Unit 6: Multiplication and division (2)

Lesson 1: Problem solving – addition and multiplication

➜ pages 6–8

1. Method 1: 5 × 4 = 20, 5 × 3 = 15, 20 + 15 = 35
Method 2: 4 + 3 = 7, 7 × 5 = 35
There are 35 counters in total.

2. 4 + 2 = 6
6 × 3 = 18
There are 18 pens in total.

3. a) 9 × 2 = 18 There are 18 balls in total.
b) 7 × 3 = 18 There are 21 balls in total.

4. Explanations may vary; for example:
4 × 3 + 5 × 3 = 12 + 15 = 27; 4 + 5 = 9, 9 × 3 = 27
Diagrams could include 4 rows of 3 counters in one colour with 5 rows of 3 counters in a different colour, showing a total 9 rows of 3 counters altogether.

5. a) 7 d) 6
b) 10 e) 9
c) 2 f) 4

6. First I added together the number of columns of counters (3 + 2 + 5 =10).
Then I multiplied the number of columns by the number of rows (10 × 4 = 40).
There are 40 counters in total.
(Note: this is the most efficient method.)
OR
First I found how many black counters (4 × 3 = 12) and the white counters (4 × 2 = 8) and the grey counters (4 × 5 = 20).
Then I added these totals together (12 + 8 + 20 = 20).
There are 40 counters in total.

Reflect

Explanations may vary; for example:
If you have 5 threes and 2 threes, you have 7 threes altogether so 5 × 3 + 2 × 3 = 7 × 3.

Alternatively, children may draw diagrams or write calculations: 5 × 3 = 15, 2 × 3 = 6; 15 + 6 = 21; also 7 × 3 = 21 so 5 × 3 + 2 × 3 = 7 × 3.

Lesson 2: Problem solving – mixed problems

➜ pages 9–11

1. a) 6 × 3 = 18 Jamie has 18 cards in total.
b) 18 ÷ 2 = 9 Jamie and Richard each get 9 cards.

2. 8 × 3 = 24, 24 ÷ 4 = 6. Each horse gets 6 apples.

3. 12 towers of 3 cubes can be made.

4. a) Total value = 18, missing number in bottom row = 6
b) Total value = 48, missing number in bottom row = 8

5. 5 × 400 g = 2,000 g = 2 kg; 2 kg ÷ 2 = 1 kg
1 teddy bear weighs 1 kg.

6. 8 × £3 = £24; £24 ÷ 6 = £4; 5 × £4 = £20
5 large cones cost £20.

Reflect

Bar model should look similar to the model below; pineapple (p) represented in the top row, divided into two equal parts. Apples (a) represented in the bottom row, divided into 5 equal parts.

Explanations may vary, but should reference how the top and bottom rows in the bar model are of equal length despite each being made up of a different number of sections.

<table>
<tr><td colspan="5">p</td><td colspan="5">p</td></tr>
<tr><td colspan="2">a</td><td colspan="2">a</td><td colspan="2">a</td><td colspan="2">a</td><td colspan="2">a</td></tr>
</table>

Lesson 3: Using written methods to multiply

➜ pages 12–14

1. a) 10 × 6 + 3 × 6 = 60 + 18 = 78
There are 78 eggs in total.
b) 13 × 6 = 78 There are 78 eggs in total.
c) The answers are the same. Explanations may vary; for example:
In both questions there are 13 boxes of eggs altogether.

2. 10 × 3 = 30 8 × 3 = 24
30 + 24 = 54 So, 18 × 3 = 54
There are 54 beads in total.

3. a) 10 × 5 = 50
7 × 5 = 35
17 × 5 = 85

c) 3 × 6 = 18
20 × 6 = 120
23 × 6 = 138

e) 20 × 8 = 160
5 × 8 = 40
25 × 8 = 200

b) 4 × 10 = 40
4 × 6 = 24
4 × 16 = 64

d) 3 × 40 = 120
3 × 5 = 15
3 × 45 = 135

f) 11 × 7 = 77
5 × 7 = 35
16 × 7 = 112

4. a) Parts: 10 × 6 = 60; 6 × 6 = 36
b) Whole: 9 × 5 = 45 Parts: 7 × 5 = 35; 2 × 5 = 10

5. a) 8
b) 12
c) 13
d) 17 × 6
e) 7
f) 19
g) 3 × 25

Reflect

Methods may vary; for example:
Method 1: Find the totals separately for the pencils on the left-hand side (5 × 10 = 50) and on the right-hand side (5 × 3 = 15) and then add these together (50 + 15 = 65).

Method 2: Add together the number of packs of pencils (10 + 3 =13) and multiply this by 5 (13 × 5 = 65).

Lesson 4: Multiplying a 2-digit number by a 1-digit number

➜ pages 15–17

1.

$$\begin{array}{rrrr} & & 4 & 1 \\ \times & & & 5 \\ \hline & 2 & 0 & 5 \\ \hline \end{array}$$

41 × 5 = 205

2. a)

$$\begin{array}{rrrr} & & 5 & 3 \\ \times & & & 6 \\ \hline & 3 & 1 & 8 \\ \hline & & {\scriptstyle 1} & \end{array}$$

b)

$$\begin{array}{rrrr} & & 4 & 7 \\ \times & & & 3 \\ \hline & 1 & 4 & 1 \\ \hline & & {\scriptstyle 2} & \end{array}$$

c)

$$\begin{array}{rrrr} & & 2 & 9 \\ \times & & & 4 \\ \hline & 1 & 1 & 6 \\ \hline & & {\scriptstyle 3} & \end{array}$$

d)

$$\begin{array}{rrrr} & & 2 & 2 \\ \times & & & 8 \\ \hline & 1 & 7 & 6 \\ \hline & & {\scriptstyle 1} & \end{array}$$

3. a) 28 × 5 = 140
b) 37 × 4 = 148
c) 64 × 9 = 576
d) 7 × 32 = 224

4. 54 × 5 = 270
Amal travels 270 km in 5 days.
(Children may suggest an answer of 540 km if they assume he travels 54 km to work and 54 km back from work each day).

5. Explanations may vary; for example:
Lee has not correctly considered the value of each digit in his answer.
4 ones × 6 gives 24 ones = 2 tens and 4 ones.
5 tens × 6 gives 30 tens = 3 hundreds
So, the answer = 3 hundreds, 2 tens and 4 ones = 324.

$$\begin{array}{rrrr} & & 5 & 4 \\ \times & & & 6 \\ \hline & & 2 & 4 \\ & 3 & 0 & 0 \\ \hline & 3 & 2 & 4 \\ \hline \end{array}$$

6. a)

$$\begin{array}{rrrr} & & 5 & 7 \\ \times & & & 3 \\ \hline & 1 & 7 & 1 \\ \hline & & {\scriptstyle 2} & \end{array}$$

b)

$$\begin{array}{rrrr} & & 2 & 3 \\ \times & & & 6 \\ \hline & 1 & 3 & 8 \\ \hline & & {\scriptstyle 1} & \end{array} \quad \text{or} \quad \begin{array}{rrrr} & & 2 & 8 \\ \times & & & 6 \\ \hline & 1 & 6 & 8 \\ \hline & & {\scriptstyle 4} & \end{array}$$

c)

$$\begin{array}{rrrr} & & 6 & 9 \\ \times & & & 7 \\ \hline & 4 & 8 & 3 \\ \hline & & {\scriptstyle 6} & \end{array}$$

Reflect

Explanations will vary; for example:
There are 4 rows of 26 on the left-hand side, with 2 sets of 10 one counters grouped to make 2 tens. In the middle these are exchanged for 2 ten counters and 10 ten counters are grouped together. On the right-hand side the group of 10 ten counters are exchanged for 1 hundred counter showing the answer of 104.

Lesson 5: Multiplying a 3-digit number by a 1-digit number

➜ pages 18–20

1.

$$\begin{array}{rrrr} & 1 & 3 & 4 \\ \times & & & 2 \\ \hline & 2 & 6 & 8 \\ \hline \end{array}$$

134 × 2 = 268

2. a)

$$\begin{array}{rrrr} & 2 & 1 & 3 \\ \times & & & 4 \\ \hline & 8 & 5 & 2 \\ \hline & & {\scriptstyle 1} & \end{array}$$

b)

$$\begin{array}{rrrr} & 1 & 1 & 4 \\ \times & & & 5 \\ \hline & 5 & 7 & 0 \\ \hline & & {\scriptstyle 2} & \end{array}$$

c)

$$\begin{array}{rrrr} & 1 & 1 & 5 \\ \times & & & 4 \\ \hline & 4 & 6 & 0 \\ \hline & & {\scriptstyle 2} & \end{array}$$

d)

$$\begin{array}{rrrr} & 1 & 4 & 8 \\ \times & & & 3 \\ \hline & 4 & 4 & 4 \\ \hline & {\scriptstyle 1} & {\scriptstyle 2} & \end{array}$$

e)

$$\begin{array}{rrrrr} & & 2 & 5 & 2 \\ \times & & & & 7 \\ \hline & 1 & 7 & 6 & 4 \\ \hline & & {\scriptstyle 3} & {\scriptstyle 1} & \end{array}$$

f)

$$\begin{array}{rrrrr} & & 3 & 1 & 8 \\ \times & & & & 6 \\ \hline & 1 & 9 & 0 & 8 \\ \hline & & {\scriptstyle 1} & {\scriptstyle 4} & \end{array}$$

3. a) 122 × 6 = 732
b) 215 × 5 = 1,075
c) 270 × 3 = 810
d) 4 × 624 = 2,496

4. a)

$$\begin{array}{rrrrr} & & 2 & 9 & 3 \\ \times & & & & 5 \\ \hline & 1 & 4 & 6 & 5 \\ \hline & & {\scriptstyle 4} & {\scriptstyle 1} & \end{array}$$

b)

$$\begin{array}{rrrrr} & & 5 & 1 & 6 \\ \times & & & & 7 \\ \hline & 3 & 6 & 1 & 2 \\ \hline & & {\scriptstyle 1} & {\scriptstyle 4} & \end{array}$$

5. 8 bars of soap weigh 1,160 g.

6.

$$\begin{array}{cccc} & 1 & 3 & 6 \\ \times & & & 7 \\ \hline & 9 & 5 & 2 \\ \hline & & {\scriptstyle 2} & {\scriptstyle 4} \end{array}$$

Explanations will vary; for example:
Alex has incorrectly multiplied 6 × 7 to get 43 (should be 42). She has put the 3 in the ones column and carried over the 4 tens. She has then multiplied 7 × 3 tens to get 21 tens but then added on the 4 tens carried over (to get 25 tens). She has written 25 in the tens column rather than exchanging 20 tens for 2 hundreds and carrying the 2 into the hundreds column.

7.

$$\begin{array}{ccccc} & & 2 & 1 & 5 \\ \times & & & & 7 \\ \hline & 1 & 5 & 0 & 5 \\ \hline & & {\scriptstyle 1} & {\scriptstyle 3} & \end{array} \qquad \begin{array}{ccccc} & & 5 & 1 & 2 \\ \times & & & & 7 \\ \hline & 3 & 5 & 8 & 4 \\ \hline & & & {\scriptstyle 1} & \end{array}$$

$$\begin{array}{ccccc} & & 1 & 5 & 2 \\ \times & & & & 7 \\ \hline & 1 & 0 & 6 & 4 \\ \hline & & {\scriptstyle 3} & {\scriptstyle 1} & \end{array} \qquad \begin{array}{ccccc} & & 2 & 5 & 1 \\ \times & & & & 7 \\ \hline & 1 & 7 & 5 & 7 \\ \hline & & {\scriptstyle 3} & & \end{array}$$

Reflect

$$\begin{array}{cccc} & 1 & 9 & 5 \\ \times & & & 3 \\ \hline & 5 & 8 & 5 \\ \hline & {\scriptstyle 2} & {\scriptstyle 1} & \end{array}$$

Explanations will vary; for example:
Using column multiplication, multiply 5 ones × 3 to give 15 ones. Exchange 10 ones for 1 ten, write the 5 in the ones column and carry over the 1 ten. Multiply 9 tens × 3 to give 27 tens and then add on the 1 ten carried over. This gives 28 tens so 20 tens can be exchanged for 2 hundreds. Write 8 in the tens column and carry over 2 to the hundreds column. Multiply 1 hundred × 3 to give 3 hundreds and then add on the 2 hundreds carried over to give 5 and write this in the hundreds column.

Other methods could include the expanded column method:

$$\begin{array}{cccc} & 1 & 9 & 5 \\ \times & & & 3 \\ \hline & & 1 & 5 \\ + & 2 & 7 & 0 \\ + & 3 & 0 & 0 \\ \hline & 5 & 8 & 5 \\ \hline \end{array}$$

Lesson 6: Problem solving – multiplication

➜ pages 21–23

1. Emma uses 161 cm of ribbon.

2. a) Holly travels 672 km. (Children may give answer of 1,344 km if they include the return journey).
b) It costs 6,048p in total for the 3 journeys. (Children may give answer of 12,096p if they included the return journey).

3. 5 × 79 = 395; 3 × 119 = 357
395 + 357 = 752
Andy spends £7 and 52p in total.

4. The total weight of the cookies is 1,608 g.

5. Tower A: 7 × 86 cm = 602 cm
Tower B: 4 × 142 cm = 568 cm
Tower A is taller.

Reflect

Explanations will vary; for example:
The first bar model is split into 7 sections, one for each day of the week. Placing 83 in each section helps work out the total of 7 × 83 = 581.

The second bar model is split into 5 sections, one each for Monday to Friday. Placing 127 in each section helps work out the total of 5 × 127 = 635.

The difference is 635 km – 581 km = 54 km

Lesson 7: Multiplying more than two numbers (1)

➜ pages 24–26

1. a) 4 × 2 × 4 = 32, 8 × 4 = 32
b) 3 × 5 × 3 = 45, 15 × 3 = 45 (numbers may be multiplied in a different order)

2. Diagram showing 2 boxes of chocolates with each box showing 12 chocolates in an array.

3. Explanations will vary. Look for children who identify in their answer that doubling or multiplying by 2 is a relatively easy multiplication, even for numbers with 2 or more digits. By multiplying 7 by 9 Aki did the harder multiplication first and then doubled it.

4. 5 × 2 × 11 = 110 (numbers may be multiplied in a different order). There are 110 candles in total.

5. a) 2 × 4 × 6 = 48
b) 80 = 8 × 5 × 2
c) 4 × 5 × 5 = 100
d) 5 × 7 × 3 = 105
e) 72 = 9 × 2 × 4
f) 9 × 2 × 8 = 144

6. a) 4 × 4 × 2 = 32
b) 2 × 7 × 5 = 70
c) 2 × 7 × 5 = 70
d) 54 = 3 × 9 × 2
e) 7 × 0 × any number = 0
f) 36 = 6 × 1 × 6

7. The answer is 0 regardless of the order.
Explanations may vary; for example:
0 × any number = 0, so there is no need to work out the product of the other numbers as multiplying by 0 will give a final product of 0 in any case.

8. There are 12 possible ways to complete the calculation using single-digit numbers:

3 × 8 × 9 = 216	4 × 6 × 9 = 216
3 × 9 × 8 = 216	4 × 9 × 6 = 216
8 × 3 × 9 = 216	6 × 4 × 9 = 216
8 × 9 × 3 = 216	6 × 9 × 4 = 216
9 × 3 × 8 = 216	9 × 4 × 6 = 216
9 × 8 × 3 = 216	9 × 6 × 4 = 216

Reflect

Different methods are possible; however the most efficient method is to work out 2 × 5 = 10 and 8 × 9 = 72 and then multiply these answers together.
2 × 8 × 5 × 9 = 10 × 72 = 720

Lesson 8: Multiplying more than two numbers (2)

➜ pages 27–29

1. 5 × 5 × 3; 5 × 5 = 25; 25 × 3 = 75 (numbers may be multiplied in a different order)
There are 75 beads in total.

2. 2 × 7 × 7 = 98 There are 98 counters in total.
First I found 7 × 7 = 49. Then I doubled 49 to get 98.

3. a) Explanations may vary, but should reference that there are 16 frames with 9 counters in each frame, organised into 2 rows of 8 frames with 9 counters in each frame. So, the total number of counters can be worked out using the calculation 16 × 9 or the calculation 2 × 8 × 9. Therefore 16 × 9 = 2 × 8 × 9.
b) There are 144 counters in total.

4. Explanations may vary, but should reference the following:
Andy is correct because the factors of 15 are 3 and 5, i.e. 15 = 5 × 3 and so 15 × 8 = 5 × 3 × 8.
Reena is correct because multiplication is commutative and so the order of the numbers does not matter, i.e. 5 × 3 × 8 = 5 × 8 × 3 = 40 × 3.

5. 35 is equal to 5 × 7
16 is equal to 2 × 8
So, I can work out 35 × 16 by 5 × 7 × 2 × 8 =
5 × 2 × 7 × 8 = 10 × 56 = 560

6. a) 3,600
b) 6 × 2 × 3 × 5 × 4 × 5 = 12 × 15 × 20 because 6 × 2 = 12, 3 × 5 = 15, 4 × 5 = 20

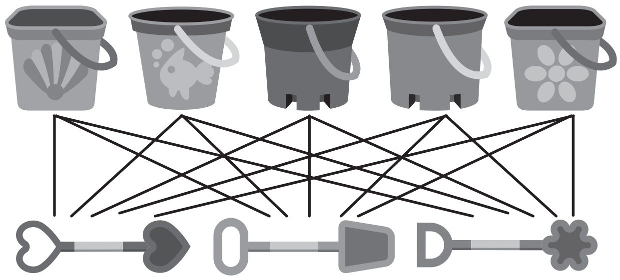
Reflect

Explanations may vary; for example:
Multiplication is commutative which means that the order in which you multiply the numbers does not matter, since 3 × 4 = 4 × 3, then 3 × 4 × 6 = 4 × 3 × 6.

Lesson 9: Problem solving – mixed correspondence problems

➜ pages 30–32

1. a)



Children should draw lines joining the buckets and spades.
There are 15 different ways to choose a bucket and a spade.
b) 5 × 3 = 15

2. 7 × 5 = 35 Andy has 5 T-shirts.

3. 5 × 2 = 10, so there are 10 possible choices. The ten possible totals are:
2p + £1 = £1 and 2 pence; 2p + £2 = £2 and 2 pence;
5p + £1 = £1 and 5 pence; 5p + £2 = £2 and 5 pence;
10p + £1 = £1 and 10 pence; 10p + £2 = £2 and 10 pence;
20p + £1 = £1 and 20 pence; 20p + £2 = £2 and 20 pence;
50p + £1 = £1 and 50 pence; 50p + £2 = £2 and 50 pence

4. a) Possible 2-digit numbers:
12, 13, 14, 15, 16,
21, 23, 24, 25, 26,
31, 32, 34, 35, 36,
41, 42, 43, 45, 46,
51, 52, 53, 54, 56,
61, 62, 63, 64, 65
b) 6 × 5 = 30
30 different 2-digit numbers can be made.

5. There are 15 different pairs of snack that Reena can buy (see shaded cells in table below, where letters A-F each represent a different snack in the vending machine).

	A	B	C	D	E	F
A						
B						
C						
D						
E						
F						

For her first choice, Reena has 6 different snacks to pick from. She then has 5 snacks to pick from for her second choice. This gives 6 × 5 = 30 possibilities. However this set of 30 possibilities includes each pair of snacks twice as it counts choosing snack A then snack B and choosing snack B then snack A. So, there are 30 ÷ 2 = 15 distinct pairs of snacks.

Reflect

Explanations may vary, but should reference the following:
Each shirt can be matched with 3 ties. There are 5 shirts, so 5 × 3 = 15, meaning there are 15 different ways of choosing one shirt and one tie.

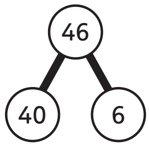
Lesson 10: Dividing a 2-digit number by a 1-digit number (1)

➜ pages 33–35

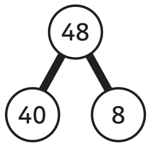
1. a) 22 There are 22 cakes on each plate.
b) 11; 60 ÷ 6 = 10, 6 ÷ 6 = 1

2. a) 64 ÷ 2 = 32; 60 ÷ 2 = 30; 4 ÷ 2 = 2
b) 69 ÷ 3 = 23; 60 ÷ 3 = 20; 9 ÷ 3 = 3

3. a) 46 ÷ 2 = 23;



b) 48 ÷ 4 = 12;



c) 77 ÷ 7 = 11
d) 93 ÷ 3 = 31

4. Explanations may vary; for example:
Lexi is correct in saying that 8 ÷ 4 = 2 and 4 ÷ 4 = 1, but she is working out 84 ÷ 4 and needs to remember that the 8 represents 8 tens and that dividing this by 4 gives 2 tens, i.e. 80 ÷ 4 = 20 and 4 ÷ 4 = 1, so 84 ÷ 4 = 20 + 1 = 21.

5. a) 10; 11; 12; 13
b) 21; 22; 23; 24

6. Explanations may vary, but should reference that both are correct. Jamilla is using halving and Olivia is using multiplication facts. 68 = 60 + 8 and so halving gives 30 (3 tens) + 4 = 34. 30 × 2 = 60 and 4 × 2 = 8 so 34 × 2 = 68.

7. Explanations may vary; for example:
Dividing the same number (48) into a larger number of groups will give a smaller answer.
48 ÷ 4 = 12, 48 ÷ 2 = 24

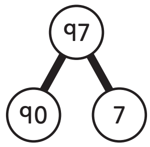
Reflect

Methods will vary; for example:
26 is 20 + 6. Half of 20 is 10 and half of 6 is 3. Adding these together gives 13. This could be shown with a part-whole model or counters in a diagram.

Lesson 11: Division with remainders

➜ pages 36–38

1. a) 20 ÷ 2 = 10, 9 ÷ 2 = 4 remainder 1,
29 ÷ 2 = 14 remainder 1
b)



90 ÷ 3 = 30, 7 ÷ 3 = 2 remainder 1,
97 ÷ 3 = 32 remainder 1

2. The number in the picture has 4 tens and 5 ones. The picture shows 45 ÷ 2 = 22 remainder 1.

3. a) 10 r 1 c) 20 r 2
b) 11 r 4 d) 22 r 1

4. Explanations may vary, for example:
No, Luis is not correct. He has divided the 6 tens into 3, rather than 2. Also he has a remainder of 3, which can be divided by 2. 63 ÷ 2 = 31 r 1.

5. There are many possible answers; for example:
13 ÷ 2 = 6 r 1; 97 ÷ 2 = 48 r 1; 25 ÷ 3 = 8 r 1;
64 ÷ 7 = 9 r 1

Reflect

87 is an odd number and so is not divisible by 4, so there will be a remainder. Pictures could include a part-whole model showing 87 split into 80 and 7 (other combinations possible) or counters. 87 ÷ 4 = 21 r 3

Lesson 12: Dividing a 2-digit number by a 1-digit number (2)

➜ pages 39–41

1. 20 ÷ 2 = 10; 18 ÷ 2 = 9; 10 + 9 = 19.
So, 38 ÷ 2 = 19
They each get 19 cakes.

2. a) 14 c) 24
b) 15 d) 38

3. a) 58 ÷ 2 = 29, different partitions possible, for example: 50 and 8 or 40 and 18
b) 65 ÷ 5 = 13, different partitions possible, for example: 60 and 5 or 50 and 15

4. a) 16 c) 13
b) 23 d) 17

5. Tilly needs 25 plant pots.

6. 95 ÷ 5 is greater.
54 = 30 + 24, so 54 ÷ 3 = 10 + 8 = 18.
95 = 50 + 45, so 95 ÷ 5 = 10 + 9 = 19.

7. 48 ÷ 6 = 8; 48 ÷ 3 = 16; 48 ÷ 2 = 24 (accept 48 ÷ 1 = 48)

Reflect

Explanations will vary; for example:
No, neither 40 nor 17 are divisible by 3. When partitioning it is useful to partition into numbers that are divisible by the divisor. Here it would be more helpful to partition 57 into 30 and 27 which are both divisible by 3.

Lesson 13: Dividing a 2-digit number by a 1-digit number (3)

→ pages 42–44

1. 30 ÷ 3 = 10; 16 ÷ 3 = 5 r 1; So, 46 ÷ 3 = 15 r 1
Each guinea pig gets 15 peas and there is 1 pea left over.

2. a) 50 ÷ 5 = 10
17 ÷ 5 = 3 r 2
So, 67 ÷ 5 = 13 r 2

b) 50 ÷ 5 = 10
15 ÷ 5 = 3
So, 67 ÷ 5 = 13 r 2

3. a) 23 r 1
b) 13 r 1
c) 16 r 2
d) 14 r 2

4. a) 33 r 1
b) 22 r 1
c) 16 r 3
d) 13 r 2
e) 11 r 1

5. 16 chocolate bars are needed (76 ÷ 5 = 15 r 1, so 16 bars are needed and 4 pieces will be left over).

6. Yes. There are many possible answers: 21, 51, 81, 111, 141, 171, 201, 231, … (adding 30 each time).

Reflect

Explanations will vary; for example:
It is not possible to divide 7 by 4 without a remainder (no odd numbers are divisible by 4). The greatest possible remainder, when dividing by 4, is 3.

Lesson 14: Dividing a 3-digit number by a 1-digit number

→ pages 45–47

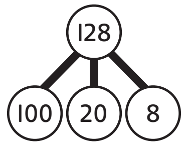
1. a) 100 ÷ 2 = 50 80 ÷ 2 = 40
8 ÷ 2 = 4
50 + 40 + 4 = 94
So, 188 ÷ 2 = 94

b) 180 ÷ 3 = 60 9 ÷ 3 = 3
60 + 3 = 63
So, 189 ÷ 3 = 63

c) 150 ÷ 5 = 30 45 ÷ 5 = 9
30 + 9 = 39
So, 195 ÷ 5 = 39

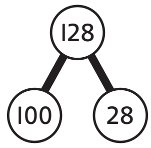
d) 250 ÷ 5 = 50 25 ÷ 5 = 5
50 + 5 = 55
So, 275 ÷ 5 = 55

2. a)



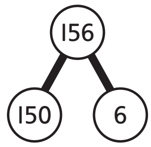
128 ÷ 2 = 64

b)



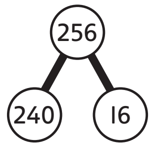
128 ÷ 2 = 64

c)



156 ÷ 3 = 52

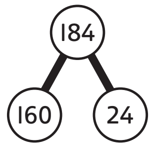
d)



256 ÷ 4 = 64

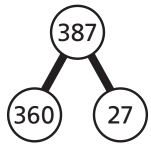
3. a) 37
b) 44
c) 156
d) 124

4. a)



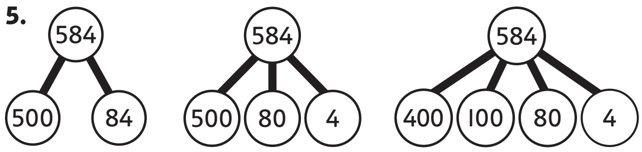
184 ÷ 4 = 46

b)



360 ÷ 9 = 40 and 27 ÷ 9 = 3;
387 ÷ 9 = 43

5.



(or acceptable alternative)

Reflect

Methods may vary; for example:
Use a part-whole model to split 172 into 160 and 12. Then divide 160 by 4 to give 40 and 12 by 4 to give 3. 40 + 3 = 43 so 172 ÷ 4 = 43. This method works since 172 is split into numbers that are easily divisible by 4 (different answers and partitions possible).

Lesson 15: Problem solving – division

→ pages 48–50

1. 96 ÷ 2 = 48 Each class gets 48 pens.

2. 57 ÷ 3 = 19 They each get £19.

3. 44 ÷ 5 = 8 r 4 9 benches are needed.

4. True. 77 ÷ 2 = 38 r 1; 49 ÷ 4 = 12 r 1. The remainder is 1 in both cases.
5. Different answers possible, for example: 35 ÷ 4 = 8 r 3, 43 ÷ 5 = 8 r 3, 51 ÷ 6 = 8 r 3, 83 ÷ 10 = 8 r 3
6. No, the remaining children cannot stand in pairs. 7 × 5 = 35 and 58 – 35 = 23. There is an odd number of children remaining (23); this is not divisible by 2.

Reflect

Explanations may vary; for example:
If a number ends in a 0 or a 5 it is divisible by 5, so any number that does not end in a 0 or a 5 will have a remainder. For a number to be divisible by 3 it must be in the 3 times-table or can be partitioned into numbers that are divisible by 3.

End of unit check

→ pages 51–53

My journal

1.

$$\begin{array}{r} 4\,5 \\ \times \quad 7 \\ \hline 3\,1\,5 \\ \hline {}_{3}\ \ \end{array} \qquad \begin{array}{r} 1\,3\,2 \\ \times \quad 6 \\ \hline 7\,9\,2 \\ \hline {}_{1\ 1}\ \ \ \end{array}$$

78 can be partitioned into 60 and 18, 60 ÷ 6 = 10, 18 ÷ 6 = 3, 68 ÷ 6 = 13 (other partitions possible).
94 can be partitioned into 50 and 44, 50 ÷ 5 = 10, 44 ÷ 5 = 8 r 4, 94 ÷ 5 = 18 r 4 (other partitions possible).

2. The answers are the same (126 × 3 = 378) whichever method is used. On the left-hand side there is the expanded method for column multiplication whereas on the right-hand side they have carried over the tens.

Power puzzle

1.

Number divided by	2	3	4	5	6	7	8
Remainder	1	1	1	4	1	0	1

2.

Number divided by	2	3	4	5	6	7	8
Remainder	0	2	2	0	2	1	2

3.

Number divided by	2	3	4	5	6	7	8
Remainder	1	0	3	1	3	2	3

4. When dividing by 2 there is a remainder for odd numbers but no remainder for even numbers.
The remainders increase by 1 as the numbers increase (i.e. from 48 to 49 to 50 to 51) until a number divisible by that number is reached and then the remainder is 0.
5. This must be an odd number because it leaves a remainder of 1 when divided by 2. It is divisible by 3. It ends in either a 2 or a 7 (because it has a remainder of 2 when divided by 5). However, if it ends in a 2 it is even and so this is not possible. It must end in a 7. One number that ends in a 7 and is divisible by 3 is 27. Now, checking the other remainders:
27 ÷ 4 = 6 r 3
27 ÷ 5 = 5 r 2
27 ÷ 6 = 4 r 3
27 ÷ 7 = 3 r 6
27 ÷ 8 = 3 r 3

So, 27 is an answer. Other answers are possible, for example: 867; 1,707; … (adding 840 each time).

Unit 7: Measure – area

Lesson 1: What is area?

➜ pages 54–56

1. a) Answers will depend on the size of counters.
   b) This is its area.
2. a) The area of this quadrilateral is 9 dominoes.
   b) The area of this triangle is 15 buttons.
3. a) Area is the word used to describe the space inside a 2D shape.
   b) The space inside each shape should be shaded.
4. Boxes for a), b) and d) ticked (accept other answers with reasoning; for example, a child may argue that a) does not properly show area as the space taken up by each child will be different).
5. Explanations will vary, but should reference the following:
   All playing cards cover the same space but coins of different value cover different space so are not good objects to measure area.
6. This is sometimes true. It depends on the shape and its size.

Reflect

The area will vary depending on the item chosen. Explanations of how to measure area may vary; for example: The area can be measured by counting how many counters it takes to cover it.

Lesson 2: Counting squares (1)

➜ pages 57–59

1. A ➜ Area = 8 squares
   B ➜ Area = 3 squares
   C ➜ Area = 6 squares
   D ➜ Area = 5 squares
   E ➜ Area = 7 squares
2. a)

Shape	Area (squares)
A	5
B	4
C	9
D	6
E	9

   b) Shapes C and E have the same area.
3. The area of the piece of paper is 8 squares.
4. He has not fitted the shapes together exactly so the squares do not completely fill the space.
5. T A B L E T O P

6. a) 1, 4, 9, 16
   b) 25, 36, 49
   Each shape is a square and so has equal sides.
   The sequence is the square numbers i.e. 1 × 1 = 1, 2 × 2 = 4, 3 × 3 = 9, 4 × 4 = 16, 5 × 5 = 25, 6 × 6 = 36, 7 × 7 = 49 …

Reflect

Explanations may vary; for example:
The area is the space a shape takes up and is measured in squares. The area of a shape can be found by counting the number of squares that can fit in it.

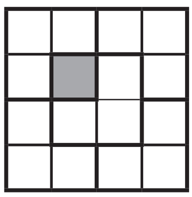
Lesson 3: Counting squares (2)

➜ pages 60–62

1. a)

Object	Area (squares)
Desk	10
Chair	5
Wardrobe	18
Mat	10
Bookshelf	7
Bed	32
Answers will vary	Answers will vary

   b) Answers will vary depending on object.
2. Rectangle A has an area of 18 squares.
   Rectangle B has an area of 10 squares.
   Area of A + B = 18 squares + 10 squares = 28 squares.
   The whole shape has an area of 28 squares.
3. Answers will vary depending on rectangles drawn.
   Total area will be a multiple of 3.
4. 20 squares
5. Different answers possible. Each field should have an area of 3 squares; for example:



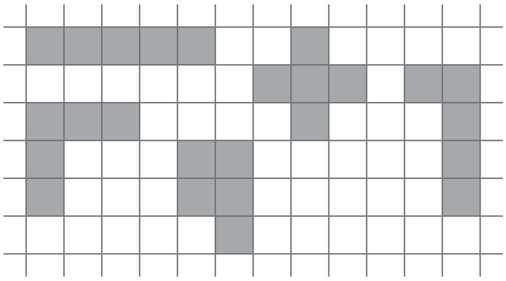
Reflect

Methods may vary; for example:
Line up the sides of the shape with the edges of the squares as much as possible. Draw around the cardboard shape and then count the number of squares within the shape outline.

Lesson 4: Making shapes

➜ pages 63–65

1. Answers will vary. Children should draw five rectilinear shapes with an area of 5 squares, for example:



2. Answers will vary. Children should draw two rectilinear shapes with an area of 6 squares.
3. Ticked: 1st shape (made from four 2×2 concrete slabs) and 2nd shape (made from four 1×1 concrete slabs).
4. a) The 1st and 3rd shapes and the 2nd, 4th and 5th shapes are the same. They have included shapes which are reflections and rotations of each other.
   b) They could try turning the page to view shapes from different positions or cut the shapes out of paper to see if they fit into the area of another shape.
5. Answers will vary depending on letters and how they are drawn. Children should work out the area of letters in their name.

Reflect

Descriptions may vary; for example:

1. Make a chain of the squares.
2. Then move only 1 of the squares to begin with.
3. Then move 2 of the squares at a time, repeating with an extra square each time while checking for reflections and rotations.

Lesson 5: Comparing area

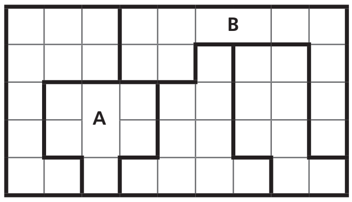
➜ pages 66–68

1. a) Answers will vary.
   b)

Player	Area of shape
Abdul	52
Bryony	38
Chloe	50

   c) Abdul has won since he has made the shape with the largest area.

2. a) and b)



   c) The area of the whole board is 45 squares.

3. a) 5 squares and 4 squares; shape on the left coloured
   b) 3 squares and 1 square; shape on the left coloured
   c) 9 squares and 10 squares; shape on the right coloured
   d) 7 squares and 7 squares; neither shape coloured (same size)
4. Sometimes true; the area of the shape depends not only on its height and width but also on its shape.

Reflect

Methods may vary; for example:
To compare the areas of two shapes, I would count the number of squares inside each shape to find out which one had the larger area.

End of unit check

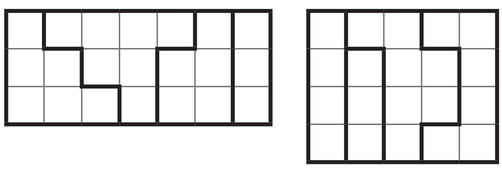
➜ pages 69–70

My journal

Shapes will vary but are likely to be rectangles with areas of 12 squares, i.e. 1×12, 2×6 and 3×4. Look for children deciding on the measurements for their shapes by finding factors of 12 (1, 2, 3, 4, 6, 12) demonstrating understanding of the link between area and multiplication.

Power play

a)



Students could add together the number of squares of all the pieces to find the area of the two rectangles then see how this area can be divided into 2 to give the size of the two rectangles.

b) The areas of the chocolate bars are 20 squares and 21 squares.

c) Answers will vary but look for answers explaining that the longer, narrower bar has an area of 21 squares and so is bigger than the area of the other rectangle which is 20 squares. Therefore, they would likely choose the bigger bar of chocolate!

Unit 8: Fractions (I)

Lesson I: Tenths and hundredths (I)

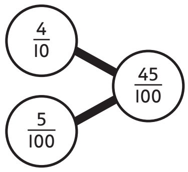
➜ pages 71–73

1. a) 9 tenths are shaded. $\frac{9}{10}$ are shaded.
b) 83 hundredths are shaded. $\frac{83}{100}$ are shaded.
c) 7 tenths are shaded.
d) 3 tenths are shaded. $\frac{3}{10}$ are shaded.
e) 65 hundredths are shaded. $\frac{65}{100}$ are shaded.

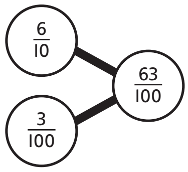
2. a) 7 squares shaded on the tenths grid; 70 squares shaded on the hundredths grid.
b) 31 squares shaded on the hundredths grid. $\frac{69}{100}$ are not shaded.

3. Explanations will vary; for example:
Andy is correct because 96 squares are shaded on the hundredths grid and each square is $\frac{1}{100}$.
Bella is correct because $\frac{9}{10} + \frac{6}{100} = \frac{90}{100} + \frac{6}{100} = \frac{96}{100}$.
Emma is correct because $\frac{8}{10} + \frac{16}{100} = \frac{80}{100} + \frac{16}{100} = \frac{96}{100}$.

4. There are 4 tenths and 5 hundredths.
$\frac{4}{10} + \frac{5}{100} = \frac{45}{100}$



There 6 tenths and 3 hundredths.
$\frac{6}{10} + \frac{3}{100} = \frac{63}{100}$



Reflect

Methods may vary; for example:
Divide the square piece of paper into one hundred smaller squares. Shading 10 squares would give a tenth and shading 1 square would equal a hundredth.

Lesson 2: Tenths and hundredths (2)

➜ pages 74–76

1. $\frac{3}{10}, \frac{4}{10}, \frac{5}{10}, \frac{6}{10}, \frac{8}{10}, \frac{9}{10}$

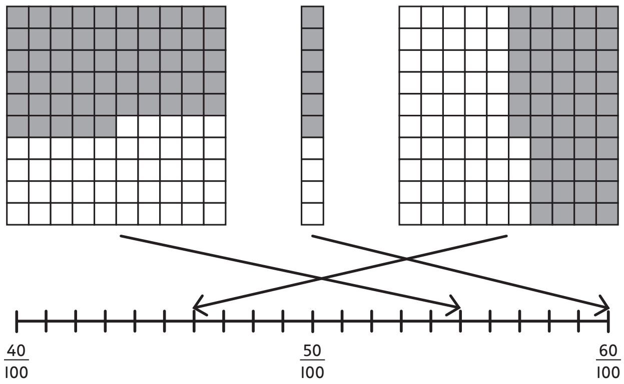
2. a) The fraction shown is 61 hundredths or $\frac{61}{100}$.
b) The fraction shown is 9 tenths or $\frac{9}{10}$.
c) The fraction shown is $\frac{99}{100}$.

3. Answers will vary; for example:
It is the same because $\frac{30}{100}$ on the hundredths grid is 3 columns of 10 small squares, this is equivalent to shading 3 columns on the tenths grid (i.e. $\frac{3}{10}$), so $\frac{3}{10} = \frac{30}{100}$.

4. a) $\frac{7}{10} = \frac{70}{100}$ c) $\frac{1}{10} = \frac{10}{100}$
b) $\frac{5}{10} = \frac{50}{100}$ d) $\frac{9}{10} = \frac{90}{100}$

5. a) $\frac{32}{100} = \frac{3}{10} + \frac{2}{100}$ b) $\frac{87}{100} = \frac{8}{10} + \frac{7}{100}$

6. $\frac{55}{100}$ ➜ 5 marks to the right of $\frac{50}{100}$
$\frac{6}{10}$ ➜ $\frac{60}{100}$
$\frac{46}{100}$ ➜ 6 marks to the right of $\frac{40}{100}$



Reflect

Explanations may vary; for example:
No. Although 5 squares are shaded in both diagrams, the grids are different. The diagram on the left shows $\frac{5}{10}$ and the diagram on the right shows $\frac{5}{100}$.

Lesson 3: Equivalent fractions (I)

➜ pages 77–79

1. a) $\frac{2}{3} = \frac{4}{6}$
b) $\frac{6}{8} = \frac{3}{4}$
c) $\frac{5}{10} = \frac{4}{8} = \frac{6}{12}$

2. a) $\frac{5}{8}$ is not equal to $\frac{1}{2}$.
b) $\frac{3}{6}$ is not equal to $\frac{3}{9}$.
c) $\frac{4}{8}$ is not equal to $\frac{1}{4}$.
d) $\frac{4}{6}$ is equal to $\frac{6}{9}$.
e) $\frac{4}{4}$ is equal to $\frac{9}{9}$.

3. a) Top strip with $\frac{1}{3}$ shaded (1 section) and bottom strip with $\frac{3}{9}$ (3 sections) shaded.
b) Top strip with $\frac{2}{5}$ (2 sections) shaded and bottom strip with $\frac{4}{10}$ (4 sections) shaded.
c) Top strip with $\frac{1}{4}$ (1 section) shaded, middle strip with $\frac{2}{8}$ (2 sections) shaded and bottom strip with $\frac{3}{12}$ (3 sections) shaded.

4. Lee is incorrect. Explanations may vary; for example: Lee's strip is divided into 4 sections (quarters) and Zac's strip is divided into 8 sections (eighths). So Lee's fraction strip shows $\frac{3}{4}$ and Zac's shows $\frac{3}{8}$ and $\frac{3}{4} > \frac{3}{8}$.

Reflect

Explanations will vary; for example:
Each strip on a fraction wall shows one whole divided into different fractions. Equivalent fractions will line up on the fraction wall.

Lesson 4: Equivalent fractions (2)

➜ pages 80–82

1. a) $\frac{1}{2} = \frac{3}{6}$
b) 8 sections of right-hand diagram shaded; $\frac{4}{5} = \frac{8}{10}$
c) 2 sections of right-hand diagram shaded; $\frac{1}{4} = \frac{2}{8}$
d) Answers will vary but fractions should be equivalent to $\frac{2}{3}$; $\frac{10}{15} = \frac{2}{3}$

2. a) $\frac{1}{2} = \frac{4}{8}$
b) $\frac{3}{4} = \frac{15}{20}$
c) $\frac{3}{5} = \frac{9}{15}$
d) $\frac{1}{6} = \frac{4}{24}$
e) $\frac{2}{7} = \frac{6}{21}$
f) Answers will vary but fractions should be equivalent to $\frac{5}{6}$.

3. Lines drawn to connect equivalent fractions: $\frac{1}{5} = \frac{4}{20}$
$\frac{2}{3} = \frac{4}{6}$
$\frac{10}{20} = \frac{1}{2}$
$\frac{5}{6} = \frac{10}{12}$
$\frac{2}{9} = \frac{6}{27}$
$\frac{11}{12} = \frac{55}{60}$

4. a) Answers will vary but left-hand numerator should be 9 × right-hand numerator each time; for example:
$\frac{9}{45} = \frac{1}{5}, \frac{18}{45} = \frac{2}{5}, \frac{27}{45} = \frac{3}{5}$
b) Answers will vary but right-hand denominator should be 3 × left-hand denominator each time; for example:
$\frac{6}{8} = \frac{18}{24}, \frac{6}{9} = \frac{18}{27}, \frac{6}{10} = \frac{18}{30}$

5. a) Answers will vary; for example: $\frac{5}{6} = \frac{10}{12} = \frac{15}{18} = \frac{20}{24}$
b) Answers will vary; for example: $\frac{10}{10} = \frac{20}{20} = \frac{30}{30} = \frac{40}{40}$
c) Answers will vary; for example: $\frac{1}{8} = \frac{2}{16} = \frac{3}{24} = \frac{4}{32}$

6. Explanations will vary; for example:
12 and 20 are both divisible by 4 so $\frac{12}{20} = \frac{3}{5}$. Multiplying both the numerator and the denominator by 3 gives $\frac{9}{15}$. So $\frac{12}{20} = \frac{9}{15}$, i.e. they are equivalent.

Reflect

Methods will vary; for example:
Multiplying the numerator and denominator by the same number will give equivalent fractions or you can use a fraction wall to find fractions that line up.

Lesson 5: Simplifying fractions

➜ pages 83–85

1. a) $\frac{2}{10} = \frac{1}{5}$
b) Dividing the numerator and denominator by 5; $\frac{5}{10} = \frac{1}{2}$

2. a) $\frac{6}{9} = \frac{2}{3}$ b) $\frac{10}{12} = \frac{5}{6}$

3. Lines drawn to match the diagrams with the fractions:
Top diagram ➜ $\frac{3}{4}$
Middle diagram ➜ $\frac{1}{2}$
Bottom diagram ➜ $\frac{4}{5}$

4. Richard ate $\frac{8}{20}$, Zac ate $\frac{3}{5} = \frac{12}{20}$ and Ambika ate $\frac{8}{10} = \frac{16}{20}$.
Richard ate the least amount of chocolate.

5. a) Divide numerator and denominator by 6 (giving $\frac{2}{5}$).
b) Divide numerator and denominator by 8 (giving $\frac{1}{4}$).
c) Divide numerator and denominator by 18 (giving $\frac{1}{2}$).

6. No, Lee is incorrect. The numerator and denominator are both divisible by 3 and so can be simplified further, i.e. $\frac{3}{9} = \frac{1}{3}$.

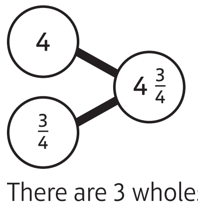
Reflect

Explanations may vary, but should reference that a fraction is in its simplest form when there is no number (other than 1) that will divide into both the numerator and the denominator.

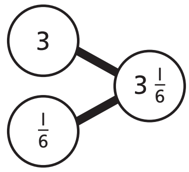
Lesson 6: Fractions greater than 1 (1)

➜ pages 86–88

1. a) There are 4 wholes and $\frac{3}{4}$ or $4\frac{3}{4}$ circles.



b) There are 3 wholes and $\frac{1}{6}$ or $3\frac{1}{6}$ hexagons.

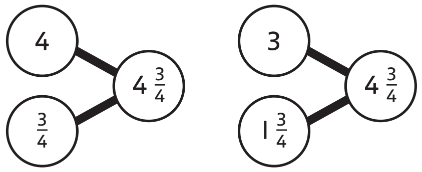


2. There are 2 wholes and $\frac{5}{8}$ or $2\frac{5}{8}$ rectangles shaded.

3. a) 1 whole rectangle shaded and 3 columns shaded on other rectangle.
b) 3 wholes circles shaded with 3 segments shaded on final circle.

4. a) 14
b) 2, 2
c) $2\frac{2}{6}$
d) 13
e) 2, 1
f) $2\frac{1}{6}$

5. Answers will vary; for example:



Reflect

Answers will vary and could include a part-whole model splitting $2\frac{3}{4}$, fraction strips or shapes showing $2\frac{3}{4}$.

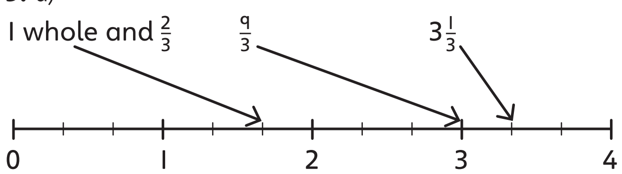
Lesson 7: Fractions greater than I (2)

➜ **pages 89–91**

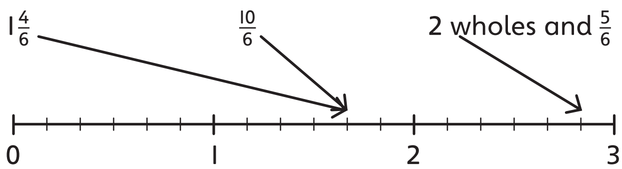
1. a) 1 whole box is used.
b) $\frac{5}{8}$ of a box is used.

2. a) $\frac{9}{4}$ (or $2\frac{1}{4}$) b) $\frac{16}{9}$ (or $1\frac{7}{9}$)

3. a)



b)



4. a) 2 wholes and $\frac{2}{5} = \frac{12}{5}$
b) $\frac{9}{6}$ = 1 whole and $\frac{3}{6} = 1\frac{3}{6}$

5. $\frac{10}{3}$, 3 wholes and $\frac{1}{3} = 3\frac{1}{3}$

6. Yes, the arrow is pointing to $1\frac{1}{2}$. Explanations may vary; for example: the line shows $\frac{12}{8}$ which written as a mixed number is $1\frac{4}{8}$ which simplifies to $1\frac{1}{2}$.

Reflect

Fractions greater than 1 can be written as mixed numbers or improper fractions. A mixed number has whole numbers and parts, and improper fractions have numerators that are larger than the denominators.

Answers will vary as to which children prefer.

End of unit check

➜ **pages 92–93**

My journal

$\frac{3}{12}$ simplifies to $\frac{1}{4}$; fractions that are equivalent to $\frac{1}{4}$ include $\frac{2}{8}$, $\frac{4}{16}$, $\frac{5}{20}$ (other answers possible)

$\frac{6}{18}$ simplifies to $\frac{1}{3}$; fractions that are equivalent to $\frac{1}{3}$ include $\frac{2}{6}$, $\frac{3}{9}$, $\frac{4}{12}$ (other answers possible)

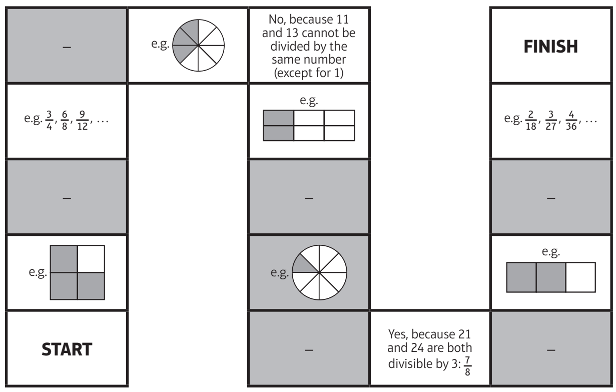
$\frac{11}{20}$ cannot be simplified; fractions that are equivalent to $\frac{11}{20}$ include $\frac{22}{40}$, $\frac{33}{60}$, $\frac{44}{80}$ (other answers possible)

Explanations will vary but should show that children know when a fraction cannot be further simplified.

Power play

Children may choose to use a number line, hundredths grid or shapes to help them with the game.

Answers will vary; for example:



Unit 9: Fractions (2)

Lesson 1: Adding fractions

➜ pages 94–96

1. $\frac{4}{5} + \frac{2}{5} = 1\frac{1}{5}$. Tino eats $1\frac{1}{5}$ bales of hay.

2. $\frac{7}{9} + \frac{5}{9} = \frac{12}{9}$. Alexis runs $\frac{12}{9}$ km in total.

3. a) $\frac{6}{4}$ c) $\frac{16}{12}$ e) $\frac{9}{5}$

b) $\frac{6}{5}$ d) $\frac{13}{10}$ f) $\frac{13}{9}$

4. Calculations matched to answers:

$\frac{6}{7} + \frac{3}{7} = 1\frac{2}{7}$

$\frac{5}{7} + \frac{1}{7} + \frac{6}{7} = \frac{12}{7}$

$\frac{3}{7} + \frac{4}{7} = 1$

$\frac{6}{7} + \frac{5}{7} = \frac{11}{7}$

5. a) Fred has added the numerators together and then the denominators together, rather than adding just the numerators and leaving the denominator the same.

b) $\frac{10}{8}$ (children may write this as $\frac{5}{4}$ or $1\frac{2}{8}$ or $1\frac{1}{4}$)

6. Missing numbers:

a) 3, 3, 4

b) 6, 4, 5

c) Different answers are possible; for example:

$\frac{15}{8} = \frac{3}{8} + \frac{6}{8} + \frac{6}{8}$ (missing numerators total 12)

$\frac{15}{8} = \frac{4}{8} + \frac{5}{8} + \frac{6}{8}$ (missing numerators total 11)

$\frac{15}{8} = \frac{5}{8} + \frac{5}{8} + \frac{5}{8}$ (missing numerators total 10)

$\frac{15}{8} = \frac{6}{8} + \frac{5}{8} + \frac{4}{8}$ (missing numerators total 9)

Reflect

Diagrams may vary; for example, children may draw a number line marked in fifths and count on $\frac{4}{5}$ from $\frac{4}{5}$. Alternatively, children may draw two shapes divided into fifths with $\frac{4}{5}$ of each shaded.

Lesson 2: Subtracting fractions (1)

➜ pages 97–99

1. $2\frac{7}{10} - \frac{9}{10} = 1\frac{8}{10}$ Rusty ate $1\frac{8}{10}$ kg this week.

2. $3\frac{1}{5} - \frac{4}{5} = \frac{12}{5}$ (or $2\frac{2}{5}$)

3. a) $1\frac{4}{8}$ b) $2\frac{5}{9}$ c) $1\frac{8}{11}$

4. a) 3 b) $\frac{1}{7}$

5. a) $1\frac{3}{5}$ d) $2\frac{5}{8}$

b) $2\frac{2}{3}$ e) $6\frac{6}{12}$

c) $\frac{6}{8}$ f) $5\frac{1}{8} - \frac{5}{8} = 4\frac{4}{8}$

g) Answers may vary; for example: $3\frac{1}{6} - \frac{7}{6} = 2$

h) $4\frac{2}{10}$ i) $\frac{3}{5}$

6. $4\frac{2}{9}$ m

Reflect

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

Diagrams may vary; for example, children may draw a fraction strip showing $2\frac{1}{5}$ with $\frac{3}{5}$ crossed out.

Lesson 3: Subtracting fractions (2)

➜ pages 100–102

1. $2 - \frac{3}{8} = 1\frac{8}{8} - \frac{3}{8} = 1\frac{5}{8}$. Amelia has $1\frac{5}{8}$ cake left.

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

b) $3 - \frac{2}{5} = 2\frac{3}{5}$ e) $3 - \frac{5}{5} = 2\frac{0}{5}$

c) $3 - \frac{3}{5} = 2\frac{2}{5}$

3. a) $2\frac{3}{7}$

b) Explanations may vary; for example:
Mary has worked out the answer to $\frac{5}{7} - \frac{2}{7}$, not $5 - \frac{2}{7}$.
The correct answer is $5 - \frac{2}{7} = 4\frac{7}{7} - \frac{2}{7} = 4\frac{5}{7}$

4. a) $3\frac{3}{9}, 3\frac{2}{9}, 3\frac{1}{9}$ c) $9\frac{1}{3}, 7\frac{1}{3}, 5\frac{1}{3}$

b) $4\frac{3}{9}, 4\frac{2}{9}, 4\frac{1}{9}$ d) $5\frac{1}{4}, 5\frac{1}{5}, 5\frac{1}{10}$

5. a) $\frac{4}{7}$ c) $15\frac{7}{9}$ e) 5

b) $\frac{2}{3}$ d) $\frac{2}{3}$ f) 10

6. Explanations may vary; for example:
No, after 60 mins Jen will have run
$\frac{5}{8} + \frac{5}{8} + \frac{5}{8} + \frac{5}{8} + \frac{5}{8} + \frac{5}{8} = \frac{30}{8} = 3\frac{6}{8}$ km.

Reflect

No, the calculation is not correct. $4 - \frac{3}{4} = 3\frac{1}{4}$. Diagrams may vary; for example, children could draw 4 circles divided into quarters; subtracting 3 quarters leaves 3 wholes and 1 quarter.

Lesson 4: Problem solving – adding and subtracting fractions (1)

➜ pages 103–105

1 a) $3 - \frac{5}{7} = 2\frac{7}{7} - \frac{5}{7} = 2\frac{2}{7}$
There is $2\frac{2}{7}$ kg of flour left in the cupboard.

b) $\frac{5}{7} + \frac{6}{7} = \frac{11}{7}$ Tulpesh uses $1\frac{4}{7}$ kg of flour.

c) $2\frac{2}{7}$ kg of flour is used in total.

2. The farmer ploughed $1\frac{2}{7}$ acres of his field in total.

3. $\frac{9}{17}$ of the juice is remaining.

4. There are many possible ways; for example: $\frac{3}{8} + \frac{9}{8} - \frac{5}{8} = \frac{7}{8}$

5. $\frac{4}{7}$ kg of strawberries were left.

Reflect

Many different answers are possible. Encourage children to demonstrate an understanding of adding or subtracting fractions using common denominators. They should be able to fluently convert whole numbers to fractions and vice versa as necessary.

Lesson 5: Problem solving – adding and subtracting fractions (2)

➜ pages 106–108

1. $\frac{12}{8}$ of the Spanish omelettes have been eaten in total.

2. Missing numbers:

a) 2 d) 2 f) 3
b) 4 e) 3 g) 2
c) 5
h) The possible calculations are: $\frac{1}{5} + \frac{1}{5} + \frac{5}{5}$; $\frac{1}{5} + \frac{2}{5} + \frac{4}{5}$; $\frac{1}{5} + \frac{3}{5} + \frac{3}{5}$; $\frac{2}{5} + \frac{2}{5} + \frac{3}{5}$ (together with variations where fractions are written in a different order).

3. Missing numbers:

a) 4 b) 10 c) 2

4. Explanations may vary but should reference the following:
$\frac{3}{8} + \frac{7}{8} + \frac{7}{8} = \frac{17}{8} = \frac{8}{8} + \frac{8}{8} + \frac{1}{8} = 2\frac{1}{8}$. Two full jars with $\frac{1}{8}$ left over.

5. Florence runs $2\frac{1}{4}$ km more than Kofi.

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

Reflect

Many different calculations are possible; for example:
$1 + \frac{7}{10} = \frac{10}{10} + \frac{7}{10} = \frac{17}{10}$
Encourage children to demonstrate confidence when they convert whole numbers to fractions and vice versa.

Lesson 6: Calculating fractions of a quantity

➜ pages 109–111

1 a) 42 ÷ 7 = 6; The small teddy bear is 6 cm tall.
b) 42 ÷ 7 = 6
6 × 4 = 24; The medium teddy bear is 24 cm tall.

2. a) 10 m b) 18 kg c) £15

3. Working out may vary, but look for children recognising the following:
The statement is true: 24 ÷ 8 = 3, so $\frac{3}{8}$ of 24 is 3 × 3 = 9; 36 ÷ 4 = 9, so $\frac{1}{4}$ of 36 is 9.

4. Calculations matched to answers:
$\frac{2}{3}$ of 18 ➜ 12; $\frac{1}{9}$ of 18 ➜ 2
$\frac{5}{6}$ of 18 ➜ 15; $\frac{7}{18}$ of 18 ➜ 7

5. Missing numbers:

a) 6 c) 7
b) 40 d) $\frac{5}{6}$

6. $\frac{5}{7}$ of 56 is 40 so Chloe scored 40 marks in the test.
$\frac{3}{8}$ of 56 is 21 so Mike got 21 marks wrong in the test. He therefore scored 56 – 21 = 35 marks in the test. Chloe got 5 more marks than Mike.

Reflect

Different contexts and answers are possible, but most are likely to be based on the calculation $\frac{7}{9}$ of 45 cm is 35 cm. For example: A piece of ribbon is 45 cm long. Amy cuts $\frac{7}{9}$ of the ribbon. How long is the piece Amy cuts?

Lesson 7: Problem solving – fraction of a quantity (1)

➜ pages 112–114

1 a) 3 × 6 = 18. Amelia has to complete 18 questions in total.
b) 12 ÷ 2 = 6 6 × 5 = 30
Amelia has to learn 30 spellings in total.

2. a) 25 b) 108

3. There were 30 buttons at the start.

4. Ethan gives £30 to his friend.

5. a) 15 b) 4

6. The total distance Jen and Toshi have to drive is 72 km.

Reflect

Different diagrams are possible, for example, a bar model split into 5 equal sections with 3 sections labelled as £60. 1 section is equal to £20 and so the whole amount is 5 × £20 = £100.

Lesson 8: Problem solving – fraction of a quantity (2)

➜ pages 115–117

1. $\frac{2}{9}$ of 36 is greater.

2. a) 60 b) 45

3. a) Red = 2; Blue = 6; Yellow = 8
b) Red = 24; Blue = 6; Green = 10

4. 387

5. Missing numbers:

a) 36 b) 5

Reflect

Explanations may vary; for example:
If $\frac{2}{3}$ of a number is equal to 18 then to find $\frac{1}{3}$ it is necessary to divide by 2 (not 3). This gives $18 \div 2 = 9$ and so $\frac{1}{3}$ of the number is equal to 9. To find the original number it is necessary to find 3 thirds ($\frac{3}{3} = 1$) and so to multiply by 3 (not 2) to give $9 \times 3 = 27$. The original number is 27 not 12.

End of unit check

➜ pages 118–119

My journal

1. a) $1 = \frac{6}{6}$ so, $1\frac{5}{6} = \frac{6}{6} + \frac{5}{6} = \frac{11}{6}$

b) $\frac{5}{6} + \frac{3}{6} = \frac{8}{6} = \frac{6}{6} + \frac{2}{6} = 1\frac{2}{6}$

c) $2 = 1 + \frac{6}{6}$ so, $2 - \frac{5}{6} = 1\frac{6}{6} - \frac{5}{6} = 1\frac{1}{6}$

Power puzzle

Emma gets 8 grapes, Andy gets 13 grapes, Reena gets 9 grapes and Lee gets 9 grapes.

Holly eats 9 grapes in total. Andy gets the most grapes.

Unit 10: Decimals (1)

Lesson 1: Tenths (1)

➜ pages 120–122

1. a) This shows $\frac{2}{10}$ or 0·2.
   b) This shows $\frac{4}{10}$ or 0·4.
   c) The white cubes represent $\frac{7}{10}$ or 0·7.
   The grey cubes represent $\frac{3}{10}$ or 0·3.
   d) The white beads represent $\frac{4}{10}$ or 0·4.
   The grey beads represent $\frac{6}{10}$ or 0·6.
2. a) 3 tenths counters in the tenths (Tth) column.
   b) 1 counter in 8 squares of the ten frame (8 counters in total).
3. Missing numbers:
   a) 0·1 c) $\frac{7}{10}$
   b) $\frac{3}{10}$ d) 0·6
4. 0·2, 0·3, … , 0·5, 0·6, … , 0·9, 1·0
5. Emma is incorrect because $\frac{1}{10}$ as a decimal is 0·1 (the digit 1 written in the tenths column).
6. Alex is thinking of 0·8.

Reflect

Various representations are possible including 6 tenths counters in a place value grid, 6 counters in a ten frame, a fraction strip divided into 10 with 6 sections shaded and as a fraction $\frac{6}{10}$.

Lesson 2: Tenths (2)

➜ pages 123–125

1. a) The number 4·3 has 4 ones and 3 tenths.
   b) The number 2·6 has 2 ones and 6 tenths.
   c) 4 tens counters and 6 tenths counters in the place value grid; the number 40·6 has 4 tens, 0 ones and 6 tenths.
   d) 7 tens counters, 5 tens counters and 1 tenth counters in the place value grid; the number 75·1 has 7 tens, 5 ones and 1 tenth.
2. a) The shaded parts represent $\frac{13}{10}$ or 1·3.
   b) 23 tenths shaded (2 wholes and 3 tenths).
3. Statements matched:
   This number has 7 tenths ➜ 0·7
   The digit in the tenths column is 1 more than the digit in the ones column ➜ 74·5
   There are more ones than tenths ➜ 7·6
   This number has 15 tenths ➜ 1·5
4. 1·0
5. a) The largest number that could be made is 8·7.
   b) The smallest number that could be made is 2·6.
   c) 82 < 82·6 < 83 82 < 82·7 < 83

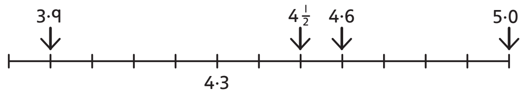
Reflect

Max is incorrect. The one is in the tens column, not the tenths column. The value of each digit is 1 ten, 2 ones and 3 tenths.

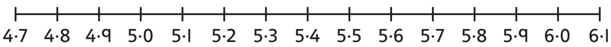
Lesson 3: Tenths (3)

➜ pages 126–128

1. a) The worm is 1·2 cm long.
   b) The ladybird is 0·8 cm long.
2. a) The container holds 9·5 ml of water.
   b) The container holds 15·9 ml of water.
3. a) The grasshopper is 9·6 cm long.
   b) The second grasshopper is 8·9 cm long.
4. 3·9, 4, 4·1, 4·2, 4·3, 4·4, …, 4·6, 4·7, 4·8, 4·9, …, 5·1, 5·2
5. Arrows drawn to correct mark on number line:



6. Explanations may vary but should reference the following:
   The number '4·10' has been incorrectly written. This number is one tenth (0·1) more than 4·9 and so is 5.



Reflect

It is true. Both numbers have 5 wholes. $\frac{4}{10}$ is 4 tenths, which is written as a decimal as 0·4. So, $5\frac{4}{10}$ = 5·4

Lesson 4: Dividing by 10 (1)

➜ pages 129–131

1. a) 2 ones = 20 tenths
   20 tenths ÷ 10 = 2 tenths
   2 ÷ 10 = 0·2
   b) 8 ones = 80 tenths
   80 tenths ÷ 10 = 8 tenths
   So 8 ÷ 10 = 0·8
   c) 7 ÷ 10 = 0·7
2. Each section in the bar model represents 0·5;
   5 ÷ 10 = 0·5
3. Explanations may vary but should reference the following:
   1 ones counter is equal to 10 tenths counters.
   However, Max is dividing by 10 and so dividing 1 whole (or 10 tenths) by 10 gives 1 tenth, i.e. 1 ÷ 10 = $\frac{1}{10}$ or 0·1.
4. a) 6 ÷ 10 = 0·6 e) 4 ÷ 10 = 0·4
   b) 8 ÷ 10 = 0·8 f) 0·5 = 5 ÷ 10
   c) 1 ÷ 10 = 0·1 g) 0·3 = 3 ÷ 10
   d) 0 ÷ 10 = 0 h) 10 ÷ 10 = 1

5. I disagree because 5 ÷ 10 = 0·5 or $\frac{5}{10}$. Explanations may vary; for example: using a place value grid and exchange shows that 5 is equal to 50 tenths. Dividing 50 tenths by 10 gives 5 tenths or 0·5.

6. Explanations of patterns may vary; for example, when a single-digit number is divided by 10 the answer will have the digit in the tenths column and 0 in the ones column.
The pattern will continue: 4 ÷ 10 = 0·4; 5 ÷ 10 = 0·5, …

Reflect

Methods will vary but children could include using a place value grid and exchange to convert the ones into tenths and then divide these by 10. Answers should show that when a single-digit number is divided by 10 the answer will have the digit in the tenths column and 0 in the ones column.

Lesson 5: Dividing by 10 (2)

→ pages 132–134

1. a) 2 tens = 20 ones
20 ones ÷ 10 = 2 ones
4 ones = 40 tenths
40 tenths ÷ 10 = 4 tenths
So, 24 ÷ 10 = 2 ones and 4 tenths = 2·4
b) 4 tens = 40 ones
40 ones ÷ 10 = 4 ones
5 ones = 50 tenths
50 tenths ÷ 10 = 5 tenths
So, 45 ÷ 10 = 4 ones and 5 tenths = 4·5
c) 51 ÷ 10 = 5·1

2. 28 ÷ 10 = 2·8

3. Explanations may vary; for example:
The 4 tens are equal to 40 ones, the 7 ones are equal to 70 tenths. 40 ones ÷ 10 = 4 ones and 70 tenths ÷ 10 = 7 tenths. 4 ones + 7 tenths = 4.7.
The digits stay the same but their positions in the place value grid change as they move one column to the right.

4. False
False
True
True

5. a) 46 ÷ 10 = 4·6
b) 18 ÷ 10 = 1·8
c) 72 ÷ 10 = 7·2
d) 3·9 = 39 ÷ 10
e) 39 ÷ 10 = 3·9
f) 6·5 = 65 ÷ 10

6. Sometimes true; if the 2-digit number has the digits 1 to 9 in the ones column then dividing by 10 will give an answer with a digit in the tenths column. However, if the 2-digit number has a 0 in the ones column, then dividing by 10 will give a 0 in the tenths column, which does not need to be written in. For example: 12 ÷ 10 = 1·2 but 10 ÷ 10 = 1.

7. The missing number could be 78, 77, 76, 75 or 74.
5 ways.

Reflect

Answers will vary; for example:

Same: Both are being divided by 10. The digits stay the same but their positions in the place value grid change; they will move one place to the right. The digit in the ones column will become the digit in the tenths column. Answers to both will have no digit in the tens column.

Different: The answer when dividing the 2-digit number by 10 will have a (non-zero) digit in the ones column, whereas the answer when dividing the 1-digit number by 10 will have zero in the ones column. Dividing the 2-digit number by 10 could make a whole number (if the 2-digit number was a multiple of 10) but dividing the 1-digit number by 10 will always produce a decimal.

Lesson 6: Hundredths (1)

→ pages 135–137

1. a) 2 squares shaded in the hundredths grid $\frac{2}{100}$ 0·02
b) 14 squares shaded in the hundredths grid $\frac{14}{100}$ 0·14
c) 5 squares shaded in the hundredths grid $\frac{5}{100}$ 0·05

2. $\frac{10}{100}$ or 0·1

3.

Fraction	$\frac{16}{100}$	$\frac{18}{100}$	$\frac{20}{100}$	$\frac{22}{100}$	Any fraction
Decimal	0·16	0·18	0·2 (or 0·20)	0·22	Decimal equivalent

4. a) $\frac{32}{100}$ = 0·32
b) 0·27 = $\frac{27}{100}$
c) 0·39 = $\frac{39}{100}$
d) Nineteen hundredths = 0·19
e) 0·46 = 46 hundredths
f) $\frac{52}{100}$ = 0·52
g) 0·59 = $\frac{59}{100}$
h) $\frac{93}{100}$ = 0·93
i) Ninety hundredths = 0·90 (or 0·9)
j) 0·03 = 3 hundredths

5. Jamie is correct. Explanations may vary; for example:
There are 20 squares shaded, which is $\frac{20}{100}$ or 0·20. This could also be written as 0·2.
2 columns are shaded. Each column is 1 tenth, which as a fraction is $\frac{2}{10}$ and as a decimal is 0·2.

Reflect

Explanations will vary, but children should reference that, when placed in a place value grid, the 7 in 0·07 would be in the hundredths column, meaning it is $\frac{70}{100}$.

Lesson 7: Hundredths (2)

➜ pages 138–140

1. a) 44 squares shaded in hundredths grid $\frac{44}{100}$ 0·44
b) 14 hundredths counters $\frac{14}{100}$ 0·14
c) 15 squares shaded in hundredths grid $\frac{15}{100}$ 0·15

2. Mo has $\frac{23}{100}$, or 0·23
Isla has $\frac{45}{100}$, or 0·45
Zac has $\frac{32}{100}$, or 0·32

3. 0·5 + 0·5 = 1

4. $\frac{83}{100}$ 0·83

5. I disagree because 5 squares are shaded; this is 5 hundredths or $\frac{5}{100}$, which written as a decimal is 0·05.

6. 0·40 is 4 tenths, which is equivalent to 40 hundredths; Ebo should shade 40 squares on the hundredths grid.

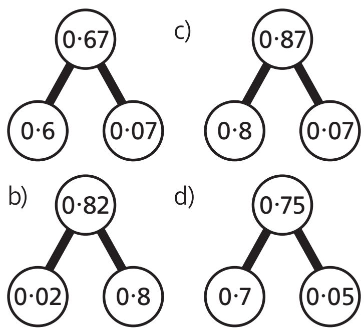
Reflect

0·31, 0·32, 0·33, 0·34, 0·35, 0·36, 0·37, 0·38, 0·39. There are 9 ways of completing the number sentence using decimals with 2 digits after the decimal point.

Lesson 8: Hundredths (3)

➜ pages 141–143

1. a) The 3 tenth counters represent 0·3.
The 5 hundredth counters represent 0·05.
3 tenths and 5 hundredths make 0·35.
b) The 5 tenth counters represent 0·5.
The 3 hundredth counters represent 0·03.
5 tenths and 3 hundredths make 0·53.
c) The 4 tenth counters represent 0·4.
The 5 hundredth counters represent 0·05.
4 tenths and 5 hundredths make 0·45.

2.


3. Missing numbers:
a) 7 c) 27
b) 17 d) 37

4. a) 0·47 = 0·4 and 0·07
b) 0·3 and 0·05 = 0·35
c) 0·4 and 0·06 = 0·46
d) 0·51 = 0·5 and 0·01
e) 0·09 and 0·3 = 0·39
f) 0·37 = 0·3 and 0·07

5. Disagree. Luis has six 0·01 (hundredths) counters and three 0·1 (tenths) counters. This makes 0·36.

6. 0·1, 0·2, 0·3, 0·31, 0·32, 0·42, 0·43, 0·44, 0·45, 0·46, 0·47, 0·48, 0·58, 0·59, 0·6

Reflect

Explanations may vary; for example:
Since 10 hundredths are equal to 1 tenth, 57 hundredths can be represented by:

5 tenths and 7 hundredths; 4 tenths and 17 hundredths; 3 tenths and 27 hundredths; 2 tenths and 37 hundredths; 1 tenth and 47 hundredths.

Lesson 9: Dividing by 100

➜ pages 144–146

1. a) 5 ones = 500 hundredths
500 hundredths ÷ 100 = 5 hundredths
So, 5 ÷ 100 = 0·05
b) 10 squares split into 10 parts means there are 100 tenths.
100 tenths ÷ 100 = 1 tenth
1 square split into 100 pieces means there are 100 hundredths.
100 hundredths ÷ 100 = 1 hundredth
11 ÷ 100 = 0·11

2. The digits move 2 columns to the right; for example:
15 ÷ 100 = 0·15

3. a) 0·08 c) 0·14 e) 0·55
b) 0·09 d) 0·15 f) 0·65

4. False
False
True
True

5. a) 0·54 d) 0·32 g) 50
b) 63 e) 0·35 h) 0·23
c) 5 f) 36

6. a) The value of the digit 5 in the answer is $\frac{5}{100}$ (5 hundredths).
b) The value of the digit 9 in the answer is $\frac{9}{100}$ (9 hundredths).

Reflect

Explanations may vary; for example:
$\frac{12}{100}$ is the same as 12 ÷ 100, so if you know that $\frac{12}{100}$ = 0·12 then you know 12 ÷ 100 = 0·12.

Lesson 10: Dividing by 10 and 100

→ pages 147–149

1. a) The mass of each box is 4·5 kg.
b) The mass of each bowl is 0·3 kg.

2. 83 ÷ 10 = 8·3

3. Circled: 3 hundredths

4. a) 5·6, 0·56
b) 34, 34
c) 7·2, 0·72
d) 10, 100

5. a) 6·8
b) 0·46
c) 0·18
d) 10
e) 97
f) 0

6. a) Danny would get the answer 0·96.
96 ÷ 10 = 96 so Danny started with the number 96.
96 ÷ 100 = 0·96
b) Bella would get the answer 0·7.
7 ÷ 100 = 0·07 so Bella started with the number 7.
7 ÷ 10 = 0·7

7. $\frac{1}{10}$ of 7 is 0·7
$\frac{1}{100}$ of 70 is 0·7
So $\frac{1}{10}$ of 7 is equal to $\frac{1}{100}$ of 70.

Reflect

Explanations may vary; for example:

The values of the digits change but the order of the digits remains the same. The digits move one column to the right when dividing by 10 and 2 columns to the right when dividing by 100.

So, (answer when you divide a number by 100) = (answer when you divide a number by 10) ÷ 10

End of unit check

→ pages 150–151

My journal

1. 1·34, 1·43, 3·14, 3·41, 4·13, 4·31, 13·4, 14·3, 31·4, 34·1, 41·3, 43·1

2. Different answers possible. Look for children confidently identifying the values of the digits. Pictorial representations could include place value grids, hundredths grids and part-whole models.

Power play

Check that children can understand the game and play it correctly.