7

Number and algebra

Decimals

Since the introduction of the metric system, decimals have become more commonly-used than fractions to describe parts of a whole.

Metric units follow a decimal system, meaning that they are related by powers of ten, for example: 1 km = 1000 m, 1 m = 100 cm, 1 cm = 10 mm. However, before the metric system was adopted in Australia in 1974, we used the imperial system of measurement that was not decimal-based: 1 mile = 1760 yards, 1 yard = 3 feet, 1 foot = 12 inches. In those days, measurement calculations were more difficult.

Chapter outline

	Proficiency strands			
7-01 Ordering decimals	U	F		
7-02 Decimals and fractions	U	F		
7-03 Adding and subtracting decimals	U	F	PS	
7-04 Multiplying and dividing decimals by powers of 10	U	F		
7-05 Multiplying decimals by estimating	U	F		
7-06 Multiplying decimals	U	F	PS	R
7-07 Dividing decimals by whole numbers	U	F	PS	R
7-08 Dividing decimals	U	F	PS	R
7-09 Terminating and recurring decimals	U	F		R
7-10 Rounding decimals	U	F	PS	
7-11 Decimal problems		F	PS	

Wordbank

ascending Increasing from smallest to largest

decimal places The places after the decimal point in a number

recurring decimal A decimal that has one or more digits that repeat endlessly

round To write a number to a given number of places

tenth The fraction $\frac{1}{10}$ or the decimal 0.1, the first decimal place

terminating decimal A decimal that is not recurring, but comes to an end

In this chapter you will:

- compare and order decimals
- connect fractions and decimals and carry out simple conversions
- add and subtract decimals, with and without digital technologies, and use estimation and rounding to check the reasonableness of answers
- multiply and divide decimals by powers of 10
- multiply and divide decimals using efficient written strategies and digital technologies
- round decimals to a specified number of decimal places
- investigate terminating and recurring decimals

SkillCheck

1 Copy this place value table so that it has 8 blank rows.

hundreds	tens	units	•	tenths	hundredths	thousandths

Write each decimal in the table, with the digits in their correct columns.
a 14.82   **b** 6.014   **c** 931.02   **d** 70.8
e 0.375   **f** 0.19   **g** 8.592   **h** 715.3

2 Write the value of the digit 4 in each decimal.
a 431.70   **b** 31.047   **c** 761.04
d 114.37   **e** 3.734   **f** 907.431

3 Simplify each fraction.
a $\dfrac{18}{100}$ **b** $\dfrac{4}{10}$ **c** $\dfrac{350}{1000}$ **d** $\dfrac{24}{100}$

4 List each set of numbers in ascending order.
a 21, 32, 34, 30, 20   **b** 213, 216, 234, 206, 230

5 Evaluate each expression.
a 32 × 10   **b** 578 × 100   **c** 325 × 1000
d 400 × 10   **e** 400 ÷ 10   **f** 1200 ÷ 100
g 1 000 000 ÷ 1000   **h** 81 000 ÷ 100   **i** 640 ÷ 10

6 List each set of numbers in descending order.
a 44, 39, 42, 45, 38, 40   **b** 505, 556, 513, 520, 549, 522

7 Round:
a 27 to the nearest ten   **b** 752 to the nearest hundred
c 9079 to the nearest thousand   **d** 16 837 to the nearest thousand

8 Estimate the value of each expression.
  a $140 + 32 + 381$ **b** $432 + 45 + 2341 + 7$ **c** $746 - 29$
  d $596 - 338$ **e** $1138 - 374$ **f** 58×3
  g 126×25 **h** $5920 \div 8$ **i** $2233 \div 7$

9 Evaluate each expression in question **8** without using a calculator.

7-01 Ordering decimals

A **decimal** is a special type of fraction where the denominator is a **power of ten** such as 10, 100 or 1000. This shape has been divided into 10 equal parts, of which 9 have been shaded.
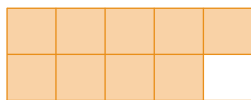
- As a fraction, $\frac{9}{10}$ or 'nine-tenths' of the shape is shaded.

- As a decimal, 0.9 or 'zero-point-nine' of the shape is shaded.
  You are familiar with numbers that have decimal points, for example:
  – money $532.81
  – measurements 6.2 km.

The position of a digit in a number shows its size. This is called the **place value**.
In a decimal, the digits after the decimal point indicate a part of a whole. For example, the meaning of the decimal 532.81 is shown on the place value table below:

hundreds	tens	units	tenths	hundredths
100	10	1	$\frac{1}{10}$	$\frac{1}{100}$
5	3	2	8	1

decimal point

532.81 is $5 \times 100 + 3 \times 10 + 2 \times 1 + 8 \times \frac{1}{10} + 1 \times \frac{1}{100}$.

Summary

The number of digits after the decimal point tells us the number of **decimal places** in a decimal.

Worksheet
Decimals wall
MAT07NAWK10052

Worksheet
Dewey decimals
MAT07NAWK10053

Skillsheet
Decimals
MAT07NASS10025

TLF learning object
Swamp survival: thousandths challenge (L7906)

TLF learning object
Design a farm (L124)

Worksheet
Decimals 1
MAT07NAWK00035

Worksheet
Decimals 10
MAT07NAWK00039

Example 1

How many decimal places are there in:

a 3.6567?   **b** 15.801?

Solution

a 3.<u>6567</u> has 4 decimal places.
     1234
b 15.<u>801</u> has 3 decimal places.
      123

Example 2

Arrange these decimals in ascending order: 67.41, 67.14, 6.714, 67.04.

Solution

To compare decimals more easily, place them in a column with the decimal points in a vertical column and make them all have the same number of decimal places by inserting 0s at the end.

For example, 67.41 becomes 67.410.
67.410
67.140
 6.714
67.040
All numbers now have three decimal places.

From smallest to largest: 6.714, 67.040, 67.140, 67.410.

In ascending order: **6.714, 67.04, 67.14, 67.41**

Example 3

Arrange these numbers in descending order: 0.5, 0.08, 1.7, 0.85.

Solution

Make them all have the same number of decimal places by inserting 0s at the end.

0.5 becomes 0.50 and 1.7 becomes 1.70.
0.50
0.08
1.70
0.85
All numbers now have two decimal places.

From largest to smallest: 1.70, 0.85, 0.50, 0.08.

In descending order: **1.7, 0.85, 0.5, 0.08**

Exercise 7-01 Ordering decimals

1 How many decimal places does each number have?

See **Example 1**

   a 1.65   **b** 3.881   **c** 15.3062

   d 0.005   **e** 7.045 73   **f** 814.3

   g 9.597 684   **h** 203.602 39   **i** 0.0424 706

2 Which of these is the smallest decimal? Select the correct answer **A**, **B**, **C** or **D**.

See **Example 2**

   A 1.07   **B** 1.7   **C** 1.077   **D** 1.77

3 Arrange each set of numbers in ascending order.

   a 43.89, 56.324, 9.998, 80.879, 400, 23.89, 56.314

   b 0.568, 0.684, 0.099, 1.002, 0.586, 5.608, 0.0586

   c 1.23, 0.891, 1.814, 0.222, 7.007, 0.89

   d 0.5, 0.05, 0.005

   e 3.441, 3.404, 3.4, 3.44, 3.004, 3.044

   f 0.2, 0.202, 0.22, 0.022

4 Arrange each set of numbers in descending order.
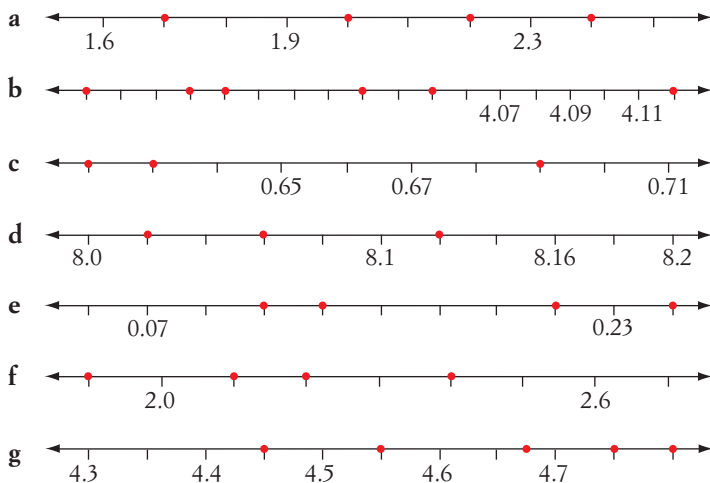
See **Example 3**

   a 570.25, 125.63, 0.9899, 4000.99, 1256.3, 400.099

   b 5.37, 6.539, 5.639, 5.367, 3.659, 3.66, 5.369

   c 1.6, 1.61, 1.599, 1.601, 1.509

   d 6, 0.06, 0.6, 6.6

   e 0.7, 0.07, 0.707, 0.77, 0.007, 7.07

   f 0.4004, 0.044, 0.404, 0.44

5 Insert < or > to make each statement true.

   a 0.2 _____ 0.25   **b** 0.731 _____ 0.73

   c 0.035 _____ 0.305   **d** 0.007 _____ 0.070

   d 1.59 _____ 1.059   **f** 0.099 _____ 0.99

   g 44.44 _____ 4.444   **h** 0.7932 _____ 0.7239

6 Copy each number line and write the values of the points marked with dots.

7 Write a decimal that is:

   a less than 1.3   **b** greater than 2.07

   c between 8.25 and 8.5   **d** 6.401 and 6.41

8 Find a path from START to TOP. You can make your move from START in any direction, but then you can only move to a larger decimal. Try to find the shortest path, then try to find the longest path.
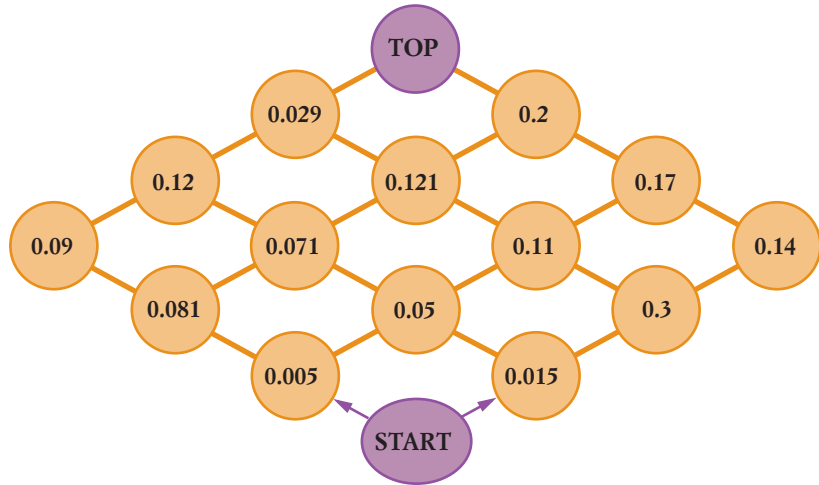
Investigation: Comparing heights

1 Use the clues below to find each girl's name and height.

- Mandy is taller than Sarah.
- Sarah is shorter than Yin.
- Kelly is taller than Sarah but shorter than Mandy.
- Mandy is not the tallest.

The heights of the girls are 168.5 cm, 166.3 cm, 164.2 cm and 160.7 cm.

    A   **B**   **C**   **D**

2 Use the clues below to find each boy's name and height.
   • Steve is 164.7 cm tall.
   • Mike is 14.7 cm taller than Milof.
   • Steve is 3.9 cm shorter than Milof.
   • Ganesh is 1.6 cm taller than Mike.

A   B   C   D

3 Use the clues below to find each student's name and height.
   • Yoko is 15.1 cm taller than Peter.
   • Jade is 13.7 cm shorter than Yoko.
   • Karl is 20.6 cm taller than Jade.
   • Yoko is 6.9 cm shorter than Karl.
   • Peter is 163 cm tall.

A   B   C   D

4 Create your own problem using four students from your class. Estimate their heights and
   height differences. Write a set of clues. (Don't forget to change their names!)

7-02 Decimals and fractions

Example 4

Convert each decimal to a simplified fraction.

a 0.09   **b** 0.274   **c** 1.45

Solution

a $0.09 = \dfrac{9}{100}$ 2 decimal places means hundredths $\left(\dfrac{}{100}\right)$

b $0.274 = \dfrac{274}{1000}$ 3 decimal places means thousandths $\left(\dfrac{}{1000}\right)$

     $= \dfrac{137}{500}$ Simplify the fraction

c $1.45 = 1 + \dfrac{45}{100}$ 2 decimal places means hundredths $\left(\dfrac{}{100}\right)$

     $= 1\frac{9}{20}$ Simplify the fraction

Note: The number of decimal places in the decimal gives the number of zeros in the denominator of the fraction.

Summary

- tenths have one decimal place ($\frac{1}{10}$ has 1 zero)
- hundredths have two decimal places ($\frac{1}{100}$ has 2 zeros)
- thousandths have three decimal places ($\frac{1}{1000}$ has 3 zeros)
- ten thousandths have four decimal places ($\frac{1}{10\,000}$ has 4 zeros)

Example 5

Convert each fraction to a decimal.

a $\dfrac{22}{100}$ **b** $3\frac{7}{10}$ **c** five thousandths

Solution

a $\dfrac{22}{100} = 0.22$ 2 zeros $\longrightarrow$ 2 decimal places

b $3\frac{7}{10} = 3.7$ 1 zero $\longrightarrow$ 1 decimal place
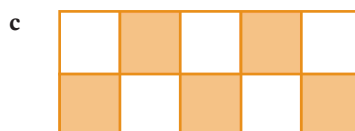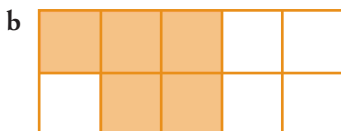
c five thousandths $= \dfrac{5}{1000} = 0.005$ 3 zeros $\longrightarrow$ 3 decimal places

Exercise 7-02 Decimals and fractions

1 What part of each shape has been shaded? Write the answer as:

i a fraction   **ii** a decimal

a

b   **c**

d

2 Convert each decimal to a simplified fraction.
See **Example 4**

a 0.7	**b** 0.4	**c** 0.39	**d** 0.572
e 0.003	**f** 0.05	**g** 0.11	**h** 0.328
i 0.3	**j** 0.999	**k** 0.013	**l** 0.0004
m 0.0471	**n** 0.321	**o** 0.5005	**p** 0.91
q 0.082	**r** 1.6	**s** 27.25	**t** 2.007

3 Which decimal is equal to $\dfrac{23}{1000}$? Select the correct answer **A**, **B**, **C** or **D**.
See **Example 5**

A 0.23   **B** 0.023   **C** 0.0023   **D** 0.000 23

4 Convert each fraction to a decimal.

a $\dfrac{9}{10}$	**b** $\dfrac{15}{100}$	**c** $\dfrac{79}{100}$	**d** $\dfrac{60}{100}$
e four-tenths	**f** $\dfrac{23}{100}$	**g** $\dfrac{6}{10}$	**h** $\dfrac{411}{1000}$
i $\dfrac{704}{1000}$	**j** eighty-seven hundredths		**k** $\dfrac{7}{100}$
l $\dfrac{14}{100}$	**m** $\dfrac{8}{10}$	**n** $\dfrac{235}{1000}$	**o** $\dfrac{247}{1000}$
p $\dfrac{17}{100}$	**q** $\dfrac{368}{1000}$	**r** $\dfrac{9345}{10\,000}$	**s** $\dfrac{493}{1000}$
t $1\dfrac{67}{100}$	**u** $4\dfrac{47}{100}$	**v** $23\dfrac{9}{10}$	**w** $6\dfrac{8}{10}$
x twenty-three thousandths		**y** forty-five hundredths	

7-03 Adding and subtracting decimals

Summary

When adding or subtracting decimals:

- keep decimal points below one another
- check your answer by estimating

Example 6

Find the sum of 10.92, 0.89, 32 and 0.6.

Solution

$$
\begin{array}{r}
10.92 \\
0.89 \\
32.00 \\
+0.60 \\
\hline
44.41 \\
\end{array}
$$

Fill in any spaces with zeros.

Remember that 32 is the same as 32.00.

Estimate: $10.92 + 0.89 + 32 + 0.6 \approx 11 + 1 + 32 + 1 = 45$

Example 7

Evaluate each difference.

a $76.029 - 8.914$ **b** $4.31 - 2.183$

Solution

a
$$
\begin{array}{r}
76.029 \\
-8.914 \\
\hline
67.115 \\
\end{array}
$$
Estimate: $76.029 - 8.914 \approx 76 - 9 = 67$

b
$$
\begin{array}{r}
4.310 \\
-2.183 \\
\hline
2.127 \\
\end{array}
$$
Fill in any spaces with zeros.

Estimate: $4.31 - 2.183 \approx 4 - 2 = 2$

Exercise 7-03   Adding and subtracting decimals

See **Example 6**

1 Copy and complete each sum.

a
$$
\begin{array}{r}
5.3 \\
6.2 \\
+0.5 \\
\hline
\end{array}
$$
b
$$
\begin{array}{r}
4.723 \\
0.01 \\
+12.2 \\
\hline
\end{array}
$$
c
$$
\begin{array}{r}
43.5 \\
116.29 \\
7.3 \\
+\;\;0.227 \\
\hline
\end{array}
$$
d
$$
\begin{array}{r}
0.0076 \\
1.23 \\
+0.09 \\
\hline
\end{array}
$$

See **Example 7**

2 Copy and complete each difference.

a
$$
\begin{array}{r}
57.703 \\
-16.21 \\
\hline
\end{array}
$$
b
$$
\begin{array}{r}
6.1 \\
-0.2 \\
\hline
\end{array}
$$
c
$$
\begin{array}{r}
23.57 \\
-16.88 \\
\hline
\end{array}
$$
d
$$
\begin{array}{r}
22.6 \\
-13.54 \\
\hline
\end{array}
$$

3 Evaluate $0.61 + 12.345$. Select the correct answer **A**, **B**, **C** or **D**.

  A 73.345   **B** 18.445   **C** 12.955   **D** 12.406

4 An electrician needed these lengths of cable to complete a wiring job: 12.3 m, 4.8 m, 18.7 m, 7.98 m, 13.65 m and 23.6 m.

  a How many metres of cable did the electrician use?

  b If the full spool of cable was 100 m long, how many metres of cable were left on the spool after the electrician completed the job?

5 To keep fit, Angela runs each day. Last week she ran 3.8 km, 4.1 km, 2.3 km, 2.6 km, 3 km, 1 km and 1.8 km. How far did she run last week?

6 A truck carrying sand had a total mass of 13 248 kg. If the truck alone had a mass of 5210.8 kg, what is the mass of the sand?

7 Five runners in the school's 100 m race recorded the following times: 13.5 s, 13.81 s, 12.7 s, 14.62 s, 12.45 s.

  a Place these times in order, from fastest to slowest.

  b What is the time difference between the fastest and slowest runners?

  c If the runner in second place had run 0.3 seconds faster, would she have won the race? Explain your answer.

Worked solutions

Exercise 7-03

MAT07NAWS10040

8 Dion's expenses for one week are shown in the table below.

Food	$128.80
Clothing	$ 88.45
Car	$ 58.35
Rent	$185.00
Entertainment	$ 78.95
Savings	$ 66.00

  a How much did he spend?

  b How much did he have left out of his weekly pay of $620.80?

9 A new block of wood is 11.27 cm thick. If it has 0.34 cm shaved off one side and 0.55 cm shaved off the other side, how thick is the block of wood? Select the correct answer **A**, **B**, **C** or **D**.

  A 10.38 cm   **B** 11.06 cm   **C** 11.16 cm   **D** 11.48 cm

10 Wendy was making teddy bears. She needed these amounts of material for five bears: 2.6 m, 0.8 m, 1.2 m, 0.75 m and 0.88 m. How much material did she need altogether?

11 Copy and complete each equation with the correct decimals.

a $4.8 +$ _____ $= 7.34$ **b** _____ $- 6.6 = 2.14$ **c** $8.75 -$ _____ $= 3.3$

d _____ $+$ _____ $= 10.719$ **e** _____ $-$ _____ $= 3.016$

Investigation: Multiplying and dividing decimals by powers of 10

When a number is multiplied by 10, 100, 1000 or other powers of 10, every digit in the number increases in place value by moving to the left.

When a number is divided by a power of 10, every digit decreases in place value by moving to the right.

1 Copy the place value table below, then use a calculator to evaluate each expression involving multiplying or dividing by a power of 10. Notice the pattern in your answers.

Calculation	Ten thousands	Thousands	Hundreds	Tens	Units	tenths	hundredths	thousandths	ten thousandths
36.7				3	6	7			
36.7 × 10									
36.7 × 100									
36.7 × 1000									
2.35					2	3	5		
2.35 × 10									
2.35 × 100									
2.35 × 1000									
36.7 ÷ 10									
36.7 ÷ 100									
36.7 ÷ 1000									
2.35 ÷ 10									
2.35 ÷ 100									

2 Copy and complete each statement.
  a To multiply by 10, move the decimal point _____ place to the _____.
  b To multiply by 100, move the decimal point _____ places to the _____.
  c To multiply by 1000, move the decimal point _____ places to the _____.
  d To divide by 10, move the decimal point _____ place to the _____.
  e To divide by 100, move the decimal point _____ places to the _____.
  f To divide by 1000, move the decimal point _____ places to the _____.

7-04 Multiplying and dividing decimals by powers of 10

Summary

To multiply a decimal by:	Move the decimal point:
10	1 place to the right
100	2 places to the right
1000	3 places to the right
To divide a decimal by:	Move the decimal point:
10	1 place to the left
100	2 places to the left
1000	3 places to the left

Note that the number of 0s in the power of 10 is how many places the decimal point is moved.

Example 8

Evaluate each expression.

a 13.69×100 **b** 2.54×1000 **c** $13.69 \div 10$ **d** $2.54 \div 100$

Solution

a $13.69 \times 100 = 13.\overset{\frown}{6}\overset{\frown}{9}$ Move the decimal point 2 places to the right

              $= 1369$ Moving right makes the decimal bigger

b $2.54 \times 1000 = 2.\overset{\frown}{5}\overset{\frown}{4}\overset{\frown}{0}$ Move the decimal point 3 places to the right:
add a 0 to the end to allow this.

              $= 2540$

c $13.69 \div 10 = 1\overset{\frown}{\,}3.69$ Move the decimal point 1 place to the left

              $= 1.369$ Moving left makes the decimal smaller

d $2.54 \div 100 = 0\,\overset{\frown}{0}\,2.54$ Move the decimal point 2 places to the left:
add two 0s to the start to allow this

              $= 0.0254$

Exercise 7-04 | Multiplying and dividing decimals by powers of 10

See **Example 8**

1 Evaluate each product.

a 2.49×100	**b** 0.81×10	**c** 37.42×1000
d 3.416×100	**e** 7.25×100	**f** 2.196×1000
g 6.043×100	**h** 0.032×100	**i** 0.065×10
j 45.213×100	**k** 10.64×1000	**l** 63.04×100
m 5.98×1000	**n** 847.612×100	**o** 0.0592×10
p 36.2×100	**q** 219.4×1000	**r** 40.075×10

2 Evaluate $18.5 \div 1000$. Select the correct answer **A**, **B**, **C** or **D**.

A 0.00 185   **B** 1.85   **C** 0.0185   **D** 0.185

3 Evaluate each quotient.

a $46.3 \div 10$	**b** $507 \div 100$	**c** $1203 \div 1000$
d $36.4 \div 100$	**e** $381.5 \div 1000$	**f** $55.02 \div 10$
g $11.46 \div 1000$	**h** $694.3 \div 1000$	**i** $4.28 \div 1000$
j $67 \div 100$	**k** $21.31 \div 1000$	**l** $5.72 \div 10$
m $81.348 \div 1000$	**n** $50.2 \div 100$	**o** $4.91 \div 100$
p $0.4 \div 1000$	**q** $1.73 \div 100$	**r** $125.3 \div 10\ 000$

4 Copy and complete each equation.

a $14.219 \times \underline{\hspace{1cm}} = 14\ 219$ **b** $892.5 \times \underline{\hspace{1cm}} = 8.925$

c $742 \div \underline{\hspace{1cm}} = 7.42$ **d** $205.7 \div \underline{\hspace{1cm}} = 20.57$

e $\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = 560.1$ **f** $\underline{\hspace{1cm}} \div \underline{\hspace{1cm}} = 0.382$
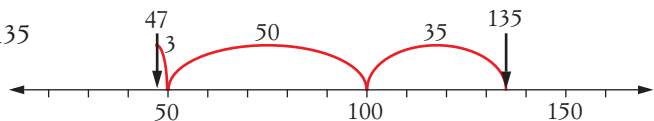
Mental skills 7 | Maths without calculators

Calculating differences and making change

In every subtraction problem, for example $135 - 47$, think of finding the 'gap' between the two numbers. That is, find the number that must be added to 47 to get 135.

1 Study each example.

a $135 - 47$
Think: $47 + \underline{\hspace{1cm}} = 135$
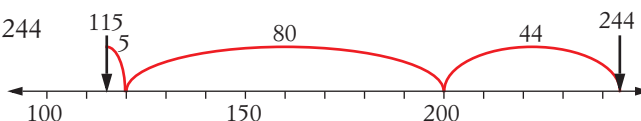
Count: '47, 50, 100, 135'
Add: $3 + 50 + 35 = 88$
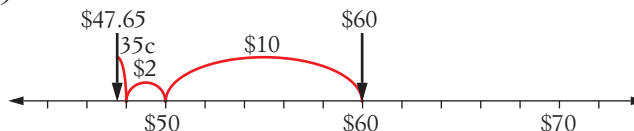Answer: $135 - 47 = 88$

b 244 − 115

Think: 115 + _____ = 244

Count: '115, 120, 200, 244'

Add: 5 + 80 + 44 = 129

Answer: 244 − 115 = 129

c $60 − $47.65
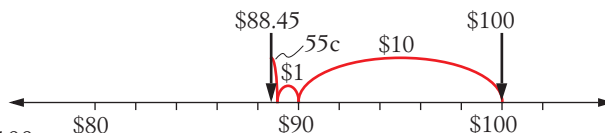

Count: '$47.65, $48, $50, $60'

Add: $0.35 + $2 + $10 = $12.35

Answer: $60 − $47.65 = $12.35

d $100 − $88.45

Count: '$88.45, $89, $90, $100

Add: $0.55 + $1 + $10 = $11.55

Answer: $100 − $88.45 = $11.55

2 Now evaluate each difference.

a 176 − 88	**b** 221 − 54	**c** 670 − 356	**d** 425 − 340
e 518 − 389	**f** 199 − 78	**g** $70 − $58.40	**h** $80 − $73.25
i $45 − $40.30	**j** $100 − $69.95	**k** $30 − $22.90	**l** $50 − $17.10

7-05 Multiplying decimals by estimating

If you know the answer to a whole number multiplication, then you can use estimation to find the answer to a related decimal multiplication by correctly positioning the decimal point.

Example 9

a Given that $17 \times 12 = 204$, find:

i 1.7×12 **ii** 1.7×1.2

b Given that $23 \times 47 = 1081$, find:

i 2.3×4.7 **ii** 230×4.7 **iii** 23×0.47

Solution

a $17 \times 12 = 204$

	Multiplication	Estimate	Answer	
i	1.7×12	$\approx 2 \times 10 = 20$	20.4	⟸ use the digits 204 to make a number near 20
ii	1.7×1.2	$\approx 2 \times 1 = 2$	2.04	⟸ use the digits 204 to make a number near 2

b $23 \times 47 = 1081$

	Multiplication	Estimate	Answer	
i	2.3×4.7	$\approx 2 \times 5 = 10$	10.81	$\Leftarrow$ use the digits 1081 to make a number near 10
ii	230×4.7	$\approx 200 \times 5 = 1000$	1081	$\Leftarrow$ use the digits 1081 to make a number near 1000
iii	23×0.47	$\approx 20 \times 0.5 = 10$	10.81	$\Leftarrow$ use the digits 1081 to make a number near 10

Exercise 7-05 Multiplying decimals by estimating

See Example 9

1 Use the result of the whole number multiplication to copy and complete each table.

a $69 \times 18 = 1242$

Multiplication	Estimate	Answer
0.69×18		
6.9×180		
6.9×1.8		
690×1.8		

b $104 \times 42 = 4368$

Multiplication	Estimate	Answer
10.4×42		
1.04×4.2		
104×4.2		
0.104×4.2		

c $38 \times 92 = 3496$

Multiplication	Estimate	Answer
3.8×92		
0.38×92		
38×0.92		
380×0.92		

2 Given that $63 \times 34 = 2142$, use estimates to find:

a 6.3×3.4 **b** 0.63×3.4 **c** 0.63×3400
d 630×3.4 **e** 6.3×34 **f** 63×0.34

3 Given that $1.7 \times 1.2 = 2.04$, use estimates to find:

a 1.7×12 **b** 17×0.12 **c** 0.17×1.2
d 0.17×12 **e** 17×12 **f** 17×1.2

4 Given that $7.2 \times 3.4 = 24.48$, use estimates to find:

a 7.2×34 **b** 72×3.4 **c** 0.72×3.4
d 72×34 **e** 7.2×0.34 **f** 0.72×34

5 Given that $1.26 \times 6 = 7.56$, use estimates to find:

    a 12.6×6 **b** 126×6 **c** 1.26×0.6

    d 0.126×6 **e** 0.126×0.6 **f** 126×0.6

6 Use the fact that $0.3 \times 0.24 = 0.072$ to find:

    a 3×0.24 **b** 0.3×2.4 **c** 0.3×24

    d 3×24 **e** 3×2.4 **f** 0.03×24

7 Write an estimate for each product.

    a 2.7×3.1 **b** 6.2×0.44 **c** 8.6×19

Investigation: Decimal places in multiplication answers

1 What happens when you multiply by a number less than one?
    a Is the answer to 12×0.8 more or less than 12? Why?
    b Estimate the answer to 12×0.8.
    c How many decimal places do 12 and 0.8 each have?
    d Use a calculator to evaluate 12×0.8. How many decimal places does the answer have?

2 a Is the answer to 0.7×0.3 more or less than 0.7? Why?
    b Estimate the answer to 0.7×0.3.
    c How many decimal places do 0.7 and 0.3 each have?
    d Use a calculator to evaluate 0.7×0.3. How many decimal places does the answer have?

3 a Is the answer to 2.5×4.1 more or less than 2.5? Why?
    b Estimate the answer to 2.5×4.1.
    c How many decimal places do 2.5 and 4.1 each have?
    d Use a calculator to evaluate 2.5×4.1. How many decimal places does the answer have?

4 What is the relationship between the number of decimal places in the question and the number of decimal places in the answer?

5 a If $82 \times 6 = 492$, what do you think is the answer to 82×0.6? Where does the decimal point go?
    b If $4 \times 17 = 68$, what do you think is the answer to 0.4×1.7?
    c If $367 \times 51 = 18\ 717$, what do you think is the answer to 3.67×5.1?
    d What is the answer to 0.5×0.9?

7-06 Multiplying decimals

Summary

When **multiplying decimals**, the number of decimal places in the answer equals the total number of decimal places in the question.

Example 10

Evaluate each product.

a 3.06×4.8 **b** 0.6×4.1

Solution

a Complete the multiplication without decimal points.

$$
\begin{array}{r}
306 \\
\times\,48 \\
\hline
2448 \\
12240 \\
\hline
14688
\end{array}
$$

Method 1

Decide where to place the decimal point by counting decimal places.
3.06 has 2 decimal places.
4.8 has 1 decimal place.
So we need $2 + 1 = 3$ decimal places.

Insert the decimal point so that the answer has 3 decimal places.
$3.06 \times 4.8 = \mathbf{14.688}$

Method 2

Estimate the answer.
$3.06 \times 4.8 \approx 3 \times 5 = 15$

Insert the decimal point so that the answer is near 15.
$3.06 \times 4.8 = \mathbf{14.688}$

b Complete the multiplication without decimal points.

$$
\begin{array}{r}
41 \\
\times\,6 \\
\hline
246
\end{array}
$$

Method 1

Decide where to place the decimal point by counting decimal places.
0.6 has 1 decimal place.
4.1 has 1 decimal place.
So the answer has 2 decimal places.

Insert the decimal point so that the answer has 2 decimal places.
$0.6 \times 4.1 = \mathbf{2.46}$

Method 2

Estimate the answer.
$0.6 \times 4.1 \approx 1 \times 4 = 4$

Insert the decimal point so that the answer is near 4.
$0.6 \times 4.1 =$ **2.46**

Exercise 7-06 — Multiplying decimals

1 How many decimal places will each product have?

a 0.25×11	**b** 10.2×4	**c** 0.5×10
d 7×2.193	**e** 0.9×0.75	**f** 8.06×4.1
g 0.11×1.01	**h** 6.3×0.04	**i** 2.95×5.3
j 0.237×1.2	**k** 0.023×0.042	**l** 321.2×8.1

2 Evaluate each product.

See **Example 10**

a 3.05×4	**b** 1.02×7	**c** 2.001×9	**d** 17.1×2
e 10×2.25	**f** 3×4.20	**g** 6.95×5	**h** 1.004×8
i 0.18×5	**j** 0.4×12	**k** 6×0.002	**l** 3×4.2
m 0.4×0.8	**n** 3.9×0.5	**o** 0.8×0.6	**p** 0.3×0.24

3 Estimate each product, then evaluate the product.

a 47.9×0.3	**b** 6.43×7.2	**c** 83.4×6.3

4 Dress material costs $31.24 per metre. How much does 5.2 metres of material cost?

5 Sean earns $18.45 per hour working at a cinema. How much will he earn for working a 39-hour week?

6 A flower bed is 2.6 m long by 0.8 m wide. Calculate its area.

7 Calculate the total of this grocery shopping bill. Select **A**, **B**, **C** or **D**.

- 3 kg of butter at $2.50 per kilogram
- 500 g of cheese at $12.88 per kilogram
- 2 kg of meat at $6.90 per kilogram
- 2 dozen eggs at $4.26 per dozen

A $30.47 **B** $36.26 **C** $64.70 **D** $129.98

7-07 Dividing decimals by whole numbers

Summary

When dividing a decimal by a whole number:

- rewrite the question in 'short division' form
- make the decimal point in the answer line up with the decimal point in the question
- add zeros to the end of the decimal being divided, if needed

Example 11

Evaluate each quotient.

a $10 \div 4$ **b** $0.018 \div 6$ **c** $2.66 \div 8$

Solution

a
$$4 \overline{)\, 10.^20} \;\; \begin{array}{c} 2.\,5 \end{array}$$

Write 10 as 10.0 so that you can complete the division

$10 \div 4 = 2.5$

b
$$6 \overline{)\, 0.01^18} \;\; \begin{array}{c} 0.0\,0\,3 \end{array}$$

$0.018 \div 6 = 0.003$

c
$$8 \overline{)\, 2.6^26^20^40} \;\; \begin{array}{c} 0.3\,3\,2\,5 \end{array}$$

Write two 0s after 2.66 so that you can complete the division

$2.66 \div 8 = 0.3325$

Exercise 7-07 Dividing decimals by whole numbers

1 Evaluate each quotient.

a $4.8 \div 2$	**b** $18.6 \div 3$	**c** $20.8 \div 5$	**d** $32.8 \div 8$
e $29.3 \div 2$	**f** $8.79 \div 4$	**g** $0.056 \div 7$	**h** $10.71 \div 4$
i $195.6 \div 8$	**j** $7.35 \div 2$	**k** $4.15 \div 8$	**l** $0.318 \div 3$
m $12 \div 5$	**n** $13.56 \div 4$	**o** $23 \div 8$	**p** $256.84 \div 4$
q $107.1 \div 9$	**r** $82.5 \div 6$	**s** $0.732 \div 6$	**t** $2075.6 \div 8$

2 Yesterday, Anh earned $137.12 for working 8 hours at the chemist. How much was he paid per hour?

3 Trent took 5 hours to travel 163.5 km on his bike. What was his average speed in km/h? Select **A**, **B**, **C** or **D**.

A 30.6 **B** 32.6 **C** 8.175 **D** 32.7

4 At the restaurant, the bill for 6 friends totalled $168.96. How much should each friend pay if the bill is to be split evenly?

5 Nadine ran 100 metres in the following times (in seconds): 11.4, 12.1, 11.5, 11.3, 11.6, 11.7.
  a Calculate the sum of Nadine's six times.
  b Calculate Nadine's average time.

6 Copy and complete each equation with the correct decimals.

  a _____ $\div\, 8 = 3.1$ **b** _____ $\div\, 5 = 2.46$ **c** _____ $\div$ _____ $= 6$

7-08 Dividing decimals

Look at this pattern:

$18 \div 3 = 6$
$180 \div 30 = 6$
$1800 \div 300 = 6$

This is like writing them as equivalent fractions: $\dfrac{18}{3} = \dfrac{180}{30} = \dfrac{1800}{300}$.

When dividing numbers, if we multiply both numbers by the **same number** first, the answer stays the same. We can use this property to help us divide decimals. For example:

$9.8 \div 0.08 = 980 \div 8$ (multiplying both numbers by 100)
$\qquad\qquad\quad = 122.5$

$980 \div 8$ is easier to evaluate than $9.8 \div 0.08$ because 8 is a whole number.

Summary

To divide a decimal by a decimal:

- make the second decimal a whole number by moving the decimal point the required number of places to the right
- move the point in the first decimal the same number of places to the right
- divide the new first number by the whole number

This works because we multiply both decimals by the same power of 10 before dividing.

Example 12

Evaluate each of the following:

a $0.4 \div 0.2$ **b** $1.75 \div 0.5$ **c** $122.4 \div 0.03$

Solution

a $0.4 \div 0.2 = 0.4 \div 0.2$ Move both decimal points one place to the right so that 0.2 becomes a whole number
$\qquad\qquad\quad = 4 \div 2$
$\qquad\qquad\quad = 2$

multiplying both decimals by 10

b $1.75 \div 0.5 = 1.75 \div 0.5$ Move both decimal points one place to the right
$\qquad\qquad\quad = 17.5 \div 5$
$\qquad\qquad\quad = 3.5$

c $122.4 \div 0.03 = 122.40 \div 0.03$ Move both decimal points two places to the right so that 0.03 becomes a whole number
$\qquad\qquad\qquad = 12\,240 \div 3$
$\qquad\qquad\qquad = 4080$

multiplying both decimals by 100

Exercise 7-08 Dividing decimals

1 **a** $18 \div 0.5$ means 'how many times does 0.5 go into 18?'. Is the answer more or less than 18?
   Why?
   b Estimate the answer to $18 \div 0.5$.
   c Evaluate $18 \div 0.5$.
   d Show that $18 \div \frac{1}{2}$ gives the same answer.

2 **a** $20.4 \div 0.3$ means 'how many times does 0.3 go into 20.4?'. Is the answer more or less than
   20.4?
   b Estimate the answer to $20.4 \div 0.3$.
   c Find the exact answer to $20.4 \div 0.3$.

3 What happens when you divide by a number less than 1? Is the answer more or less than the
   number? (Check your answers to questions **1** and **2**).

4 Which of the following is the answer to $13.59 \div 0.03$? Select **A**, **B**, **C** or **D**.
   A 45.3 **B** 453 **C** 4.53 **D** 4530

5 Rewrite each of the following divisions so that the second decimal is a whole number.
   a $508.8 \div 0.8$ **b** $17.92 \div 0.07$ **c** $333 \div 0.9$
   d $1.725 \div 0.05$ **e** $129.2 \div 0.4$ **f** $49.5 \div 0.06$
   g $168 \div 0.7$ **h** $14.823 \div 0.09$ **i** $0.66 \div 0.3$

6 Evaluate each of these, and check that your answers seem reasonable by estimating.
   a $3.48 \div 0.4$ **b** $7.32 \div 0.2$ **c** $2.94 \div 0.6$
   d $16.28 \div 0.08$ **e** $27 \div 0.9$ **f** $10.08 \div 0.8$
   g $10.4 \div 0.05$ **h** $5.6 \div 0.07$ **i** $1.71 \div 0.3$
   j $40.82 \div 0.02$ **k** $0.532 \div 0.5$ **l** $0.7812 \div 0.006$

7 A drink bottle holds 0.8 litres. How many drink bottles can be filled from a container that
   holds 12.8 litres?

8 A square wall tile has length 0.3 m. If a bathroom wall has length 5.2 m, how many whole tiles
   are needed for one row along the wall?

9 James can cycle 0.7 km in one minute.
   a How far will he travel in 20 minutes?
   b How long will it take him to travel 26.6 km?

10 Copy and complete each blank with the correct decimal.
   a $27.2 \div \underline{\hspace{1.5cm}} = 8$
   b $\underline{\hspace{1.5cm}} \div 5 = 2.46$
   c $\underline{\hspace{1.5cm}} \div \underline{\hspace{1.5cm}} = 6.2$

Investigation: Back-to-front problems

The cards for this set of questions have been printed without any decimal points. Insert the decimal points so that the numbers on the cards fit the clues.

1 The difference between these two numbers is 53.7.
The sum of the numbers is 58.5.

| 561 | 24 |

2 The difference between the numbers is 178.8. When you divide the greater number by the smaller number, the quotient is between 43 and 44.

| 183 | 42 |

3 The sum of the three numbers is 5.36.
The product of the numbers is 1.2096.

| 8 | 42 | 36 |

4 The sum of the three numbers is 4.61.
The product of the numbers is 0.9135.

| 15 | 29 | 21 |

5 The sum of the four numbers is 2.55.
The product of two of the numbers is 0.196. The product of the other two numbers is 0.217.

| 7 | 31 | 14 | 14 |
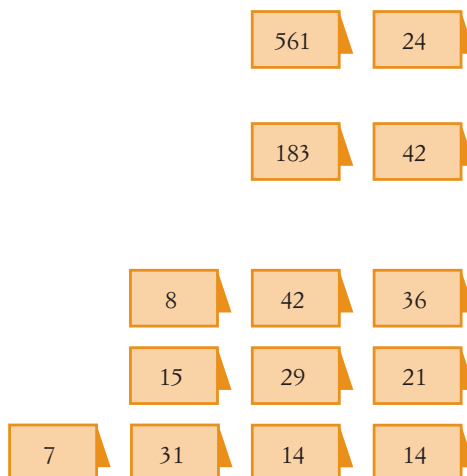
7-09 Terminating and recurring decimals

When fractions are converted to decimals, the decimals can be **terminating** or **recurring**. **Terminating decimals** have a definite number of decimal places, such as 0.625, while **recurring decimals** are decimals whose digits repeat endlessly, such as 0.272727 … 'Terminate' means 'to stop' while 'recurring' means 'repeating'.

Terminating decimals

Example 13

Convert each fraction into a decimal.
a $\frac{3}{5}$ **b** $\frac{5}{8}$

Solution

a $\frac{3}{5}$ means $3 \div 5$

$$5\overline{)3.0} = 0.6$$

b $\frac{5}{8}$ means $5 \div 8$

$$8\overline{)5.000} = 0.625$$

Remember to add zeros, if necessary, to complete the division.

$\frac{3}{5} = 0.6$ $\frac{5}{8} = 0.625$

Note also that $\frac{3}{5} = \frac{6}{10} = 0.6$.

YEAR 8   Recurring decimals

Example   14

Convert each fraction to a decimal.

a $\frac{1}{3}$ **b** $\frac{5}{6}$ **c** $\frac{2}{11}$

Solution

a $\frac{1}{3}$ means $1 \div 3$ $3 \overline{\smash{)}\, 1.000\ldots}^{\,0.333\ldots}$

   $\frac{1}{3} = 0.333\ldots = 0.\dot{3}$ or $0.\overline{3}$

b $\frac{5}{6}$ means $5 \div 6$ $6 \overline{\smash{)}\, 5.0000\ldots}^{\,0.833\ldots}$

   $\frac{5}{6} = 0.8333\ldots = 0.8\dot{3}$ or $0.8\overline{3}$

c $\frac{2}{11}$ means $2 \div 11$ $11 \overline{\smash{)}\, 2.00000\ldots}^{\,0.18181\ldots}$

   $\frac{2}{11} = 0.181\,818\ldots = 0.\dot{1}\dot{8}$ or $0.\overline{18}$

The answers are all **recurring decimals**, where one or more of the digits in the decimal repeat endlessly. To show this, we use dots or a line to mark the repeating section: for example, $0.259\,259\,259\ldots = 0.\dot{2}5\dot{9}$ or $0.\overline{259}$.

Exercise 7-09   Terminating and recurring decimals

See **Example 13**   **1**   Copy and complete this table. Use a calculator if you need to.

	Common fraction	Meaning as division	Decimal
a	$\frac{3}{5}$	$3 \div 5$	0.6
b	$\frac{1}{2}$	$1 \div 2$	
c	$\frac{1}{4}$		0.25
d	$\frac{4}{5}$		
e	$\frac{2}{5}$		
f		$3 \div 4$	0.75
g		$1 \div 5$	
h		$1 \div 8$	

2 Use your answers from question **1** to help you convert each fraction into a decimal.

a $\frac{2}{5}$ **b** $\frac{3}{8}$ **c** $\frac{3}{4}$ **d** $\frac{2}{2}$

e $\frac{2}{4}$ **f** $\frac{6}{8}$ **g** $\frac{3}{5}$ **h** $\frac{2}{8}$

i $\frac{5}{8}$ **j** $\frac{7}{8}$ **k** $\frac{4}{8}$ **l** $\frac{5}{5}$

3 Explain why some of the fractions in question **2** have the same decimal value.

4 Write each mixed numeral as a decimal.

a $4\frac{8}{10}$ **b** $23\frac{3}{4}$ **c** $12\frac{5}{8}$ **d** $6\frac{3}{5}$

e $57\frac{2}{5}$ **f** $19\frac{1}{8}$ **g** $110\frac{7}{8}$ **h** $80\frac{1}{4}$

> Worked solutions
>
> Exercise 7-09
>
> MAT07NAWS10045

5 Rewrite each recurring decimal using the dot notation.

a 0.41666666 … **b** 0.27272727… **c** 0.111111 … **d** 0.1027510275 …

6 Rewrite each recurring decimal showing the repeated pattern.

a $0.858\dot{3}$ **b** $0.04\dot{5}$ **c** $0.\dot{7}$ **d** $0.\dot{4}6153\dot{8}$

7 Convert each fraction to a recurring decimal.

See **Example 14**

a $\frac{1}{9}$ **b** $\frac{1}{6}$ **c** $\frac{5}{6}$ **d** $\frac{1}{7}$ **e** $\frac{2}{3}$

f $\frac{2}{7}$ **g** $\frac{2}{9}$ **h** $\frac{3}{7}$ **i** $\frac{4}{7}$ **j** $\frac{4}{9}$

k $\frac{4}{6}$ **l** $\frac{5}{9}$ **m** $\frac{6}{7}$ **n** $\frac{7}{9}$ **o** $\frac{8}{9}$

8 Copy and complete the table and notice the pattern.

Fraction	$\frac{1}{9}$	$\frac{2}{9}$	$\frac{3}{9}$	$\frac{4}{9}$	$\frac{5}{9}$	$\frac{6}{9}$	$\frac{7}{9}$	$\frac{8}{9}$
Decimal								

7-10 Rounding decimals

Sometimes, to approximate an answer with many decimal places, we round to fewer decimal places. We need to be able to round when working with money, measuring quantities or writing answers to division calculations.

Summary

To round a decimal, 'cut' it at the required decimal place and look at the digit in the next place:

- if the digit is less than 5 (that is 0, 1, 2, 3 or 4), **round down**
- if the digit is 5 or more (that is 5, 6, 7, 8 or 9), **round up**

Example 15

a Round 86.246 to:

   i one decimal place   **ii** two decimal places

b Write 0.087 1245 correct to:

   i one decimal place   **ii** the nearest thousandth

Solution

a i 86.2|46

cut   the next digit is 4 (less than 5), so round **down**

So 86.245 ≈ 86.2 (correct to one decimal place).

  ii 86.24|6

cut   the next digit is 6 (more than 5), so round **up** to 86.25

So 86.246 ≈ 86.25 (correct to two decimal places).

b i 0.0|87 1245

cut   the next digit is 8 (more than 5), so round **up** to 0.1

0.087 1245 ≈ 0.1

  ii 0.087|1245

cut   the next digit is 1 (less than 5), so round **down**

'the nearest thousandth' means 3 decimal places

0.087 1245 ≈ 0.087

Summary

Rounding to:

- the nearest tenth = one decimal place
- the nearest hundredth = two decimal places
- the nearest thousandth = three decimal places

Exercise 7-10 Rounding decimals

1 Write each decimal correct to one decimal place.

a 0.35	**b** 0.47	**c** 0.81	**d** 0.69
e 2.55	**f** 0.32	**g** 0.90	**h** 2.88

2 Round each decimal to two decimal places.

a 0.481	**b** 0.736	**c** 0.069	**d** 0.293
e 0.309	**f** 0.655	**g** 2.096	**h** 3.995

3 Write each decimal correct to two decimal places.

a 25.3759	**b** 341.6143	**c** 420.8971
d 734.6541	**e** 27.359 94	**f** 1314.210 47

4 Copy and complete this table. Use a calculator to help you.

	Question	Calculator display	Rounded to the nearest tenth	Rounded to the nearest hundredth
a	12.19 ÷ 3	4.0633333333	4.1	4.06
b	12.32 ÷ 6			
c	19.82 ÷ 9			
d	56.85 ÷ 11			
e	17.13 ÷ 4			
f	12.65 ÷ 12			
g	4.875 ÷ 21			
h	27.45 ÷ 8			
i	17 ÷ 12			
j	254.678 ÷ 32			

5 Round each number to four decimal places.

    a 10.33374   **b** 431.54327   **c** 1.444 95

    d 3217.654 061   **e** 4.67089   **f** 0.888 88

6 The answers to the following problems are whole numbers but, for particular reasons, some need to be rounded up and some need to be rounded down. Find each rounded answer, giving the reason why you rounded up or down.

    a A box of chocolates with 44 chocolates is shared among a family of 5 people. How many chocolates does each person receive?

    b A new bathroom requires 32 square metres of tiles. A box of tiles covers 0.8 square metres of area. How many boxes are needed to tile the bathroom?

    c A team of four golfers wins 27 new golf balls in a competition. How many does each person receive?

    d Some timber comes in 0.9 m lengths. How many lengths are needed to build a chicken coop needing 23 m of timber?

    e One dress requires 1.3 m of material. How many dresses can be made from a 5 m length of material?

7 Write a decimal that could be rounded to:

    a 2.718   **b** 0.8   **c** 25.6

8 Australia had 1c coins and 2c coins until 1990. After that, supermarket prices had to be rounded to the nearest 5 cents. Find out how prices are rounded this way.

Technology Rounding decimals

This activity will show you how to format a cell so that its value is rounded to a specific number of decimal places. Start a new spreadsheet.

1 Enter **748.61** into cell A1, **x** (for multiply) into cell A2 and **3.75** into cell A3.

2 Enter a formula into cell A4 for the product of A1 and A3 and **bold** your answer.

3 To round this answer to 1 decimal place, **right-click** on cell A4, choose **Format Cells**, **Number**, and 1 decimal place.

4 Enter **748.61** into cell B1, **/** (for divide) into cell B2 and **3.75** into cell B3.

5 Enter a formula into cell B4 for B1 divided by B3 and **bold** your answer.

6 To round this answer to 2 decimal places, **right-click** on cell B4, choose **Format Cells**, **Number**, and 2 decimal places.

7 Complete each calculation using your spreadsheet and creating appropriate formulas.

  a 284.796×32.4 (round to 2 decimal places)

  b $1217.9 \div 45.6$ (round to 3 decimal places)

  c $1.15 \div 1.5$ (to 2 decimal places)

  d $1604.12 \div 0.02 \times 4.578$

  e $(8756.32 - 9025.198 + 1023.5697) \div 1.444$ (to 4 decimal places)

  f $(12.3 + 6.59) \div (56.4 \times 0.04)$ (to 5 decimal places)

Just for the record The salami technique

When banks started using computers to keep track of customers' accounts, they left themselves open to a new type of crime: computer theft. One such crime employs the **salami technique**, where computer hackers steal a cent or a fraction of a cent from many bank accounts. They round down the decimal amount of an account balance (for example $234.6523 would become $234.65) and the stolen fraction of a cent ($0.0023) is deposited into the hacker's account, with no one noticing it missing. When this is done to thousands of bank customers over a number of years, a considerable amount of money can be accumulated. **Why do you think this type of crime is difficult to detect? Why do you think it is called the 'salami technique'?**

7-11 Decimal problems

Exercise 7-11 Decimal problems

1 Find the cost of 352 units of electricity at 25.3 cents per unit.

2 A farmer wants to fence a rectangular paddock. The paddock is 35.6 metres long and 20.85 metres wide. How many metres of fencing will be needed?

3 Mark buys golf balls for $4.85 each and sells them for $5.15 each. How much money does he make if he sells 30 golf balls?

9780170188777

4 A drink bottle holds 0.6 litres. How many drink bottles can be filled from a tub that holds 4.5 litres?

5 A car travels 110.3 kilometres on 7 litres of petrol. How many kilometres would the car travel on one litre of petrol? (Give the answer to one decimal place.)

6 Anja runs 3.8 kilometres each day of the week. How far does she run in one week?

7 A long distance train is made up of a diesel engine, two dining cars and 15 passenger carriages. The engine has a mass of 20.2 tonnes, each dining car has a mass of 14.35 tonnes and each passenger carriage has a mass of 13.96 tonnes. How heavy is the entire train?

8 Samir is cutting shelves from a board which is 4.6 metres long. Each shelf needs to be 0.9 metres long. How many shelves can be cut?

9 Holly walks to work and back each day. She works six days a week and, in one week, walks 16.8 kilometres. How far is Holly's apartment from work?

10 The table lists some Sydney FM radio stations and their allocated frequencies measured in megahertz (MHz).

Station	Frequency (MHz)	Station	Frequency (MHz)
C91.3	91.3	Hope	103.2
ABC Classic	92.9	2DAY	104.1
Classic Rock	95.3	Triple M	104.9
The Edge	96.1	Triple J	105.7
Nova	96.9	Mix	106.5
SBS	97.7	2SER	107.3
WS-FM	101.7		

a Copy this number line, then locate the stations on it according to their frequencies.

90   100   110

b What is the frequency difference in megahertz between 2DAY and WS-FM?
c Find the smallest frequency difference between adjacent stations. ('Adjacent' means side-by-side.)
d What is the largest difference in frequency between adjacent stations?

11 The following are calculator displays for amounts in dollars and cents. Rewrite each amount in dollars and cents, to the nearest cent.

a 15.236   **b** 6.8412   **c** 487.759318   **d** 1234.047126

12 A sheet of cardboard is 0.03 cm thick. How many sheets would be in a stack that is 3.6 cm high?

Technology Fruit and vegetables

In this activity, a spreadsheet is used to show a shopping list of items and to complete calculations involving their cost.

1 Zoe did her fruit and vegetables shopping for the week. Enter the items into a spreadsheet, as shown below. (Centre values, bold headings, include cell borders and $ signs for column B values.)

	A	B	C	D
1	Item	Cost per kg	kg bought	Cost
2	Oranges	$3.99	1	
3	Apples	$4.99	0.5	
4	Kiwi fruit	$2.99	0.4	
5	Bananas	$5.60	1.2	
6	Tomatoes	$7.49	1.5	
7	Grapes	$3.50	1	
8	Carrots	$1.55	2	
9	Potatoes	$2.45	5	
10	Beans	$6.95	0.355	
11	Pumpkins	$3.20	0.562	
12	Zucchinis	$2.85	0.38	

2 Write a formula in cell D2 to calculate the cost of the oranges.

3 Use **Fill Down** to calculate the cost of each item purchased.

4 In cell C13, enter the label 'Total cost'.

5 In cell D13, write a **sum** formula to find the cost of Zoe's shopping.

6 In cell C14, enter the label 'Cash'. In cell C15, enter the label 'Change'.

7 If Zoe paid $60 for her shopping, enter this value into cell D14 and in cell D15 write a formula to calculate the amount of change Zoe will receive.

8 Zoe paid cash, but because the change is an irregular amount, she could not be given the amount in cell D15 in coins. In cell C16, enter the label 'Rounded change'. In cell D16, enter the amount of change Zoe will actually receive.

9 Create a spreadsheet with similar formatting to calculate a different shopping list.

Power plus

1 Copy and complete the table and notice the pattern.

Fraction	$\frac{1}{7}$	$\frac{2}{7}$	$\frac{3}{7}$	$\frac{4}{7}$	$\frac{5}{7}$	$\frac{6}{7}$
Decimal						

2 Investigate the value of $0.\dot{9}$.

3 Evaluate each expression.

a $(0.02)^2$ b $(0.02)^3$ c $(1.1)^3$
d $\sqrt{0.04}$ e $\sqrt{0.36}$ f $\sqrt[3]{0.027}$

4 Wolf, the warrior, is trying to break a decimal code that will open the dungeon doors. He has to free the prisoners before midnight so that they will not be turned into frogs by an evil spell. Each castle door is operated by a combination lock. Use the following clues to match the various combinations with the doors to the different rooms in the castle.
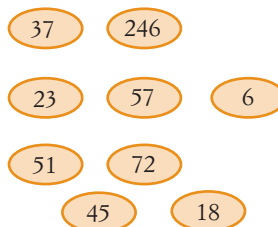
Combinations	Rooms
8.262	Queen's chamber
9.24	armoury
9.96	throne room
8.07	banquet hall
8.16	kitchen
8.79	dungeon

Clues

- Combination 9.24 opens a door to a room that deals with food.
- The combination to the armoury has a 6 in the hundredths place.
- The combinations of the throne room and the banquet hall add to 18.03.
- The Queen's chamber has a combination that is bigger than 3.78×2.1 but smaller than $25.11 + 3.1$.
- The kitchen combination is one of the three largest combination numbers.

(*Hint*: The doors in the dungeon and the throne room remained locked when Wolf tried 9.96 and 8.262.)

5 Evaluate $28.98 \div 1.2$ without using a calculator.

6 Decide where the decimal points should be so that the numbers in the ovals fit the clues.

  a The product of the two numbers is 91.02.
    The sum of the numbers is 28.3.

  b The sum of the three numbers is 14.
    The product of the three numbers is 78.66.

  c The sum of the four numbers is 28.32.
    The product of two of the numbers is 3.672.
    The product of the other two is 81.

     37   246

     23   57   6

     51   72

       45   18

Language of maths

ascending	descending	power of 10	tenth
decimal	estimate	recurring decimal	terminating decimal
decimal place	fraction	round down	thousandth
decimal point	hundredth	round up	

1 What is the collective name for numbers such as 10, 100 and 1000?

2 'The bushfire decimated the possum population of the forest.' Look up the meaning of the word '**decimate**'.

3 What is a **recurring** dream or a **recurring** back pain? What does 'recurring' mean?

4 What happens when a train **terminates** at a station?

5 What is a 'decimetre'?

6 How many decimal places do you round to if you are rounding to the nearest hundredth?
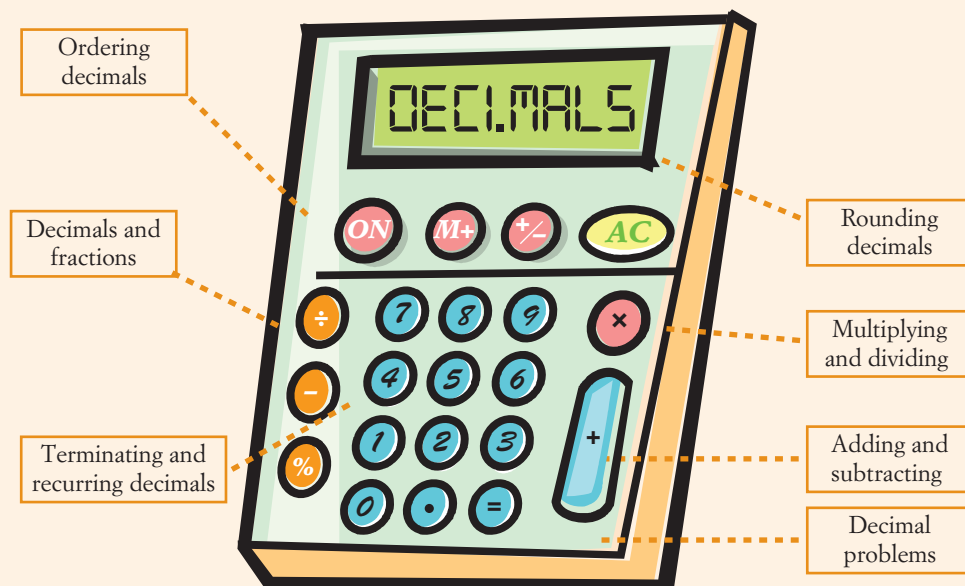
Topic overview

- What parts of this topic were new to you? What parts did you already know?
- Write any rules you have learnt about working with decimals.
- What parts of this topic did you not understand? Be specific. Talk to a friend or your teacher about them.
- Give three examples of where decimals are used.

Print (or copy) and complete this mind map of the topic, adding detail to its branches and using pictures, symbols and colour where needed. Ask your teacher to check your work.

Ordering decimals

Decimals and fractions

Terminating and recurring decimals

DECIMALS

Rounding decimals

Multiplying and dividing

Adding and subtracting

Decimal problems

1 **a** Arrange 34.98, 36.86, 3.998, 38.141, 340, 34.89 in ascending order.   *See* Exercise 7-01
   b Arrange 1.015, 1.293, 1.1015, 1.239, 1.006 in descending order.

2 Convert each decimal to a simplified fraction.   *See* Exercise 7-02
   a 0.5   **b** 0.89   **c** 0.09   **d** 0.444

3 Convert each fraction to a decimal.   *See* Exercise 7-02
   a $\dfrac{4}{10}$ **b** $\dfrac{13}{100}$ **c** $\dfrac{7}{100}$ **d** $\dfrac{11}{1000}$

4 Evaluate each expression.   *See* Exercise 7-03
   a $12.35 + 4.53 + 0.56 + 3.125 + 24.7 + 20.09$ **b** $214.33 - 109.84$
   c $0.568 + 23 + 4.027 - 16.28$ **d** $1600.8 - 562.9$
   e $1453.6 + 1287.31 - 2344.4$ **f** $9.23 - 6.851$

5 Evaluate each expression.   *See* Exercise 7-04
   a 7.54×10 **b** 7.54×100 **c** 7.54×1000
   d $13.9 \div 10$ **e** $13.9 \div 100$ **f** $13.9 \div 1000$

6 Given that $42 \times 76 = 3192$, find: *See* Exercise 7-05
   a 4.2×76 **b** 4.2×7.6 **c** 0.42×760
   d 4.2×0.76 **e** 42×7.6 **f** 0.42×0.76

7 Evaluate each product.   *See* Exercise 7-06
   a 2.75×6 **b** 0.5×1.2 **c** 72.23×4
   d 6.1×1.2 **e** 0.92×5 **f** 3×9.7
   g 3.25×0.41 **h** 0.05×0.02 **i** 4.67×1.1

8 Evaluate each quotient.   *See* Exercise 7-07
   a $762.4 \div 2$ **b** $97.6 \div 8$ **c** $2.75 \div 4$ **d** $195.6 \div 3$

9 Evaluate each quotient.   *See* Exercise 7-08
   a $12.5 \div 0.5$ **b** $12.72 \div 0.4$ **c** $6.9 \div 0.03$ **d** $0.508 \div 0.02$

10 Convert each fraction to a decimal.   *See* Exercise 7-09
    a $\dfrac{4}{5}$ **b** $\dfrac{3}{8}$ **c** $\dfrac{5}{9}$ **d** $\dfrac{2}{3}$

11 Round each number to the given number of decimal places.   *See* Exercise 7-10
    a 406.28 to the nearest tenth   **b** 125.724 to 2 decimal places
    c 2345.876 to 1 decimal place   **d** 3.8967 to the nearest hundredth
    e 78 654.056 to 2 decimal places   **f** 678.4309 to the nearest thousandth

12 The Liverpool Women's Cricket Club is having a pizza night. They order 16 Super Supreme   *See* Exercise 7-11
    pizzas at $13.70 each and 10 Hawaiian pizzas at $12.10 each. How much will the club need to
    spend?

13 Ray bought 800 bricks for $572.80. How much did one brick cost?   *See* Exercise 7-11

14 Maria saved $90 to go to a rock concert. Her return fare cost $5.60, her concert ticket cost   *See* Exercise 7-11
    $48.95, the program cost $11 and food cost $8.70. She did not have enough to buy the band's
    latest compact disc (priced $24) after the concert. How much did she need to borrow from
    her friend Sam to buy the disc?