Unit I

Lesson I

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

Four hundred and eighty-three thousand, two hundred and ninety-seven

One hundred and eighteen thousand, nine hundred and forty-three

5**43**,**81**5

79**6**,**5**2**8**

Lesson 2

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

Eight hundred and four thousand, two hundred and three

Six hundred and forty-eight thousand and seven

1**04**,**061**

640,**50**0

Lesson 3

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

Four million, nine hundred and six thousand, two hundred and seventeen

One million, two thousand, three hundred and eleven

5,4**97**,**04**1

9,**093**,**90**3

Lesson 4

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

3,496,224 and 8,103,097

8,103,097 is the biggest number because it has a greater digit in the millions place.

Lesson 5

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

7,030,673 and 7,112,018

7,112,018 is the biggest number because it has a greater digit in the hundred thousands place.

Lesson 6

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

Answers will vary. Children should show that they can make a 7-digit number and then choose who has the bigger and the smaller number.

Lesson 7

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

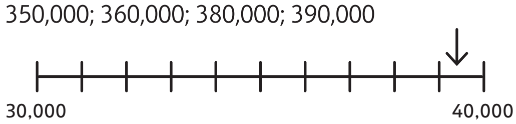
Answers:

Answers will vary. Children should show that they can make a 7-digit number and then choose who has the bigger and the smaller number.

Unit 1: Place value within 10,000,000

Lesson 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) 750,167 660,167 649,167 651,167
7. Answers will vary – ensure that 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.

Lesson 2: Numbers to 10,000,000 (1)

→ 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. 643,506 or 6,*43,506 where * is any digit
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.

Lesson 3: Numbers to 10,000,000 (2)

→ pages 12–14

1. a) 2,000,000 + 300,000 + 20,000 + 6,000 + 400 + 50 + 7 = 2,326,457
   Luis has £2,326,457.
   b) 300,000 + 50,000 + 30 + 7 = 350,037
   Bella has £350,037.
   c) Jamilla has £2,100,320.
2. a) 7,000; 10
   b) 60,320
3. 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

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

5. a) 7 million or 7,000,000
b) 7 hundred thousands or 700,000
c) 7 thousands or 7,000
d) 7 tens or 70

6. Answers will vary. One possible answer is 1,523,324.

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

Lesson 4: Number line to 10,000,000

→ pages 15–17

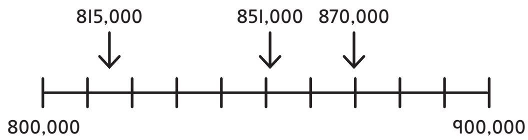
1. a) 100,000s
b) 1,000s

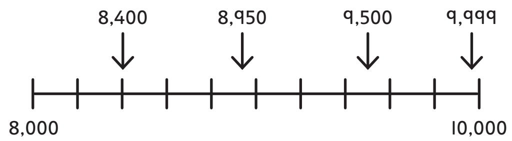
2. a) 5,700; 5,800; 5,900; 6,000; 6,100; 6,200
b) 66,340; 66,350; 66,360

3. a) 130,520; 131,520; 132,520
b) 720,700; 820,700; 920,700
c) 7,100; 7,000; 6,900
d) 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:

a)


b)


6. a) Answer may vary ≈ 5,450,000
b) Answer may vary ≈ 7,100,000
c) Answer may vary ≈ 8,300,000

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.

Lesson 5: Comparing and ordering numbers to 10,000,000

→ pages 18–20

1. Number A is greater. Explanations may vary, for example: 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 < 9,589
9,580 < 9,680   9,580 < 10,000
9,580 < 9,681   10,000 > 9,580
b) 540,000 > 54,000   540,000 > half a million
540,000 > 450,000   540,000 < 600,000
540,000 > 540   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.

Lesson 6: Rounding numbers

→ pages 21–23

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. The number rounds to 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) 25,497 rounded to the nearest 10 and 100 is 25,500.
d) 25,997 rounded to the nearest 10, 100 and 1,000 is 26,000.

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.

Lesson 7: Negative numbers

➜ pages 24–26

1. a) 1 °C
b) 10 °C

2. 8 places

3. 14 metres

4. a) ⁻10 °C; ⁻5 °C; 5 °C; 10 °C; 25 °C
b) ⁻16; ⁻12; ⁻8; ⁻4; 4; 8; 12; 16
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
⁻11·1 ➜ section B
b) Three numbers between ⁻12 and ⁻9

6. A = ⁻16
B = 8

7. a) 175
b) ⁻225

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.

End of unit check

➜ pages 27–28

My journal

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

Power puzzle

5,293,187

Unit 1

Strengthen activities

MISCONCEPTION: Children may read larger numbers incorrectly, particularly when there are place-holding zeros.

Answers

3,041,009 is read as three million, forty-one thousand and nine

MISCONCEPTION: Children may miscalculate the unlabelled intervals on a number line.

Answers

Children should work out the intervals and label the number line accordingly.

MISCONCEPTION: Children may assume that negative numbers work in a similar way to positive numbers (for example, assuming that $^{-}5$ must be greater than $^{-}1$ because 5 is greater than 1).

Answers

$^{-}6$, $^{-}3$, 1, 2

Deepen activities

Answers

Activity 1

a) An even number as close to 5 million as possible is 4,975,316

b) The second largest odd number you can make is 9,765,413

The second smallest odd number you can make is 1,345,697

The difference between them is 8,419,716

c) You can make 6 different multiples of 5 greater than 9,750,000: 9,764,135, 9,764,315, 9,763,415, 9,763,145, 9,761,345, 9,761,435

Activity 2

a) 3 degrees colder

b) Any two temperatures (one positive, one negative) with a difference of 11. For example 1 and $^{-}10$, 2 and $^{-}9$, 3 and $^{-}8$ through to 10 and $^{-}1$

Activity 3

Number = 6,778,158

Circle = 6, triangle = 7, square = 8, star = 1 and ring = 5

Unit 2

Lesson 1

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

Answers will vary. Children should show that they can make a 7-digit number and then choose who has the bigger or the smaller number.

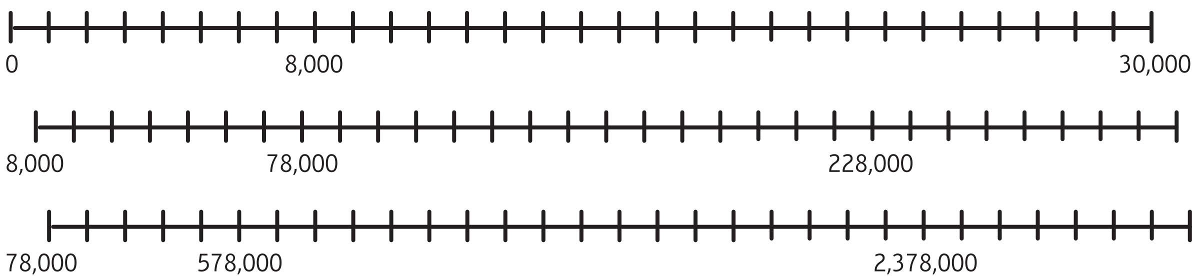
Lesson 2

NC strands and objectives:

Number – number and place value

Count forwards or backwards in steps of powers of 10 for any given number up to 10,000,000

Answers:



Lesson 3

NC strands and objectives:

Number – number and place value

Count forwards or backwards in steps of powers of 10 for any given number up to 10,000,000

Answers:

8,000, 9,000, 10,000, …, 50,000, 51,000, 52,000
52,000, 51,000, 50,000 …, 19,000, 18,000, 17,000

17,000, 27,000, 37,000, …, 147,000, 157,000, 167,000
167,000, 157,000, 147,000, …, 117,000, 107,000, 97,000

97,000, 197,000, 297,000, …, 1,197,000, 1,297,000, 1,397,000
1,397,000, 1,297,000, 1,197,000, …, 897,000, 797,000, 697,000

Lesson 4

NC strands and objectives:

Number – number and place value

Count forwards or backwards in steps of powers of 10 for any given number up to 10,000,000

Answers:

19,000, 20,000, 21,000, …, 39,000, 40,000, 41,000
41,000, 40,000, 39,000, …, 15,000, 14,000, 13,000

13,000, 23,000, 33,000, …, 233,000, 243,000, 253,000
253,000, 243,000, 233,000, …, 103,000, 93,000, 83,000

83,000, 183,000, 283,000, …, 1,983,000, 2,083,000, 2,183,000
2,183,000, 2,083,000, 1,983,000, …, 1,083,000, 983,000, 883,000

Lesson 5

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

Answers will vary. Children should show that they can make a 7-digit number and then choose who has the bigger number.

Lesson 6

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

Answers will vary. Children should show that they can make a 7-digit number and then choose who has the smaller number.

Lesson 7

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

Children should show they can add or subtract the correct power of ten multiples of the number shown on the digit card.

Lesson 8

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

Children should show they can add or subtract the correct power of ten multiples of the number shown on the digit card.

Lesson 9

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

Children should show they can add or subtract the correct power of ten multiples of the number shown on the digit card.

Lesson 10

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

230,156

5,920,871

658,530

From smallest to largest: 230,156, 658,530, 5,920,871

Unit 2

Lesson 1

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

Answers will vary. Children should show that they can make a 7-digit number and then choose who has the bigger or the smaller number.

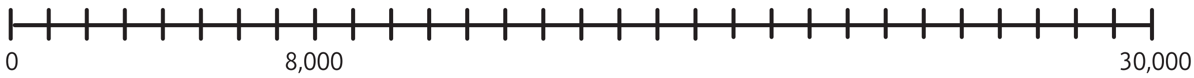
Lesson 2

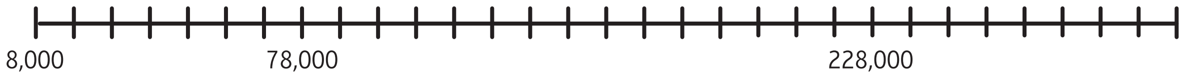
NC strands and objectives:

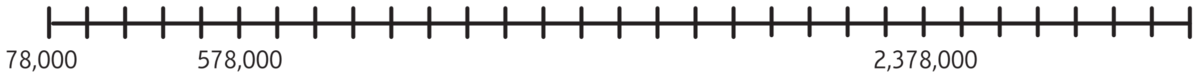
Number – number and place value

Count forwards or backwards in steps of powers of 10 for any given number up to 10,000,000

Answers:







Lesson 3

NC strands and objectives:

Number – number and place value

Count forwards or backwards in steps of powers of 10 for any given number up to 10,000,000

Answers:

8,000, 9,000, 10,000, …, 50,000, 51,000, 52,000
52,000, 51,000, 50,000 …, 19,000, 18,000, 17,000

17,000, 27,000, 37,000, …, 147,000, 157,000, 167,000
167,000, 157,000, 147,000, …, 117,000, 107,000, 97,000

97,000, 197,000, 297,000, …, 1,197,000, 1,297,000, 1,397,000
1,397,000, 1,297,000, 1,197,000, …, 897,000, 797,000, 697,000

Lesson 4

NC strands and objectives:

Number – number and place value

Count forwards or backwards in steps of powers of 10 for any given number up to 10,000,000

Answers:

19,000, 20,000, 21,000, …, 39,000, 40,000, 41,000
41,000, 40,000, 39,000, …, 15,000, 14,000, 13,000

13,000, 23,000, 33,000, …, 233,000, 243,000, 253,000
253,000, 243,000, 233,000, …, 103,000, 93,000, 83,000

83,000, 183,000, 283,000, …, 1,983,000, 2,083,000, 2,183,000
2,183,000, 2,083,000, 1,983,000, …, 1,083,000, 983,000, 883,000

Lesson 5

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

Answers will vary. Children should show that they can make a 7-digit number and then choose who has the bigger number.

Lesson 6

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

Answers will vary. Children should show that they can make a 7-digit number and then choose who has the smaller number.

Lesson 7

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

Children should show they can add or subtract the correct power of ten multiples of the number shown on the digit card.

Lesson 8

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

Children should show they can add or subtract the correct power of ten multiples of the number shown on the digit card.

Lesson 9

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

Children should show they can add or subtract the correct power of ten multiples of the number shown on the digit card.

Lesson 10

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

230,156

5,920,871

658,530

From smallest to largest: 230,156, 658,530, 5,920,871

Unit 2: Four operations (1)

Lesson 1: Problem solving – using written methods of addition and subtraction (1)

➜ pages 29–31

1.

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

2. Numbers from left to right along number line: 21,310; 21,312; 21,322
25,322 – 4,012 = 21,310

3. a) 1,141

	HTh	TTh	Th	H	T	O
	1	0	1	5	7	3
–	1	0	0	4	3	2
	0	0	1	1	4	1

b) 274,579

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

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

5. Max has added in the hundreds column instead of subtracting. In the ten thousands column, Max thinks that 2 take away 0 is 0. The correct answer is 23,048.

6.

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

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

7. a) 9,090,909
b) 969,499

Reflect

The missing number is 53,305. Problems will vary. Encourage children to write a story where the unknown is the part that was taken away from the whole of 74,505 to leave 21,200 behind.

Lesson 2: Problem solving – using written methods of addition and subtraction (2)

➜ pages 32–34

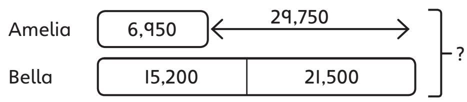
1. a) 14,321 – 1,234 = 13,087
b) Methods may vary, for example:
14,321 – (1,234 + 9,876) = 3,211 or
13,087 – 9,876 = 3,211
c) 1,234 – 909 = 325; 9,876 – 909 = 8,967;
14,321 – 909 = 13,412

2. 6 years. Methods may vary – encourage children to use mental strategies of counting on or back, which they can show on a number line.

3. C = 18,186
Total = 7,614 + 12,900 + 18,186 = 38,700
Alternatively, since B is mid-way, it is the average of the three numbers so the total is 3 × 12,900, which is 38,700.

4. a) 3,087
b) 6,419,754

5. 15,200 + 21,500 – 29,750 = 6,950
15,200 + 21,500 + 6,950 = 43,650



They scored 43,650 points altogether.

Reflect

Explanations may vary – encourage children to explain that both numbers have decreased by 1, meaning that the difference remains the same. However, the calculation has become simpler as there is no longer any exchange needed in the calculation.

5,000 – 1,728 = 4,999 – 1,727 = 3,272
50,000 – 26,304 = 49,999 – 26,303 = 23,696

Lesson 3: Multiplying numbers up to 4 digits by a 1-digit number

➜ pages 35–37

1. a) 3 × 2,324 = 6,972
2,324 + 2,324 + 2,324 = 6,972
6,000 + 900 + 60 + 12 = 6,972
b) 2,153 × 5 = 10,765

	2,000	100	50	3
5	10,000	500	250	15

c) 5,203 × 6 = 31,218
d) 7 × 1,593 = 11,151

2. 3,050 × 6 = 18,300

3. a) 251 × 7 = 1,757

b) 1,251 × 7 = 8,757

c) 1,251 × 8 = 10,008

4. a) 2 × 5,500 = 11,000; 11,000 + 1,350 = 12,350
The total mass of the boxes is 12,350 g.

b) 1,350 × 5 = 6,750
The total mass of the boxes is 6,750 g.

c) 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. a) Answers will vary. Ensure that children have taken the smaller product from the larger product to find the difference.

b) Biggest 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, for example: The 12,000 in the grid method can be seen as 1 ten thousand and 2 thousands in the column method. The 150 and 21 in the grid method combine in the column method to show 171 as 1 hundred, 7 tens and 1 one.

Lesson 4: Multiplying numbers up to 4 digits by a 2-digit number

➜ pages 38–40

1. a) 3,125 × 15 = 46,875

		3	1	2	5	
×				1	5	
				2	5	5 × 5
			1	0	0	5 × 20
			5	0	0	5 × 100
	1	5	0	0	0	5 × 3,000
				5	0	10 × 5
			2	0	0	10 × 20
		1	0	0	0	10 × 100
	3	0	0	0	0	10 × 3,000
	4	6	8	7	5	

	3,000	100	20	5
10	30,000	1,000	200	50
5	15,000	500	100	25

b) 5,123 × 13 = 66,599

	5,000	100	20	3
10	50,000	1,000	200	30
3	15,000	300	60	9

		5	1	2	3	
×				1	3	
	1	5	3	6	9	3 × 5,123
	5	1	2	3	0	10 × 5,123
	6	6	5	9	9	

c) 1,972 × 24 = 47,328

2. a) 365 × 24 = 8,760
There will be 8,760 hours in 2021.

b) 3,600 × 24 = 86,400
There are 86,400 seconds in a day.

3. Column multiplication showing:
5,056 × 7 = 35,392; 35,392 × 2 = 70,784;
5,056 × 14 = 70,784
An explanation that 2 × 7 = 14 so you can first multiply 5,056 by 7 and then the answer by 2 and this will give the same answers as 5,056 × 14.

4. 17 × 379 = 6,443
The pool has 6,443 litres of water in it, so it is not full.

5. 3,629 × 55 = 199,595

Reflect

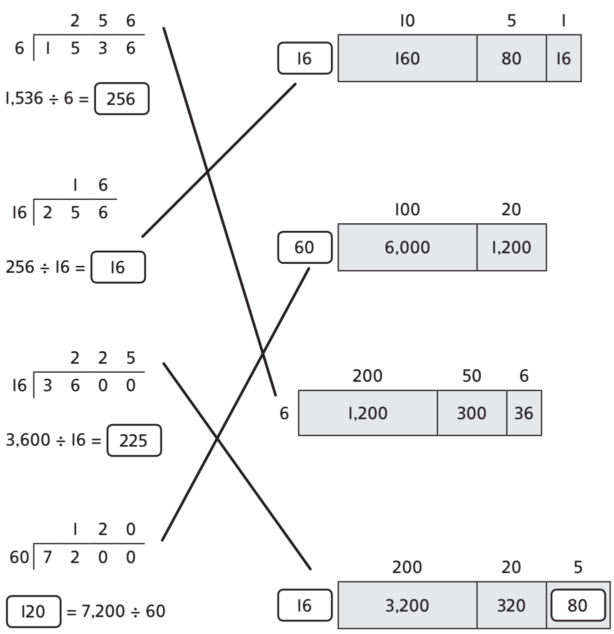
Reasoning may vary, for example:

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.

Lesson 5: Dividing numbers up to 4 digits by a 2-digit number (1)

➜ pages 41–43

1.



2. a) 759 ÷ 33 = 23

b) 2,954 ÷ 14 = 211

3. 3,500 ÷ 25 = 140. Max can use 140 g of guinea pig food per day.

4. a) 468 ÷ 9 = 52
b) 4,689 ÷ 9 = 521
c) 378 ÷ 18 = 21
d) 3,798 ÷ 18 = 211

5.

$$\begin{array}{r|cccc} & 0 & 3 & 1 & 3 \\ \hline 22 & 6 & 8 & 8 & 6 \end{array} \qquad \begin{array}{r|cccc} & 0 & 3 & 1 & 4 \\ \hline 21 & 6 & 5 & 9 & 4 \end{array}$$

$\boxed{6{,}886} \div 22 = \boxed{313}$ $\boxed{6{,}594} \div 21 = \boxed{314}$

Reflect

1,887 ÷ 17 = 111

Methods may vary. Children could use short division or the inverse grid method. Some children may already have an idea of the 'chunking' or 'partitioning' method and could show these too.

Lesson 6: Dividing numbers up to 4 digits by a 2-digit number (2)

→ pages 44–46

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
Aki can make 15 clay shells.

2. 1,260 ÷ 10 = 126; 126 ÷ 2 = 63; 1,260 ÷ 20 = 63
180 ÷ 3 = 60; 60 ÷ 5 = 12; 180 ÷ 15 = 12
960 ÷ 2 = 480; 480 ÷ 8 = 60; 960 ÷ 16 = 60
1,100 ÷ 11 = 100; 100 ÷ 2 = 50; 1,100 ÷ 22 = 50 or
1,100 ÷ 2 = 550; 550 ÷ 11 = 50; 1,100 ÷ 22 = 50

3. a) Factors may vary. 2,700 ÷ 18 = 150
b) Factors may vary. 7,200 ÷ 12 = 600
c) Factors may vary. 5,400 ÷ 36 = 150
d) Dividing by factors 7 and 2 (in either order)
5,600 ÷ 14 = 400

4. a) i) 480 ÷ 8 = 60
60 ÷ 2 = 30
So, 480 ÷ 16 = 30
ii) 960 = 480 × 2 and 32 = 2 × 16
Therefore, 960 ÷ 32 = 480 multiplied by 2, divided by 2 and divided by 16.
Multiplying by 2 and dividing by 2 are inverse operations so will cancel each other out.
So 960 ÷ 32 = 480 ÷ 16 = 30
b) 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 disprove 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

Lesson 7: Dividing numbers up to 4 digits by a 2-digit number (3)

→ pages 47–49

1. a) 399 ÷ 19 = 21

	10	10	1
9	190	190	19

$$\begin{array}{r|ccc|l} & & 2 & 1 & \\ \hline 19 & 3 & 9 & 9 & \\ & 1 & 9 & 0 & 10 \\ \hline & 2 & 0 & 9 & \\ & 1 & 9 & 0 & 10 \\ \hline & & 1 & 9 & \\ & & 1 & 9 & 1 \\ \hline & & & 0 & \end{array}$$

b) 385 ÷ 11 = 35
c) 888 ÷ 37 = 24

2. 992 ÷ 31 = 32
There are 32 classes.

3. a) 182 ÷ 13 = 14 c) 528 ÷ 11 = 48
b) 364 ÷ 13 = 28 d) 528 ÷ 22 = 24

4. Answers may vary.

Mo could have done:

$$\begin{array}{r|cccc|l} & & & 3 & 3 & \\ \hline 37 & {}^{0}\cancel{1} & {}^{11}\cancel{2} & {}^{1}2 & 1 & \\ & & 7 & 4 & 0 & 20 \\ \hline & & 4 & 8 & 1 & \\ & & 3 & 7 & 0 & 10 \\ \hline & & 1 & 1 & 1 & \\ & & 1 & 1 & 1 & 3 \\ \hline & & & & 0 & 33 \end{array}$$

Olivia could have done:

$$\begin{array}{r|cccc|l} & & & 3 & 3 & \\ \hline 37 & {}^{0}\cancel{1} & {}^{11}\cancel{2} & {}^{1}2 & 1 & \\ & & 3 & 7 & 0 & 10 \\ \hline & & {}^{7}\cancel{8} & {}^{1}5 & 1 & \\ & & 3 & 7 & 0 & 10 \\ \hline & & 4 & 8 & 1 & \\ & & 3 & 7 & 0 & 10 \\ \hline & & {}^{0}\cancel{1} & {}^{10}\cancel{1} & {}^{1}1 & \\ & & & 7 & 4 & 2 \\ \hline & & & 3 & 7 & 1 \\ & & & 3 & 7 & \\ \hline & & & & 0 & 33 \end{array}$$

5. 702 ÷ 26 = 27

Reflect

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

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

➜ pages 50–52

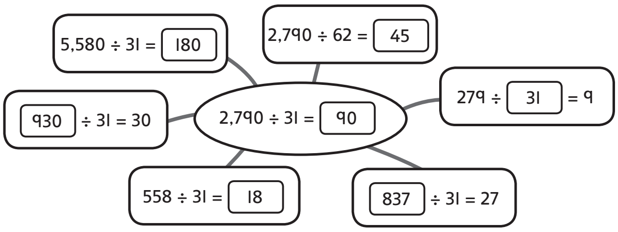
1. a) 735 ÷ 15 = 49
b) 1,890 ÷ 15 = 126
c) 5,610 ÷ 15 = 374

2. 1,331 ÷ 11 = 121
There will be 121 teams.

3. 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.

4. 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: 427, 488, 549, 610
b) 8,845 ÷ 61 = 145

5. 2,790 ÷ 31 = 90



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

Lesson 9: Dividing numbers up to 4 digits by a 2-digit number (5)

➜ pages 53–55

1. Aki is correct.
100 ÷ 13 = 7 remainder 9
Emma: 100 ÷ 14 = 7 remainder 2
Aki: 101 ÷ 13 = 7 remainder 10

2. 200 ÷ 15 = 13 remainder 5
Andy can fill up 13 pages and will have 5 stickers left over.

3. Lines drawn to match calculations to remainders:
450 ÷ 20 ➜ 10
301 ÷ 10 ➜ 1
955 ÷ 50 ➜ 5
685 ÷ 25 ➜ 10
335 ÷ 33 ➜ 5

4. a) 300 ÷ 11 = 27 remainder 3
b) 300 ÷ 31 = 9 remainder 21
c) 750 ÷ 17 = 44 remainder 2
d) 850 ÷ 17 = 50

5. 475 ÷ 35 = 13 remainder 20
The ranger needs to buy 14 bags of seeds.

6. Answers will vary. Encourage children to use their knowledge of multiples to solve this. The missing number can be 1 less than any multiple of 41.
This will always leave a remainder of 40. For example:
41 × 10 = 410, so 409 ÷ 41 = 9 remainder 40

Reflect

Explanations may vary. Encourage children to use Reena's method and then check if 300 ÷ 21 has a remainder of 2. Reena is incorrect although her calculation is correct i.e. 300 ÷ 3 = 100; then 100 ÷ 7 = 14 remainder 2. However, this remainder as a fraction is $\frac{2}{7}$ and if you use equivalence and link it back to the original divisor, $\frac{2}{7} = \frac{6}{21}$. There the remainder is 6 and not 2.

Lesson 10: Dividing numbers up to 4 digits by a 2-digit number (6)

➜ pages 56–58

1. a) 2,000 ÷ 75 = 26 remainder 50
Amelia can make 26 ice lollies. She will have 50 ml of juice left.
b) 2,500 ÷ 95 = 26 remainder 30
Bella has 30 ml of juice left, which is less than Amelia.
c) Amelia can make $\frac{50}{75}$ or $\frac{2}{3}$ of an ice lolly with her remaining juice.
Bella can make $\frac{30}{95}$ or $\frac{6}{19}$ of an ice lolly with her remaining juice.

2. a) 1,000 ÷ 11 = 90 remainder 10
b) 2,000 ÷ 11 = 181 remainder 9
c) 4,000 ÷ 22 = 181 remainder 18
d) 8,000 ÷ 22 = 363 remainder 14
Answers will vary, for example:
2,000 ÷ 11 = (2 × 1,000) ÷ 11. The answer will therefore be 2 × 90 with a remainder of 2 × 10. However, it does not make sense to have a remainder of 20 when dividing by 11. Instead this gives 1 more group of 11 with a remainder of 9. So, 2,000 ÷ 11 = 181 remainder 9.

3. 2,515 ÷ 20 = 125 remainder 15
So, working out the division exactly gives
$125\frac{15}{20}$ or $125\frac{3}{4}$. $\frac{3}{4}$ of £1 is 75p or £0·75
Each class gets £125·75.

4. Answers may vary. Encourage a systematic approach – make the divisor the largest possible number so that you can make larger remainders.
1,137 ÷ 95 = 11 remainder 92

Reflect

Answers will vary. Encourage children to work out a division equation 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 calculation which will have a remainder of 10, for example: 35 × 20 = 700. Therefore 700 ÷ 35 = 20 so 710 ÷ 35 = 20 remainder 10.

End of unit check

→ pages 59–60

My journal

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

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

Unit 2

Strengthen activities

MISCONCEPTION: Children may multiply incorrectly using the column method. For example, they may work out 257 × 36 as the total of 257 × 6 and 257 × 3.

Answers

In each rectangle of the area model you would expect to write 2,400, 480 and 32.

For 364 × 28 you would expect the numbers 6,000, 1,200, 80 and 2,400, 480, 32

295 × 63 = 18,585 and can be partitioned into 295 × 60 and 295 × 3 to help find the answer.

MISCONCEPTION: Children may misunderstand the concept of a remainder, counting up to the next multiple of the divisor, rather than looking at what is left over.

Answers

91 remainder 2

MISCONCEPTION: Children may try to solve a calculation such as 1,260 ÷ 14 by partitioning 14 as they would do if they were multiplying (1,260 ÷ 10 and then the answer ÷ 4) rather than using its factors (1,260 ÷ 2 and then the answer ÷ 7).

Answers

Answers should mention finding a factor pair of 14 (2 and 7) and dividing by these factors to help. (Either ÷ 2 then ÷7 or vice versa). 7,504 ÷ 14 = 536.

Deepen activities

Answers

Activity 1

a) There are 49 pairs that equal 100 (1 + 99, 2 + 98 and so on). 49 × 100 = 4,900. Add the 50 in the middle and the 100 on the end = 5,050.

b) There are 499 pairs that make 1,000, from 1 + 999 up to 499 + 501. This equals 499 × 1,000 = 499,000. Plus the 500 in the middle and the 1,000 on the end equals 500,500.

c) Similarly there would be 499,999 pairs that make 1,000,000 from 1 + 999,999 up to 499,999 + 500,001. This equals 499,999 × 1,000,000 = 499,999,999,000, plus the 500,000 in the middle. No need to add on the 1,000,000 on the end as we are not adding up to 1,000,000.

Activity 2

a) 751 × 93 = 69,843 is the greatest product you can make.

b) The smallest product is 359 × 17 = 6,103

Activity 3

The calculation could be 2273 ÷ **281** = **8** remainder 25. Other possible answers are 2273 ÷ 562 = 4 r 25, 2273 ÷ 1124 = 2 r 25, 2273 ÷ 2248 = 1 r 25

Unit 3

Lesson 1

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

54,822 + **70** = 54,892

32,078 + **6,000** = 38,078

287,645 + **1,000** = 288,645

834,217 + **80** = 834,297

1,275,346 + **300,000** = 1,575,346

7,443,297 + **40,000** = 7,483,297

Lesson 2

NC strands and objectives:

Number – number and place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

Answers:

31,822 – **700** = 31,122

46,708 – **5,000** = 41,708

573,119 – **300,000** = 237,119

743,566 – **500** = 743,066

4,388,291 – **60,000** = 4,328,291

9,382,100 – **2,000** = 9,380,100

Lesson 3

NC strands and objectives:

Number – number and place value

Count forwards or backwards in steps of powers of 10 for any given number up to 10,000,000

Answers:

8,000, 9,000, 10,000, …, 30,000, 31,000, 32,000
32,000, 31,000, 30,000, …, 11,000, 10,000, 9,000
(23 steps)

9,000, 19,000, 29,000, …, 99,000, 109,000, 119,000
119,000, 109,000, 99,000, …, 49,000, 39,000, 29,000
(9 steps)

29,000, 129,000, 229,000, …, 1,129,000, 1,229,000, 1,329,000
1,329,000, 1,229,000, 1,129,000, …, 729,000, 629,000, 529,000 (8 steps)

Lesson 4

NC strands and objectives:

Number – number and place value

Round any whole number to a required degree of accuracy

Answers:

23,957 rounds to: 23,960, 24,000, 24,000
61,075 rounds to: 61,080, 61,100, 61,000
87,550 rounds to: 87,550, 87,600, 88,000
21,827 rounds to: 21,830, 21,800, 22,000

156,487 rounds to: 156,500, 156,000, 160,000
741,928 rounds to: 742,000, 742,000, 740,000
117,805 rounds to: 117,800, 118,000, 120,000
287,996 rounds to: 288,000, 288,000, 290,000

Lesson 5

NC strands and objectives:

Number – number and place value

Round any whole number to a required degree of accuracy

Answers:

278,462 rounds to: 278,500, 278,000, 280,000
893,297 rounds to: 893,300, 893,000, 890,000
927,098 rounds to: 927,100, 927,000, 930,000
438,807 rounds to: 438,800, 439,000, 440,000

2,498,275 rounds to: 2,498,000, 2,500,000, 2,500,000
5,308,289 rounds to: 5,308,000, 5,310,000, 5,300,000
7,928,109 rounds to: 7,928,000, 7,930,000, 7,900,000
9,485,979 rounds to: 9,486,000, 9,490,000, 9,500,000

Lesson 6

NC strands and objectives:

Number – number and place value

Round any whole number to a required degree of accuracy

Answers:

145·84 rounds to: 146, 145·8
368·98 rounds to: 369, 369·0
2,475·05 rounds to: 2,475, 2,475·1
52,987·47 rounds to: 52,987, 52,987·5

38·975 rounds to: 39·0, 38·98
128·994 rounds to: 129·0, 128·99
879·972 rounds to: 880·0, 879·97
1,356·739 rounds to: 1,356·7, 1,356·74

Lesson 7

NC strands and objectives:

Number – number and place value

Round any whole number to a required degree of accuracy

Answers:

238·17 rounds to: 238, 238·2
583·06 rounds to: 583, 583·1
1,582·39 rounds to: 1,582, 1,582·4
43,927·63 rounds to: 43,928, 43,927·6

54·836 rounds to: 54·8, 54·84
230·705 rounds to: 230·7, 230·71
975·094 rounds to: 975·1, 975·09
3,758·195 rounds to: 3,758·2, 3,758·20

Lesson 8

NC strands and objectives:

Number – number and place value

Round any whole number to a required degree of accuracy

Answers:

9,300 seeds

210,000 stickers

Lesson 9

NC strands and objectives:

Number – number and place value

Round any whole number to a required degree of accuracy

Answers:

4,000 beats

20,000 apples

4,300 tonnes of concrete

Unit 3: Four operations (2)

Lesson 1: Common factors

➜ pages 61–63

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

b) The common factors of 14 and 18 are 1 and 2.

c) Children can draw diagrams to show that 14 does not form into an array with rows of 6. So 6 is not a factor of 14 and it therefore cannot be a common factor of 14 and 18.

2. 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

3. 8 is in the wrong place because it is a factor of both 80 and 200. 8 × 10 = 80; 8 × 25 = 200

5 is in the wrong place because it is a factor of both 80 and 200. 5 × 16 = 80; 5 × 40 = 200

4 a)

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.

Lesson 2: Common multiples

➜ pages 64–66

1.

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.

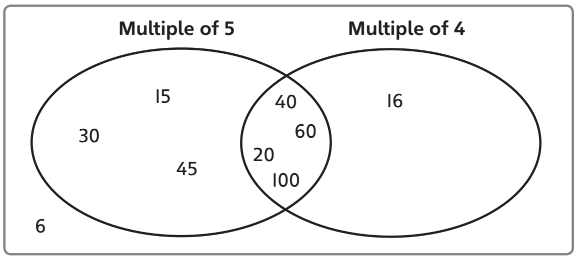
2. a)

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

b)

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

3.



Description may vary, for example: I notice that all the common multiples of 4 and 5 are multiples of 20.

4. 240, 300 and 360

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) No, the lowest common multiple of 4 and 12 is 12, so the common multiples up to 100 would be all multiples of 12 up to 100. Andy has missed out 12, 24, 36, 60, 72 and 84.

Reflect

Answers may vary but all must be multiples of 100.

Encourage children to find the lowest common multiple, which is 100. All other common multiples will be multiples of 100.

Lesson 3: Recognising prime numbers up to 100

➜ pages 67–69

1. Children to show 7 by 7 array to demonstrate that 49 has a factor of 7.
49 ÷ 7 = 7.
So, factors of 49 are 1, 7 and 49.

2. I know 51 is not a prime number because it has factors 1, 3, 17 and 51. (Alternatively, children may just give a factor which is not 1 or 51, for example they may say that 3 is a factor of 51).

I know 55 is not a prime number because it has factors 1, 5, 11 and 55. (Alternatively, children may just give a factor which is not 1 or 55, for example they may say that 5 is a factor of 55.)

53 is a prime number because it only has two factors, 1 and itself (53).

3.

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

4. 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.

5. Explanations may vary, for example:
No, I do not agree. I know that 99 has a factor of 3, so if I partition 123 into 99 + 24, I know that 24 also has a factor of 3. Therefore 123 must have a factor of 3 so it is not prime.
This shows that if a number is prime, adding on 100 will not necessarily give a prime number.

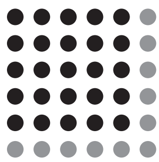
Reflect

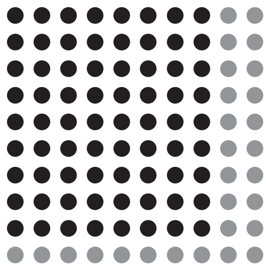
Explanations may vary. Encourage children to explain that they can work out prime or composite numbers using times-table and division knowledge or by drawing arrays. 85 is not prime as it is in the 5 times-table, so it has a factor of 5. 89 is prime – a multiplication tables grid shows that it is not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

Lesson 4: Squares and cubes

➜ pages 70–72

1. a) 49 circled; 7 × 7 = 49
b) 125 circled

2. a) 

b) 

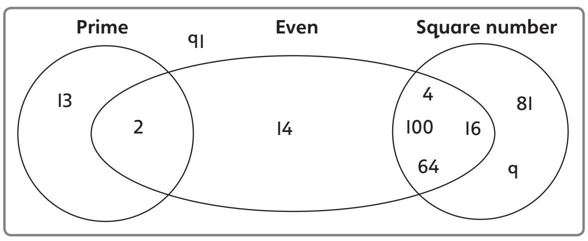
3. a) 81
b) 100
c) 121
d) 8
e) 4
f) 4
g) 1
h) 1
i) 2

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 it is true that $3 \times 3 = 9$ 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 $5^3 = 5 \times 5 \times 5 = 125$.

Lesson 5: Order of operations

➜ pages 73–75

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

2. a) $5 + 1 \times 5 = 10$ Image should show 5 counters (1 group of 5) and another 5 counters.
b) $5 \times 2 - 5 = 5$ Image should show 5 groups of 2 counters (or 2 groups of 5 counters), with 5 counters crossed out.

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) 36; 180
b) 48; 320
c) 60; 5
d) 120; 5

5. a) 50
18
500
b) Answers will vary. Each calculation should have the same number in both boxes so that the answer to the division is 1.
Explanations will vary, for example:
Each pair of missing numbers involves the same number in each box.
The dividend and divisor are always the same number to give a quotient of 1.

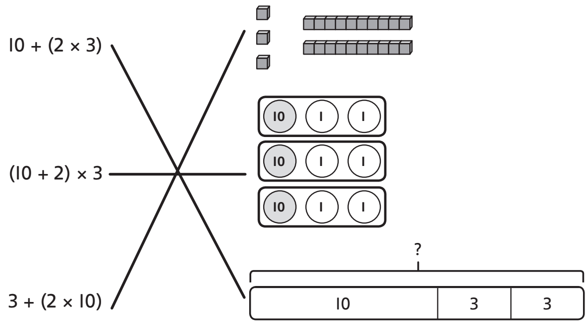
Reflect

Answers will vary – encourage children to write the multiplication and division part as the second operation in the calculation so that they cannot get it correct accidentally by just working from left to right.

Lesson 6: Brackets

➜ pages 76–78

1.



2. a) 100; $25 \times 4 = 100$
b) 9
c) 75
d) 3

3. a) Circled: $12 \times (3 + 5)$
b) $(3 + 5) \times 15 = 120$
c) $(5 \times 3) + (3 \times 5)$. This can also be written without brackets.

4. a) <
b) >
c) =

5. a) Answers may vary. Possible solutions include:
$(2 + 2 + 2) \times 2 = 12$; $2 \times (2 + 2 \times 2) = 12$
b) Answers may vary. Possible solutions include:
$10 = 3 \div 3 + 3 \times 3$; $10 = (3 \times 3) + (3 \div 3)$

6. a) Answers may vary. Possible solutions include:
Greater than 100: $(10 + 10) + (10 \times 10) = 120$;
$10 \times 10 + 10 \div 10 = 101$; $10 \times 10 \times (10 + 10) = 2{,}000$
Between 0 and 1: $(10 \div 10) \div (10 \times 10) = 0{\cdot}01$;
$(10 - 10) \times 10 \times 10 = 0$; $(10 + 10 - 10) \div 10 = 1$
Less than 0: $(10 - 10) - 10 \times 10 = {}^{-}100$;
$(10 \div 10) - (10 \times 10) = {}^{-}99$; $10 - 10 \times 10 \times 10 = {}^{-}990$
b) Answers will vary as children are asked to give the largest and smallest results they can find.
Largest: $10 \times 10 \times 10 \times 10 = 10{,}000$
Smallest: $10 - 10 \times 10 \times 10 = -990$

Reflect

Explanations may vary – encourage children to prove, by solving the calculations, that the left side is greater than the right side.

$10 \times (3 + 4) > 10 \times 4 + 3$
$70 > 43$

Lesson 7: Mental calculations (1)

→ pages 79–81

1. a) 57
b) 396
c) 35 × 9 = 315; 10 × 35 = 350

2. a) Kate receives 3p change.
b) Ebo spends £4·75 in total. He receives £15·25 change.

3. a) 200
b) 250
c) 300
d) 225

4. 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 from her answer. Sofia's mistake was that she subtracted 6 not 12. The correct answer is 588 cm or 5 m and 88 cm.

5. 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

Answers may vary – encourage an explanation of using number sense. For example, if the numbers in a calculation are near multiples of 10 it may be efficient to use rounding then adjust the answer; if an addition or subtraction calculation does not involve exchange or only one simple exchange, it may be easy to do mentally; if numbers are close together when finding the difference, then a counting up mental strategy could be used.

Lesson 8: Mental calculations (2)

→ pages 82–84

1. a) 250 – 20 = 230
250,000 – 20,000 = 230,000
The remaining counters represents two hundred and thirty thousand.
b) 115 + 5 = 120
115,000 + 5,000 = 120,000
Now Ambika can represent 120,000.

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

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

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

5.

1,000 less	100 less	Number	100 more	1,000 more
99,001	99,901	100,001	100,101	101,001
999,001	999,901	1,000,001	1,000,101	1,001,001
899,500	900,400	900,500	900,600	901,500
8,101	9,001	9,101	9,201	10,101

6. a) 424,900
b) Solution can be any number between 1,800,010 and 2,000,010 (but not 1,800,010 or 2,000,010 themselves).

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.

Lesson 9: Reasoning from known facts

→ pages 85–87

1. a) 5 × 6 × 7 = 210
b) 6 × 5 × 5 = 150
c) 3 × 7 × 9 = 189
d) 5 × 8 × 7 = 280

2. a) 425 + 85 = 510
b) 14 × 84 = 1,176
c) 4 × 164 = 656

3. 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 she already knows 48 × 6 = 288,
148 × 6 = 600 + 288 = 888.

4. a)

256 ÷ 16 = 16

16 × 17 = $\boxed{272}$

16 × 16 = $\boxed{256}$

2,560 ÷ 16 = $\boxed{160}$

$\boxed{25,600}$ = 160 × 160

$\boxed{256}$ = 8 × 32

32 × 16 = $\boxed{512}$

b) Answers will vary – ensure that children have used the related fact for their new equations, for example: 16 × 15 = 240; 2,560 ÷ 160 = 16; 16^2 = 256

5. a) $251 \times 11 = 2{,}761$
b) $65^2 = 4{,}225$
c) $25 \times 81 = 2{,}025$

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: $85 \times 6 = 510$; $255 \div 3 = 85$; $85 \times 30 = 2{,}550$.

End of unit check

➜ pages 88–89

My journal

Olivia is correct as $30^2 = 30 \times 30 = 900$

Mo's idea is also correct, as $29 \times 30 = 30^2 - 30$.
So, $29 \times 30 = 900 - 30 = 870$

Power puzzle

Yes, you can make any whole number by adding 2 or 3 prime numbers.

Here are some possible solutions:

4 = 2 + 2	15 = 5 + 5 + 5
5 = 2 + 3	16 = 7 + 7 + 2
6 = 3 + 3	17 = 7 + 7 + 3
7 = 2 + 2 + 3	18 = 13 + 5
8 = 5 + 3	19 = 17 + 2
9 = 3 + 3 + 3	20 = 17 + 3
10 = 5 + 5	
11 = 5 + 3 + 3	100 = 97 + 3
12 = 5 + 5 + 2	101 = 97 + 2 + 2
13 = 5 + 5 + 3	
14 = 7 + 7	200 = 197 + 3

Unit 3

Strengthen activities

MISCONCEPTION: Children may work from left to right in a calculation, ignoring the order of operations and/or the presence of brackets.

Answers

The answer is 90. Complete the subtraction first, multiply by 5 and then add 75.

MISCONCEPTION: Children may think that the 2 in x^2 refers to multiplying by 2 and the 3 in x^3 refers to multiplying by 3.

Answers

2. In 4 × 4 the number 4 appears twice. 4 × 2 = 8

To find 9^2 you multiply 9 by itself (81). To find 4^3 you multiply 4 by itself and then by 4 again (64).

MISCONCEPTION: Children may add or subtract incorrectly when compensating for a calculation that they have rounded to make easier.

Answers

You can round 297 to 300 and then adjust the answer by 3. 643 – 297 = 643 – 300 + 3 = 346

Deepen activities

Answers

Activity 1

a) 1 doesn't work. The others can be made: 4 = 3 + 1, 9 = 7 + 2, 16 = 11 + 5, 25 = 23 + 2 , 36 = 19 + 17, 49 = 47 + 2, 64 = 23 + 41, 81 = 79 + 2, 100 = 97 + 3

The shapes often make L shapes rather than rectangles. This is because the only rectangle that a prime number can make is a 1 × itself rectangle

Activity 2

a) Possible answers:

1 = 1 × 2 + 3 – 4 or 12 ÷ (3 × 4)

2 = 1 × 2 × 3 – 4

3 = 1 + 2 × 3 – 4 or 1 × 2 – 3 + 4

4 = (1 + 2) ÷ 3 × 4

5 = 12 – (3 + 4) or 12 – 3 – 4

6 = 1 – 2 + 3 + 4 or 1 ÷ 2 × (3 × 4)

8 = 12 ÷ 3 + 4

9 = 1 × 2 + 3 + 4

10 = 1 + 2 + 3 + 4

11 = 12 + 3 – 4

13 = (1 + 2) × 3 + 4

15 = 1 + 2 + 3 × 4

16 = 12 ÷ 3 × 4 or 12 ÷ (3 ÷ 4)

19 = 12 + 3 + 4

20 = 1 × (2 + 3) × 4

24 = 1 × 2 × 3 × 4

40 = 12 × 3 + 4

84 = 12 × (3 + 4)

b) There is a whole range of answers including:

$7\frac{1}{2} = \frac{1}{2} + 3 + 4$; $4\frac{2}{3} = 1\frac{2}{3} + 4$; $1\frac{1}{4} = \frac{1}{2} + \frac{3}{4}$;

$5\frac{2}{3} = 1 + \frac{2}{3} + 4$; $12\frac{3}{4} = 12 + \frac{3}{4}$

Activity 3

a) Katie's number could be 144

b) 15^3 = 3,375. All the factors of 3,375 are 1, 3, 5, 9, 15, 25, 27, 45, 75, 125, 135, 225, 375, 675, 1,125, 3,375

3375 × 1, 3 × 1125, 675 × 5, 375 × 9, 225 × 15, 135 × 25, 125 × 27, 45 × 75

Unit 4

Lesson 1

NC strands and objectives:

Number – number and place value

Use negative numbers in context, and calculate intervals across zero

Answers:

$^{-}$£43·55

$^{-}$£37

£32·35

Lesson 2

NC strands and objectives:

Number – number and place value

Use negative numbers in context, and calculate intervals across zero.

Answers:

$^{-}$22 °C

33 m

17 floors

Lesson 3

NC strands and objectives:

Number – multiplication

Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.

Answers:

$$\begin{array}{lr} & 4\ 0\ 8 \\ \times & 3\ 6 \\ \hline & 1\ 2,\ 2\ 4\ 0 \\ & 2,\ 4\ 4\ 8 \\ \hline & 1\ 4,\ 6\ 8\ 8 \\ \hline \end{array}$$

$$\begin{array}{lr} & 5,\ 3\ 9\ 1 \\ \times & 4\ 2 \\ \hline & 2\ 1\ 5,\ 6\ 4\ 0 \\ & 1\ 0,\ 7\ 8\ 2 \\ \hline & 2\ 2\ 6,\ 4\ 2\ 2 \\ \hline \end{array}$$

$$\begin{array}{lr} & 2\ 3\ 0 \\ \times & 5\ 2 \\ \hline & 1\ 1,\ 5\ 0\ 0 \\ & 4\ 6\ 0 \\ \hline & 1\ 1,\ 9\ 6\ 0 \\ \hline \end{array}$$

$$\begin{array}{lr} & 6,\ 2\ 8\ 3 \\ \times & 7\ 1 \\ \hline & 4\ 3\ 9,\ 8\ 1\ 0 \\ & 6,\ 2\ 8\ 3 \\ \hline & 4\ 4\ 6,\ 0\ 9\ 3 \\ \hline \end{array}$$

$$\begin{array}{lr} & 9\ 5\ 7 \\ \times & 2\ 6 \\ \hline & 1\ 9,\ 1\ 4\ 0 \\ & 5,\ 7\ 4\ 2 \\ \hline & 2\ 4,\ 8\ 8\ 2 \\ \hline \end{array}$$

$$\begin{array}{lr} & 9,\ 1\ 7\ 4 \\ \times & 8\ 3 \\ \hline & 7\ 3\ 3,\ 9\ 2\ 0 \\ & 2\ 7,\ 5\ 2\ 2 \\ \hline & 7\ 6\ 1,\ 4\ 4\ 2 \\ \hline \end{array}$$

$$\begin{array}{lr} & 7\ 4\ 5 \\ \times & 1\ 6 \\ \hline & 7,\ 4\ 5\ 0 \\ & 4,\ 4\ 7\ 0 \\ \hline & 1\ 1,\ 9\ 2\ 0 \\ \hline \end{array}$$

$$\begin{array}{lr} & 8,\ 6\ 3\ 9 \\ \times & 5\ 5 \\ \hline & 4\ 3\ 1,\ 9\ 5\ 0 \\ & 4\ 3,\ 1\ 9\ 5 \\ \hline & 4\ 7\ 5,\ 1\ 4\ 5 \\ \hline \end{array}$$

Lesson 4

NC strands and objectives:

Number – multiplication

Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.

Answers:

$$\begin{array}{lr} & 4\ 5\ 2 \\ \times & 9\ 7 \\ \hline & 4\ 0,\ 6\ 8\ 0 \\ & 3,\ 1\ 6\ 4 \\ \hline & 4\ 3,\ 8\ 4\ 4 \\ \hline \end{array}$$

43,844 bricks are needed.

$$\begin{array}{lr} & 1\ 8\ 5 \\ \times & 2\ 5 \\ \hline & 3,\ 7\ 0\ 0 \\ & 9\ 2\ 5 \\ \hline & 4,\ 6\ 2\ 5 \\ \hline \end{array}$$

The gardener has 4,625 seeds.

$$\begin{array}{lr} & 9,\ 6\ 8\ 0 \\ \times & 2\ 4 \\ \hline & 1\ 9\ 3,\ 6\ 0\ 0 \\ & 3\ 8,\ 7\ 2\ 0 \\ \hline & 2\ 3\ 2,\ 3\ 2\ 0 \\ \hline \end{array}$$

The pilot has flown 232,320 km altogether.

Lesson 5

NC strands and objectives:

Number – multiplication

Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.

Answers:

$$
\begin{array}{r}
1{,}280 \\
\times \quad 18 \\
\hline
12{,}800 \\
10{,}240 \\
\hline
23{,}040 \\
\hline
\end{array}
$$

Jamie will burn 23,040 calories.

$$
\begin{array}{r}
3{,}865 \\
\times \quad 31 \\
\hline
115{,}950 \\
3{,}865 \\
\hline
119{,}815 \\
\hline
\end{array}
$$

I will use 119,815 megabytes of data.

$$
\begin{array}{r}
4{,}375 \\
\times \quad 23 \\
\hline
87{,}500 \\
13{,}125 \\
\hline
100{,}625 \\
\hline
\end{array}
$$

100,625 m^2 needs to be covered in tarmac.

Lesson 6

NC strands and objectives:

Number – multiplication

Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.

Answers:

Answers will vary. Children should be able to write and check multiplication calculations for a partner and think of an appropriate context for one of their calculations.

Lesson 7

NC strands and objectives:

Number – multiplication

Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.

Answers:

Answers will vary. Children should be able to think of appropriate contexts for the numbers they choose.

Lesson 8

NC strands and objectives:

Number – division

Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context

Answers:

577 ÷ 18 = **32·06**
$577 \div 18 = \mathbf{32\frac{1}{18}}$
577 ÷ 18 = **32 r 1**

814 ÷ 35 = **23·26**
$814 \div 35 = \mathbf{23\frac{9}{35}}$
814 ÷ 35 = **23 r 9**

890 ÷ 26 = **34·23**
$890 \div 26 = \mathbf{34\frac{3}{13}}$
890 ÷ 26 = **34 r 6**

7,382 ÷ 25 = **295·28**
$7{,}382 \div 25 = \mathbf{295\frac{7}{25}}$
7,382 ÷ 25 = **295 r 7**

9,696 ÷ 29 = **334·34**
$9{,}696 \div 29 = \mathbf{334\frac{10}{29}}$
9,696 ÷ 29 = **334 r 10**

3,091 ÷ 75 = **41·21**
$3{,}091 \div 75 = \mathbf{41\frac{16}{75}}$
3,091 ÷ 75 = **41 r 16**

Lesson 9

NC strands and objectives:

Number – division

Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context

Answers:

There will be 32 streets in the housing estate.

There are 85 sheep in each field.

There are 102 groups of birds on the island

Lesson 10

NC strands and objectives:

Number – division

Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context

Answers:

He has filled 47 pages.

122 people live on each street, on average.

102 stewards were needed.

Lesson 11

NC strands and objectives:

Number – division

Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context

Answers:

Answers will vary. Children should be able to think of an appropriate context, complete the calculations and interpret the remainders correctly.

Unit 4: Fractions (1)

Lesson 1: Simplifying fractions (1)

→ pages 90–92

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

2. a) $\frac{7}{12}$ c) $\frac{4}{9}$ e) 80 ($\frac{72}{80}$)
b) $\frac{2}{5}$ d) $\frac{3}{4}$ f) 18 ($\frac{18}{24}$)

3. $\frac{90}{120} = \frac{45}{60} = \frac{15}{20} = \frac{3}{4}$

4. a) One part shaded
b) Two parts shaded
c) Four parts shaded
d) Five parts shaded

5. Ebo has found equivalence by dividing both the numerator and denominator by 4, which gives a decimal number as denominator. However, writing a fraction in its simplest form involves finding the equivalent fraction with the smallest possible whole number numerator and denominator. So, the simplest form of $\frac{4}{6}$ is $\frac{2}{3}$.

6. a) Circled: $\frac{10}{20}$
b) Circled: $\frac{18}{24}$

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

8. a) 8
b) 22
c) $\frac{4}{5}$
d) Answers may vary, for example:
1 (missing number on top), 5 (missing number on bottom)
4 (missing number on top), 9 (missing number on bottom)
7 (missing number on top), 13 (missing number on bottom)

Reflect

To simplify $\frac{12}{18}$, first find the highest common factor of 12 and 18, which is 6. Then divide both the numerator and denominator by 6 to give $\frac{2}{3}$.

Lesson 2: Simplifying fractions (2)

→ pages 93–95

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

2. a) $\frac{2}{5}$
$1\frac{2}{5}$
$2\frac{2}{5}$
$32\frac{2}{5}$

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

Descriptions of patterns may vary, for example:
In part a) I noticed that the fraction part stayed the same, just the whole number changed.
In part b) I noticed that the first three fractions gave the same answer – they are all equivalent. The last fraction swapped the digits in the numerator and denominator and so made an improper fraction which could then be converted to a mixed number.

3. a) Emma has not simplified fully as she has not used the highest common factor. She needs to simplify further by dividing both the numerator and denominator by 3 to give $\frac{1}{2}$.
b) Emma has swapped the numerator and denominator when simplifying. The fraction correctly simplified is $\frac{2}{1}$ or just 2.
c) Emma has simplified the fraction part correctly by dividing the numerator and denominator by 2, however she has also divided the whole number part by 2 which is wrong. $8\frac{4}{10}$ should simplify to $8\frac{2}{5}$.

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

5. $\frac{42}{30}$

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

7. a) $\frac{67}{16}$ or $4\frac{3}{16}$
b) $\frac{419}{48}$ or $8\frac{35}{48}$

Reflect

Look at the fractional part and find the highest common factor of 16 and 24 which is 8. Now divide both the numerator and denominator by 8 to give $\frac{2}{3}$. The whole part cannot be simplified so, $4\frac{16}{24} = 4\frac{2}{3}$.

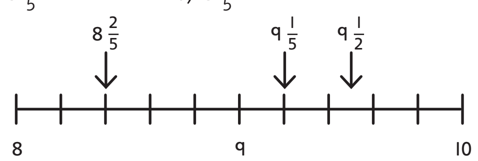
Lesson 3: Fractions on a number line

→ pages 96–98

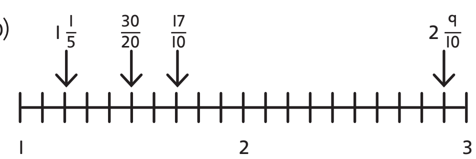
1. a) $\frac{2}{3}$; $1\frac{1}{3}$; $2\frac{2}{3}$ b) $9\frac{6}{8}$ c) $7\frac{1}{2}$; $8\frac{1}{4}$

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

3. a)



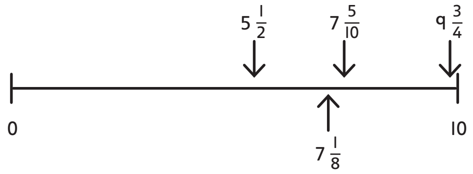
b)



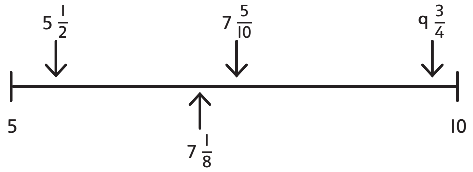
4. a) $12\frac{4}{6}, 13\frac{1}{6}, 13\frac{4}{6}, 14\frac{1}{6}, 14\frac{4}{6}$
b) $11\frac{1}{2}, 11\frac{5}{6}, 12\frac{1}{6}, 12\frac{1}{2}$
c) $14\frac{1}{6}, 13\frac{1}{2}, 12\frac{5}{6}, 12\frac{1}{6}, 11\frac{1}{2}$
d) $14\frac{1}{6}, 13\frac{1}{6}, 12\frac{1}{6}, 11\frac{1}{6}$

5. Answer d) circled. The differences between the fractions are $\frac{3}{4}$, $\frac{3}{4}$ and then $\frac{1}{2}$, so the pattern does not go up by the same amount each time.

6. a)



b)



Explanations will vary, for example: The two number lines are the same length but the top line represents the range 0 to 10 while the bottom line represents the range 5 to 10. A range of 1 on the top line is represented by $\frac{1}{10}$ of the top line but $\frac{1}{5}$ of the bottom line. So the distance between the numbers on the top line is half the distance between the same numbers on the bottom line.

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 one quarter. 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 halfway between the first part after 4, so this will be $4\frac{1}{8}$.

Lesson 4: Comparing and ordering fractions (1)

→ pages 99–101

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. a) 20 is the lowest common multiple as 20 is the smallest number which is in the 5, 10 and 4 times-tables.
b) $\frac{4}{5} = \frac{16}{20}; \frac{7}{10} = \frac{14}{20}; \frac{3}{4} = \frac{15}{20}$
$\frac{4}{5}$ is the biggest fraction. Explanations may vary, for example: I found equivalent fractions with a denominator of 20 and then compared the numerators.

3. D, C, A, B

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

5. I do not agree with the article. $\frac{3}{8} = \frac{15}{40}$ and $\frac{2}{5} = \frac{16}{40}$ so chocolate is the most popular flavour.

6. a) The missing digit could be 5, 6 or 7.
b) Answers may vary. Possible solution: $\frac{1}{2}; \frac{7}{12}; \frac{2}{3}; \frac{6}{8}$

Reflect

Lexi is incorrect.

Explanations may vary, for example:

$\frac{5}{8} = \frac{15}{25}$ and $\frac{5}{12} = \frac{10}{24}$ so $\frac{5}{8}$ is greater than $\frac{5}{12}$.

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 $\frac{5}{8}$.

Lesson 5: Comparing and ordering fractions (2)

→ pages 102–104

1. a) $4\frac{2}{3} = 4\frac{4}{6}; 4\frac{1}{2} = 4\frac{3}{6}$
So $4\frac{2}{3} > 4\frac{1}{2}$.
b) $\frac{11}{4} = \frac{22}{8}$
So $\frac{11}{4} > \frac{19}{8}$.
c) The LCM of 5 and 3 is 15.
$2\frac{1}{5} = 2\frac{3}{15}; 2\frac{1}{3} = 2\frac{5}{15}$
So $2\frac{1}{5} < 2\frac{1}{3}$.

2. a) $3\frac{3}{8} = \frac{27}{8}$, which is smaller than $\frac{29}{8}$, so $3\frac{3}{8} < \frac{29}{8}$.
Alternatively: $\frac{29}{8} = 3\frac{5}{8}$ which is greater than $3\frac{3}{8}$, so $\frac{29}{8} > 3\frac{3}{8}$.
b) Explanations may vary, for example:
$5\frac{1}{6}$ is bigger than $4\frac{5}{6}$ because 5 wholes is bigger than 4 wholes.
$5\frac{1}{6}$ is greater than 5 but $4\frac{5}{6}$ is smaller than 5, so $5\frac{1}{6} > 4\frac{5}{6}$.

3. a) The LCM of 3 and 7 is 21.
$8\frac{2}{3} = 8\frac{14}{21}; \frac{60}{7} = 8\frac{4}{7} = 8\frac{12}{21}$
So $8\frac{2}{3} > \frac{60}{7}$.
b) $\frac{11}{7} < 1\frac{11}{14}$
c) $\frac{35}{6} > \frac{45}{8}$

4. $8\frac{7}{15}, \frac{17}{2}, \frac{87}{10}, \frac{27}{3}$

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

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

Reflect

Explanations may vary – encourage children to show that they could either turn both numbers into mixed number, find equivalent fractions with a common denominator and compare, or turn both into improper fractions, find equivalents with a common denominator and compare.

Lesson 6: Adding and subtracting fractions (I)

➜ pages 105–107

1. a) The LCM of 4 and 10 is 20.
$\frac{3}{4} = \frac{15}{20}$, $\frac{1}{10} = \frac{2}{20}$; $\frac{15}{20} + \frac{2}{20} = \frac{17}{20}$
So $\frac{3}{4} + \frac{1}{10} = \frac{17}{20}$
b) The LCM of 8 and 12 is 24.
$\frac{7}{8} = \frac{21}{24}$, $\frac{5}{12} = \frac{10}{24}$; $\frac{21}{24} - \frac{10}{24} = \frac{11}{24}$
So $\frac{7}{8} - \frac{5}{12} = \frac{11}{24}$

2. $\frac{1}{20}$ of a metre remains.

3. Ambika has added both the numerator and denominator. To work out the calculation correctly, you need to find the lowest common denominator and find equivalent fractions using this denominator. You can then add the numerators but the denominator will stay the same. $\frac{3}{10} + \frac{1}{5} = \frac{3}{10} + \frac{2}{10} = \frac{5}{10}$ which can be simplified to $\frac{1}{2}$.

4. a) $\frac{13}{15}$ c) $\frac{1}{12}$
b) $\frac{23}{24}$ d) $\frac{13}{20}$

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

6. No, Richard is not correct. $\frac{5}{9} + \frac{2}{5} = \frac{25}{45} + \frac{18}{45} = \frac{43}{45}$.
This is less than the whole book as that would be $\frac{45}{45}$.

7. a) $\frac{1}{2} + \frac{3}{8} = \frac{7}{8}$ b) $\frac{1}{2} - \frac{1}{7} = \frac{5}{14}$

Reflect

Amelia found the lowest common denominator of 20, however, she forgot to multiply the numerators in order to find equivalent fractions. The correct calculation is $\frac{8}{20} + \frac{5}{20} = \frac{13}{20}$.

Lesson 7: Adding and subtracting fractions (2)

➜ pages 108–110

1. a) Add the wholes: 4 + 1 = 5
Add the parts: $\frac{2}{3} = \frac{4}{6}$
$\frac{2}{3} + \frac{1}{6} = \frac{4}{6} + \frac{1}{6} = \frac{5}{6}$
So $4\frac{2}{3} + 1\frac{1}{6} = 5\frac{5}{6}$
b) Subtract the wholes: 3 – 1 = 2
Subtract the parts: $\frac{3}{4} = \frac{9}{12}$; $\frac{1}{6} = \frac{2}{12}$
$\frac{3}{4} - \frac{1}{6} = \frac{9}{12} - \frac{2}{12} = \frac{7}{12}$
So $3\frac{3}{4} - 1\frac{1}{6} = 2\frac{7}{12}$

2. a) $3\frac{11}{15}$ c) $4\frac{19}{20}$
b) $5\frac{7}{9}$ d) $8\frac{3}{20}$

3. a) $2\frac{2}{5}$ litres of water will leak out in 2 minutes.
b) $10\frac{1}{10}$ litres is left in the bucket after 2 minutes.

4. $11\frac{2}{3} + 3\frac{1}{4} = 14\frac{11}{12}$

5. Jamie's other number is $5\frac{17}{40}$. I can check by adding:
$16\frac{3}{8} + 5\frac{17}{40} = 16\frac{15}{40} + 5\frac{17}{40} = 21\frac{32}{40} = 21\frac{4}{5}$.

Reflect

Encourage children to explain the bar model. We know the total and a part so we need to use subtraction to find the missing part. ? + $5\frac{3}{4} = 7\frac{5}{6}$, so ? = $7\frac{5}{6} - 5\frac{3}{4}$. The missing number is $2\frac{1}{12}$.

Lesson 8: Adding fractions

➜ pages 111–113

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

2. a) $9\frac{17}{30}$ b) 8

3. No, it is not the most efficient method as Kate is first converting to an improper fraction, which will result in quite large numerators. Then she will need to find equivalent fractions and this will make the numerators even bigger. She will then need to add the numerator before converting the answer back to a mixed number and/or simplifying. This involves a lot of calculation with big numbers. It will be more efficient to add the wholes and fraction parts separately then combine these and write the fraction as simply as possible.

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

Reflect

Explanations may vary – encourage children to first add the wholes and then add the parts, converting any improper fractions to mixed numbers as they go. Finally add all the wholes together and then add on the part.
$4\frac{5}{6} + 2\frac{3}{8} = 6 + \frac{20}{24} + \frac{9}{24} = 6 + \frac{29}{24} = 7\frac{5}{24}$.

Lesson 9: Subtracting fractions

→ pages 114–116

1. a) $1\frac{3}{4}$ c) $6\frac{11}{12}$
b) $\frac{11}{15}$ 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 $1\frac{13}{20}$ m tall.

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

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

Lesson 10: Problem solving – adding and subtracting fractions (1)

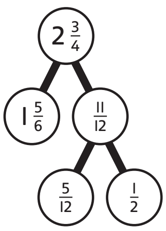
→ pages 117–119

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 $2\frac{1}{3}$.

Lesson 11: Problem solving – adding and subtracting fractions (2)

→ pages 120–122

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

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 $\frac{23}{30}$ metres from the top of the drain pipe.

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. How could they make things easier? Would being fluent with their times-tables help?

End of unit check

→ pages 123–125

My journal

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

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 4

Strengthen activities

MISCONCEPTION: Children may simply add or subtract both the numerators and denominators when adding or subtracting fractions (for example, suggesting that $\frac{4}{8} - \frac{1}{3} = \frac{3}{5}$).

Answers

$\frac{1}{4} + \frac{2}{10} = \frac{9}{20}$, $\frac{6}{10} - \frac{1}{3} = \frac{4}{15}$

MISCONCEPTION: Children may think that to simplify a fraction you always divide the numerator and denominator by 2, so as $\frac{6}{12} = \frac{3}{6}$, they either think that $\frac{9}{12}$ can be simplified as $\frac{4.5}{6}$ or do not recognise that it can be simplified at all.

Answers

$\frac{15}{27}$ both have 3 as factors so can be simplified to $\frac{5}{9}$, $\frac{16}{24}$ both have 2, 4 and 8 as factors but children should now see they can use 8 to simplify as far as possible to $\frac{2}{3}$.

MISCONCEPTION: Children may focus on the value of the numerals in fractions when comparing them (for example, suggesting that $\frac{2}{3} < \frac{10}{50}$ because 10 and 50 are larger than 2 and 3).

Answers

Children should know that they need to convert $\frac{3}{5}$ to fortieths (they cannot convert $\frac{16}{40}$ to fifths) to be able to compare the fractions. $\frac{24}{40} > \frac{16}{40}$ so $\frac{3}{5} > \frac{16}{40}$

Deepen activities

Answers

Activity 1

Jamie could have any four of:

$\frac{7}{14}$, $\frac{8}{10}$, $2\frac{2}{5}$, $1\frac{6}{8}$, $1\frac{3}{5}$, $1\frac{2}{7}$, $1\frac{1}{7}$, $2\frac{1}{3}$, $1\frac{5}{12}$

Ambika can have four out of:

$\frac{7}{14}$, $\frac{8}{10}$, $\frac{16}{20}$, $1\frac{1}{7}$, $\frac{24}{30}$, $\frac{3}{4}$

Lee can have four out of

$2\frac{2}{5}$, $1\frac{3}{5}$, $1\frac{2}{7}$, $1\frac{1}{7}$, $2\frac{1}{3}$, $1\frac{5}{12}$, $\frac{3}{4}$

For example, Jamie could have $\frac{7}{14}$, $\frac{8}{10}$, $1\frac{6}{8}$, $1\frac{3}{5}$, Ambika could have $\frac{16}{20}$, $1\frac{1}{7}$, $\frac{24}{30}$, $\frac{3}{4}$ and Lee could have $2\frac{2}{5}$, $1\frac{2}{7}$, $2\frac{1}{3}$ and $1\frac{5}{12}$

Activity 2

a)

$\frac{1}{3} = \frac{1}{4} + \frac{1}{12}$

$\frac{1}{4} = \frac{3}{12}$, $\frac{3}{12} + \frac{1}{12} = \frac{4}{12}$ and $\frac{4}{12} = \frac{1}{3}$

$\frac{1}{4} = \frac{1}{5} + \frac{1}{20}$

$\frac{1}{5} = \frac{4}{20}$, $\frac{4}{20} + \frac{1}{20} = \frac{5}{20}$ and $\frac{5}{20} = \frac{1}{4}$

$\frac{1}{5} = \frac{1}{6} + \frac{1}{30}$

$\frac{1}{6} = \frac{5}{30}$, $\frac{5}{30} + \frac{1}{30} = \frac{6}{30}$ and $\frac{6}{30} = \frac{1}{5}$

$\frac{1}{6} = \frac{1}{7} + \frac{1}{42}$

$\frac{1}{7} = \frac{6}{42}$, $\frac{6}{42} + \frac{1}{42} = \frac{7}{42}$ and $\frac{7}{42} = \frac{1}{6}$

There are other ways to make $\frac{1}{6}$

b) Many different solutions. Children should use equivalent fractions to come up with possibilities, for example: $\frac{1}{4} + \frac{1}{5} = \frac{5}{20} + \frac{4}{20} = \frac{9}{20}$

Activity 3

The answer is going to be a pair of improper fractions (as these have a value of more than 1) where the numerator is the largest two values and the denominators are the smallest two values.

So the combination that gives the largest total is

$\frac{8}{4} + \frac{6}{5} = 3\frac{1}{5}$

Unit 5

Lesson I

NC strands and objectives:

Number – division

Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context

Answers:

Answers will vary. Children should be able to write appropriate problems, complete the calculation correctly and interpret the remainders correctly.

Lesson 2

NC strands and objectives:

Number – division

Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context

Answers:

2,179 ÷ 18 = **121·06**

2,179 ÷ 18 = $\mathbf{121\frac{1}{18}}$

2,179 ÷ 18 = **121 r 1**

6,768 ÷ 32 = **211 r 16**

6,768 ÷ 32 = **211·5**

6,768 ÷ 32 = $\mathbf{211\frac{1}{2}}$

7,893 ÷ 71 = $\mathbf{111\frac{12}{71}}$

7,893 ÷ 71 = **111·17**

7,893 ÷ 71 = **111 r 12**

Lesson 3

NC strands and objectives:

Number – division

Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context

Answers:

110·3, 110 $\frac{25}{82}$, 110 r 25	He can sow 110 rows.
130·38, 130 $\frac{5}{13}$, 130 r 10	She cycles 130·38 km each day.
110·24, 110 $\frac{9}{37}$, 110 r 18	The reservoir can supply 110 houses.

Lesson 4

NC strands and objectives:

Number – division

Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context

Answers:

He drives 211·5 km.
She can complete 110 wardrobes.
231 coaches are needed.

The remainders mean you may need to round up or down when it makes sense for the answer to be a whole number.

Lesson 5

NC strands and objectives:

Number – division

Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context

Answers:

$$\begin{array}{r|rrrr} & & \mathbf{2} & 1 & \mathbf{4} \\ \hline 18 & 3 & 8 & 5 & \mathbf{2} \end{array}$$

Lesson 6

NC strands and objectives:

Number – division

Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context

Answers:

$$\begin{array}{r|llll} & \mathbf{1} & \mathbf{3} & 1 & \mathbf{r}\,\frac{\mathbf{9}}{31} \\ \hline 31 & 4 & 0 & 7 & 0 \end{array}$$

Lesson 7

NC strands and objectives:

Number – mental calculation

Perform mental calculations, including with mixed operations and large numbers

Answers:

67 + 99 = **166**

372 + 999 = **1,371**

4,726 + 9,999 = **14,725**

38,875 + 99,999 = **138,874**

289,116 + 999,999 = **1,289,115**

740,298 + 999,999 = **1,740,297**

Lesson 8

NC strands and objectives:

Number – mental calculation

Perform mental calculations, including with mixed operations and large numbers

Answers:

73 + 101 = **174**

362 + 1,001 = **1,363**

4,726 + 10,001 = **14,727**

38,875 + 100,001 = **138,876**

289,116 + 1,000,001 = **1,289,117**

740,298 + 1,000,001 = **1,740,299**

Lesson 9

NC strands and objectives:

Number – mental calculation

Perform mental calculations, including with mixed operations and large numbers

Answers:

976 – 99 = **877**

4,726 – 999 = **3,727**

38,875 – 9,999 = **28,876**

289,116 – 99,999 = **189,117**

740,298 – 99,999 = **640,299**

Unit 5: Fractions (2)

Lesson 1: Multiplying a fraction by a whole number

➜ 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) $\frac{7}{2} = 3\frac{1}{2}$ c) $\frac{18}{8} = 2\frac{2}{8}$ or $2\frac{1}{4}$

b) $\frac{12}{5} = 2\frac{2}{5}$ d) $\frac{35}{10} = 3\frac{5}{10}$ or $3\frac{1}{2}$

3. $1 \times 3 = 3$

$\frac{3}{5} \times 3 = \frac{9}{5} = 1\frac{4}{5}$

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

So $1\frac{3}{5} \times 3 = 4\frac{4}{5}$

and

$1\frac{3}{5} = \frac{8}{5}$

$\frac{8}{5} \times 3 = \frac{24}{5}$

$\frac{24}{5} = 4\frac{4}{5}$

4. a) $13\frac{1}{5}$ c) $8\frac{1}{4}$

b) $18\frac{2}{3}$ 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) The total length of 12 double decker buses is $223\frac{1}{5}$ metres.

b) $\frac{1}{5} \times \boxed{4} = \frac{4}{5}$ $\frac{\boxed{2}}{7} \times 5 = \frac{10}{7}$ $\frac{2}{3} \times \boxed{5} = 3\frac{1}{3}$

$\frac{3}{5} \times \boxed{4} = \frac{12}{5}$ $\frac{\boxed{5}}{7} \times 3 = \frac{15}{7}$ $\frac{2}{3} \times \boxed{6} = 6$

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.

Lesson 2: Multiplying a fraction by a fraction (1)

➜ pages 129–131

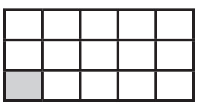
1. a) $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$

Zac uses $\frac{1}{8}$ of the bag of flour.

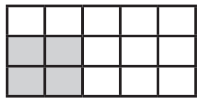
b) $\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$

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 to show 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 $\frac{3}{5}$.

Lesson 3: Multiplying a fraction by a fraction (2)

➜ pages 132–134

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

b) You can multiply the numerators together and the denominators together.

2. a) $\frac{2 \times 1}{9 \times 4} = \frac{2}{36} = \frac{1}{8}$ b) $\frac{2 \times 3}{9 \times 4} = \frac{6}{36} = \frac{1}{6}$ c) $\frac{1 \times 10}{5 \times 11} = \frac{10}{55} = \frac{2}{11}$

3. a) $\frac{1}{12}$ c) $\frac{4}{15}$ e) $\frac{35}{48}$

b) $\frac{3}{28}$ d) $\frac{7}{16}$ f) $\frac{63}{230}$

4. a) $\frac{1}{3} \times \frac{2}{5} = \frac{2}{15}$ c) $\frac{3}{5} \times \frac{1}{2} \times \frac{3}{7} = \frac{9}{20}$

b) $\frac{1}{3} \times \frac{5}{6} = \frac{5}{18}$ or $\frac{5}{3} \times \frac{1}{6} = \frac{5}{18}$ d) $\frac{7}{12} \times \frac{1}{3} = \frac{1}{6} \times \frac{7}{6}$

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. a) Answers may vary.

Some possible solutions: $\frac{2}{3} \times \frac{4}{5}$; $\frac{1}{5} \times \frac{8}{3}$

b) Answers may vary.

Some possible solutions: $\frac{2}{3} \times \frac{6}{7}$; $\frac{3}{7} \times \frac{4}{3}$

c) Answers may vary.

Some possible solutions: $\frac{2}{4} \times \frac{2}{2}$; $\frac{3}{4} \times \frac{2}{3}$

d) Answers may vary.

Some possible solutions: $\frac{1}{2} \times \frac{3}{3} \times \frac{3}{8}$; $\frac{3}{4} \times \frac{1}{2} \times \frac{3}{6}$

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.

Lesson 4: Dividing a fraction by a whole number (1)

→ pages 135–137

1. a) $\frac{1}{12}$
$\frac{1}{12}$ of the circle is shaded.
b) $\frac{1}{10}$

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

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

4. a) $\frac{1}{3} \div 2 = \frac{1}{6}$ b) $\frac{1}{5} \div 3 = \frac{1}{15}$ c) $\frac{1}{2} \div 4 = \frac{1}{8}$

5. a) $\frac{1}{18}$ d) $\frac{1}{20}$ g) 2
b) $\frac{1}{18}$ e) $\frac{1}{28}$ h) 3
c) $\frac{1}{30}$ f) $\frac{1}{24}$ i) 3 ($\frac{1}{3}$)

6. a) Each person gets $\frac{1}{6}$ of the pizza.
b) Max gets $\frac{1}{12}$ of the bar.

7. Answers will vary. The two numbers written into the empty boxes each time should have a product of 48.
Examples include:

$\frac{1}{\boxed{6}} \div \boxed{8} = \frac{1}{48}$ $\frac{1}{\boxed{12}} \div \boxed{4} = \frac{1}{48}$ $\frac{1}{\boxed{16}} \div \boxed{3} = \frac{1}{48}$

$\frac{1}{\boxed{2}} \div \boxed{24} = \frac{1}{48}$ $\frac{1}{\boxed{48}} \div \boxed{1} = \frac{1}{48}$ $\frac{1}{\boxed{4}} \div \boxed{12} = \frac{1}{48}$

Reflect

Explanations may vary.

It is false as dividing by 2 is the same as finding $\frac{1}{2}$ of $\frac{1}{10}$. This would be smaller than $\frac{1}{10}$. $\frac{1}{5}$ is actually twice as big as $\frac{1}{10}$ so it cannot be correct. $\frac{1}{10} \div 2 = \frac{1}{20}$.

Lesson 5: Dividing a fraction by a whole number (2)

→ pages 138–140

1. There are 2 twelfths in each group.
$\frac{2}{12}$

2. a) $\frac{2}{9}$ b) $\frac{3}{10}$ c) $\frac{4}{9}$

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

4. Answers may vary. Possible solution: $\frac{6}{9} \div 2 = \frac{3}{9}$

5. a) $\frac{1}{9}$ c) $\frac{3}{7}$
b) $\frac{1}{4}$ d) $\frac{4}{15}$

6. a) 2 ($\frac{2}{5}$) c) 7 d) 10
4 ($\frac{4}{5}$) 2 8
b) 6 ($\frac{6}{20}$) 14 2
15 ($\frac{15}{20}$) 1 5

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

8. 12 ($\frac{12}{18}$)
56 ($\frac{56}{60}$)
18 ($\frac{18}{24}$)

Reflect

The correct answer is $\frac{2}{15}$. Danny has divided both the numerator and 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.

Lesson 6: Dividing a fraction by a whole number (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) $\frac{10}{16} \div 2 = \frac{5}{16}$ c) $\frac{15}{24} \div 3 = \frac{5}{24}$ e) $\frac{10}{45} \div 5 = \frac{2}{45}$
b) $\frac{12}{15} \div 3 = \frac{4}{15}$ d) $\frac{12}{40} \div 4 = \frac{3}{40}$ 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 Triangle = 4
a) $\frac{3}{80}$ b) $\frac{2}{20}$ or $\frac{1}{10}$ c) $\frac{2}{25}$

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

Lesson 7: Four rules 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 multiplication calculation first and then the addition. So the correct answer is $\frac{5}{8}$.

Lesson 8: Calculating fractions of amounts

→ pages 147–149

1. 8 of the buttons are blue.

2. Andy had £480 left.

3. Kate sells 5 more cookies than Ebo.

4. Sofia pays £2·88 more than Holly.

5. a) 153 km
b) 36 minutes (accept $\frac{3}{5}$ 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.

Lesson 9: Problem solving – fractions of amounts

→ pages 150–152

1. 17 × 3 = 51
There are 51 animals in the field.

2. The number is 72.

3. Danny gets £7·50 pocket money.

4. Toshi earns £51 more per week.

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

6. Zac's number is 6·4.

7. 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 whole 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

End of unit check

→ pages 153–154

My journal

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

1.

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

2.

Unit 5

Strengthen activities

MISCONCEPTION: Children may multiply both the numerator and denominator when multiplying a fraction by a whole number (for example, thinking that $3 \times \frac{2}{10} = \frac{6}{30}$).

Answers

$3 \times \frac{5}{30} = \frac{15}{30}$ or $\frac{1}{2}$

MISCONCEPTION: When dividing a fraction by a whole number, children may divide one section of the shape by the whole number but not the remaining sections and so get unequal parts (e.g. dividing a third of a circle into 2, but not the other two thirds, giving $\frac{1}{4}$, not $\frac{1}{6}$).

Answers

$\frac{1}{5} \div 3 = \frac{1}{15}$ Children should be able to show this by folding a shape and making sure they're always dealing with equal parts.

MISCONCEPTION: Some children may always just find a fraction of an amount regardless of the question. For example, for the question $\frac{2}{5}$ *of a number is 10. What is the number?* they will work out $\frac{2}{5}$ of 10 = 4.

Answers

$\frac{3}{4}$ of a number = 27

$27 \div 3 = 9$

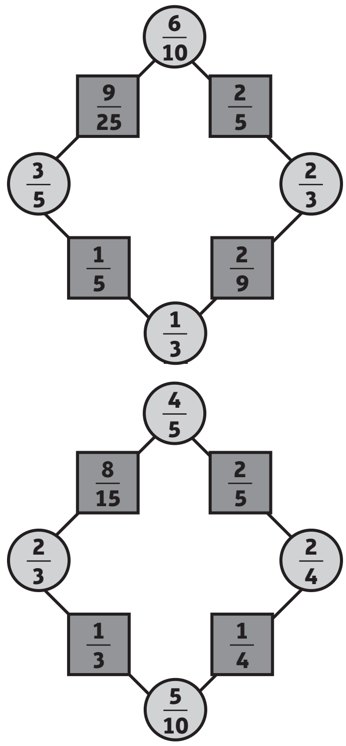
So, $\frac{1}{4} = 9$, $\frac{3}{4} = 27$ and $\frac{4}{4}$ (or the whole number) must be 36.

Deepen activities

Answers

Activity 1

a)



b) The following can be simplified:

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

Activity 2

The code word is BANANAS

Activity 3

She cuts off a triangle = $\frac{1}{2}$ of one of the sides which equals $\frac{1}{4}$ of the shape.

And then cuts off a rectangle = $\frac{2}{6}$ of one of the sides which equals $\frac{2}{12}$ of the whole shape (or $\frac{1}{6}$)

$\frac{1}{4} + \frac{1}{6}$

$= \frac{3}{12} + \frac{2}{12}$

$= \frac{5}{12}$

$1 - \frac{5}{12} = \frac{7}{12}$

Alex's shape is $\frac{7}{12}$ of the whole piece of paper.

Unit 6

Lesson I

NC strands and objectives:

Number – addition and subtraction

Perform mental calculations, including with mixed operations and large numbers

Answers:

True

False

True

False

False

Lesson 2

NC strands and objectives:

Number – addition and subtraction

Perform mental calculations, including with mixed operations and large numbers

Answers:

5,836,429 + 100 = **5,836,529** – 10,000 = 5,826,529 + 1,000,000 = **6,826,529** – 1 = **6,826,528** + 10,000 = **6,836,528** – 1,000,000 = **5,836,528** + 1 = **5,836,529** – 100 = **5,836,429**

Lesson 3

NC strands and objectives:

Number – addition and subtraction

Perform mental calculations, including with mixed operations and large numbers

Answers:

6,219,477 + 10,000 = **6,229,477** – 100 = 6,229,377 + 100,000 = **6,329,377** – 1,000 = **6,328,377** – 1,000,000 = **5,328,377** + 10 = **5,328,387** – 10,000 = **5,318,387** + 1,000 = **5,319,387**

Lesson 4

NC strands and objectives:

Number – addition and subtraction

Perform mental calculations, including with mixed operations and large numbers

Answers:

270 × 400 + 999 = **108,999**

3,500 × 600 – 99,999 = **2,000,001**

51,000 × 70 + 9,999 = **3,579,999**

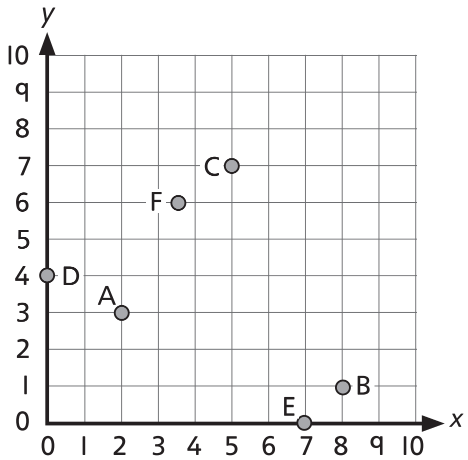
480 × 900 – 99,999 = **332,001**

Unit 6: Geometry – position and direction

Lesson 1: Plotting coordinates in the first quadrant

→ pages 155–157

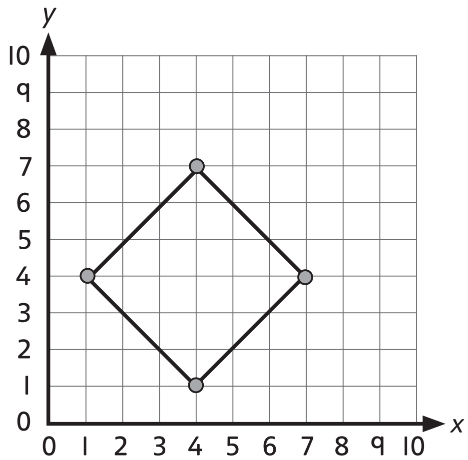
1.



2. A (4,7) B (6,5) C (4,3) D (2,5) E (7,7) F (9,7) G (10,5) H (8,4) I (6,5)

3. a) (4,10) and (1,10) or (4,4) and (1,4)
b) (8,4) and (8,2) or (0,4) and (0,2)

4. a)



b) The vertices of the square are:
(1,4)
(4,7)
(7,4)
(4,1)

5. Point A (2,4) Point B (8,7) Point C (11,4) Point D (11,1) Point E (8,1)

Reflect

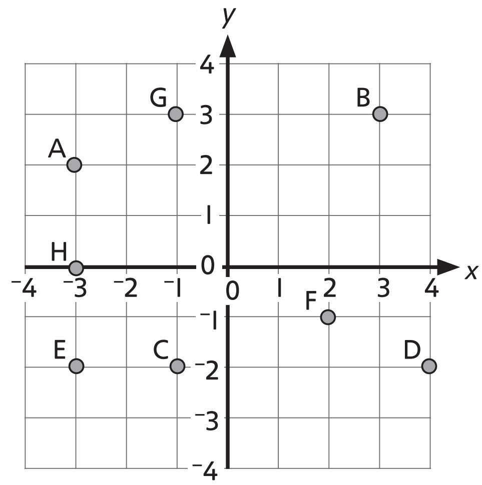
It tells me that the point lies on one of the axes. If the zero is the first coordinate, then the point lies on the *y*-axis; if the zero is the second coordinate, then the point lies on the *x*-axis.

Lesson 2: Plotting coordinates

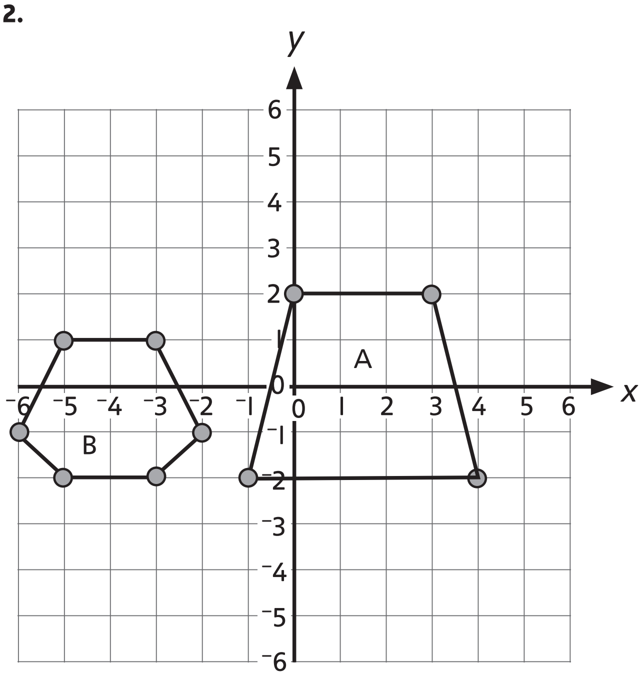
→ pages 158–160

1. a) Point A ($^-3$,2)
Point B (3,3)
Point C ($^-1$,$^-2$)
Point D (4,$^-2$)

b)



2.



Shape A is a trapezium.
Shape B is a hexagon.

3. Lucy is not correct. The first coordinate tells you how far the point is from the origin if you move in the *x*-direction (horizontally). The second coordinate tells you how far the point is from the origin in the *y*-direction (vertically). It therefore does matter which way round you write the coordinates as, for example, (2,5) is a different point to (5,2).

4. Mia needs to plot the point ($^-3$,$^-1$) to complete her rectangle.

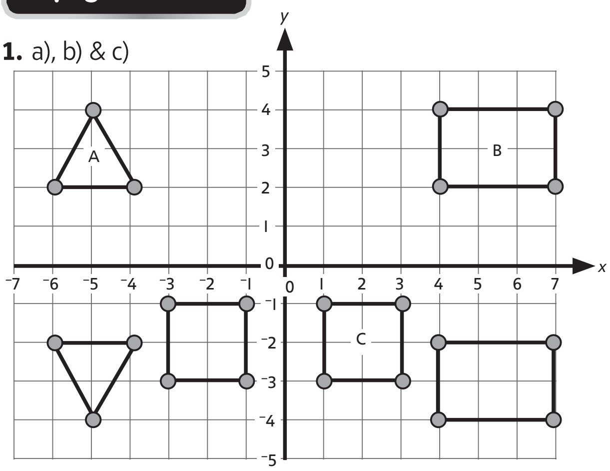
Reflect

Answers may vary; encourage children to justify their reasons and give examples. For example, children might argue that it is harder to plot coordinates in all four quadrants because you have to consider whether the point lies to the left or right of the origin and whether it lies above or below the origin.

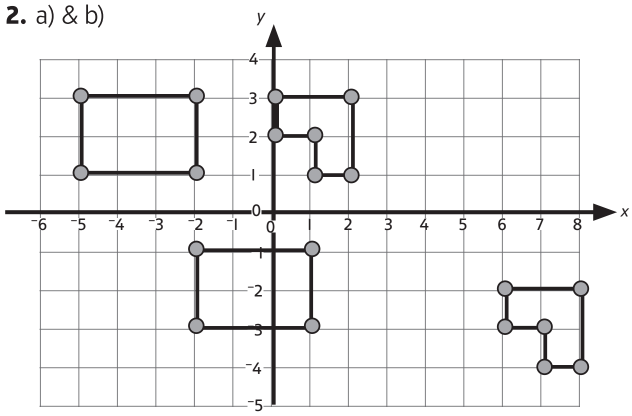
Lesson 3: Plotting translations and reflections

➜ pages 161–163

1. a), b) & c)



2. a) & b)

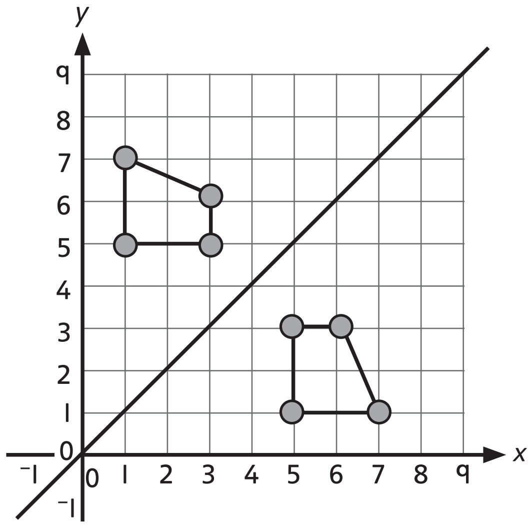


3. Shape A has been reflected in the *x*-axis to make shape B.

Shape C has been reflected in the *y*-axis to make shape D.

Shape E has been translated 6 units right and 3 units up to make shape F.

4.



5. $(^-1,5)$, $(^-1,2)$, $(^-5,2)$, $(^-5,5)$

6. a) The coordinates will be: (11,2), (9,3), (7,3), (6,2) and (8,1).

b) The coordinates will be: (5,2), (3,3), (1,3), (0,2) and (2,1).

Explanations will vary, for example: I do not get the same answers because the order you do reflections and translations matters.

Reflect

Yes, the shape is identical as you have not changed the dimensions of the shape – you have just changed its position (and possibly orientation).

Lesson 4: Reasoning about shapes with coordinates

➜ pages 164–166

1. $(^-4,1)$, $(^-4,^-1)$ or (0,1), $(0,^-1)$

2. C $(^-3,^-2)$ D $(1,^-6)$

3. a) Point B (0,2)
Point C $(^-2,5)$

b) Point D $(1,^-5)$
Point E $(5,^-5)$

4. Point A $(1,^-5)$
Point B $(5,^-5)$

5. Point A (3,2)
Point B $(9,^-1)$
Point C $(5,^-4)$
Point D $(^-1,^-1)$

Reflect

Answers will vary; encourage children to think about which aspects were challenging and why. What could they do to help this become easier in the future?

End of unit check

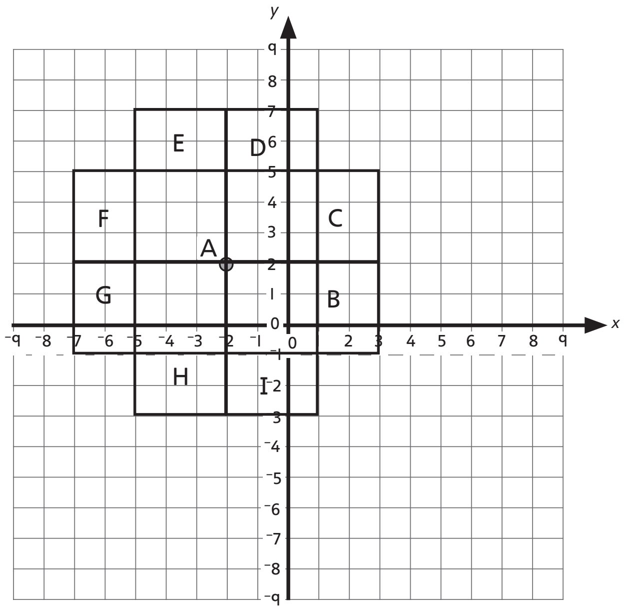
➜ pages 167–169

My journal

1. Reasons and justifications may vary. A possible response could be:

No, Kate is incorrect as we can work out any missing information. As the shape is a square, we can use the properties of a square to help us. When reflecting in the *y*-axis, there is no need to know the coordinates of the shape, as you are simply reflecting the same distance from the *y*-axis either side.

2.



Rectangle B (3,2), (3,$^{-}$1), ($^{-}$2,$^{-}$1)
Rectangle C (3,2), (3,5), ($^{-}$2,5)
Rectangle D (1,2), (1,7), ($^{-}$2,7)
Rectangle E ($^{-}$2,7), ($^{-}$5,7), ($^{-}$5,2)
Rectangle F ($^{-}$2,5), ($^{-}$7,5), ($^{-}$7,2)
Rectangle G ($^{-}$7,2), ($^{-}$7,$^{-}$1), ($^{-}$2,$^{-}$1)
Rectangle H ($^{-}$5,2), ($^{-}$5,$^{-}$3), ($^{-}$2,$^{-}$3)
Rectangle I ($^{-}$2,$^{-}$3), (1,$^{-}$3), (1,2)

Power play

Answers will vary depending on the squares drawn by the child and their partner.

Unit 6

Strengthen activities

MISCONCEPTION: Children may read from the *y*-axis first when using coordinates or misremember the names of each axis.

Answers

Children should plot the point (4,5) on a grid and describe another point by giving its coordinates

MISCONCEPTION: Children may plot negative values as positive values (e.g. plotting $(^{-}2, ^{-}3)$ as (2,3).

Answers

Children should correctly plot the points $(^{-}1, ^{-}5)$ and $(^{-}3, 2)$ on a grid

MISCONCEPTION: Some children may think that a shape has been translated, when it has actually been reflected.

Answers

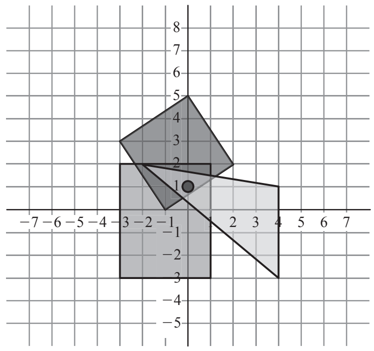
Children should be able to identify a reflected shape by where the position of certain points (i.e. corners) are.

Deepen activities

Answers

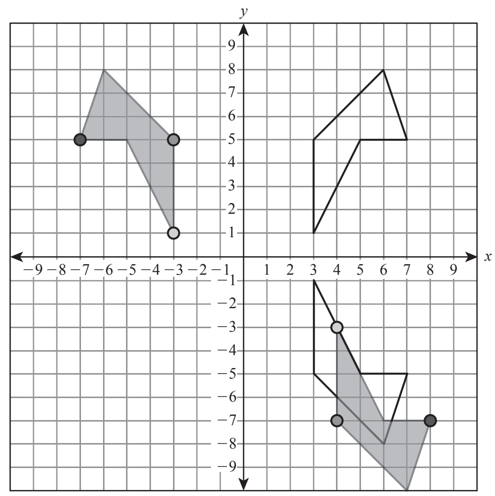
Activity 1

The treasure is found at point (0, 1)

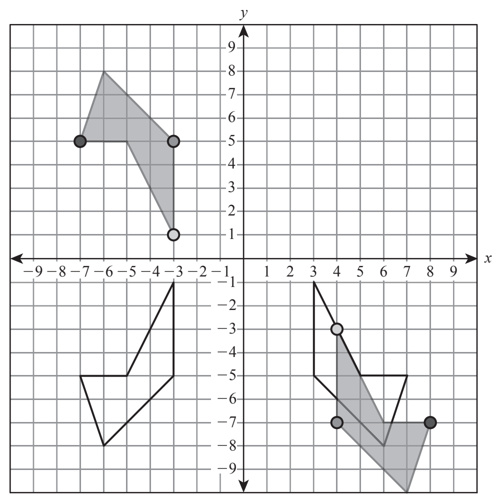


Activity 2

Most obvious answers are:



Reflected in the *y*-axis, reflected in the *x*-axis and then translated 1 square right and 2 squares down.
and also…



Reflected in the *x*-axis, reflected in the *y*-axis and then translated 1 square right and 2 squares down

Activity 3

a) The third vertex could be at (0,1), (1, ⁻2), (3, ⁻1), (⁻2, ⁻4), (⁻4, ⁻5), (⁻1,⁻7)

b) The coordinates of the square can be: (⁻2, ⁻2), (1, ⁻4), (3, ⁻1), (0,1) or (⁻2, ⁻2), (1, ⁻4), (⁻4, ⁻5), (⁻1,⁻7)

c) Each of the two squares has four possible rectangles.

For one of the squares the coordinates could be:

(3,⁻1), (0,1), (⁻4,⁻5), (⁻1,⁻7)

or (4,-6), (2,⁻9), (⁻2, ⁻2), (⁻4,⁻5),

or (⁻2, ⁻2), (1, ⁻4), (⁻3, ⁻10), (⁻6, ⁻8)

or (⁻5,0), (⁻7, ⁻3), (⁻1,⁻7), (1, ⁻4)

For the other one the coordinates could be:

(3,⁻1), (0,1), (⁻4,⁻5), (⁻1,⁻7)

or (⁻2, ⁻2), (0,1), (⁻4, ⁻6), (6, ⁻3)

or (⁻3,3), (⁻5,0), (1, ⁻4), (3, ⁻1)

or (⁻1, ⁻4), (⁻2, ⁻2), (5,2), (2,5)