Unit I2 – Geometry – properties of shapes
I Understand and use degrees

Discover

1. a) Lexi will be facing Lee.
   b) She could be facing the flowers or the bench after a 90° turn.

Think together

1. Lexi will turn 360°, a whole turn, so will be back facing Lee again.

2. Amelia has turned 270° anticlockwise.

3. a)

Start	Turn	Finish
facing B	180°	facing **F**
facing A	90°	facing **G**
facing E	**90°** **clockwise**	facing C
facing G	**90°** **clockwise**	facing A
facing G	**45°** **clockwise**	facing H
facing **A**	45° clockwise	facing B

   b) 135° clockwise or 215° anticlockwise.

2 Measure acute angles

Discover

1. a) The ramp is now at an angle of 30°.
   b) Amal's mistake is reading the wrong scale.

Think together

1. Between 30° and 70°.

2. a = 60°   b = 50°   c = 45°

3. Approximately two angles of 75° and one angle of 30° for both triangles.

3 Measure angles up to I80°

Discover

1. a) Mo turns an angle of 120°.
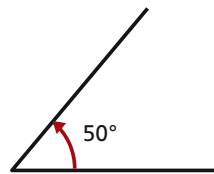   b) Emma turns an angle of 120°.

Think together

1. a is 120°   b is 170°

2. d, a, b, c

3. a) Amelia turns 140–145° or 215–220°.
   b) Amelia turns 140–145° or 215–220°.
   If Amelia turns the same way both times, the sum of her two turns is 360°. If she turns one way from A to C and then the opposite way from C to F, she will turn through the same angle both times.
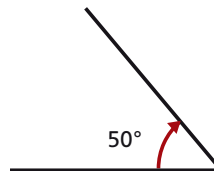
4 Draw lines and angles accurately

Discover

1. a)

b)

Think together

1. Compare children's angles for both a and b with those on the page.

2. Compare children's angles for both a and b with those on the page.

3. c) The missing angles are **50°** and **60°**.
   The missing line measurement is **62 mm**.
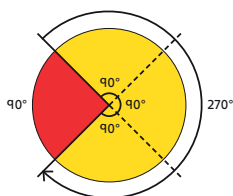
5 Calculate angles around a point

→ **pages 24–27**

Discover

1. a) A whole turn is 360°. A 90° angle is a quarter turn.

   The angle-maker can be used in any of these ways to show a 90° angle:

   b) One right angle is a quarter turn, so there must be 3 quarter turns remaining.
   90° + 90° + 90° = 270°
   270° is a three-quarter turn.

Think together

1. Approximately 48° and 312°.

2. a) **230°**   c) **182°**
   b) **120°**

3. a) Draw an angle of 130°. The remaining angle around the point will be 230°.
   b) Children should accurately draw angles of 130° and 48°, labelling the reflex angles 230° and 312° respectively.

6 Calculate angles on a straight line

→ **pages 28–31**

Discover

1. a) Angle a is **100°**.
   b) Max cuts two **90°** angles.

Think together

1. a = **140°**   b = **105°**   c = **10°**

2. a = **120°**   c = **35°**   e = **90°**
   b = **155°**   d = **60°**   f = **25°**
   a and **d** fit together to make a straight line.
   b and **f** fit together to make a straight line.

3. a = **36°**

4. a) Both angles will equal 45° (half of the remaining 90°).
   b) 30° and 60°

7 Lengths and angles in shapes

→ **pages 32–35**

Discover

1. a) The interior angles of the parallelogram are 45°, 135°, 45° and 135°.
   b) Length A is 20 cm but length B is longer than 10 cm.
   Lee is correct about length A but incorrect about length B.

Think together

1. p = 45°   q = 135°   r = 90°
   s = 135°   t = 45°   u = 270°

2. length = **200** mm   width = **45** mm

3. Max is incorrect. The diagonals of a rectangle do not split the 90° angles at the vertices in half, unless the rectangle is also a square.

8 Regular and irregular polygons

→ **pages 36–39**

Discover

1. a) Every interior angle is 135°. Isla is correct.
   b) The sides are not all the same length, so Richard is not correct.

Think together

1. The angles are not all equal.

   The sides are not all equal.

   Neither the sides nor the angles are all equal.

2. Shape A has measurements of 21 mm (top lines), 20.5 mm (side lines) and 25 mm (bottom line).
   Shape B is 28 mm all sides.
   Shape C has measurements clockwise from top line of: 26 mm, 26 mm, 33 mm, 23 mm and 35 mm.
   Shape B is regular as all the sides are equal and all the angles are equal.

3. a) Max should use the left board to make a square, the only regular quadrilateral.
Ambika should use the right board to make a hexagon with side length 1 or 2.
b) Board 1: Square or equilateral triangle.
Board 2: Equilateral triangle.
c) Any other polygons, apart from those mentioned in b). For example, a pentagon, an octagon or a decagon.
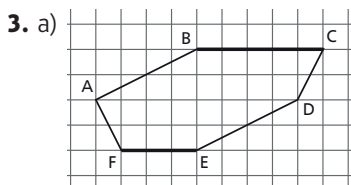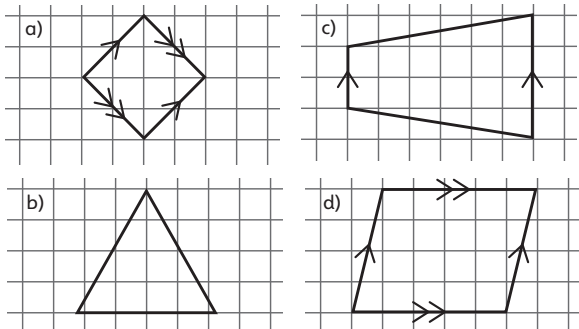
9 Parallel lines

→ **pages 40–43**

Discover

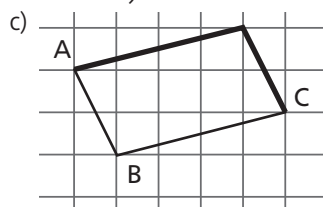**1.** a) All the horizontal and all the vertical lines on the gates are parallel.
b) The diagonal lines on the gates are not parallel because if they continued they would cross over.

Think together

1. The same pairs of lines are still parallel.

2. Shape b) has no parallel lines.

3. a)

b) AB and DE are parallel. The distance between the lines stays the same.
c)

10 Perpendicular lines

→ **pages 44–47**

Discover

1. a) The streetlamps on the top of the hill and on the right are perpendicular to the road because they make right angles.
b) The streetlamps on the top of the hill are both vertical and perpendicular to the road, as they make right angles.

Think together

1. C and D show perpendicular lines.

2. a) AF and CD are perpendicular to AB.
b) GH, KL and IJ are perpendicular to HI.

3. a) Bella is incorrect.
She has not made rectangles because all the angles should be 90° and the adjacent sides should be perpendicular to each other.
b) Perpendicular lines to those shown are needed.
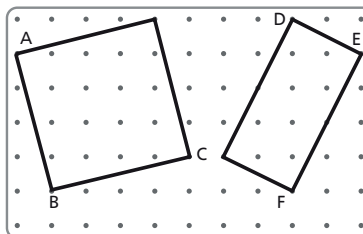
11 Investigate lines
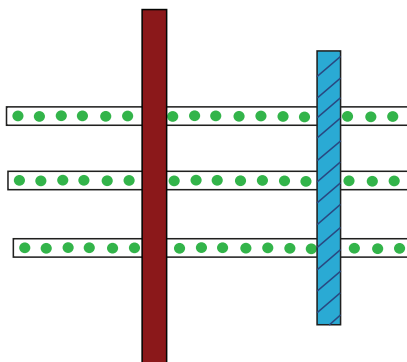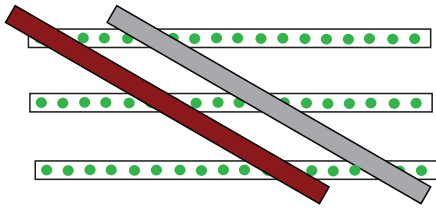
→ **pages 48–51**

Discover

1. a) The plain red strip crosses each dotted strip of paper at an angle of 150°.
The angle is the same each time.
b) The red strip is now perpendicular to the dotty strip and parallel to the stripy strip.

Think together

1. Place a strip at the same angle to the dotty strip as the red strip is.

2. Children should correctly identify the parallel and perpendicular lines.
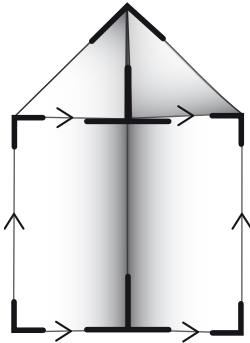
3. a) A, B and D have perpendicular diagonals.
   b) Agree. The diagonals of all squares are perpendicular to each other.
      The sides of a square are all equal so the diagonals of a square make 4 identical right angled isosceles triangles

12 3D shapes

→ **pages 52–55**

Discover

1. a) Position A is a top view.

   b) Bella and Aki both have a side view.

Think together

1. C because all the views are 2 by 2 squares.

2. Luis and Jamie see rectangles.
   Children should correctly draw a rectangle.
   Andy sees a triangle.
   Children should correctly draw a triangle.

3. B

End of unit check

→ **pages 56–57**

1. C
2. A
3. B
4. D
5. A
6. A

Unit 13 – Geometry – position and direction
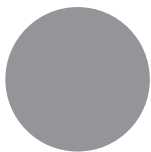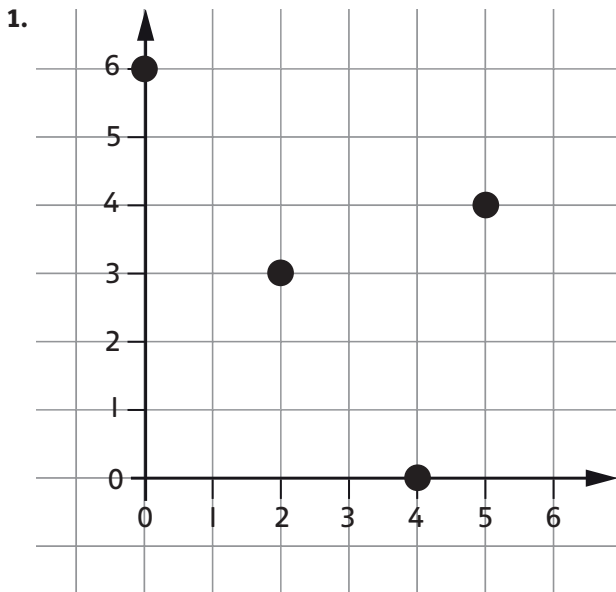
1 Read and plot coordinates

→ pages 60–63

Discover

1. a) The triangle is at (8,2).
  b) Reena has written the coordinates in the wrong order.
   The centre of the rhombus is at (4,5).

Think together

1.

2. A **(1,9)**
  B **(9,1)**
  C **(6,2)**
  D **(2,6)**

3. No answers required.

2 Problem solving with coordinates

→ pages 64–67

Discover

1. a) This is a right-angled triangle.
   It is isosceles because two sides are the same length.
  b) A (2,8)
   B (2,2)
   C (8,8)
   D (8,2)

Think together

1. (1,5) and (5,2)

2. (5,9)

3. (10,30) and (25,45)

3 Translate shapes

→ pages 68–71

Discover

1. a) The new position of Bella's bed will be above the table.
  b) The table will now be in the bottom right corner of her room, near the desk.

Think together

1. The desk has moved **3** squares **up**.

2. a) A to B: **1** left and 2 **down**
   B to A: **1 right** and **2 up**
  b) C to D: 3 left and 5 down
   D to C: 3 right and 5 up
  c) The number of squares is the same, but left becomes right and down becomes up.

3. a) B and D are translations.
   C and E are reflections.
  b) A to B: 2 left and 2 up
   A to D: 3 right and 4 up
  c) & d)
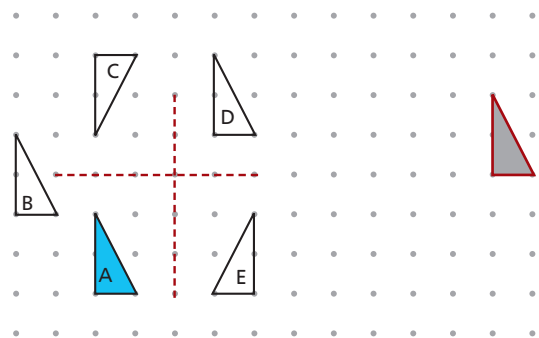
4 Translate points

→ pages 72–75

Discover

1. a) The coordinates of Andy's new position are (10,8).
  b) A translation of Alex's counter 3 left, 4 down would win.

Think together

1. A_1**(12,8)**
  B_1**(13,5)**
  A_2**(12,5)**
  B_2**(13,2)**

2. A_1**(14,10)**
  B_1**(14, 12)**
  C_1**(16,12)**
  D_1**(16,10)**

3. a) P**(0,1)**
   Q**(2,3)**
   R**(3,0)**
  b) A**(13,13)**
   B**(12,10)**
   C**(15,11)**

5 Reflection

→ pages 76–79

Discover

1. a)
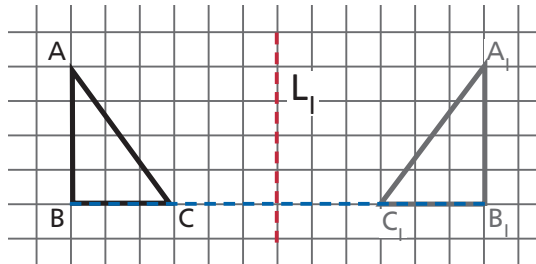
b)
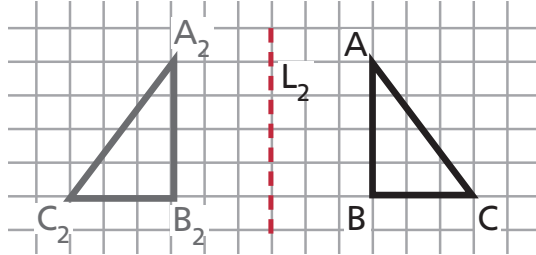
Think together

1.
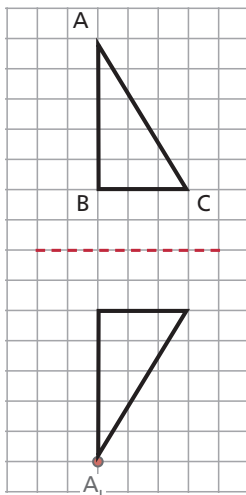
2. Bella has translated the triangle 9 squares up.
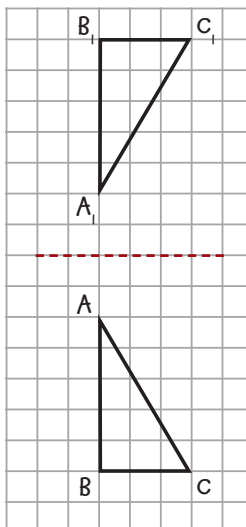
3. a) Reflect it vertically then horizontally or horizontally then vertically.
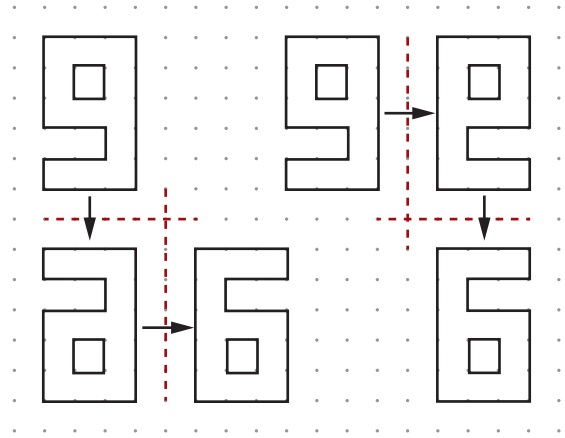
b)
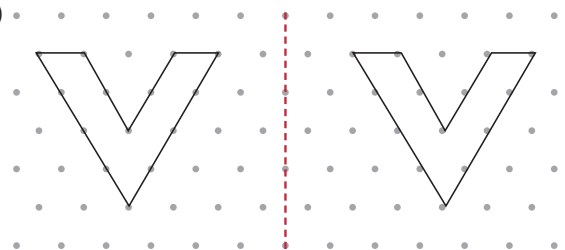
6 Reflection in horizontal and vertical lines

→ pages 80–83

Discover

1. a) The true coordinates of the treasure, T_1, are (8,3).
b) The coordinates of the secret cave are (4,8).

Think together

1. A_1**(2,5)**
B_1**(3,6)**
C_1**(7,1)**

2. A_1**(8,11)**
B_1**(8,14)**
C_1**(3,14)**
D_1**(3,11)**

3. a) A_1**(6,5)**
B_1**(11,5)**
C_1**(6,2)**
D_1**(11,2)**
b) Children should estimate the coordinates.

End of unit check

→ pages 84–85

1. A

2. C

3. A

4. C

5. (25,0)

Unit 14 – Decimals

1 Add and subtract decimals within 1 (1)

→ **pages 88–91**

Discover

1. a) 0·4 m, 0·3 m and 0·1 m sections
   b) There are several possible answers:
      0·4 + 0·2 + 0·2 = 0·8
      0·3 + 0·3 + 0·2 = 0·8

Think together

1. a) **0·6** m + **0·2** m = **0·8** m
      The track is **0·8** m in total.
   b) **0·7** m – **0·1** m = **0·6** m
      Track piece C is **0·6** m longer than track piece D.

2. a) 0·4 + 0·5 = 0·9
   b) 0·5 – 0·4 = 0·1
      0·4 – 0·3 = 0·1
      0·3 – 0·2 = 0·1
      0·2 – 0·1 = 0·1
   c) 0·2 and 0·4

3. a) Isla has put the decimal point in the wrong
      position.
      0·1 + 0·2 + 0·7 = 1·0
   b) 1 m – 0·7 m = 0·3 m

2 Add and subtract decimals within 1 (2)

→ **pages 92–95**

Discover

1. a) Olivia and Luis can make 0·68 l of orange paint.
   b) 0·89 l - 0·68 l = 0·21 l
      Olivia and Luis need to make 0·21 l more
      orange paint.

Think together

1. a) 0·83 l
   b) 0·47 l
   c) 0·23 l more

2. a)

	O	•	Tth	Hth
	0	•	6	3
+	0	•	0	5
	0	•	6	8

b)

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

c)

	O	•	Tth	Hth
	0	•	5	3
+	0	•	4	6
	0	•	9	9

3. a) They have 0·526 l of slime altogether.
   b) 0·322 l

3 Complements to 1

→ **pages 96–99**

Discover

1. a) Aki can use the 0·7 m and 0·3 m pieces to decorate
      one border of the mirror, and 0·57 m and 0·43 m
      pieces to decorate the other.
   b) Aki has 0·765 m of ribbon left.

Think together

1. a) 0·6 m
   b) 0·51 m
   c) 0·32 m

2. a) 0·8   c) 0·868
   b) 0·16   d) 0·479

3. a) 0·29 + **0·71** = 1
   b) 0·724 + **0·276** = 1
   c) 0·34 + 0·21 + **0·45** = 1
      0·34 – 0·21 + **0·87** = 1
      There are many possible solutions.
      The sum of the missing digits is **0·766**,
      for example:
      0·234 + **0·383** + **0·383** = 1

4 Add and subtract decimals across 1

→ **pages 100–103**

Discover

1. a) At the end of the month the height of the
      bamboo tree is 1·6 m.
   b) The sunflower has grown by 0·6 m.

Think together

1. a) 2·5 m
  b) Emma has collected 1·2 kg.
    She has forgotten that 10 tenths = 1
    5 tenths + 7 tenths = 12 tenths = 1·2

2. a) 7 + 8 = **15**
    0·7 + 0·8 = **1·5**
    0·07 + 0·08 = **0·15**
    1·7 + 0·8 = **2·5**
  b) 12 − 8 = **4**
    1·2 − 0·8 = **0·4**
    0·12 − 0·08 = **0·04**

3. 0·7 + 0·8 + 0·3 = **1·8**
    10 − 1·5 = **8·5**
    0·99 + 0·99 = **1·98**
    0·36 + 0·25 = **0·61**

5 Add decimals with the same number of decimal places

→ **pages 104–107**

Discover

1. a) Max's meal costs £4 in total, so he has
    enough money.
  b) The total cost of Jamie's meal is £5·35.

Think together

1. a) £6·09   b) £5·27

2. a) 6·6   c) 13·63
  b) 7·685

3. a) ruler, pencils and marbles
    £2·38 + £6·47 + £3·15 = £12
  b) eraser + pencils = £0·94 + £6·47 = £7·41
    marbles + notebook = £3·15 + £4·26 = £7·41

6 Subtract decimals with the same number of decimal places

→ **pages 108–111**

Discover

1. a) The watermelon costs £3·49.
  b) Amelia gets 26p change.

Think together

1. £1·63

2. a) 0·82 − 0·38 = **0·44**   c) 37·5 − 13·9 = **23·6**
  b) 3·25 − 1·73 = **1·52**   d) 2·054 − 1·375 = **0·679**

3. a) Ebo has the correct calculation but he has
    subtracted 3 from 7 instead of exchanging and
    subtracting 7 from 13. Lexi's number is 4·6.
  b) Ebo's number is 8·73
    Reena's number is 7·24

7 Add decimals with a different number of decimal places

→ **pages 112–115**

Discover

1. a) Ambika's paper plane flew 5·83 m.
  b) Lee's paper plane flies 3·81 m.

Think together

1. a) 4·05 m
  b) 5·521 m

2.

		6·192		
	3·192		3	
	1·732	1·46	1·54	
1·572	0·16	1·3	0·24	
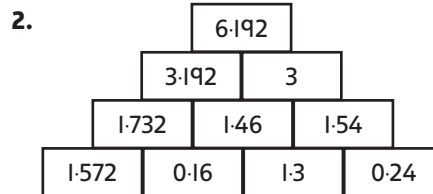
3. a) 4·5 + 1·34
    The digits are not lined up correctly. There are 4
    ones and 5 tenths, not 4 tenths and 5 hundredths.
    82·43 + 1·89
    The numbers in the top row have not been
    adjusted after the exchanging.
  b) 4·5 + 1·34 = **5·84**
    82·43 + 1·89 = **84·32**

8 Subtract decimals with a different number of decimal places

→ **pages 116–119**

Discover

1. a) There is 6·25 l of juice in the two bottles in total.
  b) There is 1·704 kg of flour left in the bag.

Think together

1. a) 2·2 kg more
  b) 1·35 kg more
  c) 2·642 litres

2. a) 7·6 − 3·52 = 4·08   d) 17·68 − 3·9 = 13·78
  b) 7·68 − 3·5 = 4·18   e) 4·2 − 1·79 = 2·41
  c) 7·68 − 3·9 = 3·78   f) 4·25 − 1·795 = 2·455

3. a) Children choose the method they prefer.
  b) 6 − 3·45 = 2·55   3 − 0·914 = 2·086   26 − 2·8 = 23·2

9 Problem solving with decimals (1)

→ pages 120–123

Discover

1. a) The weight of the astronaut on Earth is 64·05 kg more than on the moon.
   b) The total mass is 189·98 kg.

Think together

1. 7·644 m

2. £13·86
   Methods could include column addition or rounding to the nearest pound and adjusting.

3. a) The total mass is 37·15 kg
      A = 12 – 3·6 = 8·4 kg
      C = 12 + 4·75 = 16·75 kg
      A + B + C = 8·4 kg + 12 kg + 16·75 kg
      Or 3 × 12 kg – 3·6 kg + 4·75 kg
   b) Rock C weighs 8·35 kg more than rock A.
      16·75 – 8·4 or 3·6 + 4·75

10 Problem solving with decimals (2)

→ pages 124–127

Discover

1. a) The oats and pears will still be heavier as 3·49 kg > 3 kg.
   b) 3·49 kg – 3 kg = 0·49 kg
      Emma and Ebo can add 0·49 kg of sugar to the bag of sugar.
      Or they can remove 0·49 kg of oats from the bag of oats.

Think together

1. 1·61 kg

2. 21·3 g
   18·6 – 15·9 = 2·7   2·7 + 18·9 = 21·3
   Or 18·6 + 18·6 – 15·9 = 21·3

3. The distance between the 3rd and 4th lamppost is 5·511 m.
   3 × 5·85 = 5·85 + 5·85 + 5·85 = 17·55
   17·55 – 5·85 – 6·189 = 5·511

11 Decimal sequences

→ pages 128–131

Discover

1. a)

Month	April	May	June	July	Aug	Sept	Oct
Height (cm)	15·4	17·9	20·4	22·9	25·4	27·9	30·4

The rule is to add 2·5 each time.

b)

May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April
59·7	62·2	64·7	67·2	69·7	72·2	74·7	77·2	79·7	82·2	84·7	87·2

11 months ago, the rose bush was shorter than 60 cm. So, the rose bush has been over 60 cm tall for the last 10 months.

Think together

1.

	April	May	June	July	Aug	Sept	Oct
White rose	15·1	15·2	15·3	**15·4**	**15·5**	**15·6**	**15·7**
Climbing rose	10·0	12·6	15·2	**17·8**	**20·4**	23	**25·6**
Wild rose	**12·429**	12·43	12·431	12·432	**12·433**	**12·434**	**12·435**

2. a) 20·5   20·75   21   21·25   **21·5**   **21·75**   **22**
   b) 0·65   **0·68**   0·71   0·74   **0·77**   **0·8**   0·83   **0·86**
   c) 7·0   **7·2**   **7·4**   **7·6**   **7·8**   8·0

3. a) The sequence has a difference of 0·1 between each number. The cards that are covered up could be 3.6 or 3.8.
   b) The sequence increases by 3·1, so in order the given numbers are 29·4, 32·5, 35·6, 38·7, 41·8.
      The missing numbers could be:
      23·2 and 26·3, or 26·3 and 44·9, or 44·9 and 48·0.
      51·1 is the first number in the sequence above 50.

12 Multiply by 10

→ pages 132–135

Discover

1. a) Aki is using a method that works for whole numbers (placing a zero) but it does not work for decimals.
   b) 10 × 0·1 = 1

Think together

1. a) i) 0·14 × 10 = **1·4**   ii) 2·3 × 10 = **23**
   b) i) 3·7 × 10 = **37**   iii) 2·39 × 10 = **23·9**
   ii) 4·5 × 10 = **45**   iv) 0·196 × 10 = **1·96**

2. a) 0·1 × 10 = **1**   c) 0·256 × 10 = **2·56**
   1·2 × 10 = **12**   1·256 × 10 = **12·56**
   5·7 × 10 = **57**   31·126 × 10 = **311·26**
   19·1 × 10 = **191**
   b) 0·72 × 10 = **7·2**
   1·25 × 10 = **12·5**
   5·71 × 10 = **57·1**
   19·16 × 10 = **191·6**
   d) The digits stay the same and in the same order
   but their place value increases 10 times.

3. a) 10 × 3·9 = **39**   d) **1·262** × 10 = 12·62
   b) 10 × 11·6 = **116**   e) **0·32** × 10 = 3·2
   c) **0·456** × 10 = 4·56   f) **1·586** × 10 = 15·86

13 Multiply by 10, 100 and 1,000

→ **pages 136–139**

Discover

1. a) There are 1,000 bags on the lorry.
   b) The mass of all the potatoes on the lorry
   is 2,500 kg.

Think together

1.

Th	H	T	O	Tth
			3	7
		3	7	
	3	7	0	
3	7	0	0	

3·7 × 10 = **37**
3·7 × 100 = **370**
3·7 × 1,000 = **3,700**

2. a) 1·72 × 10 = **17·2**   c) 39·3 × 100 = **3,930**
   1·72 × 100 = **172**   3·93 × 100 = **393**
   1·72 × 1,000 = **1,720**   0·393 × 100 = **39·3**
   b) 4·13 × 1,000 = **4,130**
   0·413 × 1,000 = **413**
   0·041 × 1,000 = **41**

3. a) 0·8 × 10 = **8**
   0·4 × 100 = **40**
   0·2 × 1,000 = **200**
   b) Move each digit up two rows.
   1,000 + 20 + 40 + 7
   12·47 × 100 = 124·7

14 Divide by 10

→ **pages 140–143**

Discover

1. a) Each hand span is 0·09 m wide.
   b) The digits move one place to the left
   when you divide by 10.

O	Tth	Hth
0	9	
0	0	9

Think together

1. 0·26 m

2. a) 0·92 ÷ 10 = **0·092**   d) **58·6** ÷ 10 = 5·86
   b) 53·6 ÷ 10 = **5·36**   e) 89·02 ÷ 10 = **8·902**
   c) 95 ÷ 10 = **9·5**   f) **10·02** ÷ 10 = 1·002

3. a) 0·295 ml
   (2·25 + 0·7) ÷ 10
   Or 2·25 ÷ 10 + 0·7 ÷ 10
   b) 100 ml costs 12p.
   200 ml costs 24p.
   c) 0·8 kg
   d) Various responses are possible.

15 Divide by 10, 100 and 1,000

→ **pages 144–147**

Discover

1. a) There are 100 sachets of curry powder in the
   large box.
   b) There is 0·085 kg of curry powder in each sachet.

Think together

1. a) 12·8 kg ÷ 100 = **0·128** kg   128 ÷ 100 = **1·28**
   2·52 m ÷ 100 = **0·0252** m   0·9 ÷ 100 = **0·009**
   b) i) 0·012   ii) 0·006 m   iii) 0·718 km   iv) 7p or £0·07

2. 4 litres ÷ **100** = **0·04** litres

3. a) 46 kg ÷ 1,000 = 0·046 kg = 46 g
   b) ÷ 10 ÷ 10 ÷ 10 = ÷ 1,000

End of unit check

→ **pages 148–149**

1. C   **6.** B
2. B   **7.** 0·18 kg
3. B   **8.** B: 18·98
4. D   C: 50·48
5. A

Unit I5 – Negative numbers

I Understanding negative numbers

Discover

1. a) Reception is on the ground level, so floor 0.
The Restaurant is up one level from Reception.
Car Park A is one level down from Reception.
The Restaurant is on the first floor, so floor 1.
Car Park A is one level lower than ground level,
so floor ⁻1.

b) The waiter is in the Kitchen on floor ⁻3.

Think together

1. a) 2 °C
b) 0 °C
c) ⁻1 °C
d) ⁻4 °C

2. a) Children count: 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, 0, ⁻1, ⁻2, ⁻3,
⁻4, ⁻5, ⁻6, ⁻7, ⁻8, ⁻9, ⁻10
Ash has missed out zero.
b) Children count: ⁻10, ⁻9, ⁻8, ⁻7, ⁻6, ⁻5, ⁻4, ⁻3, ⁻2, ⁻1, 0,
1, 2, 3, 4, 5, 6, 7, 8, 9, 10

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

4. a) ⁻2   b) ⁻7   c) ⁻16

2 Count through zero

Discover

1. a) The thermometers go up in jumps of 2 °C.
b) Arctic World is at exactly ⁻8 °C.
Nocturnal World is ⁻3 °C.
Oceanic World is 13 °C.

Think together

1. a) ⁻5 °C   b) ⁻10 °C   c) ⁻15 °C

2. a) Children count: ⁻50, ⁻40, ⁻30, ⁻20, ⁻10, 0, 10, 20, 30,
40, 50;
50, 40, 30, 20, 10, 0, ⁻10, ⁻20, ⁻30, ⁻40, ⁻50
b) Children count: ⁻50, ⁻45, ⁻40, ⁻35, ⁻30, ⁻25, ⁻20, ⁻15,
⁻10, ⁻5, 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50
50, 45, 40, 35, 30, 25, 20, 15, 10, 5, 0, ⁻5, ⁻10, ⁻15, ⁻20,
⁻25, ⁻30, ⁻35, ⁻40, ⁻45, ⁻50

3. Lee will say ⁻20: 10, 5, 0, ⁻5, ⁻10, ⁻15, ⁻20.
Emma will say ⁻20: 8, 4, 0, ⁻4, ⁻8, ⁻12, ⁻16, ⁻20.
Zac will not say ⁻20. Zac will say: 5, 3, 1, ⁻1, ⁻3, …, ⁻17,
⁻19, ⁻21. All of Zac's numbers are odd.

3 Compare and order negative numbers

Discover

1. a) 18 is greater than 4, but a negative number is
always less than a positive number.
⁻18 < 4, so ⁻18 °C < 4 °C.
b) 4 °C is 4 degrees above 0 °C.
⁻18 °C is 18 degrees below 0 °C.

Think together

1. a) 0 > ⁻10   c) 10 > ⁻10   e) ⁻10 < 1
b) ⁻5 > ⁻10   d) ⁻10 < ⁻1   f) ⁻9 > ⁻10

2. **⁻40 < ⁻30 < ⁻25 < 45 < 70**

3. Children's answers to a), b) and c) should all be
related.
a) A ⁻9   B ⁻6   C ⁻2   D 2   E 8
b) A ⁻90   B ⁻60   C ⁻20   D 20   E 80
c) A ⁻0·9   B ⁻0·6   C ⁻0·2   D 0·2   E 0·8

4 Find the difference

Discover

1. a) In Tomsk, May is 13 °C warmer than March.
b) The two months that have the greatest
temperature difference are January and July.
The temperature difference is 27 °C.

Think together

1. It is 21 °C warmer in Cairo than in New York.

2. Mrs Dean travels 19 floors down.

3. Children may give various answers, such as:
The temperature rises between 1 am and 3 am, it
increases by 11 degrees.
The temperature rises between 3 am and 1 pm, it
increases by 21 degrees.
The temperature falls between 1 pm and 6 pm, it
decreases by 15 degrees.
It was 32 degrees warmer at 1 pm than at 1 am.

End of unit check

1. D
2. B
3. C
4. D
5. C
6. ⁻21, ⁻16, ⁻11, ⁻6, ⁻1, 4, 9

Unit I6 – Measure – converting units

I Kilograms and kilometres

→ **pages 172–175**

Discover

1. a) It is 930,000 metres from London to Berlin.
   b) 6 kg < 7 kg, so Jen can take her bag onto the plane.

Think together

1. a) 1 kg = 1,000 g; to convert kg to g, multiply by 1,000.
      When we multiply by 1,000, the digits shift to the left by 3 places.
      Blue rucksack: 5 × 1,000 = 5,000
      The scales will show 5,000 g when the rucksack is placed on them.
   b) Green rucksack: 12,000 ÷ 1,000 = 12
      The scales will show 12 kg when the rucksack is placed on them.
      Pink suitcase: 42,000 ÷ 1,000 = 42
      The scales will show 42 kg when the suitcase is placed on them.

2. a) 3 km = **3,000** m
      5 km = **5,000** m
      17 km = **17,000** m
      4·8 km = **4,800** m
      11·3 km = **11,300** m
      0·6 km = **600** m
   b) 6,000 m = **6** km
      19,000 m = **19** km
      260,000 m = **260** km
      7,600 m = **7·6** km
      750 m = **0·75** km
      26,500 m = **26·5** km

3. Multiplying by 1,000 involves shifting digits 3 places to the left.
   Lee has only added three zeros which is incorrect.
   8·3 kg = 8,300 g

2 Millimetres and millilitres

→ **pages 176–179**

Discover

1. a) 1,500 < 2,000, so Ebo does not have enough fencing to go along the flower bed.
   b) Alex has put 4·5 litres of water in the watering can.

Think together

1. There are 1,000 ml in 1 l.
   0·7 × 1,000 = 700
   The bottle contains 700 ml of plant food.

2. a) 4 l = **4,000** ml
      9 m = **9,000** mm
      14 l = **14,000** ml
   b) 4,000 mm = **4** m
      19,000 mm = **19** m
      185,000 mm = **185** m
   c) 8·2 l = **8,200** ml
      24·5 m = **24,500** mm
      0·6 l = **600** ml
   d) 6,900 mm = **6·9** m
      750 ml = **0·75** litres
      26,500 ml = **26·5** l

3. a) 1 mm = $\frac{1}{1,000}$ of a metre   1 ml = $\frac{1}{1,000}$ of a litre
      1 cm = $\frac{1}{100}$ of a metre
      1 m = 1,000 **mm**   1 l = 1,000 **ml**
      1 m = 100 **cm**
      1 mm is 0·001 **m** or 1 m is 0·001 **km**   1 ml is 0·001 l
   b) Although they are concerned with different types of measurement, the digits are the same in each column of the table. Words which begin 'milli' are always one thousandth of the whole.
      The units of measurements are different, length is measured in millimetres, centimetres and kilometres. Capacity is measured in millilitres and litres.

3 Convert units of length

→ **pages 180–183**

Discover

1. a) The children will need 100,000 1 p coins to make a line 1 km long.
      They will have raised £1,000 for charity.
   b) The children would raise £9,000 more if they placed the coins on their sides.

Think together

1. a) 1·6 m = **160** cm
   b) Each barrel is 32 cm tall.

2. a) B, C, A
   b) Max walks 50,000 cm.

3. Children should be able to complete a diagram like this one.
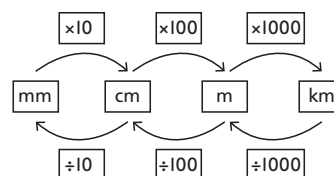
Children's explanations should include that each number has a 1 and a number of zeros (accept any alternative answer that describes the fact they are all powers of 10).

4 Imperial units of length

→ **pages 184–187**

Discover

1. a) The penguin swallowed the ring.
   b) The ostrich is 120 cm tall, which is the same as 1·2 m.

Think together

1. $5 \times 12 =$ **60**   **60** $+ 3 =$ **63**
   5 feet 3 inches is equal to 63 inches.
   The emu is 63 inches tall.

2. $15 \times 3 = 45$, so 15 yards = 45 feet
   $45 \times 12 = 540$, so 15 yards = 540 inches
   The pond is 540 inches wide.

3. Children's answers will vary. For example:
   1 inch ≈ 2·5 cm, 25 mm, 0·025 m
   1 foot ≈ 30 cm, 300 mm, 0·3 m $(12 \times 2·5 = 30)$
   1 yard ≈ 90 cm, 900 mm, 0·9 m $(3 \times 30 = 90)$

5 Imperial units of mass

→ **pages 188–191**

Discover

1. a) Alex should ask for 2 lb of apples and $\frac{1}{4}$ lb
      (or 0·25 lb) of blueberries.
   b) Alex's fruit will weigh about 1·008 kg (1,008 g).

Think together

1. $28 \times 15 =$ **420**
   There are 420 g of raspberries in the container.

2. a) 4 lb = **16** oz $\times$ **4** = **64** oz;
      10 lb = **16** oz $\times$ 10 = **160** oz;
      $\frac{1}{2}$ lb = **16** oz $\div$ 2 = **8** oz
   b) $\frac{1}{4}$ lb = 16 oz $\div$ 4 = 4 oz, so $\frac{3}{4}$ lb = 4 oz $\times$ 3 = 12 oz

3. a) The second set of scales will show 13·2 lb.
   b) The dog weighs 49 lbs, which is about 22 kg
      (also accept 22·3 kg).

6 Imperial units of capacity

→ **pages 192–195**

Discover

1. a) 2·28 l are approximately equal to 4 pints of milk.
   b) Mo has 3·42 l of water.

Think together

1. a) $5 \times$ **570** = **2,850**
      2,850 $\div 1,000 =$ **2·85**
      5 pints are about the same as 2·85 l.
   b) 3 pints is the difference.
      1,710 millilitres is the difference.
      $1,710 \div 1,000 = 1·71$
      1·71 litres is the difference.

2. 1 pint is approximately 570 ml.
   Half a pint is approximately 285 ml.
   So half a pint of milk is less than a 330 ml
   can of lemonade.

3. Yes, the bucket can be filled and there will
   be 0·26 litres (or 260 ml) left over.

7 Convert units of time

→ **pages 196–199**

Discover

1. a) Toshi has had his phone for 5 weeks and 4 days.
   b) 4 bars of Amal's battery should be charged
      fully. There are 15 minutes left until the next
      bar is charged.

Think together

1. 378 is between 360 and 420.
   So there are 6 minutes and there will be a
   remainder of seconds.
   $378 - 360 = 18$
   Amal's phone has been downloading updates
   for 6 minutes and 18 seconds.

2. 5 weeks = $5 \times 7 =$ **35** days
   $35 - 22 = 13$
   There are 13 days until the sale ends.

3. a) On the ferry: 13:00 Tuesday; arrived: 19:00 Tuesday;
      visiting auntie: 13:00 Thursday;
      theme park: 10:00 Friday.
   b) Jen has 154 hours until she returns home.

8 Timetables - calculating

→ **pages 200–203**

Discover

1. a) Emma catches Bus A. Emma arrives at school
      at 08:05 (five minutes past 8).
   b) Bus C arrives at school at 08:35.

Think together

1. a) Lexi arrives in Ashtown Central at 15:50.
   b) It takes Andy 24 minutes to get to Birchfield.

2. It takes **32** minutes to get from Birchfield
   to Ashtown Parkway.

3. The express train is 20 minutes quicker.

9 Problem solving – units of measure (1)

Discover

1. a) 1·40 m < 1·45 m so Isla is not tall enough to go on the roller coaster.

b) Aki is buying 750 ml of fizzy pop altogether.

Think together

1. 0·9 kg = **900** g   0·3 kg = **300** g
0·9 kg + 0·3 kg = **900** g + **300** g = **1,200** g
Ambika should guess a total of **1,200** g.

2. The roller coaster is now **597** metres long.

3. a) A, D, B, C, E

b) Yes, you would get the same order.
Children's explanations should mention that the mass of each parcel is still the same, whether it is expressed in grams or kilograms. Converting to kilograms and then comparing or converting to grams and then comparing will both give the same order.

10 Problem solving – units of measure (2)

Discover

1. a) Reena needs to convert ounces into grams:
2 oz = 56 g oats   4 oz = 112 g brown sugar
4 oz = 112 g butter   5 oz = 140 g plain flour

b) 5 cooking apples, 70 g oats, 140 g brown sugar, 140 g butter, 175 g plain flour

Think together

1. a) 2 litres = **2,000** ml
Jamie needs to open 4 cartons of milk.

b) Jamie will have 280 ml left over.

2. The latest time Danny should start preparing is 15:50 (ten minutes to 4).

3. A: 1·4 kg = 1,400 g, B: 10 oz = 280 g,
C: 1,250 g, D: 2 lb = 900 g
Bag A is the best value.

End of unit check

1. C

2. C

3. D

4. A

5. B

6. D

7. $4\frac{1}{2}$ minutes, 300 seconds, 5 minutes 10 seconds, $\frac{1}{4}$ of an hour
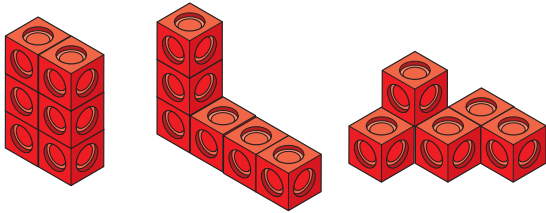
Unit 17 – Measure – volume

1 Cubic centimetres

→ **pages 216–219**

Discover

1. a) Zac is correct. Both shapes have a volume of 6 cm^3.
Volume is the amount of space that an object fills.

b)

Think together

1. a) **8** cm^3
b) **8** cm^3
c) **20** cm^3
d) **20** cm^3

2. Children's shapes will vary, but should all include 12 cubes to make 12 cm^3.

3. a) Children should correctly draw cubes to match the example on isometric paper.
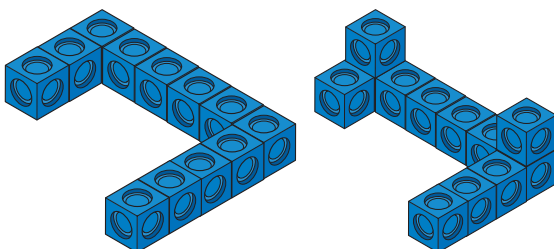

b) Left-hand shape: 3 cubes
Middle shape: 3 cubes
Right-hand shape: 4 cubes
(There is a hidden cube underneath the top cube.)

2 Compare volumes

→ **pages 220–223**

Discover

1. a) 9 < 10 < 12
Emma has built the shape with the greatest volume.
b) Isla needs to add 3 more cubes, for example:

Think together

1. Emma's shape has the smallest volume. The volume is 12 cubes.

Isla's shape has a volume of 13 cubes.

2. A < C < B (A = 16 cubes, B = 20 cubes, C = 18 cubes)

3. a) Emma is correct.
Andy's shape has a volume of 8 cubes and Emma's shape has a volume of 8 cubes (including a hidden cube at the back).
b) Isla's shape will have a larger volume.
She has the same number of cubes as Andy but since the cubes are larger, the total volume will also be larger.

3 Estimate volume

→ **pages 224–227**

Discover

1. a) Jamilla estimated the volume of the triangular prism.
Each cube has a volume of 1 cm^3. There are 90 cubes. An estimate of the triangular prism is, therefore, 90 cm^3.
b) The volume is an estimate because it is not exact, as there would still be spaces left in the triangular prism if it were filled with the cubes.

Think together

1. a) 30 cm^3
b) 30 cm^3
c) 27 cm^3 The most accurate estimate would be the estimate of the cube because if it was filled with cm^3 cubes there wouldn't be any spaces.

2. Children's answers will vary depending on the object chosen. They should make a model of the object using centimetre cubes and then count the cubes to find the volume in cm^3.

3. a) Make models of the different balls using centimetre cubes and then count the cubes to find the volume in cm^3.
b) Reena is incorrect.
The height of the ball is 3 balls but this is just one dimension. Volume is three dimensional since it involves height, width and depth. If the football is 3 times higher than the tennis ball then the volume will be 3 × 3 × 3 = 27 times greater. Another way of visualising this is to make layers of the tennis balls to fit a box the size of the football. There would be 3 layers in total with 9 tennis balls per layer thus making 27 tennis balls.

End of unit check

1. A

2. B

3. D

4. 24 cm^3

5. Children may suggest different methods for estimating the volume of the triangular prism. They might suggest making a shape out of cm^3 cubes that could fit inside it. However, this will result in an underestimate. They may also make a cuboid from cm^3 cubes that is the same length but slightly bigger than the triangular prism. This will give an overestimate for the volume.

6. 2 × 2 × 2 = 8 cm^3

Each sphere's diameter is half the length of the box. So 4 spheres will fill the bottom layer of the box, and 4 spheres will fit the top layer making a total of 8.

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.