Unit I: Place value within I00,000

Lesson I: Numbers to I0,000

→ pages 6–8

1. a) There are 1 thousands, 2 hundreds, 5 tens and 3 ones.
1,000 + 200 + 50 + 3 = 1,253
The number is 1,253.
b) There are 2 thousands, 4 hundreds, 4 tens and 0 ones.
The number is 2,440.

2. a) Children should add counters: 1 thousand, 3 hundreds, 0 tens and 1 one.
b) 5,632 = 5,000 + 600 + 30 + 2

3. Box crossed out which says in words: Four thousand, two hundred and twenty-five.

4. a) 6,230 3,575 9,499 7,009
b) 3,230 575 6,499 4,009

5. Andy's number is 8,520.
Kate's number is 5,208.

Reflect

7,562 = 7,000 + 500 + 60 + 2

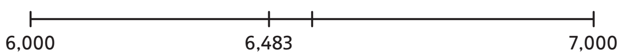
Explanations will vary; for example: Only the digit 7 (value 7,000) will change: 3,000 less than 7,000 is 4,000, so the 7 in the thousands column will change to a 4. The other digits will stay the same so:

3,000 less than 7,562 will be 4,562.

Lesson 2: Rounding to the nearest I0, I00 and I,000

→ pages 9–11

1. a) The number is 6,483.
b) 6,483 is between 6,000 and 7,000.



It is closer to 6,000.
The number rounds to 6,000 to the nearest 1,000.
c) 6,480
d) 6,500

2. Circled numbers: 2,850 2,909 2,949

3. a) 10,000
b) Answers may vary; children should mark four numbers between 9,000 and 9,499 (just before half-way along the number line) on the number line.

4. Table completed with the following amounts in the empty fields:
Charity A: £4,700 £4,700
Charity B: £5,350 £5,000

5. a) Accept answers between 7,525 and 7,925.
b) Accept answers between 6,100 and 6,140.
c) Accept answers between 945 and 949.
d) 6,501
e) 1,000
f) 10

6. Two counters added to the hundreds column.

7. The number could be any number between 2,650 and 2,659.
The number could **not** be any number outside of that range.

Reflect

Answers may vary.

Some possible similarities include: Rounding involves writing a number which is close to the given number. When you round a number to the nearest 10, 100 or 1,000 it will give a number with a zero in the ones column.

Some possible differences include: When you round to the nearest 10, the answer will be a multiple of 10. When you round to the nearest 100, the answer will be a multiple of 100. When you round to the nearest 1,000, the answer will be a multiple of 1,000.

Lesson 3: I0,000s, I,000s, I00s, I0s and Is (I)

→ pages 12–14

1. a) 5,000
10
80,000
0
b) 58,013
Fifty-eight thousand and thirteen

2. Lines drawn to match:
43,250 → 40,000
32,409 → 400
34,250 → 4,000
23,546 → 40

3. Counters added into columns:

TTh	Th	H	T	O
1	1	0	1	2

4. Numbers written in to complete part-whole models:
a) 50,000 5,000 7
b) 10,000 300
c) 20,090

5. a) 14,572
b) 13,672
c) 13,372
d) 63,572

6. First card: 5 Second card: allow 6–9
   Third card: any digit

   Examples given should contain the digits the child has chosen plus 2 and 0:

   Any 5-digit number greater than 60,000.

   Any 5-digit number with an even digit in the tens position.

   Any 5-digit number with 5 in the thousands position.

Reflect

Answers may vary; for example:
64,231 = 60,000 + 4,000 + 200 + 30 + 1

Lesson 4: 10,000s, 1,000s, 100s, 10s and 1s (2)

→ pages 15–17

1. a) 86,521
   b) 40,070
2. Boxes completed:
   a) 53,604 3 6 4
   b) 53,604 600 4
   c) 53,604 100
   d) 53,604 104
3. a) Boxes completed:
   Above number line: 30,000 82
   Below number line: 30,500
   b) 30,000 + 500 + 82 = 30,582
4. Boxes completed:
   8,000 300 50
   (or any three numbers that total 8,350)

   Any four numbers that total 68,359.
   Any three numbers that total 68,359.
   Any two numbers that total 68,359.
5. Buckets circled: 7,000 ml 9,000 ml 2,750 ml
6. Answers may vary.

   Numbers in each column must total 5,400. Only numbers greater than, or equal to, 1,000 can be used, for example:

Ship	Solution 1	Solution 2
Voyager	1,000	1,200
Princess	1,000	2,200
Neptune	3,400	2,000

Reflect

Explanations may vary; for example:

Because 20,000 + 6,000 = 10,000 + 16,000 and 500 + 30 + 2 = 500 + 32.

Lesson 5: The number line to 100,000

→ pages 18–20

1. Numbers on number line from left to right:
   23,000 25,500 27,000 29,900 (approximately)
2. a) Point A is 65,000 (approximately).
   Point B is 29,000 (approximately).
   b) Any three numbers between 45,000 and 55,000.
   c) 47,300 marked on line just under $\frac{3}{4}$ of the way between 40,000 and 50,000.
   d) Explanations may vary; for example:
   Because the number with the greatest place value in both numbers is the ten thousands number. 98,500 has 9 in this position (value 90,000) but 89,500 only has 8 (value 80,000).
3. B circled.
4. 76,100 circled.
5. Answers may vary; for example:
   A = 35,000
   B = 16,000
   C = 52,000
   D = 47,000
   (Allow +/– 2,000)
6. a) Possible answers:
   6,023 6,027 6,032 6,037 6,072 6,073
   b) Possible answers: 36,027 36,207
   c) Any number made from the 5 digits (apart from those with 76 thousands).
   d) 72,360

Reflect

Answers may vary; for example:
They are all between 40,000 and 50,000.

Lesson 6: Comparing and ordering numbers to 100,000

→ pages 21–23

1. 84,054 (bottom number) > 84,045
   Explanations may vary; for example:
   Both numbers have same numbers of ten thousands, thousands and hundreds, but the bottom number has 1 more ten so it is the larger number.
2. 6,432 < 23,460 < 26,034 < 32,604
3. 51,795 or 51,975 54,500 or 63,124

4. a) False
b) True
c) False
Explanations may vary; for example:
The first number has 9,000 while the second has 12,000 and 12,000 > 9,000.

5. 9,999 km 11,561 km 11,651 km 13,200 km 13,320 km

6. 56,787 < 56,794 or 56,787 < 56,974

7. Answers may vary; for example:
Car A: £24,510 Car B: £24,150

Reflect

8,976 67,559 74,030 74,300 76,955

Children should mention comparing the digit in the place of largest value first (ten thousands). Where the digit in this place is the same, they need to look at the digit in the next place (thousands), etc.

Lesson 7: Rounding numbers within 100,000

➜ pages 24–26

1. a) 90,000 100,000
b) 90,000 100,000
90,000

2. 96,304 100,000 96,000 96,300 96,300

3. a) Number between 39,001 and 39,499.
b) Number between 39,500 and 39,999.

4. a) 45,300
b) 90,000
c) 20,010

5. a) Number between 5 and 9.
b) Number between 0 and 4.
c) 8
d) Possible answers: 50, 51, 52, 53 or 54.

6. Amounts circled: £19,450 £19,549 £19,488

7. Answers may vary.
Top row: digits in the thousands and ones positions are between 5 and 9;
digits in the hundreds and tens positions are between 0 and 4.
Bottom row: digits in the thousands and ones positions are between 0 and 4;
digits in the hundreds and tens positions are between 5 and 9.

Reflect

hundreds
10,000
10
tens

Explanations may vary; for example:
The number 87,500 is between 87,000 and 88,000. Look at the hundreds digit – this is 5, so 87,500 will round up to 88,000.

Lesson 8: Roman numerals to 10,000

➜ pages 27–29

1.

100	C	**600**	DC
200	CC	**700**	DCC
300	CCC	**800**	DCCC
400	CD	**900**	CM
500	D	**1,000**	M

2. a) 1,000 + 1,000 + 100 + 10 + 1 = 2,111
b) 500 + 100 + 100 + 50 = 750
c) 100 + 100 – 10 + 5 = 195

3. Part-whole diagrams completed:
a) CD LXX
b) 1,047 (whole)
40 7 (parts)

4. a) MCCXI ➜ 1211
b) MDXLV ➜ 1545
c) MCDLXI ➜ 1461
d) MCMI ➜ 1901

5. Lexi is wrong.
MCX = 1,000 + 100 + 10 = 1,110
CMX = 1,000 – 100 + 10 = 910

6. a) MCMLXXV
b) MDLXXX
c) MMXII

7. MCDXCV 1,495

8. a) There are three possible solutions:
Solution 1:
L (to give MDCLIX) = 1,659
D (to give MCDVI) = 1,406
X (to give DCCLX) = 760
C (to give CDXXI) = 421
V (to give CCCXV) = 315
Solution 2:
L (MDCLIX) = 1,659
D (to give MCDVI) = 1,406
V (to give DCCLV) = 755
C (to give CDXXI) = 421
X (to give CCCXX) = 320

Solution 3:
X (MDCXIX) = 1,619
D (to give MCDVI) = 1,406
V (to give DCCLV) = 755
C (to give CDXXI) = 421
L (to give CCCXL) = 340

b) 315/320/340 < 421 < 760/755/755 < 1,406 < 1,659/1,619

Reflect

1,000
500 50

Together, MDXL represents the number 1,540 because M = 1,000, D = 500 and XL = 50 – 10 = 40.

End of unit check

→ pages 30–31

My journal

1. Children may describe the number 12,546 in many ways. For example:

12,546 is a 5-digit number because it has a digit in the 10,000s place;
12,546 is 546 more than 12,000;
12,546 is between the multiples 12,000 and 13,000;
12,546 is a little more than half-way between 12,000 and 13,000;
12,546 rounds to 13,000 to the nearest 1,000;
12,546 rounds to 10,000 to the nearest 10,000.

Representations could include place value grids and partitioning in part-whole models, on number lines or as abstract number sentences.

Unit 2: Place value within 1,000,000

Lesson 1: 100,000s, 10,000s, 1,000s, 100s, 10s and 1s (1)

➜ pages 32–34

1. 600,000 six hundred thousand
2. a) 500,000 five hundred thousand
   b) 1,000,000 one million (not 'a million')
3. a) One hundred and twenty-three thousand, four hundred and nineteen.
   b) Six hundred and ninety thousand, four hundred and three.
4. a) 329,100
   b) 37,581
   c) 600,040
   d) 400,596
5. a) 4,000 (4 thousands)
   b) 40 (4 tens)
   c) 40 (4 tens)
   d) 4 (4 ones)
   e) 400,000 (4 hundred thousands)
6. Answers will vary; all answers must have one counter in the thousands column. For example:
   111,225 301,035 311,205 411,114 301,134

Reflect

Check that the number drawn on the place value grid matches numerals and words.

Lesson 2: 100,000s, 10,000s, 1,000s, 100s, 10s and 1s (2)

➜ pages 35–37

1. 252,723
2. a) 310,450
   b) Circled: 2 × £100,000 1 × £10,000 5 × £1,000 4 × £1
3. a) Circled: 1 × 100,000 7 × 10,000 6 × 1,000 3 × 1
   b) Circled: 4 × 10,000 5 × 1,000 1 × 100 4 × 10
4. a) 218,492 = 200,000 + 10,000 + 8,000 + 400 + 9 + 2
   b) 710,388 = 700,000 + 10,000 + 300 + 80 + 8
   c) 39,448 = 30,000 + 9,000 + 400 + 40 + 8
   d) 279,731
   e) 502,981
   f) 7,073
   g) 650,103
5. a) 549,527
   b) 70,506
   c) 910,028
6. a) 536,215
   b) 735,000
   c) 10,976
   d) 15,100
   e) 2,132

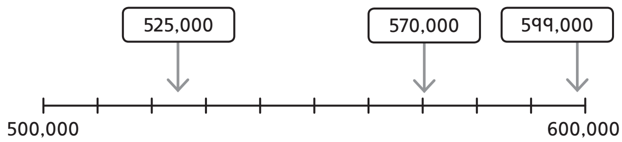
Reflect

Answers may vary. Look for 452,093 partitioned in a variety of ways; for example:
400,000 + 50,000 + 2,000 + 90 + 3
200,000 + 200,000 + 52,000 + 80 + 13

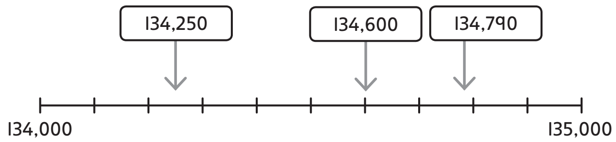
Lesson 3: Number line to 1,000,000

➜ pages 38–40

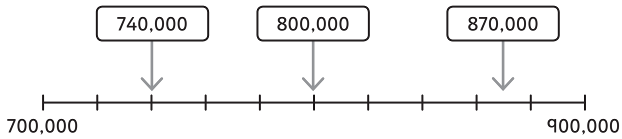
1. a) 200,000 650,000 900,000
   b) 210,000 270,000
   Allow answers between 297,500 and 299,000.
   c) 270,500 275,000 279,000
2. a)



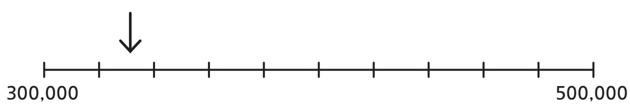
b)



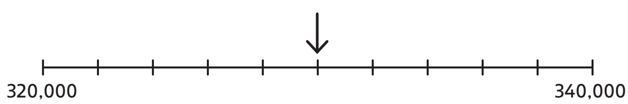
c)



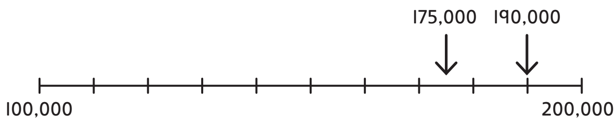
3. A: approximately 410,000
   B: approximately 475,000
   C: approximately 495,000
   Answers will vary and children should explain their reasoning for estimation.
4. Circled: 370,000 507,000 429,781
5. Top number: 330,000
   Middle number line:



Lower number line:



Reflect



Answers will vary; for example:

150,000 is half-way between 100,000 and 200,000 so 175,000 is $\frac{3}{4}$ of the way along the line.

Lesson 4: Comparing and ordering numbers to 1,000,000

➜ pages 41–43

1. Circled numbers:
a) Lower number (258,300)
b) Lower number (131,500)
c) Right-hand number (70,000)
d) Right-hand number (six hundred thousand)
e) Middle number (523,000)

2. a) Cliff Edge
b) Cliff Edge Fred's Farm Shaw Farm High Top

3. a) 56,720 < 73,405
b) 300,000 > 37,940
c) 517,182 < 517,185
d) 59,472 < 59,505
e) one million > 764,914
f) 3,189 < thirty thousand

4.

	Population
Hull	265,180
Southampton	238,700
Dover	31,200

5. Missing digits:
a) Number between 0 and 4.
b) If 2nd digit is 4 or less, 1st digit can have any value. If 2nd digit is 5, 1st digit must be 3 or more.
c) If 1st digit is 8 or 9, other digits can take any value. If 1st box is 7, there are many possible answers – check answer given.
d) 2nd digit = 8; 1st digit = 3rd digit.
e) 2nd digit = 3; other digits can take any value.

6. a) 5
b) 7
c) Answers will vary; middle number must start with a digit between 4 and 7.

Reflect

Explanations will vary. Children should explain that they will compare the digits with the greatest place value first (hundred thousands). If these are the same, they will need to compare the digits with the second greatest place value (ten thousands) and so on.

Lesson 5: Rounding numbers to 1,000,000

➜ pages 44 –46

1. a) 200,000
b) 600,000
c) 300,000
d) 700,000
e) 100,000
f) 700,000

2. a) 240,000
b) 470,000
c) 160,000
d) 420,000
e) 30,000
f) 720,000
g) 350,000
h) 610,000

3. (Danny's number is 237,412.)
a) 200,000
b) 237,000
c) Counters cannot be drawn in the hundred thousands or ten thousands columns but can be drawn anywhere else, to make numbers such as: 239,634 or 237,492.

4.

Number	Rounded to the nearest 10,000	Rounded to the nearest 1,000	Rounded to the nearest 10
239,145	240,000	239,000	239,150
128,783	130,000	129,000	128,780
758,007	760,000	758,000	758,010
632,175 – 632,184	630,000	632,000	632,180
825,425 – 825,434	830,000	825,000	825,430
627,141 – 627,149	630,000	627,000	627,150
635,*72 (* any digit)	640,000	635,000 or 636,000	635,*70

(Bottom row: third column will be 635,000 if * is between 0 and 4, and 636,000 if * is between 5 and 9.)

5. Answers will vary.
a) Allow numbers 450,000 to 549,999 made with correct digits.
b) Allow numbers 605,000 to 614,999 made with correct digits.
c) 610,548 or 610,584.

6. Answers will vary.
a) Ten thousands digit must be 5 or more; other digits cannot be 0.
For example: 151,111 ➜ 200,000
372,481 ➜ 400,000
699,999 ➜ 700,000
b) Ten thousands digit and thousands digit must be 9; other digits cannot be 0.
For example: 199,111 ➜ 200,000
399,481 ➜ 400,000
699,999 ➜ 700,000

Reflect

Explanations will vary; for example:
I would look at the ten thousands digit. If it is 4 or less I will need to round down. If it is 5 or more I will need to round up.

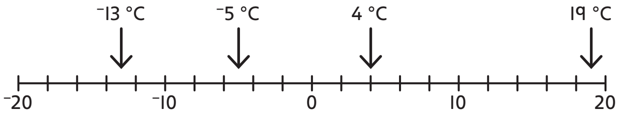
Lesson 6: Negative numbers

➜ pages 47–49

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

2. 11

3. a)



b) 17
c) $^{-}13$ $^{-}5$ 4 19
d) $^{-}4$

4. a) 15
b) 7

5. 2,300

6. 108

Reflect

Answers will vary; for example:
From 6 am to 2 pm the temperature increases by 19 °C.
The temperature is below freezing before 6:00 am and after 10:00 pm.

Lesson 7: Counting in 10s, 100s, 1,000s, 10,000s

➜ pages 50–52

1. a) 230,416
b) 240,416
c) 230,516
d) 220,516 (assuming she is starting from 230,516)

2. Missing numbers:
a) 170,000 180,000 190,000 200,000
b) 97,000 100,000 101,000 102,000
c) 760,400 760,700 760,800 761,000

3. Missing numbers:
a) 308,150 408,150 508,150 708,150
b) 555,420 565,420 575,420 585,420
c) 751,097 751,107 751,127 751,137

4. Answers will vary; for example:
+ 100,000: 320,000 420,000 520,000 620,000 720,000 820,000
+ 10,000: 680,000 690,000 700,000 710,000 720,000 730,000

5.

100,000 less	695,104	100,000 more	895,104
10,000 less	785,104	10,000 more	805,104
1,000 less	794,104	1,000 more	796,104
100 less	795,004	100 more	795,204
10 less	795,094	10 more	795,114

6. a) 877,777
b) 434,444
c) 556,555

7. a) 825,007
b) 184,512
c) 869,300
d) 382,150
e) 392,107
f) 184,512

8. A = 126,928 B = 26,928 C = 36,928

Reflect

Answers will vary. Children should recognise that there will be more steps of 100 than steps of 10,000 so it will take longer to count in 100s than to count in 10,000s.

Lesson 8: Number sequences

➜ pages 53–55

1. a) Children should draw three matches to make 3 linked horizontal squares.
b) 4 7 10 13 16
c) 22 matchsticks. Explanations will vary; for example: The rule for the pattern is to add 3 each time so I added 3 and 3 again to 16 (which is the 5th number in the pattern).

2. Rule for the sequence is to add 4 but 19 + 4 = 23, not 22. All numbers in the sequence will be odd.

3. a) 23 26
b) 11 13
c) 23 27
d) 4 0
e) 31 37
f) 125 100
g) 7 2
h) 21 31
i) 7 10
j) $^{-}2$ $^{-}8$

4. 41

5. 204

6. 48

Reflect

Children should design and describe their own sequence.

End of unit check

➜ pages 56–57

My journal

1.

A number between 250,000 and 35,000.	For example: 315,689 315,869
A number that has a smaller number of 100s than 10,000s.	For example: 536,189 or 695,831
The greatest even number that can be made.	985,316
A number that rounds to 600,000 to the nearest 100,00.	For example: 613,589
The smallest number that rounds to 600,000 to the nearest 100,000.	561,389
The number that is 10,000 less than 875,913.	865,913

Power puzzle

⁻4 2 8 14 20
1 4 7 10 13 16

Unit 3: Addition and subtraction

Lesson 1: Adding whole numbers with more than 4 digits (1)

➜ pages 58–60

1. a) 77,467

b)

	3	6	4	5	8
+		2	9	2	0
	3	9	3	7	8
		1			

c) 42,824 e) 81,509
d) 77,796 f) 16,245

2. a) Kate has not lined up 4,362 correctly.

b)

	5	3	1	7	5
+		4	3	6	2
	5	7	5	3	7
	1		1		

3. a)

	1	7	2	7	0
+	2	4	1	9	5
	4	1	4	6	5
			1		

b)

	4	5	9	0	7
+	3	3	2	8	4
	7	9	1	9	1

4. a) 35,510 + 26,138 = 61,648
b) 73,825 + 4,395 = 78,220
c) 20,327 + 18,872 = 39,199

5.

	2	6	5	0	0
+		2	3	0	0
	2	8	8	0	0

6. a) 400,005
b) 400,050
c) 405,000
d) 45,000

Reflect

Explanations will vary. Children should talk through correct placing of digits and exchanging when adding.

Lesson 2: Adding whole numbers with more than 4 digits (2)

➜ pages 61–63

1. a) 43,753
b) 44,527 c) 80,903

2. a) 127,420 + 337,293 = 464,713
b) 37,915 + 8,759 = 46,674
c) 11,759 + 817 = 12,576
d) 519,000 + 294,000 = 813,000

3. a)

	1	9	2	5
+	2	1	5	0
+	2	4	7	5
	6	5	5	0
	1	1	1	

Yes, they reached the target as their total is 6,550 metres.

b) The digits in the ones position are 5, 5 and 0 which add up to make 10, which will be carried as 1 ten into the tens position. This means there will be no ones in the answer and it will be a multiple of 10.

4. a) Max has not lined up 6,293 correctly. The 6 should be in the thousands place value position.

b)

	2	6	3	4	8
+		6	2	9	3
	3	2	6	4	1
	1	1	1		

5. a)

	2	5	7	8	4
+	3	6	2	3	1
	6	2	0	1	5
	1	1	1		

b)

	6	5	6	4	2	6
+	3	1	3	6	2	4
	9	7	0	0	5	0
		1	1		1	

6. Answers may vary; for example:

a)

	7	4	6	3	9
+	2	5	0	1	8
	9	9	6	5	7
				1	

b)

	7	5	6	9	8
+	1	4	3	0	2
	9	0	0	0	0
	1	1	1	1	

Reflect

Children should write a 5 digit + 5 digit calculation with two exchanges. For example:

a)

	4	2	3	1	7
+	1	5	8	2	3
	5	8	1	4	0
		1		1	

Lesson 3: Subtracting whole numbers with more than 4 digits (1)

→ pages 64–66

1. a) 24,592 – 3,470 = 21,122
b) 51,340 – 30,720 = 20,620
c) 4,365 – 2,423 = 1,942
d) 76,185 – 5,224 = 70,961
e) 15,712 – 6,000 = 9,712

2. a) 48,200

	$^{6}\not{7}$	$^{1}3$	2	0	0
–	2	5	0	0	0
	4	8	2	0	0

b) 11,541

	4	8	$^{8}\not{9}$	$^{1}2$	3
–	3	7	3	8	2
	1	1	5	4	1

3. a) 127,365 – 102,724 = 24,641
The house next door costs £24,641 less.
b) 18,495 – 7,620 = 10,875
The motorbike is £10,875 cheaper than the car.

4. a)

	2	$^{5}\not{6}$	$^{1}1$	8	2
–		4	7	3	2
	2	1	4	5	0

b)

	4	9	9	$^{7}\not{8}$	$^{1}3$
–	1	4	6	2	7
	3	5	3	5	6

5. The first chest contains 18,455 coins.
The second chest contains 14,255 coins.
The third chest contains 9,135 coins.

Reflect

Children should explain subtraction including exchanging 1 ten thousand for 10 thousands.

Lesson 4: Subtracting whole numbers with more than 4 digits (2)

→ pages 67–69

1. a) 2,417
b) 23,640
c) 1,647
d) 4,749

2. a) 6,347
b) 38,963
c) 83,652
d) 651,123

3. 19,572

4. a)

	$^{*6}\not{7}$	$^{14}\not{5}$	$^{1}0$	6
–	*4	8	3	2
	*2	6	7	4

(* where these digits can vary.)

b)

	3	$^{8}\not{9}$	$^{11}\not{2}$	$^{1}1$	7
–	1	1	8	3	7
	2	7	3	8	0

5. a) 2,700 – 1,375 = 1,325
b) 27,000 – 18,904 = 8,096

6. 349,500 – 186,956 = 162,544
162,544 – 73,290 = 89,254
89,254 boys attend the concert.

Reflect

Children should show a 5 digit – 5 digit calculation with two exchanges. For example:
52,971 – 44,753 = 8,218

Lesson 5: Using rounding to estimate and check answers

→ pages 70–72

1. a) 300
200
300 + 200 = 500
500
b) 7,000
2,000
7,000 – 2,000 = 5,000
5,000
c) 300
7,200
300 + 7,200 = 7,500
7,500

2. a) 12,000
7,600
12,000 + 7,600 = 19,600
b) Bella has not lined up 7,620 correctly using her place value knowledge.
c) 19,625

3. a) 3,200 (3,400 – 200)
b) 220,000 (170,000 + 50,000)

4. Max made his estimate by rounding to the nearest thousand.
Jamie made his estimate by rounding to the nearest hundred.

5. a) £20,000 + £4,000 = £24,000
£24,000 – £4,000 = £20,000
b) £19,995 + £3,941 = £23,936
£23,936 – £4,081 = £19,855

Reflect

Answers will vary. Children should explain that estimating helps to check whether an answer seems sensible.

Lesson 6: Mental addition and subtraction (1)

→ pages 73–75

1. a) 40 + 30 = 70
5 + 2 = 77
45 + 32 = 70 + 7 = 77
b) 84 c) 379

2. a) 57, 57, 570, 5,700
b) 288, 288, 1,288, 2,817
c) 87, 87, 870, 87,000
d) 840, 840, 84,000, 8,400

3. 38 + 2 = 40 40 + 50 = 90
The missing number is 52.

4. a) 24 b) 56 c) 606 d) 67 e) 58 f) 33

5. a) 330 b) 260 c) 4,700 d) 560 e) 450 f) 1,200 g) 34 h) 340 i) 54 j) 18

6. Methods will vary. Children should have recorded steps in their working.
a) 64 + 83 = 127
b) 260 + 197 = 457
c) 64 + 830 = 894
d) 125 + 575 = 700

7. a) 1,230 b) 278 c) 420

Reflect

Children's methods will vary. Children should have recognised that the numbers in calculation b) are ten times larger than the numbers in calculation a).
a) 40 + 30 = 70, 5 + 2 = 7
So, 70 + 7 = 77
b) 450 + 380 = 770, using answer to a).
c) 360 + 198 = 360 + 200 – 2 = 560 – 2 = 558

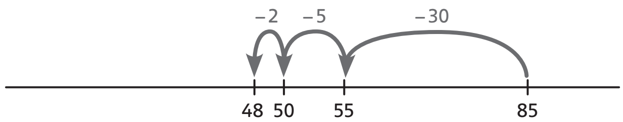
Lesson 7: Mental addition and subtraction (2)

→ pages 76–78

1. a) 78 – 20 = 58
58 – 5 = 53
So, 78 – 25 = 53
70 – 20 = 50
8 – 5 = 3
So, 78 – 25 = 53
b) 670 – 200 = 470
470 – 20 = 450
So, 670 – 220 = 450
600 – 200 = 400
70 – 20 = 50
So, 670 – 220 = 450

2. a) 43, 430, 4,300
b) 37
c) 300
d) 22, 220, 2,200
e) 250
f) 3,200

3. a) 85 – 30 = 55
55 – 5 = 50
50 – 2 = 48
So, 85 – 37 = 48
b) Children should draw jumps on the number line:



4. a) 27, 27
b) 122, 118
c) 16, 53
d) 82, 78

5. a) 4 b) 8 c) 8 d) 13 e) 10 f) 16
g) The difference between 8,002 and 7,997 is 5.

6. a) 261 b) 747 c) 7 d) 388 e) 245

Reflect

Methods may vary but children should have recognised that 792 and 801 are close to each other so may choose to use a counting on method. For example:
792 + 8 = 800
800 + 1 = 801
So, 801 – 792 = 9

Lesson 8: Using inverse operations

➜ pages 79–81

1. a) 1,440 + 1,264 = 2,704
   Ticked: The answer is correct.
   b) 15,995 – 14,600 = 1,395
   Ticked: The answer is incorrect.
   c)

	1	8	4	6	8
+	1	8	4	8	2
	3	6	9	5	0
	1		1	1	

   Ticked: The answer is incorrect.

2. a) Order of calculations may vary:
   2,600 + 3,500 = 6,100
   3,500 + 2,600 = 6,100
   6,100 – 2,600 = 3,500
   6,100 – 3,500 = 2,600
   b) 26,000 + 35,000 = 61,000
3. a) 1,120 needs to be written into the correct place value positions.
   Correct answer = 35,846
   b) Exchange needs to be completed.
   Correct answer = 128
4. a) 10,000 – 7,500 = 2,500 or 10,000 – 3,500 = 6,500
   b) Richard has forgotten 500 + 500 = 1,000 so the answer is 11,000.
5. 14,264 – 764 = 13,500 or 14,264 – 13,500 = 764

Reflect

Answers will vary; for example, children may suggest that if they just do the calculation again they might repeat the same mistake.

Lesson 9: Problem solving – addition and subtraction (1)

➜ pages 82–84

1. a) 3,240
   b) 127,500 kg
   c) £3,371
2. 34,055
3. 1,308 + 750 = 2,058 2,058 + 1,308 = 3,366
   The café sells 3,366 cups of coffee in total.
4. 3,456 + 2,922 = 6,378 8,000 – 6,378 = 1,622
5. 126,000 + 12,600 + 1,260 + 126 = 139,986
6. Week = 12,440
   Weekend = 14,660 14,660 – 12,440 = 2,220
   2,220 more eggs were sold at the weekend than during the week.

Reflect

Children should write their own problem involving adding two numbers and then subtracting a third number.

Lesson 10: Problem solving – addition and subtraction (2)

➜ pages 85–87

1. 160,500 + 85,000 – 7,900 = 237,600
   There are 237,600 litres of water in the pool now.
2. a) Tex made more toys than Karl in September and in October, so he must have made more toys than Karl in total.
   b) Karl: 12,675 + 9,580 = 22,255
   Tex: 13,188 + 10,680 = 23,868
   23,868 – 22,255 = 1,613
   Alternatively, some children may work out:
   13,188 – 12,675 = 513 10,680 – 9,580 – 1,100
   513 + 1,100 = 1,613
   Tex made 1,613 more toys in total.
3. 12,840 + 7,319 = 20,159 30,000 – 20,159 = 9,841
   The missing number is 9,841.
4. First barrel: 1,280
   Second barrel: 1,280 + 480 = 1,760
   Third barrel: 1,280 – 276 = 1,004
   Total: 1,280 + 1,760 + 1,044 = 4,044
   (Alternatively, some children may work out:
   3 × 1,280 + 480 – 276)
   There are 4,044 apples in total.
5. a) 100,385 – 75,560 = 24,825
   100,385 + 24,825 = 125,210
   125,210 is at A.
   b) 125,210 + 24,825 + 24,825 + 24,825 + 24,825 = 224,510
   224,510 is the first number above 200,000 that Kate will reach.

Reflect

Explanations will vary. Children should explain their methods for each calculation. For example:
182,000 – 79,000 = 103,000 500 – 320 = 180
So, 182,500 – 79,320 = 103,180
75,000 + 28,000 = 103,000
111 + 396 = 111 + 400 – 4 = 507
So 75,111 + 28,396 = 103,507
So, the second calculation has the bigger answer.

End of unit check

➜ pages 88–89

My journal

1. Children should make up a story problem using the bar model provided.
39,480 + 39,480 = 78,960
100,000 – 78,960 = 21,040
So, ? = 21,040

Power puzzle

1. a)

13,197	5,966	**837**	**20,000**
3,457	11,102	15,441	**30,000**
23,346	32,932	3,722	**60,000**
40,000	**50,000**	**20,000**	

b) Answers will vary; children should complete the table provided, and then make their own table for a partner to solve.

Unit 4: Graphs and tables

Lesson 1: Interpreting tables

→ pages 90–92

1. a) 799
b) Friday
c) 103
d) Monday and Wednesday
e) Isla is not correct; 192 × 2 = 384

2. a) thread snake
b) 6·5 m
c) 4 m
d) The acrochordus is half the length of the cobra.

3. Bus = 71
The difference between the number of children who travel by bus and the number of children who walk to school is 83.

4. 8 + 9 + 7·5 + 4 + 1·5 = 30
30 × 15 = 450
In total, Toshi gets paid £450.

Reflect

Answers will vary; for example:
50 cars were in the survey.
The difference between the number of black cars and red cars is 14.
There were more black than red and white cars put together.

Lesson 2: Two-way tables

→ pages 93–95

1. a)

	Spots	Stripes	Solid black
Square	///	//	/
Triangle	//	~~////~~ /	/
Star	///	//	//

b)

	Spots	Stripes	Solid black	Total
Square	3	2	1	6
Triangle	2	6	1	9
Star	3	2	2	7
Total	8	10	4	22

c) 8 shapes have spots.
I worked this out by looking at the total of the spots column.

2. a)

	Girl	Boy	Total
Brown	3	10	13
Blue	7	5	12
Total	10	15	25

b) 13
c) 4
d) $\frac{10}{25}$ or $\frac{2}{5}$.

3. a)

	Rabbits	Guinea Pigs	Hamsters	Total
Petz R Us	24	15	49	88
Animals	52	17	26	95
We Love Pets	28	51	13	92

b) We Love Pets
c) Animals
d) 275

4. a)

	Walk	Cycle	Car	Other	Total
Boys	7	3	4	1	15
Girls	8	1	3	0	12
Total	15	4	7	1	27

b) 11
c) Mrs Dean is correct because double 15 is 30, which is greater than 27.

Reflect

Answers will vary. Children should appreciate that two-way tables are used to show data against two criteria.

Lesson 3: Interpreting line graphs (1)

→ pages 96–98

1. a) 2 pm
b) 20
c) 20, 7, 10, 25, 0
d) 18
e) The pool was closed (though children might suggest other reasons).

2. a) Day 7
b) 390 (approximately)
c) 210 (approximately)
d) 340 km + 285 km + 410 km = 1,035 km
e) The graph starts at 180 km as the shortest distance travelled is 190, so you don't need to show 0–180 km.

3. 60 (approximately)

Reflect

Explanations will vary. Children should explain that they would need to identify the time on the horizontal axes and then look vertically upwards to see what temperature the graph shows at this point. To work out the value of the temperature, they will need to look horizontally to read the temperature from the vertical axis.

Lesson 4: Interpreting line graphs (2)

➜ pages 99–101

1. a) 22
b) 5
c) 3 and 11·75
d) The balloon bursts after 10 seconds because, at this point, its height starts to drop quickly.
e) 10

2. a) 7
b) 7
c) 2 pm and 5:30 pm
d) 6
e) 3

3. Approximately 19,500 (about 18,000 to 37,500).

Reflect

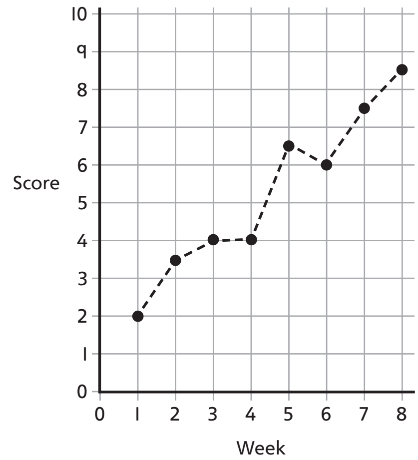
The statement is sometimes true. Children's explanations will vary; for example:

A temperature graph could start from below zero if it were recording temperatures in winter, whereas a graph measuring the height of a hot air balloon would start at zero. This shows that some line graphs will start from zero but not all.

Lesson 5: Drawing line graphs

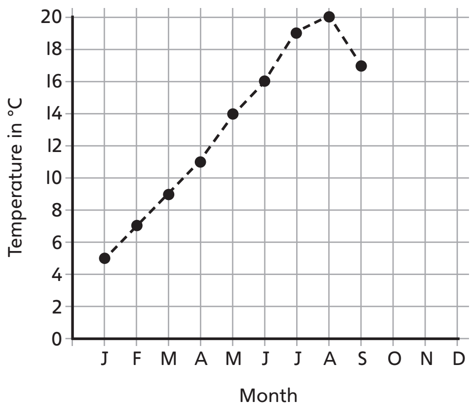
➜ pages 102–104

1. a)

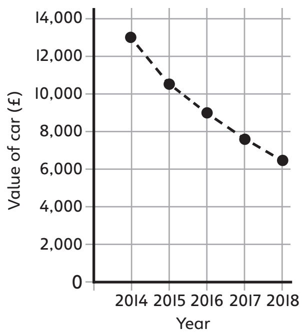


b) Week 8 = 8·5

2.



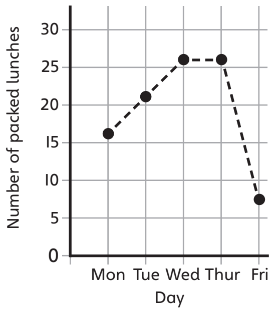
3.



4. a)

Day	Mon	Tue	Wed	Thur	Fri
Number of packed lunches	16	21	26	26	7

b) Graphs that children will draw may vary; for example:



Reflect

Answers will vary; for example:

1. Label the axes.

2. Make sure the numbers are equally spaced along the axes.

3. Draw a dotted line when there is no measured data between points.

End of unit check

→ pages 105–107

My journal

1. a) 12–16 people because the graph shows 16 people were there at 3 pm and 12 people were there at 4 pm. (Allow approximately 14 people.)

b) 7 pm because there are no people in the shop after that time.

c) Answers will vary; for example:
The shop might open at 9 am; the shop is busiest at 1 pm; there are 22 people in the shop at 12 pm; etc.

2. a) A line graph would not work because there are different types of clothes.

b) Answers will vary; for example:
Shorts were sold the most; swimwear was sold the least; people bought more T-shirts than trainers; etc.

Power puzzle

	First	Second	Total
Red	34	26	60
Blue	16	74	90
Total	50	100	150

There are 58 more blue counters in the second box.

Unit 5: Multiplication and division (I)

Lesson I: Multiples

➜ pages 108–110

1. 3 × 3 = 9
5 × 3 = 15
8 × 3 = 24
These all show the multiples of the number 3.
9, 15 and 24 are all multiples of 3.

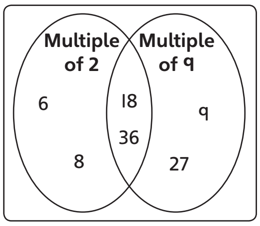
2. a) 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100 should be shaded in.
b) 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63, 66, 69, 72, 75, 78, 81, 84, 87, 90, 93, 96 and 99 should be shaded in.

3. a) 80, 30, 102 and 300 should be circled.
b) 70, 95, 530, 35 and 300 should be circled.

4. Circled: is not
Explanations will vary; for example:
64 is not a multiple of 6 because 64 ÷ 10 has a remainder so 64 is not a multiple of 6.

5. a) Answers may vary, but the top right box in the two-way table cannot be filled in as all multiples of 6 are also multiples of 2:

	Multiple of 2	Not a multiple of 2
Multiple of 6	6 12	
Not a multiple of 6	8 4	5 9



b) The section 'multiple of 6 and not a multiple of 2' has no numbers in it as all multiples of 6 are also multiples of 2.

6. It is sometimes true.
Explanations will vary; for example:
If you add the same number of multiples of 4 and 5 together, then the answer will also be a multiple of 9; for example: (3 × 4) + (3 × 5) = 12 + 15 = 27. 27 is a multiple of 9.
It is not always true, though, because 12 is a multiple of 4 and 20 is a multiple of 5 but 4 + 20 = 24, which is not a multiple of 9.

7. No, 777 will not be in the sequence even though it is a multiple of 7 because the start number is not zero but 2. That means all the numbers in the sequence will be 2 more than a multiple of 7.

Reflect

Richard is confused about multiples. A multiple of 7 is any number in the 7 times-table. As 10 is not in the 7 times-table it is not a multiple of 7. However, the calculation does show that 70 is in the 7 times-table so 70 is a multiple of 7.

Lesson 2: Factors

➜ pages 111–113

1. 1 × 18 = 18
2 × 9 = 18
6 × 3 = 18
4 × 5 = 20
2 × 10 = 20
1 × 20 = 20
The factors of 18 are: 1, 2, 3, 6, 9, 18
The factors of 20 are: 1, 2, 4, 5, 10, 20

2. Arrays should be drawn for 1 × 32, 2 × 16 and 4 × 8.
The factors of 32 are 1, 2, 4, 8, 16 and 32.

3. a) Circled: is not
Explanations may vary; for example:
6 is not a factor of 28 because 6 does not divide into 28 exactly.
b) Circled: is
Explanations may vary; for example:
7 is a factor of 84 because 7 goes into 84 exactly 12 times.

4. a) 1 × 36 = 36
2 × 18 = 36
3 × 12 = 36
4 × 9 = 36
6 × 6 = 36
b) 36 ÷ 1 = 36
36 ÷ 2 = 18
36 ÷ 3 = 12
36 ÷ 4 = 9
36 ÷ 6 = 6
36 has 9 factors. They are 1, 2, 3, 4, 6, 9, 12, 18 and 36.

5. 1, 2, 5, 10, 25 and 50.

6. a) Numbers shaded: 20, 1, 10, 50, 4, 5, 100
b) The missing factors are 2 and 25.

7. It is always true. If X is a factor of Y, then Y is a multiple of X.

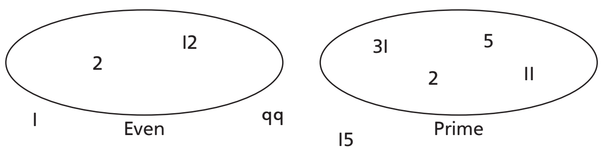
Reflect

Andy is wrong. Explanations will vary; for example:
Some even numbers (4, 8, 12, …) are multiples of 4 but others are not (2, 6, 10, …).
70 is even, which means it is a multiple of 2. Therefore 70 does have a factor of 2.

Lesson 3: Prime numbers

➜ pages 114–116

1. 11 cannot be made into an array (other than a 1 by 11 array) as there is always a remainder. Children should show this pictorially.
   11 has 2 factors. It is a prime number.
2. Arrays should be drawn for:
   15: 1 × 15 or 3 × 5
   17: 1 × 17
   19: 1 × 19
   21: 1 × 21 or 3 × 7
   17 and 19 are prime numbers.
   15 and 21 are composite numbers.
3.



   2 is in both groups.
   1, 15 and 99 are not in either group.
   No other number can join both groups. All even numbers have 2 as a factor, therefore even numbers which are not 2 will have more than 2 factors (1, 2, the number itself …) so they are not prime.
4. 99 is not a prime number as it is divisible by 1, 3, 9, 11, 33 and 99 so it has more than 2 factors. It is sufficient to show that it has at least 1 factor in addition to 1 and itself; for example: recognising that 3 is a factor of 99 is sufficient to show that it is not prime.
5. a) Circled: true
   This is true because some odd numbers (3, 5, 7, 11, …) are prime, but others (9, 15, 21, 25, …) are not.
   b) Circled: true
   This is true because all numbers that end in 5 have 5 as a factor. So every number that ends in 5 (apart from 5 itself) will have more than 2 factors (1, 5, the number itself …) so they are not prime.
6. a) Circled: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41
   b) Answers may vary; for example:
   Most prime numbers appear in the 1st and 5th columns.
   c) Some columns have no prime numbers because they only contain even numbers greater than 2.
   d) Chart filled in up to 100 and circled: 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97
   The 5th column has the most prime numbers.

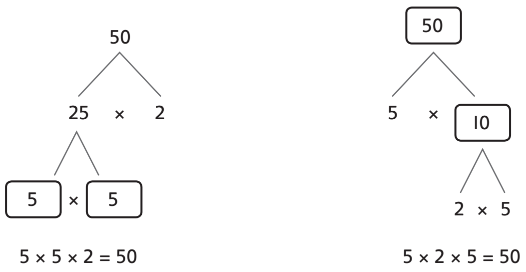
Reflect

Answers will vary; for example:
Children could draw 33 dots in groups of 3 or 11 to show that 33 has factors of 3 and 11, making it a composite number.

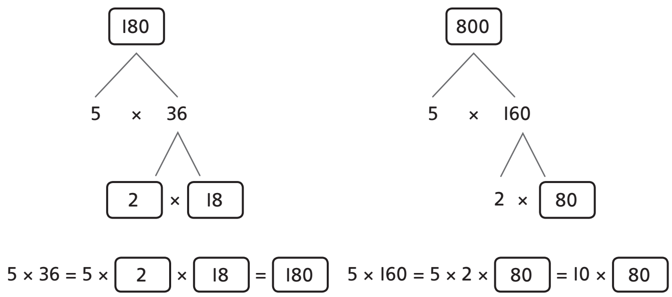
Lesson 4: Using factors

➜ pages 117–119

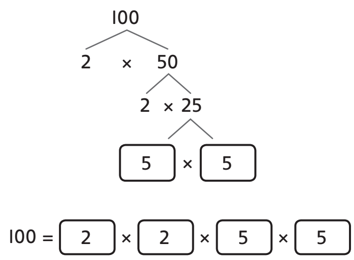
1. a) 3 × 2 × 2 = 12
   b) 2 × 3 × 2 = 12 or 2 × 2 × 3 = 12
   c) The two calculations give the same product. This is because the 3 factors are the same.
2.



3. 4 × 20 × 5 = 400
   a) 4 × 20 = 80
   80 × 5 = 400
   b) 20 × 5 = 100
   100 × 4 = 400
   There are 400 hinges in total.
4.



   Answers may vary, but look out for the most efficient calculations.
5. Order of factors may vary.
   a)



   b) Children should draw a factor tree showing:
   75 = 3 × 5 × 5
   c) Children should draw a factor tree showing:
   200 = 2 × 2 × 2 × 5 × 5
   d) Answers will vary; ensure all factors are prime numbers.

Reflect

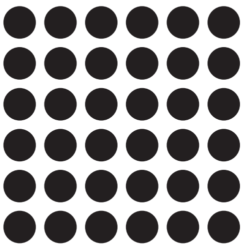
Answers will vary; for example:
Children could draw a factor tree to show the different factors of 28 and then use the factors in a number sentence to equal 140. Encourage the use of the factor 2, as 2 × 5 = 10 and will be easier to multiply; for example: 28 × 5 = 14 × 2 × 5 = 14 × 10 = 140.

Lesson 5: Squares

➜ pages 120–122

1. a) $3^2 = 3 \times 3 = 9$
9 is a square number.
b) 6 squared = 6^2
6 × 6 = 36
36 is a square number.

2. Children must show 6 × 6 = 36 as a square number.



$6^2 = 36$

3. 10 is not a square number. Drawings should show that 10 cannot be arranged as a square array.

4. a) Circled: does
This does show a square number because it represents 3 × 3 = 9.
b) Circled: does not
This does not show a square number because 18 cannot be arranged as a square array.
c) Circled: does
This does show a square number because there are 5 parts of 5. 25 is a square number.

5. Diagrams may vary. Ensure children represent 16 as 4 × 4.

6. Shaded: 4, 1, 81, 144

7. a)

Number	9	25	49
All factors	1, 3, 9	1, 5, 25	1, 7, 49
How many factors?	3	3	3

b) Answers will vary; for example:
16 has factors 1, 2, 4, 8 and 16 so has 5 factors.
c) Yes, Isla is correct. Non-square numbers have pairs of factors, so will always have an even number of factors. As one of the factor pairs in a square number uses the same factor twice, this will mean the square number will always have an odd number of factors.

Reflect

There are 5 square numbers between 50 and 150. They are: 64, 81, 100, 121 and 144.

Lesson 6: Cubes

➜ pages 123–125

1. Diagrams matched:
1st diagram ➜ 3 × 3 × 3
2nd diagram ➜ 2^3
3rd diagram ➜ 2 squared
4th diagram ➜ 2 × 3

2. a) $5^3 = 5 \times 5 \times 5$
b) 6 cubed = 6 × 6 × 6
c) $1^3 = 1 \times 1 \times 1$

3. a) 4 × 4 = 16
4 × 16 = 64
$4^3 = 4 \times 4 \times 4 = 64$
b) 2 × 4 = 8
4 × 8 = 32
32 × 2 = 64
c) 2 × 8 = 16
2 × 16 = 32
32 × 2 = 64

4. a) 3 is not a cube number as $1^3 = 1 \times 1 \times 1 = 1$
b) To work out 3^3, multiply 3 × 3 × 3. So, 3 × 3 = 9; 9 × 3 = 27

5. a) 7 cubed = 343
b) $10^3 = 1{,}000$
c) $1^3 = 1$
d) $0^3 = 0$

6. a) Eight 2 × 2 × 2 cubes will make a 4 × 4 × 4 cube.
Explanations may vary; for example:
$4^3 = 64$ and $2^3 = 8$ and eight lots of 8 go into 64.
b) Eight 5 × 5 × 5 cubes would make a 10 × 10 × 10 cube.
Explanations may vary; for example:
$10^3 = 1{,}000$ and $5^3 = 125$ and eight lots of 125 go into 1,000.
c) $20^3 = 20 \times 20 \times 20 = 8{,}000$

Reflect

You could work systematically to calculate the first 5 cube numbers. These are:
$1^3 = 1 \times 1 \times 1 = 1$
$2^3 = 2 \times 2 \times 2 = 8$
$3^3 = 3 \times 3 \times 3 = 27$
$4^3 = 4 \times 4 \times 4 = 64$
$5^3 = 5 \times 5 \times 5 = 125$

Lesson 7: Inverse operations

➜ pages 126–128

1. a) 8 × 4 = 32
32 ÷ 8 = 4
32 ÷ 4 = 8
b) 6 × 3 = 18
18 ÷ 6 = 3
18 ÷ 3 = 6
c) 4 × 25 = 100
100 ÷ 4 = 25
100 ÷ 25 = 4

2. a) 48 ÷ 6 = 8
b) 8 × 6 = 48

3. a) There are 6 vases and 12 white roses.
b) She needs 33 red roses.

4. a) 2 × 16 = 32
32 ÷ 16 = 2
64 ÷ 2 = 32
32 × 2 = 64
b) 4 × 5 = 20
20 ÷ 5 = 4
100 ÷ 5 = 20
100 = 20 × 5
c) 15 = 45 ÷ 3
30 = 90 ÷ 3
150 ÷ 5 = 30
15 = 75 ÷ 5

5. Bella has written the numbers 5, 13 and 65 in the wrong order in the second division. It should say 65 ÷ 5 = 13. When you use the numbers in a multiplication calculation to write a related division calculation, the product (answer from the multiplication) will be the first number in the related division.

6. a) Reena started with 23.
b) Andy divided by 7.
c) Possible starting numbers: 61, 67, 73, 79 or 97.

Reflect

18 ÷ 6 = 3 54 ÷ 3 = 18
Encourage children to use the inverse to solve the missing number equations; for example:
3 × ? = 18 and 3 × 18 =?

Lesson 8: Multiplying whole numbers by 10, 100 and 1,000

➜ pages 129–131

1. a) 4 × 100 = 400
b) 10 × 6 = 60 (6 ten counters drawn)
c) 1,000 × 5 = 5,000 (5 thousand counters drawn)

2. Diagrams matched:
1st diagram ➜ 1 × 3
2nd diagram ➜ 100 × 3
3rd diagram ➜ 3 × 1,000
4th diagram ➜ 10 × 10

3. a) 11 × 1 = 11
b) 11 × 100 = 1,100
c) 11 × 10 = 110
d) 11 × 1,000 = 11,000

4. Errors corrected: 40 × 100 = 4,000 (not 400)
1,000 × 20 = 20,000 (not 2,000)

5.

	TTh	Th	H	T	O
Number				3	7
× 10			3	7	0
× 100		3	7	0	0
× 1,000	3	7	0	0	0

	TTh	Th	H	T	O
Number				7	0
× 10			7	0	0
× 100		7	0	0	0
× 1,000	7	0	0	0	0

6. a) 5 × 10 = 50
50 × 10 = 500
50 × 100 = 5,000
5 × 1,000 = 5,000
b) 3 × 1,000 = 3,000
300 × 10 = 3,000
300 × 100 = 30,000
300 × 1 = 300
c) 15 × 1,000 = 15,000
100 × 15 = 1,500
1,500 = 150 × 10
15,000 = 150 × 100
Children may explain what they notice in different ways; for example:
Each set of calculations are related.

7. a) Answers will vary; for example:
8 × 100 < 90 × 10
5 × 10 × 10 < 20 × 100
100 × 50 > 10 × 10 × 10 × 4
7 × 10 < 10 × 10 × 6 < 10 × 100
b) Possible answers (the order of operations may vary):
2 × 1,000 × 10 = 2,000 × 10
2 × 100 × 100 = 2,000 × 10
2 × 1,000 × 100 = 2,000 × 100
2 × 1,000 × 1,000 = 2,000 × 1,000

20 × 100 = 200 × 10
20 × 1,000 = 200 × 100

2,000 × 10 = 200 × 100
2,000 × 100 = 200 × 1,000

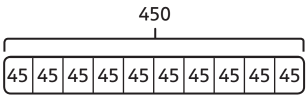
Reflect

Answers will vary. Children should show calculations which involve powers of 10 and have the answer 1,300; for example:
13 × 100 = 1,300
130 × 10 = 1,300
1,300 × 1 = 1,300

Lesson 9: Dividing whole numbers by 10, 100 and 1,000

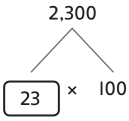
➜ pages 132–134

1. a)



450 is 45 tens.
450 ÷ 10 = 45

b)



2,300 is 23 hundreds.
2,300 ÷ 100 = 23

c) 7,000 is 7 thousands.
7,000 ÷ 1,000 = 7

d) Answers may vary but most likely answer is:
500 is 5 hundreds.
500 ÷ 100 = 5

2. 1,100 ÷ 11 = 100
1,100 ÷ 100 = 11

3. a) 8,000 ÷ 1,000 = 8
8 1,000 kg weights would balance the scales.
b) 8,000 ÷ 100 = 80
80 100 kg weights would balance the scales.
c) 8,000 ÷ 10 = 800
800 10 kg weights would balance the scales.

4. a) 500 ÷ 10 = 50
500 ÷ 100 = 5
50 ÷ 10 = 5
b) 1,500 ÷ 100 = 15
150 ÷ 10 = 15
15,000 ÷ 1,000 = 15
c) 5,000 ÷ 50 = 100
5,000 ÷ 500 = 10
500 ÷ 50 = 10

5. a) There are 20 marbles in each jar.
b) In total, there are 100 jars.

6. a)

☆	△
5	500
70	7,000
7	700
500	50,000

△ is 100 times greater than ☆.

b) Calculations will vary but ♡ should be 1,000 × ☁; for example:
4,000 ÷ 10 = 10 × 10 × 4; 13,000 ÷ 10 = 10 × 10 × 13

Reflect

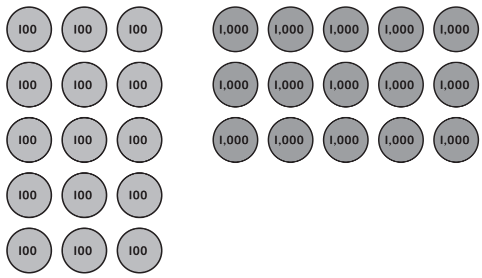
3,300 ÷ 100 = 33 is correct. When you divide by 100, all the digits move 2 places to the right. You can use a place value grid to check.

Lesson 10: Multiplying and dividing by multiples of 10, 100 and 1,000

➜ pages 135–137

1. Diagrams matched:
Top diagram ➜ 4 × 3 tens ➜ 12 tens = 120
2nd diagram ➜ 3 × 2 hundreds ➜ 6 hundreds = 600
3rd diagram ➜ 2 × 3 thousands ➜ 6 thousands = 6,000
4th diagram ➜ 3 × 4 hundreds ➜ 12 hundreds = 1,200

2. Children should draw 5 lots of 3 hundred counters and 3 lots of 5 thousand counters.



a) 5 × 300 = 15 hundreds = 1,500
b) 3 × 5,000 = 15 thousands = 15,000

3. a) 300 × 6 = 1,800
6 × 300 = 1,800
1,800 ÷ 300 = 6
1,800 ÷ 6 = 300
b) 30 × 60 = 1,800
60 × 30 = 1,800
1,800 ÷ 30 = 60
1,800 ÷ 60 = 30

4. a) 3 × 700 = 2,100
b) 5,000 × 9 = 45,000
c) 5 × 80 = 400
d) 1,200 ÷ 300 = 4
e) 150 ÷ 5 = 30
f) 72,000 ÷ 9,000 = 8

5. I agree with Reena.
Explanations will vary; for example:
because 4 × 5 = 20 so 40 × 5 = 200 and 40 × 50 = 2,000.

6. a) 600 × 6 = 400 × 9
There are nine 400 g boxes.
b) 80 × 70 = 800 × 7
2,100 ÷ 30 = 21,000 ÷ 300
40,000 ÷ 500 = 400 ÷ 5

Reflect

Answers may vary but should include multiplying and/or dividing by powers of ten or multiples of powers of ten; for example: 4 × 10 = 40; 80 ÷ 2 = 40; 800 ÷ 20 = 40

End of unit check

➜ pages 138–139

My journal

Children may write answers such as:

I know 250 isn't a square number because 15 squared is 225 and 16 squared is 256; 2,500 is a square number because 50 × 50 is 2,500; I know 2,500 is going to be square because 5 × 5 is 25. If I multiply both 5s by 10 then the answer must be multiplied by 100.
25 × 100 = 2,500.

Power puzzle

Prime factors of 90 = 2 × 3 × 3 × 5

Prime factors of 210 = 2 × 3 × 5 × 7

Unit 6: Measure – area and perimeter

Lesson 1: Measuring Perimeter

→ pages 140–142

1. a) 8 cm + 6 cm + 4 cm + 4 cm + 4 cm + 2 cm = 28 cm
   The perimeter of the shape is 28 cm.
   b) 6 cm + 5 cm + 3 cm + 2 cm + 8 cm + 5 cm + 1 cm + 2 cm = 32 cm
   The perimeter of the shape is 32 cm.
2. a) Perimeter = 16 cm
   b) Perimeter = 26 cm
   c) Perimeter = 12 cm
   d) Perimeter = 24 cm
   e) Shape B
3. Words circled: incorrect shorter
4. A rectangle has 4 sides. Amelia has 5 measurements, so it looks like she has measured the same side twice.
   52 cm
5. False: because you need to double its length too
   True: because the perimeter of a square is 4 × the length of one side
   False: because two of the sides now lie inside the new shape so won't count as part of the perimeter

Reflect

Explanations may vary. Children should discuss the need to measure sides accurately and write the length of each side then add all the lengths together. Some children may explain how you can work out the length of one vertical/horizontal side if you have measured the other vertical/horizontal sides.

Lesson 2: Calculating perimeter (1)

→ pages 143–145

1. a) = (220 × 2) + (90 × 2)
   = 440 + 180
   = 620
   The perimeter of this playing field is 620 m.
   b) = (125 × 2) + (110 × 2)
   = 250 + 220
   = 470
   The perimeter of this playing field is 470 m.
2. A = 70 cm B = 70 cm C = 80 cm
3.

Shape	Number of tiles used	Perimeter (cm)
A	1	40
B	2	60
C	3	80
D	3	80

4. 2 × 8 cm = 16 cm; 50 cm – 16 cm = 34 cm;
   34 cm ÷ 2 = 17 cm
   Alternative method: 50 cm ÷ 2 = 25 cm;
   25 cm – 8 cm = 17 cm
   The length of the rectangle is 17 cm.
5. 128 ÷ 4 = 32
   One side is 32 cm long.
6. Answers will vary. Children should give 4 pairs of dimensions where length + width = 90 cm each time; for example:
   1 cm by 89 cm; 40 cm by 50 cm; 30 cm by 60 cm;
   a square with side 45 cm

Reflect

Children should have ticked the methods explained by Bella and Max.

Lesson 3: Calculating perimeter (2)

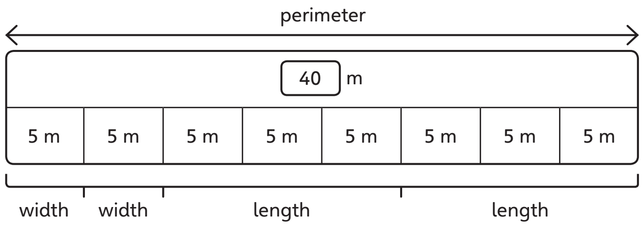
→ pages 146–148

1. Route A 100 m + 80 m + 100 m + 40 m + 200 m + 120 m
   = 640 m
   Length of Route A = 640 m

   Route B A + C = 180 m B + D = 240 m
   (180 m × 2) + (240 m × 2)
   = 360 m + 480 m
   = 840 m
   Length of Route B = 840 m

   Route C (230 m × 2) + (300 m × 2) = 1,060 m
   Length of Route C = 1,060 m
2. 6 cm + 23 cm = 29 cm; 13 cm + 6 cm = 19 cm
   (29 cm × 2) + (19 cm × 2) = 96 cm
   Perimeter = 96 cm
3. 102 – (21 × 2) = 102 – 42 = 60
   60 ÷ 2 = 30 width = 30 cm
   30 – 20 = 10 B = 10 cm
   Side B = 10 cm

4.



width = 10 m ÷ 2 = 5 m
length = 5 m × 3 = 15 m

5. Children should sketch 6 squares joined in different arrangements and find perimeters. Answers will vary; for example:
All 6 tiles in one row have a perimeter of 140 cm; tiles arranged in two rows of 3 have a perimeter of 100 cm.

Reflect

Answer will vary; for example:
Add the two horizontal measurements to find the overall horizontal width of the shape:
9 cm + 31 cm = 40 cm.
Add the two vertical measurements to find the overall vertical height of the shape:
10 cm + 23 cm = 33 cm.
Doubling these gives:
40 cm × 2 = 80 cm 33 cm × 2 = 66 cm
Adding together to find the total perimeter:
80 cm + 66 cm = 146 cm

Lesson 4: Calculating Area (1)

➜ pages 149–151

1. a) 18
10
18 squares × 10 m^2 = 180 m^2
b) 12 squares × 10 m^2 = 120 m^2
c) 35 squares × 10 m^2 = 350 m^2

2. A = 16 squares × 3 m^2 = 48 m^2
B = 12 squares × 5 m^2 = 60 m^2
C = 21 squares × 2 m^2 = 42m^2
C A B

3. a) Children should draw a 1 × 8, 4 × 2, 2 × 4 or 8 × 1 rectangle.
b)

If 1 square is equal to …	the actual area is …
1 cm^2	8 cm^2
1 m^2	8 m^2
4 cm^2	32 cm^2
9 m^2	72 m^2
25 cm^2	200 cm^2

4. 90 ÷ 10 = 9 cm^2, so the area of each square is 9 cm^2.

5. 600 cm^2

6. Left-hand grid: Children should draw a rectangle with an area of 40 squares; for example:
4 × 10 or 5 × 8
Right-hand grid: Children should draw a rectangle with an area of 20 squares; for example:
2 × 10 or 5 × 4

Reflect

The actual area of the room in real life is 96 m^2.
I know this because the drawing contains 24 squares (8 × 3) and each square is worth 4 m^2.
24 squares × 4 m^2 = 96 m^2

Lesson 5: Calculating Area (2)

➜ pages 152–154

1. a) 6 rows
5 squares in each row
6 × 5 = 30
Area = 30 cm^2
b) 7 × 6
Area = 42 cm^2
c) 9 × 8
Area = 72 cm^2

2. a) Possible arrays: 1 × 16, 2 × 8, 4 × 4
b) Children should draw two rectangles from: 1 × 16, 2 × 8, 4 × 4

3.

Shape	Length	Width	Area (cm^2)
A	9	7	63
B	7	7	49
C	11	3	33
D	7	4	28

4. Factor pairs for 40: 1 × 40 2 × 20 4 × 10 5 × 8
Rectangles: 1 cm × 40 cm 2 cm × 20 cm
4 cm × 10 cm 5 cm × 8 cm

5. 100 cm^2
Area of card = 25 cm × 20 cm = 500 cm^2
Area of square = 20 cm × 20 cm = 400 cm^2
500 cm^2 – 400 cm^2 = 100 cm^2

Reflect

Length of each side = 8 m
So, area = 8 m × 8 m = 64 m^2

Lesson 6: Comparing area

➜ pages 155–157

1. a) Window A
2 rows of 6
= 2 × 6
= 12 m^2

Window B
5 rows of 3
= 5 × 3
= 15 m^2

Window C
9 × 8 = 72 m^2

Window D
8 × 8 = 64 m^2

b) C D B A

2. a) A = 42 cm^2 B = 49 cm^2 C = 55 cm^2 D = 42 cm^2
b) Area of A < Area of C Area of D < Area of B
Area of A = Area of D Area of B < Area of C

3. a) Assuming Max uses one straw for each side, possible rectangles are:

Shape	Length	Width	Area (cm^2)
A	9 cm	9 cm	81 cm^2
B	10 cm	10 cm	100 cm^2
C	12 cm	12 cm	144 cm^2
D	10 cm	9 cm	90 cm^2
E	12 cm	9 cm	108 cm^2
F	12 cm	10 cm	120 cm^2

b) A
c) 12 12

4. Aki is incorrect; for example, a 2 cm × 4 cm rectangle has an area of 8 cm^2 whereas a 1 cm × 12 cm rectangle has an area of 12 cm^2. The rectangle with the shorter width has the greater area.

5. If area of square is 100 cm^2 then length of side = 10 cm, so width of original strip = 10 cm.
82 cm – 20 cm = 62 cm 62 cm ÷ 2 = 31 cm
Length of original strip = 31 cm
Length of paper left over = 31 cm – 10 cm = 21 cm
Area of rectangle leftover is 21 cm × 10 cm = 210 cm^2

Reflect

Answers will vary; children should explain why the square with the longer side length will have the greater area.

Lesson 7: Estimating areas

➜ pages 158–160

1. Answers may vary slightly.

Footprint	Whole squares	Almost-whole squares	Half squares	Less-than-half squares	Estimated area
A	12	4	6 (= 3 whole squares)	4	19
B	18	4	8 (= 4 whole squares)	4	26
C	27	11	4 (= 2 whole squares)	10	40
D	24	9	2 (= 1 whole square)	15	34

2. Answers vary; squares should be divided in half in a variety of ways, not always with straight lines.

3. The area of the paint spillage is about 30 cm^2.

4. Children should draw shapes with areas of about 15 squares.

5. Children should draw round their own hand and record their findings in the form of whole, almost whole, half and less than half, then estimate their hand area.

Reflect

Explanations may vary; for example:
I would count whole squares then look at part-squares. I will count part-squares that are larger than half towards the area. I will count half-squares as one half. I will ignore part-squares smaller than half.

End of unit check

➜ pages 161–162

My journal

1. a) I know that the perimeter of the shape is 58 cm because the perimeter is the total of double the length (which is 40 cm) plus double the width (which is 18 cm).

b) I know that the area of this shape is 63 m2 because the area of a rectangle is found by multiplying the length by the width. 9 × 7 = 63

Power puzzle

1. The possible rectangles are: 24 cm × 1 cm (perimeter: 50 cm), 12 cm × 2 cm (perimeter: 28 cm), 8 cm × 3 cm (perimeter: 22 cm) and 6 cm × 4 cm (perimeter: 20 cm).

The rectangle that maximises perimeter, therefore, is the one with the longest length (24 cm × 1 cm).

2. The possible rectangles are: 11 cm × 1 cm (area: 11 cm^2), 10 cm × 2 cm (area: 20 cm^2), 9 cm × 3 cm (area: 27 cm2), 8 cm × 4 cm (area: 32 cm^2), 7 cm × 5 cm (area: 35 cm^2) and 6 cm × 6 cm (area: 36 cm^2).

The rectangle that maximises area, therefore, is the one that is square (6 cm × 6 cm).

Unit 7: Multiplication and division (2)

Lesson 1: Multiplying numbers up to 4 digits by a 1-digit number

→ pages 6–8

1. 6 × 20 = 120
6 × 7 = 42
120 + 42 = 162
So, 6 × 27 = 162

2. 5 × 100 = 500 5 × 30 = 150 5 × 5 = 25
500 + 150 + 25 = 675
So, 5 × 135 = 675

3 a) 32 × 7 = 224

	30	2
7	7 × 30 = 210	7 × 2 = 14

	H	T	O
	2	1	0
+		1	4
	2	2	4

b) 3 × 314 = 942

	300	10	4
3	900	30	12

	H	T	O
	9	0	0
		3	0
+		1	2
	9	4	2

4 a) 19 × 6 = 114
b) 48 × 6 = 288
c) 235 × 3 = 705
d) 8 × 711 = 5,688
e) 1,704 × 5 = 8,520
f) 739 × 9 = 6,651

5. There are 18,400 sweets in 8 jars.

6. The answer lies between 2,100 and 2,800, because 7 × 300 = 2,100 and 7 × 400 = 2,800. So 7 × 384 must lie between these two numbers.

7. Total weight of all the boxes = 4,017 g.
Methods may vary. Work out total of 1 of each box (45 g + 376 g + 918 g = 1,339 g). Multiply this by 3 (1,339 g × 9 = 4,017 g).

Reflect

Explanations may vary. Encourage children to explain each step of the calculation, referring to the place value of digits and explaining how to exchange between columns.

Lesson 2: Multiplying 2-digit numbers (1)

→ pages 9–11

1. a) 26 = 20 + 6; 14 = 10 + 4

	20	6
10	10 × 20 = 200	10 × 6 = 60
4	4 × 20 = 80	4 × 6 = 24

26 × 14 = 364

b) 17 = 10 + 7; 42 = 40 + 2

	10	7
40	400	280
2	20	14

	H	T	O
	4	0	0
	2	8	0
		2	0
+		1	4
	7	1	4

42 × 17 = 714

c) Yes, Zac will get the same answer as multiplication is commutative. 17 × 42 = 42 × 17.

2 a) 27 × 34 = 918
b) 53 × 38 = 2,014

3. Mike runs 779 km in 19 days.

4.

	50	3
20	50 × 20 = (100)	3 × 20 = 60
7	50 × 7 = 350	3 × 7 = (10)

	Th	H	T	O
		3	5	0
		1	0	0
		6	0	
+		1	0	
	1	1	5	0

53 × 27 = 1,431

5. Gina has forgotten to do 20 × 7 and 3 × 40 before adding all four products together. Her method will not work because she has only found the products of two of the parts and not all four parts.

6. Isla is trying to work out 36 × 38

	30	8
30	900	240
6	180	48

36 × 38 = 1,368

Reflect

56 × 21 = 1,176. Methods may vary. Encourage children to give a full explanation of the method they are using with reasons. Children may also want to demonstrate their method using a visual representation. Is there more than one method? Which method was the most efficient?

Lesson 3: Multiplying 2-digit numbers (2)

➜ pages 12–14

1. 10 × 24 = 240   2 × 24 = 48
240 + 48 = 288
There are 288 pencils in total.

2. 21 × 36 = 10 × 36 + 10 × 36 + 1 × 36
= 360 + 360 + 36
= 756
There are 756 jelly beans in total.

3. a) Lexi's working
30 × 12 = 360
2 × 12 = 24
360 + 24 = 384
Danny's working
32 × 10 = 320
32 × 2 = 64
320 + 64 = 384
b) Answers may vary. Ensure children explain their preferred method with justification.

4. a) 25 × 13 = 25 × 10 + 25 × 3
= 250 + 75
= 325
b) 41 × 24 = 984
c) 14 × 62 = 868

5. 41 × 14 = 574

6. The shopkeeper made £1,292 last month.
(£51 – £34 = £17; £17 × 76 = £1,292)

Reflect

45 × 23 = 1,035. Explanations and methods may vary. Encourage children to use formal as well as informal methods, justifying and reasoning to demonstrate real understanding.

Lesson 4: Multiplying 2-digit numbers (3)

➜ pages 15–17

1. a) **Olivia's method**

	34
10	340
2	68

	H	T	O
	3	4	0
+		6	8
	4	0	8

Jamilla's method

		3	4
×		1	2
		6	8
	3	4	0
	4	0	8

34 × 12 = 408
b) Answers may vary. Ensure children explain their preferred method with justification.

2. a) 29 × 23 = 667

		2	9	
×		2	3	
		8	$_2$7	29 × 3
	5	$_1$8	0	29 × 20
	6	6	7	29 × 23

b) 37 × 16 = 592

		3	7	
×		1	6	
	2	2	$_4$2	37 × 6
	3	7	0	37 × 10
	5	9	2	37 × 16

3. a) 45 × 27 = 1,215

			4	5	
×			2	7	
		3	1	$_3$5	45 × 7
		9	$_1$0	0	45 × 20
	1	2	1	5	45 × 27

b) 52 × 17 = 884

		5	2	
×		1	7	
	3	6	$_1$4	52 × 7
	5	2	0	52 × 10
	8	8	4	52 × 17

c) 1,666 (Children to show long multiplication method)
d) 2,128 (Children to show long multiplication method)

4. There are 2,040 calories in a pack of 24 snack bars.

5. The bar model represents 14 × 89 = 1,246

6. a)

		3	6
×		1	3
	1	0	$_1$8
	3	6	0
	4	6	8

b)

			7	4
×			4	3
		2	2	$_1$2
	2	9	$_1$6	0
	3	1	8	2

Reflect

Explanations may vary. Encourage children to see that 99 × 47 = 100 × 47 – 47 = 4,653. Children could use visuals representations such as place value counters or place value grids to support their explanations.

Lesson 5: Multiplying a 3-digit number by a 2-digit number

➜ pages 18–20

1. a) 172 × 24 = 4,128

	100	70	2
20	100 × 20 = 2,000	20 × 70 = 1,400	20 × 2 = 40
4	4 × 100 = 400	4 × 70 =280	4 × 2 = 8

	Th	H	T	O
	2	0	0	0
	1	4	0	0
			4	0
		4	0	0
		2	8	0
+				8
	4	1	2	8
		1	1	

b) 325 × 18 = 5,580

	300	20	5
10	10 × 300 = 3,000	10 × 20 = 200	10 × 5 = 50
8	8 × 300 = 2,400	8 × 20 =160	8 × 5 = 40

	Th	H	T	O
	3	0	0	0
		2	0	0
			5	0
	2	4	0	0
		1	6	0
+			4	0
	5	8	5	0
			1	

2. a)

		1	7	2	
×			2	4	
		6	$_2$8	8	172 × 4
	3	$_1$4	4	0	172 × 20
	4	1	2	8	172 × 24
		1	1		

b)

		3	2	5	
×			1	8	
	2	$_2$6	$_4$0	0	325 × 8
	3	2	5	0	325 × 10
	5	8	5	0	325 × 18

3. a) 145 × 39 = 5,655 (Children to show long multiplication method)
b) 408 × 25 = 10,200 (Children to show long multiplication method)
c) 418 × 72 = 30,096 (Children to show long multiplication method)
d) 529 × 44 = 23,276 (Children to show long multiplication method)

4. 72 × 314 = 22,608
The second method is more efficient as the answer is found in 3 steps, whereas the first method uses 4 steps.

5. There are 1,066 bottles of water left.
(288 × 12 = 3,456; 3,456 – 2,390 = 1,066)

6. Explanations may vary. Children may say since the answer has 5 in the ones digit, the ones digit of the missing number must be 5 (the only single-digit number that has an answer ending in 5 when multiplied by 7). They may say they then worked out 5 × 567 = 2,835 and put this in the top row. They may say they then worked out that 5,670 must be in the second row (8,505 – 2,835). This is 10 × 567 so the missing number is 10 + 5 = 15.

		5	6	7
×			1	5
	2	8	$_3$3	$_3$5
+	5	6	7	0
	8	5	0	5
		1	1	

Reflect

Answers may vary. Encourage children to see that 354 × 30 can be worked out as 354 × 3 and then multiply the answer by 10. With 300 × 52, this can be worked out as 3 × 52 then multiply the answer by 100.

354 × 30 = 10,620
300 × 52 = 15,600

Lesson 6: Multiplying a 4-digit number by a 2-digit number

➜ pages 21–23

1. a) 1,203 × 26 = 31,278 (Children to show long multiplication method)
b) 1,612 × 24 = 38,688 (Children to show long multiplication method)
c) 25 × 2,459 = 61,475 (Children to show long multiplication method)
d) 3,006 × 37 = 111,222 (Children to show long multiplication method)

2. 23 bags of marbles weigh 38,042 g.

3. a) 3,612 × 38 = 137,256
b) 6,005 × 23 = 138,115

4. 72 × 17 = 1,224
720 × 17 = 12,240
7,200 × 17 = 122,400
1,700 × 72 = 122,400
Explanations may vary.
7,200 × 17 = 72 × 100 × 17 = 72 × 1,700 = 1,700 × 72

5. The car and the motorbike cost £47,000 in total (£2,350 × 20).

6. 26 × 37 × 49 = 47,138
It does not matter which order you multiply the numbers in. When you multiply numbers together the order of the numbers does not affect the answer, which will always be the same.

7.

			5	7	0	3
×					8	2
		1	1	$_1$4	0	6
	4	5	$_5$6	2	$_2$4	0
	4	6	7	6	4	6

Reflect

Explanations may vary. The answer cannot be correct as the ones digits are 5 and 7. 5 × 7 ends in 0 so the answer will have a 5 on the end, not 0.

Correct answer: 51,615

Lesson 7: Dividing up to a 4-digit number by a 1 digit number (1)

→ pages 24–26

1. a) 200 ÷ 2 = 100
60 ÷ 2 = 30
8 ÷ 2 = 4
100 + 30 + 4 = 134
So, 268 ÷ 2 = 134
b) 5,000 ÷ 5 = 1000
50 ÷ 5 = 10
5 ÷ 5 = 1
1,000 + 10 + 1 = 1,011
So, 5,055 ÷ 5 = 1,011

2. When dividing anything by 1, the number stays the same. Here, you can think of it as how many 1s go into 723, so 723 1s go into 723.

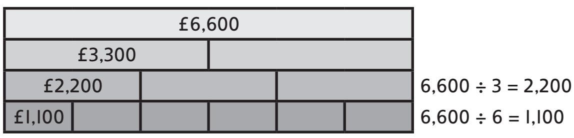
3. Each child gets 13 marbles.

4. a) 844 ÷ 4 = 211
b) 9,690 ÷ 3 = 3,230
c) 84 ÷ 2 = 42
d) 7,070 ÷ 7 = 1,010

5. a)
    3 2 0 1
3 | 9 6 0 3

b)
    2 1 1 0
4 | 8 4 4 0

c) Answer may vary, for example,
    1 2 1
3 | 3 6 3

6.


Dividing by a larger number gives you a smaller answer as the whole is split into more equal parts, so the amount is each part will be smaller.

Reflect

Children may say they will use short division to work out how many groups of 2 there are in 4,804, or they can think of it as halving 4,804. They start with the largest value digit, so how many twos in 4 thousands = 2 thousands. Then how many twos in 8 hundreds = 4 hundreds. How many twos in 0 tens = 0 tens. Finally, how many twos in 4 ones = 2 ones. So, the answer is 2,402.

Lesson 8: Dividing up to a 4-digit number by a 1-digit number (2)

→ pages 27–29

1. 78 ÷ 3 = 26

2. Olivia can make 16 hexagons.

3. a) 642 ÷ 6 = 107
b) 725 ÷ 5 = 145
c) 5,016 ÷ 3 = 1,672

4. a) 7,924 ÷ 7 =1132
b) 711 ÷ 3 = 237
c) 916 ÷ 4 = 229

5. The bar model represents the division 2,454 ÷ 6 = 409

6. Isla has made a mistake when exchanging from the thousands column to the hundreds column. Instead of exchanging the 1 thousands for 10 hundreds, she has made 30 hundreds.

7. a)
    2 4 3
4 | 9 ^{1}7 ^{1}2

b)
    2 2 9 1
3 | 6 8 ^{2}7 3

c)
    1 2 6
5 | 6 ^{1}3 ^{3}0

or

    1 3 6
5 | 6 ^{1}8 ^{3}0

8. Bella's method
4,755 ÷ 3 = 1,585
1,585 ÷ 5 = 317
Ebo's method
4,755 ÷ 5 = 951
951 ÷ 3 = 317
Both Bella and Ebo get the same answer.
In the diagram you can see that dividing by 5 (the solid lines) and then dividing each part by 3 (the dotted lines) is the same as dividing the whole by 15 (there are 15 equal parts altogether).

Reflect

Explanations may vary. Children may say they know that the answer must be wrong because 7 ÷ 7 = 1 so 307 ÷ 7 cannot be 1. Encourage children to notice that there is no exchange, for instance, the 3 hundreds has not been exchanged for 30 tens.

Lesson 9: Division with remainders (1)

→ pages 30–32

1. 74 ÷ 3 = 24 r 2

2. a) Each friend gets 12 sweets.
b) There are 4 sweets left over.
c) There will not be 5 sweets left over as 5 is bigger than the divisor 3 so that means an extra sweet could be put in each of the 3 jars.

3. a) 56 ÷ 5 = 11 r 1
b) 329 ÷ 2 = 164 r 1
c) 418 ÷ 9 = 46 r 4
d) 4,175 ÷ 4 = 1,043 r 3
e) 973 ÷ 6 = 162 r 1
f) 1,111 ÷ 8 = 138 r 7

4. 712 ÷ 6 = 118 r 4. Toshi cannot pack all jars into boxes without any remainders.

5. Match calculations to remainders:
5 | 4 8 → r 3   7 | 9 7 → r 6   2 | 9 9 → r 1
9 | 7 6 → r 4   3 | 9 3 → r 0   4 | 8 6 → r 2

6. The mints will last for **66** days.

7. a) $7\,\overline{)\,2\ {}^{2}3\ {}^{2}5}$ = 0 3 3 r 4 $4\,\overline{)\,9\ {}^{1}7\ {}^{1}1\ {}^{3}8}$ = 2 4 2 9 r 2
b) There are 3 possible answers:
511 ÷ 3 = 170 r 1
514 ÷ 3 = 171 r 1
517 ÷ 3 = 172 r 1

Reflect

Explanations will vary – this can never be correct – if the 'remainder' is bigger than the divisor, then it can be further divided.

Lesson 10: Division with remainders (2)

→ pages 33–35

1. a) Circled: 300 95 6,045
Numbers that end in 0 or 5 are divisible by 5, so these numbers are divisible exactly by 5.
b) Circled: 1,252 390 788
These numbers are all even. Even numbers are divisible by 2.
c) Circled: 156 384 72
The digit sum of these numbers are multiples of 3. So, these numbers are all divisible by 3.

2. Methods may vary. Children may use short division or halving and halving again to show 756 ÷ 4 = 189. Since 100 is divisible by 4, it is sufficient to show that 56 is divisible by 4.

3. a) Circled: 78 342 726 2,412
b) ☐46 possible digits are: 2, 5 or 8
3,1☐2 possible digits are: 0, 3, 6 or 9
28☐ possible digits are: 2 or 8

4. a) remainder = 1
b) remainder = 2
c) remainder = 5
d) remainder = 0
Explanations will vary. Children may say they found the difference between the number and 712 to see if it was possible to make another group of 8 or whether there would be a remainder.

5. Circled: 516 ÷ 4 1,748 ÷ 4 ?04 ÷ 4

6. a) Possible digits: 3 or 8
b) Possible digits: 1, 4 or 7
c) Possible digits: 3 or 9

Reflect

No. Explanations may vary, for example, if you get a remainder of 9, 10, 11… when dividing by any single-digit number then you can divide further.

Lesson 11: Problem solving – division with remainders

→ pages 36–38

1. a) 602 ÷ 3 = 200 r 2
b) 3,862 ÷ 8 = 482 r 6

2. 365 ÷ 7 = 52 r 1
Max is incorrect as there are 52 weeks and one extra day each year.

3. a) 5 × 32 + 3 = 163
163 stickers were shared out altogether.
b) 163 ÷ 6 = 27 r 1
Each child gets 27 stickers. There is 1 sticker left over.

4. (2,050 – 187) ÷ 9 = 207
One box is 207 mm wide.

5. 6 × 416 = 2,496
5,000 – 2,496 = 2,504
2,504 ÷ 8 = 313
There is 313 ml of water in each short glass.

Reflect

Methods may vary. Children may check using short multiplication. Children could multiply 1,143 by 10 and then halve the answer. Children might use a pictorial method such as the grid method. Children might divide 5,715 by 5 to check the answer is 1,143.

End of unit check

→ pages 39–41

My journal

1. Mo is trying to do the long multiplication method, but he has not found 9 × 235 and then 30 × 235. The correct answer is 9,165.
Reena thinks that there are only 8 lots of 3 in 28, when in fact there are 9 lots of 3 with 1 left to be exchanged. The correct answer is 295.
Danny has worked out the remainders incorrectly as 2 lots of 4 are 8, which means 3 are left over from 11. Correct answer is 1,762 r 3.

2. Methods may vary. Here are some possible answers:

99 × 764	First do 100 × 764 and then subtract 764 from the answer.
5,917 × 1	When multiplying any number by 1, the answer is the number itself.
723 ÷ 1	When dividing any number by 1, the answer is the number itself.
7,000 × 30	Work out 7 × 3 and then multiply it by 10,000.

Power play

a) 27 × 37 × 47
b) 28 × 38 × 48 = 51,072
c) 27 × 28 × 29
Sparks's statement is true. When you multiply any three consecutive numbers ending in:
0, 1 and 2; 3, 4 and 5; 4, 5 and 6; 5, 6 and 7; 8, 9 and 0 make 0
2, 3 and 4; 7, 8 and 9 make 4
1, 2 and 3; 6, 7 and 8 make 6.

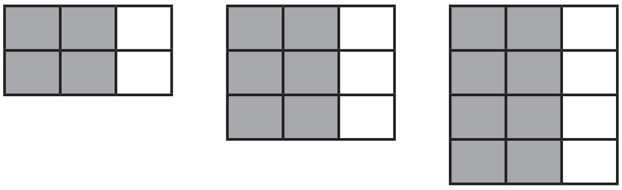
Unit 8: Fractions (I)

Lesson I: Equivalent fractions

→ pages 42–44

1 a) $\frac{1}{2} = \frac{4}{8}$ $\frac{1}{2} = \frac{3}{6}$ $\frac{1}{2} = \frac{8}{16}$

b) Answers may vary, for example:



$\frac{2}{3} = \frac{4}{6}$ $\frac{2}{3} = \frac{6}{9}$ $\frac{2}{3} = \frac{8}{12}$

c) 4 small squares should be shaded in each diagram as fractions are all equivalent to $\frac{1}{4}$ and $\frac{1}{4}$ of 16 is 4.

2 a) $\frac{1}{5} = \frac{3}{15}$ c) $\frac{10}{16} = \frac{5}{8}$ e) $\frac{1}{10} = \frac{3}{30}$

b) $\frac{3}{15} = \frac{4}{20}$ d) $\frac{3}{5} = \frac{9}{15}$ f) $\frac{3}{10} = \frac{9}{30}$

3 a) $\frac{80}{240} = \frac{8}{24} = \frac{2}{6} = \frac{200}{600}$

b) $\frac{3}{12} = \frac{5}{20} = \frac{8}{32}$

Answers will vary for the last fraction, for example, $\frac{1}{4}$, $\frac{2}{16}$.

4. Ambika is incorrect. Fractions are equivalent if each numerator has been multiplied by the same number to give the denominator. Children could draw diagrams to show that $\frac{3}{5}$ is not equal to $\frac{7}{9}$ or work out that $\frac{3}{5} = \frac{27}{45}$ but $\frac{7}{9} = \frac{35}{45}$.

5. a) $\frac{4}{16} = \frac{25}{100}$ $\frac{4}{25} = \frac{16}{100}$

b) $\frac{5}{6} = \frac{10}{12}$ $\frac{5}{10} = \frac{6}{12}$

c) $\frac{9}{10} = \frac{27}{30}$ $\frac{9}{27} = \frac{10}{30}$

d) $\frac{10}{25} = \frac{30}{75}$ $\frac{10}{30} = \frac{25}{75}$

Explanations will vary. Children may say they notice that you can swap the denominator of one fraction with the numerator of the other to make another pair of equivalent fractions.

Reflect

Methods may vary. Encourage children to show both pictorially and using multiplication or division to find equivalence.

Lesson 2: Converting improper fractions to mixed numbers

→ pages 45–47

1. a) 1 kg in each bracket on top of the bar model

$\frac{7}{2}$ kg = $3\frac{1}{2}$ kg

b) Missing number in diagram: 1

$\frac{9}{4}$ litres = $2\frac{1}{4}$ litres

c) $\frac{1}{3}$ written in each part of the bar model

$\frac{11}{3} = 3\frac{2}{3}$

2. 4 quarters make one whole circle.

Max has $\frac{15}{4}$ circles in total. That is $3\frac{3}{4}$ whole circles.

3. a) $\frac{13}{3} = 4\frac{1}{3}$ d) $\frac{14}{5} = 2\frac{4}{5}$

b) $\frac{13}{4} = 3\frac{1}{4}$ e) $\frac{15}{5} = 3$

c) $\frac{13}{5} = 2\frac{3}{5}$ f) $\frac{16}{5} = 3\frac{1}{5}$

4. a) $\frac{14}{4} = 3\frac{2}{4} = 3\frac{1}{2}$

b) $\frac{27}{6} = 4\frac{3}{6} = 4\frac{1}{2}$

c) $\frac{40}{12} = 3\frac{4}{12} = 3\frac{1}{3}$

5. Answers may vary. $\frac{11}{10} = 1\frac{1}{10}$; $\frac{12}{10} = 1\frac{2}{10}$; $\frac{23}{10} = 2\frac{3}{10}$

The square equals the whole number when the triangle is divided by 10 and the star is the remainder.

Reflect

Explanations may vary. Encourage children to see that $\frac{17}{3}$ is $\frac{1}{3}$ less than 6 and $\frac{19}{3}$ is $\frac{1}{3}$ greater than 6, so 6 is right in the middle between $\frac{17}{3}$ and $\frac{19}{3}$.

Lesson 3: Converting mixed numbers to improper fractions

→ pages 48–50

1. a) $5\frac{1}{3} = \frac{16}{3}$ b) $4\frac{1}{4} = \frac{17}{4}$ c) $6\frac{3}{5} = \frac{33}{5}$

2. Images matched:

Top image ($3\frac{1}{2}$) ➜ $\frac{7}{2}$

Second image ($3\frac{1}{4}$) ➜ $\frac{13}{4}$

Third image ($2\frac{1}{4}$) ➜ $\frac{9}{4}$

Fourth image ($2\frac{2}{4}$) ➜ $\frac{5}{2}$

3. a) $3\frac{1}{2} = \frac{7}{2}$ c) $4\frac{2}{5} = \frac{22}{5}$

b) $2\frac{2}{3} = \frac{8}{3}$ d) $7\frac{1}{2} = \frac{15}{2}$ or $7\frac{2}{4} = \frac{30}{4}$

4. a) $4\frac{1}{5} = \frac{21}{5}$ b) $4\frac{2}{5} = \frac{22}{5}$ c) $4\frac{4}{5} = \frac{24}{5}$

5. The waiter can fill 14 glasses.

6. 22 $\frac{1}{8}$ kg weights would balance the box.

7. a) $\frac{14}{4} = 3\frac{1}{2}$ b) $4\frac{5}{10} = \frac{9}{2}$

$\frac{28}{8} = 3\frac{1}{2}$ $4\frac{6}{10} = \frac{23}{5}$

$\frac{21}{6} = 3\frac{1}{2}$ $4\frac{7}{10} = \frac{94}{20}$

$4\frac{8}{10} = \frac{72}{15}$

Reflect

Diagrams may vary. Encourage children to clearly show equal wholes and equal size parts of fifths. Diagrams should show $2\frac{4}{5}$ equals $\frac{14}{5}$.

Lesson 4: Number sequences

➜ pages 51–53

1. a) $\frac{1}{4}$; $\frac{2}{4}$ ($\frac{1}{2}$); $\frac{3}{4}$; 1; $1\frac{1}{4}$; $1\frac{2}{4}$ ($1\frac{1}{2}$)
   b) $\frac{4}{3}$; $\frac{5}{3}$; $\frac{6}{3}$; $\frac{7}{3}$; $\frac{8}{3}$
   c) Children should have drawn diagrams to match the sequence.
   The rule for the sequence is counting back in quarters.

2. Sequences matched to descriptions:
   Top sequence ➜ counts up in quarters
   Second sequence ➜ counts down in halves
   Third sequence ➜ counts up in eighths
   Fourth sequence ➜ counts down in thirds

3. a) 3, $3\frac{1}{4}$, $3\frac{1}{2}$, $3\frac{3}{4}$, 4
   b) $9\frac{1}{4}$, 9, $8\frac{3}{4}$, $8\frac{1}{2}$, $8\frac{1}{4}$

4. a) 2 and 3 are factors of 6 and so appear as denominators in the sequence. 4 is not a factor of 6 and so will not be a denominator in this sequence.
   b) $\frac{1}{12}$, $\frac{1}{6}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{5}{12}$, $\frac{1}{2}$, $\frac{7}{12}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$, $\frac{11}{12}$
   All denominators in this sequence are factors of 12.

Reflect

Answers may vary. Encourage children to write as quarters and as equivalent fractions. Do the children notice that all denominators are factors of 4?

Lesson 5: Comparing and ordering fractions (I)

➜ pages 54–56

1. a) $\frac{1}{6} < \frac{3}{6}$
   1 part shaded
   3 parts shaded
   b) $\frac{2}{3} > \frac{2}{6}$
   2 parts shaded
   2 parts shaded
   c) $\frac{4}{5} > \frac{3}{5}$
   4 parts shaded
   3 parts shaded
   d) $\frac{5}{8} < \frac{3}{4}$
   5 parts shaded
   Bar split into quarters, 3 parts shaded

2. a) $\frac{2}{5} > \frac{3}{10}$
   Max has run farther.
   b) No, no one is in the lead as $\frac{8}{10}$ is equivalent to $\frac{4}{5}$.

3. a) $\frac{7}{8}$, $\frac{3}{4}$, $\frac{3}{8}$ b) $\frac{5}{6}$, $\frac{1}{2}$, $\frac{5}{12}$ c) $\frac{17}{20}$, $\frac{4}{5}$, $\frac{3}{4}$, $\frac{7}{10}$

4. Bella has not started with equal wholes. Both bars should be the same size and then be split into 5ths and 10ths before being shaded and compared.

5. $\frac{2}{5} > \frac{5}{15}$
   $\frac{1}{8} < \frac{1}{4}$
   $\frac{6}{12} < \frac{3}{4}$ or $\frac{6}{9} < \frac{3}{4}$
   $\frac{1}{9} < \frac{5}{18}$ or $\frac{1}{12} < \frac{5}{18}$

6. a) Answers may vary – possible solutions are $\frac{1}{2}$, $\frac{5}{9}$, $\frac{7}{12}$
   b) Answers may vary – possible solutions are $\frac{3}{10}$, $\frac{5}{15}$, $\frac{7}{20}$
   c) Answers may vary – possible solutions are $\frac{19}{20}$, $\frac{29}{30}$, $\frac{99}{100}$

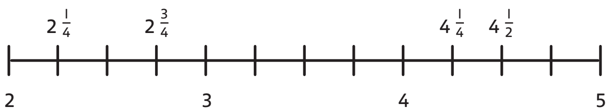
Reflect

Answers may vary, for example, $\frac{1}{5}$, $\frac{9}{5}$, $\frac{12}{12}$ or $\frac{1}{12}$, $\frac{5}{12}$, $\frac{5}{9}$.
Encourage children to use equivalence to help compare and order the fractions made.

Lesson 6: Comparing and ordering fractions (2)

➜ pages 57–59

1. a)



   b) $2\frac{1}{4}$, $2\frac{3}{4}$, $4\frac{1}{4}$, $4\frac{1}{2}$

2. a) Right-hand diagram circled
   b) Left-hand diagram circled
   c) Right-hand diagram circled

3. a) $3\frac{1}{5} < 3\frac{4}{5}$ c) $\frac{15}{5} < 3\frac{3}{5}$ e) $4\frac{2}{6} > \frac{23}{6}$
   b) $\frac{13}{5} < \frac{17}{5}$ d) $4\frac{2}{5} < \frac{23}{5}$ f) $\frac{23}{7} < 4\frac{2}{7}$

4. Kate has cycled farther.

5. a) $2\frac{7}{8} < 4\frac{3}{4}$ e) $\frac{31}{5} > \frac{31}{10}$ i) $\frac{21}{5} > 2\frac{1}{5}$
   b) $3\frac{2}{3} > 3\frac{1}{6}$ f) $\frac{41}{6} < \frac{41}{2}$ j) $\frac{31}{10} = 3\frac{1}{10}$
   c) $5\frac{1}{5} = 5\frac{2}{10}$ g) $\frac{21}{2} > \frac{41}{4}$ k) $5\frac{1}{3} > \frac{31}{6}$
   d) $6\frac{3}{6} < 6\frac{2}{3}$ h) $\frac{13}{3} = \frac{39}{3}$ l) $4\frac{4}{9} > \frac{13}{3}$

6. a) Answers may vary depending on the denominators chosen – a possible solution is:
   $\frac{43}{10}$, $\frac{87}{20}$, $\frac{44}{10}$
   $\frac{21}{5} < \frac{43}{10} < \frac{87}{20} < \frac{44}{10} < 4\frac{5}{10}$
   b) Answers may vary depending on the denominator chosen – a possible solution is:
   $3\frac{11}{32}$, $3\frac{21}{64}$, $3\frac{23}{64}$, $3\frac{41}{128}$
   From greatest to least: $3\frac{3}{8}$, $3\frac{23}{64}$, $3\frac{11}{32}$, $3\frac{21}{64}$, $3\frac{41}{128}$, $\frac{53}{16}$

Reflect

Answers may vary, for example, $\frac{8}{3} = 2\frac{2}{3}$; $\frac{2}{3}$ is greater than $\frac{1}{6}$ so $\frac{8}{3} > 2\frac{1}{6}$.
$2\frac{1}{6} = \frac{13}{6}$; $\frac{8}{3} = \frac{16}{6}$ so $\frac{8}{3}$ is greater than $2\frac{1}{6}$.

Lesson 7: Fractions as division (1)

→ pages 60–62

1. a) $4 \div 5 = \frac{4}{5}$
There is $\frac{4}{5}$ of a cake for each table.
b) $3 \div 8 = \frac{3}{8}$
There is $\frac{3}{8}$ of a pie for each table.
c) $5 \div 6 = \frac{5}{6}$. There is $\frac{5}{6}$ kg of strawberries in each bowl.

2. a) $1 \div 5 = \frac{1}{5}$ c) $3 \div 5 = \frac{3}{5}$ e) $\frac{4}{11} = 4 \div 11$
b) $2 \div 5 = \frac{2}{5}$ d) $3 \div 10 = \frac{3}{10}$ f) $8 \div 9 = \frac{8}{9}$

3. a) Each length is $\frac{3}{8}$ m long.
b) Each length is $\frac{4}{8}$ or $\frac{1}{2}$ m long.

4. Each circle shows $\frac{1}{6}$, so the diagram shows that $4 \div 6 = 4$ sixths $= \frac{4}{5}$.

5. Divisions matched to fractions.
$2 \div 8 \rightarrow \frac{1}{4}$ $3 \div 9 \rightarrow \frac{1}{3}$ $1 \div 10 \rightarrow \frac{2}{20}$
$4 \div 10 \rightarrow \frac{2}{5}$ $4 \div 20 \rightarrow \frac{1}{5}$ $3 \div 4 \rightarrow \frac{9}{12}$

6. a) The first glasses hold $\frac{5}{6}$ litre and the second glasses hold $\frac{6}{9}$ litre.
$\frac{5}{6} = \frac{15}{18}$; $\frac{6}{9} = \frac{12}{18}$
$\frac{15}{18} > \frac{12}{18}$ so $\frac{5}{6} > \frac{6}{9}$
This means the first glasses are bigger.
b) Red watering cans hold $\frac{8}{20}$ litre $= \frac{2}{5}$ litre
Blue watering cans hold $\frac{12}{30}$ litre $= \frac{2}{5}$ litre
So, the red and blue watering cans are equal in size.

Reflect

Explanations may vary. Encourage children to explain that the answer to the calculation $3 \div 8$ is equal to $\frac{3}{8}$. Children may draw diagrams to show why this is true.

Lesson 8: Fractions as division (2)

→ pages 63–65

1. a) $5 \div 2 = 2$ remainder 1
$5 \div 2 = 2\frac{1}{2}$
b) $8 \div 3 = 2$ remainder 2
$8 \div 3 = 2\frac{2}{3}$

2. a) $14 \div 3 = 4\frac{2}{3}$ m
b) $24 \div 3 = 8$ m

3. Each person receives $62\frac{1}{2}$ g of chocolate.

4. a) $97 \div 8 = 12$ remainder $1 = 12\frac{1}{8}$
b) $98 \div 8 = 12\frac{2}{8} = 12\frac{1}{4}$
c) $100 \div 8 = 12\frac{1}{2}$
d) $102 \div 8 = 12\frac{3}{4}$
e) $193 \div 8 = 24\frac{1}{8}$

5.

Division with remainder	Mixed number	Improper fraction
$6 \div 4 = 1$ remainder 2	$1\frac{2}{4}$ or $1\frac{1}{2}$	$\frac{6}{4}$ or $\frac{3}{2}$
$18 \div 4 = 4$ remainder 2	$4\frac{2}{4}$ or $4\frac{1}{2}$	$\frac{18}{4}$ or $\frac{9}{2}$
$22 \div 5 = 4$ remainder 2	$4\frac{2}{5}$	$\frac{22}{5}$
$26 \div 5 = 5$ remainder 1	$5\frac{1}{5}$	$\frac{26}{5}$
$58 \div 10 = 5$ remainder 8	$5\frac{8}{10}$ or $5\frac{4}{5}$	$\frac{58}{10}$ or $\frac{29}{5}$

6. a) $20 \div 6 = 3\frac{2}{6}$ or $3\frac{1}{3}$
b) Parts in diagram: $\frac{54}{6}$ and $\frac{3}{6}$
$57 \div 6 = 9\frac{3}{6}$ or $9\frac{1}{2}$
c) Missing part in diagram: $\frac{1}{7}$
$365 \div 7 = 52\frac{1}{7}$

Reflect

$150 \div 4 = 37$ remainder 2
$150 \div 4 = 37\frac{2}{4} = 37\frac{1}{2} = 37{\cdot}5$

End of unit check

→ pages 66–67

My journal

Answers may vary – some possible answers include:

$\frac{5}{10} = \frac{6}{12}$
$\frac{3}{10} = \frac{6}{20}$
$\frac{4}{10} = \frac{6}{15}$
$\frac{10}{10} = \frac{6}{6}$
$\frac{12}{10} = \frac{6}{5}$
$\frac{15}{10} = \frac{6}{4}$

Power play

Children should be able to use their understanding of improper fractions and mixed number fractions to fluently find equivalent fractions. If asked, children should be able to prove their equivalent fractions with a picture of shared 2D shapes or a fraction strip. If children find this activity challenging it will be beneficial to offer them support with finding equivalent fractions and converting between mixed numbers and improper fractions. If dice are not available then children could use spinners labelled 1 to 6 (which they can make with a paper clip and some paper).

Unit 9: Fractions (2)

Lesson 1: Adding and subtracting fractions with the same denominator

→ pages 68–70

1. a) $\frac{2}{5} + \frac{1}{5} = \frac{3}{5}$
b) $\frac{3}{8} + \frac{3}{8} = \frac{6}{8} = \frac{3}{4}$
c) $\frac{9}{10} - \frac{7}{10} = \frac{2}{10} = \frac{1}{5}$

2. a) $\frac{13}{9} = 1\frac{4}{9}$ b) $\frac{10}{7} = 1\frac{3}{7}$

3. a) Circle: $\frac{7}{12} + \frac{3}{12}$ $\frac{7}{9} - \frac{4}{9}$
b) Circle: $\frac{3}{4} + \frac{3}{4}$ $\frac{7}{8} + \frac{9}{8}$

4. a) $\frac{3}{5}$ d) $\frac{6}{12} = \frac{1}{2}$ f) $\frac{10}{11}$
b) $\frac{1}{9}$ e) $\frac{5}{3} = 1\frac{2}{3}$ g) $\frac{15}{8} = 1\frac{7}{8}$
c) $\frac{11}{10} = 1\frac{1}{10}$

5. Join fractions: $\frac{6}{7}$ and $\frac{1}{7}$, $\frac{2}{7}$ and $\frac{5}{7}$, $\frac{3}{7}$ and $\frac{4}{7}$.
Explanations may vary. $\frac{7}{7}$ makes 1 whole, so I chose pairs of numerators that total 7.

6. Missing numbers:
a) 5 c) 1 e) 1
b) 2 d) 5 f) 9

7. a) Yes, it is correct as $\frac{4}{5} + \frac{1}{5} = 1$ and $\frac{1}{6} + \frac{5}{6} = 1$; $1 + 1 = 2$
b) Yes, it is correct as $\frac{5}{8} + \frac{3}{8} = 1$ and $1 - \frac{5}{6} = \frac{1}{6}$

Reflect

The numerator of the second fraction must be greater than 4.

Explanations may vary. Children may say they know that $\frac{5}{9} + \frac{4}{9} = 1$, so any numerator greater than 4 will total a number greater than 1.

Lesson 2: Adding and subtracting fractions (1)

→ pages 71–73

1. a) $\frac{2}{3}$ is equivalent to $\frac{4}{6}$
$\frac{2}{3} + \frac{1}{6} = \frac{4}{6} + \frac{1}{6} = \frac{5}{6}$
b) $\frac{1}{4} = \frac{2}{8}$
$\frac{3}{8} + \frac{1}{4} = \frac{3}{8} + \frac{2}{8} = \frac{5}{8}$
c) $\frac{1}{3} = \frac{3}{9}$
$\frac{4}{9} - \frac{1}{3} = \frac{4}{9} - \frac{3}{9} = \frac{1}{9}$

2. a) $\frac{2}{5} = \frac{4}{10}$
$\frac{2}{5} + \frac{3}{10} = \frac{4}{10} + \frac{3}{10} = \frac{7}{10}$
b) $\frac{1}{3} = \frac{4}{12}$
$\frac{7}{12} - \frac{1}{3} = \frac{7}{12} - \frac{4}{12}$
$= \frac{3}{12} = \frac{1}{4}$

3. a) $\frac{7}{20} - \frac{1}{5} = \frac{7}{20} - \frac{4}{20} = \frac{3}{20}$
b) $\frac{7}{20} - \frac{3}{10} = \frac{1}{20}$

4. a) $\frac{1}{4}$ c) $\frac{2}{5}$ (= $\frac{4}{10}$)
b) $\frac{1}{3}$ (= $\frac{2}{6}$) d) $\frac{7}{20}$

5. $\frac{1}{2} + \frac{1}{6} = \frac{2}{3}$. $\frac{2}{3}$ of the circle is shaded.

Reflect

Answers may vary – the denominators have been added, which is incorrect. Instead, $\frac{1}{4}$ can be written as $\frac{2}{8}$ and added to $\frac{5}{8}$ to get $\frac{7}{8}$.

Lesson 3: Adding and subtracting fractions (2)

→ pages 74–76

1. a) $\frac{1}{5} = \frac{2}{10}$
$\frac{1}{5} + \frac{7}{10} = \frac{2}{10} + \frac{7}{10} = \frac{9}{10}$
Bella has given away $\frac{9}{10}$ of the flowers.
b) Bella has $\frac{1}{10}$ of the flowers left.

2. a) $\frac{3}{4} + \frac{3}{8} = \frac{6}{8} + \frac{3}{8} = \frac{9}{8} = 1\frac{1}{8}$
b) $\frac{5}{9} - \frac{1}{3} = \frac{5}{9} - \frac{3}{9} = \frac{2}{9}$

3. a) $\frac{4}{12} = \frac{1}{3}$ c) $\frac{16}{20} = \frac{4}{5}$
b) $\frac{24}{25}$ d) $\frac{7}{20}$

4. a) The total length of the strips is $\frac{4}{5}$ m.
b) The white strip is $\frac{3}{10}$ m shorter than the grey strip.

5. The total of the three fractions is $\frac{7}{8}$.
$\frac{1}{2} = \frac{4}{8}$, $\frac{1}{4} = \frac{2}{8}$; $\frac{4}{8} + \frac{2}{8} + \frac{1}{8} = \frac{7}{8}$.

6. a) $\frac{7}{12}$ b) $\frac{5}{24}$

Reflect

Answers may vary – the denominators have been added, which is incorrect. Instead, $\frac{1}{3}$ can be written as $\frac{3}{9}$ and added to $\frac{1}{9}$ to get $\frac{4}{9}$.

Lesson 4: Adding fractions (1)

→ pages 77–79

1. a) $\frac{1}{3} = \frac{2}{6}$
$\frac{5}{6} + \frac{1}{3} = \frac{5}{6} + \frac{2}{6}$
$= \frac{7}{6} = 1\frac{1}{6}$
b) $\frac{1}{2} = \frac{5}{10}$
$\frac{1}{2} + \frac{9}{10} = \frac{5}{10} + \frac{9}{10}$
$= \frac{14}{10} = 1\frac{2}{5}$

2. $\frac{1}{2}$

3. a) $\frac{3}{4} = \frac{6}{8}$
$\frac{3}{8} + \frac{3}{4} = \frac{3}{8} + \frac{6}{8} = \frac{9}{8} = 1\frac{1}{8}$
b) $\frac{2}{3} = \frac{8}{12}$
$\frac{5}{12} + \frac{2}{3} = \frac{5}{12} + \frac{8}{12} = \frac{13}{12} = 1\frac{1}{12}$

4. The total amount of juice in both bottles is $1\frac{1}{10}$ litres.

5. a) $1\frac{1}{4}$ b) $1\frac{8}{15}$

6. a) $\frac{11}{12}$ c) $\frac{7}{12}$ e) $\frac{5}{12}$
b) $\frac{3}{4}$ d) $\frac{7}{12}$ f) $\frac{1}{4}$

Reflect

Answers may vary. The denominators have been added, which is incorrect. Instead, $\frac{2}{3}$ can be written as $\frac{6}{9}$ and added to $\frac{7}{9}$ to get $\frac{13}{9}$ or $1\frac{4}{9}$.

Lesson 5: Adding fractions (2)

➜ pages 80–82

1. $2 + 1 = 3$
$\frac{1}{4} = \frac{2}{8}$
$\frac{1}{4} + \frac{3}{8} = \frac{2}{8} + \frac{3}{8} = \frac{5}{8}$
Olivia walks $3\frac{5}{8}$ km in total.

2. $3 + 2 = 5$
$\frac{3}{5} = \frac{6}{10}$
$\frac{3}{5} + \frac{9}{10} = \frac{6}{10} + \frac{9}{10} = \frac{15}{10} = 1\frac{1}{2}$
So, $3\frac{3}{5} + 2\frac{9}{10} = 6\frac{1}{2}$

3. a) $1\frac{2}{3}$ b) $4\frac{1}{4}$
c) If you move 2 wholes from $3\frac{2}{3}$ to $\frac{7}{12}$, this changes the calculation in b) to $2\frac{7}{12} + 1\frac{2}{3}$ but the total will stay the same.

4. a) $3\frac{8}{9}$ b) $6\frac{8}{9}$
The fractional part of the answer in b) is the same as in a) as children are adding the same fractional parts together. Just the whole number part is different as children are adding different whole numbers.

5. $3\frac{2}{3} + 5\frac{5}{6} = 9\frac{1}{2}$ or $5\frac{2}{3} + 3\frac{5}{6} = 9\frac{1}{2}$

6. $\frac{5}{6}$

Reflect

The fractional parts have already been added, so just add on the whole parts (4 + 3) to make $7\frac{5}{8}$.

Lesson 6: Adding fractions (3)

➜ pages 83–85

1. $2\frac{1}{3} = \frac{7}{3}$ $1\frac{2}{9} = \frac{11}{9}$
$\frac{7}{3} = \frac{21}{9}$
$\frac{21}{9} + \frac{11}{9} = \frac{32}{9}$
$= 3\frac{5}{9}$
So, $2\frac{1}{3} + 1\frac{2}{9} = 3\frac{5}{9}$

2. $2\frac{7}{8}$

3. a) $2\frac{7}{8}$ c) $5\frac{11}{20}$
b) $6\frac{1}{5}$ d) $5\frac{3}{16}$

4. The total weight of the two boxes is $4\frac{1}{4}$ kg.

5. Yes, children should agree with Kate because if they convert these fractions to improper fractions before adding, then the numbers will get very big and they are more likely to make a mistake. Whereas adding wholes and then parts will keep the numbers that they are working with smaller.

6. $1\frac{5}{6} + 1\frac{7}{12} = \frac{11}{6} + \frac{19}{12} = \frac{22}{12} + \frac{19}{12} = \frac{41}{12} = 3\frac{5}{12}$

7. a) Max has finished on $9\frac{5}{16}$
b) Max jumped $2\frac{11}{16}$ more to land on 12.

Reflect

Children's preference will vary. Encourage children to use the most efficient method of adding wholes, finding a common denominator for the parts, adding parts and then adding the wholes back on, instead of converting to improper fractions first.

Lesson 7: Subtracting fractions (I)

➜ pages 86–88

1. $\frac{7}{9} - \frac{5}{9} = \frac{2}{9}$
So $2\frac{7}{9} - \frac{5}{9} = 2\frac{2}{9}$

2. a) $\frac{1}{4} = \frac{2}{8}$
$3\frac{7}{8} - \frac{1}{4} = 3\frac{7}{8} - \frac{2}{8}$
$3\frac{5}{8}$
b) $\frac{1}{2} = \frac{4}{8}$
$3\frac{7}{8} - \frac{1}{2} = 3\frac{7}{8} - \frac{4}{8}$
$3\frac{3}{8}$
c) $3\frac{7}{8} - 1 = 2\frac{7}{8}$ $3\frac{7}{8} - \frac{7}{8} = 3$

3. There are $2\frac{1}{4}$ pies left.

4. a) $2\frac{1}{4}$ c) $2\frac{3}{8}$
b) $1\frac{1}{5}$ d) $1\frac{1}{10}$

5. a) $\frac{1}{2}$ c) 4 (or $3\frac{9}{9}$)
b) $3\frac{7}{9}$ d) $\frac{7}{12}$

6. The second show lasts $2\frac{1}{8}$ hours.

Reflect

Explanations will vary.

$\frac{1}{10}$ is smaller than $\frac{1}{5}$ so $\frac{3}{10}$ is smaller than $\frac{3}{5}$. Therefore $\frac{3}{10}$ can be subtracted from $\frac{3}{5}$ without a need to exchange one of the whole numbers, so the answer will be more than 2.

Lesson 8: Subtracting fractions (2)

→ pages 89–91

1. a) $3\frac{2}{5} = 2\frac{7}{5}$
$2\frac{7}{5} - \frac{4}{5} = 2\frac{3}{5}$
So $3\frac{2}{5} - \frac{4}{5} = 2\frac{3}{5}$
b) $2\frac{3}{8} = 1\frac{11}{8}$
$1\frac{11}{8} - \frac{7}{8} = 1\frac{4}{8}$
So $2\frac{3}{8} - \frac{7}{8} = 1\frac{1}{2}$

2. Missing fractions:
a) $\frac{3}{7}$ c) $\frac{7}{7}$
b) $\frac{5}{7}$ d) $\frac{1}{7}$

3. a) $4\frac{1}{4} = 4\frac{2}{8} = 3\frac{10}{8}$
$3\frac{10}{8} - \frac{7}{8} = 3\frac{3}{8}$
So, $4\frac{1}{4} - \frac{7}{8} = 3\frac{3}{8}$
b) $1\frac{7}{10}$

4. a) $4\frac{5}{9}$ c) $6\frac{5}{7}$
b) $4\frac{5}{12}$ d) $3\frac{13}{24}$

5. There are $1\frac{5}{8}$ sandwiches left.

6. Triangle = $\frac{7}{12}$
Circle = $1\frac{1}{12}$

Reflect

Explanations will vary. $\frac{9}{20}$ is more than $\frac{2}{5}$ so this means that one of the wholes in 2 will need to be exchanged into 20ths in order for the parts to be subtracted.

Lesson 9: Subtracting fractions (3)

→ pages 92–94

1. $1\frac{1}{3} = 1\frac{2}{6}$
$3 - 1 = 2$
$\frac{5}{6} - \frac{2}{6} = \frac{3}{6}$
$3\frac{5}{6} - 1\frac{1}{3} = 2\frac{3}{6} = 2\frac{1}{2}$

2. $4\frac{3}{4} = 4\frac{6}{8}$
$4 - 2 = 2$
$\frac{6}{8} - \frac{5}{8} = \frac{1}{8}$
$4\frac{3}{4} - 2\frac{5}{8} = 2\frac{1}{8}$

3. $4\frac{1}{2} = 4\frac{4}{8}$
$4\frac{4}{8} - 2\frac{7}{8} = 3\frac{12}{8} - 2\frac{7}{8}$
$= 1\frac{5}{8}$
So $4\frac{1}{2} - 2\frac{7}{8} = 1\frac{5}{8}$

4. a) $3\frac{7}{11}$ c) $1\frac{14}{15}$
b) $4\frac{5}{6}$ d) $\frac{13}{18}$

5. Calculations circled: $7\frac{8}{9} - 6\frac{1}{9}$, $4\frac{1}{9} - 2\frac{1}{3}$ and $6\frac{5}{8} - 4\frac{19}{24}$.
Explanations may vary. $5 - 3 = 2$ so $5\frac{1}{8} - 2$ will be more than 3.

6. Towns B and C could be $2\frac{2}{5}$ km apart (if B lies between A and C) or $11\frac{2}{5}$ km apart (if A lies between B and C).

Reflect

Aki has forgotten that subtraction is not commutative. He has subtracted $\frac{1}{12}$ from $\frac{8}{12}$ instead of exchanging 1 whole to make more 12ths in order to complete the subtraction. The actual answer is $1\frac{1}{3}$.

Lesson 10: subtracting fractions (4)

→ pages 95–97

1. a) $2\frac{3}{5} = \frac{13}{5}$
$1\frac{4}{5} = \frac{9}{5}$
$2\frac{3}{5} - 1\frac{4}{5} = \frac{13}{5} - \frac{9}{5} = \frac{4}{5}$
b) $3\frac{1}{6} = \frac{19}{6}$
$1\frac{1}{2} = 1\frac{3}{6} = \frac{9}{6}$
$3\frac{1}{6} - 1\frac{1}{2} = \frac{19}{6} - \frac{9}{6} = \frac{10}{6} = 1\frac{4}{6} = 1\frac{2}{3}$
c) $2\frac{8}{9}$

2. a) $3\frac{1}{9}$ b) $2\frac{1}{9}$

3. a) Parcel B weighs $2\frac{13}{15}$kg.
b) Parcel B weighs $1\frac{2}{5}$ kg more than parcel A.

4. a) $3\frac{7}{11}$ c) $1\frac{14}{15}$
b) $4\frac{5}{6}$ d) $\frac{13}{18}$

5. $126\frac{11}{15} - 72\frac{3}{5} = 54\frac{2}{15}$
Methods may vary. Encourage children to use the most efficient method, in this case, subtracting the wholes then finding a common denominator to subtract the parts.

Reflect

Answers may vary. Encourage children to see that the whole part of the equations are the same, but the fractional parts are different. In the first equation, $\frac{2}{3}$ is bigger than $\frac{1}{6}$ so no exchange is needed. In the second equation $\frac{1}{6}$ is less than $\frac{2}{3}$, so exchange will be needed.
$4\frac{2}{3} - 2\frac{1}{6} = 2\frac{1}{2}$; $4\frac{1}{6} - 2\frac{2}{3} = 1\frac{1}{2}$

Lesson 11: Problem solving – mixed word problems (1)

→ pages 98–100

1. Alex has read $\frac{1}{2}$ of the book.

2. a) The rabbit eats $\frac{9}{10}$ of the bag of carrots.
b) The rabbit has $\frac{1}{10}$ of the bag of carrots left.

3. Kate uses $6\frac{2}{3}$ kg of compost in total.

4. a) Jen travels $17\frac{1}{8}$ km in total.
b) It is $6\frac{3}{8}$ km further from home to the cinema than from the cinema to the shops.

5.

	$2\frac{3}{4}$	
$1\frac{5}{8}$		$1\frac{1}{8}$
$\frac{1}{2}$	$1\frac{1}{8}$	0

Reflect

$2\frac{3}{5} - 1\frac{9}{10} = \frac{7}{10}$. Problems will vary. Ensure children have used an appropriate context for the subtraction problem. Remind children to answer their question with a sentence.

Lesson 12: Problem solving – mixed word problems (2)

→ pages 101–103

1. Ebo has $\frac{2}{9}$ of his pocket money left.

2. a) $\frac{4}{9}$ of the shape is now shaded.
b) Explanations may vary. Encourage children to use a pictorial representation to visualise that $\frac{1}{3}$ is the same as $\frac{3}{9}$, so they understand that adding the extra $\frac{1}{9}$ makes $\frac{4}{9}$.

3. $\frac{1}{8}$ kg of oats is left in the bag.

4. Kate used $4\frac{7}{9}$ m of ribbon in total.

5. Missing numbers:
a) 4
b) 1
c) 2
d) 12

6. The difference between A and B is $1\frac{3}{10}$.
Explanations may vary. B is $1\frac{7}{10}$ and A is $\frac{2}{5}$; $1\frac{7}{10} - \frac{2}{5} = 1\frac{3}{10}$

7. The length of the missing side is $2\frac{3}{5}$ cm.

Reflect

Answers will vary. Encourage children to justify what they found challenging and explain what they now know about adding and subtracting fractions.

End of unit check

→ pages 104–106

My journal

1. a) Methods may vary. Encourage children to explain preference with justifications.
b) Methods may vary. Encourage children to explain preference with justifications.

2. Max drank $6\frac{4}{6}$ or $6\frac{2}{3}$ litres of milk in the last two weeks.

Power puzzle

a) $\frac{1}{2} + \frac{1}{4} = \frac{3}{4}$

$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} = \frac{7}{8}$

$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} = \frac{15}{16}$

$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} = \frac{31}{32}$

Answers may vary. Children may notice that each fraction is half the size of the fraction before in the number sentence and that the numerator of the answer is always 1 less than the denominator of the answer.

$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \frac{1}{64} = \frac{63}{64}$

$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \frac{1}{64} + \frac{1}{128} = \frac{127}{128}$

Unit 10: Fractions (3)

Lesson 1: Multiplying fractions (1)

➜ pages 107–109

1. a) $5 \times \frac{1}{7} = \frac{5}{7}$
b) $5 \times \frac{1}{3} = \frac{5}{3} = 1\frac{2}{3}$
c) $9 \times \frac{1}{4} = \frac{9}{4} = 2\frac{1}{4}$. Mike needs $2\frac{1}{4}$ bananas for 9 cakes.

2. a) $7 \times \frac{1}{8} = \frac{7}{8}$ $\frac{1}{8} \times 7 = \frac{7}{8}$
b) $\frac{1}{10} \times 7 = \frac{7}{10}$ $7 \times \frac{1}{10} = \frac{7}{10}$
c) $\frac{1}{9} \times 4 = \frac{4}{9}$ $4 \times \frac{1}{9} = \frac{4}{9}$

3. a) $\frac{1}{5} \times 2 = \frac{2}{5}$ b) $\frac{1}{7} \times 6 = \frac{6}{7}$

4. a) $5 \times \frac{1}{2} = \frac{5}{2} = 2\frac{1}{2}$
b) $\frac{1}{4} \times 7$ kg $= \frac{7}{4}$ kg $= 1\frac{3}{4}$ kg
c) $\frac{1}{3} \times 5 = 5 \times \frac{1}{3}$
d) $\frac{1}{8} \times 8 = 1$
e) $\frac{1}{5} \times 9 = \frac{9}{5} = 1\frac{4}{5}$
f) $11 \times \frac{1}{3}$ l $= \frac{11}{3}$ l $= 3\frac{2}{3}$ l

5. a) $\frac{1}{5} \times 7 = 1\frac{2}{5}$ b) $\frac{1}{8} \times 9 = 1\frac{1}{8}$

6. a) This is false because 0 multiplied by anything equals zero.
b) This is true because $8 \times \frac{1}{8} = \frac{8}{8} = 1$ whole
c) This is true because $\frac{1}{8} \times 6 = \frac{6}{8} = \frac{3}{4}$

7. a) $\frac{1}{10} \times 6 = \frac{3}{5}$ b) $\frac{1}{6} \times 8 = 1\frac{1}{3}$

Reflect

Answers may vary, for example, $\frac{1}{5} \times 4$ or $4 \times \frac{1}{5}$ or $\frac{1}{10} \times 8$.

Explanations will vary. Children may say they know that 4 lots of $\frac{1}{5}$ is equal to $\frac{4}{5}$. As multiplication is commutative, this means they can write the numbers either way round.

Encourage children to further prove their answers with a pictorial representation.

Lesson 2: Multiplying fractions (2)

➜ pages 110–112

1. $\frac{3}{10} \times 3 = \frac{9}{10}$
There are $\frac{9}{10}$ of a pizza in total.

2. $\frac{3}{8} \times 5 = \frac{15}{8} = 1\frac{7}{8}$
There are $1\frac{7}{8}$ litres of milk in total.

3. a) $\frac{3}{5} \times 4 = \frac{12}{5} = 2\frac{2}{5}$
b) $2 \times \frac{7}{9} = \frac{14}{9} = 1\frac{5}{9}$

4. a) $2\frac{8}{11}$ c) $5\frac{1}{4}$
b) 5 d) $6\frac{3}{5}$

5. a) $6\frac{3}{10}$ b) $5\frac{19}{10}$

6. a) $\frac{3}{7} \times 11 = \frac{33}{7}$ $\frac{3}{7} \times 11 = 4\frac{5}{7}$
b) $\frac{5}{8} \times 5 = \frac{25}{8}$ $\frac{5}{8} \times 5 = 3\frac{1}{8}$
c) $\frac{4}{9} \times 10 = 4\frac{4}{9}$
d) $13 \times \frac{3}{10} = 3\frac{9}{10}$

Reflect

Explanations may vary. The size of the parts (7ths as shown by the denominator 7) stays the same, but there are 5 times more of them. The denominator will stay the same but the numerator will be multiplied by 5.

Lesson 3: Multiplying fractions (3)

➜ pages 113–115

1. $2 \times 3 = 6$
$\frac{3}{4} \times 3 = \frac{9}{4} = 2\frac{1}{4}$
$6 + 2\frac{1}{4} = 8\frac{1}{4}$
The horse eats $8\frac{1}{4}$ carrots over 3 days.

2. $6\frac{7}{8}$

3. Laura runs $17\frac{1}{2}$ km from Monday to Friday.

4. Disagree – although in both equations the whole parts make 12, $\frac{1}{3} \times 4 = \frac{4}{3}$, whilst $\frac{1}{3} \times 3 = 1$. This means that the two equations are not equal.

5. a) $44\frac{2}{5}$ b) 50

6. 32 full glasses of lemonade can be poured.

Reflect

Agree. Children could use pictorial representations to prove they are equal. Children should advise Max to turn the top-heavy fraction $\frac{15}{4}$ into a mixed number $3\frac{3}{4}$ and add this to the 10 to get $13\frac{3}{4}$.

Lesson 4: Multiplying fractions (4)

➜ pages 116–118

1. a) $1\frac{3}{5} = \frac{8}{5}$
$\frac{8}{5} \times 2 = \frac{16}{5} = 3\frac{1}{5}$ kg
b) $\frac{8}{5} \times 3 = \frac{24}{5} = 4\frac{4}{5}$ kg
c) $\frac{8}{5} \times 4 = \frac{32}{5} = 6\frac{2}{5}$ kg

2. $11\frac{1}{4}$ m of sticky tape is needed to seal 5 boxes.

3. a) $1\frac{2}{3} \times 3 = \frac{5}{3} \times 3$
$= \frac{15}{3}$
$= 5$
b) $1\frac{2}{3} \times 5 = \frac{5}{3} \times 5$
$= \frac{25}{3}$
$= 8\frac{1}{3}$

c) $1\frac{2}{3} \times 7 = \frac{5}{3} \times 7$
$= \frac{35}{3}$
$= 11\frac{2}{3}$

d) $10 \times 1\frac{2}{3} = 10 \times \frac{5}{3}$
$= \frac{50}{3}$
$= 16\frac{2}{3}$

4. a) Yes, Louise does meet her target. She rows $13\frac{1}{2}$ km in 5 days.
b) It will take Louise 8 days to cycle more than 12 km.

5. a) Circle: $1\frac{2}{3} \times 10$
b) Circle: $2\frac{2}{7} \times 13$
Explanations will vary, for example, $5 \times 8 = 40$ so $5\frac{1}{5} \times 8$ will be greater than 40; $3 \times 13 = 39$ so $2\frac{2}{7} \times 13$ will be less than 39 so will be less than $5\frac{1}{5} \times 8$.

6. $2\frac{3}{8} \times 15 = 35\frac{5}{8}$ $7\frac{1}{8} \times 5 = 35\frac{5}{8}$

$11\frac{7}{8} \times 3 = 35\frac{5}{8}$

Reflect

$2\frac{4}{5} \times 6 = 16\frac{4}{5}$. Methods may vary. Encourage children to use an efficient method such as multiplying the whole number part and the fractional part separately then recombining the answer.

Lesson 5: Calculating fractions of amounts

➜ pages 119–121

1. $50 \div 10 = 5$
$5 \times 3 = 15$
15 balloons are red.

2. Bar model: whole = 30; each part = 5
There are 25 yellow counters in the box.

3. a) £20
b) 28 kg
c) £440
d) £520

4. Bella's number is 54.
Ebo's number is 27.

5. The string is 32 cm long.
Lexi has not realised that we are not finding $\frac{3}{4}$ of 24, but that $\frac{3}{4}$ of the string is 24 cm. Lexi first needs to divide 24 by 3 to find $\frac{1}{4}$ and then times by 4 to find the whole length of the string.

6. There are 70 pages in the book.

Reflect

$\frac{2}{3}$ of 24 = 16
$\frac{2}{3}$ of a number is 24. The number is 36
Both calculations involve division and then multiplication, however in the first calculation children need to divide by the denominator and then multiply by the numerator. The second calculation involves dividing by the numerator first and then multiplying by the denominator.

Lesson 6: Using fractions as operators

➜ pages 122–124

1. a) $10 \div 5 = 2$
So $\frac{1}{5}$ of 10 = 2
b) $\frac{1}{5} \times 10 = \frac{10}{5} = 2$
c) Answers may vary. Both calculations involve the fraction $\frac{1}{5}$ and the whole number 10. Both calculations give the same answer of 2. So, finding $\frac{1}{5}$ of 10 is the same as finding $\frac{1}{5} \times 10$.

2. Lines drawn to match:
$\frac{1}{3} \times 15$ ➜ $\frac{1}{3}$ of 15
$9 \times \frac{1}{4}$ ➜ $\frac{1}{4}$ of 9
$\frac{4}{5} \times 30$ ➜ $\frac{4}{5}$ of 30
$8 \times \frac{1}{8}$ ➜ $\frac{1}{8}$ of 8

3. a) $\frac{1}{6}$ of $72 = 72 \div 6 = 12$
$\frac{5}{6}$ of $72 = 12 \times 5 = 60$
b) $\frac{5}{6} \times 72 = \frac{360}{6} = 60$
c) Preferences will vary. Make sure children should justify their reasons. Oliva's method keeps the numbers smaller.

4. a) $\frac{7}{3} = 2\frac{1}{3}$ b) $\frac{32}{7} = 4\frac{4}{7}$ hours

5. There is $3\frac{1}{3}$ kg of flour left in the bag.

Reflect

Methods may vary. Encourage children to use the most efficient methods depending on the numbers in the calculation. For $\frac{1}{3}$ of 17, as 17 is not a multiple of 3, children should write this as $\frac{17}{3}$ and then convert into a mixed number = $5\frac{2}{3}$. For $\frac{4}{5} \times 45$, as 45 is a multiple of 5, then it is simpler for children to divide 45 by 5 ($\frac{1}{5}$ of 45 = 9) and then multiply the answer by 4 to give $\frac{4}{5}$ of 45 = 36.

Lesson 7: Problem solving – mixed word problems

➜ pages 125–127

1. 24 ÷ 2 = 12
   12 × 7 = 84
   There are 84 green counters.
2. 54 ÷ 6 = 9
   9 × 7 = 63
   Adam has 63 model cars.
3. a) Tom and Donna shared 96 pencils.
   b) There are 72 red pencils.
4. There are 34 squares in the box.
5. They shared £132.

Reflect

Answers will vary. Encourage children to explain what they found difficult and how they could perhaps make questions easier using bar models.

End of unit check

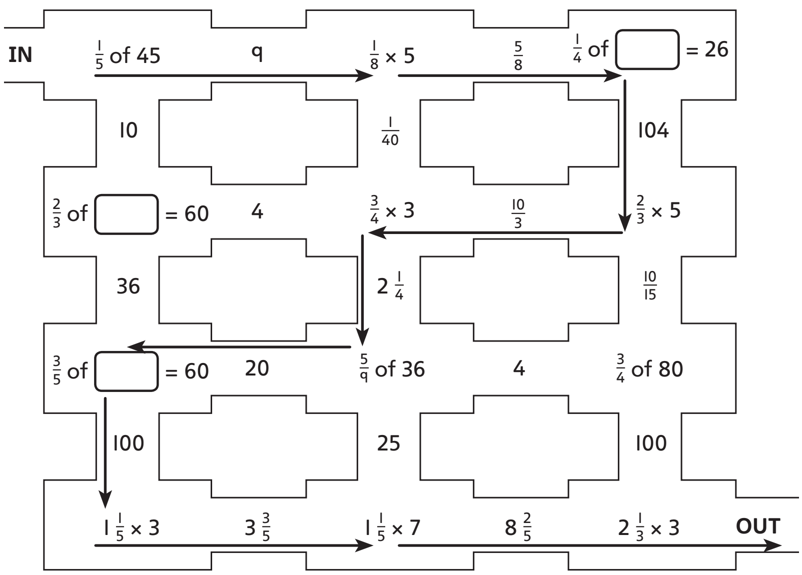
➜ pages 128–129

My journal

Explanations may vary. Encourage children to use more efficient methods of working depending on the numbers in the calculations.

Answers: $\frac{1}{4} \times 60$ kg = 15 kg
$\frac{1}{3}$ of 5 litres = $\frac{5}{3}$ litres = $1\frac{2}{3}$ litres

Power puzzle



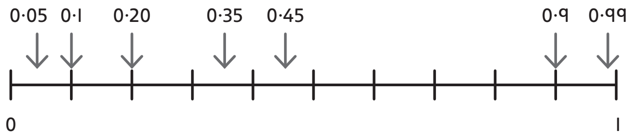
Unit 11: Decimals and percentages

Lesson 1: Writing decimals (1)

→ pages 130–132

1. 0·7 0·75
0·4 0·43
0·6 0·62

2.



3. 0·23 – two 0·1 counters, three 0·01 counters
0·03 – three 0·01 counters
0·30 – three 0·1 counters

4. a) The value of the digit 4 in 0·34 is 4 hundredths.
b) 9 has the value of 9 tenths in the number 0·90
c) The value of the digit 5 in 0·5* is 5 tenths (* can be any digit)
d. You could put any digit, except 5, in the hundredths column and the statement will still be true, so there is more than one correct answer.

5. a) 0·28 b) 0·01

6. a) There are 18 possible answers: 0·10, 0·01, 0·21, 0·12, 0·32, 0·23, 0·43, 0·34, 0·54, 0·45, 0·65, 0·56, 0·76, 0·67, 0·87, 0·78, 0·98, 0·89
b) Two possible answers: 0·09, 0·90
c) There are only 10 digits, the largest digit being 9. So, there is only one pair of digits that have a difference of 9 (0 and 9). However, there are 9 pairs of digits with a difference of 1.

Reflect

Answers will vary. Same – 0·7 and 0·07 both contain one digit (7) but all other digits are 0; both numbers are smaller than 1. Different – the 7 digit has a different value (7 tenths in 0.7 and 7 hundredths in 0·07); 0·7 is greater than 0·1 whereas 0·07 is smaller than 0·1.

Lesson 2: Writing decimals (2)

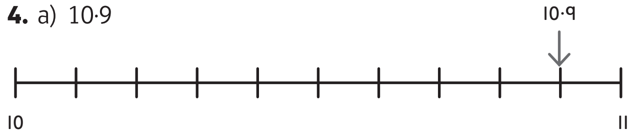
→ pages 133–135

1. Numbers added to number line:
1·3, 1·4, 1·5, 1·6, 1·7, 1·8, 1·9, 2
1·11 … 1·13 … 1·15, 1·16, 1·17, 1·18, 1·19, 1·2
9·8, 9·9, 10, 10·1, 10·2, 10·3, 10·4, 10·5
5·66, 5·67, 5·68, 5·69, 5·7, 5·71, 5·72, 5·73, 5·74

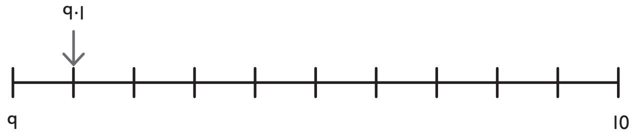
2. a) 1·4 c) 4·01
b) 5·59 d) 5·05

3. a) 1·3, 1·2, 1·1, 1, 0·9, 0·8, 0·7
b) 1·3, 1·31, 1·32, 1·33, 1·34, 1·35
c) 3·02, 3·01, 3, 2·99, 2·98, 2·97, 2·96
d) 5·9, 5·91, 5·92, 5·93, 5·94, 5.·95, 5·96

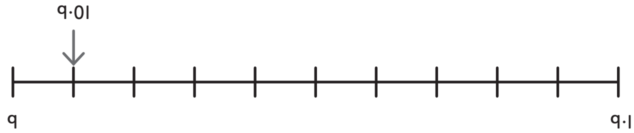
4. a) 10·9



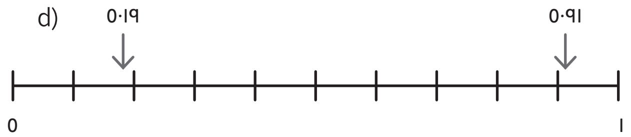
b) 9·1 (or 9·10)



c) 9·01



d)



5. a) 9·95 10·05
b) 99·5 100·5
c) 99·95 100·05
d) 999·5 1,000·5

Reflect

True – the digit 5 is in a different column in each number, which means its value is different. In 5·17 its value is 5 ones; in 7·15 its value is 5 hundredths; in 1·57 its value is 5 tenths.

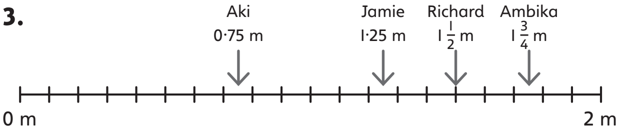
Lesson 3: Decimals as fractions (1)

→ pages 136–138

1. a) A = $\frac{1}{10}$
B = $\frac{3}{10}$
C = $\frac{5}{10}$ or $\frac{1}{2}$
D = $\frac{9}{10}$
b) $\frac{5}{10}$ can be simplified to $\frac{1}{2}$ as they are equivalent.

2. Place value counters drawn on grid:
$\frac{4}{10}$: 4 counters in Tths column
$2\frac{3}{4}$: 2 counters in O column, 7 counters in Tth column, 5 counters in Hth column
$1\frac{4}{10}$: 1 counter in O column, 4 counters in Tth column
$1\frac{1}{4}$: 1 counter in O column, 2 counters in Tth column, 5 counters in Hth column

3.



Methods may vary. Children may say they converted the fractions to decimals first. Then they counted that there were 20 intervals between 0 m and 2 m so this meant that each interval was 0·1 m, and each half interval was 0·05 m.

4. a) 0·25 b) 0·5 c) 0·75 d) 1·0 e) 1·5 f) 2·0 g) $\frac{3}{10}$ h) 1·5 i) $3\frac{1}{5}$ (or $3\frac{2}{10}$) j) $3\frac{2}{5}$ (or $3\frac{4}{10}$) k) 1 l) $\frac{6}{3}$

5. Encourage children to use pictorial representations to see that $\frac{1}{5}$ is not the same as $\frac{1}{2}$ and therefore not 0·5.

Reflect

Diagrams may vary, for example children might draw a fraction wall to include tenths or a 0-1 number line divided into tenths. Ensure the correct representation of each fraction is shaded.

$\frac{1}{4}$ = 0·25 $\frac{1}{2}$ = 0·5 $\frac{3}{4}$ = 0·75 $\frac{1}{10}$ = 0·1

Lesson 4: Decimals as fractions (2)

→ pages 139–141

1. a) 0·09 = $\frac{9}{100}$ b) 0·23 = $\frac{23}{100}$ c) 0·35 = $\frac{35}{100}$ (or $\frac{7}{10}$) d) 0·03 = $\frac{3}{100}$ e) 0·7 = $\frac{7}{10}$ f) 0·9 = $\frac{9}{10}$

2. Place value counters drawn on grid:
a) $\frac{21}{100}$: no counters in O column, 2 counters in Tth column, 1 counter in Hth column
b) $\frac{21}{10}$: 2 counters in O column, 1 counter in Tth column, no counters in Hth column
c) $\frac{201}{100}$: 2 counters in O column, no counters in Tth column, 1 counter in Hth column

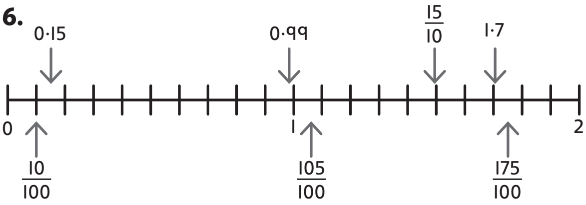
3. a) Numbers ticked: $\frac{11}{100}$ and 0·15
b) Numbers ticked: 2·80, 2·71 and $2\frac{87}{100}$

4. Answers will vary – any fraction, decimal or mixed number between 5·5 and 5·75.
Decimal = 5·6 Fraction = $\frac{45}{8}$ Mixed number = $5\frac{5}{8}$

5.

Decimal number	Mixed number	Improper fraction
1·61	$1\frac{61}{100}$	$\frac{161}{100}$
1·6	$1\frac{6}{10}$	$\frac{16}{10}$
2·26	$2\frac{26}{100}$	$\frac{226}{100}$
2·06	$2\frac{6}{100}$	$\frac{206}{100}$
4·6	$4\frac{60}{100}$	$\frac{460}{100} = \frac{46}{10}$

6.



Reflect

Reena is incorrect as $\frac{35}{10}$ = 3·5. Instead, 3·05 = $\frac{305}{100}$. Encourage children to explain with the use of pictorial representations such as place value counters.

Lesson 5: Understanding thousandths

→ pages 142–144

1. a) 0·004 = $\frac{4}{1,000}$
b) 0·024 = $\frac{24}{1,000}$

2. a) 5 squares shaded
$\frac{50}{1,000} = \frac{5}{100}$ = 0·05
b) 90 squares shaded
$\frac{900}{1,000} = \frac{90}{100} = \frac{9}{10}$ = 0·9

3.

Decimal	0·002	0·02	0·251	0·25	0·2
Fraction	$\frac{2}{1,000}$	$\frac{20}{1,000}$	$\frac{251}{1,000}$	$\frac{250}{1,000}$	$\frac{200}{1,000}$

Decimal	1	1·001	1·251	1·25	0·000
Fraction	$\frac{1,000}{1,000}$	$\frac{1,001}{1,000}$	$\frac{1,251}{1,000}$	$1\frac{250}{1,000}$	$\frac{0}{1,000}$

4. a) 0·2 = 0·20 = 0·200 $\frac{2}{10} = \frac{20}{100} = \frac{200}{1,000}$ (= $\frac{1}{5}$)
b) 0·07 = 0·070 $\frac{7}{100} = \frac{70}{1,000}$
c) 0·35 = 0·350 $\frac{35}{100} = \frac{350}{1,000}$ (= $\frac{7}{20}$)

5. a) Answers will vary. Parts should total 0·01 (= $\frac{10}{1,000}$).
For example, $\frac{1}{1,000}$ and $\frac{2}{1,000}$ and $\frac{7}{1,000}$ or $\frac{5}{1,000}$ and $\frac{3}{1,000}$ and $\frac{2}{1,000}$.
b) Answers will vary. Parts should total $\frac{1,600}{1,000}$ (= 1·6).
For example 1 and $\frac{600}{1,000}$ or 1 and $\frac{6}{10}$ or $\frac{800}{1,000}$ and $\frac{800}{1,000}$ or $\frac{95}{100}$and $\frac{65}{100}$.

Reflect

$\frac{3}{100}$ and $\frac{30}{1,000}$ are both equivalent to 0·03.
Explanations may vary. Children may say they can check by using division as 3 ÷ 100 = 0·03 and 30 ÷ 1000 = 0·03.

Lesson 6: Writing thousandths as decimals

→ pages 145–147

1. a) 0·225 b) 2·205 c) 1·166

2. a) No counters in O column, 4 counters in Tth column, 2 counters in Hth column, 5 counters in Thths column
b) No counters in O column, 4 counters in Tth column, no counters in Hth column, 5 counters in Thths column

3. 1·12

4. a) 3·91 3·95 3·98
b) 3·989 3·997 4·002

5. The mistake is that they think each interval represents 1 thousandth when in fact they represent 1 hundredth. The numbers should be labelled 0·11 and 0·19.

6. a) There are three possible solutions: 0·231, 0·462 and 0·693
b) There are four possible solutions: 8·003, 8·513, 9·004 and 9·514

Reflect

Answers may vary. Encourage children to show a pictorial representation as well as a fractional representation. The number has 1 one, 2 tenths, 0 hundredths and 5 thousandths.

Lesson 7: Ordering and comparing decimals (I)

→ pages 148–150

1. a) 0·7 is greater than 0·5
b) 1·7 is less than 2·5
c) 0·85 is greater than 0·75
d) 0·42 is greater than 0·05

2. Answers may vary – between 15 and 25 squares in middle grid.
0·25 is greater than (shaded number between 0·15 and 0·25) which is greater than 0·15.

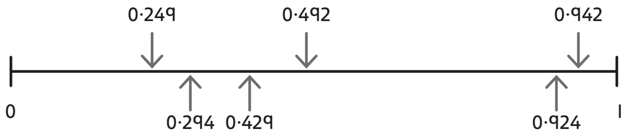
3.

Order (Ist is least fierce, 5th is most fierce)	Dinosaur
Ist	Brachiosaurus
2nd	Stegosaurus
3rd	Triceratops
4th	Spinosaurus
5th	T-Rex

4. 0·255 > $\frac{251}{1,000}$
0·089 < 1·001
$\frac{980}{1,000}$ > $\frac{97}{100}$

5. a) 6·701, 1·760, 1·607, 0·176
b) $\frac{15}{100}$, $\frac{126}{1,000}$, $\frac{1}{10}$
Explanations may vary. Encourage children to convert fractions to decimals and then to compare the decimal numbers.

6. 0·249, 0·294, 0·429, 0·492, 0·924, 0·942



Reflect

Methods may vary. First, compare digits in the column of largest value. In this case they are all zero, so then compare the next highest value column. If the digits in this column are the same, then compare digits in the next column and so on.

So in ascending order: 0·453, 0·456, 0·998.

Lesson 8: Ordering and comparing decimals (2)

→ pages 151–153

1. a) Least 2·21 < 2·25 < 2·3 < 3·1 Greatest
b) Greatest 1·42 > 0·43 > 0·4 > 0·33 > 0·322 Least

2. Lee has not compared digits in corresponding columns accurately. The digit 1 in 1·627 represents 1 one, whereas the digit 1 in 15·6 is 1 ten. This means that 15·6 is greater than 1·627 even though 1·627 has more digits.

3. a) 0·5 < 0·51 e) $\frac{11}{1,000}$ < 0·11
b) 0·51 < 0·6 f) $\frac{101}{100}$ > 0·101
c) 1·6 > 0·511 g) 0·11 = $\frac{110}{1,000}$
d) 1·056 > 1·05 h) $\frac{1,001}{1,000}$ < 1·01

4. Place value counters drawn:
Three 0·1 counters and some 0.·01 and/or 0·001 counters (with total value less than 0·1)
One 0·1 counter, one 0·01 counter and from two to nine 0·001 counters

5. a) Numbers circled: 2 $\frac{51}{100}$ 2 $\frac{52}{100}$ 2·501
b) Answers will vary, numbers must be between 2·5 and 2·52, for example 2·51 and $\frac{2,507}{1,000}$.

6. There are many possible answers, for example
Less than 2·12: 0·005, 0·014, 1·111, 2·102, 2·003
Greater than 2·12: 2·201, 2·21, 3·002, 3·101, 4·01
To find all possibilities, encourage children to list answers in a methodical way such as in a particular order.

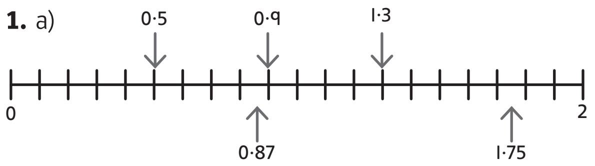
Reflect

Children should disagree. Explanations may vary, for example both numbers have 3 ones and 3 tenths, however, 3·309 has no hundredths, whereas 3·31 has 1 hundredth. So, this means that 3·31 is greater than 3·309.

Lesson 9: Rounding decimals

➜ pages 154–156

1. a)



b. 0·9 rounds to [1] to the nearest whole number.
1·3 rounds to [1] to the nearest whole number.
0·87 rounds to [1] to the nearest whole number.
0·5 rounds to [1] to the nearest whole number.
1·75 rounds to [2] to the nearest whole number.

2. 3·9 cm rounds to 4 cm.
5·2 cm rounds to 5 cm.
3·5 cm rounds to 4 cm.
4·4 cm rounds to 4 cm.

3. a) 5·23 rounds to 5·2 to the nearest tenth.
b) Explanations will vary. First, identify the tenths the number is between. Then look at the hundredths digit, if it is less than 5 then the number rounds down to the smaller tenth. If it is 5 or more then it rounds up to the next tenth.

4.

Number	Rounded to nearest whole number	Rounded to the nearest tenth
1·19	1	1·2
10·19	10	10·2
0·75	1	0·8
100·75	101	100·8
100·03	100	100
100·037	100	100

5. When rounding to the nearest tenth, it means the nearest multiple of tenths – therefore there would not be a digit in the hundredths column after rounding, so the answer should be 2·8.

6. a) The number is in the range 8·45 to 8·5 (including 8·45 but not including 8·5).
b) 0·529 rounded to the 1 decimal place is 0·5
0·592 rounded to the 1 decimal place is 0·6
2·950 rounded to the 1 tenth place is 3·0

Reflect

2·91 to the nearest tenth is 2·9 and to the nearest whole number is 3.

Methods may vary – encourage children to show rounding on a number line as well as using what they know about the digits to help them decide whether to round up or down.

Lesson 10: Understanding percentages

➜ pages 157–159

1. a) 33 out of 100 are shaded. That is 33%.
b) 24 out of 100 are shaded. That is 24%.

2. a) 4 squares shaded
b) 96 squares shaded
c) 24 squares shaded

3. Diagrams circled: Bead string Circles divided into tenths

4. Children should not agree with Olivia as some children may wear wellies and a scarf. 112% is more than all the children! The only certain facts are that 61% of children wear wellies and 51% wear scarves.

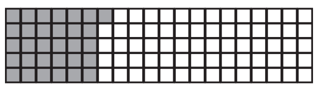
5. a) 3 squares shaded.
70% is not shaded.
b) $2\frac{1}{2}$ squares shaded in one colour and $2\frac{1}{2}$ squares shaded in another colour.
50% is not shaded. 50% is shaded.
c) Check 11 mm is one colour, 22 mm is a second colour and 33 mm is a third colour.
34% is not shaded
d) 5 × 20% = 100%

Reflect

Answers may vary. Encourage children to explain using a pictorial representation, for instance, shading 42 squares out of 100. Children should recognise that 42% is between $\frac{1}{4}$ and $\frac{1}{2}$ and is closer to $\frac{1}{2}$.

Lesson 11: Percentages as fractions and decimals

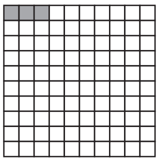
➜ pages 160–162

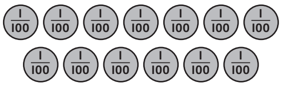
1. 0·31 ➜  ➜ 31%

$\frac{33}{100}$ ➜

O	•	Tth	Hth
0	•	3	3

➜ 33%

3% ➜  ➜ 0·03

13% ➜  ➜ 0·13

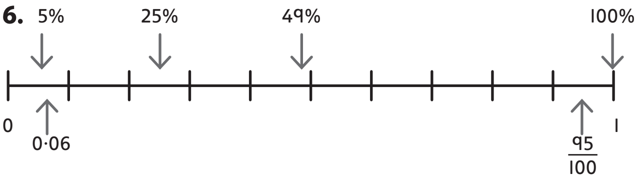
2. $\frac{32}{100}$ as a decimal is 0·32
$\frac{32}{100}$ as a percentage is 32%
$\frac{32}{100}$ as a decimal is **32%**

3.

Fraction	Decimal	Percentage
$\frac{48}{100}$	0·48	48%
$\frac{99}{100}$	0·99	99%
$\frac{1}{100}$	0·01	1%

4. a) $\frac{53}{100}$ = 0·53 = 53%
b) 0·35 = $\frac{35}{100}$ = 35%
c) 92% = $\frac{92}{100}$ = 0·92
d) 0·78 = $\frac{78}{100}$ = 78%

5. 8%, 0·18, 0·8, $\frac{81}{100}$, 88%, 1

6. 

7. The first number line is the longest.
The last number line is the shortest.
Explanations will vary. For example, each interval on the first number line is worth 1% so it will take 100 intervals to make 1. Each interval on the second and third number lines represent 10% so it will take 10 intervals to make 1. The interval length on the third number line is slightly shorter than that of the second number line so the third number line will be shorter.

Reflect

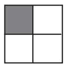
Explanations will vary – 'Per cent' means 'out of 100' so 4% = $\frac{4}{100}$ and 14% = $\frac{14}{100}$. To then work out the decimal equivalents, 4 ÷ 100 = 0·04 and 14 ÷ 100 = 0·14.

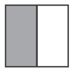
Lesson 12: Equivalent fractions, decimals and percentages

➜ pages 163–165

1. a) 40 squares shaded
40% = $\frac{40}{100}$
b) 25 squares shaded
$\frac{25}{100}$ = 25% = 0·25
c) 7 squares shaded
0·07 = 7%
d) 5 strips shaded
$\frac{5}{10}$ = 50%
e) 90 squares shaded
0·9 = 90% = $\frac{9}{10}$ = $\frac{90}{100}$

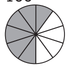
2. Pairs matched:

 ➜ 25%

50% ➜ 

1 ➜ $\frac{10}{10}$

0% ➜ $\frac{0}{100}$

60% ➜ 

$\frac{2}{10}$ ➜ 0·2

3.

Fraction	Decimal	Percentage
$\frac{4}{5}$ (or $\frac{8}{10}$)	0·8	80%
$\frac{1}{10}$ (or $\frac{10}{100}$)	0·1	10%
$\frac{1}{2}$ (or $\frac{5}{10}$)	0·5	50%
$\frac{3}{4}$	0·75	75%
$\frac{90}{100}$	0·9	90%

4. Yes – Luis achieved his target as 7 out of 14 would be 50%, he scored 7 out of 13 which means it is more than 50%.

5. a) 50% b) 80% c) 10%

6. a)

×	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

b) 25% are odd. 75% are even.
c) Explanations will vary. For example
Even × even = even Even × odd = even
Odd × even = even Odd × odd = odd
So, only 1 multiplication in every 4 will have an odd product, which means $\frac{1}{4}$ or 25% of the products will be odd. The rest, which is $\frac{3}{4}$ or 75% are even.

Reflect

Andy is incorrect. Explanations will vary, for example 0·8 = $\frac{8}{10}$ = $\frac{80}{100}$, so is the same as 80%.

End of unit check

→ pages 166–168

My journal

1. Children should not agree with Aki as $\frac{1}{20} = \frac{5}{100}$ = 5%. Aki does not realise that the bigger the denominator, the smaller the part size and therefore the smaller the number (when the numerators are the same). 20% is actually $\frac{20}{100} = \frac{1}{5}$.

2. a) Richard scored 40 points on his test.
b) Children can write Richard's score as a fraction: $\frac{40}{50} = \frac{4}{5}$.
c) Ebo has given the decimal of 0·08, which is 8%. 80% is $\frac{80}{100}$, which is 0·8.

Power play

Look for children who look to the grid below to plan their next move. Listen to the explanations of their strategies, and note down any children who may need further support. Children should be encouraged to go deeper with this Power play by creating their own similar puzzle

Unit 12: Decimals

Lesson 1: Adding and subtracting decimals (1)

→ pages 6–8

1. a) 0·9 b) 0·9 c) 0·7 d) 1·0

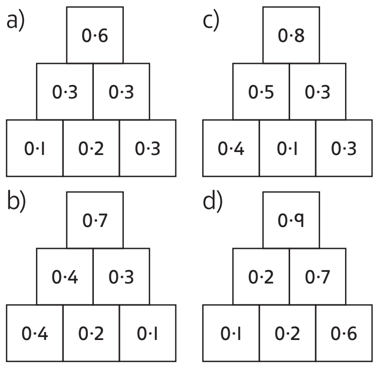
2. a) 0·9 – 0·5 = 0·4
b) 0·9 – 0·2 = 0·7

3. 0·8 = 0·1 + 0·7
Check parts on other models total 0·8.

4. a) 0·8 b) 0·8 c) 0·3 d) 0·4 e) 0·6 f) 0·5 g) 0·9 h) 0·6 i) 1 (or 1·0) j) 0

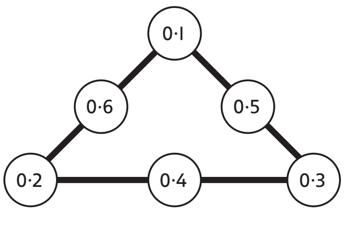
5. a) 1 (or 1·0) b) 0·4 c) 0·9 d) 0·8 e) 0·5 f) 0·8

6.



7. Answers will vary for pairs of ▲ and ◆; for example:
▲ = 0·4 ◆ = 0·1
▲ = 0·5 ◆ = 0·2
▲ = 0·6 ◆ = 0·3
▲ = 0·7 ◆ = 0·4
▲ = 0·8 ◆ = 0·5
▲ = 0·9 ◆ = 0·6
▲ = 0·46 ◆ = 0·16
▲ = 0·55 ◆ = 0·25

8. Arrangements will vary; for example:



Reflect

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

O	•	Tth
0	•	4
1	•	0

0·4 + 1 = 1·4

Lesson 2: Adding and subtracting decimals (2)

→ pages 9–11

1. a) 0·36 l + 0·22 l = 0·58 l

	O	·	Tth	Hth
	0	·	3	6
+	0	·	2	2
	0	·	5	8

b) 0·25 l + 0·47 l = 0·72 l

	O	·	Tth	Hth
	0	·	2	5
+	0	·	4	7
	0	·	7	2
			1	

c) 0·55 + 0·31 = 0·86

	O	·	Tth	Hth
	0	·	5	5
+	0	·	3	1
	0	·	8	6

d) 0·38 + 0·38 = 0·76

	O	·	Tth	Hth
	0	·	3	8
+	0	·	3	8
	0	·	7	6
			1	

2. Kate has put the 5 from 0·05 in the wrong column (tenths instead of hundredths). The correct answer is:

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

3. 0·65 – 0·34 km = 0·31 km

	O	·	Tth	Hth
	0	·	6	5
–	0	·	3	4
	0	·	3	1

4. a) 0·92 – 0·58 = 0·34

	O	·	Tth	Hth
	0	·	8 ~~9~~	1 2
–	0	·	5	8
	0	·	3	4

b) 0·49 – 0·19 = 0·30

	O	·	Tth	Hth
	0	·	4	9
–	0	·	1	9
	0	·	3	0

c) 0·71 – 0·24 = 0·47

	O	·	Tth	Hth
	0	·	${}^{6}\not{7}$	${}^{1}1$
–	0	·	2	4
	0	·	4	7

d) 0·60 – 0·45 = 0·15

	O	·	Tth	Hth
	0	·	${}^{5}\not{6}$	${}^{1}0$
–	0	·	4	5
	0	·	1	6

5. a) 0·32 b) 1·02 c) 0·19

6. 0·15 + 0·57 = 0·72 or 0·72 – 0·15 = 0·57

7. a) Calculations will vary but total should be 0·99; for example:

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

b) For decimals with 2 dp:

	O	·	Tth	Hth
	0	·	9	8
–	0	·	1	2
	0	·	8	6

Alternatively, accept 3 dp:

	O	·	Tth	Hth	Thth
	0	·	9	8	7
–	0	·	1		
	0	·	8	8	7

Reflect

If Alex works out 37 + 59 = 96, then she can use this to work out the answer to 0·37 + 0·59 as follows:

0·37 + 0·59 = 37 hundredths + 59 hundredths = 96 hundredths = 0·96

Lesson 3: Adding and subtracting decimals (3)

➜ pages 12–14

1. a) 0·8 + 0·2 = 1
b) 0·69 + 0·31 = 1

2. Pieces matched:
0·88 m ➜ 0·12 m
0·766 m ➜ 0·234 m
0·9 m ➜ 0·1 m

3. 0·84 + 0·26 = 1·1, not 1. Lexi's mistake is that she forgot about the exchange from the hundredths to the tenths. To make 1, Lexi must add 0·74, so 7 tenths counters and 4 hundredths counters.

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

5. a) 0·3 + 0·7 = 1
b) 0·71 + 0·29 = 1
c) 0·95 + 0·05 = 1
d) 0·90 + 0·1 = 1
e) 0·213 + 0·787 = 0·912
f) 0·912 + 0·088 = 1
g) 1 – 0·24 = 0·76
h) 1 – 0·93 = 0·07
i) 1 – 0·235 = 0·765

6. a) 0·4 + 0·6 = 1
0·04 + 0·96 = 1
0·004 + 0·996 = 1
b) 0·4 + 0·6 = 1
0·40 + 0·6 = 1
0·400 + 0·6 = 1

7. a) Answers will vary; for example:

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

b) Answers will vary; for example:

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

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

Same: The digits in the tenths and hundredths column total 9 and the digits in the thousandths column total 10.
Different: Digits in calculation vary and their positions vary between calculations.

Reflect

Yes, 0·207 + 0·793 does equal 1.

Explanations may vary; for example:
3 thousandths + 7 thousandths = 10 thousands which is the same as 1 hundredth. Adding this to the 9 hundredths gives 10 hundredths, which is the same as 1 tenth. Adding this to the 2 tenths and the 7 tenths gives 10 tenths, which equals 1.

Lesson 4: Adding and subtracting decimals (4)

➜ pages 15–17

1 a) 0·37 + 0·82 = 1·19

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

b) 0·675 + 0·721 = 1·396

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

c) 0·56 + 0·78 = 1·34

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

d) 0·7 + 0·7 = 1·4

	O	·	Tth
	0	·	7
+	0	·	7
	1	·	4
	1		

e) 0·82 + 0·78 = 1·6

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

2. Calculations matched to answers:
0·23 + 0·84 ➜ 1·07
0·76 + 0·52 ➜ 1·28
1 + 0·17 ➜ 1·17
0·74 + 0·63 ➜ 1·37
0·54 + 0·85 ➜ 1·39

3. The ruler and eraser cost £1·54 altogether.

4. Yes, he ran 1·25 km on Thursday compared to 1·026 km on Monday to Wednesday.

5. a)

	O	·	Tth	Hth
	0	·	4	3
+	0	·	6	7
	1	·	1	0
	1		1	

b)

	O	·	Tth	Hth
	0	·	7	8
+	0	·	5	9
	1	·	3	7
	1		1	

c)

	O	·	Tth	Hth	Thth
	0	·	7	3	2
+	0	·	7	8	1
	1	·	5	1	3
	1		1		

6. a) 0·51 + 0·63 < 0·51 + 0·73
b) 0·7 + 0·4 = 0·71 + 0·39

Reflect

0·5 + 0·6 = 5 tenths + 6 tenths = 11 tenths

Jamie needs to exchange 10 tenths for one whole to make 1·1. So, the correct answer is:

0·5 + 0·6 = 1·1

Lesson 5: Adding and subtracting decimals (5)

➜ pages 18–20

1. a)

	T	O	·	Tth	Hth
		6	·	5	0
+		4	·	3	1
	1	0	·	8	1
	1				

The total cost is £10·81.

b)

	O	·	Tth	Hth
	5	·	7	6
+	3	·	7	9
	9	·	5	5
	1		1	

The total cost is £9·55.

2. a) 2·3 + 4·6 = 6·9

	O	·	Tth
	2	·	3
+	4	·	6
	6	·	9

b) 3·5 + 5·8 = 9·3

	O	·	Tth
	3	·	5
+	5	·	8
	9	·	3
	1		

c) 1·98 + 0·77 = 2·75

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

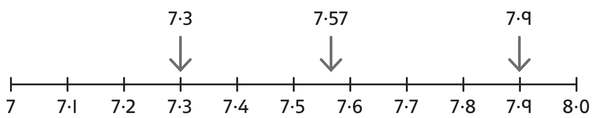
3. a) 0·502 + 4·165 > 3·258 + 0·875
b) 8·62 + 6·18 > 2·63 + 1·71 + 3·26

4. Zac has not aligned the decimal points, so the digits of 11·2 are in the wrong columns for their value.

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

The correct answer is £14·89.

5. 4·5 + 2·8 = 7·3 2·75 + 4·82 = 7·57 1·823 + 6·077 = 7·9



6.

	Theatre	Cinema	Zoo	Circus
Cost for 1 adult and 2 children	£49	£26·33	£44·90	£34·20

They can afford to do any of the activities.

Reflect

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

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

Lesson 6: Adding and subtracting decimals (6)

→ pages 21–23

1. a)

	O	·	Tth	Hth
	2	·	$^{4}\cancel{5}$	$^{1}4$
–	1	·	0	5
	1	·	4	9

The loaf of bread costs £1·49.

b) Danny gets £0·16 change.

2. a) 5·4 – 3·2 = 2·2

	O	·	Tth
	5	·	4
–	3	·	2
	2	·	2

b) 7·26 – 4·83 = 2·43

	O	·	Tth	Hth
	$^{6}\cancel{7}$	·	$^{1}2$	6
–	4	·	8	3
	2	·	4	3

c) 2·661 – 0·625 = 2·036

	O	·	Tth	Hth	Thth
	2	·	6	$^{5}\cancel{6}$	$^{1}1$
–	0	·	6	2	5
	2	·	0	3	6

3. a) 7·07 b) 8·6

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

	O	·	Tth	Hth
	$^{5}\cancel{6}$	·	$^{11}\cancel{2}$	$^{1}0$
–	0	·	5	9
	5	·	6	1

5. Holly has 5·8 km left to walk.

6. a) 2·28 b) 4·98

7. The different between A and C is 57·07 greater than between B and C.

Reflect

Answers will vary; for example:

Same: Both calculations involve subtracting from 5·8; both answers will be decimals with 1 decimal place; both answers are smaller than 3 …
Different: If completed using columnar method, a) will not involve exchange but b) will.

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

Lesson 7: Adding and subtracting decimals (7)

→ pages 24–26

1. Bella's plane flew 1·61 m further than Ebo's plane.

	O	·	Tth	Hth
	$^{1}\cancel{2}$	·	$^{1}3$	1
–	0	·	7	0
	1	·	6	1

2. a) 3·62 + 4·8 = 8·42

	O	·	Tth	Hth
	3	·	6	2
+	4	·	8	0
	8	·	4	2
	1			

b) 1·96 – 1·258 = 0·702

	O	·	Tth	Hth	Thth
	1	·	9	$^{5}\cancel{6}$	$^{1}0$
–	1	·	2	5	8
	0	·	7	0	2

3. a) 38·34 b) 11·372

4. a) 5·03 b) 114·75

5. Zac has incorrectly written the 7 in 3·7 into the hundredths column rather than the tenths column. The correct answer is 53·49 – 3·7 = 49·79.

	T	O	·	Tth	Hth
	$^{4}\cancel{5}$	$^{12}\cancel{3}$	·	$^{1}4$	9
–		3	·	7	0
	4	9	·	7	9

6. Danny's statement is always true; for example:
5·8 – 3·71 = 2·09
7·6 – 4·82 = 2·78
2·3 – 0·51 = 1·79

7. 16·1 – 4·125 = 11·975
The difference between A and B is 11·975.

8. 19·7 + 18·15 = 37·85
19·7 + 21·25 = 40·95
Sum = 37·85 or 40·95

Reflect

Answers will vary but should include:

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

Lesson 8: Adding and subtracting decimals (8)

➜ pages 27–29

1. a) 7·37
b) Answers will vary; for example:
Ebo could use a mental method, number line or column addition.

2. 12 + 2·72 = 14·72
3 + 11·72 = 14·72
5 + 5 + 4·72 = 14·72
5 + 9·72 = 14·72
0·72 + 14 = 14·72
14·7 + 0·02 = 14·72

3. a) 7 – 3·8 = 3·2

	O	·	Tth
	6 ~~7~~	·	1 0
–	3	·	8
	3	·	2

b) 12 – 4·35 = 7·65

	T	O	·	Tth	Hth
	1	1 ~~2~~	·	9 1 ~~0~~	1 0
–		4	·	3	5
		7	·	6	5

4. a) 8 – 2·807 =
7·999 – 2·806 = 5·193
b) 12 – 4·91 =
11·99 – 4·90 = 7·09
c) 16 – 1·8 =
15·99 – 1·79 = 14·20

5. a) The total cost is £16·92.
b) There is 281·3 ml of sun cream left.

6. a) 3·45 d) 14·4
b) 25·725 e) 450·85
c) 10·67 f) 475·513

7. There is 9,250 ml more milk than lemonade.

8. a) 0·08 b) 9·52

Reflect

Number lines drawn may vary, but children should show that the difference between 2·4 and 7 is the same as the difference between 2·3 and 6·9.

Lesson 9: Decimal sequences

➜ pages 30–32

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, 13·9, 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, 0·80, 0·81, 0·82, 0·83
b) 5·615, 5·620, 5·625, 5·630, 5·635, 5·640, 5·645, 5·650

3. Kate is counting up 0·3 or 3 tenths each time. When she gets to 12 tenths, she has incorrectly said that this is 0·12.
12 tenths = 1 whole and 2 tenths = 1·2
The sequence should be: 0, 0·3, 0·6, 0·9, 1·2, 1·5.

4. a) 10·9; True c) 0; False
b) 39·69; False d) 0·88; True

5. a) 12·49, 12·51, 12·53
b) 18·01

6. a) 0·21, 0·42, 0·63, 0·84, 1·05, 1·26, 1·47
Rule: add 0·21
b) 11·3, 11·7, 12·1, 12·5, 12·9, 13·3, 13·7
Rule: add 0·4
c) 7·68, 7·61, 7·54, 7·47, 7·40, 7·33, 7·26
Rule: subtract 0·07

7.

Round	1	2	3	4	5	6
Distance travelled in round (km)	0·8	1·6	2·4	3·2	4·0	4·8
Total distance travelled so far (km)	0·8	2·4	4·8	8	12	16·8

Reflect

Answers will vary depending on sequence chosen; for example:

0, 0·6, 1·2, 1·8, 2·4, 3·0, 3·6
Rule: add on 0·6 each time

4·9, 4·2, 3·5, 2·8, 2·1, 1·4, 0·7, 0
Rule: subtract 0·7 each time

Lesson 10: Problem solving – decimals

➜ pages 33–35

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 2·55 g.

4. 0·21 and 0·99 circled.

5. 98·889

6. £7·70

Reflect

Answers will vary; for example:

Lucy the dog has a mass of 54·47 kg and Deano the dog has a mass of 44·305 kg. What is their total mass? (98·775 kg)

Lesson 11: Problem solving – decimals (2)

→ pages 36–38

1. The total cost of the three items is £18·04.

2. £12·48

3. 14·98 litres

4. 3·578 + 8·655 – 2·233 = 10

5. 3·4 m

6. 0·02

7. Richard has: £100 – £1·20 = £98·80
Kate has: £98·80 – £36·98 = £61·82
She had: £61·82 + £24·78 (stationery) = £86·60
£98·80 – £86·60 = £12·20
So, Richard has saved £12·20 more than her.

Reflect

Answers will vary; for example:

Holly is baking. She has a 5 kg bag of flour. She uses 1·1 kg of flour making cup cakes and then 690 g of flour making pancakes. How much flour has she left?

Lesson 12: Multiplying decimals by 10 decimals (1)

→ pages 39–41

1. a) 24 b) 1·3

2. a) 13 (place value grid shows 13)
b) 13·5 (place value grid shows 13·5)
c) 135 (place value grid shows 135)
d) 1·35 (place value grid shows 1·35)

3. Olivia has added a 0 at the end; however, putting a 0 into the hundredths column does not change the value of the number so does not multiply it by 10. The correct answer is obtained by moving the digits one column to the left to get 148.

4. Lines drawn to match calculations to answers:
0·003 × 10 ➜ 0·03
3·53 × 10 ➜ 35·3
0·03 × 10 ➜ 0·3
10 × 0·353 ➜ 3·53
0·3 × 10 ➜ 3
10 × 3·003 ➜30·03
0·0353 × 10 ➜ 0·353

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) 125 × 10 = 1,250 so Luis is not correct. He needs to use the inverse operation to find the missing number. The inverse of multiplication is division, so the missing number is 12·5 ÷ 10 = 1·25. (1·25 × 10 = 12·5)
b) 1·5 × 10 = 15
2·5 × 10 = 25
0·92 × 10 = 9·2
10 × 1·52 = 15·2
0·173 × 10 = 1·73
1·73 × 10 = 17·3

7. Mo has travelled 3 m further than Lexi.

Reflect

Explanations will vary; for example:

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

1·1 × 10 = 11

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

→ pages 42–44

1. a) 79
790
7,900

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

b) 21·9
219
2,190

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

c) 84

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

d) 700

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

e) 5

Th	H	T	O	•	Tth	Hth
				•	0	5
			5	•		

f) 1,700

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

2. a) 40
4
0·4
40

b) 170
1,700
170

c) 9·12
0·912
0·00912
0·0912

d) 100
100
10
1,000

3. a) 335 litres b) 20 m

4.

Number	0·1207	0·0036	0·38	0·07691	0·012
× 1,000	120·7	3·6	380	76·91	12
× 100	12·07	0·36	38	7·691	1·2

5. a) In any order:
6·8 × 10 = 68
0·68 × 100 = 68
0·068 × 1,000 = 68

b) Answers will vary; for example:
6·8 × 10 = 0·68 × 100
0·68 × 10 = 0·068 × 100
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.

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

Lesson 14: Dividing decimals by 10

→ pages 45–47

1. 0·12

2. a) 0·45 c) 4·5
b) 0·045 d) 0·452

3. 0·231 in each section of bar model.
2·31 ÷ 10 = 0·231

4. The mass of one apple is 0·28 kg.

5. a) 60·3 d) 10 g) 0·35
b) 16·03 e) 0·8 h) 87·19
c) 1·631 f) 0·3978 i) 389·5

6. Max has correctly divided 35 by 10 to get the answer of 3·5, but since this is money, he needs to put the answer to 2 decimal places by writing 0 in the hundredths column, i.e. £3·50.

7. a) 100 ml of lemonade costs £0·18.
b) 200 g of cocoa costs £2·40.
Explanations may vary; for example:
1 kg = 1,000 g
So, 100 g of cocoa costs:
£12 ÷ 10 = £1·20
Therefore, 200 g of cocoa costs:
2 × £1·20 = £2·40

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

Reflect

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

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

→ pages 48–50

1. a) 0·23

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

b) 0·145

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

c) 0·052

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

d) 0·013

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

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

3. a) True
b) True
c) False, 53 ÷ 100 = 0·53
d) True
e) False, 8·7 ÷ 100 = 0·087
f) False, 9·1 ÷ 1,000 = 0·0091

4. Calculations matched:
0·8 ÷ 100 ➜ 8 ÷ 1,000
0·18 ÷ 100 ➜ 1·8 ÷ 1,000
10·8 ÷ 100 ➜ 108 ÷ 1,000
0·108 ÷ 10 ➜ 1·08 ÷ 100

5. a) 10
100
1,000

b) 1·2
12
120

6. Jamie saved £1·06 more each day.

7. ■ = 0·98
▲= 0·00098
★ = 0·00061
● = 0·0061

Reflect

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

0·351 ÷ 10 = 0·0351
3·51 ÷ 100 = 0·0351
35·1 ÷ 1,000 = 0·0351

All three of these calculations are equal.

End of unit check

➜ pages 51–53

My journal

1. a)

	T	O	·	Tth	Hth
	1̸	¹1	·	9	9
–		4	·	3	4
		7	·	6	5

	T	O	·	Tth	Hth
	1	¹¹2̸	·	⁹¹0̸	¹0
–		4	·	3	5
		7	·	6	5

It is easier to do the calculation 11·99 – 4·34 than 12 – 4·35.
Max could also count on from 4·35 to 12·00.

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

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

Power play

Answers will vary; for example:

2	÷ 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 13: Geometry – properties of shapes (1)

Lesson 1: Measuring angles in degrees

→ pages 54–56

1. a) Diagrams ticked: 2nd and 4th
b) Diagrams ticked: 1st, 3rd and 6th
c) i) 360° clockwise
ii) 180° anticlockwise
iii) 180° anticlockwise
iv) 90° clockwise
v) 270° clockwise
vi) 360° clockwise

2.

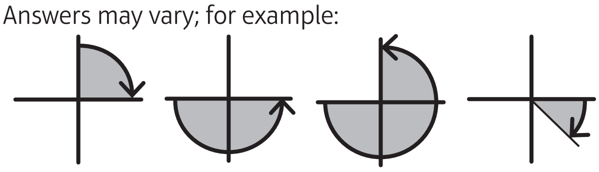
Starts facing	Turns	Now facing
whirlpool	90° clockwise	island
harbour	180° clockwise	island
island	270° anticlockwise	rocks
island	360°	island
island	270° clockwise	whirlpool

3. a) 180° clockwise or anticlockwise
b) 90° clockwise or 270° anticlockwise
c) 45° clockwise or 315° anticlockwise
d) 135° anticlockwise or 225° clockwise

4. Answers will vary; for example:
1 □ and 5 △
2 □ and 3 △
Fewest button pushes: 3 □ and 1 △

Reflect

Answers may vary; for example:



90° 180° 270° 45°

Lesson 2: Measuring with a protractor (1)

→ pages 57–59

1. a) 50° c) 80°
b) 25° d) 42°

2. Allow 2° either side:
a) 70° c) 62°
b) 55° d) 44°

3. a) Each angle = 60°
b) Top = 45°
Bottom left = 60° Bottom right = 75°

4. a) Richard has read the wrong scale; he needs to use the inner scale, starting on the right-hand side. The angle is acute and is 60°.
b) Emma has not aligned the zero line of the protractor with one of the lines of the angle. The angle is 50°.

5. Allow 2° either side:
a) 80° b) 61° c) 28°

Reflect

Explanations may vary; for example:

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

Lesson 3: Measuring with a protractor (2)

→ pages 60–62

1. Ticked: b) and c)

2. Allow 2° either side:
a) 135° c) 115°
b) 127° d) 130°

3. d c a b

4. Allow 2° either side:
a) All three angles = 135°
b) 152°

5. Allow 5° either side:

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

Reflect

Answers will vary; for example:

Since the angle is obtuse you should read the scale where the value is greater than 90°.
Use the scale where 0° is matched up to the other line.

Lesson 4: Drawing lines and angles accurately

➜ pages 63–65

1. Check drawn angles.

2. Check drawn angles.

3. The missing length is 9·5 cm (allow 0·2 cm either way). The missing angles are 50° and 50°.

4. Check that the triangles are drawn with angles of 45°, 60° and 75°.
All sides are different lengths.

5. Check that equilateral triangles are drawn with 3 angles of 60° and sides of 3 cm.

Reflect

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

Lesson 5: Calculating angles on a straight line

➜ pages 66–68

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

2. a) 140° c) 80°
b) 35° d) 141°

3. a) a (45°) and h (135°) *or* b (145°) and g (35°)
b) c (20°) and d (100°) and f (60°) *or* a (45°) and d (100°) and g (35°)

4. a) 5° b) 30°

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

Reflect

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

Lesson 6: Calculating angles around a point

➜ pages 69–71

1 a) 360° – 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) Children should draw an angle of 250°.
b) Children should draw an angle of 350°.

4. Max turned 105°.

5. 4 × 90 = 360
An obtuse angle is greater than 90° so 4 obtuse angles together would turn further than 360°, or a full turn. The circle therefore cannot be split into four obtuse angles.

6. a) 72° (360 ÷ 5 = 72)
b) 36° (180 ÷ 5 = 36)
c) 18° (90 ÷ 5 = 18)
d) Explanations may vary; for example:
The size of the angles is halved each time so the answers are halved.

Reflect

Answers will vary.

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

120° and 130°; 100° and 150°; etc.

Lesson 7: Calculating lengths and angles in shapes

➜ pages 72–74

1. Angles clockwise around shape from top left:
A: 90°, 90°, 45°, 135°
B: 90°, 45°, 45°
C: 45°, 90°, 45°
D: 45°, 45°, 90°
E: 90°, 90°, 90°, 90°

2. a) 75 mm
150 mm
45°
b) 75 mm
150 mm
135°
c) 150 mm
270°

3. a = 105° b = 53° c = 107°

4. a = 120° b = 300° c = 60°

Reflect

Answers will vary; for example:

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

End of unit check

➜ pages 75–77

My journal

1. a) a, b and g (a = 15°, b = 90° and g = 255°, so: 15 + 90 + 255 = 360°)
b) a, b, c and f (a = 15°, b = 90°, c = 45° and f = 30°, so: 15 + 90 + 45 + 30 = 180°)

2. a = 70° b = 20°
Answers may vary but children should notice that a + b = 90°.

Power puzzle

Star should be drawn in space provided.

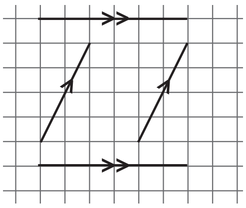
Unit 14: Geometry – properties of shapes (2)

Lesson 1: Recognising and drawing parallel lines

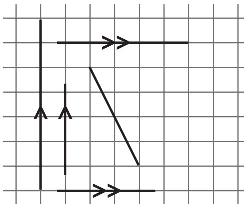
➜ pages 78–80

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

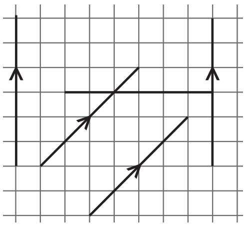
a)



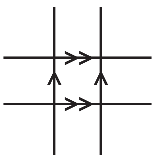
c)



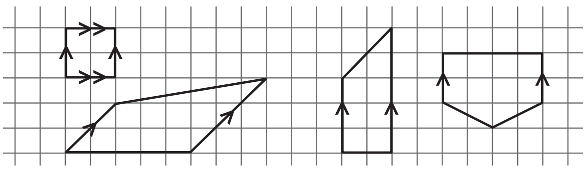
b)



d)



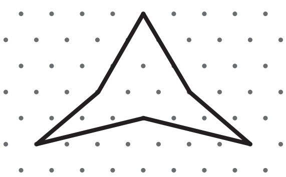
2.



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

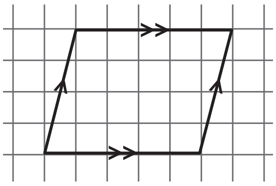
4. FE is parallel to AD and BC.
BF would be parallel to CD.
No. EC is not parallel to any lines in the shape.

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



Reflect

Answers will vary; for example: parallelogram



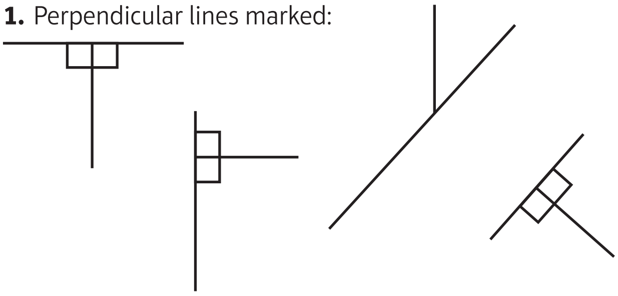
Explanations will vary; for example:

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

Lesson 2: Recognising and drawing perpendicular lines

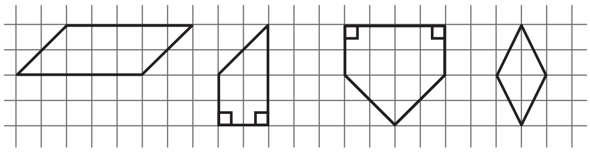
➜ pages 81–83

1. Perpendicular lines marked:



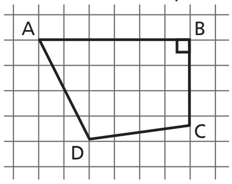
2. Check children have drawn perpendicular lines.

3.



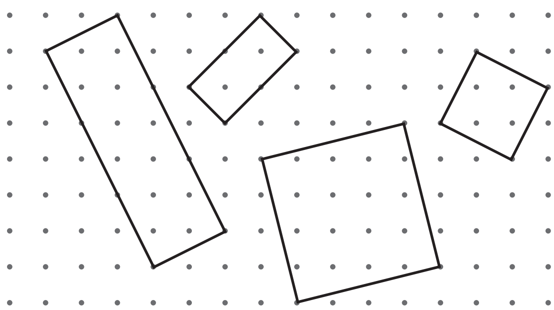
4. a) False; the angle between the two lines is clearly smaller than 90°
b) False; the angle between the two lines is clearly greater than 90°
c) True; EF is perpendicular to AF
d) False, CD is perpendicular to DE

5. Answers will vary; for example:



AB is perpendicular to BC

6.



Reflect

Explanations may vary; for example:

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

Lesson 3: Reasoning about parallel and perpendicular lines

➜ pages 84–86

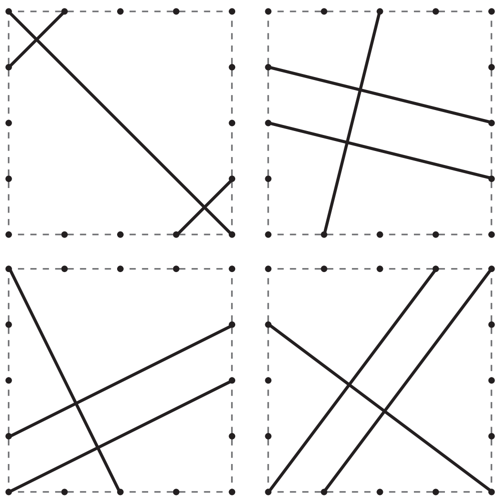
1. a) Angle a = 135°
Angle b = 45°
Angle c = 135°
Angle d = 45°
b) The two diagonal lines are parallel.
They both cross the horizontal line at angles of 135° and 45°.

2. Answers will vary but the line should cross both parallel lines at the same angle.

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

4. a) Diagonals do not cross at right angles.
b) Diagonals do not cross at right angles.
c) Diagonals do not cross at right angles.
d) Diagonals do not cross at right angles.

5. Answers will vary; for example:



Reflect

Answers will vary; for example:

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

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

Lesson 4: Regular and irregular polygons

➜ pages 87–89

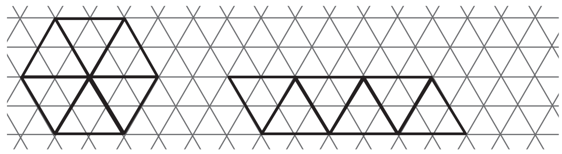
1. Shapes and descriptions joined:
Angles different, sides same ➜ rhombus
Angles same, sides different ➜ rectangle
Angles same, sides same ➜ square
Angles different, sides different ➜ parallelogram
Circled: square (only regular quadrilateral)

2. irregular irregular regular irregular

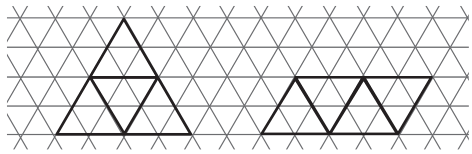
3. This is not a regular shape because the sides are not all the same length.

4. a) C and F b) C, E and F

5. a) Regular shape will be regular hexagon; irregular shape will vary; for example:



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

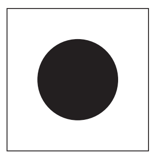
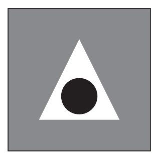


Reflect

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

Lesson 5: Reasoning about 3D shapes

➜ pages 90–92

1. a)  b)  c) 

2. a) Circled: 1st and 3rd
b) Circled: 1st and 2nd

3. They could be looking at shape D.

4. a) Equilateral triangle (drawn)
b) Equilateral triangle (drawn)
c) Equilateral triangle (drawn)

5. Drawings of
a) circle c) rectangle
b) rectangle d) rectangle

Reflect

Views can be rectangles or triangles.

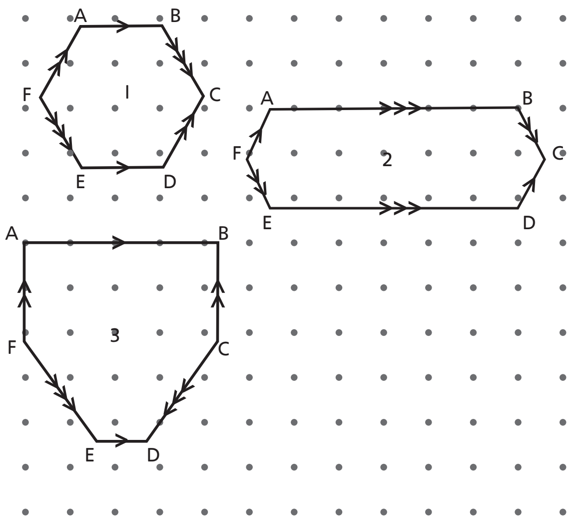
End of unit check

➜ pages 93–95

My journal

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

2. Answers will vary; for example:



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

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

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

Power puzzle

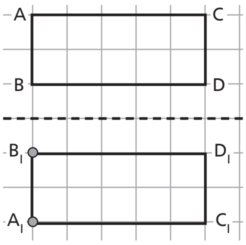
Note: angles of diagonals should be 45° and right angles should be 90°. Sides of squares should be the same length.

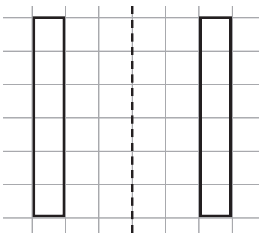
Unit 15: Geometry – position and direction

Lesson 1: Reflection

➜ pages 96–98

1. Reflections drawn:

a)


c)


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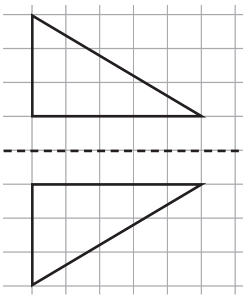
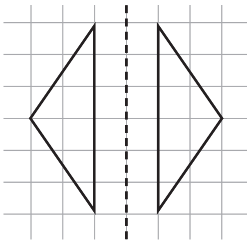
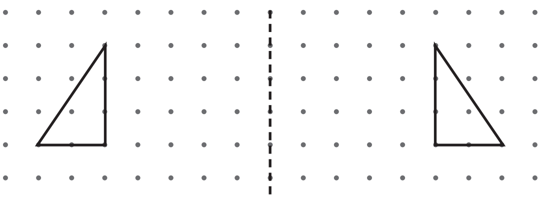
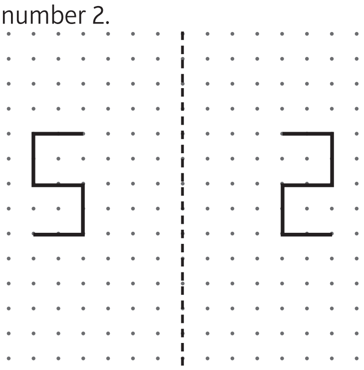


d)


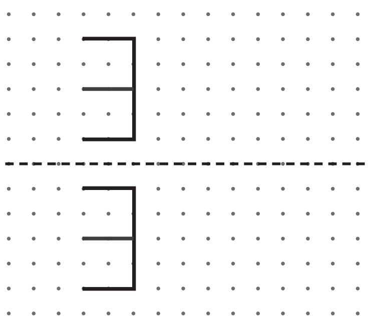
e)


2. Predictions may vary; for example:

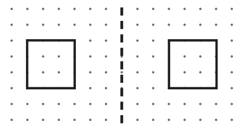
a) I predict that the reflected shape will look like the number 2.

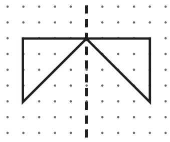


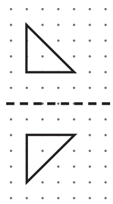
b) I predict that the reflected shape will look like the number 3.

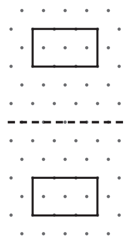


3. Mirror lines drawn:

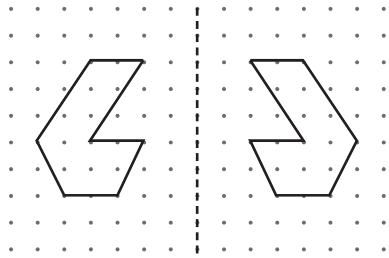
a)


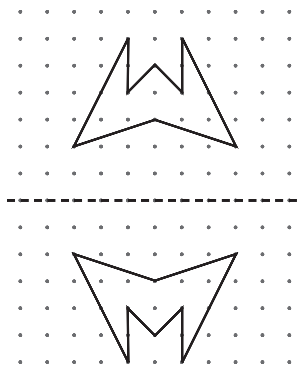
b)


c)


d)


4. Reflections drawn:

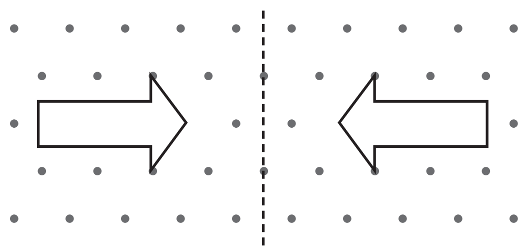
a)


b)


Reflect

Explanations may vary; for example:

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

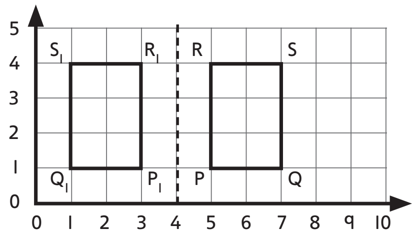


Lesson 2: Reflection with coordinates

➜ pages 99–101

1. A (1,5) ➜ 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(3,1)
Q_1(1,1)
R_1(3,4)
S_1(1,4)

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

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

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

6.

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

Reflect

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

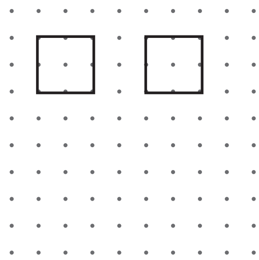
Reflecting T in the horizontal line gives the new coordinate T_1(9,2) and reflecting T in the vertical line gives T_2(3,8).

Lesson 3: Translation

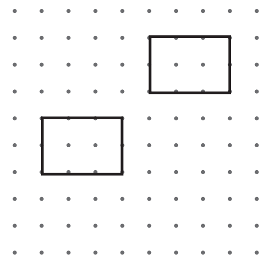
➜ pages 102–104

1. Shapes translated:

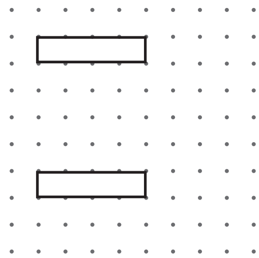
a)



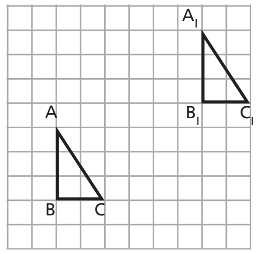
c)



b)

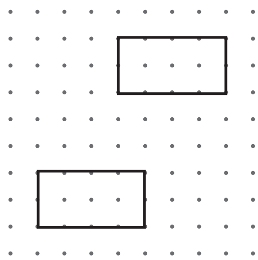


d)



2. 5 right, 1 up

3.



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

5. A: 8 right
B: 4 left

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

Reflect

5 left and 4 up.

Lesson 4: Translation with coordinates

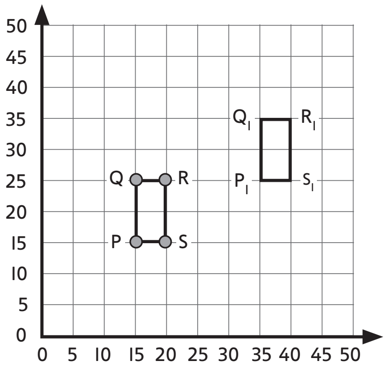
→ pages 105–107

1. a)

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

b) 3 right, 9 up

2.



P_1(35,25)
Q_1(35,35)
R_1(40,35)
S_1(40,25)

3. Order may vary:

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

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

Reflect

Methods may vary; for example:

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

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

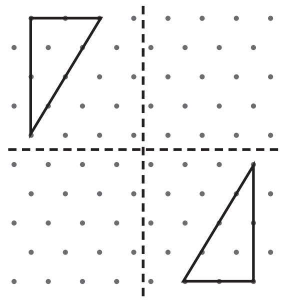
End of unit check

→ pages 108–110

My journal

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

2.



Power puzzle

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

Unit 16: Measure – converting units

Lesson 1: Metric units (1)

➜ pages 111–113

1. a) To convert metres into kilometres, divide by 1,000.
   162,000 m ÷ 1,000 = 162 km
   London ➜ Birmingham = 162 km
   b) To convert kilometres into metres, × by 1,000.
   50 km × 1,000 = 50,000 m
   Manchester ➜ Liverpool = 50,000 m
   c) Glasgow ➜ Edinburgh = 67·1 km
2. Letters written into circles:
   A and D ➜ ÷ 1,000
   B and C ➜ × 1,000
3. a) 12 kg = 12,000 g
   b) 8,000 g = 8 kg
   c) 6,500 g = 6 kg and 500 g
   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
4. To convert from kilograms to grams Kate needs to multiply by 1,000. Her mistake is that she has divided instead of multiplied.
   27·5 kg = 27,500 g
5. Possible distances: 04·5 km, 05·4 km, 40·5 km or 50·4 km
   Answers in metres: 4,500 m, 5,400 m, 40,500 m, 50,400 m
6. 2 bags: 18,000 g = 18 kg and 8,000 g = 8 kg
   Explanations will vary; for example:
   Masses that are multiples of 1,000 g are a whole number of kilograms.

Reflect

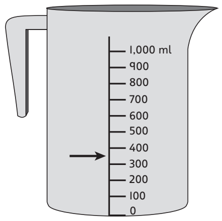
Explanations may vary; for example:

To convert grams into kilograms divide by 1,000.
12,500 ÷ 1,000 = 12·5
So, 12,500 g = 12·5 kg

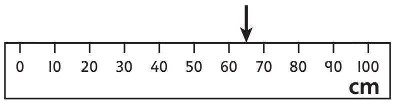
Lesson 2: Metric units (2)

➜ pages 114–116

1. a) To convert mm into cm, divide by 10.
   30 mm ÷ 10 = 3 cm
   The blade of grass is 3 cm long.
   b) To convert litres into millilitres, multiply by 1,000.
   1·2 l × 1,000 = 1,200 ml
   The bottle holds 1,200 ml.
2. a)



   b)



3. Lines drawn to join strategy and task:
   ÷ 10 ➜ Measure the width of a stamp in mm and convert it into cm.
   × 10 ➜ Change the height of a flower (in cm) into mm.
   ÷ 1,000 ➜ Convert an amount of water from millilitres into litres.
   × 1,000 ➜ Convert the mass of a bag of sand (in kg) into g.
   ÷ 100 ➜ Write a length in cm as m.
   × 100 ➜ Convert the height of a building (in m) into cm.
4. 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
5. To convert from centimetres to millimetres you multiply by 10, so Mo is correct since his measurement (in millimetres) is 10 times Lee's (measured in centimetres).
6.

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:

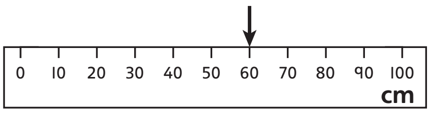
It is true that 10 mm is equal to 1 cm but Danny needs to multiply by 10 to convert cm into mm, rather than dividing. So, 5·6 cm = 56 mm.

Lesson 3: Metric units (3)

➜ pages 117–119

1. a) 7,200 ml + 1,000 ml = 8,200 ml
   b) 6·2 kg + 2000 g
   = 6,200 g + 2,000 g = 8,200 g
   c) 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, B, A, D

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

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

Lesson 4: Metric units (4)

➜ pages 120–122

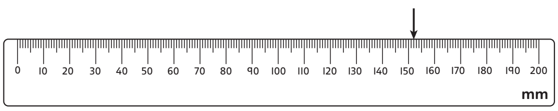
1. a) 10 mm = 1 cm
To convert from mm to cm, divide by 10.
b) 100 cm = 1 m
1,000 m = 1 km
100 × 1,000 = 100,000
To convert from cm to km, ÷ by 100,000.
To convert from km to cm, × by 100,000.

2. a) The mouse's tail is 14·2 cm long.
Check that children have drawn tails that are 14·2 cm long.
b) 40,000 cm = 400 m = 0·4 km

3. Lexi, Reena, Ebo, Max

4. a) Danny has treated the length of the ribbon as if it was 2 cm. The length of 2 m needs to be converted to cm (2 × 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.

5. 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

Answers will vary; for example:

There are 10 mm in 1 cm.
There are 100 cm in 1 m.
There are 1,000 ml in 1 l / There are 1,000 g in 1 kg / There are 1,000 mm in 1 m / There are 1,000 m in 1 km.

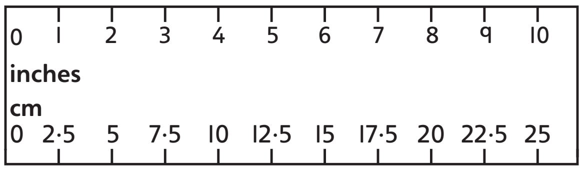
Lesson 5: Imperial units of length

➜ pages 123–125

1. a) Circled: 10 inch pizza
Park 100 yards
Amal 6 feet 2 inches
b) 1 inch is approximately 2 $\frac{1}{2}$ 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. 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.

6.

55 inches

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

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

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

Reflect

Answers will vary; for example:

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

Imperial units include inches, feet and yards.

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

12 inches = 1 foot
1 yard = 3 feet
1 inch = 2·5 cm (roughly)

Lesson 6: Imperial units of mass

→ pages 126–128

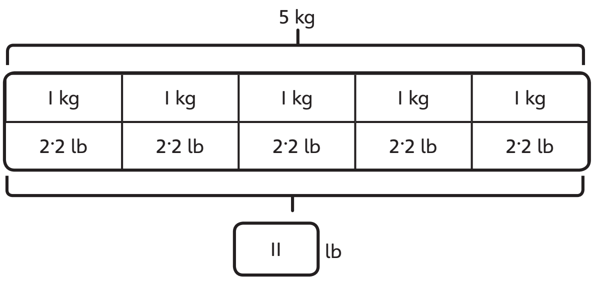
1.

lb	0	1	2	3	4	5	6	7	8	9	10
oz	0	16	32	48	64	80	96	112	128	144	160

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) 17 lb
b) 17 lb = 272 oz

3.



4. $3\frac{1}{2}$ lb is about 1·575 kg.
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) Coloured measurements: T = 4,500 g, O = 4·5 kg, N = 160 oz
b) The imperial unit is ton.

6. a) The giant octopus has a mass of 100 lb.
b) 2·2 lb is about 1 kg, so 9·9 lb is about 4·5 kg. This means 100 lb is close to 45 kg.
The giant octopus has a mass of approximately 45 kg.

Reflect

Methods may vary; for example:

1 lb = 2·2 kg (approximately)
So: 14 lb = 14 × 2 kg + 14 × 0·2 kg = 30·8 kg (approximately)

Lesson 7: Imperial units of capacity

→ pages 129–131

1.

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

2. a) 5 pints = 2,850 ml
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.
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.

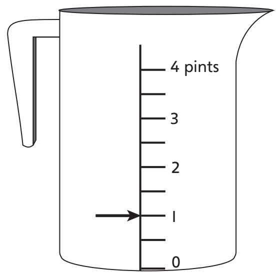
4.

gallons	0	1	2	3	4	5	6	7	8	9	10
pints	0	8	16	24	32	40	48	56	64	72	80

Pond C contains the most water.

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

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



7. a) 1 gallon = 8 pints = 8 × 570 ml = 4·56 l (approximately)
So, 1 gallon costs £5 at petrol station A but only £4·56 at petrol station B.
Petrol station B is cheaper.
b) She saves £4·40 (10 × £0·44)

Reflect

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

Lesson 8: Converting units of time

➜ pages 132–134

1. a)

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

The rail journey is 5 hours 10 minutes.

b)

195 s			
60 s	60 s	60 s	15 s

The pop song is 3 minutes 15 seconds.

2. 2 hours 7 minutes = 127 minutes
137 minutes = 2 hours 17 minutes
Escape from Planet Zarg is longer.

3. No, Ambika is not correct. 0·25 of an hour is a quarter of an hour, which is 60 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

Descriptions may vary; for example:

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

Lesson 9: Timetables

➜ pages 135–137

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

2. a) She is on the train for 40 minutes.
b) He will wait 1 hour and 54 minutes.

c)

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

3.

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

Reflect

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

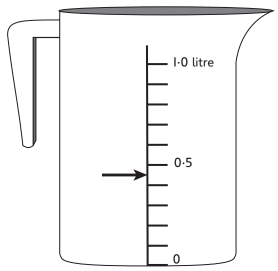
Lesson 10: Problem solving – measure

➜ pages 138–140

1. 2·7 kg is 2,700 grams.

2. The frog has jumped 1·35 metres.

3.



4. They have 160 grams each.

5. £1·50 = 90 cm
10 cm costs £0·1$\dot{6}$
100 cm = 1 m = £1·67
Shop A is cheaper

6. 2·8 kg = 2,800
2,800 g – 800 g = 2,000 g
2,000 g ÷ 5 = 400 g
One football has a mass of 400 g.

7. 1·25 m = 125 cm
125 cm – 80 cm= 45 cm
45 cm ÷ 3 = 15 cm
The length of each space is 15 cm (or 0·15 m).

Reflect

Explanations may vary; for example:

1 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 141–142

My journal

1. a) 1·2 litres = 1,200 millilitres
I know this because there are 1,000 ml in 1 l.
To convert, multiply by 1,000.

b) 490 minutes = 8 hours 10 minutes
I know this because there are 60 minutes in 1 hour.
To convert divide by 60 and write the remainder as minutes.

c) 60 inches = 1·5 metres
There are 2·5 cm in 1 inch and 100 cm in 1 m.
To convert inches to centimetres multiply by 2·5 and then to convert cm to m divide by 100.

Power play

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

Unit 17: Measure – volume and capacity

Lesson 1: What is volume?

➜ pages 143–145

1. a) 6
b) 6
c) 6
d) 20
e) 12
f) 9 (accept 10 or 11 as some cubes could be obscured)

2. Shapes matched to volume:
Top row left to right: 8 12 6
Bottom row left to right: 8 8 16 12

3. Richard is not correct. 6 unit cubes are visible but, in order for the tower of 2 cubes that can be seen to be attached to the shape, there must be another cube below them which cannot be seen. This means the shape has a volume of 7 unit cubes.

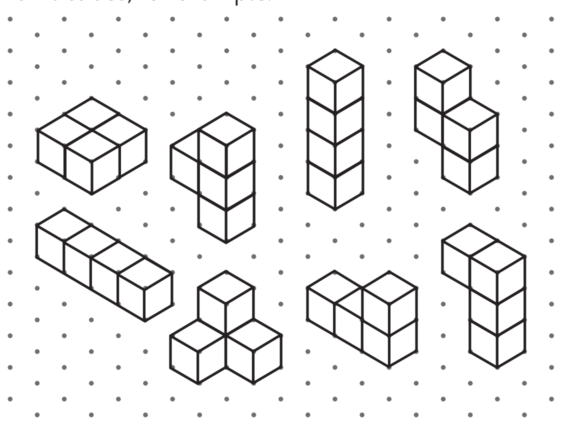
4.

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

Explanations may vary; for example:
The shapes increase by a layer each time and each layer contains the next square number of cubes, i.e.
Shape A = $1^2 + 2^2 = 5$
Shape B = Shape A $(1^2 + 2^2) + 3^2 = 14$
Shape C = Shape B $(1^2 + 2^2 + 3^2) + 4^2 = 30$

5. Copies of cubes drawn accurately, i.e. 1 × 1 × 1 cube and 2 × 2 × 2 cube.

6. Answers will vary. Check each shaped drawn contains 4 unit cubes; for example:



Reflect

Explanations may vary; for example:

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

Lesson 2: Comparing volumes

➜ pages 146–148

1. a) Ticked: 2nd shape
b) Ticked: 2nd shape
c) Ticked: 1st shape
d) It is often not necessary to count all cubes as you can count the number in one row and use multiplication.

2. A, B, C, D

3. Bella, Max, Amelia

4. 2 cubes added to shape A.

5. I predict that Emma has made the shape with the greatest volume because 4 × 2 × 2 = 16.
Look for children making a tower 15 cubes tall and a cuboid with dimensions 4 × 2 × 2.

Reflect

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

Lesson 3: Estimating volume

➜ pages 149–151

1. a) 14
b) 14

2. Answers will vary; look for children recognising that the pencil is circular in cross section and has a point, so using the cubes to estimate the volume is likely to produce an overestimate of the volume (assuming the diameter of the pencil is equal to the side of the cube).

3. a) Ticked: half sphere (hemisphere)
b) Ebo can use the estimate for the half sphere and double this to find an estimate for the sphere.

4. No; the orange is likely to have the greatest volume since it is wider and deeper than the carrot. This means it is likely to fill more space than the carrot so will have a larger volume.

5. Answers will vary greatly depending on sizes of objects, based on using 1 cm^3 cubes; for example:
Glue stick
28 unit cubes
Ball
100 unit cubes
Hockey stick
350 unit cubes

6. Answers will vary. Check suggestions are reasonable.

Reflect

Answers will vary; for example:

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

Power puzzle

Answers will vary, depending on size of classroom.

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

Lesson 4: Estimating capacity

➜ pages 152–154

1. a) 750 ml b) 70 l

2. Circled: watering can, pond/lake, bath tub

3. A, C, E, B, D (accept C, A, E, B, D as it not clear what sort of bottle is shown in A).

4. Answers will vary slightly; for example:
a) 3,000 ml
b) 1,300 ml
c) 2,500 ml

5. The water poured out is $\frac{1}{5}$ of a bottle which equals 400 ml. Thus the capacity of one full bottle is:
5 × 400 = 2,000 ml
The capacity of one full bottle is 2,000 ml.

6. Jug A contains 500 ml. $\frac{1}{4}$ of this is poured out, which is 125 ml. This is equal to $\frac{1}{10}$ of jug B, so jug B holds:
10 × 125 = 1,250 ml

Reflect

Explanations may vary; for example:

Volume is the amount of space that an object fills. Capacity describes how much a container can hold.

End of unit check

➜ pages 155–156

My journal

1. Method 1: Count the cubes individually (18).
Method 2: Calculate the cubes in the different layers and then add these together:
3 × 3 = 9
2 × 3 = 6
1 × 3 = 3
9 + 6 + 3 = 18