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Primary Mathematics

Learner's Book 6

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Introduction

Welcome to Stage 6 of Cambridge Primary Mathematics. We hope this book will show you how interesting Mathematics can be and make you want to explore and investigate mathematical ideas.

Mathematics is everywhere. Developing our skills in mathematics makes us better problem-solvers through understanding how to reason, analyse and reflect. We use mathematics to understand money and complete practical tasks like cooking and decorating. It helps us to make good decisions in everyday life.

In this book you will work like a mathematician to find the answers to questions like these:

- What is the value of $2 + 2^2 + 2^3$?
- Which would you choose 20% of \$10 or $\frac{1}{10}$ of \$20?
- What is a common multiple?
- Why is the answer to $3 \times (4 + 5)$ different to the answer to $3 \times 4 + 5$?
- What time is it in Mumbai when it is 9 a.m. in Mexico City?
- What is a reflex angle?
- How do you draw a waffle diagram?
- How can a shape be translated?

Talk about the mathematics as you explore and learn. This helps you to reflect on what you did and refine the mathematical ideas to develop a more effective approach or solution.

You will be able to practise new skills, check how you are doing and also challenge yourself to find out more. You will be able to make connections between what seem to be different areas of mathematics.

We hope you enjoy thinking and working like a mathematician.

Mary Wood, Emma Low, Greg Byrd and Lynn Byrd

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How to use this book

In this book you will find lots of different features to help your learning.

Questions to find out what you know already.

Getting started

1 What is the value of the digit 9 in these numbers?
a 809.46 b 2021.89 c 123 456.95

2 Write these numbers in words and digits.
a 200 000 + 5000 + 400 + 8 + 0.9
b 500 000 + 70 000 + 30 + 6 + 0.01

3 a What number is ten times bigger than 0.01?
b What number is one hundred times smaller than 555?

4 What is the missing number?
100 × 10 = 10 000 ÷ ☐

What you will learn in the unit.

We are going to ...

- explain the value of each digit in numbers with up to 3 decimal places
- multiply and divide whole numbers and decimals by 10, 100 and 1000
- compose, decompose and regroup numbers with up to 3 decimal places.

Important words that you will use.

bisect decompose
diagonal justify
parallel trapezia

Step-by-step examples showing a way to solve a problem.

Worked example 1

Write this as a decimal number.
$3 + \frac{6}{1000} + 10 + \frac{3}{100} + \frac{1}{10}$

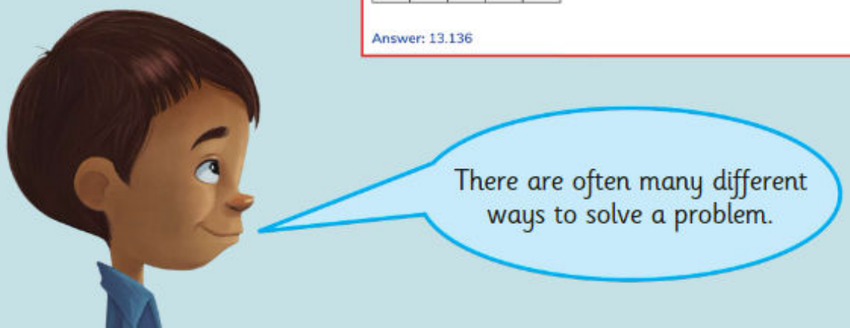
$10 + 3 + \frac{1}{10} + \frac{3}{100} + \frac{6}{1000}$

Write the terms in order of size, starting with the one with the highest place value.

Put the digits in a place value grid.

10	1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
1	3	1	3	6

Answer: 13.136



These questions will help you develop your skills of thinking and working mathematically.

3 Find the odd one out.
1.234 1234 thousandths 12.34
123.4 hundredths 123 hundredths and 4 thousandths
Explain your answer.

An investigation to carry out with a partner or in groups.
Where this icon appears, the activity will help develop your skills of thinking and working mathematically.

Think like a mathematician

Daphne the dog had four litters of puppies. The mean average number of puppies in a litter was 5. Investigate how many puppies could be in each litter. Find different ways that make the mean average 5.
What do you notice about the total number of puppies in each solution where the mean is 5?
Check that it is true for another solution. Explain what you find out.

Questions to help you think about how you learn.

Think about your answer. Are there any other possible answers? How do you know? Did you think about checking your answer with your partner?

What you have learned in the unit.

Look what I can do!

- ☐ I can explain the value of each digit in numbers with up to 3 decimal places.
- ☐ I can multiply and divide whole numbers and decimals by 10, 100 and 1000.
- ☐ I can compose, decompose and regroup numbers with up to 3 decimal places.

Questions that cover what you have learned in the unit.

Check your progress

1 Hassan counts in steps of 0.4.
His first number is 1.
He counts 1, 1.4, 1.8, ...
What is the tenth number in his sequence?

Project 4

At the end of several units, there is a project for you to carry out using what you have learned. You might make something or solve a problem.

Projects and their accompanying teacher guidance have been written by the NRICH Team. NRICH is an innovative collaboration between the Faculties of Mathematics and Education at the University of Cambridge, which focuses on problem solving and on creating opportunities for students to learn mathematics through exploration and discussion: **nrich.maths.org**.

Ordering times

Put these lengths of time in order, from shortest to longest.
You might like to use a calculator to help you.

A second	Time since you were born	A thousand seconds	A decade
Time for light to reach the Earth from the Sun	A minute	Time it takes you to eat a meal	100 000 hours
1000 months	A century	A day	Time it takes you to say the alphabet
A month	1000 days	Time since the last Olympic Games	A fortnight
Time it takes the Moon to go once around the Earth	A year	5 000 000 minutes	Time since the invention of the telephone

Thinking and Working Mathematically

There are some important skills that you will develop as you learn mathematics.

Specialising
is when I choose an example and check to see if it satisfies or does not satisfy specific mathematical criteria.

Characterising
is when I identify and describe the mathematical properties of an object.

Generalising
is when I recognise an underlying pattern by identifying many examples that satisfy the same mathematical criteria.

Classifying
is when I organise objects into groups according to their mathematical properties.

Critiquing
is when I compare and evaluate mathematical ideas, representations or solutions to identify advantages and disadvantages.

Improving
is when I refine mathematical ideas or representations to develop a more effective approach or solution.

Conjecturing is when I form mathematical questions or ideas.

Convincing
is when I present evidence to justify or challenge a mathematical idea or solution.

1 The number system

Getting started

1 What is the value of the digit 9 in these numbers?

a 809.46 b 2021.89 c 123 456.95

2 Write these numbers in words and digits.

a 200 000 + 5000 + 400 + 8 + 0.9

b 500 000 + 70 000 + 30 + 6 + 0.01

3 a What number is ten times bigger than 0.01?

b What number is one hundred times smaller than 555?

4 What is the missing number?

100 × 10 = 10 000 ÷ ☐

5 Round these lengths to the nearest whole number.

a 6.2 m b 36.5 cm c 12.3 m d 10.6 cm

6 A number with 1 decimal place is rounded to the nearest whole number.

a What is the smallest number that rounds to 100?

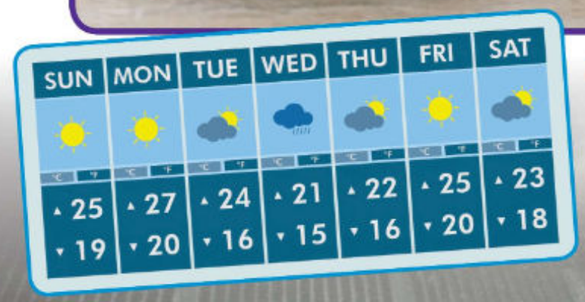
b What is the largest number that rounds to 10?

Numbers are important. We use them every day.

- We use a series of digits when we telephone a friend.
- We use decimal numbers when we work out prices.
- We use positive and negative numbers when we use a thermometer.

When do you use numbers? Make a list.

Here are some ideas to help you get started.



1.1 Place value

We are going to ...

- explain the value of each digit in numbers with up to 3 decimal places
- multiply and divide whole numbers and decimals by 10, 100 and 1000
- compose, decompose and regroup numbers with up to 3 decimal places.

compose numbers · decimal point · decompose · digit · hundredth · place value · regroup · tenth · thousandth

You already know how to read and write decimal numbers with 1 or 2 decimal places.

You can compose, decompose and regroup numbers, and you can multiply and divide by 10, 100 and 1000.

The Western Pygmy Blue Butterfly is very small. Some have a wingspan of only 0.375 inches, which is between 9 and 10 millimetres.

In this unit, you will learn about numbers with 3 decimal places.

Worked example 1

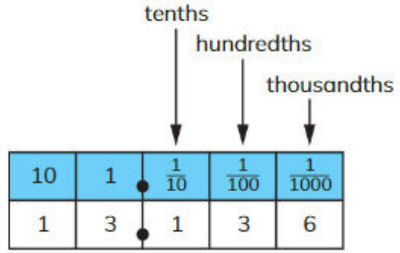
Write this as a decimal number.

$3 + \frac{6}{1000} + 10 + \frac{3}{100} + \frac{1}{10}$

$10 + 3 + \frac{1}{10} + \frac{3}{100} + \frac{6}{1000}$

Write the terms in order of size, starting with the one with the highest place value.

Put the digits in a place value grid.



10	1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
1	3	1	3	6

Answer: 13.136

Exercise 1.1

1 What is the value of the digit 7 in these numbers?

a 6703.46 b 213.807 c 456.702 d 60.078

2 Sonia has these five cards.

What is the smallest number, greater than 1, she can make using all her cards?

3 Find the odd one out.

1.234 · 1234 thousandths · 12.34 · 123.4 hundredths · 123 hundredths and 4 thousandths

Explain your answer.

4 Add these numbers together and write the total number in words and digits.

a 2 + 0.1 + 0.03 + 0.009

b −900 − 9 − 0.9 − 0.009

c 20 + 5 + 0.4 + 0.03 + 0.001

d −3 − 0.4 − 0.08 − 0.001

Swap books with your partner and check their answer.
Read the numbers to each other.

5 Copy and complete.

37.844 = 30 + 7 + ☐ + 0.04 + ☐

6 Petra is regrouping decimal numbers.

She spills ink on her work.

What number is under each ink blot?

a 0.546 = 0.4 + + 0.006

b 0.789 = 0.7 + 0.07 +

7 Find the missing numbers.

a 7.2 × 1000 = ☐

b 0.85 × 100 = ☐

c 4.28 × 10 = ☐

d 670 ÷ 100 = ☐

e 151 ÷ 1000 = ☐

f 5.5 ÷ 10 = ☐

Check your answers with your partner.

8 Look at these number cards.

A	B	C	D	E	F	G
1200	1.2	12000	0.12	120	12	120000

Write the letter of the card that is:

a one thousand times bigger than 12

b one hundredth of 12

c one thousandth of 120 000.

9 Mira divides a number by 10, then by 10 again and then by 10 again.

Her answer is 0.005.

What number did she start with?

Did you find any question particularly hard? Why?
If you are asked to do similar questions, what would you do differently?

Think like a mathematician

There are 10 trees in the Numberland Woods.

Each tree has 10 branches. Each branch has 10 twigs.
Each twig has 10 flowers. Each flower has 10 petals.

Sofia went into the woods.

She took 1 petal, 1 flower, 1 twig and 1 branch.

How many petals are left in the woods?

Look what I can do!

- ☐ I can explain the value of each digit in numbers with up to 3 decimal places.
- ☐ I can multiply and divide whole numbers and decimals by 10, 100 and 1000.
- ☐ I can compose, decompose and regroup numbers with up to 3 decimal places.

1.2 Rounding decimal numbers

We are going to ...

- round a number with 2 decimal places to the nearest whole number
- round a number with 2 decimal places to the nearest tenth.

Rounding makes it easier to describe and understand numbers. It is easier to understand that Usain Bolt ran 100 metres in less than 10 seconds than he ran 100 metres in 9.63 seconds.

nearest
round

Worked example 2

Round these numbers to the nearest tenth.

a 8.80 **b** 6.45 **c** 3.95

a 8.8 **b** 6.5 **c** 4.0

If the hundredths digit is 0, 1, 2, 3 or 4, round down by keeping the tenths digit the same.

If the hundredths digit is 5, 6, 7, 8 or 9, round up by increasing the value of the tenths digit by 1. If the tenths digit is 9, it will change to 0 and the ones digit will increase by 1.

There must always be 1 decimal place in the answer, even if it is zero.

Exercise 1.2

1 Round these decimals to the nearest whole number.

4.09 7.89 2.55 7.45

2 Leo bought a book costing $14.65.

What is the cost of the book to the nearest dollar?

3 Which of these numbers rounds to 5 when rounded to the nearest whole number?

4.35 4.05 4.5 5.05 4.55 5.35 5.5 5.53

Check your answers to questions **1** to **3** with your partner.

4 Round these numbers to the nearest tenth.

4.52 7.81 2.35 9.07

5 Which of these numbers rounds to 7.5 when rounded to the nearest tenth?

7.35 7.05 7.51 7.55 7.49 7.56 7.53

Check your answers to questions **4** and **5** with your partner.

6 Correct all the statements that are false.

A 3.04 is 3 when rounded to the nearest whole number and the nearest tenth.

B 5.03 is 5 when rounded to the nearest whole number and 5.0 when rounded to the nearest tenth.

C 6.95 is 7 when rounded to the nearest whole number and 6.9 when rounded to the nearest tenth.

Discuss your answers with your partner.
Make sure you explain the reasons you have given.

7 Round these measures to the nearest tenth.

55.55 litres 12.22 metres 35.45 kilograms

8 Choose the **smallest** number from this list that rounds to 1.

0.55 0.99 1.9 1.45 0.5 1.05 0

9 Jasper says, '7.97 is 8 when rounded to the nearest whole number and is also 8 when rounded to the nearest tenth.'

Is Jasper correct?

Explain your answer.

Look back over your answers.
Did you use the worked example to guide you?
Did you find any question particularly hard? Why?

Think like a mathematician

The sides of a rectangular face on a cuboid are measured in centimetres to 2 decimal places using a micrometer (an instrument for measuring length accurately).

The measurements are rounded to the nearest whole number. They are 5 cm and 6 cm.

What is the smallest possible perimeter of the rectangle?

What is the largest possible perimeter of the rectangle?

Investigate the smallest and largest perimeters for other rectangles if the measurements have been rounded to the nearest centimetre.

You will show you are **specialising** when you work out solutions.

If you explain your results for a number of rectangles, you will show you are **convincing**.

Tip

Think about the smallest number with 2 decimal places that rounds to 5 cm, then think about the largest number with 2 decimal places that rounds to 5 cm. Do the same for 6 cm.

Look what I can do!

- ☐ I can round a number with 2 decimal places to the nearest whole number.
- ☐ I can round a number with 2 decimal places to the nearest tenth.

Check your progress

1 Copy and complete.

$87.655 = 80 + 7 + \square + \square + \square$

2 What decimal number is represented by the following?

$90 + 7 + \frac{3}{10} + \frac{1}{100} + \frac{4}{1000}$

3 How many times bigger is the value of the digit 6 in 64.53 than the value of the digit 6 in 0.367?

4 a What is 3.08 rounded to the nearest tenth?

b What is 9.55 rounded to the nearest whole number?

5 Find the missing numbers.

a $\square \times 0.9 = 9$

b $705 \div \square = 7.05$

c $\square \times 0.16 = 160$

d $34 \div 1000 = \square$

6 The announcer said, 'Ingrid won the 100 metre race in 13.9 seconds.'

Her time was originally measured to 2 decimal places.

What was the slowest time she could have run?