10·7, **10·9**
Add 0·2 is **true**.
b) 39·57, 39·60, 39·63, 39·66, **39·69**
Add 0·3 is **false**, the rule is add 0·03.
c) 3·0, 2·25, 1·5, 0·75, **0**
Subtract 0·25 is **false**, the rule is subtract 0·75.
d) 0·4, 0·52, 0·64, 0·76, **0·88**
Add 0·12 is **true**.

5. **12·47**, **12·49**, **12·51**

6. a) 0·21, 0·42, 0·63, **0·84**, 1·05, 1·26, **1·47**
The rule is 'add 0·21'.
b) 11·3, **11·7**, 12·1, **12·5**, **12·9**, 13·3, 13·7
The rule is 'add 0·04'.
c) 7·68, 7·61, 7·54, 7·47, **7·4(0)**, **7·33**, 7·26
The rule is 'subtract 0·07'.

7.

Round	1	2	3	4	5	6
Distance travelled in round (km)	0·8	1·6	2·4	3·2	4·8	5·6
Total distance travelled so far (km)	0·8	2·4	4·8	8	12·8	18·4

Reflect

Answer depends on sequence generated by each child.

12 Multiply by 10

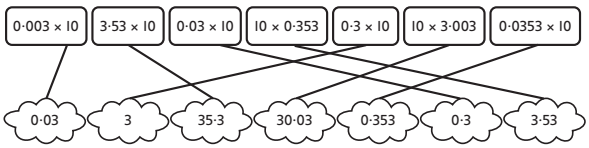
→ pages 99–101

1. a) **24** b) **1·3**

2. a) **13** c) **135**
b) **13·5** d) **1·35**

3. Olivia has treated the decimal number as a whole number, placing a zero on the end.
The correct answer is 148.

4.



5. a) 5·8 × 10 = **58**
b) 5·82 × 10 = **58·2**
c) 24·9 × 10 = **249**
d) 1·09 × 10 = **10·9**
e) 21·08 × 10 = **210·8**
f) 0·198 × 10 = **1·98**
g) 10 × 21·08 = **210·8**
h) 0·019 × 10 = **0·19**
i) **30·9** = 3·09 × 10
j) 0·04 × 10 = **0·4**
k) **30·99** = 3·099 × 10
l) 0·004 × 10 = **0·04**
m) **309·9** = 30·99 × 10
n) 0·040 × 10 = **0·4**

6. a) Luis is not correct. **1·25** × 10 = 12·5
12·5 × 10 = 125
b) **1·5** × 10 = 15 **0·92** × 10 = 9·2 **0·173** × 10 = 1·73
2·5 × 10 = 25 10 × **1·52** = 15·2 **1·73** × 10 = 17·3

7. Mo has travelled **3** m further than Lexi.

Reflect

Each digit moves one place to the left.

13 Multiply by 10, 100 and 1,000

→ pages 102–104

1. a) 7·9 × 10 = **79**
7·9 × 100 = **790**
7·9 × 1,000 = **7,900**
b) 2·19 × 10 = **21·9**
2·19 × 100 = **219**
2·19 × 1,000 = **2,190**
c) 0·84 × 100 = **84**
d) 0·7 × 1,000 = **700**
e) 0·05 × 100 = **5**
f) 1,000 × 1·7 = **1,700**

2. a) 0·4 × 100 = **40**
0·04 × 100 = **4**
0·004 × 100 = **0·4**
100 × 0·4 = **40**
b) 1·7 × 100 = **170**
1·7 × 1,000 = **1,700**
0·17 × 1,000 =**170**
c) 9·12 × 100 = **912**
0·912 × 100 = 91·2
0·00912 × 1,000 = 9·12
1,000 × **0·0912** = 91·2
d) 4·5 × **100** = 450
0·045 × **100** = 4·5
0·045 × **10** = 0·45
0·045 × **1,000** = 45

3. a) 335 litres
b) 20 m

4.

Number	0·127	0·003	0·38	0·076	0·012
× 1,000	127	3	380	76	12
× 10	12·7	0·3	38	7·6	1·2

5. a) **6·8** × **10** = 68
0·68 × **100** = 68
0·068 × **1,000** = 68
b) Various answers such as:
0·68 × **1,000** = **6·8** × **100**
0·68 × **100** = **6·8** × **10**
6·8 × **100** = **0·68** × **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.

Children should use a place value grid to show how the digits move one place to the left when multiplying by 10, two places to the left when multiplying by 100 and three places to the left when multiplying by 1,000.

I4 Divide by I0

→ pages 105–107

1. **0·12**

2. a) **0·45**
b) **0·045**
c) **4·5**
d) **0·452**

3. **23** ÷ **10** = **2·3**

4. The mass of one apple is **0·28** kg.

5. a) 603 ÷ 10 = **60·3**
b) 160·3 ÷ 10 = **16·03**
c) 16·31 ÷ 10 = **1·631**
d) 75·3 ÷ **10** = 7·53
e) **0·8** ÷ 10 = 0·08
f) 3·978 ÷ 10 = **0·3978**
g) 0·035 = **0·35** ÷ 10
h) 8·719 = **87·19** ÷ 10
i) 3·895 × 10 = **389·5** ÷ 10

6. Max's calculation is correct, 35 ÷ 10 = 3·5, but money amounts must always have two decimal places for the pence, so £3·5**0** is the correct answer.

7. a) 100 ml of lemonade costs £**0·18**.
b) 200 g of cocoa costs £**2·40**.
1 kg = 1,000 g
100 g = 1,000 g ÷ 10
100 g = £1·20

8. Toshi uses **0·025** kg of hot chocolate powder in each cup.

Reflect

Children should explain or show how the digits move one place to the right.

I5 Divide by I0, I00 and I,000

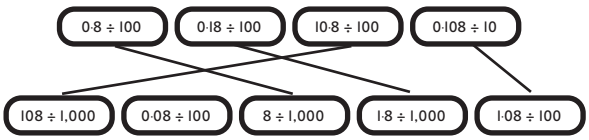
→ pages 108–110

1. a) **0·23**
b) **0·145**
c) **0·052**
d) **0·013**

2. Children should split each column into ten, giving 100 cells altogether.

3. a) 9 ÷ 100 = 0·09
true
b) 7 ÷ 1,000 = 0·007
true
c) 53 ÷ 100 = 0·053
false 53 ÷ 100 = **0·53**
d) 75 ÷ 1,000 = 0·075
true
e) 8·7 ÷ 100 = 0·87
false 8·7 ÷ 100 = **0·087**
f) 9·1 ÷ 1,000 = 0·00091
false 9·1 ÷ 1,000 = **0·0091**

4.



5. a) 37 ÷ **10** = 3·7
37 ÷ **100** = 0·37
37 ÷ **1,000** = 0·037
b) **1·2** ÷ 10 = 0·12
12 ÷ 100 = 0·12
120 ÷ 1,000 = 0·12

6. Jamie saved £**1·06** more each day.

7. ■ = 0·98 ★ = 0·00061

▲ = 0·0009 ● = 0·0061

Reflect

Reena is correct.

The answer to each calculation is 0·0351.

End of unit check

➜ pages 111–113

My journal

1. a) Children may demonstrate using column subtraction or a number line to show that 12 – 4·35 = 7·65 and an equivalent calculation, such as 11·99 – 4·34, also equals 7·65.

b) Ebo needs to remember to line digits up in their correct place value when using column subtraction and to always subtract the digit in the lower line from the digit in the upper line, remembering to make any necessary exchanges to enable that.

2. Each sum has numbers with differing numbers of decimal places. Zero placeholders will be needed for 25 + 2·95 and 18·3 + 9·65.
25 + 2·95 = 27·95
Can be worked out mentally using place value, same answer as 18·3 + 9·65 = 27·95
12·47 + 13·48 = 25·95
Column addition, same number of decimal places, could use knowledge of adding 2-digit numbers.
Same decimal part as the other two additions.
18·3 + 9·65 = 27·95
Column addition with zero as a placeholder for 18·3(0) to make the decimals the same length.
Same answer as 25 + 2·95.

Power puzzle

There may be several routes. Here is one solution for each puzzle:

2	~~÷ 100~~	~~÷ 10~~	× 100	× 10	÷ 100
÷ 1,000	× 100	× 10	÷ 10	× 100	× 10
× 10	÷ 100	× 10	~~÷ 10~~	~~× 100~~	~~÷ 1,000~~
× 100	÷ 10	× 1,000	× 100	× 10	0·002

2	÷ 100	÷ 10	× 100	× 10	÷ 100
÷ 1,000	× 100	× 10	÷ 10	× 100	× 10
× 10	÷ 100	× 10	÷ 10	× 100	÷ 1,000
× 100	÷ 10	× 1,000	× 100	× 10	2

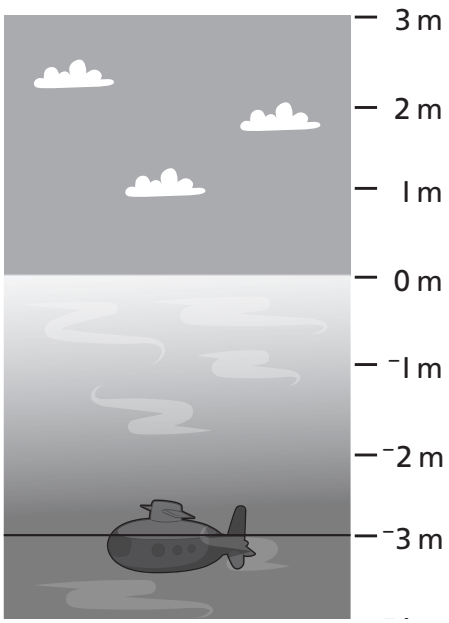
Unit I5 – Negative numbers

I Understanding negative numbers

→ pages 114–116

1. a) The submarine is at **⁻3** metres.

b)



2. a) **3** °C
b) **⁻3** °C
c) **0** °C
d) **⁻5** °C

3. From the top, the missing numbers are:
a) **1**, **⁻1**, **⁻4**
b) **2**, **0**, **⁻2**, **⁻4**
c) **⁻2**, **⁻3**, **⁻4**, **⁻5**, **⁻6**, **⁻7**, **⁻8**, **⁻9**, **⁻10**
d) **2**, **1**, **0**, **⁻1**, **⁻2**, **⁻3**, **⁻4**, **⁻5**
e) **0**, **⁻1**, **⁻2**, **⁻3**, **⁻4**, **⁻5**, **⁻6**, **⁻7**, **⁻8**

4. a) 3, 2, 1, 0, **⁻1**, **⁻2**, **⁻3**
b) ⁻5, ⁻4, ⁻3, ⁻2, ⁻1, **0**, **1**, **2**
c) 6, **5**, 4, **3**, 2, **1**, 0, **⁻1**, **⁻2**, **⁻3**
d) **⁻6**, **⁻5**, -4, -3, **⁻2**, **⁻1**, **0**, **1**, **2**

5. a) **⁻2**
b) **⁻7**
c) **⁻16**

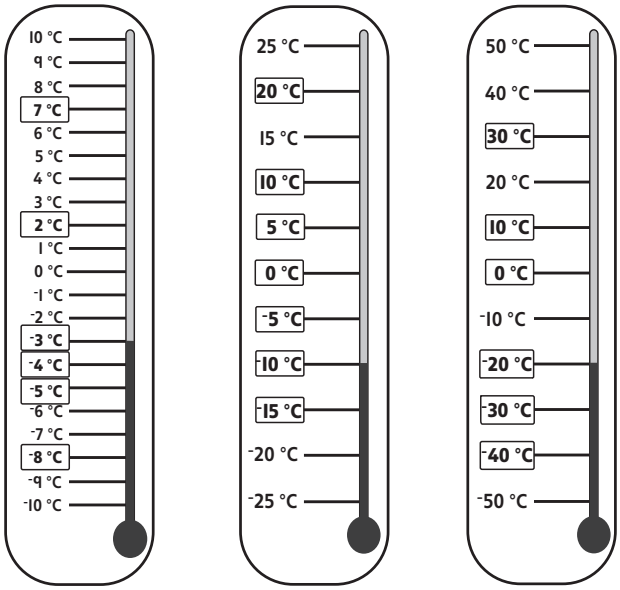
Reflect

No answers are needed for this board game, but players could discuss strategies for ensuring they do not fall off the end of the board.

2 Count through zero

→ pages 117–119

1.

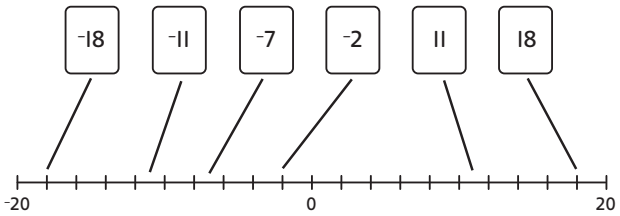


a) **⁻3** °C
b) **⁻10** °C
c) **⁻20** °C

2. ⁻10, ⁻8, **⁻6**, **⁻4**, ⁻2, **0**, **2**, 4, **6**, **8**, 10

3. a) **⁻9**, **⁻4**, **1**, **4**
b) **⁻90**, **⁻40**, **⁻10**, **10**
c) **⁻18**, **⁻2**, **2**, **14**, **18**

4.



5. a) 11, 9, 7, **5**, **3**, **1**, **⁻1**, **⁻3**, **⁻7**, **⁻9**
b) ⁻11, ⁻9, ⁻7, **⁻5**, **⁻3**, **⁻1**, **1**, **3**, **7**, **9**
c) ⁻81, ⁻71, ⁻61, **⁻51**, **⁻41**, **⁻31**, **⁻21**, **⁻11**, **⁻1**, **9**
d) ⁻20, **⁻15**, ⁻10, **⁻5**, **0**, **5**, 10, **15**, **20**, **25**
e) ⁻21, **⁻16**, -11, **⁻6**, **⁻1**, **4**, 9, **14**, **19**, **14**

Reflect

A game, so no answers are required.

3 Compare and order negative numbers

➜ pages 120–122

1. a) $0 > {}^{-}5$ c) $0 > {}^{-}1$ e) $^{-}1 < 0$
b) $^{-}5 < 6$ d) $^{-}8 < 5$ f) $8 > {}^{-}8$

2. a) $^{-}20 < {}^{-}5$ c) $^{-}6 > {}^{-}7$ e) $^{-}1 > {}^{-}2$
b) $^{-}100 < {}^{-}60$ d) $^{-}85 < 84$ f) $^{-}1 > {}^{-}999$

3. $\mathbf{^{-}65 < {}^{-}45 < {}^{-}35 < {}^{-}20 < 40}$

4. Approximately:
a) **$^{-}8$**, **$^{-}5$**, **$^{-}1$**, **5**, **9**
b) **$^{-}16$**, **$^{-}10$**, **$^{-}5$**, **5**, **15**
c) **$^{-}0{\cdot}7$**, **$^{-}0{\cdot}4$**, **$^{-}0{\cdot}2$**, **0·4**, **0·9**
d) **$^{-}1{\cdot}9$**, **$^{-}1{\cdot}5$**, **$^{-}1{\cdot}05$**, **$^{-}0{\cdot}5$**, **$^{-}0{\cdot}1$**

5. a) The negative numbers are in reverse order.
$^{-}1$ should be nearest to 0 and $^{-}7$ should be at the beginning of the line.
$^{-}7$, $^{-}6$, $^{-}5$, $^{-}4$, $^{-}3$, $^{-}2$, $^{-}1$, 0, 1, 2, 3, 4, 5, 6, 7
b) All of the numbers are in reverse order.
The positive numbers should be to the right of zero.
The negative numbers should be to the left of zero.
$^{-}7$, $^{-}6$, $^{-}5$, $^{-}4$, $^{-}3$, $^{-}2$, $^{-}1$, 0, 1, 2, 3, 4, 5, 6, 7

Reflect

Max is not correct, $^{-}4$ is less than $^{-}1$.
$^{-}1$ is closer to zero than $^{-}4$, so is $^{-}1$ is more than $^{-}4$.

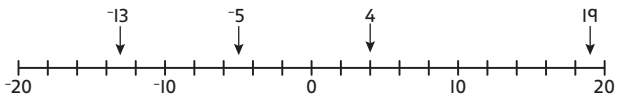
4 Find the difference

➜ pages 123–125

1. a) **$^{-}8$** °C
b) **5** °C
c) **13** °C

2. **11** °C colder.

3. a)



b) **17** °C
c) **$^{-}13$** °C, **$^{-}5$** °C, **4** °C, **19** °C
d) **–4** °C

4. a) Toshi travels down **15** floors.
b) Holly is now on floor **7**.

5. The mountain is **2**,**300** m tall.

6. The iceberg is **108** m tall in total.

Reflect

Expect children to write about temperature rises and falls during the day and temperature differences between different times of the day.

End of unit check

➜ pages 126–127

My journal

Various explanations may be given for children's estimates, for example:
I estimate **$^{-}7{\cdot}5$** for A because it is about half-way between $^{-}10$ and B.
I estimate **$^{-}5$** for B because it is about a quarter of the way along the line.
I estimate **$^{-}2{\cdot}5$** for C because it is about half-way between $^{-}5$ (B) and 0 (D).
I estimate **0** for D because it is about half-way between -10 and 10.

Power puzzle

$^{-}22$, $^{-}16$, $^{-}10$, $^{-}4$, 2
7, 4, 1, $^{-}2$, $^{-}5$, $^{-}8$

Or the inverses:

2, $^{-}4$, $^{-}1$, $^{-}16$, $^{-}22$
$^{-}8$, $^{-}5$, $^{-}2$, 1, 4, 7

Unit I6 - Measure – converting units

I Kilograms and kilometres

➜ pages 128-130

1. a) 5 km = **5,000** m
8 km = **8,000** m
14 km = **14,000** m
54 km = **54,000** m
103 km = **103,000** m
b) 5,000 m = **5** km
9,000 m = **9** km
18,000 m = **18** km
70,000 m = **70** km
140,000 m = **140** km
c) 3·2 km = **3,200** m
5·9 km = **5,900** m
12·5 km = **12,500** m
0·8 km = **800** m
1·75 km = **1,750** m
d) 1,900 m = **1·9** km
3,800 m = **3·8** km
14,500 m = **14·5** km
1,050 m = **1·05** km
340 m = **0·34** km

2.

From	To	Distance in m	Distance in km
Swansea	Mumbles	**7,900 m**	7·9 km
London	Birmingham	162,000 m	**162 km**
Glasgow	Edinburgh	67,100 m	**67·1 km**
Manchester	Liverpool	**50,000 m**	50 km
Lynton	Lynmouth	1,300 m	**1·3 km**

3. Letters written into circles:
A and **D** ÷ 1,000
B and **C** × 1,000

4. a) 12 kg = **12,000** g
b) 8,000 g = **8** kg
c) 6,500 g = **6·5** kg
d) 3·4 kg = **3,400** g
e) 10 kg 200 g = **10,200** g
10 kg 200 g = **10·2** kg
f) 4 kg 3,000 g = **7,000** g
4 kg 3,000 g = **7** kg

5. 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 kg = 27,500 g

6. 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 or 50,400 m

7. 2 bags: 18,000 g = 18 kg and 8,000 g = 8 kg
Children's explanations will vary; for example: Masses that are multiples of 1,000 g are a whole number of kilograms.

Reflect

Children's explanations may vary; for example:

To convert grams into kilograms, you divide by 1,000.

12,500 ÷ 1,000 = 12·5

So, 12,500 g = 12·5 kg.

2 Millimetres and millilitres

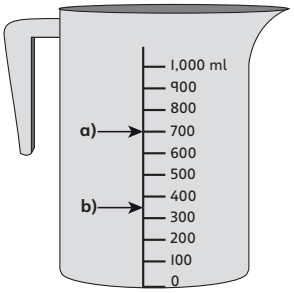
➜ pages 131-133

1. a) 2,000 ml = **2** l
b) 7,000 ml = **7** l
c) 23,000 ml = **23** l
d) 3 litres = **3,000** ml
e) 3·5 litres = **3,500** ml
f) 8,200 ml = **8·2** l
g) 16,900 ml = **16·9** l
h) 1·75 l = **1,750** ml
i) 0·3 l = **300** ml
j) 0·03 l = **30** ml

2. a) 1,000 mm = **1** m
b) 2,000 mm = **2** m
c) 9 m = **9,000** mm
d) 3,500 mm = **3·5** m
e) 6·7 m = **6,700** mm
f) 12,000 mm = **12** m
g) 6·75 m = **6,750** mm

3. a) **3** m
b) **1,250** ml

4.



5. a) 4,000 ml = **4** l
b) 15 l = **15,000** ml
c) 7·2 l = **7** l and **200** ml
d) 1,600 ml = **1·6** l
e) 12 l 500 ml = **12,500** ml
12 l 500 ml = **12·5** l
f) 9 l 2,500 ml = **11,500** ml
9 l 2,500 ml = **11·5** l

6. 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).

7.

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 cm = 56 mm.

3 Convert units of length

→ pages 134–136

1. 1 cm = **10** mm 1 m = **100** cm 1 km = **1,000** m

2. a) 3 cm = **30** mm
b) 7 cm = **70** mm
c) 12 cm = **120** mm
d) 4·3 cm = **43** mm
e) 0·8 cm = **8** mm
f) 15·7 cm = **157** mm
g) 90 mm = **9** cm
h) 170 mm = **17** cm
i) 59 mm = **5·9** cm
j) 103 mm = **10·3** cm

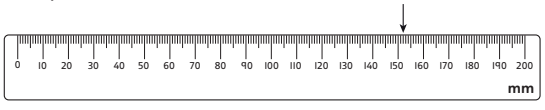
3. a) 200 cm = **2** m
b) 900 cm = **9** m
c) 780 cm = **7·8** m
d) 90 cm = **0·9** m
e) 8 m = **800** cm
f) 8·3 m = **830** cm
g) 0·45 m = **45** cm

4. The mouse's tail is 14·2 cm long.
Check that children have drawn tails that are 14·2 cm long.

5. Lexi, Reena, Ebo, Max

6. 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 × 100 = 200 cm) so that the length and width are in the same units before carrying out his calculation.
b) The perimeter is **406** cm = **4·06** m.

7. a)



b) The cola will travel **7,582** cm.
c) 310 mm = 31 cm
So, any person who is less than 31 cm in width can walk down it, but it would be very narrow.

Reflect

Children's 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**.

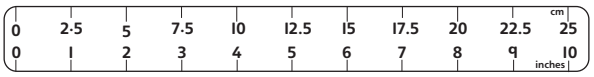
4 Imperial units of length

→ pages 137–139

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

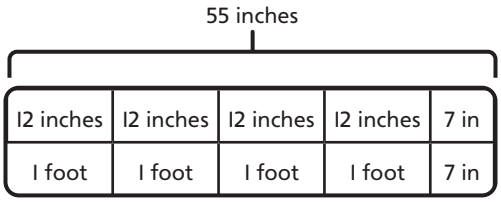
2. **4** × **12** = **48**
The snake is **48** inches long.

3.



4. a) a 48 inch chimpanzee
($3\frac{1}{2}$ ft = 36 + 6 = 42 inches or 48 inches = 4 ft)
b) 21 foot patio
(6 yards = 6 × 3 = 18 ft or 21 ft = 21 ÷ 3 = 7 yards)

5.



= **4** ft **7** in
= **1** yd **1** ft **7** in

6. 20 yards = 20 × 90 cm = 1,800 cm = 18 m
100 yards = 100 × 90 cm = 9,000 cm = 90 m
20 yards is about **18** m. 100 yards is about **90** m.

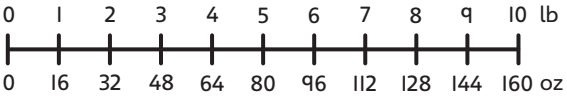
Reflect

Jamie is confusing yards and feet; she means 2 yards which is 6 feet.

5 Imperial units of mass

➜ pages 140-142

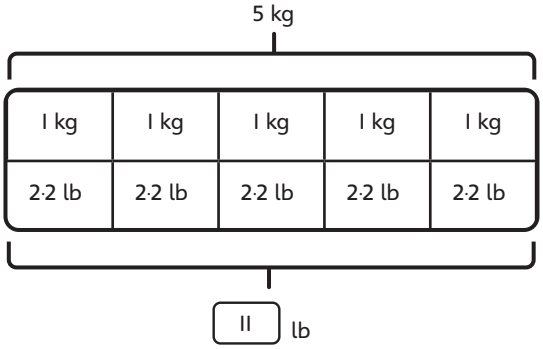
1.



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

2. a) The box of oranges has a mass of **17** lb.
b) **17** lb = **272** oz

3.



Max is correct as 5 kg = 11 lbs.

4. 3 $\frac{1}{2}$ lb is about 1·575 kg.
Children's explanations may vary; for example:
3 $\frac{1}{2}$ × 450 = 1,350 + 225 = 1,575
So, 3 $\frac{1}{2}$ lb is about 1,575 g, which is 1·575 kg.

5. a) Shaded 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

Children's methods may vary; for example:

Divide the lbs mass value by the kg value.

As 1 kg = 2·2 lb (approximately),

14 lb ÷ 2·2 kg = **6·36** kg (approximately).

6 Imperial units of capacity

➜ pages 143-145

1.

1 pint	2 pints	3 pints	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
b) 8 pints = **4,560** ml
c) 3 pints = **1,710** ml
d) 1 litre 140 ml = **2** pints
e) **3** litres **420** ml = 6 pints
f) **7** pints = 3·99 litres
g) $\frac{1}{2}$ pint = **285** millilitres

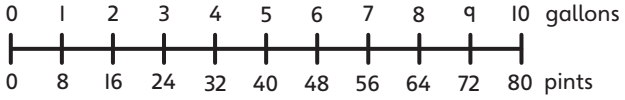
3. Circled: 4 $\frac{1}{2}$ litres

Children's 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.

4. The jug contains **3 $\frac{1}{2}$** pints = **1·995** litres approximately (accept close answer; for example: 2 litres).

5. Line drawn on jug at (or just over) 1 pint:

6.



Pond **C** contains the most water.

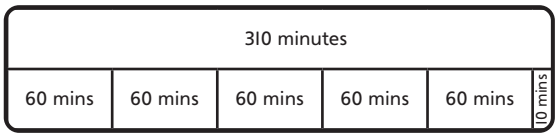
Reflect

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.

7 Convert units of time

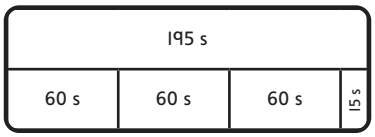
➜ pages 146-148

1. a)



The rail journey is 5 hours 10 minutes.

b)



The pop song is 3 minutes 15 seconds.

2. Children should correctly draw a bar model.
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 minutes ÷ 4 = 15 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 → × 60 → × 60 → seconds
days → × 24 → × 60 → minutes
days → ÷ 7 → weeks
b) leap year → × 366 → × 24 → × 60 → minutes

Reflect

30 months = 2 years and 6 months

Children's descriptions may vary; for example:

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

8 Timetables - calculating

→ pages 149-151

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) Olivia is on the train for 40 minutes.
b) Mo 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

Children's 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.

9 Problem solving – units of measure (1)

→ pages 152-154

1. a) 7,200 ml + **1,000** ml = **8,200** ml
6·2 kg + 2,000 g = **6,200 g** + **2,000 g** = **8,200** g
b) In each of these examples, I converted the numbers by multiplying by 1,000.

2. 60 centimetres are left.

3. a) 800 g + $\frac{1}{2}$ kg
= 800 g + **500** g
= **1,300** g

800 g + $\frac{1}{2}$ kg
= **0·8** kg + **0·5** kg
= **1·3** kg

b) 10·5 cm – 62 mm
= 10·5 cm – **6·2** cm
= **4·3** cm

10·5 cm – 62 mm
= **105** mm – 62 mm
= **43** mm

4. C, A, D, B

5. a) 1·1 litres = 1,100 ml
1,100 ml – 300 ml = 800 ml
Richard has 800 ml of squash left.
b) Each glass has 200 ml of squash.

Reflect

Children's explanations may vary; for example:

First, convert 0·6 km to m by multiplying by 1,000.

0·6 × 1,000 = 600

250 m + 600 m = 850 m

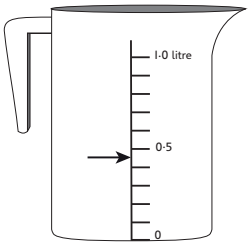
I0 Problem solving – units of measure (2)

➜ pages 155-157

1. 2·7 kg is **2,700** grams.

2. The frog has jumped **1·35** metres.

3.



4. They get **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 g
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 m = 100 cm

2·5 cm = 1 inch

100 ÷ 2·5 = 40

So, she needs to measure 40 inches of string.

End of unit check

➜ pages 158-159

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
I know this because 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 puzzle

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

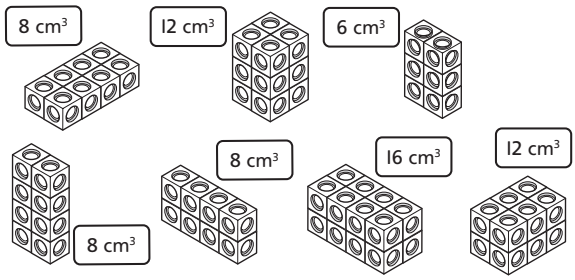
Unit 17 – Measure – volume

1 Cubic centimetres

➜ pages 167–169

1. a) **6** cm^3
b) **6** cm^3
c) **6** cm^3
d) **20** cm^3
e) **12** cm^3
f) **9** cm^3

2.



3. Richard is incorrect.

There are 6 cubes that are visible but there is a hidden cube on the bottom row. So there are 7 cubes and the volume is 7 cm^3.

4.

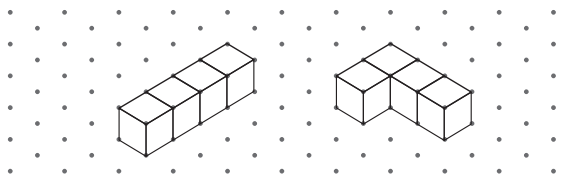
Shape	Volume
Shape A	5 cm^3
Shape B	**14** cm^3
Shape C	**30** cm^3

Children should describe how they counted the number of cubes in each layer and added the layers together.

There are several cubes that they cannot see and so they should make the connection that each layer is square and therefore the number of cubes in each layer is the width × width or $width^2$.

5. Children should accurately draw copies of the cubes on isometric paper.

6. Children's drawings will vary; for example:



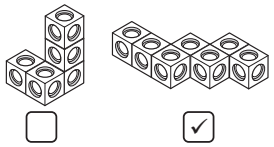
Reflect

Volume is the amount of space that a 3D shape takes up, it is measured in cubic units, for example centimetres cubed or cm^3.

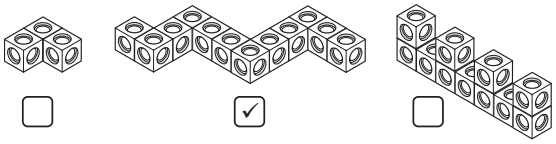
2 Compare volumes

➜ pages 170–172

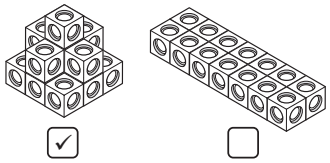
1. a)



b)



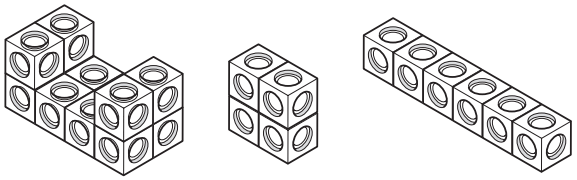
c)



d) No. In some cases the cubes could be found by multiplying; for example, in part c the cube on the right-hand side had 2 rows of 7 cubes and so the volume is 14 cubes = 14 cm^3.

2. Greatest volume **D**, **A**, **B**, **C** Least volume

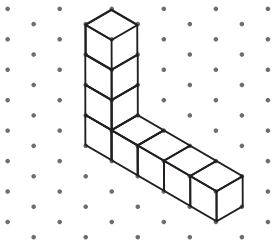
3.



Bella Max Amelia

4. Children's answers will vary, but shape A must have 8 cubes.

For example:



5. I predict that **Emma** has made the shape with the greatest volume because **the volume of her shape is 4 × 2 × 2 = 16** cm^3.

Reflect

Children's answers will vary but should acknowledge that the same number of cubes can be arranged differently to make up different 3D shapes. However, since the number of cubes has not changed the volumes will be the same.

Please note: Shapes are shown from one angle, so sometimes cubes are hidden. It would be possible to build some of the shapes with fewer unifix cubes than the answer suggests (i.e. if 'hidden' cubes were actually not part of the shape). If children draw attention to this, it will be an interesting discussion point.

3 Estimate volume

➜ pages 173-175

1. a) **14** cm^3
b) **14** cm^3

2. Children's answers will vary.

They should acknowledge that Lexi's volume will be an over-estimate because the pencil is a cylinder with a sharp end where the cubes produce a cuboid. The cuboid is larger than the pencil.

3. a) Ticked: hemisphere
b) Ebo could double his estimated volume for the hemisphere to make an estimate for the whole sphere. This is because the volume of a hemisphere is half that of a sphere.

4. No. The estimate with the greatest number of cubes will have the greatest volume. The carrot is long but this is only one direction (dimension) and so may not have such a large volume as the orange.

5. Children's answers will vary, for example:

Glue stick: Estimate **20–32** cm^3

Tennis ball: Estimate **110–160** cm^3

Hockey stick: Estimate approx. **1,800** cm^3

6. Children's answers will vary, for example:

Volume less than 10 cm^3	**Volume between 10 and 100 cm^3**	**Volume between 100 and 1,000 cm^3**
Pencil sharpener	Small notepad	TV remote control

Reflect

Children's answers will vary. For example, I could put a single layer of cubes on my hand and then count them.

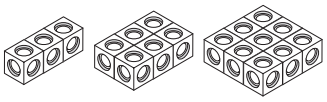
End of unit check

➜ pages 176-177

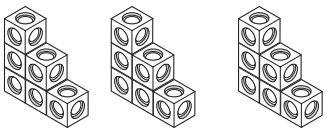
My journal

Possible answers are:

- Split the shapes horizontally into three different layers, then add the layers. Children have access to cm^3 cubes and can make each of the layers in the shape. They can then add the number of cubes in each layer to find the volume of the whole shape.



- Split the shape into three equal slices. The volume of the shape = the number of cubes in one of the slices multiplied by 3.



If children need support to explain how to calculate the volume, encourage them to make the shape and ask: *How many cubes can you see? How many cubes are there in each of the layers?*

Power puzzle

Children's answers will vary.

They should think about how many footballs they can fit along the length and width of the classroom floor. They can then multiply this together to find the number of footballs that would fit on the floor. They could then multiply this by the number of layers of footballs that could fit in the classroom.

Please note: Shapes are shown from one angle, so sometimes cubes are hidden. It would be possible to build some of the shapes with fewer unifix cubes than the answer suggests (i.e. if 'hidden' cubes were actually not part of the shape). If children draw attention to this, it will be an interesting discussion point.