Unit 1 – Place value within 10,000,000

1 Numbers to 1,000,000

➜ pages 6–8

1. a) 329,412
b) 72,304

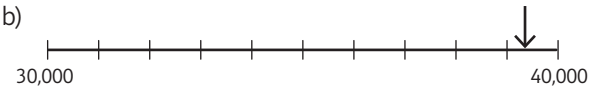
2. a) 123,000
b) 439,286
c) 97,103
d) 305,246

3. a) 40 or 4 tens
b) 4,000 or 4 thousands
c) 3 or 3 ones
d) 500,000 or 5 hundred thousands
e) 4 or 4 ones
f) 100 or 1 hundred

4. a) Answers will vary – any number using all six digits with a 4 or 8 in the ones column.
b) Answers will vary – any number using all six digits with a 3, 5, 7 or 9 in the ones column.
c) Answers will vary – any number using all six digits with a 5 in the ones column.
d) Answers will vary – any number using all six digits with a 5 in the hundred thousands column.

5. a) Missing numbers from left to right along the number line:
310,000; 320,000; 340,000; 350,000; 360,000; 380,000; 390,000

b)



6. a) 74,400 73,500 73,410 73,390

b) 750,167 660,167 651,167 649,167

7. Answers will vary – ensure that the number is greater than 500,000, is odd, has the same digit in the ones and the thousands column and the digits total 26. Example answers: 853,163; 507,707.

Reflect

Answers will vary. Encourage children to write down facts they know about the number. Include information about odd and even, place value and comparing and ordering numbers or digits.

2 Numbers to 10,000,000

➜ pages 9–11

1. a) 500,000
b) 1,000,000
c) 1,600,000

2. a) 2,903,471; two million, nine hundred and three thousand, four hundred and seventy-one
b) 3,005,765; three million, five thousand, seven hundred and sixty-five

3. Counters drawn in columns:

a)

M	HTh	TTH	Th	H	T	O
6	1	4	6	0	0	5

b)

M	HTh	TTH	Th	H	T	O
0	5	7	0	2	3	0

4. a) 1,084,300
b) 2,202,002
c) 92,092

5. 6*4,506 or 6,**4,506 where * is any number

6. Yes, Danny is correct. You can tell if a number is odd or even using just the ones digit – if the ones digit is 0, 2, 4, 6 or 8, then the number is even; if it is 1, 3, 5, 7 or 9, then the number is odd.

Reflect

The value of each digit in 8,027,361: 8,000,000 or 8 million; 20,000 or 2 ten thousands; 7,000 or 7 thousands; 300 or 3 hundreds; 60 or 6 tens; 1 or 1 one.

3 Partition numbers to 10,000,000

➜ pages 12–14

1. a) 2,000,000 + 300,000 + 20,000 + 6,000 + 400 + 50 + 7 = 2,326,457
b) 300,000 + 50,000 + 30 + 7 = 350,037

2. Jamilla has £2,100,320.

3. a) 7 millions or 7,000,000
b) 7 hundred thousands or 700,000
c) 7 thousands or 7,000
d) 7 tens or 70

4. a) 7,000; 10
b) 60,320

5. a) 7
b) 400 + 20 + 9
c) 200,000 + 60,000 + 300 + 90 + 2
d) 8,512
e) 723,572
f) 3,056,825
g) 412,000

6. a) 3,098,828
b) 3,099,728
c) 3,108,728
d) 2,098,728
e) 2,998,728

7. Answers will vary, as long as the tens digit in each is 7. Children should recognise that the value of the 10s digit stays the same no matter how many digits the number has.

8. There are many possible answers:
The ones digit must be even for the ten thousand digit to be half of it.
The hundreds digit must be a multiple of 3 (3, 6 or 0) so that it can be 3 times the millions digit.
Ensure the digits add up to 20.
For example, 3,510,902; 2,131,616.

Reflect

Answers will vary. Ensure that children have partitioned the number correctly. Parts should total 4,508,375 when recombined, for example:
4,000,000 + 500,000 + 8,000 + 300 + 70 + 5
3,000,375 + 1,508,000

4 Powers of 10

→ pages 15–17

1. a) 38,200
b) 382,000
c) 3,820,000

2. a) 35,000
350,000
3,500,000
b) 350
35

3. a) 1,260,000
b) 600,000
c) 750
d) 80
e) 3,900,000
f) 104,000
g) 850

4. a) 120,000
b) 3,100,000
c) 1,650,000
d) 5,600

5. a) 6
b) 60
c) 600
d) 6,000
e) 60,000

Reflect

Children should recognise that when you multiply a number by 10, you add one 0 to the end of the number and move the comma(s). When you divide a number by 10, you remove one 0 from the end of the number and move the comma(s). To find 100 times bigger than a number you move two rows up, to find 100 times smaller than a number you move two rows down.

5 Number line to 10,000,000

→ pages 18–20

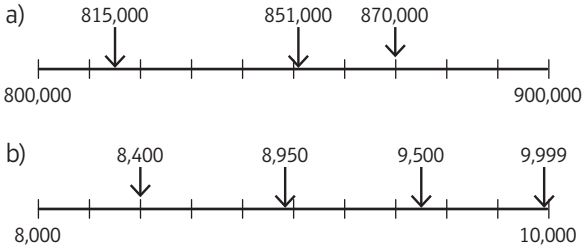
1. a) 100,000
b) 1,000

2. 1,255,700; 1,255,800; 1,255,900; 1,256,000; 1,256,100; 1,256,200
b) 66,340; 66,350; 66,360

3. a) 130,520; 131,520; 132,520
b) 720,700; 820,700; 920,700
c) 3,230,000; 3,240,000; 3,250,000

4. a) 20,000; 70,000; 95,000
b) 2,300,000; 2,550,000
c) 620; 730; 785 approximately

5. Arrows drawn to number line:



6. a) 5,500,000
b) 7,500,000
c) 8,500,000

Reflect

Encourage children to use reasoning to explain their chosen number. The number is less than half-way between 200,000 and 300,000 so will be less than 250,000. Estimate ≈ 2,400,000.

6 Compare and order any number

→ pages 21–23

1. Number A is greater. Number A is greater because the two numbers have the same millions, hundred thousands and ten thousands, but A has the greater number of thousands than B.

2. a) 9,580 > 9,570
9,580 < 9,680
9,580 < 9,681
9,580 < 9,589
9,580 < 10,000
10,000 > 9,580
b) 540,000 > 54,000
540,000 > 450,000
540,000 > 540
540,000 > half a million
540,000 < 600,000
540,000 < 3,000,000

3. D (£357,905); A (£370,500); C (£375,000); B (£429,700)

4. Benny is fed third.

5. 73,000; 725,906; 725,960; 728,000

6. a) 0, 1 or 2
b) 6, 7, 8 or 9
c) 4, 5, 6, 7, 8 or 9
d) 0, 1, 2, 3, 4, 5, 6, 7 or 8
e) 0

7. Answers may vary. Ensure that each number in the row is bigger than the previous number.
First number: Missing digit can be any digit.
Second number: First missing digit is 6; second missing digit is 8 or 9.
Third number: First missing digit is 1, 2 or 3; second missing digit can be any digit.

Reflect

False – Ensure children know that to order numbers, we first need to look at the place value of each digit starting from the largest value place. In this case, the digit 1 in 120,000 is 1 hundred thousand compared to the digit 1 in 15,600, which is only 1 ten thousand. Therefore the numbers are not in descending order as 120,000 is bigger than 15,600.

7 Round any number

→ pages 24–26

1. a) Olivia is incorrect. She needs to look at the hundreds column and then decide if she will need to round the thousands column up to 4 thousands or down to 3 thousands.

b) 14,000
13,700

2. 7,000,000 because it is closer to 7,000,000 than 6,000,000.

3. a) 100,000
100,000
200,000
200,000

b) 60,000
60,000
60,000
60,000

4.

Rounded to the nearest	128,381	1,565,900	72,308
100,000	**100,000**	**1,600,000**	**100,000**
10,000	**130,000**	**1,570,000**	**70,000**
1,000	**128,000**	**1,566,000**	**72,000**
100	**128,400**	**1,565,900**	**72,300**
10	**128,380**	**1,565,900**	**72,310**

5. Circled: 17,450; 16,790; 17,399; 16,500; 16,999; 17,098

6. a) 15,692
b) Answers will vary but must have 56, 59, 61 or 62 thousands.
c) 59,612 or 59,621

7. a) 10
b) Any digit
c) Maximum: 549,499
Minimum: 450,000

Reflect

The answer is true. Explanations will vary. Encourage children to give two explanations to prove it, perhaps using a number line and using a 'rule' that they may have come up with.

8 Negative numbers

→ pages 27–28

1. a) 1 °C
b) 7 °C

2. a) 4
b) $^{-}2$
c) $^{-}2$

3. $^{-}4$, $^{-}3$, $^{-}2$, $^{-}1$, 0, 1, 2

4. a) $^{-}10$ °C; $^{-}5$ °C; 5 °C; 10 °C; 25 °C
b) $^{-}8$, $^{-}6$, $^{-}4$, $^{-}2$, 2, 4, 6, 8
c) $^{-}20$; 0; 20; 40; 60; 80; 100; 140

5. a) 7 section H
17·5 section K
11 section I
$^{-}3\frac{1}{2}$ section D
$^{-}5$ section D
$^{-}11{\cdot}1$ section B

b) Three numbers between $^{-}12$ and $^{-}9$.

6. 14 m

7. A = $^{-}16$
B = 8

Reflect

A = $^{-}50$; B = 20. Explanations will vary. Encourage children to explain that between 0 and 40, there are 4 intervals, which means that each interval is worth 10. Now we know that B is 20 and if we count backwards in tens from zero, then A = $^{-}50$.

My journal

➜ page 30

Answers may vary. Ensure that each number satisfies the statement.

Some only have once answer:

A number that is 10,000 more than 50,389: 60,389.

The greatest number less than seven million that you can make: 6,985,310

Power puzzle

➜ page 31

5,293,187

Unit 2 – Four operations (I)

I Add integers

➜ pages 32–34

1.

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

2. a) 10,635
b) 64,328
c) 112,746
d) 583,542
e) 921,217
f) 1,959,810

3. a) 76,492
b) 537,439
c) 23,573
d) £8,264,000

4. 11,883 ml

5. a) 3**6**,18**2** + **2**5,0**5**7 = 61,**2**39
b) **2**85,**0**6**6** + 19**5**,5**0**6 = 4**8**0,572

6. Max and Jamie's numbers are:
38,625 and 52,863 or 38,652 and 52,836

Reflect

Various answers are possible. Children should explain how to line up the digits correctly according to their place values and to remember to add in any carried (exchanged) numbers from the previous column.

2 Subtract integers

➜ pages 35–37

1. a) 2,203
b) 4,254
c) 3,361
d) 17,533
e) 177,308
f) 493,028

2. a) 13,708
b) £176,844

3. a) Olivia has not lined up the digits correctly.
b) 43,877

4. a) 77,338
b) 5,885,500

5. a) 14,048
b) 13,548

6. 48,7**0**6 – **1**3,**5**8**1** = 3**5**,125
615,003 – 7**1**,**187** = 5**4**3,816

7. a) Max has subtracted 1 from each number to avoid too many exchanges.
b) 40,000 – 17,605 = 39,999 – 17,604 = 22,395
200,000 – 136,419 = 199,999 – 136,418 = 63,581
30,001 – 6,984 = 29,999 – 6,982 = 23,017 (subtract 2)

Reflect

Various answers are possible.

3 Problem solving – addition and subtraction

➜ pages 38–40

1. a) 2,438 – 1,330 = 1,108
She flew 1,108 km further on Monday than on Tuesday.
b) Wednesday: 2,438 – 227 = 2,211
2,438 + 1,330 + 2,211 = 5,979
She flew 5,979 km in total.

2. a) The total cost is £203,805.
b) The difference in cost is £50,175.

3. 831 km in total.

4. C: 18,186
A + B + C = 38,700

5. Bella: 36,700
Amelia: 6,950
Altogether they scored 43,650.

Reflect

Answers will vary according to how easy or difficult they find the subtraction methods.

4 Common factors

➜ pages 41–43

1. a) 1 × 14 = 14
2 × 7 = 14
The factors of 14 are 1, 2, 7 and 14.
1 × 18 = 18
2 × 9 = 18
3 × 6 = 18
The factors of 18 are 1, 2, 3, 6, 9 and 18.
b) The common factors of 14 and 18 are 1 and 2.

2. a) 5 × 6 = 30
30 ÷ 5 = 6 (a whole number) so 5 is a factor of 30.
b) 30 ÷ 8 = 3 remainder 6 (not a whole number) so 8 is not a factor of 30.

3. Factors of 40: 1 × 40; 2 × 20; 4 × 10; 5 × 8
Factors of 100: 1 × 100; 2 × 50; 4 × 25; 5 × 20; 10 × 10
The common factors of 40 and 100 are:
1, 2, 4, 5, 10, 20.

4. a) 1, 2, 4, 5, 10, 20
b) 1, 3, 5, 9, 15, 45
c) The common factors of 20 and 45 are 1 and 5.

5. Left circle: 8, 24
Right circle: 5, 10, 15, 20, 30, 60
Middle: 1, 2, 3, 4, 6, 12
The common factors of 24 and 60 are 1, 2, 3, 4, 6, 12.

6. a) Common factors of 35, 50 and 70 are circled.

Factors of 35	Factors of 50	Factors of 70
(1)	(1)	(1)
(5)	2	2
7	(5)	(5)
35	10	7
	25	10
	50	14
		35
		70

b) Answers may vary but must be a multiple of 60. The lowest common factor of 1, 2, 3, 4 and 5 is 60, so any multiple of 60 will be a common factor.

Reflect

Common factors of 15 and 60: 1, 3, 5, 15.

No, you would not need to check all the numbers up to 60. All the common factors must be factors of 15 so you would only need to check all the numbers up to 15.

5 Common multiples

→ pages 44–46

1. Multiples of 8 are circled. Multiples of 6 are shaded.

1	2	3	4	5	6	7	(8)	9	10
11	12	13	14	15	(16)	17	18	19	20
21	22	23	(24)	25	26	27	28	29	30
31	(32)	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	(48)	49	50
51	52	53	54	55	(56)	57	58	59	60
61	62	63	(64)	65	66	67	68	69	70
71	(72)	73	74	75	76	77	78	79	(80)
81	82	83	84	85	86	87	(88)	89	90
91	92	93	94	95	(96)	97	98	99	100

The common multiples of 6 and 8 up to 100 are: 24, 48, 72 and 96.

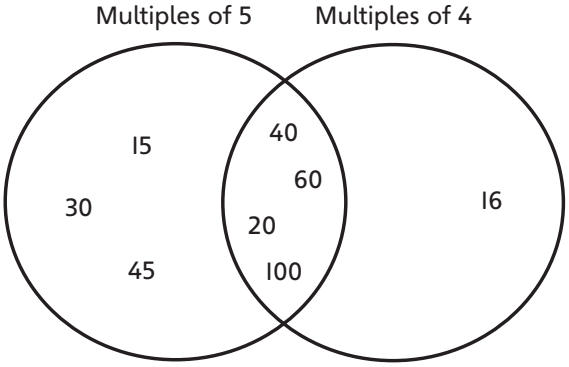
2. a) Multiples of 3 are circled.
b) Multiples of 7 are shaded.

1	2	(3)	4	5	(6)	7	8	(9)	10
11	(12)	13	14	(15)	16	17	(18)	19	20
(21)	22	23	(24)	25	26	(27)	28	29	(30)
31	32	(33)	34	35	(36)	37	38	(39)	40
41	(42)	43	44	(45)	46	47	(48)	49	50
(51)	52	53	(54)	55	56	(57)	58	59	(60)
61	62	(63)	64	65	(66)	67	68	(69)	70
71	(72)	73	74	(75)	76	77	(78)	79	80
(81)	82	83	(84)	85	86	(87)	88	89	(90)
91	92	(93)	94	95	(96)	97	98	(99)	100

c) The common multiples of 3 and 7 are: 21, 42, 63, 84
d) The common multiples of 3 and 7 are multiples of 21.

3. a) 10, 20, 30, 40, 50, 60, 70, 80, 90, 100
b) 15, 30, 45, 60, 75, 90
c) The common multiples of 10 and 15 are: 30, 60, 90

4.



Descriptions may vary. For example: I notice that all the common multiples of 4 and 5 are multiples of 20.

5. a) The bar model shows that 48 is divisible by 12 exactly and it is also divisible by 4 exactly. Therefore 48 is a multiple of 12 and a multiple of 4, so it is a common multiple of 12 and 4.
b) The common multiples of 4 and 12 are multiples of 12: 12, 24, 36, 48, 60, 72, 84, 96.

Reflect

Encourage children to find the lowest common multiple, which is 100.

All other common multiples will be multiples of 100.

6 Rules of divisibility

➜ pages 47–49

1. a) 76, 150, 36,108, 70,000, 261,396 to be shaded.
b) 95, 190, 7,000, 1,360,045 to be shaded.
c) Multiples of 2 end in 0, 2, 4, 6 or 8.
Multiples of 5 end in 0 or 5

2. Yes: 282, 3,189, 75,000
No: 146, 136,003
A number is divisible by 3 if the digits added together equal a multiple of 3.

3. a) Divisible by 2: 136, **288**, **1,452**
Divisible by 3: **288**, **1,452**, 3,315
b) 288 and 1,452 are divisible by 6.
c) They are multiples of both 2 and 3, so are multiples of $2 \times 3 = 6$.
Even multiples of 3 are also multiples of 6.

4. a) If the last two digits form a number that is divisible by 4, then the number is also divisible by 4.
48 is divisible by 4, so all of the numbers are also divisible by 4.
b) 224, 1,488, 62,936, 342,196, 500,000 to be shaded.

5. a) 0, 2, 4, 6 or 8
b) 2, 5 or 8
c) 2 or 8
d) 0 or 5
e) 2 or 6

Reflect

Many possible answers. Check that the last two digits form a multiple of 4 and that the digits sum to a multiple of 3. For example, 3,636 or 4,128.

7 Primes to 100

➜ pages 50–52

1. a) 7 only has two factors: one and itself.
b) Children may mention one or more of the following:
- 27 has more than 2 factors.
- Its factors are 1, 3, 9 and 27.
- 27 is divisible by 3 and 9.
- 27 is a multiple of 3 and 9.
- $3 \times 9 = 27$

2. a) Children may mention one or more of the following:
- Their last digit is 5, so they are all multiples of 5.
- They are divisible by 5.
- 5 is a factor of all these numbers.

b) All the numbers are even, so 2 is a factor.
The only even prime number is 2.

3. a) 13
b) 23
c) 41

4.

1	(2)	(3)	4	(5)	6	(7)	8	9	10
(11)	12	(13)	14	15	16	(17)	18	(19)	20
21	22	(23)	24	25	26	27	28	(29)	30
(31)	32	33	34	35	36	(37)	38	39	40
(41)	42	(43)	44	45	46	(47)	48	49	50
51	52	(53)	54	55	56	57	58	(59)	60
(61)	62	63	64	65	66	(67)	68	69	70
(71)	72	(73)	74	75	76	77	78	(79)	80
81	82	(83)	84	85	86	87	88	(89)	90
91	92	93	94	95	96	(97)	98	99	100

5. Children should write two numbers in each cell from the following possible answers:
Top left cell: 2, 5
Bottom left cell: 1, 4, 10, 20, 25, 50, 100
Top right cell: Any prime number except 2 and 5
Bottom right cell: Any non-prime numbers except 1, 4, 10, 20, 25, 50 and 100
The top left section can have no more numbers in it as they are the only two factors of 100 that are also prime.

6. a) Children may mention one or more of the following:
- 2,375 is a multiple of 5 so is not prime.
- 5 is a factor of 2,376, so 2,375 is not prime.
- 2,375 is in the 5 times table.

b) The sum of the digits of 212,703 is 15, which is a multiple of 3. So 212,703 is also a multiple of 3.
3 is a factor of 212,703.
212,703 is in the 3 times table.

7. Explanations may vary. Encourage children to explain that they can work out prime or composite numbers using knowledge of times tables and divisions.
- 123 is not prime because the sum of its digits is 6, so it is a multiple of 3.
- 223 is prime because it only has 2 factors, 1 and 223.
- If the last two digits are prime, this does not mean the whole number will be prime.

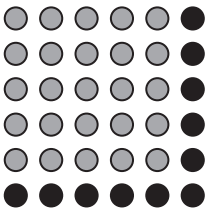
Reflect

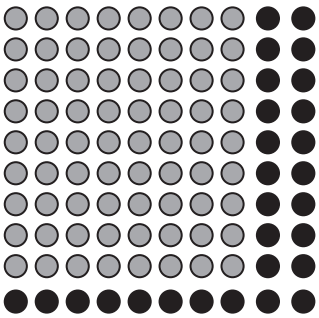
Explanations may vary. Encourage children to explain that they can work out prime or composite numbers using knowledge of times-tables and divisions or by drawing arrays. 85 is not prime as it is in the 5 times-table, so it has a factor of 5. 89 is prime – a multiplication tables grid shows that it is not a multiple of any number between 2 and 10 and so it only has two factors, 1 and itself.

8 Squares and cubes

➜ pages 53–55

1. a) 49
b) 125

2. a) 

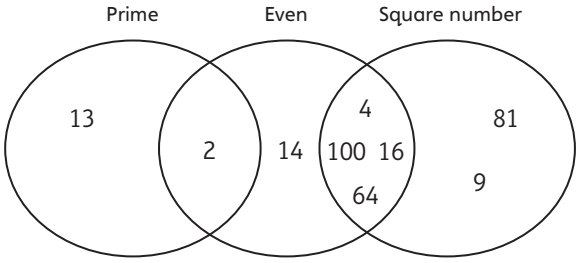
b) 

3. a) 81
b) 100
c) 121
d) 8
e) 4
f) 4
g) 1
h) 1
i) 2

4. 72 more cubes need to be added.
Explanations may vary. For example:
- … because each layer is made from 6 × 6 cubes and you need 2 more layers to complete the big cube. 6 × 6 × 2 = 72.
- … because there are 6 × 6 × 4 = 144 cubes in the shape, whereas 6 × 6 × 6 = 216. 216 – 144 = 72.

5. Bella is incorrect as 30 × 30 = 900. She only multiplied 30 by 3 and not by 30.

6.



All square numbers can be written as $a \times a$, for some whole number a. Square numbers (apart from 1) therefore have more than two factors, since their factors include 1, a and the number itself. The square number 1 is not prime as it has only one factor, 1 (itself). So, there are no prime square numbers and the circles do not need to overlap.

Reflect

Corrected equations: $1^2 = 1$; $3^2 = 9$; $5^3 = 125$.

Comments may vary. For example:
- Danny has worked out 1 × 2, but this is not the same as 1^2. Danny needs to remember that when you square a number you multiply it by itself so $1^2 = 1 \times 1 = 1$.
- $9^2 = 9 \times 9 = 81$, so it is not true that $9^2 = 3$. Danny has squared the wrong number as $3 \times 3 = 9$, so $3^2 = 9$.
- Danny has worked out 5 × 3, but this is not the same as 5^3. Danny needs to remember that when you cube a number you multiply it by itself and then by itself again, so $5^3 = 5 \times 5 \times 5 = 125$.

My journal

➜ page 56

A square number, for example: 1, 4, 16, 25, 36, 64 (256, 324, 625)

A cube number, for example: 1, 64, 125, 216

A 3-digit prime number, for example: 163, 241, 251

A 3-digit number that has 3 and 5 as common factors: various answers are possible but check that they end in 0 or 5 and the digits sum to a multiple of 3. They are all multiples of 15; for example, 165, 540, 255.

Power puzzle

➜ page 57

Children should find that, whatever numbers they begin with, they eventually find themselves 'stuck', constantly using and reusing the digits 6, 1, 4 and 7.

This chain gives 7,173, 6,354, 3,087, 8,352, 6,174, 6,174.

Unit 3 – Four operations (2)

1 Multiply by a 1-digit number

➜ pages 58–60

1. a) 492
b) 1,085
c) 31,218
d) 11,151

2. 3,050 × 6 = 18,300

3. a) 251 × 7 = 1,757
b) 1,271 × 7 = 8,897
c) 5,718 × 4 = 22,872
d) 3,014 × 7 = 21,098

4. 5,500 × 3 = 16,500
1,350 × 3 = 4,050
16,500 + 4,050 = 20,550
Alternative method:
5,500 + 1,350 = 6,850
6,850 × 3 = 20,550
The total mass of the boxes is **20,550 g**.

5. Greatest number = 8,765 × 9 = 78,885
Smallest number = 6,789 × 5 = 33,945

Reflect

Explanations may vary. Encourage children to notice the link between multiplying out each column in the short multiplication and where the answer is found on the grid method.

2 Multiply up to a 4-digit number by a 2-digit number

➜ pages 61–63

1. a)

	100	20	5	
10	**1,000**	**200**	**50**	**= 1,250**
5	**500**	**100**	**25**	**= 625**

125 × 15 = 1,875

b)

	700	20	6	
10	**7,000**	**200**	**60**	**= 7,260**
3	**2,100**	**60**	**18**	**= 2,178**

726 × 13 = 9,438

2. a) 182 × 23 = 4,186
b) 3,194 × 31 = 99,014

3. Column multiplication showing
a) 4,105 × 26 = 106,730
b) 3,183 × 15 = 47,745
c) 2,078 × 34 = 70,652
d) 3,883 × 73 = 283,459

4. 365 × 24 = 8,760
There will be 8,760 hours in 2023.

5. 17 × 379 = 6,443
The pool has 6,443 litres of water in it. This is not enough to fill the pool.

6. 3,62**9** × **5**5 = 199,595

Reflect

Reasoning may vary. For example:

1,254 × 21 = 26,334; 2,508 × 11 = 27,588
so 2,508 × 11 is larger.

2,508 × 11 = 1,254 × 2 × 11 = 1,254 × 22,
which is larger than 1,254 × 21
so 2,508 × 11 is larger.

3 Short division

➜ pages 64–66

1. a) 486 ÷ 3 = **162**
b) 186 ÷ 3 = **62**

2. a) 759 ÷ 3 = **253**
b) 1,785 ÷ 5 = **357**
c) 2,954 ÷ 2 = **1,477**
d) 2,933 ÷ 7 = **419**

3. 425 ÷ 5 = 85
Max can use 85 g of guinea pig food every day.

4. a) 468 ÷ 9 = **52**
b) 4,689 ÷ 9 = **521**
c) 378 ÷ 6 = **63**
d) 3,798 ÷ 6 = **633**

5. 5 is not a factor of 657.

6. 657 ÷ 5 = **131 r 2**
350 ÷ 4 = **87 r 2**
2,379 ÷ 7 = **339 r 6**

7. a) 1,750 ÷ 11 = **159 r 1**
b) 3,416 ÷ 12 = **284 r 8**

Reflect

Answers may vary. Children may mention forgetting to carry over any remainders to the next column. Some children may mention difficulties with some division facts.

4 Division using factors

➜ pages 67–69

1. a) 3,500 ÷ 7 = **500** **500** ÷ 2 = **250**
3,500 ÷ 14 = **250**
There is 250 ml of juice in each glass.
b) 360 ÷ 6 = **60** **60** ÷ 4 = **15**
360 ÷ 24 = **15**
Aki can make 15 clay shells.

2. a) 1,260 ÷ 20 = **63**
b) 180 ÷ 15 = **12**
c) 1,100 ÷ 22 = **50**

3. Factors may vary.
a) 270 ÷ 18 = **15**
b) 7,200 ÷ 24 = **300**
c) 5,400 ÷ 36 = **150**
d) 5,600 ÷ 14 = **400**

4. Ambika is correct. Encourage children to prove this using an example or by drawing a diagram. For example:
160 ÷ 4 = 40 and 160 ÷ 8 = 20. This means that if I double the divisor, the quotient is halved.
Bella is incorrect. Encourage children to prove this using an example or a diagram. For example:
160 ÷ 4 = 40 and 320 ÷ 8 = 40. This means that if I double both the dividend and divisor, the quotient remains the same.

Reflect

6,440 ÷ 20 = 322
Methods may vary. For example:
6,440 ÷ 2 = 3,220; 3,220 ÷ 10 = 322
6,440 ÷ 5 = 1,288; 1,288 ÷ 4 = 322

5 Divide a 3-digit number by a 2-digit (long division)

➜ pages 70–72

1. a) 266 ÷ 19 = **14**
b) 399 ÷ 19 = **21**

2. a) 52, 65, 78, 91, 104, 117
b) 221 ÷ 13 = **17**
364 ÷ 13 = **28**

3. a) 92, 115, 138, 161, 184, 207
b) 805 ÷ 23 = **35**

		3	5	
23	8	0	5	
–			4	20
	3	4	5	
–			2	10
	1	1	5	
–			1	5
			0	

c) Subtractions may vary. Children may have subtracted in groups of 10.
The two subtractions should show 690 (30 lots) and 115 (5 lots).

4. a) 528 ÷ 11 = **48**
b) 528 ÷ 22 = **24**

5. 992 ÷ 31 = 32
There are **32** classes.

6. 702 ÷ **26** = 27

Reflect

Answers may vary. Encourage children to check the answer using the inverse calculation of 23 × 24.

6 Divide a 4-digit number by a 2-digit (long division)

➜ pages 73–75

1. a) 735 ÷ 15 = **49**
b) 1,890 ÷ 15 = **126**
c) 5,610 ÷ 15 = **374**

2. a) 1,258 ÷ 17 = **74**
b) 2,465 ÷ 17 = **145**

3. a) 1,508 ÷ 29 = **52**
b) 2,730 ÷ 42 = **65**
c) 6,603 ÷ 31 = **213**

4. 2,444 ÷ 26 = 94. Jen cycles 94 km per day.
2,325 ÷ 25 = 93. Toshi cycles 93 km per day.
Jen cycles more kilometres per day than Toshi.

5. a) I know that 10 × 61 = 610, not 620. Ebo has made a mistake at 7 × 61, as it should be 427, not 437.
Number line corrections: 437, 498, 559, 620 becomes 427, 488, 549, 610.
b) 8,845 ÷ 61 = 145

Reflect

2,553 ÷ 23 circled. Explanations may vary.
Encourage children to notice that 23 is a prime number so there are no useful factors to divide by to make the calculation easier.
1,440 ÷ 30 = 48
2,553 ÷ 23 = 111

7 Long division with remainders

→ pages 76–78

1. a) 15 r 5
b) 26 r 11
c) 54 r 2
d) 128 r 14

2. 200 ÷ 15 = 13 r 5
Andy can fill **13** pages with **5** stickers left over.

3. a) 9 r 21
b) 35 r 10

4. a) 9
b) One more than for 1,000

5. 475 ÷ 35 = 13 r 20.
The ranger will need to buy **14** bags of seed.

Reflect

Answers will vary. Encourage children to work out a division that leaves a remainder of 10 first. They can then use this equation to create the story problem.

Encourage children to use multiplication to find a division which will have a remainder of 10.
For example: 35 × 20 = 700. Therefore 700 ÷ 35 = 20 so 710 ÷ 35 = 20 remainder 10.

8 Order of operations

→ pages 79–81

1. Lines should be drawn to match:
3 × 2 + 6 → second image (towers of cubes)
3 + 2 × 6 → third image (bead string)
3 × 6 + 2 → first image (ten frames)

2. a) Reena has forgotten the order of operations. She has added then multiplied instead of multiplying then adding.
b) 11

3. a) **36** – 3 = **33**
b) 20 + 140 = **160**
c) 10 – 8 = **2**
d) 800 – 8 = **792**
e) 50 – 5 = **45**
f) 64 – 56 = **8**

4. a) 11
b) 90
c) 12

5. a) 22
b) 28
Children should explain the order of operations, multiplication before addition and subtraction, to a partner.

6. a) 50
b) 9
c) 6
d) 5
e) 18

Reflect

Answers will vary but children should include at least one multiplication or division and at least one subtraction or addition.

9 Brackets

→ pages 82–84

1. 10 + (2 × 3) → bottom image (bar model)
(10 + 2) × 3 → middle image (grid of place value counters)
3 + (2 × 10) → top image (base 10 equipment)

2. a) 100
b) 9
c) 75
d) 3

3. a) 3 × 5 + 4 = **19**
b) 3 × (5 + 4) = **27**
c) 10 – 4 ÷ 2 = **8**
d) (10 – 3) ÷ 2 = **3.5**
e) 10 – 3 × 2 + 5 = **9**
f) (10 – 3) × 2 + 5 = **19**
g) (10 – 3) × (2 + 5) = **49**
h) 10 – 3 × (2 + 5) = **¯11**

4. a) Circle 12 × (3 + 5) = £96
b) **(**3 + 5**)** × 15 = **£120**

5. a) 6 × **(**3 + 5**)** = 48
b) **(**7 – 2**)** × 4 = 20
c) 3 + **(**4 × 5**)** = 23
d) **(**12 + 6**)** ÷ 3 – 1 = 5
e) **(**12 + 6**)** ÷ **(**3 – 1**)** = 9

6. a) <
b) >
c) =

7. Answers may vary. Possible solutions include:
a) (2 + 2 + 2) × 2 = 12; 2 × (2 + 2 × 2) = 12
b) 10 = 3 ÷ 3 + 3 × 3; 10 = (3 × 3) + (3 ÷ 3)

Reflect

Multiply 3 times 5 and then add 3 = 18.

I0 Mental calculations (I)

➜ pages 85–87

1. a) 27
b) 396
c) £57
d) 315

2. a) £8.97
b) £14.95
c) £39.90

3. a) £5.88
b) £5.70

4. a) 497 kg
b) £119.94
c) 1,428
d) 900
e) 882
f) 618

5. Explanations may vary. For example, Sofia rounded 98 to 100 and worked out 6 × 100 = 600. She added 2 cm to each length of wood, so she needs to subtract 6 × 2 = 12 from her answer. Sofia's mistake was that she only subtracted 1 cm for each length of wood, 6 x 1 = 6.
The correct answer is 588 cm or 5 m and 88 cm.

6. Explanations may vary. Encourage children to use mental methods to work out that 9 × 49 = 9 × 50 – 9 = 441. Then use mental maths to solve 9 × 25 = 10 × 25 – 25 = 225.
Use subtraction to work out 441 – 225 = 216 and use addition to work out 441 + 225 = 666.

Reflect

Explanations will vary but expect to see the use of rounding and adjusting.

I1 Mental calculations (2)

➜ pages 88–90

1. a) 130,000
b) 170,000
c) 320,000
d) 370,000
e) 100,000

2. a) 18
180
1,800
18,000
180,000

b) 7
70
700
7,000
70,000

c) 239
23,900
239,000

3. a) 354,000
b) ninety-three thousand
c) three hundred thousand
d) 3,205,500

4. a) 49,000
b) 800,000
c) 850,000

5. a) 900
b) 9,000
c) 5
d) 19,000

6. a) 24 24,000
b) 76 760
c) £597 £597,000

7. 424,900

Reflect

Answers will vary. Encourage an explanation that the calculations that can easily be solved mentally will involve limited exchange, for example, addition or subtraction of multiples of powers of 10. Calculations not easily solved mentally will involve multiple exchanges.

I2 Reason from known facts

➜ pages 91–93

1. a) 290
b) 291
c) 286
d) 269
e) 389
f) 3,600

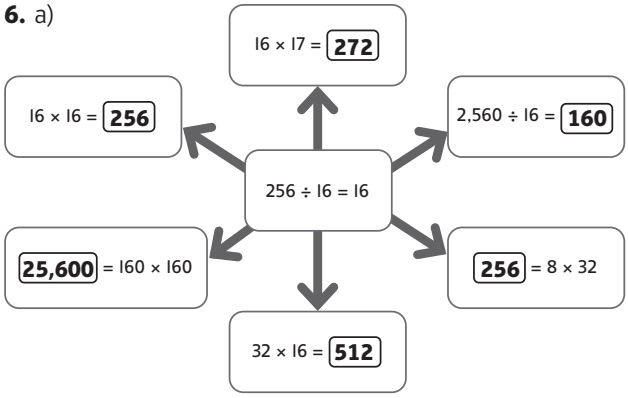
2. a) Lee needs to add 2 instead of subtracting 2.
b) 697

3. a) 615
b) 123
c) 5
d) 6,150
e) 5
f) 12,300

4. a) 391 + 23 = 414
b) 391 × 2 = 782
c) 391 × 10 × 10 = 39,100

5. Jamilla has multiplied by the difference between 148 and 48, instead of adding 6 lots of the difference.
To get the correct answer:
148 × 6 = (100 × 6) + (48 × 6).
As Jamilla already knows 48 × 6 = 288,
148 × 6 = 600 + 288 = 888.

6. a)



b) Answers will vary. Ensure that children have used the related fact for their new equations.
For example: 16 x 15 = 240; 2,560 ÷ 160 = 16; $16^2 = 256$.

Reflect

Answers may vary. Encourage children to write facts that include doubling or multiplying by a power of ten, and/or using the inverse. For example: 85 × 6 = 510; 255 ÷ 3 = 85; 85 × 30 = 2,550.

My journal

➜ page 94

Answers will vary. Encourage children to use their number sense (in this case, knowing the patterns in multiples of 25) to help them find an equation that leaves a remainder of 10 when divided by 25.

Power puzzle

➜ page 95

Answer will depend on the number rolled and where the children place the digits. Children should be encouraged to think about where they place each digit if the aim is to make the greater total.

Unit 4 – Fractions (I)

I Equivalent fractions and simplifying

➜ pages 96–98

1. a) $\frac{1}{4}$
b) $\frac{5}{6}$; $\div 7$
c) $\div 5$; $\frac{5}{7}$; $\div 5$

2. a) $\frac{7}{12}$ d) $\frac{3}{4}$
b) $\frac{2}{5}$ e) $\frac{9}{10}$
c) $\frac{4}{9}$ f) $\frac{7}{9}$

3. a) 18
b) 84
c) 50

4. a) $\frac{10}{20}$ b) $\frac{24}{36}$

5. a) $\frac{25}{40}$ b) $\frac{40}{64}$

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

7. a) 1 part shaded
b) 2 parts shaded
c) 4 parts shaded

8. $\frac{20}{40}$

Reflect

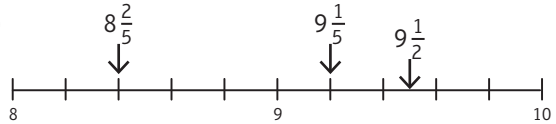
To simplify a fraction, find the highest common factor of the numerator and denominator and use it to divide both parts of the fraction. If the highest common factor is 6, then divide the numerator and denominator by 6. You can also simplify in stages by dividing by common factors of the numerator and denominator until there are no common factors left.

2 Equivalent fractions on a number line

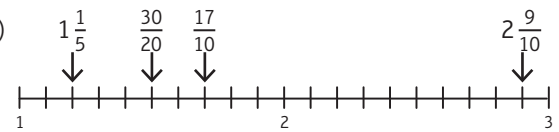
➜ pages 99–101

1. a) $\frac{2}{3}$; $1\frac{1}{3}$; $2\frac{2}{3}$ b) $9\frac{6}{8}$ c) $7\frac{1}{2}$; $8\frac{1}{4}$

2. a)



b)



3. a) $\frac{1}{4}$; $\frac{1}{2}$; $\frac{3}{4}$
b) $\frac{1}{8}$; $\frac{1}{4}$; $\frac{3}{8}$; $\frac{1}{2}$; $\frac{5}{8}$; $\frac{3}{4}$; $\frac{7}{8}$
c) $\frac{1}{10}$; $\frac{1}{5}$; $\frac{3}{10}$; $\frac{2}{5}$; $\frac{1}{2}$; $\frac{3}{5}$; $\frac{7}{10}$; $\frac{4}{5}$; $\frac{9}{10}$
d) $\frac{1}{12}$; $\frac{1}{6}$; $\frac{1}{4}$; $\frac{1}{3}$; $\frac{5}{12}$; $\frac{1}{2}$; $\frac{7}{12}$; $\frac{2}{3}$; $\frac{3}{4}$; $\frac{5}{6}$; $\frac{11}{12}$

4. A = $11\frac{3}{6}$ *or* $11\frac{1}{2}$
B = $12\frac{2}{6}$ *or* $12\frac{1}{3}$
C = $13\frac{4}{6}$ *or* $13\frac{2}{3}$
D = $14\frac{5}{6}$

5. $\frac{1}{36}$, $\frac{1}{18}$, $\frac{1}{12}$, $\frac{1}{9}$, $\frac{5}{36}$, $\frac{1}{6}$, $\frac{7}{36}$, $\frac{2}{9}$, $\frac{1}{4}$, $\frac{5}{18}$, $\frac{11}{36}$, $\frac{1}{3}$

Reflect

The first arrow is pointing to $3\frac{3}{4}$. I know this because each whole is split into 4 equal parts on the number line, making each part $\frac{1}{4}$. It is on the third part up from 3 so this will be $3\frac{3}{4}$.

The second arrow is pointing to $4\frac{1}{8}$. I know this because half of $\frac{1}{4}$ is $\frac{1}{8}$. The arrow is pointing half-way between the first part after 4, so this will be $4\frac{1}{8}$.

3 Compare and order fractions

➜ pages 102–104

1. a) The LCM of 2 and 4 is 4.
$\frac{1}{2} = \frac{2}{4}$. So $\frac{1}{2} < \frac{3}{4}$.
b) The LCM of 5 and 10 is 10.
$\frac{3}{5} = \frac{6}{10}$. So $\frac{3}{5} < \frac{7}{10}$.
c) The LCM of 8 and 3 is 24.
$\frac{3}{8} = \frac{9}{24}$; $\frac{2}{3} = \frac{16}{24}$. So $\frac{3}{8} < \frac{2}{3}$.
d) The LCM of 5 and 7 is 35.
$\frac{3}{5} = \frac{21}{35}$; $\frac{4}{7} = \frac{20}{35}$. So $\frac{3}{5} > \frac{4}{7}$.

2. From smallest to greatest: $\frac{7}{10}$, $\frac{3}{4}$, $\frac{4}{5}$.

3. From greatest to smallest: D, C, A, B.

4. a) $\frac{11}{15}$, $\frac{7}{10}$, $\frac{2}{3}$ b) $\frac{3}{3}$, $\frac{7}{8}$, $\frac{3}{4}$, $\frac{1}{6}$

5. a) $\frac{11}{7} < 1\frac{11}{24}$ b) $\frac{35}{6} < \frac{45}{8}$

6. A $\frac{4}{9}$ B $\frac{10}{6}$ C $\frac{8}{3}$

Reflect

Explanations may vary. For example:
$\frac{5}{8} = \frac{15}{24}$ and $\frac{5}{12} = \frac{10}{24}$, so $\frac{5}{8}$ is greater than $\frac{15}{12}$.
Dividing a whole into a larger number of equal pieces will mean that the size of each piece is smaller. Therefore $\frac{1}{12}$ is smaller than $\frac{1}{8}$. This means that $\frac{5}{12}$ will be smaller than $\frac{5}{8}$.

4 Add and subtract simple fractions

➜ pages 105–107

1. a) $\frac{3}{5}$ d) $\frac{3}{7}$
b) $\frac{5}{6}$ e) $\frac{1}{9}$
c) $\frac{12}{13}$ f) $\frac{10}{19}$

2. Aki has added the denominators as well as the numerators. When adding fractions, only the numerators are added.

$\frac{3}{10} + \frac{6}{10} = \frac{9}{10}$

3. a) $\frac{11}{15} - \frac{\mathbf{7}}{\mathbf{15}} = \frac{4}{15}$ d) $\frac{24}{50} + \frac{\mathbf{15}}{\mathbf{50}} = \frac{39}{50}$
b) $\frac{23}{31} - \frac{\mathbf{8}}{\mathbf{31}} = \frac{15}{31}$ e) $\frac{\mathbf{9}}{\mathbf{24}} + \frac{11}{24} = \frac{20}{24}$
c) $\frac{\mathbf{45}}{\mathbf{51}} - \frac{15}{51} = \frac{30}{51}$ f) $\frac{39}{200} + \frac{\mathbf{82}}{\mathbf{200}} = \frac{121}{200}$

4. $\frac{1}{20} \rightarrow \frac{9}{20}$ $\frac{7}{20} \rightarrow \frac{3}{20}$
$\frac{5}{20} \rightarrow \frac{5}{20}$ $\frac{2}{20} \rightarrow \frac{8}{20}$
$\frac{4}{20} \rightarrow \frac{6}{20}$

5. a) $\frac{4}{12} = \frac{1}{3}$ d) $\frac{2}{8} = \frac{1}{4}$
b) $\frac{8}{10} = \frac{4}{5}$ e) $\frac{18}{24} = \frac{3}{4}$
c) $\frac{15}{20} = \frac{3}{4}$ f) $\frac{20}{100} = \frac{1}{5}$

6. a) $\frac{3}{10}$ d) $\frac{5}{8}$
b) $\frac{1}{9}$ e) $\frac{2}{10}$
c) $\frac{1}{8}$ f) $\frac{12}{30}$

Explanations may vary, but children should mention changing the answer to an equivalent fraction with the same denominator as in the question

Reflect

Children should explain that the numerators should be added, not the denominators, and that the answer can be simplified: $\frac{1}{8} + \frac{3}{8} = \frac{4}{8} = \frac{1}{2}$.

5 Add and subtract any two fractions

➜ pages 108–110

1. a) $\frac{6}{10} + \frac{1}{10} = \frac{7}{10}$
b) $\frac{21}{24} - \frac{10}{24} = \frac{11}{24}$

2. a) $\frac{4}{5} - \frac{1}{2} = \frac{8}{10} - \frac{5}{10} = \frac{3}{10}$
$\mathbf{\frac{3}{10}\ m}$ remains.

3. a) $\frac{2}{5} + \frac{7}{15} = \frac{6}{15} + \frac{7}{15} = \frac{13}{15}$
b) $\frac{5}{8} + \frac{1}{3} = \frac{15}{24} + \frac{8}{24} = \frac{23}{24}$
c) $\frac{3}{4} - \frac{2}{3} = \frac{9}{12} - \frac{8}{12} = \frac{1}{12}$
d) $\frac{9}{10} - \frac{1}{4} = \frac{18}{20} - \frac{5}{20} = \frac{13}{20}$
e) $\frac{3}{10} + \frac{3}{20} = \frac{6}{20} + \frac{3}{20} = \frac{9}{20}$
f) $\frac{9}{10} - \frac{3}{4} = \frac{18}{20} - \frac{15}{20} = \frac{3}{20}$

4. $\frac{4}{21} + \frac{2}{3} = \frac{4}{21} + \frac{14}{21} = \frac{18}{21}$

5. a) $\frac{2}{5} + \frac{1}{4} = \frac{8}{20} + \frac{5}{20} = \frac{13}{20}$
b) Answers can vary.
For example: $\frac{1}{4} + \frac{5}{14} = \frac{7}{28} + \frac{10}{28} = \frac{17}{28}$.

Reflect

Children should mention using equivalent fractions, using their LCM, to change the denominators so that they are the same value. One of the answers can be simplified.

The LCM of 4 and 5 is 20: $\frac{2}{5} + \frac{1}{4} = \frac{8}{20} + \frac{5}{20} = \frac{13}{20}$.

The LCM of 10 and 5 is 10: $\frac{3}{10} - \frac{1}{5} = \frac{3}{10} - \frac{1}{10} = \frac{2}{10} = \frac{1}{5}$.

6 Add mixed numbers

➜ pages 111–113

1. a) Add the wholes: $3 + 2 = 5$
Add the fractions: $\frac{1}{3} + \frac{1}{4} = \frac{4}{12} + \frac{3}{12} = \frac{7}{12}$
Combine the whole and fraction: $5\frac{7}{12}$.
b) Add the fractions: $\frac{5}{6} + \frac{1}{2} = \frac{5}{6} + \frac{3}{6} = \frac{8}{6} = 1\frac{2}{6} = 1\frac{1}{3}$.
Add the wholes: $1 + 1\frac{1}{3} = 2\frac{1}{3}$.

2. a) $3 + \frac{2}{3} + \frac{1}{10} = 3 + \frac{20}{30} + \frac{3}{30} = 3\frac{23}{30}$
b) $2 + \frac{1}{14} + 5 + \frac{5}{7} = 7 + \frac{1}{14} + \frac{10}{14} = 7\frac{11}{14}$

3. a) $1 + \frac{1}{2} + 2 + \frac{3}{5} = 3 + \frac{5}{10} + \frac{6}{10} = 3\frac{11}{10} = 4\frac{1}{10}$
b) $2 + \frac{3}{4} + 1 + \frac{5}{6} = 3 + \frac{18}{24} + \frac{20}{24} = 3\frac{38}{24} = 4\frac{14}{24} = 4\frac{7}{12}$

4. Aki spends $4\frac{1}{12}$ of an hour on his homework.

5. The distance from the café to the beach is $5\frac{1}{10}$ km.

6. Mo needs $18\frac{9}{10}$ m of fencing.
Mo needs to buy 5 packs of fencing.

Reflect

Changing such large numbers into improper fractions is not the most efficient method. A better method would be to add the whole numbers together, add the fractional parts together and then combine them for the answer.

$12 + 7 = 19$

$\frac{3}{5} + \frac{3}{4} = \frac{12}{20} + \frac{15}{20} = \frac{27}{20} = 1\frac{7}{20}$

$19 + 1\frac{7}{20} = 20\frac{7}{20}$

$12\frac{3}{5} + 7\frac{3}{4} = 20\frac{7}{20}$

7 Subtract mixed numbers

➜ pages 114–116

1. a) $2\frac{1}{4}$ c) $6\frac{11}{12}$

b) $2\frac{4}{15}$ d) $4\frac{17}{20}$

2. a) $3\frac{3}{5}$ b) $2\frac{2}{5}$

3. $1\frac{11}{15}$

4. The baby giraffe is $2\frac{3}{20}$ m tall.

5. Add together the difference of $\frac{1}{6} + 1 + \frac{1}{5} = 1\frac{11}{30}$.

$3\frac{1}{5} - 1\frac{5}{6} = 1\frac{11}{30}$

6. $1\frac{7}{10}$.

7. Heart = $4\frac{5}{12}$ (Star = $1\frac{11}{12}$)

Reflect

Methods may vary. Children may choose to convert both mixed numbers to improper fractions, then find equivalent fractions with the same denominator, before doing the subtraction and simplifying/converting back to a mixed number.

Or

Children may opt to exchange one whole into fifths to ensure the fraction part in the minuend is bigger than the fraction part in the subtrahend, before finding equivalence with the same denominator and subtracting.

Or

Children could show finding the difference by counting on from the subtrahend to the minuend and adding the parts together. For example:

$\frac{1}{4} + 2 + \frac{1}{5}$

Solution: $5\frac{1}{5} - 2\frac{3}{4} = 2\frac{9}{20}$

8 Multi-step problems

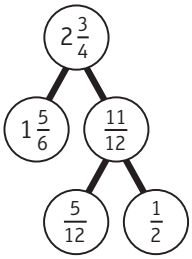
➜ pages 117–119

1. The total mass of the apple and pineapple is $\frac{9}{10}$ kg.

2. The perimeter of the triangle is $1\frac{5}{21}$ m.

3. There is $3\frac{9}{10}$ m of wood remaining.

4.



5. The total length of the pencils is $22\frac{7}{20}$ cm.

6. Georgia weighs $1\frac{4}{15}$ lbs more than Anna.

Reflect

Answers will vary. Ensure that the calculation in the problem gives an answer of $2\frac{1}{3}$.

9 Problem solving – adding and subtracting fractions

➜ pages 120–122

1. The height of the tallest elephant is $2\frac{17}{20}$ m.

2. The mass of the empty picnic basket is $\frac{1}{4}$ kg.

3. There were $11\frac{3}{4}$ million downloads in total.

4. The spider is $\frac{23}{30}$ m from the top of the drainpipe.

5. The distance BC is bigger than the distance AB by $\frac{8}{9}$.

Reflect

Answers will vary.

Encourage children to spot their mistakes and learn from them. Ask: *How could they make things easier? Would being fluent with their times-tables help?*

My journal

➜ page 123

1. a) $1\frac{7}{15}$ c) $1\frac{1}{24}$ e) $5\frac{7}{18}$

b) $\frac{19}{20}$ d) $8\frac{3}{20}$ f) $1\frac{1}{12}$

2. Danny's method is correct. Jamie's method is not quite correct as first she will need to exchange one whole for 4 quarters to ensure that the fraction part of the minuend is bigger than the fraction part of the subtrahend.

Solution: $1\frac{17}{20}$.

Power puzzle

➜ page 124

1. a) $6\frac{3}{7} + 3\frac{4}{5} = 9\frac{8}{35}$

b)

$1\frac{3}{10}$	$2\frac{1}{2}$	$3\frac{1}{5}$
$4\frac{3}{4}$	$\frac{2}{3}$	$1\frac{7}{12}$
$\frac{19}{20}$	$3\frac{5}{6}$	$4\frac{47}{60}$

Unit 5 – Fractions (2)

I Multiply fractions by integers

→ pages 126–128

1. a) $\frac{7}{4} = 1\frac{3}{4}$
b) $\frac{8}{5} = 1\frac{3}{5}$
c) $\frac{12}{3} = 4$

2. a) $\frac{7}{2} = 3\frac{1}{2}$
b) $\frac{12}{5} = 2\frac{2}{5}$
c) $\frac{18}{8} = 2\frac{2}{8} = 2\frac{1}{4}$
d) $\frac{35}{10} = 3\frac{5}{10} = 3\frac{1}{2}$

3. $1 \times 3 = 3$ and $1\frac{3}{5} = \frac{8}{5}$
$\frac{3}{5} \times 3 = \frac{9}{5} = 1\frac{4}{5}$ $\frac{8}{5} \times 3 = \frac{24}{5}$
$3 + 1\frac{4}{5} = 4\frac{4}{5}$ $\frac{24}{5} = 4\frac{4}{5}$
So, $1\frac{3}{5} \times 3 = 4\frac{4}{5}$

4. a) $13\frac{1}{5}$
b) $18\frac{2}{3}$
c) $8\frac{1}{4}$
d) $20\frac{2}{5}$

5. Kate has multiplied the numerator and the denominator by 4. The denominator is the unit of that number and so does not change when you multiply a fraction. The answer should be $\frac{8}{3} = 2\frac{2}{3}$.

6. $\frac{11}{5} = 2\frac{1}{5}$
His owner needs to buy 3 bags of dog biscuits.

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

Reflect

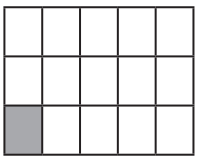
Encourage children to prove that $1\frac{2}{3} \times 4 = 4\frac{8}{3} = 6\frac{2}{3}$. Children could show this with calculations and/or pictorial representations.

2 Multiply fractions by fractions (I)

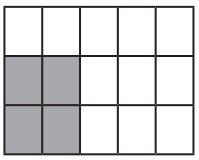
→ pages 129–131

1. a) $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$
Zac uses $\frac{1}{8}$ of the bag of flour.
b) $\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$
Zac needs $\frac{3}{8}$ of the bag.

2. a) $\frac{1}{15}$



b) $\frac{2}{3} \times \frac{2}{5} = \frac{4}{15}$



3. a) $\frac{6}{20} = \frac{3}{10}$
b) $\frac{10}{18} = \frac{5}{9}$

4. a) $\frac{2}{3} \times \frac{6}{7} = \frac{12}{21} = \frac{4}{7}$
b) $\frac{3}{4} \times \frac{2}{5} = \frac{6}{20} = \frac{3}{10}$

5. This statement is always true because you are multiplying a number less than one by another number less than one. In other words, you are finding a part of a part.

Reflect

Children should draw a pictorial representation of $\frac{1}{2} \times \frac{3}{5}$. Encourage children to explain that $\frac{1}{2}$ times $\frac{3}{5}$ is the same as $\frac{1}{2}$ of $\frac{3}{5}$.

3 Multiply fractions by fractions (2)

→ pages 132–134

1. a) $\frac{3}{8}$
b) You can multiply the numerators together and the denominators together.

2. a) $1 \times \frac{2}{5} \times 3 = \frac{2}{15}$
b) $2 \times \frac{1}{9} \times 4 = \frac{2}{36} = \frac{1}{18}$
c) $2 \times \frac{3}{9} \times 4 = \frac{6}{36} = \frac{1}{6}$
d) $1 \times \frac{10}{5} \times 11 = \frac{10}{55} = \frac{2}{11}$

3. a) $\frac{1}{12}$
b) $\frac{3}{28}$
c) $\frac{4}{15}$
d) $\frac{7}{16}$
e) $\frac{35}{48}$
f) $\frac{63}{230}$

4. a) $\frac{\mathbf{1}}{3} \times \frac{2}{\mathbf{5}}$
b) $\frac{\mathbf{1}}{3} \times \frac{\mathbf{5}}{6}$ *or* $\frac{\mathbf{5}}{3} \times \frac{\mathbf{1}}{6}$
c) $\frac{\mathbf{3}}{5} \times \frac{1}{\mathbf{2}}$
d) $\frac{7}{12} \times \frac{1}{\mathbf{3}} = \frac{1}{6} \times \frac{\mathbf{7}}{6}$

5. a) Aki has added the numerators instead of multiplying them.
b) Kate has the correct answer of $\frac{6}{56}$. She has just simplified it to $\frac{3}{28}$.

6. Answers may vary. Some possible solutions are:

a) $\frac{2}{3} \times \frac{4}{5}$; $\frac{1}{5} \times \frac{8}{3}$

b) $\frac{2}{3} \times \frac{6}{7}$; $\frac{3}{7} \times \frac{4}{3}$

c) $\frac{2}{4} \times \frac{2}{2}$; $\frac{3}{4} \times \frac{2}{3}$

d) $\frac{1}{2} \times \frac{3}{3} \times \frac{3}{8}$; $\frac{3}{4} \times \frac{1}{2} \times \frac{3}{6}$

Reflect

Answers may vary. Encourage children to relate the shortcut method of multiplying numerators together and denominators together to using pictorials to help explain what is going on and why it works.

4 Divide a fraction by an integer (I)

➜ pages 135–137

1. $\frac{2}{12}$

2. a) $\frac{2}{9}$ c) $\frac{4}{9}$

b) $\frac{3}{10}$

3. a) $\frac{2}{11}$ b) $\frac{1}{5}$

4. a) $\frac{1}{9}$ e) $\frac{2}{15}$

b) $\frac{1}{4}$ f) $\frac{4}{17}$

c) $\frac{3}{7}$ g) $\frac{1}{17}$

d) $\frac{4}{15}$ h) $\frac{3}{20}$

5. a) $\mathbf{\frac{2}{5}}$ $\mathbf{\frac{4}{5}}$

b) $\mathbf{\frac{6}{20}}$ $\mathbf{\frac{15}{20}}$

c) 7 2 14 1

d) 10 8 2 5

6. The snail travels $\frac{4}{15}$ km each day.

7. $\mathbf{\frac{12}{18}}$ $\mathbf{\frac{56}{60}}$ $\mathbf{\frac{18}{24}}$

Reflect

The correct answer is $\frac{2}{15}$. Danny has divided both the numerator and the denominator by 5. As the divisor is a factor of the numerator, the denominator, which is just the unit of that number, will not need to change here.

Encourage children to prove their calculation with a pictorial representation.

5 Divide a fraction by an integer (2)

➜ pages 138–140

1. a) $\frac{1}{12}$ b) $\frac{1}{10}$

2. $\frac{1}{16}$

3. a) $\frac{1}{12}$ b) $\frac{1}{12}$

4. a) $\frac{1}{5} \div 3 = \frac{1}{15}$ b) $\frac{1}{2} \div 4 = \frac{1}{8}$

5. a) $\frac{1}{18}$ f) $\frac{1}{24}$

b) $\frac{1}{18}$ g) 2

c) $\frac{1}{30}$ h) 3

d) $\frac{1}{20}$ i) $\mathbf{\frac{1}{3}}$

e) $\frac{1}{28}$

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

$\frac{1}{6} \div 2 = \frac{1}{12}$

7. $\frac{1}{2} \div 24$ $\frac{1}{4} \div 12$

$\frac{1}{6} \div 8$ $\frac{1}{8} \div 6$

Reflect

This is false. $\frac{1}{10} \times 2 = \frac{2}{10} = \frac{1}{5}$. $\frac{1}{10} \div 2 = \frac{1}{20}$.

6 Divide a fraction by an integer (3)

➜ pages 141–143

1. a) $\frac{6}{8} \div 2 = \frac{3}{8}$ b) $\frac{6}{15} \div 3 = \frac{2}{15}$

2. a) $\frac{6}{10} \div 2 = \frac{3}{10}$ b) $\frac{6}{14} \div 2 = \frac{3}{14}$

3. a) $\frac{10}{16} \div 2 = \frac{5}{16}$ d) $\frac{12}{40} \div 4 = \frac{3}{40}$

b) $\frac{12}{15} \div 3 = \frac{4}{15}$ e) $\frac{10}{45} \div 5 = \frac{2}{45}$

c) $\frac{15}{24} \div 3 = \frac{5}{24}$ f) $\frac{10}{18} \div 2 = \frac{5}{18}$

4. a) $\frac{8}{20} \div 4 = \frac{2}{20} = \frac{1}{10}$ b) $\frac{6}{18} \div 3 = \frac{2}{18} = \frac{1}{9}$

5. $\frac{4}{50}$ or $\frac{2}{25}$ of the bottle of milk will be in each glass.

6. Square = $\frac{3}{16}$; circle = $\frac{2}{5}$; rhombus = 5.

a) $\frac{3}{80}$

b) $\frac{2}{25}$

Reflect

Explanations may vary. Children may explain that they will need to find equivalent fractions to make the numerator a multiple of the divisor 4 and then divide. Some children may have figured out a shortcut of multiplying the denominator by 4, but do ensure that children understand why it works. Some children may also see that 'dividing by 4' is the same as finding 'a quarter of' and so choose to do $\frac{2}{7} \times \frac{1}{4}$.

$\frac{2}{7} \div 4 = \frac{8}{28} \div 4 = \frac{2}{28} = \frac{1}{14}$

7 Mixed questions with fractions

➜ pages 144–146

1. a) $\frac{8}{3} = 2\frac{2}{3}$
The perimeter is $2\frac{2}{3}$ cm.
b) $\frac{3}{7} \times 6 = \frac{18}{7} = 2\frac{4}{7}$
The perimeter is $2\frac{4}{7}$ cm.

2. The area is $\frac{8}{35}$ cm^2.
The perimeter is $2\frac{6}{35}$ cm.

3. Richard walks $4\frac{2}{7}$ km in total.

4. a) $\frac{5}{12}$ b) $\frac{1}{15}$

5. Each side of the square is $\frac{1}{10}$ m.

6. $\frac{3}{20}$ of the middle rectangle is shaded.

Reflect

Max forgot about the order of operations. He should have done the mutiplication calculation first and then the addition. The correct answer is $\frac{5}{8}$.

8 Fraction of an amount

➜ pages 147–148

1. 8 of the buttons are blue.

2. Andy had £480 left.

3. Kate sells 5 more cookies han Ebo.

4. Sophia pays £3.60 more than Holly.

5. a) 153 km
b) 36 minutes (accept $\frac{3}{5}$ of an hour)
c) 50 metres or 0·05 kilometres

6. a) < b) <

7. 9

Reflect

Answers will vary. Encourage children to explain what they found challenging and how they might help themselves make it easier.

9 Fraction of an amount – find the whole

➜ pages 150–152

1. $12 \times 3 = 36$
There are 36 animals in the field.

2. 36

3. £30

4. Toshi earns £51 more per week.

5. a) 80 c) 200
b) 64 d) 108

6. a) There are 120 pages in Alex's book.
b) There are 60 pages in Lee's book.

Reflect

Answers will vary. Although both equations involve $\frac{3}{4}$ of amounts, in one case you know the amount and are asked to find $\frac{3}{4}$ of it. In the other, you know the value of $\frac{3}{4}$ of the amount and are asked to find the whole amount.

Solutions: $\frac{3}{4}$ of 60 = 45; $\frac{3}{4}$ of 80 = 60.

My journal

➜ page 153

Answers will vary. Encourage children to show step-by-step with reasoning to demonstrate their understanding of fractions and the four operations. Are they able to teach a partner?

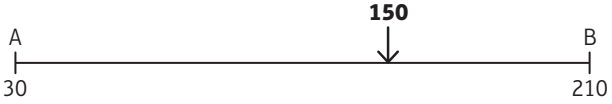
Power puzzle

➜ page 154

1.

A	B	C	D	E	F	G	H
36	**18**	**27**	**15**	**4·5**	**8**	**2**	$\frac{\mathbf{1}}{\mathbf{20}}$

2.



Unit 6 – Measure – imperial and metric measures

1 Metric measures

➜ pages 155–157

1. Children should circle:
a) km
b) kg
c) mm
d) l
e) m

2.

	More than	Less than	About the same as
Yoghurt pot		✓	
Drinking glass		✓	
Cereal bowl		✓	
Carton of milk	✓		
Watering can	✓		
Tin of soup			✓

3. a) Any two from: m, cm, mm or km.
b) Any two from: mg (milligram), g or kg.
c) Any two from: ml, l, mm^3, cm^3 or m^3.

4. Circled:
a) 2 m
b) 25 kg
c) 21 mm
d) 200 ml
e) 800 g

5. Boxes ticked from top to bottom:
True, False, False, True, False.

6. a) Ticked: Less than 1 gram.
b) Answers will vary. Look for children recognising that medicines are generally taken in very small amounts and so are best described using a small unit of measure. Children may also use knowledge that a millimetre is smaller than a metre (or millilitre is smaller than a litre) to reason that a milligram must be smaller than a gram.

Reflect

No. The milk is given as 1,000 ml, which is 1 litre, the flour is given as 0·25 kg, which is 250 g, and the shoelaces are likely to be sold in pairs rather than length.

2 Convert metric measures

➜ pages 158–160

1. a) 3,000 g
4,000 g
7,000 g
12,000 g
3,500 g
b) 300 cm
900 cm
2,600 cm
450 cm
425 cm

2. a) 2,000 ml
3,000 ml
3,500 ml
3,540 ml
35,400 ml
b) 5 kg
6 kg
6·5 kg
6·58 kg
65·8 kg

3. a) 500 cm
b) 7,500 g
c) 0·65 l
d) 34 mm
e) 30 m
f) 12,050 ml
g) 8,400 m
h) 1,005 g

4. a) Lexi has multiplied by 100 instead of 1,000. The correct answer is **2,600** g.
b) Lexi divided by 100 instead of multiplying by 100. The correct answer is **490** cm.

5. a) Possible pairs for A and B:
mm (A) and m (B); m (A) and km (B);
mg (A) and g (B); g (A) and kg (B); ml (A) and l (B).
b) Yes. D and E are both cm, as you multiply by 100 to convert from m to cm, and multiply by 10 to convert from cm to mm.

Reflect

Ticked. Alex

Alex is correct because, when converting within metric units, you either divide or multiply by 10, 100 or 1,000. This changes the positions of the digits in the place value grid and so changes the values of these digits. However, the digits themselves do not change – although zeros may need to be added as place holders. So, the answer will only contain the digits 5, 7 and 0.

3 Calculate with metric measures

➜ pages 161–163

1. a) Isla has **2,100 km** left to run.
b) The bush is **45 cm** taller than the fence.
c) 12 servings of **200 g** can be taken from the bag.

2. Aki needs to convert the units to a common unit, either grams or kilograms. He has just added the amounts without converting first.
Correct answer: 880 g + 1,500 g = 2,380 g (or 2·38 kg)

3. a) There are 300 ml of squash in each glass.
b) There are 60 ml of orange juice in each glass.

4. 1·78 m or 178 cm

5. The mass of one banana is 150 g.
The mass of one apple is 200 g.

Reflect

Answers will vary. For example:

Bella has a water bottle that has 0·5 l of water in it. She pours 300 ml into a glass. How much water does she have left?

Look for children fluently and accurately converting between units of metric measure so that they can solve problems.

4 Miles and kilometres

➜ pages 164–166

1. a) 32 km
b) 56 km
c) 96 km

2.

	Speed (mph)	Speed (km/h)
A	2·5	4
B	**5**	**8**
C	**10**	**16**
D	**35**	**56**
E	**50**	**80**

3. a) 40 ÷ 8 = 5
5 × 5 = 25
40 km = 25 miles
b) 72 ÷ 8 = 9
9 × 5 = 45
72 km = 45 miles

4.

Name of river	Length (miles)	Length (km)
River Mersey	70	**112**
River Tamar	**50**	80
River Severn	220	**352**
River Clyde	**110**	176

The longest river is the River Severn.

5. Ticked: A

Explanations may vary. For example:

8 km is about 5 miles, so 80 km is about 50 miles.
So, Train B only travels about 50 miles every hour, but Train A travels 60 miles every hour. Train A is faster.

Reflect

Answers will vary. For example:

If I know that 5 miles is about the same as 8 km, I also know that:

10 miles is about the same as 16 km;
800 km is about the same as 500 miles;
1 mile is about $\frac{8}{5}$ km = 1·6 km.
To convert from miles to kilometres, multiply by 1·6.
To convert from kilometres to miles, multiply by 0·625.

5 Imperial measures

➜ pages 167–169

1. a) 5 cm is about 2 inches.
b) 11 cm is about 4·3 inches.
(Accept reasonable estimates.)
c) 8 inches is about 20 cm.
d) $6\frac{1}{2}$ inches is about 16·3 cm.
(Accept reasonable estimates.)
e) Explanations may vary. For example:
5 cm = 2 inches, so multiply both sides of the equation by 10 to give 50 cm = 20 inches.

2.

Kilograms	1	2	3	4	5	50	**100**
Pounds	2·2	**4·4**	**6·6**	**8·8**	**11**	**110**	220

3. Ticked: b)

4. 560 x 3·5 = 1,960 ml, so Mo has about 1·96 litres of milk (or approximately 2 litres).

5. Converting heights to cm:
Aki: 145 cm
Lee: 50 inches = 125 cm
Jamilla: 5 feet = 60 inches = 150 cm
Jamilla is the tallest.

Reflect

Answers will vary. For example:

Working with metric is useful because conversion between units involves 10, 100 and 1,000, and these are easy to multiply and divide. However, working with imperial can involve smaller numbers, such as measuring height in feet and inches, which are easier to work with.

My journal

➜ page 170

1. a) The mistake is that Lexi has multiplied/divided by 100, not 1,000.
The correct answer is 4,500 ml, which is the same as 4·5 l (or 450 millilitres is the same as 0·45 litres).

b) The mistake is that Max has not converted the unit to a common unit of measurement (grams). He cannot just take away 1, he needs to convert the kg to g first.
The correct answer is 750 g.

c) The mistake is that Kate has doubled ·6 to get ·12. 1·6 x 2 = 3·2.
The correct answer is 3·2 km.

Power puzzle

➜ page 171

a) Answer: pasties

	Number	Letter
56 km = ? m	**56,000**	**P**
470 g = ? kg	**0·47**	**A**
47 cm = ? mm	**470**	**S**
210 g = ? kg	**0·21**	**T**
390 mm = ? cm	**39**	**I**
2,100 ml = ? l	**2·1**	**E**
0·47 l = ? ml	**470**	**S**

b) Answer: apple pie

	Number	Letter
47 cm = ? m	**0·47**	**A**
56 kg = ? g	**56,000**	**P**
560 m = ? cm	**56,000**	**P**
5·6 kg = ? g	**5,600**	**L**
0·21 cm = ? mm	**2·1**	**E**
56 l = ? ml	**56,000**	**P**
3,900 cm = ? m	**39**	**I**
2,100 g = ? kg	**2·1**	**E**