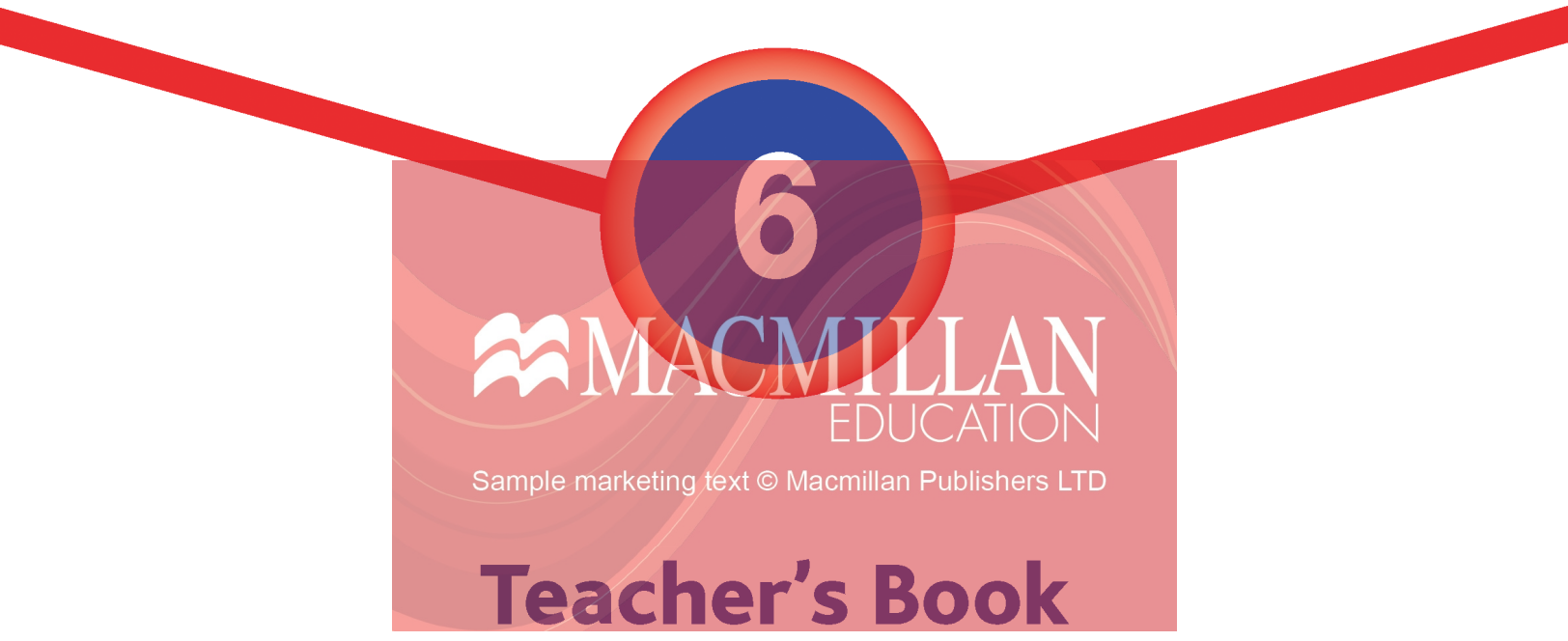
Macmillan Mathematics



Teacher's Book

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MACMILLAN

Contents

Introduction

Macmillan Mathematics is a complete mathematics scheme for pupils from Grades 1 to 6. It is written not only to develop a thorough understanding of mathematics, but also to foster interest, enthusiasm and confidence in mathematics. Its mathematical structure provides progression and development of concepts to ensure continuity and curriculum coverage.

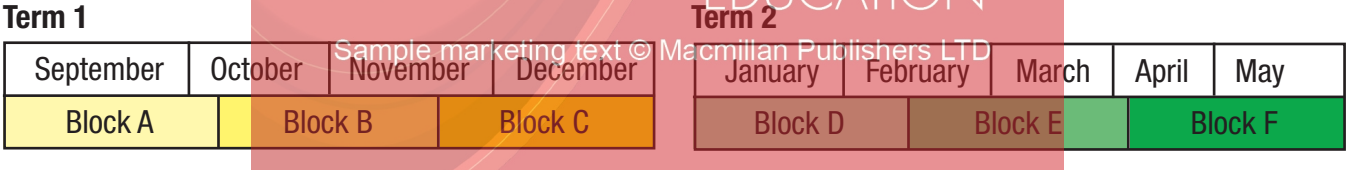
Components

- The **Teacher's Book** gives clear guidance on planning, practical activities and the use of the pupil's material for each unit of work.
- The **Pupil's Book** provides a clear explanation of the key steps needed to learn specific skills and concepts, as well as practice, reinforcement and enrichment activities to consolidate these skills and concepts.
- The **Pupil's CD-ROM** provides further reinforcement and assessment of the skills and concepts developed within each unit, with the provision of interactive exercises.

Planning and organisation

For each grade, the curriculum has been organised into six blocks of work that are developed over the year. Each block is split into four teaching units. A teaching unit consists of a week of lessons, and covers the set of objectives that guide planning, teaching and students' learning. The fourth unit in each block is an 'assess and review' unit. This provides an opportunity for pupils to use and apply the skills and concepts learnt in the previous three units, and also allows teachers to assess and monitor students' progress. Those students who are not keeping up with their peers can then receive the additional attention and support they need.

Teaching sequence



Successful teaching and learning with Macmillan Mathematics

Macmillan Mathematics is intended to be used in the context of quality-first teaching, with activities to support the teacher in their efforts to develop pupils learning, confidence and love of mathematics. The authors give these principles to outline their thoughts on teaching and learning mathematics:

1 Plan and provide a balanced, practical experience that incorporates the acquisition, consolidation and application of knowledge and skills, with opportunities to use and extend thinking and reasoning.
2 Model ways to explore mathematics. Look for patterns, rules and properties. Direct pupils' learning by providing examples that enable them to identify appropriate methods and understand rules and ideas.
3 Give pupils the opportunity to consolidate their learning, with frequent and regular periods of practice that are short, sharp and focused.
4 Ensure that pupils recognise how their learning builds on previous learning and help them to see connections. Ensure that they feel appropriately supported and challenged by the work they are given.
5 Engage with pupils' thinking. Give them sufficient time for discussion and time to think about their ideas and methods by prompting and by asking probing questions.
6 Demonstrate and promote the correct use of mathematical vocabulary and the interpretation and use of symbols, images, diagrams and models as tools to support pupils' mathematical thinking and communication.
7 Share the excitement of mathematics, capturing pupils' imagination by teaching creatively and with enthusiasm for the subject.

Structure of Teacher's Book

Objectives: The objectives from the Syllabus covered by this particular unit.

Vocabulary: The key words to use and develop with pupils. List these on the wall or board for the pupils to read.

Lessons: The focus for each lesson. Share this with your pupils at the start of each lesson.

Oral and mental starters: Suggested starter activities for the first 5 minutes of each lesson (see below).

Resources: Practical resource suggestions to help support the teaching and learning of this unit.

Prior learning: The step before this unit of work. Use this as a basis for some questions at the start of the unit to assess the pupils' prior knowledge and understanding.

Background notes: Linking theory with practice, this briefly outlines some common difficulties and misconceptions for this unit of work and gives key teaching points.

Supporting the topic: Lists suggestions for using and applying the mathematics in real-life situations.

End of unit evaluation: Learning outcomes for this unit of work, with key areas of assessment linked to the objectives.

This unit overview is followed by lesson notes containing practical activities and references to the pupil's book.

Oral and mental starters

These are suggestions for whole class mental mathematics activities for the first 5 or 10 minutes of each lesson. They are interactive and lively oral activities, with questions, games and practical activities that actively involve the pupils. They enable pupils to become confident and agile with mental calculation and number, as well as consolidating work done on shape, measures and handling data. The starters have a number of purposes.

- They can prepare the pupils for the unit of work ahead, rehearsing and sharpening skills. For example, for a unit on fractions of amounts you may plan mental starters on division facts to support their understanding.
- They can be used as a method of 'keeping sharp' the skills and concepts introduced in previous units. For example, an oral starter on names and properties of 2-D shapes, 4 weeks after teaching shape, will remind pupils' of that teaching and consolidate their learning.
- They reinforce the importance of the language of mathematics, with regular re-visiting of vocabulary.
- They allow you to quickly assess pupils' knowledge and understanding of an area you intend to teach in the main part of the lesson. For example, before teaching subtraction of 2-digit numbers, you could ask oral questions on adding tens to check pupils' understanding.

Basic resources such as number cards, counters and number lines are important. Once you have used some of the activities, refine and develop them and plan your own starters to support your teaching.

Hold up (reading and writing numbers 0.001 to 99 999 999): Write a set of 8 appropriate numbers on the board. Ask a pupil to point to a given number and ask the class to hold up either a tick (if they agree) or a cross (if they disagree). Then ask each pupil to write a new given number and hold it up. Repeat.

Steps (multiples and sequences): Ask the class to count on from a given starting number in multiples of an appropriate number and then back (e.g. in 2s, 3s, 4s, 5s, 6s, 7s, 8s, 9s, 10s, 20s, 25s, 50s, 60s,100s, 1000s, 10 000s, 100 000s, 0.1s, 0.05s etc.).

What's the order? (ordering numbers 0.001 to 99 999 999): Write a set of numbers in random order on the board. Explain that the numbers need to be put in order, starting with the smallest. Ask the class to suggest which should come first, second etc. Write the numbers out in the order suggested. Ask 'Is this correct?'

What's the value? (place value in numbers 0.001 to 99 999 999): Write a number on the board and ask for the place value of each digit in random order.

What's the rule? (number sequences): Write the beginning of a sequence on the board, e.g. 3, 8, 13, 18 …; 8 436 750, 8 436 720, 8 436 690, 8 436 660 …; 0.05, 0.1, 0.15, 0.2 … . Ask pupils to work out and state the rule (e.g. the numbers go up in steps of 5; down in steps of 30; up in steps of 0.05) and continue the sequence.

Just a fraction (fractions of whole numbers): Give multiples of appropriate numbers for pupils to find a given fraction, e.g. multiples of 10 for pupils to find $\frac{7}{10}$, multiples of 4 for them to find $\frac{3}{4}$, multiples of 3 for them to find $\frac{2}{3}$ etc. They could respond as a whole class when you give a signal, or individually, or a mixture of both.

Equal parts (equivalent fractions): Write a fraction or mixed number on the board, e.g. $\frac{5}{6}$. Ask pupils to suggest equivalent fractions. Record all correct suggestions on the board. Include decimal fraction equivalents to common fractions.

Ordering parts (ordering fractions): Write a set of 3 or 4 fractions on the board. Use proper fractions, improper fractions and mixed numbers. Ask pupils to suggest which is the smallest, the next smallest etc until they are all in order. Each time ask how they know.

Decimal parts (ordering decimals): As 'Ordering parts' above, but use decimals.

Language (understanding mathematical language): Give instructions or ask questions involving the mathematical language being developed such as product, factor, multiple, common multiple, lowest common multiple, common factor, highest common factor, dividend, divisor, quotient, remainder, equivalent fraction, lowest terms, improper fraction, mixed number, decimal fraction, percentage, ratio, proportion, simplify, function, volume, perimeter, area, mean, median, mode, average speed etc. E.g. 'What is the product of 7 and 5?; Is 3 a factor of 32?; Give me the lowest common multiple of 4 and 6'; 'What is 45% as a fraction in its lowest terms? What is the average speed of a boy who runs 24 km in 3 hours?'

Flash facts (addition, subtraction, multiplication or division facts): Ask addition, subtraction, multiplication or division fact questions (e.g. 8 + 7, 13 – 6, 7 × 8, 42 ÷ 6) for pupils to answer together as a class, or by holding up a number card when you give a signal.

Pairs for sums (addition): Give an appropriate number, e.g. 173. Pupils choose 2 numbers which have that total when added together. Use number cards and hold them up or give individual answers orally.

Product pairs (multiplication): As 'Pairs for sums', but pupils show 2 numbers which make the given number when multiplied together.

My way (adding and subtracting 2- or 3-digit numbers mentally): Write a 2- or 3-digit addition or subtraction calculation on the board for pupils to work out mentally. After a moment ask for the answer, then ask volunteers to explain how they worked it out. Record the method on the board as each explanation is given, e.g. for 246 + 435, 'I added 200 and 400 which is 600, then 646 and 30 which is 676, then I added 5 more to 681' (record 200 + 400 = 600, 646 + 30 = 676, 676 + 5 = 681). Include decimals occasionally.

Name it (2-D and 3-D shapes): Describe a shape to the class using mathematical properties (e.g. 'This 3-D shape has 4 faces. They are all triangles; This 2-D shape has 8 sides. All the sides are the same length, all the angles are equal'). Pupils name the shape from its description.

Tell me a story (word problems): Write a calculation on the board, e.g. 276 – 118 = 258, 8 × 7 = 56, $4\frac{1}{2} + 3\frac{2}{3}$, 5.25 – 3.07, 35% of 200. Ask pupils to make up a 'number story' using the calculation.

What's the question? (using and developing knowledge of relationships in number): Ask 'The answer is 72, what's the question?' Pupils give number statements which have 72 as the answer, e.g. 24 × 3, 35 + 37, 144 ÷ 2, 10 000 – 9928, 36% of 200 etc. Record them on the board. Use a whole number, fraction or decimal as the answer, depending on the content of the lesson or the need to revise previous learning.

What's my number? (using inverse operations): Ask 'I'm thinking of a number. When I add 26 to it the answer is 61. What's my number?' Ask individuals for similar questions.

Pupil's Book 6A

Block A Understanding numbers

Maths Topic	National Standards from Government Guidelines	
Unit	*Curriculum area*	*End of year objectives / success criteria*
1 Integers and decimals	Understanding numbers, ways of representing them and the relation between them Understand numerical operations and relations between them Skilfully calculate and obtain reasonable estimates of the results	● Write and read large numbers and decimals. ● Give the place value of a digit in a whole number. ● Round to the nearest 10, 100 and 1000 and decimals to the nearest whole number and tenth. ● Compare and order whole numbers and decimals. ● Divide numbers by 10, 100, 1000. ● Solve problems involving powers. ● Add and subtract decimals. ● Estimate and give an approximate answer for + and –. ● Judge results using different strategies.
2 Number properties	Understanding numbers, ways of representing them and the relations between them	● Identify prime numbers. Find prime factors. ● State the multiples of numbers up to 144. ● State the pairs of factors of numbers up to 100. ● Use the rules for divisibility by 2, 3, 4, 5, 6, 8, 9, 10. ● Identify common factors (HCF) and multiples (LCM). ● Calculate squares of numbers up to 500. ● Calculate square roots of perfect squares. ● Write numbers in index form.
3 Fractions	Understanding numbers, ways of representing them and the relations between them Understand numerical operations and relations between them Skilfully calculate and obtain reasonable estimates of the results	● Discover the relations between natural numbers, ordinary and decimal fractions and percentages. ● Read and write fractions and mixed numbers. ● Identify equivalent fractions. Simplify fractions. ● Compare fractions and put them in order. ● Understand what percentage represents, the way to express it and the conditions of calculating it. ● Add and subtract fractions and mixed numbers. ● Estimate and approximate the results of + and –. ● Judge results using different strategies.
4 Assess and review	Revision of previous 3 units – problems, formative and summative assessment. Monitor, assess, evaluate and consolidate children's knowledge and understanding.	

During this block of work, pupils will experience:

1 Understanding and finding differences between positive and negative integers.
2 Rounding numbers to the nearest 10, 100, ... and 1 000 000; using index notation for large numbers.
3 Reading, ordering, rounding, adding and subtracting decimal numbers; using rules of divisibility.
4 Approximating numbers to estimate the results of calculations and using calculators for checking.
5 Identifying multiples, common multiples and LCM, factors, common factors, HCF and prime numbers.
6 Finding squares, square roots and powers; equivalent fractions and fractions in their simplest terms.
7 Comparing, ordering, + and – and changing between proper fractions, improper fractions and mixed numbers.
8 Changing fractions to percentages and vice versa; finding one amount as a percentage of another.

Unit 1 **Integers and decimals**

Term 1 Block A
Understanding numbers
Unit 1 Integers and decimals
Unit 2 Number properties
Unit 3 Fractions
Unit 4 Assess and review

Objectives
At the end of the unit, students should be able to …
- Write and read large numbers and decimals.
- Give the place value of a digit in a given whole number.
- Round whole numbers to the nearest 10, 100 and 1000 and decimals to the nearest whole number and tenth.
- Compare whole numbers and decimals and order them.
- Divide numbers by 10, 100, 1000.
- Solve problems involving powers.
- Add and subtract decimals.
- Estimate and give an approximate answer for + and –.
- Judge results using different strategies and a calculator.

Vocabulary
integer, whole number, positive, negative, more/less than or equal to, round, approximate, digit, abbreviation, index form, power, decimal, place value names (ten thousandths – billions), estimate

Lessons
1 Integers
2 Rounding and approximation
3 Large numbers
4 Decimal numbers
5 Adding and subtracting decimals

Oral and mental starters
Hold up, Steps
What's the value?
What's the order?
What's the question?

Resources
Calculators
Pupil's Book pages 4–13

Prior learning
Understanding place value, ordering, rounding, calculating and estimating results; understanding negative numbers and finding differences between them and between 1-digit positive and negative numbers.

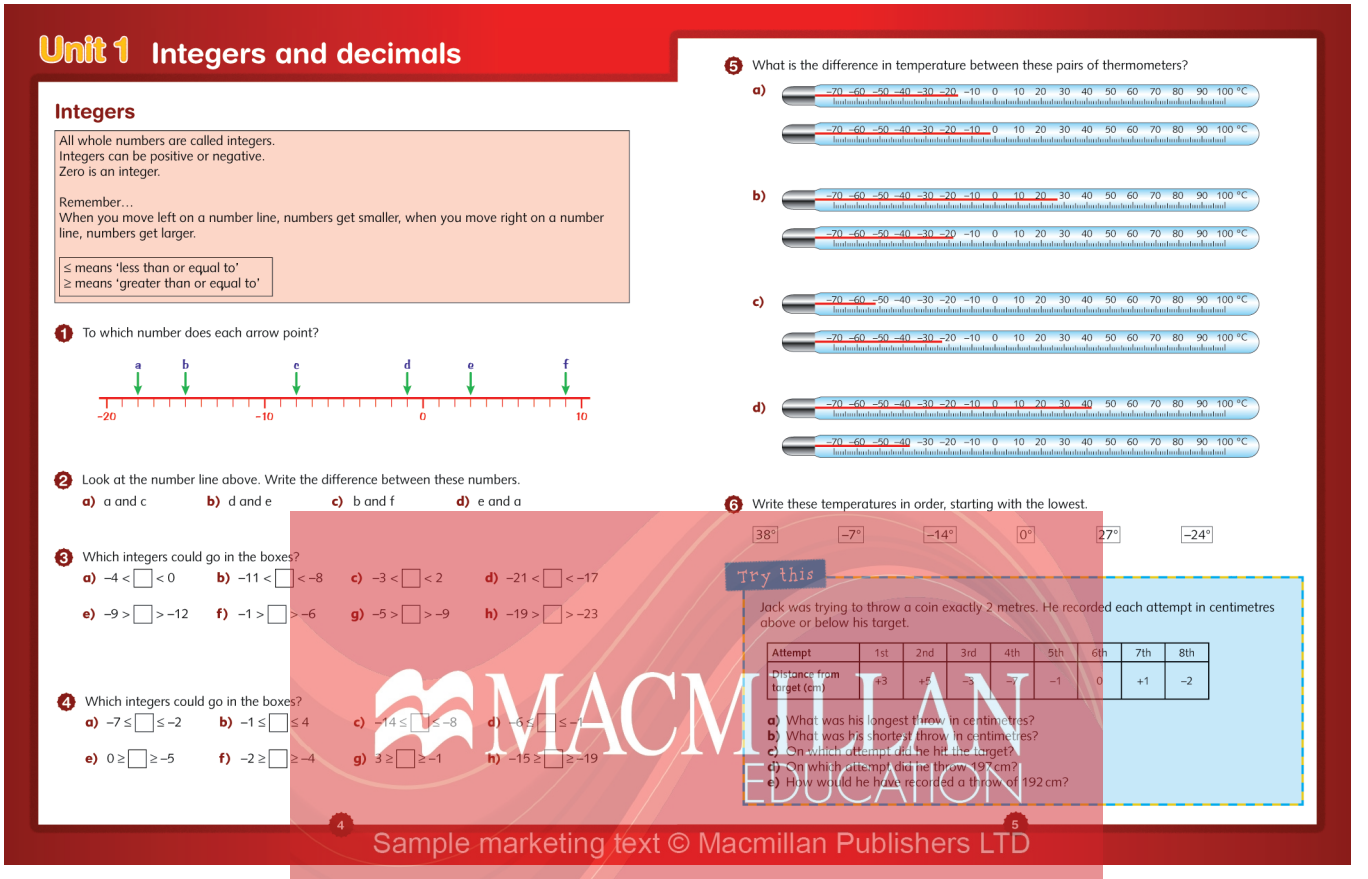
Background notes
Knowledge, skills and understanding of number is developed to include the 4th decimal place and billions and pupils should apply their previous knowledge of place value. The term 'integer' (whole number) is introduced with reference to positive and negative numbers. The terms 'less than or equal to' and 'greater than or equal to' are introduced along with the symbols ≤ and ≥.

End of unit evaluation
Check that the pupils are able to:
1 Find differences between positive and negative integers.
2 Round numbers to 10, 100, 1000, 10 000, 100 000, 1 000 000.
3 Understand and use index notation
4 Read, order and round numbers with 4 or fewer decimal places.
5 Add and subtract decimals.
6 Estimate the results of calculations.
7 Check results with a calculator.

Supporting the topic
Check that pupils can identify the place value of all the digits in the numbers they work with. Provide opportunities for them to check some of the results of calculations with a calculator.

Lesson 1 **Integers**

Pupil's Book pages 4 and 5 **Oral and mental starter: Hold up**



Unit 1 Integers and decimals

Integers

All whole numbers are called integers.
Integers can be positive or negative.
Zero is an integer.

Remember…
When you move left on a number line, numbers get smaller, when you move right on a number line, numbers get larger.

≤ means 'less than or equal to'
≥ means 'greater than or equal to'

1 To which number does each arrow point?

a b c d e f

−20 −10 0 10

2 Look at the number line above. Write the difference between these numbers.
a) a and c b) d and e c) b and f d) e and a

3 Which integers could go in the boxes?
a) −4 < □ < 0 b) −11 < □ < −8 c) −3 < □ < 2 d) −21 < □ < −17
e) −9 > □ > −12 f) −1 > □ > −6 g) −5 > □ > −9 h) −19 > □ > −23

4 Which integers could go in the boxes?
a) −7 ≤ □ ≤ −2 b) −1 ≤ □ ≤ 4 c) −14 ≤ □ ≤ −8 d) −6 ≤ □ ≤ −1
e) 0 ≥ □ ≥ −5 f) −2 ≥ □ ≥ −4 g) 3 ≥ □ ≥ −1 h) −15 ≥ □ ≥ −19

5 What is the difference in temperature between these pairs of thermometers?
a) b) c) d)

6 Write these temperatures in order, starting with the lowest.
38° −7° −14° 0° 27° −24°

Try this

Jack was trying to throw a coin exactly 2 metres. He recorded each attempt in centimetres above or below his target.

Attempt	1st	2nd	3rd	4th	5th	6th	7th	8th
Distance from target (cm)	+3	+5	−3	−7	−1	0	+1	−2

a) What was his longest throw in centimetres?
b) What was his shortest throw in centimetres?
c) On which attempt did he hit the target?
d) On which attempt did he throw 197 cm?
e) How would he have recorded a throw of 192 cm?

4 5

Activities

- Draw a number line on the board with 21 points and mark the centre point 0. Ask pupils to count from 0 to 10 as you write the positive numbers on the line. Ask them to count back from 10, continuing beyond zero, as you write the negative numbers to −10. Revise the terms *positive* and *negative* numbers. Ask for differences between pairs of numbers on the line, e.g. 6 and −5.
- Look at page 4 and go through the introduction with the class. Stress that *integer* means 'whole number'. Ask 'Is 100 an integer? Why? Is $\frac{1}{3}$ an integer? Why? Is 37.45 an integer? Why? Is −36 an integer? Why?'
- Ask volunteers to give numbers from −3 to 2, then from 5 to −2. Record these on the board, using the symbols ≤ and ≥ .

Answers

1 a) −18 b) −15 c) −8 d) −1 e) 3 f) 9

2 a) 10 b) 4 c) 24 d) 21

3 a) −3, −2, −1 b) −10, −9
c) −2, −1, 0, 1 d) −20, −19, −18
e) −10, −11 f) −2, −3, −4, −5
g) −6, −7, −8 h) −20, −21, −22

4 a) −7, −6, −5, −4, −3, −2
b) −1, 0, 1, 2, 3, 4
c) −14, −13, −12, −11, −10, −9, −8
d) −6, −5, −4, −3, −2, −1
e) 0, −1, −2, −3, −4, −5
f) −2, −3, −4 g) 3, 2, 1, 0, −1
h) −15, −16, −17, −18, −19

5 a) 14° b) 45° c) 29° d) 79°

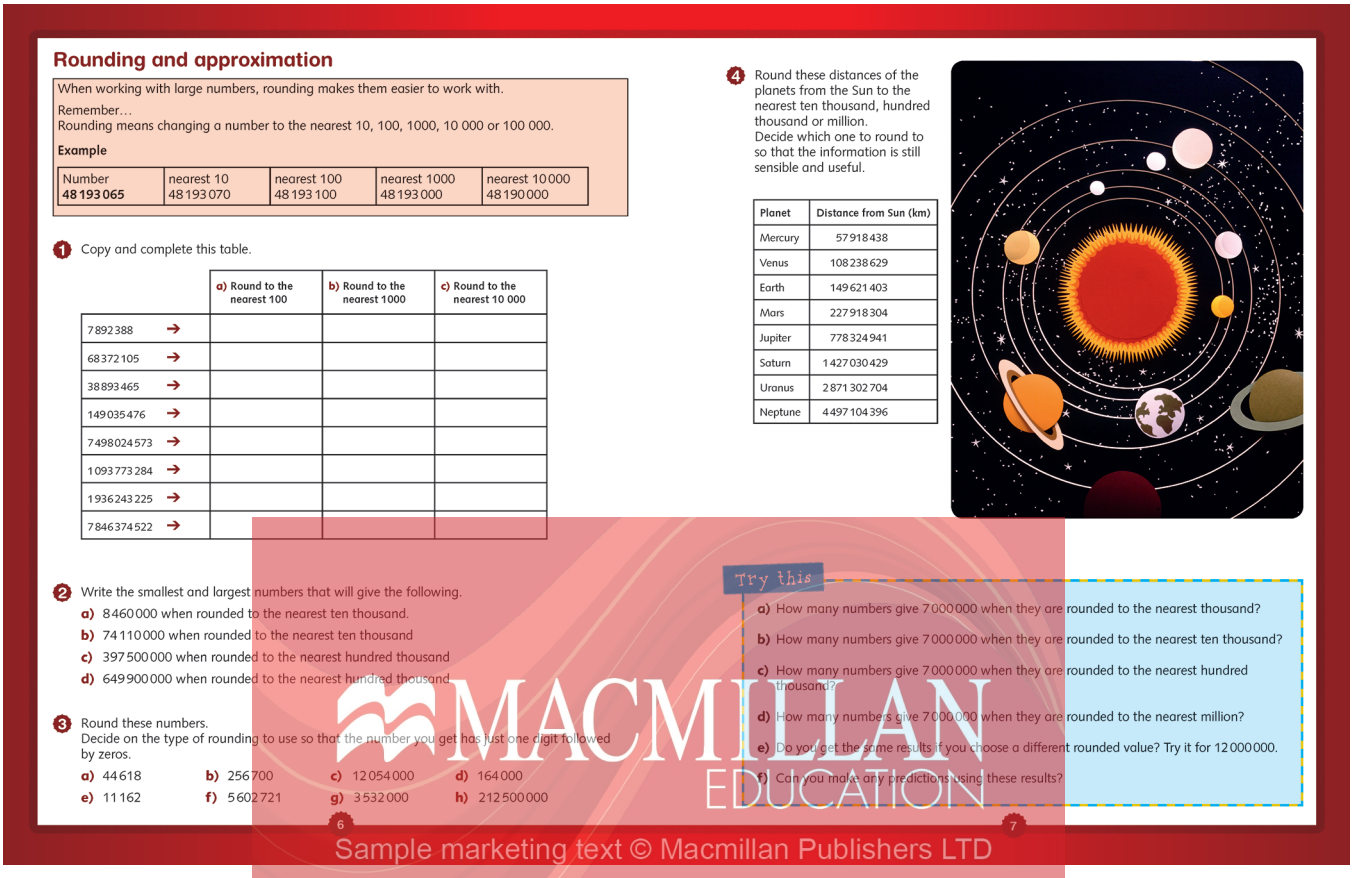
6 −24°, −14°, −7°, 0°, 27°, 38°

Try this

a) 205 cm b) 193 cm c) 6th d) 3rd e) −8

Lesson 2 **Rounding and approximation**

Pupil's Book pages 6 and 7 **Oral and mental starter: Steps**



Rounding and approximation

When working with large numbers, rounding makes them easier to work with.

Remember…
Rounding means changing a number to the nearest 10, 100, 1000, 10 000 or 100 000.

Example

Number	nearest 10	nearest 100	nearest 1000	nearest 10 000
48 193 065	48 193 070	48 193 100	48 193 000	48 190 000

1 Copy and complete this table.

	a) Round to the nearest 100	b) Round to the nearest 1000	c) Round to the nearest 10 000
7892388 →			
68372105 →			
38893465 →			
149035476 →			
7498024573 →			
1093773284 →			
1936243225 →			
7846374522 →			

2 Write the smallest and largest numbers that will give the following.
- **a)** 8460000 when rounded to the nearest ten thousand.
- **b)** 74110000 when rounded to the nearest ten thousand
- **c)** 397500000 when rounded to the nearest hundred thousand
- **d)** 649900000 when rounded to the nearest hundred thousand

3 Round these numbers.
Decide on the type of rounding to use so that the number you get has just one digit followed by zeros.

a) 44618 **b)** 256700 **c)** 12054000 **d)** 164000
e) 11162 **f)** 5602721 **g)** 3532000 **h)** 212500000

6

4 Round these distances of the planets from the Sun to the nearest ten thousand, hundred thousand or million.
Decide which one to round to so that the information is still sensible and useful.

Planet	Distance from Sun (km)
Mercury	57918438
Venus	108238629
Earth	149621403
Mars	227918304
Jupiter	778324941
Saturn	1427030429
Uranus	2871302704
Neptune	4497104396

Try this

a) How many numbers give 7000000 when they are rounded to the nearest thousand?
b) How many numbers give 7000000 when they are rounded to the nearest ten thousand?
c) How many numbers give 7000000 when they are rounded to the nearest hundred thousand?
d) How many numbers give 7000000 when they are rounded to the nearest million?
e) Do you get the same results if you choose a different rounded value? Try it for 12000000.
f) Can you make any predictions using these results?

7

Activities

- Write a 10-digit whole number on the board leaving a space after the billions, the millions and the thousands, e.g. 5 356 271 298. Revise the place value of each digit in order to hundred millions, starting with units. Emphasise that in each group of 3 digits there are units, tens and hundreds, first of ones, then of thousands and then of millions. Explain that the tenth digit from the right is billions.
- Read the introduction on page 6. When rounding to a particular place, the digit to the right of that place determines whether it is rounded up or down: 5 or more rounds up, 4 or fewer rounds down.
- Write a 10-digit number and ask a pupil to read it and round it to the nearest: 10, 100, 1 000, … up to 1 000 000 000.

Answers

1 a) 7 892 400, 68 372 100, 38 893 500, 149 035 500, 7 498 024 600, 1 093 773 300, 1 936 243 200, 7 846 374 500
b) 7 892 000, 68 372 000, 38 893 000, 149 035 000, 7 498 025 000, 1 093 773 000, 1 936 243 000, 7 846 375 000
c) 7 890 000, 68 370 000, 38 890 000, 149 040 000, 7 498 020 000, 1 093 770 000, 1 936 240 000, 7 846 370 000

2 a) 8 455 000, 8 464 999 b) 74 105 000, 74 114 999
c) 397 450 000, 397 549 999 d) 649 850 000, 649 949 999

3 a) 40 000 b) 300 000 c) 10 000 000
d) 200 000 e) 10 000 f) 6 000 000
g) 4 000 000 h) 200 000 000

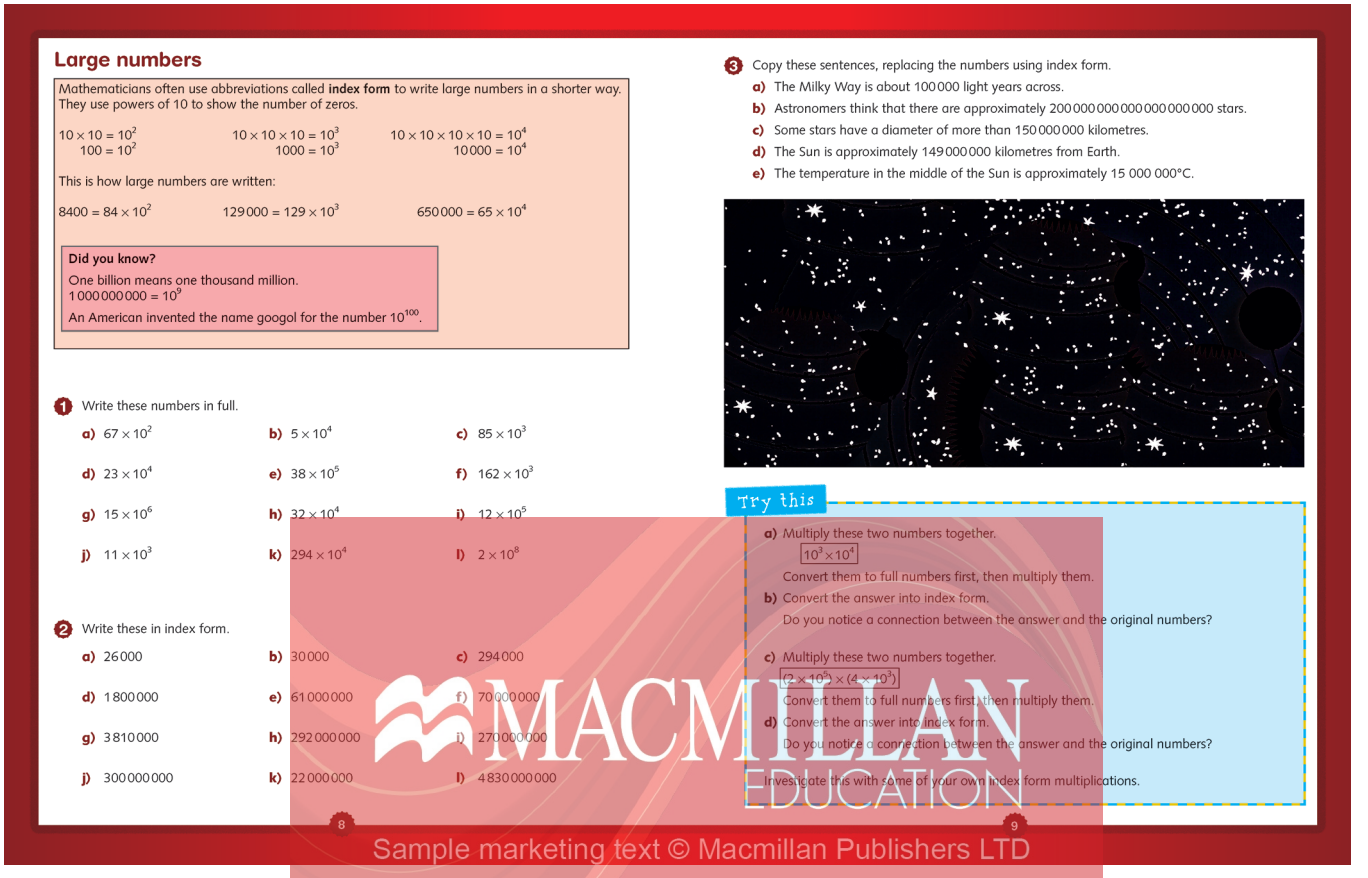
4 Check rounding is sensible.

Try this

a) 1000 b) 10 000 c) 100 000
d) 1 000 000 e) Yes
f) There are 1000 numbers that can be rounded to the nearest 1000 and 1 000 000 numbers to the nearest million, etc.

Lesson 3 **Large numbers**

Pupil's Book pages 8 and 9 **Oral and mental starter: What's the value?**



Large numbers

Mathematicians often use abbreviations called **index form** to write large numbers in a shorter way. They use powers of 10 to show the number of zeros.

$10 \times 10 = 10^2$ $\quad 100 = 10^2$

$10 \times 10 \times 10 = 10^3$ $\quad 1000 = 10^3$

$10 \times 10 \times 10 \times 10 = 10^4$ $\quad 10000 = 10^4$

This is how large numbers are written:

$8400 = 84 \times 10^2$ $\qquad 129000 = 129 \times 10^3$ $\qquad 650000 = 65 \times 10^4$

Did you know?

One billion means one thousand million.
$1000000000 = 10^9$

An American invented the name googol for the number 10^{100}.

1 Write these numbers in full.

a) 67×10^2 **b)** 5×10^4 **c)** 85×10^3

d) 23×10^4 **e)** 38×10^5 **f)** 162×10^3

g) 15×10^6 **h)** 32×10^4 **i)** 12×10^5

j) 11×10^3 **k)** 294×10^4 **l)** 2×10^8

2 Write these in index form.

a) 26 000 **b)** 30 000 **c)** 294 000

d) 1 800 000 **e)** 61 000 000 **f)** 70 000 000

g) 3 810 000 **h)** 292 000 000 **i)** 270 000 000

j) 300 000 000 **k)** 22 000 000 **l)** 4 830 000 000

3 Copy these sentences, replacing the numbers using index form.

a) The Milky Way is about 100 000 light years across.

b) Astronomers think that there are approximately 200 000 000 000 000 000 000 stars.

c) Some stars have a diameter of more than 150 000 000 kilometres.

d) The Sun is approximately 149 000 000 kilometres from Earth.

e) The temperature in the middle of the Sun is approximately 15 000 000°C.

Try this

a) Multiply these two numbers together.
$10^3 \times 10^4$
Convert them to full numbers first, then multiply them.

b) Convert the answer into index form.
Do you notice a connection between the answer and the original numbers?

c) Multiply these two numbers together.
$(2 \times 10^2) \times (4 \times 10^3)$
Convert them to full numbers first, then multiply them.

d) Convert the answer into index form.
Do you notice a connection between the answer and the original numbers?

Investigate this with some of your own index form multiplications.

8 9

Activities

- Look at page 8 and go through the introduction with the class. Ask whether anyone can see a connection between the small index number, the number of tens being multiplied and the number of zeros in the full number (e.g. 10^2, 10×10, 100). Establish that they are the same.
- Write numbers such as 500, 12 000, 673 000, 47 000 000 in a vertical list on the board and ask volunteers to give the index form. Record each alongside the corresponding number, e.g. $500 = 5 \times 10^2$. Stress that the small index number is the same as the number of zeros in the full number in each case.

Answers

1 a) 6 700 b) 50 000 c) 85 000
d) 230 000 e) 3 800 000 f) 162 000
g) 15 000 000 h) 320 000 i) 1 200 000
j) 11 000 k) 2 940 000 l) 200 000 000

2 a) 26×10^3 b) 3×10^4 c) 294×10^3
d) 18×10^5 e) 61×10^6 f) 7×10^7
g) 381×10^4 h) 292×10^6 i) 27×10^7
j) 3×10^8 k) 22×10^6 l) 483×10^7

3 a) 1×10^5 b) 2×10^{20} c) 15×10^7
d) 149×10^6 e) 15×10^6

Try this

a) 10 000 000

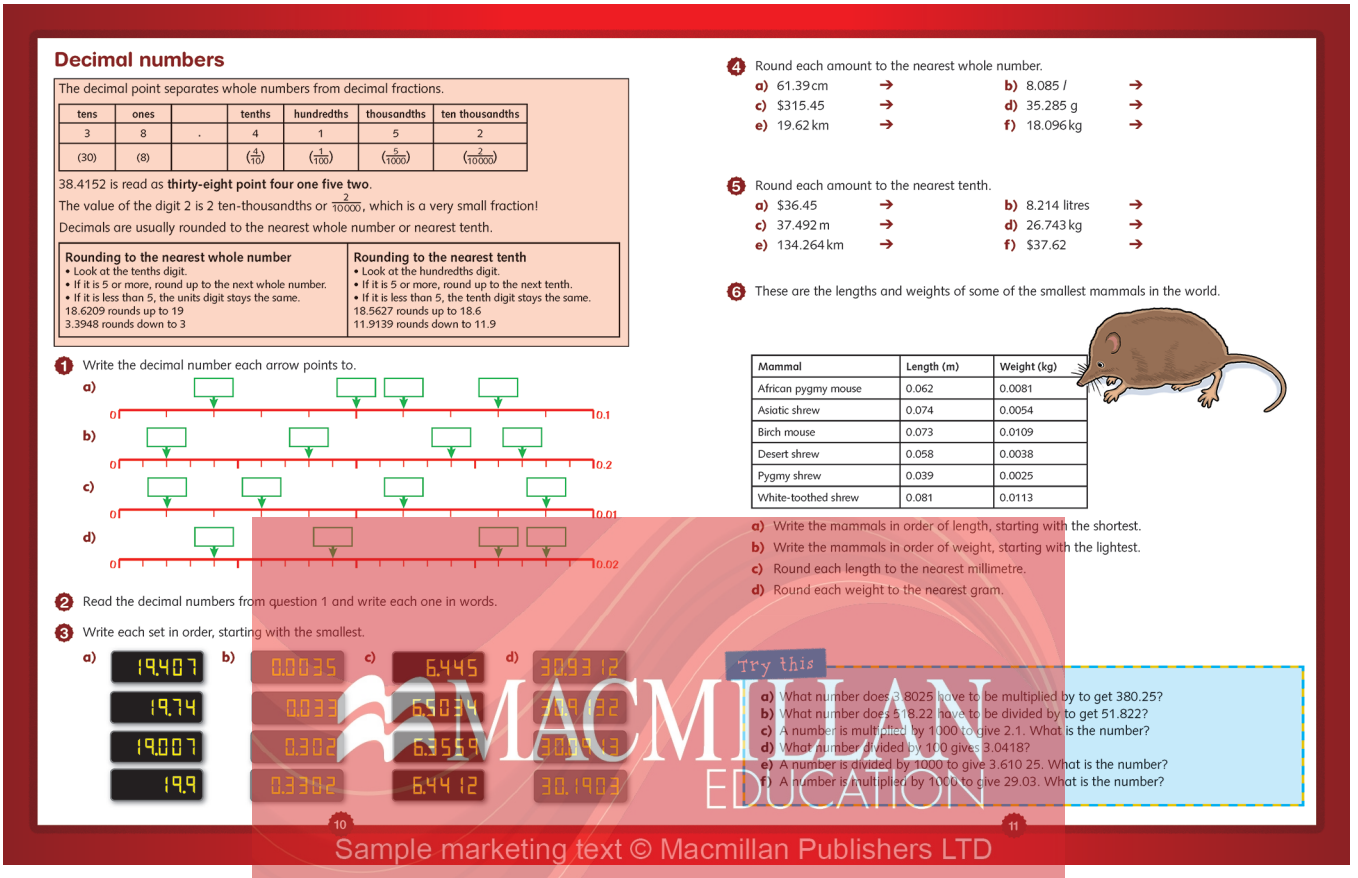
b) 10^7 The sum of the index numbers in the multiplication gives this answer.

c) 800 000 000

d) 8×10^8 The first numbers are multiplied and the index numbers are added.

Lesson 4 **Decimal numbers**

Pupil's Book pages 10 and 11 **Oral and mental starter: What's the order?**



Decimal numbers

The decimal point separates whole numbers from decimal fractions.

tens	ones		tenths	hundredths	thousandths	ten thousandths
3	8	.	4	1	5	2
(30)	(8)		$(\frac{4}{10})$	$(\frac{1}{100})$	$(\frac{5}{1000})$	$(\frac{2}{10000})$

38.4152 is read as **thirty-eight point four one five two**.

The value of the digit 2 is 2 ten-thousandths or $\frac{2}{10000}$, which is a very small fraction!

Decimals are usually rounded to the nearest whole number or nearest tenth.

Rounding to the nearest whole number
- Look at the tenths digit.
- If it is 5 or more, round up to the next whole number.
- If it is less than 5, the units digit stays the same.

18.6209 rounds up to 19
3.3948 rounds down to 3

Rounding to the nearest tenth
- Look at the hundredths digit.
- If it is 5 or more, round up to the next tenth.
- If it is less than 5, the tenth digit stays the same.

18.5627 rounds up to 18.6
11.9139 rounds down to 11.9

1 Write the decimal number each arrow points to.

a) 0 → 0.1
b) 0 → 0.2
c) 0 → 0.01
d) 0 → 0.02

2 Read the decimal numbers from question 1 and write each one in words.

3 Write each set in order, starting with the smallest.

a) 19.407, 19.74, 19.007, 19.9
b) 0.0035, 0.033, 0.302, 0.3302
c) 6.445, 6.5034, 6.3559, 6.4412
d) 30.0913, 30.1903, 30.9132, 30.9312

4 Round each amount to the nearest whole number.

a) 61.39 cm →
b) 8.085 l →
c) $315.45 →
d) 35.285 g →
e) 19.62 km →
f) 18.096 kg →

5 Round each amount to the nearest tenth.

a) $36.45 →
b) 8.214 litres →
c) 37.492 m →
d) 26.743 kg →
e) 134.264 km →
f) $37.62 →

6 These are the lengths and weights of some of the smallest mammals in the world.

Mammal	Length (m)	Weight (kg)
African pygmy mouse	0.062	0.0081
Asiatic shrew	0.074	0.0054
Birch mouse	0.073	0.0109
Desert shrew	0.058	0.0038
Pygmy shrew	0.039	0.0025
White-toothed shrew	0.081	0.0113

a) Write the mammals in order of length, starting with the shortest.
b) Write the mammals in order of weight, starting with the lightest.
c) Round each length to the nearest millimetre.
d) Round each weight to the nearest gram.

Try this

a) What number does 3.8025 have to be multiplied by to get 380.25?
b) What number does 518.22 have to be divided by to get 51.822?
c) A number is multiplied by 1000 to give 2.1. What is the number?
d) What number divided by 100 gives 3.0418?
e) A number is divided by 1000 to give 3.610 25. What is the number?
f) A number is multiplied by 100 to give 29.03. What is the number?

10 11

Activities

- Write 31.358 and ask the class to read it together. Ensure that all pupils read it correctly, i.e. thirty-one point three five eight (*not* thirty-one point three hundred and fifty-eight). Ask for the place value of each digit, stressing tenths, hundredths and thousandths of a whole unit. Put another digit on the right of the number and ask 'What is its place value?'
- Read the introduction on page 10. Ask pupils to round to the nearest whole number and tenth.

Answers

1 a) 0.02, 0.05, 0.06, 0.08
b) 0.02, 0.08, 0.14, 0.17
c) 0.001, 0.003, 0.006, 0.009
d) 0.004, 0.009, 0.016, 0.018

2 a) zero point zero two, zero point zero five, zero point zero six, zero point zero eight
b) zero point zero two, zero point zero eight, zero point one four, zero point one seven
c) zero point zero zero one, zero point zero zero three, zero point zero zero six, zero point zero zero nine
d) zero point zero zero four, zero point zero zero nine, zero point zero one six, zero point zero one eight

3 a) 19.007, 19.407, 19.74, 19.9
b) 0.0035, 0.033, 0.302, 0.3302
c) 6.3559, 6.4412, 6.445, 6.5034
d) 30.0913, 30.1903, 30.9132, 30.9312

4 a) 61 cm b) 8 l c) $315 d) 35 g e) 20 km f) 18 kg

5 a) $36.50 b) 8.21 c) 37.5 m d) 26.7 kg e) 134.3 km f) $37.60

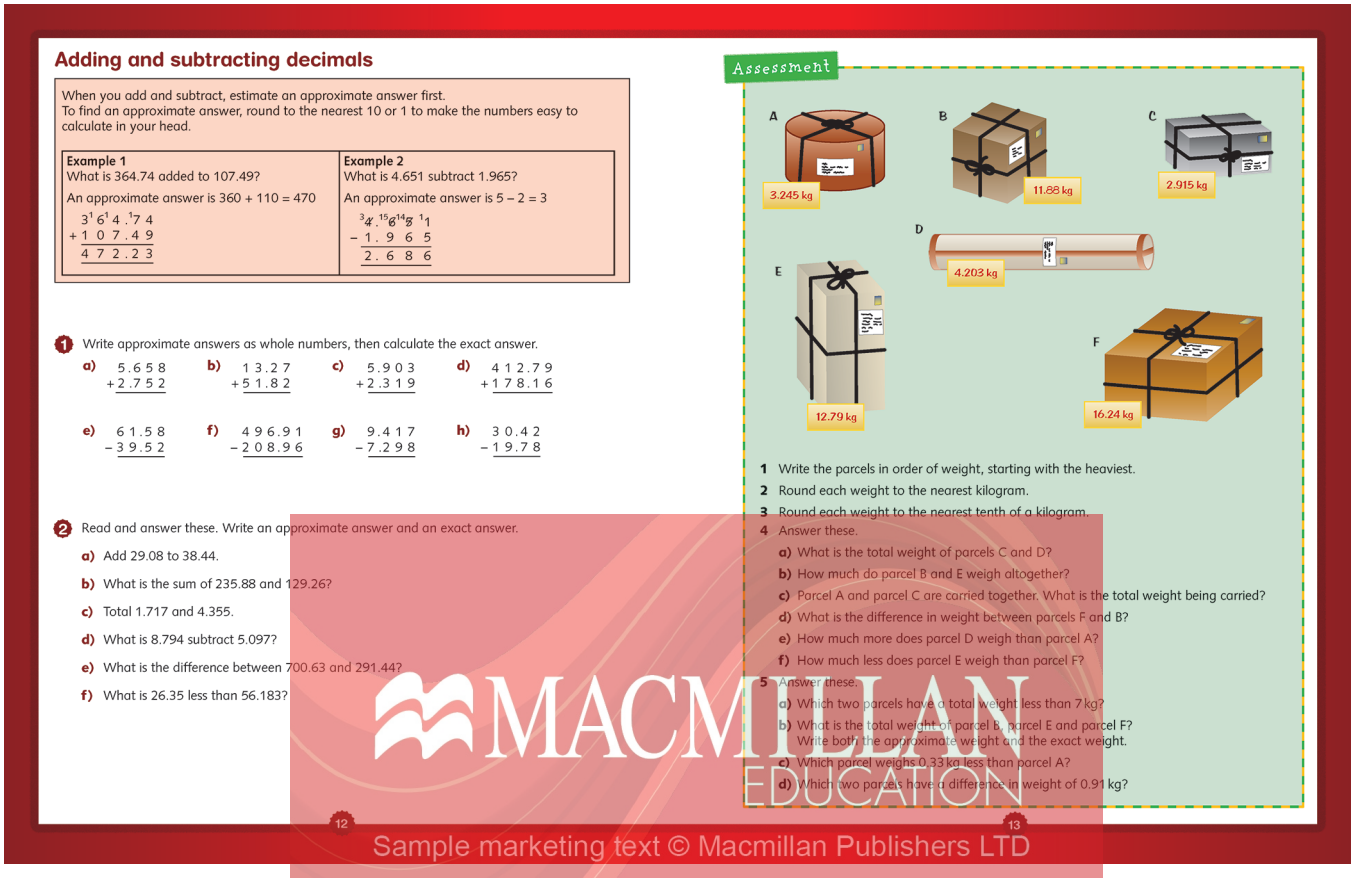
6 a) Pygmy shrew → 0.039, Desert shrew → 0.058, African pygmy mouse → 0.062, Birch mouse → 0.073, Asiatic shrew → 0.074, White-toothed shrew → 0.081
b) Pygmy shrew → 0.0025, Desert shrew → 0.0038, Asiatic shrew → 0.0054, African pygmy mouse → 0.0081, Birch mouse → 0.0109, White-toothed shrew → 0.0113
c) 62 mm, 74 mm, 73 mm, 58 mm, 39 mm, 81 mm
d) 8 g, 5 g, 11 g, 4 g, 3 g, 11 g

Try this

a) 100 b) 10 c) 0.0021
d) 304.18 e) 3610.25 f) 0.02903

Lesson 5 **Adding and subtracting decimals**

Pupil's Book pages 12 and 13 **Oral and mental starter: What's the question?**



Adding and subtracting decimals

When you add and subtract, estimate an approximate answer first.
To find an approximate answer, round to the nearest 10 or 1 to make the numbers easy to calculate in your head.

Example 1	Example 2
What is 364.74 added to 107.49?	What is 4.651 subtract 1.965?
An approximate answer is 360 + 110 = 470	An approximate answer is 5 – 2 = 3
364.74 + 107.49 = 472.23	4.651 − 1.965 = 2.686

1 Write approximate answers as whole numbers, then calculate the exact answer.

a) 5.658 + 2.752 b) 13.27 + 51.82 c) 5.903 + 2.319 d) 412.79 + 178.16

e) 61.58 − 39.52 f) 496.91 − 208.96 g) 9.417 − 7.298 h) 30.42 − 19.78

2 Read and answer these. Write an approximate answer and an exact answer.

a) Add 29.08 to 38.44.
b) What is the sum of 235.88 and 129.26?
c) Total 1.717 and 4.355.
d) What is 8.794 subtract 5.097?
e) What is the difference between 700.63 and 291.44?
f) What is 26.35 less than 56.183?

Assessment

1 Write the parcels in order of weight, starting with the heaviest.
2 Round each weight to the nearest kilogram.
3 Round each weight to the nearest tenth of a kilogram.
4 Answer these.
a) What is the total weight of parcels C and D?
b) How much do parcel B and E weigh altogether?
c) Parcel A and parcel C are carried together. What is the total weight being carried?
d) What is the difference in weight between parcels F and B?
e) How much more does parcel D weigh than parcel A?
f) How much less does parcel E weigh than parcel F?
5 Answer these.
a) Which two parcels have a total weight less than 7 kg?
b) What is the total weight of parcel B, parcel E and parcel F? Write both the approximate weight and the exact weight.
c) Which parcel weighs 0.33 kg less than parcel A?
d) Which two parcels have a difference in weight of 0.91 kg?

Activities

- Look at page 12 and go through the introduction with the class.
- Work through examples such as 13.548 + 8.647, 25.347 – 18.169 with the class. Stress the importance of aligning the digits and the decimal points correctly. In each case ask volunteers to suggest how to approximate the answer and others to prompt each stage of the calculation as you record it on the board. Discuss whether the answer seems reasonable when compared with the estimate. Ask a pupil to check the result on a calculator.

Answers

1 a) 8.410 b) 65.09 c) 8.222 d) 590.95
e) 22.06 f) 287.95 g) 2.119 h) 10.64

2 a) 67.52 b) 365.14 c) 6.072 d) 3.697
e) 409.19 f) 29.833

Assessment

1 F, E, B, D, A, C

2 A → 3 kg, B → 12 kg, C → 3 kg, D → 4 kg, E → 13 kg, F → 16 kg

3 A → 3.2 kg, B → 11.9 kg, C → 2.9 kg, D → 4.2 kg, E → 12.8 kg, F → 16.2 kg

4 a) 7.118 kg b) 24.67 kg c) 6.16 kg d) 4.36 kg
e) 0.958 kg f) 3.45 kg

5 a) A and C b) 40.91 kg c) C d) B and E