Unit 7: Decimals

Lesson 1: Multiplying by 10, 100 and 1,000

➜ pages 6–8

1. a) 1·3 × 10 = 13; 1 counter in tens column and 3 counters in ones column.
b) 3·03 × 10 = 30·3; 3 counters in tens column and 3 counters in tenths column.

2. a) 1,008; 1st box ticked.
b) 8,103, 2nd box ticked.
c) 0·012 × 1,000 = 12

3. a) 1·1 × 10 = 11
1·2 × 10 = 12
1·02 × 10 = 10·2
102 = 1·02 × 100
b) 9,990 = 99·9 × 100
99,990 = 999·9 × 100
0·999 × 100 = 99·9
9·999 × 1,000 = 9,999
c) 2·5 × 10 = 25
2·5 × 20 = 50
2·5 × 200 = 500
2·5 × 2,000 = 5,000

4. a) The total cost of the order will be £600.
b) The total mass of all the bricks is 1,000 kg.

5. 5·02 × 100 = 502
Explanations will vary; for example, children could show 5·02 with counters on a place value grid and move counters two columns to the left to represent multiplying by 100 to give 502.

6. a) 0·025 × 100 = 10 × 0·25
1,000 × 1·01 = 101 × 10
0·09 × 1,000 = 10 × 9
3·5 × 40 = 400 × 0·35
2·5 × 200 = 5 × 100
5,000 × 0·03 = 50 × 3
b) Answers will vary but triangle should be 10 × star in each case; for example:

	Solution 1	Solution 2	Solution 3	Solution 4	Solution 5	Solution 6	Solution 7
▲	10	100	20	30	40	50	200
★	1	10	2	3	4	5	20

Reflect

Answers will vary but check children recognise that multiplying by 10, 100 and 1,000 involves exchanging on a place value grid and that the digits move to the left on the grid: once for ×10, twice for ×100 and three times for ×1,000.

Lesson 2: Dividing by multiples of 10, 100 and 1,000

➜ pages 9–11

1. a) 1·7 b) 0·15

2. The tap loses 1·25 litres of water each day.

3. 2·05; tick bottom left-hand image.

4. 0·4 ÷ 10 = 0·04

5. 30·6 ÷ 100 = 0·306 3·6 ÷ 10 = 0·36 36 ÷ 1,000 = 0·036

6. a) 1·2 b) 0·04 c) 1·2
0·8 0·06 0·8
0·6 0·08 0·6
0·4 0·03 0·2

7. Completed divisions to say:
206 ÷ 1,000 = 0·206
26 ÷ 1,000 = 0·026
260 ÷ 100 = 2·6
20·6 ÷ 10 = 2·06
2·6 ÷ 100 = 0·026
2·06 ÷ 10 = 0·206

Reflect

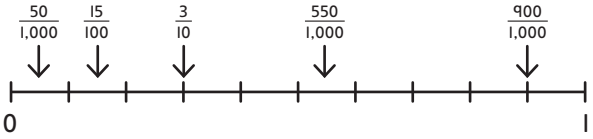
Answers will vary; for example: Danny has a rope that is 5·7 m in length and wants to cut 10 equal pieces. How long should each piece be? (5·7 ÷ 10 = 0·57)

Lesson 3: Decimals as fractions

➜ pages 12–14

1. a) 0·007 is equivalent to $\frac{7}{1,000}$
b) 0·131 is equivalent to $\frac{131}{1,000}$
c) 0·997 is equivalent to $\frac{997}{1,000}$
d) 0·51 is equivalent to $\frac{51}{100}$

2. $\frac{900}{1,000} = 0·9$ $\frac{15}{100} = 0·15$ $\frac{3}{10} = 0·3$ $\frac{550}{1,000} = 0·55$ $\frac{50}{1,000} = 0·05$



3. 0·3 ➜ $\frac{300}{1,000}$
0·03 ➜ $\frac{30}{1,000}$
0·33 ➜ $\frac{33}{100}$
0·303 ➜ $\frac{303}{1,000}$
3·3 ➜ $\frac{33}{10}$
0·003 ➜ $\frac{3}{1,000}$

4. a) $0·04 = \frac{4}{100} = \frac{1}{25}$ c) $0·04 = \frac{4}{1,000} = \frac{1}{250}$
b) $0·05 = \frac{5}{100} = \frac{1}{20}$ d) $0·005 = \frac{5}{1,000} = \frac{1}{200}$

5. a) Circled: $1\frac{823}{1,000}$ b) Circled: $\frac{17}{20}$

6. a) Two possible answers:
$0{\cdot}1 + 0{\cdot}02 = \frac{3}{25}$ (= 0·12)
$0{\cdot}105 + 0{\cdot}015 = \frac{3}{25}$ (= 0·12)
b) Two pairs:
$2 - 1{\cdot}98 = \frac{5}{250}$ (= 0·02)
$1{\cdot}02 - 1 = \frac{5}{250}$ (= 0·02)

Reflect

Explanations will vary; for example:

0·555 is a decimal involving tenths, hundredths and thousandths; there are 5 tenths, 5 hundredths and 5 thousandths which are equivalent to 555 thousandths or $\frac{555}{1{,}000}$. Both 555 and 1,000 are divisible by 5 (they end in a 0 or a 5), so $\frac{555}{1{,}000}$ can be simplified to $\frac{111}{200}$ ($111 \times 5 = 555$ and $200 \times 5 = 1{,}000$).

Lesson 4: Fractions as decimals (1)

➜ pages 15–17

1. a)

O	•	Tth	Hth	Thth
0	•	0	3	

b)

O	•	Tth	Hth	Thth
0	•	3	4	

c)

O	•	Tth	Hth	Thth
0	•	0	0	3

d)

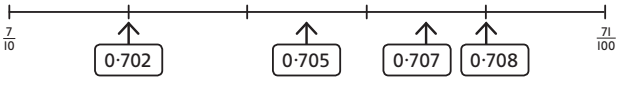
O	•	Tth	Hth	Thth
0	•	3	4	5

2. a) Circled: 7·7 b) Circled: 3·7

3. a) $\frac{2}{5} = 0{\cdot}4$ d) $\frac{4}{5} = 0{\cdot}8$
b) $\frac{8}{20} = 0{\cdot}4$ e) $\frac{11}{20} = 0{\cdot}55$
c) $\frac{17}{20} = 0{\cdot}85$

4. a) $\frac{1}{50} = \frac{2}{100} = 0{\cdot}02$ d) $\frac{3}{50} = \frac{6}{100} = 0{\cdot}06$
b) $\frac{3}{200} = \frac{15}{1{,}000} = 0{\cdot}515$ e) $\frac{99}{500} = \frac{198}{1{,}000} = 0{\cdot}198$
c) $\frac{99}{250} = \frac{396}{1{,}000} = 0{\cdot}396$

5. Missing numbers:



6. Answers will vary; for example:

Between 0 and 1	Between 1 and 10	Greater than 10
$\frac{2}{4} = 0{\cdot}5$	$\frac{500}{250} = 2$	$\frac{500}{25} = 20$
$\frac{2}{5} = 0{\cdot}4$	$\frac{500}{200} = 2{\cdot}5$	$\frac{250}{5} = 50$
$\frac{2}{25} = 0{\cdot}08$	$\frac{25}{5} = 5$	$\frac{50}{4} = 12{\cdot}5$
$\frac{5}{50} = 0{\cdot}1$	$\frac{200}{25} = 8$	$\frac{200}{4} = 50$

Reflect

Answers will vary; check that children recognise that in both cases they need to use equivalent fractions to either simplify a fraction or convert it to a fraction in tenths, hundredths, or thousandths. When writing fractions as tenths, hundredths or thousandths, the digits in the numerator are the same as the digits in the decimal.

The difference is that when converting from decimals to fractions they need to simplify the fractions using division and common factors, whereas when converting from fractions to decimals they need to use multiplication so that they can write the fractions with 10, 100 or 1,000 as a denominator (as appropriate).

Lesson 5: Fractions as decimals (2)

➜ pages 18–20

1. 0·80 0·30 0·28

2. $A = \frac{1}{20} = 0{\cdot}05$ $C = \frac{9}{20} = 0{\cdot}45$
$B = \frac{3}{10} = 0{\cdot}3$ $D = \frac{6}{10} = 0{\cdot}6$
$E = \frac{4}{10} = 0{\cdot}4$ $G = \frac{28}{10} = 2{\cdot}8$
$F = \frac{12}{10} = 1{\cdot}2$ $H = \frac{36}{10} = 3{\cdot}6$

3.

$\frac{3}{12} = \frac{1}{4}$	$\frac{7}{50} = \frac{17}{100}$	$\frac{81}{250} = \frac{324}{1{,}000}$
$1 \div 4$	$17 \div 100$	$324 \div 1{,}000$
0·25	0·17	0·324

4. Children complete the three division calculations to work out:
$\frac{5}{8} = 0{\cdot}625$ $\frac{5}{12} = 0{\cdot}4166\ldots = 0{\cdot}417$ (to 3 dp) $\frac{12}{5} = 2{\cdot}4$

5. a) $\frac{1}{6} = 0{\cdot}166$ (to 3 dp) c) $\frac{54}{1{,}000} = 0{\cdot}027$
b) $\frac{16}{80} = 0{\cdot}2$ d) $\frac{14}{24} = 0{\cdot}583$ (to 3 dp)

6. a) $\frac{1}{9} = 1 \div 9$ $\frac{2}{9} = 2 \div 9$

$$9\overline{)1{\cdot}{}^{1}0\,{}^{1}0\,{}^{1}0\ldots} \qquad 9\overline{)2{\cdot}{}^{2}0\,{}^{2}0\,{}^{2}0\ldots}$$

$\frac{3}{9} = 3 \div 9$ $\frac{4}{9} = 4 \div 9$

$$9\overline{)3{\cdot}{}^{3}0\,{}^{3}0\,{}^{3}0\ldots} \qquad 9\overline{)4{\cdot}{}^{4}0\,{}^{4}0\,{}^{4}0\ldots}$$

b) Rounded to three decimal places:

$\frac{5}{9} = 0{\cdot}556$	$\frac{9}{9} = 0{\cdot}999\ldots = 1$
$\frac{6}{9} = 0{\cdot}667$	$\frac{10}{9} = 1{\cdot}111$
$\frac{7}{9} = 0{\cdot}778$	$\frac{11}{9} = 1{\cdot}222$
$\frac{8}{9} = 0{\cdot}889$	$\frac{19}{9} = 1{\cdot}111$

Reflect

Methods may vary; for example:

$$8\overline{)5{\cdot}{}^{5}0\,{}^{2}0\,{}^{4}0}$$

So, $\frac{5}{8} = 0{\cdot}625$

$\frac{55}{100} = 0{\cdot}55$ (using decimal place value)

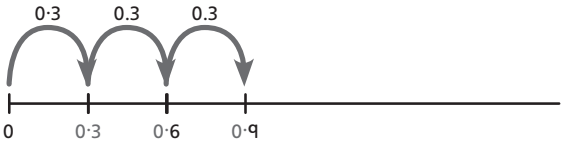
Comparing the tenths, 6 is more than 5, so $\frac{5}{8} > 0{\cdot}55$.

Lesson 6: Multiplying decimals (I)

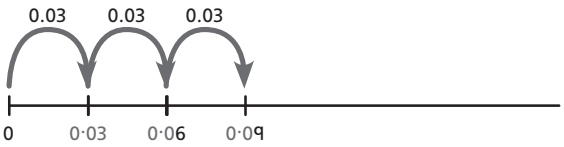
➜ pages 21–23

1. 4 × 0·2 = 0·8
3 × 0·02 = 0·06

2. a) 3 × 0·3 = 0·9, 2 more jumps of 0·3 on the number line to show 0·6 and 0·9:



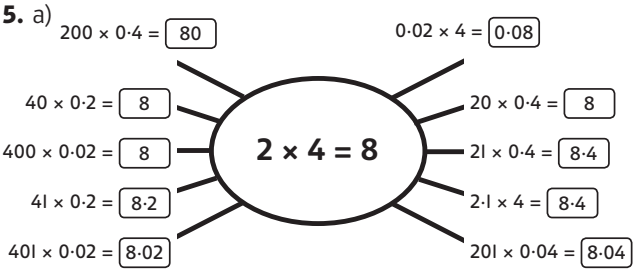
b) 3 × 0·03 = 0·09, 3 jumps of 0·03 on the number line to show 0·03, 0·06 and 0·09:



3. Bella needs 0·1 litres more water to make 1 litre.

4. a) $21 \times \frac{2}{10} = \frac{42}{10} = 4{\cdot}2$ 201 × 0·03 = 6·03
310 × 0·02 = 6·2 $31 \times \frac{3}{100} = 0{\cdot}93$
b) 0·93 4·2 6·03 6·2

5. a)



b) Answers will vary; for example:
20 × 40 = 800; 0·2 × 400 = 80

Reflect

Answers will vary; check that children recognise the importance of using core multiplication facts and adjusting for decimals by dividing by 10, 100, 1,000, etc., or adjusting for multiples of 10 by multiplying.

Lesson 7: Multiplying decimals (2)

➜ pages 24–26

1. a) 3 × 0·5 = 1·5
0·3 × 5 = 1·5
b) 4 × 0·06 = 0·24
6 × 0·04 = 0·24
c) 5 × 0·03 = 0·15
3 × 0·05 = 0·15
d) 6 × 0·04 = 0·24
4 × 0·06 = 0·24

2. a) 4 × 3 = 12
0·4 × 3 = 1·2
0·04 × 3 = 0·12
4 × 0·3 = 1·2
4 × 0·03 = 0·12
b) 14 × 3 = 42
1·4 × 3 = 4·2
14 × 0·3 = 4·2
0·14 × 3 = 0·42
0·03 × 14 = 0·42
c) 7 × 8 = 56
7 × 0·08 = 0·56
0·7 × 8 = 5·6
0·07 × 80 = 5·6
700 × 0·8 = 560

3. 140 × 0·07 = 9·8 is closest to 10.

4. Isla is not correct. The answers to the calculations are correct.
Diagrams will vary; for example: children could show an array, counters on a place value grid, jumps along a number line, etc.

5. a) Answers will vary; for example:
2·3 × 45 = 103·5
2·4 × 35 = 84
2·5 × 43 = 107·5
3·4 × 25 = 85
b) Smallest product: 2·4 × 35 = 84
Largest product: 5·2 × 43 = 223·6
Difference: 139·6

Reflect

Answers will vary. Children should use their knowledge of factors of 36 and their understanding of place value in decimals to identify calculations; for example:

0·12 × 3 = 0·36; 0·09 × 4 = 0·36; 0·6 × 0·6 = 0·36

Lesson 8: Dividing decimals (I)

➜ pages 27–29

1. a) 0·6 ÷ 3 = 0·2
b) 1·2 ÷ 6 = 0·2
c) 0·08 ÷ 4 = 0·02

2. a) 36 ÷ 4 = 9 16 ÷ 4 = 4
3·6 ÷ 4 = 0·9 1·6 ÷ 4 = 0·4
0·36 ÷ 4 = 0·09 0·16 ÷ 4 = 0·04
48 ÷ 4 = 12 28 ÷ 4 = 7
4·8 ÷ 4 = 1·2 2·8 ÷ 4 = 0·7
0·48 ÷ 4 = 0·12 0·28 ÷ 4 = 0·07
b) 3·6 ÷ 6 = 0·6 4·8 ÷ 6 = 0·8
0·72 ÷ 6 = 0·12 0·18 ÷ 6 = 0·03

3. a) 0·2 ÷ 4 = 0·05 c) 0·4 ÷ 8 = 0·05
b) 0·3 ÷ 6 = 0·05 d) 0·5 ÷ 10 = 0·05
In each calculation, the second number (divisor) is equal to the first number (dividend) multiplied by 10 and doubled. This means that the answer to each calculation will be $\frac{1}{20}$ or 0·05.

4. 7 × 8 = 56 5·6 ÷ 7 = 0·8
0·7 × 8 = 5·6 5·6 ÷ 8 = 0·7

5. 1 pen costs £0·20.

6. Amelia's sunflower is 0·7 m tall; Bella's is 2·1 m tall; Lee's is 2·6 m tall.

Reflect

Answers will vary; for example: 8 oranges cost £3·20, how much does one orange cost? (£0·40)

Lesson 9: Dividing decimals (2)

➜ pages 30–32

1.

$$4 \overline{)4 \cdot 24} = 1 \cdot 06 \qquad 6 \overline{)8 \cdot {}^{2}6\,{}^{2}4} = 1 \cdot 44 \qquad 8 \overline{)9 \cdot {}^{1}2\,{}^{4}0} = 1 \cdot 15$$

4·24 ÷ 4 = 1·06 8·64 ÷ 6 = 1·44 9·2 ÷ 8 = 1·15

2. a)

No decimal places	One decimal place	Two decimal places
E	B, C	A, D, F

b) A 25 ÷ 4 = 6·25
B 2·6 ÷ 2 = 1·3
C 100·5 ÷ 5 = 20·1
D 8·72 ÷ 4 = 2·18
E 1,080 ÷ 4 = 270
F 1·38 ÷ 3 = 0·46

3. a) 10·5 ÷ 3 = 3·5 10·5 ÷ 6 = 1·75 10·5 ÷ 30 = 0·35

b) Explanations may vary; for example:
The core fact is 10·5 ÷ 3 = 3·5.
10·5 ÷ 6 is connected to this since:
10·5 ÷ 6 = 10·5 ÷ 3 ÷ 2 = 3·5 ÷ 2 = 1·75
10·5 ÷ 30 is connected to this since:
10·5 ÷ 30 = 10·5 ÷ 3 ÷ 10 = 3·5 ÷ 10 = 0·35

4. a) The digit in the second decimal place is incorrect; she has carried over 3 but written it in the hundredths column. The 3 tenths should be exchanged for 30 hundredths. The correct answer is 0·733.

b) Dividing a number by 10 is most efficiently done using place value. 7·33 is made up of 7 ones, 3 tenths and 3 hundredths. When a number is divided by 10 each digit moves one position to the right (because this makes its value 10 times smaller) so the answer will have 7 tenths, 3 hundredths and 3 thousandths. 7·33 ÷ 10 = 0·733

5. 27·5 ÷ 10 = 2·75

$\frac{7{\cdot}7}{11} = 0{\cdot}7$

6. 6 large blocks = 6 × 14·2 kg = 85·2 kg,
so 1 small block = 85·2 kg ÷ 8 = 10·65 kg.
The mass of 1 small block is 10·65 kg.

Reflect

Answers could vary; for example:

$$4 \overline{)1\,{}^{1}2\;3 \cdot {}^{3}0\,{}^{2}0} = 30 \cdot 75$$

Children might start from the division 123 ÷ 4 = 30 r 3 and then divide the remainder by 4.

3 ÷ 4 = $\frac{3}{4}$ = 0·75 so 123 ÷ 4 = 30 + 0·75 = 30·75

End of unit check

➜ pages 33–34

My journal

3: 3 × 0·8 = 2·4 ÷ 20 = 0·12
6: 6 × 0·8 = 4·8 ÷ 20 = 0·24
20: 20 × 0·8 = 1·6 ÷ 20 = 0·8
100: 100 × 0·8 = 80 ÷ 20 = 4

The output is always multiplied by $\frac{0{\cdot}8}{20} = \frac{8}{200} = \frac{1}{25}$ which is the same as dividing by 25; for example:

3 ÷ 25 = $\frac{3}{25}$ = 0·12

Power play

Answers will vary.