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

(14)

26 × 14 = 364

b)

	17	
	10	7
40	400	280
2	20	14

(42)

	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

Jamilla's method

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

		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	7	29 × 3
	5	8	0	29 × 20
	6	6	7	29 × 23

b) 37 × 16 = 592

		3	7	
×		1	6	
	2	2	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	5	45 × 7
	9	0	0		45 × 20
1	2	1	5		45 × 27

b) 52 × 17 = 884

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

b)

			7	4	
×			4	3	
		2	2	2	
	2	9	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

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

2. a)

		1	7	2
×			2	4
		6	8	8
	3	4	4	0
	4	1	2	8

172 × 4
172 × 20
172 × 24

b)

		3	2	5
×			1	8
	2	6	0	0
	3	2	5	0
	5	8	5	0

325 × 8
325 × 10
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	5
+	5	6	7	0
	8	5	0	5

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	4	0	6
	4	5	6	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 I digit number (I)

→ 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	I
3	9	6	0	3

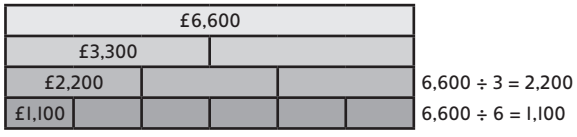
b)

	2	I	I	0
4	8	4	4	0

c) Answer may vary, for example,

	I	2	I
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 I-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	I7	I2	

b)

	2	2	9	I
3	6	8	27	3

c)

	I	2	6	
5	6	I3	30	

or

	I	3	6	
5	6	I8	30	

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 (I)

→ 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:
$5\overline{)48}$ → r 3 $7\overline{)97}$ → r 6 $2\overline{)99}$ → r 1
$9\overline{)76}$ → r 4 $3\overline{)93}$ → r 0 $4\overline{)86}$ → r 2

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

7. a) $7\overline{)235}$ = 033 r 4 $4\overline{)9178}$ = 2429 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 I0: 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 I1: 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.

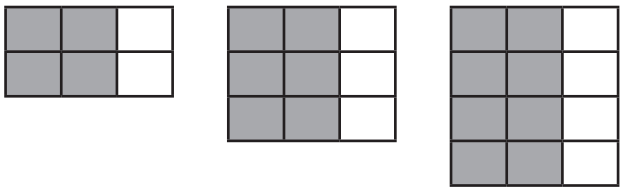
Unit 8: Fractions (I)

Lesson 1: 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 $(3\frac{1}{2}) \rightarrow \frac{7}{2}$

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

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

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

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) $\frac{14}{4} = 3\frac{1}{2}$
$\frac{28}{8} = 3\frac{1}{2}$
$\frac{21}{6} = 3\frac{1}{2}$

b) $4\frac{5}{10} = \frac{9}{2}$
$4\frac{6}{10} = \frac{23}{5}$
$4\frac{7}{10} = \frac{94}{20}$
$4\frac{8}{10} = \frac{72}{15}$

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 $\frac{19}{20}$, $\frac{29}{30}$, $\frac{99}{100}$

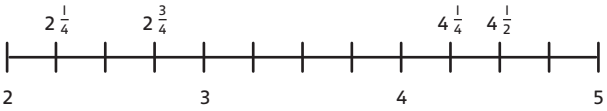
Reflect

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 (I)

➜ 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 $1\frac{1}{\boxed{2}}$	$\frac{6}{4}$ or $\frac{3}{\boxed{2}}$
$18 \div 4 =$ [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 $\frac{\boxed{29}}{5}$

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 (I)

→ 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 (I)

→ 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

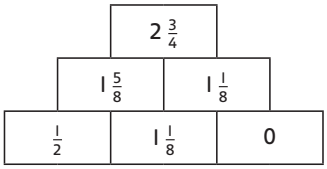
1. Alex has read $\frac{1}{2}$ of the book.

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.



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 c) 2
b) 1 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. $2\frac{3}{8} \times 15 = 35\frac{5}{8}$ $\quad 7\frac{1}{8} \times 5 = 35\frac{5}{8}$

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

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 ÷ 6 = 12
$\frac{5}{6}$ of 72 = 12 × 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) $\frac{7}{3} = 2\frac{1}{3}$ $\quad$ 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

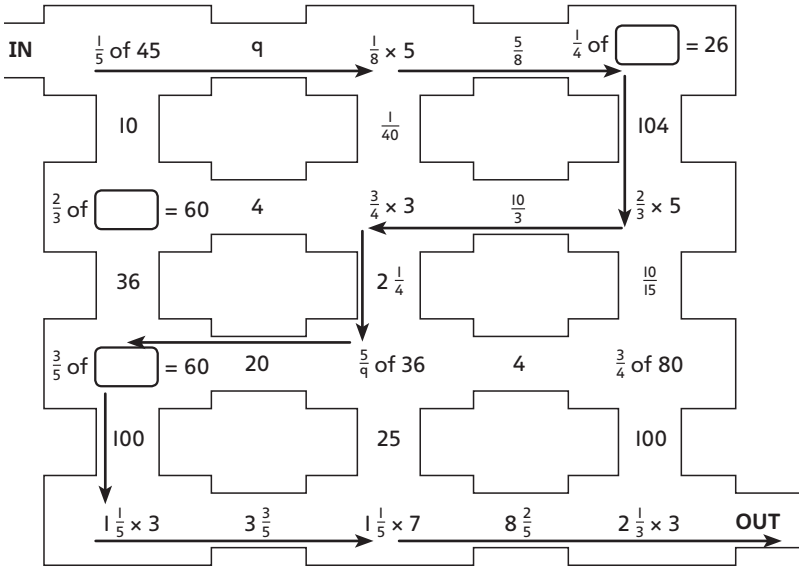
➜ pages 128–129

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



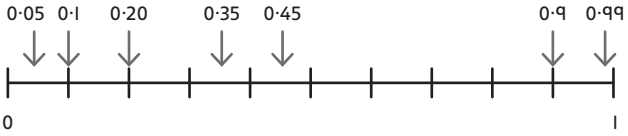
Unit 11: Decimals and percentages

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)

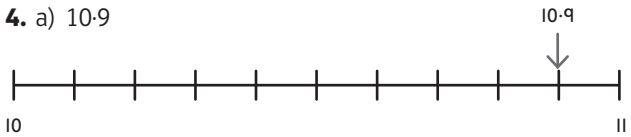
→ pages 133–135

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

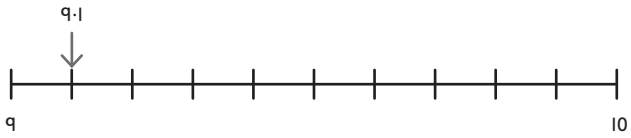
2. a) 1·4 c) 4·01
b) 5·59 d) 5·05

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

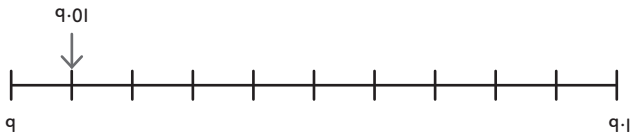
4. a) 10·9



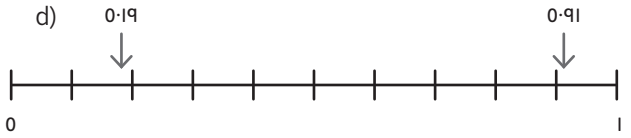
b) 9·1 (or 9·10)



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.

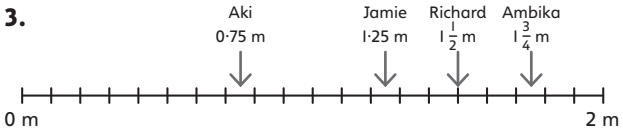
Lesson 3: Decimals as fractions (1)

→ 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.

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

Lesson 4: Decimals as fractions (2)

➜ pages 139–141

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

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

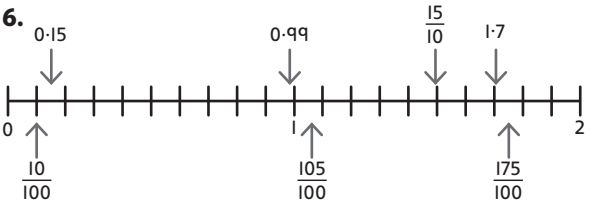
3. a) Numbers ticked: $\frac{11}{100}$ and 0·15
b) Numbers ticked: 2·80, 2·71 and $2\frac{87}{100}$

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

Lesson 5: Understanding thousandths

➜ pages 142–144

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

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

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

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 $\frac{1{,}600}{1{,}000}$ $(= 1{\cdot}6)$.
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 $3 \div 100 = 0{\cdot}03$ and $30 \div 1000 = 0{\cdot}03$.

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.

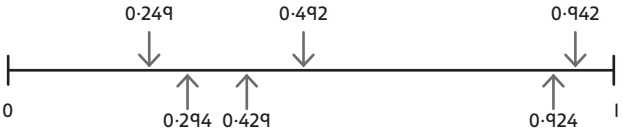
3.

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

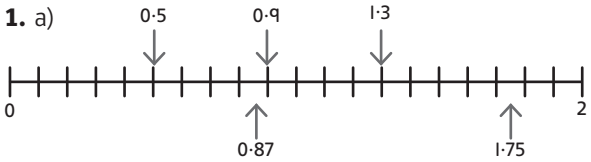
Reflect

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.

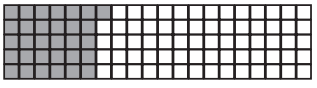
5. a) 3 squares shaded.
70% is not shaded.
b) $2\frac{1}{2}$ squares shaded in one colour and $2\frac{1}{2}$ squares shaded in another colour.
50% is not shaded. 50% is shaded.
c) Check 11 mm is one colour, 22 mm is a second colour and 33 mm is a third colour.
34% is not shaded
d) 5 × 20% = 100%

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

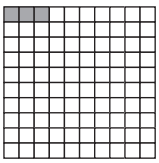
➜ pages 160–162

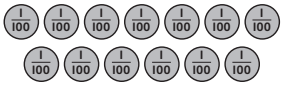
1. 0·31 ➜  ➜ 31%

$\frac{33}{100}$ ➜

O	•	Tth	Hth
0	•	3	3

➜33%

3% ➜  ➜ 0·03

13% ➜  ➜ 0·13

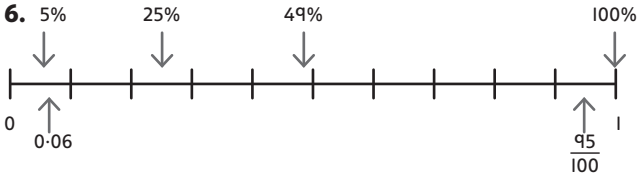
2. $\frac{32}{100}$ as a decimal is 0·32
$\frac{32}{100}$ as a percentage is 32%
$\frac{32}{100}$ as a decimal is **32%**

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