Unit 1 – Place value within 1,000,000 (1)

1 Roman numerals

➜ pages 6–8

1. a) XII
b) XXXV
c) XLIII
d) XC
e) CXIV

2.

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

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

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

5. a) MCCXI ➞ 1211
MDXLV ➞ 1545
MCDLXI ➞ 1461
b) MCMI ➞ 1901

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

7. a) MCMLXXV
b) MDLXXX
c) MMXII

8. L (to give MDC**L**IX) = 1,659 or X (MDC**X**IX) = 1,619
D (to give MC**D**VI) = 1,406
X (to give DCCL**X**) = 760 or V (to give DCCL**V**) = 755
C (to give **C**DXXI) = 421
V (to give CCCX**V**) = 315 or
X (to give CCCX**X**) = 320 or
L (to give CCCX**L**) = 340

Reflect

Today I've learnt that the letter M in Roman numerals represents **1,000**.

The letter D represents **500** and L represents **50**.

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

2 Numbers to 10,000

➜ pages 9–11

1. a) 1,253
b) 3,226
c) 2,605
d) 3,005
e) 2,824

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

3. a) 90 or 9 tens
b) 400 or 4 hundreds
c) 2000 or 2 thousands

4. a) 5,356
b) 2,105
c) 4,235

5. Possible answers:
a) 2,508
b) 2,805
c) 8,025
d) 8,520

Reflect

Many possible answers depending on the numbers children roll.

3 Numbers to 100,000

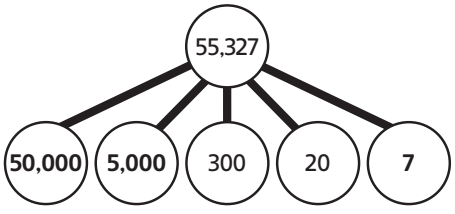
➜ pages 12–14

1. a) 1 ten
8 ten thousands
0
b) In numerals: 58,013
In words: fifty-eight thousand and thirteen

2. 43,250 = 40,000
32,409 = 400
34,250 = 4,000
23,546 = 40

3. Children should add counters: 1 ten thousand, 1 thousand, 0 hundreds, 1 ten and 2 ones.

4. a)



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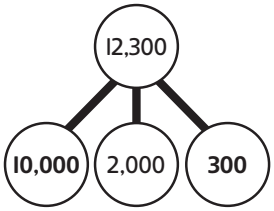

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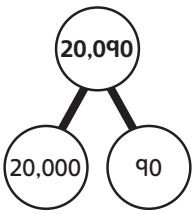


5. a) 14,572
b) 13,672
c) 13,372
d) 63,572

6. a) Many possible answers, e.g. 6 5 2
b) Many possible answers, e.g. 65,220

Reflect

The value of the digit 6 in the number 64,231 is 6 ten thousands, the value of the digit 4 is 4 thousands, the value of the digit 2 is 2 hundreds, the value of the digit 3 is 3 hundreds and the value of the digit 1 is 1 one.

4 Numbers to 1,000,000

→ pages 15–17

1. 600,000
six hundred thousand

2. a) 500,000, five hundred thousand
b) 1,000,000, one million (not 'a million')
c) 172,315, one hundred and seventy-two thousand, three hundred and fifteen

3. One hundred and twenty-three thousand, four hundred and nineteen.

4. Children should draw the following number of counters in each column:

HTh	TTh	Th	H	T	O
1	**2**	**6**	**3**	**0**	**0**

5. a) 329,100
b) 600,040
c) 400,596

6. a) 4,000 (4 thousands)
b) 40 (4 tens)
c) 40 (4 tens)
d) 4 (4 ones)
e) 400,000 (4 hundred thousands)

7. Answers will vary; all answers must have one counter in the thousands column. For example:

111,225 301,035 311,205 411,114 301,134

Reflect

Answers will vary depending on the 6-digit number chosen.

5 Read and write 5- and 6-digit numbers

→ pages 18–20

1. a) 1,324
b) 5,262
c) 61,324
d) 525,262

2. Answers will vary, e.g. 909,000, 990,000, 900,900, 900,009, 900,090

3. Twelve thousand, three hundred and twenty-four = 12,324
Twelve thousand and twenty-five = 12,025
Thirteen thousand, one hundred and thirty = 13,130
Thirty thousand, one hundred and three = 30,103

4. 32,15 → 3,215
203,21 → 20,321
42,3471 → 423,471
1,9999 → 19,999
2,1215 → 21,215
107,3 → 1,073
5,08017 → 508,017
90,9909 → 909,909

5. 20,415

Reflect

Answers will vary, but numbers should start with 56 and end in the digits 03.

6 Powers of 10

→ pages 21–23

1. a) 14 hundreds
b) 25 hundreds
c) 97 hundreds
d) 120 hundreds

2. a) 31,000 = 31 thousands
b) 73,000 = 73 thousands
c) 126,000 = 126 thousands

3. a) 50
b) 500
c) 5,000

4. a) 24,000 = 24 thousands, 240 hundreds, 2,400 tens
b) 213,000 = 213 thousands, 2,130 hundreds, 21,300 tens

5. 2,300

6. One million = 10 hundred thousands
One million = 100 ten thousands
One million = 1,000 thousands
One million = 10,000 hundreds
One million = 100,000 tens
One million = 1,000,000 ones

Reflect

30, 30, 300, 3,000, 30,000, 300,000

7 10/100/1,000/10,000/100,000 more or less

➜ pages 24–26

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

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

3.

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

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

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

6. Answers will vary; for example:

+ 100,000: 320,000 420,000 520,000 620,000 720,000 820,000

+ 10,000: 680,000 690,000 700,000 710,000 720,000 730,000

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

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

Reflect

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

8 Partition numbers to 1,000,000

➜ pages 27–29

1. 252,723

2. 310,450

3. 168,032

4. a) 6,000
b) 900
c)10

5. a) 218,492 = 200,000 + 10,000 + 8,000 + 400 + 90 + 2
b) 710,388 = 700,000 + 10,000 + 300 + 80 + 8
c) 39,448 = 30,000 + 9,000 + 400 + 40 + 8
d) 279,731
e) 502,981
f) 7,073
g) 650,103

6. a) 549,527
b) 70,506
c) 910,028

7. a) 28,230 – 8000 = 20,230
28,230 – 200 = 28,030
28,230 – 30 = 28,200
b) 615,804 – 10,000 = 605,804
615,804 – 800 = 615,004
615,804 – 15,804 = 600,000

Reflect

Answers may vary, for example, 23,421 and 32,419 and 233,421 and 632,412.

My journal

➜ page 30

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

12,546 has 12 thousands, 5 hundreds, 4 tens and 6 ones.

12,546 is a 5-digit number because it has a digit in the 10,000s place;

12,546 is 546 more than 12,000;

12,546 is between the multiples 12,000 and 13,000;

12,546 is a little more than half-way between 12,000 and 13,000;

12,546 rounds to 13,000 to the nearest 1,000;

12,546 rounds to 10,000 to the nearest 10,000.

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

Power puzzle

➜ page 31

1, 4, 7, 10, 13, 16

20, 14, 8, 2

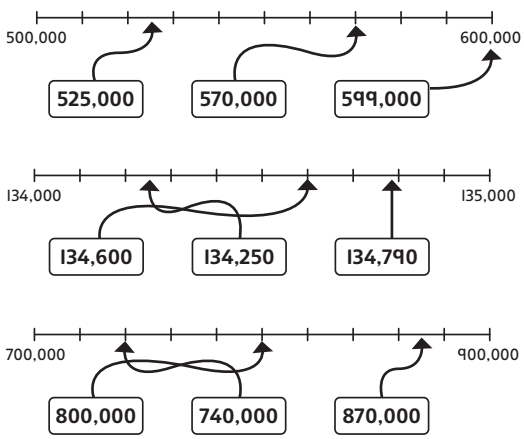
Unit 2 – Place value within 1,000,000 (2)

1 Number line to 1,000,000

➜ pages 32–34

1. a) 200,000 650,000 900,000
b) 210,000 270,000
Allow answers between 297,500 and 299,000.
c) 271,000 275,000 279,000
d) 481,200 481,500

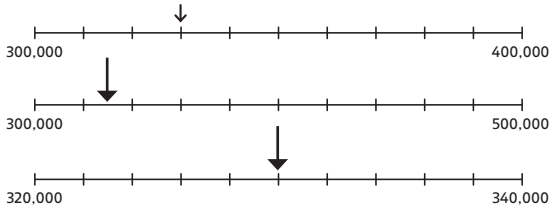
2.



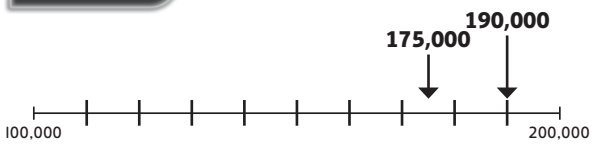
3. A: approximately 408,000
B: approximately 425,000
C: approximately 495,000
Answers will vary and children should explain their reasoning for estimation.

4. Circled: 370,000, 507,000, 429,781

5. Number already marked at the 330,000 position on the top number line. Children should then mark 330,000 as shown on the subsequent two number lines.



Reflect



Answers will vary. For example, it is more efficient to divide the number line into ten intervals of 10,000 than 100 intervals of 1,000.

2 Compare and order numbers to 100,000

➜ pages 35–37

1. 84,054 (bottom number) > 84,045
Explanations may vary. For example, both numbers have the same numbers of ten thousands, thousands and hundreds, but the bottom number has 1 more ten so it is the larger number.

2. Circled numbers:
a) 23,900
b) 46,000
c) 30,095
d) 45,000

3. a) 25,118 < 26,300
b) 5,980 > 5,874
c) 48,050 < 95,300
d) 918 <80,000

4. 6,432 < 23,460 < 26,034 < 32,604

5. 6,395, 51,795, 54,500, 63,124

6. a) False
b) True

7. 13,320 km, 13,200 km, 11,651 km, 11,561 km, 9,999 km

8. 5**6**,**7**87 < 56,**79**4 or 5**6**,**7**87 < 56,**97**4

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

Reflect

False. Explanations may vary. For example, the 9 digit is worth 9 thousands but the 1 digit is worth 1 ten thousand.

3 Compare and order numbers to 1,000,000

➜ pages 38–40

1. The number is 256,282.
The number is 258,300. It is greater.

2. Circled numbers:
a) 700,000
b) 280,000
c) six hundred thousand
d) 523,000

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

4. Sunderland: 265,180
Swansea: 238,700
Stirling: 31,200

5. a) Cliff Edge
b) Cliff Edge, Fred's Farm, Shaw Farm, Croft Top

6. a) 76,500, 180,500, 183,000, 289,400
b) 1,000,000, 728,905, 724,300, 195,317

7. Missing digits:
a) Number between 0 and 4.
b) If the second digit is 4 or less, the first digit can have any value.
If the second digit is 5, the first digit must be 3 or more.
c) If the first digit is 8 or 9, other digits can take any value.
If the first box is 7, there are many possible answers.
d) Second digit = 8; first digit = third digit.
e) Second digit = 3; other digits can take any value.

Reflect

Explanations will vary. Children should explain that they will compare the digits with the greatest place value first (100,000s). If these are the same, they will need to compare the digits with the second greatest place value (10,000s) and so on.

4 Round numbers to the nearest 100,000

➜ pages 41–43

1. A: any three numbers between 100,000 and 200,000
B: any three numbers between 600,000 and 700,000
C: any three numbers between 900,000 and 1,000,000

2. a) 250,000
b) 550,000
c) 750,000
d) 50,000

3.

Previous 100,000		Next 100,000
200,000	225,623	**300,000**
500,000	594,088	**600,000**
800,000	851,000	**900,000**
900,000	901,110	**1,000,000**
0	57,318	**100,000**

4. a) 225,623 rounds to 200,000
b) 594,088 rounds to 600,000
c) 851,000 rounds to 900,000
d) 901,110 rounds to 900,00
e) 57,318 rounds to 100,000
f) 357,000 rounds to 400,000
g) 800,050 rounds to 800,000
h) 45,000 rounds to 0
i) 999,049 rounds to 1,000,000
j) 300,000 rounds to 300,000

5. Answers will vary, for example:
864,020 and 864,200 round to 900,000
800,246 and 800,462 round to 800,000
684,002 and 684,200 round to 700,000
602,408 and 604,208 round to 600,000
468,200 and 486,200 round to 500,000
408,260 and 400,268 round to 400,000
268,400 and 286,004 round to 300,000
200,468 and 204,608 round to 200,000

Reflect

Explanations will vary. For example, children could look at the 10,000s digit. If it is 4 or less, they will need to round down. If it is 5 or more, they will need to round up.

5 Round numbers to the nearest 10,000

➜ pages 44–46

1. A: any three numbers between 10,000 and 20,000
B: any three numbers between 50,000 and 60,000
C: any three numbers between 70,000 and 80,000

2. 25,000, 65,000, 85,000

3. 105,000, 135,000, 195,000

4.

Previous 10,000		Next 10,000
20,000	25,623	**30,000**
70,000	74,088	**80,000**
80,000	81,000	**90,000**
0	6,110	**10,000**
90,000	98,318	**100,000**

5. a) 145,107 rounds to 150,000
b) 245,107 rounds to 250,000
c) 445,107 rounds to 450,000
d) 545,107 rounds to 550,000
e) 645,107 rounds to 650,000
f) 851,496 rounds to 850,000
g) 853,496 rounds to 850,000
h) 855,496 rounds to 860,000
i) 857,496 rounds to 860,000
j) 859,496 rounds to 860,000

6. Answers may vary.
a) When rounding to the nearest 10,000, you round to 10,000 if the 1,000s digit is 4 or less. A number between 10,001 and 14,999 rounds to 10,000 not 20,000.
b) When rounding to the nearest 10,000, you round to 0 if the number is between 0 and 4,999.
c) When rounding to the nearest 10,000, you round to 1,000,000 if the number is above 995,000.

Reflect

Answers may vary, for example, 71,000, 68,000, 69,999, 72,012, 70,001, 74,000.

6 Round numbers to the nearest 10, 100 and 1,000

➜ pages 47–49

1. 391,624 rounded to the nearest 100,000 is 400,000
391,624 rounded to the nearest 10,000 is 390,000
391,624 rounded to the nearest 1,000 is 392,000
391,624 rounded to the nearest 100 is 391,600
391,624 rounded to the nearest 10 is 391,620

2.

	Amount raised	Rounded to the nearest £10	Rounded to the nearest £100	Rounded to the nearest £1,000
Charity A	£4,704	**£4,700**	**£4,700**	£5,000
Charity B	£5,345	**£5,350**	£5,300	**£5,000**

3.

Number	Rounded to the nearest 10,000 it is:	Rounded to the nearest 1,000 it is:	Rounded to the nearest 100 it is:	Rounded to the nearest 10 it is:
96,304	**100,000**	**97,000**	**96,300**	**96,300**
8,195	**10,000**	**8,000**	**8,200**	**8,200**
138,057	**140,000**	**138,000**	**138,100**	**138,060**

4. a) Minimum: 17,950 kg Maximum: 18,049 kg
b Minimum: 9,950 kg Maximum: 10,049 kg

5.

Number	Nearest 100,000	Nearest 10,000	Nearest 1,000	Nearest 100	Nearest 10
555,999	600,000	560,000	556,000	556,000	556,000

6. Answers may vary.
For example, 55,336, 48,218, 68,228.

Reflect

Answers may vary. For example, 99,999.

My journal

➜ page 50

Answers will vary.

A number between 250,000 and 350,000.	**Answers will vary, for example, 315,689.**
A number that has a smaller number of 100s than 10,000s.	**Answers will vary, for example, 356,189.**
The greatest even number that can be made.	**985,316**
A number that rounds to 600,000 to the nearest 100,000.	**Answers will vary, for example, 613,589.**
The smallest number that rounds to 600,000 to the nearest 100,000.	**561,389**
The number that is 10,000 less than 875,913.	**865,913**

Power puzzle

➜ page 51

Children should play the game until they have a row, column or diagonal of four counters. Children may need to be observed to ensure they are finding the correct answers.

Unit 3 – Addition and subtraction

1 Mental strategies (addition)

➜ pages 52–54

1. a) 2 + 6 = 8
20 + 60 = 80
200 + 600 = 800
2,000 + 6,000 = 8,000
20,000 + 60,000 = 80,000

b) 7 + 5 = 12
70 + 50 = 120
700 + 500 = 1,200
7,000 + 5,000 = 12,000

2. a) 300 + 600 = 900
b) 2,000 + 4,000 = 6,000
c) 40,000 + 40,000 = 80,000
d) 300,000 + 400,000 = 700,000

3. Answers may vary as to the steps children take but might include adding the 10s first and then the 1s.
a) 62 + 35 = 97
b) 150 + 170 = 320

4. a) 26 + 31 = 57
31 + 26 = 57
260 + 310 = 570
2,600 + 3,100 = 5,700

b) 281 + 7 = 288
7 + 281 = 288
7 + 1,281 = 1,288
7 + 2,810 = 2,817

c) 72 + 15 = 87
15 + 72 = 87
150 + 720 = 870
72,000 + 15,000 = 87,000

d) 720 + 120 = 840
120 + 720 = 840
12,000 + 72,000 = 84,000
7,200 + 1,200 = 8,400

5. Answers may vary as to the steps children take but might include adding 100s, then 10s, then 1s or rounding.
a) 64 + 83 = 147
b) 260 + 197 = 457
c) 53 + 533 = 586
d) 199 + 199 = 398

6. a) 340 + 890 = 1,230
b) 38 + 41 + 199 = 278

Reflect

Answers may vary as to the steps children take but might include adding 100s, then 10s, then 1s or rounding.

45 + 32 = 77 450 + 380 = 830 360 + 198 = 558

2 Mental strategies (subtraction)

➜ pages 55–57

1. a) 78 – 20 = **58**
58 – 5 = **53**
So, 78 – 25 = **53**

70 – 20 = **50**
8 – 5 = **3**
So, 78 – 25 = **53**

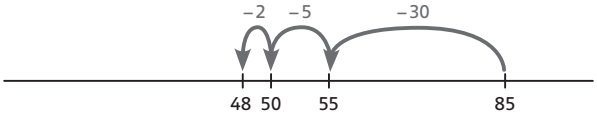
b) 670 – 200 = **470**
470 – 20 = **450**
So, 670 – 220 = **450**

600 – 200 = **400**
70 – 20 = **50**
So, 670 – 220 = **450**

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

3. a) 85 – 30 = **55**
55 – 5 = **50**
50 – 2 = **48**
So, 85 – 37 = **48**

b) Children should draw jumps on the number line.



4. a) 45 – 18 = 27
72 – 45 = 27

b) 196 – 74 = 122
196 – 78 = 118

c) 52 – 36 = 16
92 – 39 = 53

d) 144 – 62 = 82
144 – 66 = 78

5. a) 4
b) 8
c) 8
d) 13
e) 10
f) 16
g) 5

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

Reflect

801 – 792 = 9. Answers will vary but children could explain counting on from 792.

3 Add whole numbers with more than 4 digits (I)

→ pages 58–60

1. a) 39,379
b) 42,824
c) 77,796
d) 81,509
e) 16,245

2. a) Kate has not lined up 4,362 correctly. The 4 should be in the thousands place value position.
b) 57,537

3. a) 41,465
b) 79,191

4. a) 3**5**,**5**10 + 26,1**38** = **6**1,648
b) 73,82**5** + **4**,395 = 78,**22**0

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

6. Isla scores 55,300 points in total.

Reflect

Explanations will vary. Children should talk through correct placing of digits and exchanging when adding. 42,380 + 29,526 = 71,906.

4 Add whole numbers with more than 4 digits (2)

→ pages 61–63

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

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

3. a)

	Th	H	T	O
	1	9	2	5
	2	1	5	0
+	2	4	7	5
	6	5	5	0
	1	1	1	

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

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

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

b) 32,461

	TTh	Th	H	T	O
	2	6	3	4	8
+		6	2	9	3
	3	2	6	4	1
	1		1	1	

5. a)

	TTh	Th	H	T	O
	2	5	7	8	**4**
+	**3**	6	2	**3**	1
	6	**2**	**0**	1	5
	1	1	1		

b)

	HTh	TTh	Th	H	T	O
	6	5	**6**	4	2	6
+	3	1	3	**6**	2	4
	9	**7**	0	0	**5**	**0**
		1	1		1	

6. Answers may vary. For example:

a)

	TTh	Th	H	T	O
	7	4	6	3	9
+	2	5	0	1	8
	9	9	6	5	7
				1	

b)

	TTh	Th	H	T	O
	7	5	6	9	8
+	1	4	3	0	2
	9	0	0	0	0
	1	1	1	1	

Reflect

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

	TTh	Th	H	T	O
	4	2	3	1	7
+	1	5	8	2	3
	5	8	1	4	0
		1		1	

5 Subtract whole numbers with more than 4 digits (I)

➜ pages 64–66

1. a) 24,592 – 3,470 = 21,122
b) 51,340 – 30,720 = 20,620
c) 4,365 – 2,423 = 1,942
d) 76,185 – 5,224 = 70,961
e) 15,712 – 6,000 = 9,712
f) 26,318 – 11,148 =15,170

2. a) 48,200
b) 11,541

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

4. a)

	TTh	Th	H	T	O
	2	$^{5}\not{6}$	$^{1}1$	8	2
–		4	**7**	**3**	2
	2	**1**	4	5	0

b)

	TTh	Th	H	T	O
	4	9	9	$^{7}\not{8}$	$^{1}3$
–	1	**4**	6	2	7
	3	5	**3**	5	**6**

5. The first chest contains 18,455 coins.
The second chest contains 18,455 – 4,200 = 14,255 coins.
The third chest contains 14,255 – 5,120 = 9,135 coins.

Reflect

18,123. Children should explain subtraction including exchanging 1 ten thousand for 10 thousands.

6 Subtract whole numbers with more than 4 digits (2)

➜ pages 67–69

1. a) 2,417

2. a) 23,640
b) 1,650
c) 4,749
d) 6,347

3. a) 83,652
b) 651,123

4. 38,498

5. a)

	TTh	Th	H	T	O
	*	$^{6}\not{7}$	$^{14}\not{5}$	$^{1}0$	6
–	*	4	**8**	**3**	2
	*	2	6	7	**4**

(* Where these digits can vary.)

b)

	TTh	Th	H	T	O
	3	$^{8}\not{9}$	$^{11}\not{2}$	^{1}**1**	**7**
–	**1**	**1**	8	3	7
	2	7	3	8	0

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

7. 349,500 – 186,956 = 162,544
162,544 – 73,290 = 89,254
89,254 children attend in ordinary clothes.

Reflect

Children should show a 5-digit – 5-digit calculation with two exchanges. For example:

52,971 – 44,753 = 8,218

7 Round to check answers

➜ pages 70–72

1. a) 297 is close to **300**.
204 is close to **200**.
300 + 200 = 500
So, 297 + 205 must be close to **500**.
b) 6,985 is close to **7,000**.
1,995 is close to **2,000**.
7,000 – 2,000 = **5,000**
So, 6,985 – 1,995 must be close to **5,000**.
c) 311 is close to **300**.
7,189 is close to **7,200**.
300 + 7,200 = 7,500
So, 311 + 7,189 must be close to **7,500**.

2. a) 12,005 is close to **12,000**.
7,620 is close to **7,600**.
12,000 + 7,600 = 19,600
b) Bella has not lined up 7,620 correctly using her place value knowledge. 7 should be in the thousands position.
c) 19,625

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

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

5. a) £20,000 + £4,000 = £24,000
£24,000 – £4,000 = £20,000

b) £19,995 + £3,941 = £23,936
£23,936 – £4,081 = £19,855

Reflect

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

8 Inverse operations (addition and subtraction)

➜ pages 73–75

1. a) 1,440 + 1,264 = 2,704
Ticked: The answer is correct.

b) 15,995 – 14,600 = 1,395
Ticked: The answer is incorrect.

c)

	TTh	Th	H	T	O
	1	8	4	6	8
+	1	8	4	8	2
	3	6	9	5	0
	1		1	1	

Ticked: The answer is incorrect.

2. a) Order of calculations may vary:
2,600 + 3,500 = 6,100
3,500 + 2,600 = 6,100
6,100 – 2,600 = 3,500
6,100 – 3,500 = 2,600

b) 26,000 + 35,000 = 61,000

3. a) 1,120 needs to be written in the correct place value positions.
Correct answer = 35,846

b) Exchange needs to be completed.
Correct answer = 128

4. a) 10,000 – 7,500 = 2,500 or 10,000 – 3,500 = 6,500
b) Richard has forgotten 500 + 500 = 1,000 so the answer is 11,000.

5. 14,264 – 764 = 13,500 or 14,264 – 13,500 = 764

Reflect

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

9 Multi-step addition and subtraction problems (I)

➜ pages 76–78

1. a) 3,240
b) 127,500 kg
c) £3,371

2. 34,055

3. 1,308 + 750 = 2,058. 2,058 + 1,308 = 3,366.
The café sells 3,366 cups of coffee in total.

4. 3,456 + 2,922 = 6,378. 8,000 – 6,378 = 1,622.

5. Week = 12,440
Weekend = 14,660
14,660 – 12,440 = 2,220
2,220 more eggs were sold at the weekend than during the week.

Reflect

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

10 Multi-step addition and subtraction problems (2)

➜ pages 79–81

1. 160,500 + 85,000 – 7,900 = 237,600
There are 237,600 litres of water in the pool now.

2. a) Tex made more toys than Karl in September and in October, so he must have made more toys than Karl in total.

b) Karl: 12,675 + 9,580 = 22,255
Tex: 13,188 + 10,680 = 23,868
23,868 – 22,255 = 1,613
Alternatively, some children may work out:
13,188 – 12,675 = 513
10,680 – 9,580 = 1,100
513 + 1,100 = 1,613
Tex made 1,613 more toys in total.

3. 12,840 + 7,319 = 20,159
30,000 – 20,159 = 9,841
The missing number is 9,841.

4. First barrel: 1,280
Second barrel: 1,280 + 480 = 1,760
Third barrel: 1,280 – 276 = 1,004
Total: 1,280 + 1,760 + 1,044 = 4,044
Alternatively, some children may work out:
3 × 1,280 + 480 – 276
There are 4,044 apples in total.

5. a) 100,385 – 75,560 = 24,825
100,385 + 24,825 = 125,210
125,210 is at A.

b) 125,210 + 24,825 + 24,825 + 24,825 + 24,825 = 224,510

224,510 is the first number above 200,000 that Kate will reach.

Reflect

Explanations will vary. Children should explain their methods for each calculation. For example:

182,000 – 79,000 = 103,000
500 – 320 = 180
So, 182,500 – 79,320 = 103,180

75,000 + 28,000 = 103,000
111 + 396 = 111 + 400 – 4 = 507
So 75,111 + 28,396 = 103,507

So, the second calculation has the bigger answer.

I1 Solving missing number problems

➜ pages 82–84

1. 38 + **2** = 40 40 + **50** = 90
The missing number is **52**.

2. a) 46
b) 450

3. Jamilla added 1 to 40 but then miscalculated from 40 to 80. The correct answer is 41.

4. a) 24
b) 56
c) 606
d) 67
e) 58
f) 73

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

6. a) 38
b) 34
c) 53

7. 520

Reflect

Answers will vary but might include subtracting the known parts from the whole to get a missing part or adding the parts together to get a missing whole.

I2 Solve comparison problems

➜ pages 85–87

1. a) 45 + 27 = 44 + **28**
45 + 27 = 43 + **29**
45 + 27 = 46 + **26**
45 + 27 = 55 + **17**

b) 315 + 264 = 313 + **266**
315 + 264 = 305 + **274**
315 + 264 = 415 + **164**
315 + 264 = **115** + 464

2. 260,000
The first number had decreased by 10,000 after the equals sign, so the second number had to increase by 10,000 after the equals sign to balance the calculation.

3. Ambika needed to increase the other number by 10, not decrease it by 10. The missing number is 186.

4. a) 3,180
b) 10,500
8,500

5. a) 161
b) 160
c) 164
d) 172

6. 7,500

Reflect

Answers will vary.

My journal

➜ page 88

Children should make up a story problem using the bar model provided. Story problems will vary, involving the numbers 100,000, 39,480 and 60,520.

Power puzzle

➜ page 89

1. a)

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

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

Unit 4 – Multiplication and division (I)

1 Multiples

➜ pages 90–92

1. a) 3 × 3 = **9**
b) **5** × 3 = **15**
c) **8** × 3 = **24**
These all show multiples of the number 3.

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

3. a) 9, 18, 27, 36, 45, 54, 63, 72, 81, 90
b) 12, 24, 36, 48, 60
c) 16, 20, 24, 28, 32, 36, 40, 44

4. a) Children should circle: 80, 30, 102, 300.
b) Children should circle: 70, 95, 530, 35, 300.

5. a) 140, 145, 150, 155
b) 294, 301, 308, 315
c) 1,436, 1,440, 1,444, 1,448

6. a) Answers may vary. For example:

	Multiple of 2	Not a multiple of 2
Multiple of 6	**6, 12, 18, 24, 30**	
Not a multiple of 6	**2, 4, 8, 10, 14**	**1, 3, 5, 7, 9**

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

7. 12,734 is not a multiple of 4 because it is not divisible by 4.

Reflect

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

2 Common multiples

➜ pages 93–95

1.

Multiples of 4	Multiple of 5
4	5
8	10
12	15
16	20
20	25
24	30
28	35
32	40
36	45
40	50

Common multiples of 4 and 5 in this list are 20 and 40.

2. 10, 20, 30, 40, 50, 60, 70, 80, 90, 100
12, 24, 36, 48, 60, 72, 84, 96, 108, 120
Circled: 60

3. a) 8, 16, 24, 32, 40, 48, 56, 64, 72, 80
12, 24, 36, 48, 60, 72, 84, 96, 108, 120
Circled: 24
b) 5, 10, 15, 20, 25, 30, 35, 40, 45, 50
10, 20, 30, 40, 50, 60, 70, 80, 90, 100
Circled: 10
c) 5, 10, 15, 20, 25, 30, 35, 40, 45, 50
8, 16, 24, 32, 40, 48, 56, 64, 72, 80
Circled: 40

4. a) 18
b) 36, 54, 72
c) Explanations will vary but should explain a systematic method such as listing the multiples of the larger number and looking for multiples of the smaller number.

5. a) 70
b) 24
c) 12

6. Yes, because 12 is a multiple of 6.

Reflect

Explanations will vary but might include listing the multiples of the larger number first or working through the times tables for both numbers.

3 Factors

➜ pages 96–98

1. a) **1** × **18** = 18
2 × **9** = 18
6 × **3** = 18
b) The factors of 18 are: 1, 2, 3, 6, 9, 18.

2. a) Arrays should be drawn for 4 × 5 = 20 and 2 × 10 = 20.
b) 1, 2, 4, 5, 10, 20

3. a) It is not: 28 divided by 6 does not give a whole number.

4. a) 2 × **12** = 24
3 × **8** = 24
4 × **6** = 24
b) 1 × **36** = 36
2 × **18** = 36
3 × **12** = 36
4 × **9** = 36
6 × **6** = 36

5. a) 1, 2, 5, 10, 25, 50
b) 1, 2, 3, 4, 6, 8, 12, 24, 48

6. a) Children should shade: 20, 1, 10, 50, 4, 5, 100.
b) The missing factors are **2** and **25**.

7. It is always true. If X is a factor of Y, then Y is a multiple of X. For example, 2 is a factor of 4 and 4 is a multiple of 2.

Reflect

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

4 Common factors

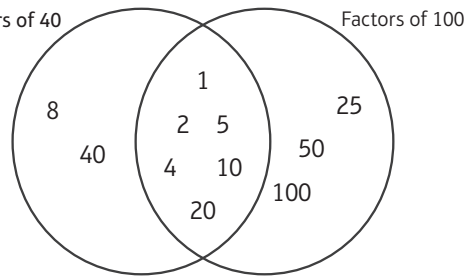
➜ pages 99–101

1. Factors of 18: 1, 2, 3, 6
Factors of 20: 1, 2, 4, 5

2. a) 1, 2, 4, 6, 8, 12, 24
b) 1, 2, 5, 10, 25, 50
c) 1, 2

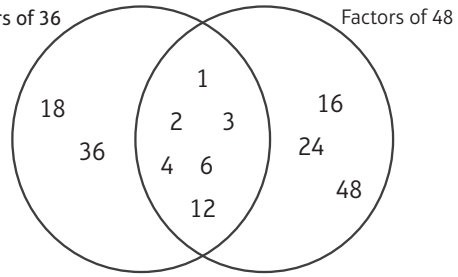
3. 1, 5

4. a)



b) In the centre overlapping section.
c) 1, 2, 4, 5, 10, 20

5.



6. 1, 2

7. a) 1, 3, 5, 15
b) It has factors that are even.
c) 60

Reflect

Yes, 1 and itself.

5 Prime numbers

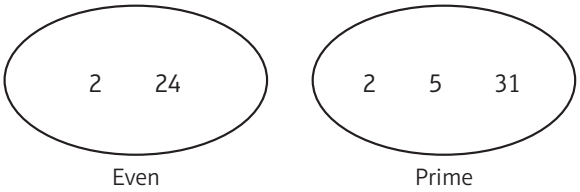
➜ pages 102–104

1. Prime numbers only have two factors: 1 and itself. For example, 1 and 11. A prime number cannot be divided by 2 and give a whole number.

2. Example multiplications will vary:

Number	Prime	Not prime
10		2 × 5
11	✓	
12		**2 × 6, 3 × 4**
13	✓	
14		**2 × 7**
15		**3 × 5**
16		**2 × 8, 4 × 4**
17	✓	
18		**2 × 9, 3 × 6**
19	✓	
20		**4 × 5, 2 × 10**

3.



a) 2
b) 21, 25 and 39 are not in either group.
c) No other number can join both groups. All even numbers have 2 as a factor, therefore even numbers which are not 2 will have more than 2 factors (1, 2, the number itself) so they are not prime.

4. 99 is not a prime number as it is divisible by 1, 3, 9, 11, 33 and 99 so it has more than 2 factors.

5. a) We know 1,265 is not a prime number because all numbers that end in 5 have 5 as a factor. So every number that ends in 5 (apart from 5 itself) will have more than 2 factors (1, 5, the number itself) so they are not prime.
b) 3,711 is not a prime number because it is divisible by 1, 3 and itself.

6. a) Shaded: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97
b) Answers may vary. For example, most prime numbers appear in the first and fifth columns.
c) Some columns have no prime numbers because they only contain even numbers greater than 2.
d) The fifth column has the most prime numbers.

Reflect

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

6 Square numbers

➜ pages 105–107

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

2.

Square	Calculation
5^2	$5 \times 5 = 25$
6^2	$6 \times 6 = 36$
7^2	**$7 \times 7 = 49$**
8^2	**$8 \times 8 = 64$**
9^2	**$9 \times 9 = 81$**
10^2	**$10 \times 10 = 100$**
11^2	**$11 \times 11 = 121$**
12^2	**$12 \times 12 = 144$**

3. Children must show $6 \times 6 = 36$ as a square array.
$6^2 = 36$

4. 10 is not a square number. Drawings should show that 10 cannot be arranged as a square array.

5. Mo is not correct. 16 is a square number.
The 16 dots can be rearranged into a square array as 4×4.

6. Shaded: 4, 1, 81, 144.

7. a)

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

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

Reflect

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

7 Cube numbers

➜ pages 108–110

1. Diagrams matched:
1st diagram → $3 \times 3 \times 3$
2nd diagram → 2^3
3rd diagram → 2 squared
4th diagram → 2×3

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

3. a) 7 cubed = 49
b) 10^3 = **1,000**
c) **1^3** = 1
d) **1^3** = 0

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

5. a) $5^3 = 125$
b) $8^3 = 512$
c) $20^3 = 8{,}000$

6. a) $4 \times (4 \times 4)$ *or*
$(4 \times 4) + (4 \times 4) + (4 \times 4) + (4 \times 4)$
b) $8 \times (2 \times 2 \times 2)$ *or*
$(2 \times 2 \times 2) + (2 \times 2 \times 2) + (2 \times 2 \times 2) + (2 \times 2 \times 2) +$
$(2 \times 2 \times 2) + (2 \times 2 \times 2) + (2 \times 2 \times 2) + (2 \times 2 \times 2)$
c) $4 \times (2 \times 2 \times 4)$ *or*
$(2 \times 2 \times 4) + (2 \times 2 \times 4) + (2 \times 2 \times 4) + (2 \times 2 \times 4)$

Reflect

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

8 Multiply by 10, 100 and 1,000

→ pages 111–113

1. a) 6 × 10 = **60**
b) 6 × 100 = **600**
c) 6 × 1,000 = **6,000**
d) 9 × 10 = **90**
9 × 100 = **900**
9 × 1,000 = **9,000**

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

3. a)

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

b)

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

4. a) 5 × 10 = **50**
13 × 10 = **130**
127 × 10 = **1,270**
10 × 25 = **250**

b) 7 × 100 = **700**
28 × 100 = **2,800**
139 × 100 = **13,900**
100 × 11 = **1,100**

c) 3 × 1,000 = **3,000**
14 × 1,000 = **14,000**
178 × 1,000 = **178,000**
1,000 × 11 = **11,000**

d) 7 × **100** = 700
19 × **1,000** =19,000
33 × **100** = 3,300
100 × 116 = 11,600

5. a) 5 × 10 = **50**
50 × 10 = **500**
50 × 100 = **5,000**
5 × 1,000 = **5,000**

b) **15** × 1,000 = 15,000
100 × **15** = 1,500
1,500 = **150** × 10
15,000 = **150** × 100

6. a) 3 × 10 × 10 = 3 × **100**
b) 5 × 10 × 10 × 10 = 5 × **1,000**
c) 6 × 10 × 10 = 60 × **10**
d) 7 × 10 × 10 × 10 = 70 × **100**
e) 20 × 10 × 10 = 200 × **10**

Reflect

Children may explain what they notice in different ways. They should explain moving the place value of the existing digits to the left and adding place-holding 0s to the end of the number (1 zero for × 10, 2 zeros for × 100, 3 zeros for × 1,000). They might explain that each set of calculations are related, for example 300 × 10 = 3,000, 300 × 100 = 30,000, 300 × 1,000 = 300,000.

9 Divide by 10, 100 and 1,000

→ pages 114–116

1. a) 2 ÷ 10 = **2**
30 ÷ 10 = **3**
40 ÷ 10 = **4**
170 ÷ 10 = **17**
230 ÷ 10 = **23**

b) 200 ÷ 100 = **2**
400 ÷ 100 = **4**
700 ÷ 100 = **7**
1,200 ÷ 100 = **12**
3,600 ÷ 100 = **36**

Children should notice the pattern of digits moving 1 place to the right when you divide by 10 and 2 places to the right when you divide by 100.

2. Max divided by 1,000 rather than 100. The correct answer is 120.

3. a) 8,000 ÷ 1,000 = 8
8 × 1,000 kg weights would balance the scales.

b) 8,000 ÷ 100 = 80
80 × 100 kg weights would balance the scales.

c) 8,000 ÷ 10 = 800
800 × 10 kg weights would balance the scales.

4. a)

	TTh	Th	H	T	O
Number		6	0	0	0
÷ 10			6	0	0
÷ 100				**6**	**0**
÷ 1,000					**6**

b)

	TTh	Th	H	T	O
Number	4	3	0	0	0
÷ 10		**4**	**3**	**0**	**0**
÷ 100			**4**	**3**	**0**
÷ 1,000				**4**	**3**

c) 26,000 ÷ 1,000 = 26
26,000 ÷ 100 = 260
26,000 ÷ 10 = 2,600

d) 5,000 ÷ 50 = 100
5,000 ÷ 500 = 10
500 ÷ 50 = 10

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

6. a) The triangle is 100 times greater than the star.

b) Calculations will vary but the heart should be 1,000 × the cloud.

For example:
4,000 ÷ 10 = 10 × 10 × 4;
13,000 ÷ 10 = 10 × 10 × 13.

★	△
5	**500**
70	7,000
7	700
500	**50,000**

Reflect

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

10 Multiples of 10, 100 and 1,000

→ pages 117–119

1. a) 3 × 2 = **6**
b) 3 × 20 = **60**
c) 3 × 200 = **600**

2. Diagrams matched:

Top diagram → 4 × 3 tens
→ 12 tens = 120
2nd diagram → 3 × 2 hundreds
→ 6 hundreds = 600
3rd diagram → 2 × 3 thousands
→ 6 thousands = 6,000
4th diagram → 3 × 4 hundreds
→ 12 hundreds = 1,200

3. a) 5 × 3 = **15**
5 × 30 = **150**
5 × 300 = **1,500**
5 × 3,000 = **15,000**

b) 7 × 10 = **70**
7 × 20 = **140**
7 × 30 = **210**
7 × 40 = **280**

4. a) 8 ÷ 2 = **4**
b) 80 ÷ 2 = **40**
c) 800 ÷ 2 = **400**

5. a) 18 ÷ 3 = **6**
180 ÷ 3 = **60**
1,800 ÷ 3 = **600**
18,000 ÷ 3 = **6,000**

b) 2,400 ÷ 2 = **1,200**
2,400 ÷ 3 = **800**
2,400 ÷ 6 = **400**

6. a) 3 × 700 = **2,100**
5,000 × 9 = **45,000**
5 × 80 = **400**

b) For example, 1,200 ÷ **300** = **4**
150 ÷ 5 = **30**
For example, 72,000 ÷ **9,000** = **8**.

7. Both have mistakenly assumed that the answer will have 2 zeros.

- Ambika: There are 2 zeros in 500, but 4 × 5 = 20 introduces a third zero: 4 × 500 = 2,000.
- Reena: 40 and 50 have 1 zero each, but 4 × 5 = 20 will introduce a third zero: 40 × 50 = 2,000.

Reflect

Answers will vary but should include multiplying and/or dividing by powers of ten or multiples of powers of ten.

My journal

→ page 120

I know 250 isn't a square number because 15 squared is 225 and 16 squared is 256.

I know 2,500 is going to be square because 5 × 5 is 25. If I multiply both 5s by 10 then the answer must be multiplied by 100. 50 × 50 = 2,500.

Power puzzle

→ page 121

1. Example answers are:

a) To make 100:

$\boxed{3} + \boxed{2} = 5$
$5^2 = 25$
$\boxed{4}^2 = 16$
$16 \div \boxed{4} = 4$
$25 \times 4 = 100$

b) To make 64:

$\boxed{2} + \boxed{3} - \boxed{4} = 1$
$\boxed{4}^3 = 64$
$1 \times 64 = 64$

c) To make 600:

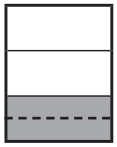
$\boxed{3}^2 - \boxed{4} = 5$
$5^2 = 25$
$\boxed{2}^3 + \boxed{4}^2 = 24$
$25 \times 24 = 600$

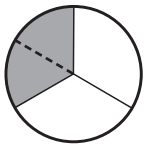
Unit 5 – Fractions (I)

I Equivalent fractions

→ pages 122–124

1.





2. $\frac{1}{2}=\frac{2}{4}$ $\frac{1}{2}=\frac{3}{6}$ $\frac{1}{2}=\frac{5}{10}$

3. a) $\frac{1}{2}=\frac{4}{\mathbf{8}}$
b) $\frac{1}{2}=\frac{\mathbf{2}}{4}$
c) $\frac{1}{8}=\frac{3}{\mathbf{24}}$
d) $\frac{1}{8}=\frac{\mathbf{5}}{40}$
e) $\frac{1}{9}=\frac{7}{\mathbf{63}}$
f) $\frac{1}{9}=\frac{\mathbf{8}}{72}$

4. a) $\frac{1}{\mathbf{7}}=\frac{4}{28}$
b) $\frac{6}{42}=\frac{1}{\mathbf{7}}$
c) $\frac{1}{\mathbf{9}}=\frac{6}{54}$
d) $\frac{3}{33}=\frac{1}{\mathbf{11}}$
e) $\frac{1}{\mathbf{9}}=\frac{7}{63}$
f) $\frac{4}{80}=\frac{1}{\mathbf{20}}$

5. ✓ ✗ ✗ ✓ ✗

6. Answers will vary. For example:

a) $\frac{2}{20}=\frac{3}{30}=\frac{4}{40}$
b) $\frac{2}{200}=\frac{3}{300}=\frac{4}{400}$
c) $\frac{2}{50}=\frac{3}{75}=\frac{4}{100}$
d) $\frac{2}{1{,}758}=\frac{3}{2{,}637}=\frac{4}{3{,}516}$

Reflect

Explanations will vary but should include multiplying the numerator and denominator by the same number to find fractions that are equivalent to $\frac{1}{9}$.

2 Equivalent fractions – unit and non-unit fractions

→ pages 125–127

1.

2. a) $\frac{3}{5}=\frac{\mathbf{9}}{15}$
b) $\frac{3}{5}=\frac{\mathbf{12}}{20}$
c) $\frac{4}{5}=\frac{\mathbf{12}}{15}$
d) $\frac{4}{5}=\frac{\mathbf{16}}{20}$

3. $\frac{3}{4}=\frac{\mathbf{6}}{\mathbf{8}}$ $\frac{3}{4}=\frac{\mathbf{9}}{\mathbf{12}}$ $\frac{3}{4}=\frac{\mathbf{15}}{\mathbf{20}}$

4. a) $\frac{2}{5}=\frac{4}{\mathbf{10}}$
b) $\frac{2}{5}=\frac{\mathbf{10}}{25}$
c) $\frac{\mathbf{6}}{15}=\frac{12}{30}$
d) $\frac{2}{9}=\frac{4}{\mathbf{18}}$
e) $\frac{2}{9}=\frac{\mathbf{8}}{36}$
f) $\frac{\mathbf{6}}{8}=\frac{3}{4}$
g) $\frac{2}{13}=\frac{4}{\mathbf{26}}$
h) $\frac{2}{13}=\frac{\mathbf{20}}{130}$
i) $\frac{8}{\mathbf{9}}=\frac{64}{72}$

5. Answers will vary. For example:

a) $\frac{2}{11}=\frac{4}{22}=\frac{6}{33}=\frac{8}{44}$
b) $\frac{4}{11}=\frac{8}{22}=\frac{12}{33}=\frac{16}{44}$
c) $\frac{6}{11}=\frac{12}{22}=\frac{18}{33}=\frac{24}{44}$
d) $\frac{10}{11}=\frac{20}{22}=\frac{30}{33}=\frac{40}{44}$

6. a) $\frac{1}{5}=\frac{\mathbf{3}}{\mathbf{15}}$
b) $\frac{3}{\mathbf{15}}=\frac{4}{\mathbf{20}}$
c) $\frac{\mathbf{10}}{16}=\frac{5}{\mathbf{8}}$
d) $\frac{3}{5}=\frac{\mathbf{9}}{\mathbf{15}}$
e) $\frac{\mathbf{1}}{10}=\frac{\mathbf{3}}{30}$
f) $\frac{\mathbf{3}}{\mathbf{10}}=\frac{9}{30}$

Reflect

Answers will vary. For example:

$\frac{10}{15}=\frac{20}{30}=\frac{30}{45}=\frac{40}{60}$

3 Equivalent fractions – families of equivalent fractions

➜ pages 128–130

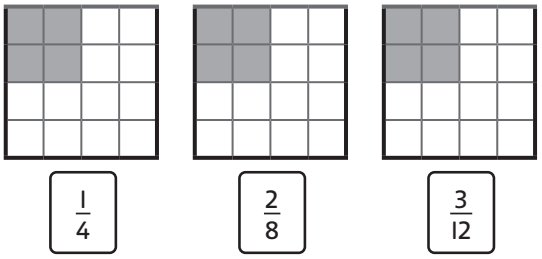
1. a) $\frac{1}{2} = \frac{\mathbf{4}}{8}$ $\frac{1}{2} = \frac{3}{\mathbf{6}}$ $\frac{1}{2} = \frac{\mathbf{8}}{\mathbf{16}}$

b) Children should draw one horizontal or three vertical lines. $\frac{2}{3} = \frac{\mathbf{4}}{6}$

Children should draw two equally spaced horizontal lines. $\frac{2}{3} = \frac{\mathbf{6}}{\mathbf{9}}$

Children should draw three equally spaced horizontal lines. $\frac{2}{3} = \frac{\mathbf{8}}{\mathbf{12}}$

c) All three diagrams should show 4 squares shaded.



$\frac{1}{4}$ $\frac{2}{8}$ $\frac{3}{12}$

2. $\frac{\mathbf{75}}{100}$ $\frac{\mathbf{30}}{40}$ $\frac{300}{\mathbf{400}}$ $\frac{3{,}000}{\mathbf{4{,}000}}$

3. a) $\frac{2}{5} = \frac{4}{10} = \frac{6}{15} = \frac{8}{20} = \frac{10}{25}$

b) $\frac{3}{10} = \frac{6}{20} = \frac{9}{30} = \frac{12}{40}$

c) $\frac{3}{8} = \frac{6}{16} = \frac{9}{24} = \frac{12}{32}$

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

b) $\frac{3}{12} = \frac{6}{\mathbf{24}} = \frac{\mathbf{8}}{32} = \frac{\mathbf{10}}{\mathbf{40}}$

5. $\frac{8}{20} = \frac{6}{15}$ is correct.

Children should explain that $\frac{8}{12} = \frac{12}{18}$ not $\frac{12}{16}$.

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

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

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

Reflect

Children should explain dividing by a common factor or multiplying by the same number.

4 Improper fractions to mixed numbers

➜ pages 131–133

1. a) $\frac{7}{2}$ kg = $\mathbf{3\frac{1}{2}}$ kg

b) $\frac{9}{4}$ litres = $\mathbf{2\frac{1}{4}}$ litres

c) $\frac{11}{3}$ m = $\mathbf{3\frac{2}{3}}$ m

2. **4** quarters make one whole circle. Max has $\frac{15}{4}$ circles in total. That is $\mathbf{3\frac{3}{4}}$ whole circles.

3. a) $\frac{13}{3} = \mathbf{4\frac{1}{3}}$

b) $\frac{13}{4} = \mathbf{3\frac{1}{4}}$

c) $\frac{11}{7} = \mathbf{1\frac{4}{7}}$

d) $\frac{15}{4} = \mathbf{3\frac{3}{4}}$

e) $\frac{13}{5} = \mathbf{2\frac{3}{5}}$

f) $\frac{14}{5} = \mathbf{2\frac{4}{5}}$

g) $\frac{20}{3} = \mathbf{6\frac{2}{3}}$

h) $\frac{25}{8} = \mathbf{3\frac{1}{8}}$

i) $\frac{15}{5} = \mathbf{3}$

j) $\frac{16}{5} = \mathbf{3\frac{1}{5}}$

k) $\frac{37}{5} = \mathbf{7\frac{2}{5}}$

l) $\frac{19}{3} = \mathbf{6\frac{1}{3}}$

4. Children should circle: $\frac{12}{4}$, $\frac{60}{12}$, $\frac{66}{6}$.

5. Solutions will vary.

For example, Triangle = 32, Square = 3, Star = 2.

$\frac{32}{10} = 3\frac{2}{10}$

Reflect

$\frac{17}{3} = 5\frac{2}{3}$

5 Mixed numbers to improper fractions

➜ pages 134–136

1. a) $5\frac{1}{3} = \mathbf{\frac{16}{3}}$

b) $4\frac{1}{4} = \mathbf{\frac{17}{4}}$

c) $6\frac{3}{5} = \mathbf{\frac{33}{5}}$

2. First diagram → $\frac{7}{2}$

$3\frac{1}{4}$ → $\frac{13}{4}$

Second diagram → $\frac{9}{4}$

Third diagram → $\frac{5}{2}$

3. a) $3\frac{1}{2} = \mathbf{\frac{7}{2}}$

b) $2\frac{2}{3} = \mathbf{\frac{8}{3}}$

c) $4\frac{2}{5} = \mathbf{\frac{22}{5}}$

4. a) $4\frac{1}{5} = \mathbf{\frac{21}{5}}$
b) $4\frac{3}{5} = \mathbf{\frac{23}{5}}$
c) $4\frac{4}{5} = \mathbf{\frac{24}{5}}$
d) $3\frac{2}{3} = \mathbf{\frac{11}{3}}$
e) $2\frac{7}{10} = \mathbf{\frac{27}{10}}$
f) $3\frac{1}{8} = \mathbf{\frac{25}{8}}$
g) $2\frac{4}{7} = \mathbf{\frac{18}{7}}$
h) $9\frac{1}{11} = \mathbf{\frac{100}{11}}$
i) $5\frac{3}{4} = \mathbf{\frac{23}{4}}$

5. 14 glasses

6. a) $\mathbf{\frac{14}{4}} = 3\frac{1}{2}$
$\mathbf{\frac{28}{8}} = 3\frac{1}{2}$
$\mathbf{\frac{21}{6}} = 3\frac{1}{2}$
b) $4\frac{5}{10} = \mathbf{\frac{9}{2}}$
$4\frac{6}{10} = \mathbf{\frac{23}{5}}$
$4\frac{7}{10} = \mathbf{\frac{94}{20}}$
$4\frac{8}{10} = \mathbf{\frac{72}{15}}$

Reflect

Diagrams will vary, but should show items split into fifths.

6 Compare fractions less than 1

➜ pages 137–139

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

2. a) $\frac{1}{4} > \frac{1}{8}$
b) $\frac{5}{24} < \frac{5}{6}$
c) $\frac{3}{12} = \frac{1}{4}$
d) $\frac{11}{20} < \frac{3}{5}$
e) $\frac{3}{10} < \frac{9}{10}$
f) $\frac{1}{100} < \frac{1}{4}$
g) $\frac{1}{3} > \frac{5}{18}$
h) $\frac{41}{100} > \frac{10}{25}$

3. a) Bella has used diagrams that are not the same length.

b)

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

5. a) $\frac{1}{7} > \frac{51}{364}$
b) $\frac{5}{6} < \frac{111}{132}$
c) $\frac{5}{9} < \frac{548}{981}$

Reflect

Descriptions will vary but children should discuss comparing numerators and denominators and finding equivalent fractions to compare. They might also discuss using diagrams.

7 Order fractions less than 1

➜ pages 140–142

1. Less than $\frac{1}{2}$: $\frac{1}{4}, \frac{3}{10}, \frac{4}{9}$.
Greater than $\frac{1}{2}$: $\frac{5}{6}, \frac{9}{14}, \frac{25}{40}, \frac{8}{15}$.

2. $< \frac{1}{10}$: $\frac{4}{50}, \frac{3}{32}, \frac{6}{100}$.
$> \frac{1}{10}$: $\frac{2}{18}, \frac{10}{80}, \frac{2}{16}, \frac{11}{100}$.

3. a) $\frac{2}{3} = \mathbf{\frac{8}{12}}$
$\frac{5}{6} = \mathbf{\frac{10}{12}}$
b) $\frac{7}{12}, \frac{2}{3}, \frac{5}{6}$

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

5. $\frac{5}{9} >$ **any number less than** $\mathbf{\frac{10}{18}}$, e.g. $\mathbf{\frac{9}{18}}, \mathbf{\frac{8}{18}}, \mathbf{\frac{7}{18}}$.
$\mathbf{\frac{1}{6}}, \mathbf{\frac{2}{6}}, \mathbf{\frac{3}{6}} < \frac{12}{18}$.

6. $\frac{1}{3} < \mathbf{\frac{1}{2}} < \frac{2}{3}$
$\frac{1}{3} < \mathbf{\frac{2}{4}} < \frac{2}{3}$
$\frac{1}{3} < \mathbf{\frac{2}{5}} < \frac{2}{3}$

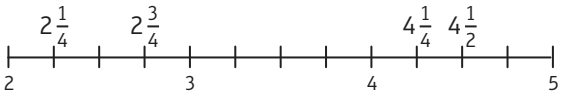
Reflect

$\frac{1}{5} < \frac{5}{12} < \frac{9}{12}$

8 Compare and order fractions greater than 1

➜ pages 143–145

1. a)



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

2. a) Children should circle the second diagram.
b) Children should circle the first diagram.
c) Children should circle the second diagram.

3. **Kate** has cycled further.

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

5. a) $2\frac{7}{8} < 4\frac{3}{4}$

b) $3\frac{2}{3} > 3\frac{1}{6}$

c) $5\frac{1}{5} = 5\frac{2}{10}$

d) $\frac{31}{5} > \frac{31}{10}$

e) $\frac{41}{6} < \frac{41}{2}$

f) $\frac{21}{2} > \frac{41}{4}$

g) $\frac{21}{5} > 2\frac{1}{5}$

h) $\frac{31}{10} = 3\frac{1}{10}$

i) $5\frac{1}{3} > \frac{31}{6}$

6. a) Answers may vary depending on the denominators chosen but should be between $\frac{21}{5}$ and $4\frac{5}{10}$.

Possible solutions include: $\frac{43}{10}$, $\frac{87}{20}$, $\frac{44}{10}$.

Answers will vary, but Kate's number should come first, and Aki's number should come last: $\frac{21}{5}$, [children's number], [children's number], [children's number], $4\frac{5}{10}$.

Using the possible solutions from part a): $\frac{21}{5} < \frac{43}{10} < \frac{87}{20} < \frac{44}{10} < 4\frac{5}{10}$.

b) Answers will vary. For example: $3\frac{11}{32}$, $3\frac{22}{64}$, $3\frac{23}{64}$, $3\frac{42}{128}$.

Reflect

Answers may vary. For example: $\frac{8}{3} = 2\frac{2}{3}$; $\frac{2}{3} > \frac{1}{6}$ so $\frac{8}{3} > 2\frac{1}{6}$.

Or, $2\frac{1}{6} = \frac{13}{6}$; $\frac{8}{3} = \frac{16}{6}$; $\frac{16}{6} > \frac{13}{6}$, so $\frac{8}{3}$ is greater than $2\frac{1}{6}$.

My journal

➜ page 146

Answers will vary. For example:

$\frac{1}{3} = \frac{2}{6} = \frac{3}{9}$

$\frac{3}{4}, \frac{5}{6}, \frac{19}{20}$

$\frac{1}{10}, \frac{2}{11}, \frac{3}{167}$

Children should discuss a systematic method or using equivalent fractions.

Power play

➜ page 147

Children might need support checking their answers as they play the game.

Unit 6 – Fractions (2)

I Add and subtract fractions

→ pages 148–150

1. a) $\frac{2}{5} + \frac{1}{5} = \mathbf{\frac{3}{5}}$

b) $\frac{3}{8} + \frac{3}{8} = \mathbf{\frac{6}{8}} = \mathbf{\frac{3}{4}}$

c) $\frac{9}{10} - \frac{7}{10} = \mathbf{\frac{2}{10}} = \mathbf{\frac{1}{5}}$

2. a) $\frac{5}{9} + \frac{3}{9} = \mathbf{\frac{8}{9}}$

b) $\frac{7}{9} - \frac{2}{9} = \mathbf{\frac{5}{9}}$

c) $\frac{2}{7} + \frac{2}{7} + \frac{2}{7} = \mathbf{\frac{6}{7}}$

3. a) $\frac{3}{9} + \frac{4}{9} = \mathbf{\frac{7}{9}}$

b) $\frac{4}{9} + \frac{3}{9} = \mathbf{\frac{7}{9}}$

c) $\frac{5}{9} + \frac{3}{9} = \mathbf{\frac{8}{9}}$

d) $\frac{3}{10} + \frac{4}{10} = \mathbf{\frac{7}{10}}$

e) $\frac{3}{12} + \frac{4}{12} = \mathbf{\frac{7}{12}}$

f) $\frac{3}{20} + \frac{4}{20} = \mathbf{\frac{7}{20}}$

g) $\frac{4}{9} - \frac{1}{9} = \mathbf{\frac{3}{9}}$

h) $\frac{4}{10} - \frac{1}{10} = \mathbf{\frac{3}{10}}$

i) $\frac{4}{11} - \frac{2}{11} = \mathbf{\frac{2}{11}}$

4. a) $\frac{3}{8} + \mathbf{\frac{4}{8}} = \frac{7}{8}$

b) $\frac{17}{20} - \mathbf{\frac{14}{20}} = \frac{3}{20}$

c) $\frac{7}{12} - \mathbf{\frac{6}{12}} = \frac{1}{12}$

d) $\frac{2}{8} + \mathbf{\frac{1}{8}} + \frac{2}{8} = \frac{5}{8}$

e) $\frac{3}{8} + \mathbf{\frac{2}{8}} = \frac{5}{8}$

f) $\mathbf{\frac{13}{21}} - \frac{5}{21} = \frac{8}{21}$

5. a) $\frac{3}{8} + \mathbf{\frac{5}{8}} = 1$

b) $\mathbf{\frac{2}{9}} + \frac{7}{9} = 1$

c) $1 - \frac{4}{5} = \mathbf{\frac{1}{5}}$

d) $1 - \frac{7}{12} = \mathbf{\frac{5}{12}}$

e) $1 - \mathbf{\frac{1}{3}} = \frac{2}{3}$

f) $1 - \mathbf{\frac{9}{10}} = \frac{1}{10}$

6. Join $\frac{6}{7}$ and $\frac{1}{7}$; join $\frac{5}{7}$ and $\frac{2}{7}$; join $\frac{4}{7}$ and $\frac{3}{7}$.

Explanations will vary. For example, $\frac{7}{7}$ makes 1 whole, so I chose pairs of numerators that total 7.

7. Explanations will vary. The calculation is correct as $\frac{5}{8} + \frac{3}{8} = 1$ and $1 - \frac{5}{6} = \frac{1}{6}$.

Reflect

Answers will vary. For example, $\frac{1}{20} + \frac{12}{20}$; $\frac{3}{20} + \frac{10}{20}$; $1 - \frac{7}{20}$; $\frac{17}{20} - \frac{4}{20}$ or $\frac{6}{20} + \frac{7}{20}$.

2 Add fractions within I

→ pages 151–153

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

$\frac{2}{3} + \frac{1}{6} = \frac{4}{6} + \frac{1}{6} = \frac{5}{6}$

b) $\frac{1}{4} = \frac{2}{8}$

$\frac{3}{8} + \frac{1}{4} = \frac{3}{8} + \frac{2}{8} = \frac{5}{8}$

c) $\frac{1}{3} = \frac{3}{9}$

$\frac{4}{9} + \frac{1}{3} = \frac{4}{9} + \frac{3}{9} = \frac{7}{9}$

2. a) $\frac{7}{12} + \frac{1}{4} = \frac{7}{12} + \frac{3}{12} = \frac{10}{12} = \frac{5}{6}$

b) $\frac{3}{5} + \frac{9}{25} = \frac{15}{25} + \frac{9}{25} = \frac{24}{25}$

c) $\frac{3}{4} + \frac{1}{20} = \frac{15}{20} + \frac{1}{20} = \frac{16}{20} = \frac{4}{5}$

d) $\frac{7}{20} + \frac{1}{2} = \frac{7}{20} + \frac{10}{20} = \frac{17}{20}$

3. $\frac{1}{5} + \frac{7}{10} = \frac{2}{10} + \frac{7}{10} = \frac{9}{10}$

Bella has given away $\frac{9}{10}$ of the flowers.

4. a) $\frac{2}{3} + \frac{4}{15} = \frac{10}{15} + \frac{4}{15} = \frac{14}{15}$ of the circle is shaded.

b) $\frac{1}{2} + \frac{1}{4} + \frac{1}{20} = \frac{10}{20} + \frac{5}{20} + \frac{1}{20} = \frac{16}{20} = \frac{4}{5}$ of the circle is shaded.

5. a) $\frac{1}{3} = \frac{4}{12}$

$\frac{4}{12} + \frac{7}{12} = \frac{11}{12}$

$\frac{1}{3} + \frac{7}{12} = \frac{11}{12}$

b) $\frac{1}{4} = \frac{6}{24}$ $\frac{1}{12} = \frac{2}{24}$

$\frac{6}{24} + \frac{2}{24} + \frac{1}{24} = \frac{9}{24}$

$\frac{1}{4} + \frac{1}{12} + \frac{1}{24} = \frac{9}{24}$

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 $\frac{7}{8}$.

3 Add fractions with a total greater than 1

→ pages 154–156

1. a) $\frac{1}{3} = \frac{2}{6}$

$\frac{5}{6} + \frac{1}{3} = \frac{5}{6} + \frac{2}{6} = \mathbf{\frac{7}{6}}$

b) $\frac{1}{2} + \frac{5}{10}$

$\frac{1}{2} + \frac{9}{10} = \frac{5}{10} + \frac{9}{10} = \mathbf{\frac{14}{10}}$

2. $\frac{2}{4}$ or $\frac{1}{2}$

3. a) $\frac{2}{3} + \frac{5}{9} = \frac{6}{9} + \frac{5}{9} = \frac{11}{9} = \mathbf{1\frac{2}{9}}$

b) $\frac{3}{4} + \frac{11}{12} = \frac{9}{12} + \frac{11}{12} = \frac{20}{12} = 1\frac{8}{20} = \mathbf{1\frac{2}{5}}$

c) $\frac{5}{12} + \frac{5}{6} = \frac{5}{12} + \frac{10}{12} = \frac{15}{12} = 1\frac{3}{12} = \mathbf{1\frac{1}{4}}$

4. $\frac{3}{4} + \frac{7}{20} = \frac{15}{20} + \frac{7}{20} = \frac{22}{20} = 1\frac{2}{20} = 1\frac{1}{10}$

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

5. a) $\frac{7}{10} + \frac{11}{20} = \frac{14}{20} + \frac{11}{20} = \frac{25}{20} = 1\frac{5}{20} = \mathbf{1\frac{1}{4}}$

b) $\frac{11}{15} + \frac{4}{5} = \frac{11}{15} + \frac{12}{15} = \frac{23}{15} = \mathbf{1\frac{8}{15}}$

6. a) $\frac{1}{2} = \frac{6}{12}$

$\frac{6}{12} + \mathbf{\frac{11}{12}} = \frac{17}{12}$

$\frac{1}{2} + \mathbf{\frac{11}{12}} = \frac{17}{12}$

b) $\frac{2}{3} = \frac{8}{12}$

$\frac{8}{12} + \frac{9}{12} = \frac{17}{12}$

$\frac{2}{3} + \mathbf{\frac{3}{4}} = \frac{17}{12}$

c) $1\frac{1}{2} = 1\frac{3}{6}$

$\frac{5}{6} + \frac{4}{6} = 1\frac{3}{6}$

$\frac{5}{6} + \mathbf{\frac{2}{3}} = 1\frac{1}{2}$

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 $1\frac{4}{9}$.

4 Add to a mixed number

→ pages 157–159

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

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

c) $2\frac{1}{3} + 1\frac{1}{3} = \mathbf{3\frac{2}{3}}$

2. a) $1\frac{2}{9} + 8 = \mathbf{9\frac{2}{9}}$

b) $1\frac{2}{9} + 9 = \mathbf{10\frac{2}{9}}$

c) $1\frac{2}{9} + \frac{6}{9} = \mathbf{1\frac{8}{9}}$

3. a) $2\frac{3}{8} + \frac{1}{2} = \mathbf{2\frac{7}{8}}$

b) $2\frac{3}{8} + 1\frac{1}{4} = \mathbf{3\frac{5}{8}}$

4. a) $5\frac{1}{8} + \frac{3}{4} = 5\frac{1}{8} + \frac{6}{8} = \mathbf{5\frac{7}{8}}$

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

5. a) $2\frac{1}{4} + \frac{5}{8} = 2\frac{2}{8} + \frac{5}{8} = \mathbf{2\frac{7}{8}}$

b) $\frac{7}{10} + 1\frac{1}{2} = \frac{7}{10} + 1\frac{5}{10} = 2\frac{2}{10} = \mathbf{2\frac{1}{5}}$

c) $4\frac{2}{5} + \frac{3}{20} = \frac{22}{5} + \frac{3}{20} = \frac{88}{20} + \frac{3}{20} = \frac{91}{20} = \mathbf{4\frac{11}{20}}$

d) $\frac{7}{16} + 4\frac{3}{4} = \frac{7}{16} + \frac{19}{4} = \frac{7}{16} + \frac{76}{16} = \frac{83}{16} = \mathbf{5\frac{3}{16}}$

6. Matching additions that total $3\frac{3}{8}$ are:
$2\frac{7}{8} + \frac{1}{2}$ and $2\frac{3}{4} + \frac{5}{8}$.

Matching additions that total $2\frac{3}{8}$ are:
$2 + \frac{1}{8} + \frac{2}{8}$ and $\frac{7}{8} + \frac{7}{8} + \frac{5}{8}$.

Matching additions that total $3\frac{5}{8}$ are:
$2\frac{6}{8} + \frac{2}{8} + \frac{5}{8}$ and $2\frac{3}{4} + \frac{7}{8}$.

Reflect

$3\frac{1}{2}$ 5 $9\frac{3}{4}$ $12\frac{1}{4}$

5 Add two mixed numbers

→ pages 160–162

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 $\mathbf{3\frac{5}{8}}$ 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, $3\frac{3}{5} + 2\frac{9}{10} = \mathbf{6\frac{1}{2}}$.

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

b) $3\frac{7}{10} + 1\frac{1}{2} = 5\frac{1}{5}$

4. $3\frac{8}{9}$

5. $4\frac{1}{4}$ kg

6. a) $7\frac{3}{10}$ b) $10\frac{1}{6}$

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

Reflect

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. Adding wholes and then parts will keep the numbers that they are working with smaller.

6 Subtract fractions within I

➜ pages 163–165

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

2. a) $\frac{1}{4}$ c) $\frac{2}{5}$

b) $\frac{1}{3}$ d) $\frac{7}{20}$

3. There is $\frac{1}{2}$ litre more water in Jug A than in Jug B.

4. a) $\frac{4}{5}$ m b) $\frac{3}{10}$ m

5. a) $\frac{7}{20}$ c) $\frac{1}{16}$

b) $\frac{19}{90}$

Reflect

Answers will vary. For example, $\frac{3}{4}-\frac{1}{2}$; $1\frac{1}{2}-1\frac{1}{4}$; $\frac{5}{6}-\frac{7}{12}$.

7 Subtract from a mixed number

➜ pages 166–168

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

So, $2\frac{7}{9}-\frac{5}{9}=\mathbf{2\frac{2}{9}}$

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

b) $3\frac{7}{8}-\frac{1}{2}=3\frac{7}{8}-\frac{4}{8}$
$=3\mathbf{\frac{3}{8}}$

c) $3\frac{7}{8}-1=2\frac{7}{8}$
$3\frac{7}{8}-\frac{7}{8}=\mathbf{3}$

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) $3\frac{8}{9}$

b) $3\frac{7}{9}$ d) $\frac{7}{12}$

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

Reflect

Explanations will vary. For example, $\frac{1}{10}$ 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 needing to exchange one of the whole numbers so the answer will be more than 2.

8 Subtract from a mixed number – breaking the whole

➜ pages 169–171

1. a) $3\frac{2}{5}=2\frac{7}{5}$
$2\frac{7}{5}-\frac{4}{5}=2\frac{3}{5}$
So, $3\frac{2}{5}-\frac{4}{5}=\mathbf{2\frac{3}{5}}$

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, $4\frac{1}{4}-\frac{7}{8}=\mathbf{3\frac{3}{8}}$

b) $1\frac{7}{10}$

4. a) $4\frac{5}{9}$ c) $6\frac{5}{7}$

b) $4\frac{5}{12}$

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

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

Reflect

Explanations will vary. $\frac{9}{10}$ is more than $\frac{2}{5}$, so this means that one of the wholes in 2 will need to be exchanged in order for the parts to be subtracted. The answer is $1\frac{1}{2}$.

9 Subtract two mixed numbers

➜ pages 172–174

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

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

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, $4\frac{1}{2} - 2\frac{7}{8} = \mathbf{1\frac{5}{8}}$

4. Max runs $\mathbf{1\frac{4}{5}}$ more miles.

5. a) $5\frac{3}{11} - 1\frac{7}{11} = \mathbf{3\frac{7}{11}}$
b) $5\frac{5}{12} - \frac{7}{12} = \mathbf{4\frac{5}{6}}$
c) $5\frac{4}{5} - 3\frac{13}{15} = \mathbf{1\frac{14}{15}}$
d) $2\frac{7}{18} - 1\frac{2}{3} = \mathbf{\frac{13}{18}}$

6. Calculations circled:
$7\frac{8}{9} - 6\frac{1}{9}$, $4\frac{1}{9} - 2\frac{1}{3}$ and $6\frac{5}{8} - 4\frac{19}{24}$.

7. 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 $\frac{9}{12}$ instead of exchanging 1 whole to make more 12ths in order to complete the subtraction. The correct answer is $1\frac{1}{3}$.

10 Solve fraction problems

➜ pages 175–177

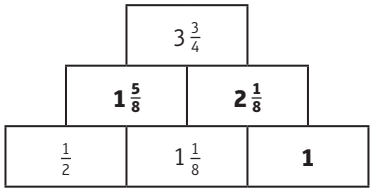
1. Alex has read $\mathbf{\frac{1}{2}}$ of the book.

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

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

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

5.



Reflect

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

11 Solve multi-step fraction problems

➜ pages 178–180

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

2. a) $\mathbf{\frac{4}{9}}$ 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 $\frac{3}{9}$ and $\frac{1}{9}$ makes $\frac{4}{9}$.

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

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

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

6. The difference between A and B is $\mathbf{1\frac{3}{10}}$.
Explanations may vary.
B is $1\frac{7}{10}$ and A is $\frac{2}{5}$. $1\frac{7}{10} - \frac{2}{5} = 1\frac{7}{10} - \frac{4}{10} = 1\frac{3}{10}$.

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.

My journal

➜ page 181

1. a) Methods may vary. Encourage children to explain preference with justifications. $8\frac{11}{12} + 7\frac{3}{4} = 16\frac{2}{3}$.
b) Methods may vary. Encourage children to explain preference with justifications. $12\frac{1}{12} - 11\frac{5}{6} = \frac{3}{12} = \frac{1}{4}$.

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

Power puzzle

➜ page 182

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

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

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

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

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.

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

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

Answers and methods will vary.

For example, $\frac{1}{5} + \frac{2}{10} + \frac{3}{15} + \frac{4}{20} + \frac{6}{30} = 1$.

Children could explain that because 5 fifths is 1 whole, if you add 5 fractions together that are each equivalent to $\frac{1}{5}$, the sum will be 1.