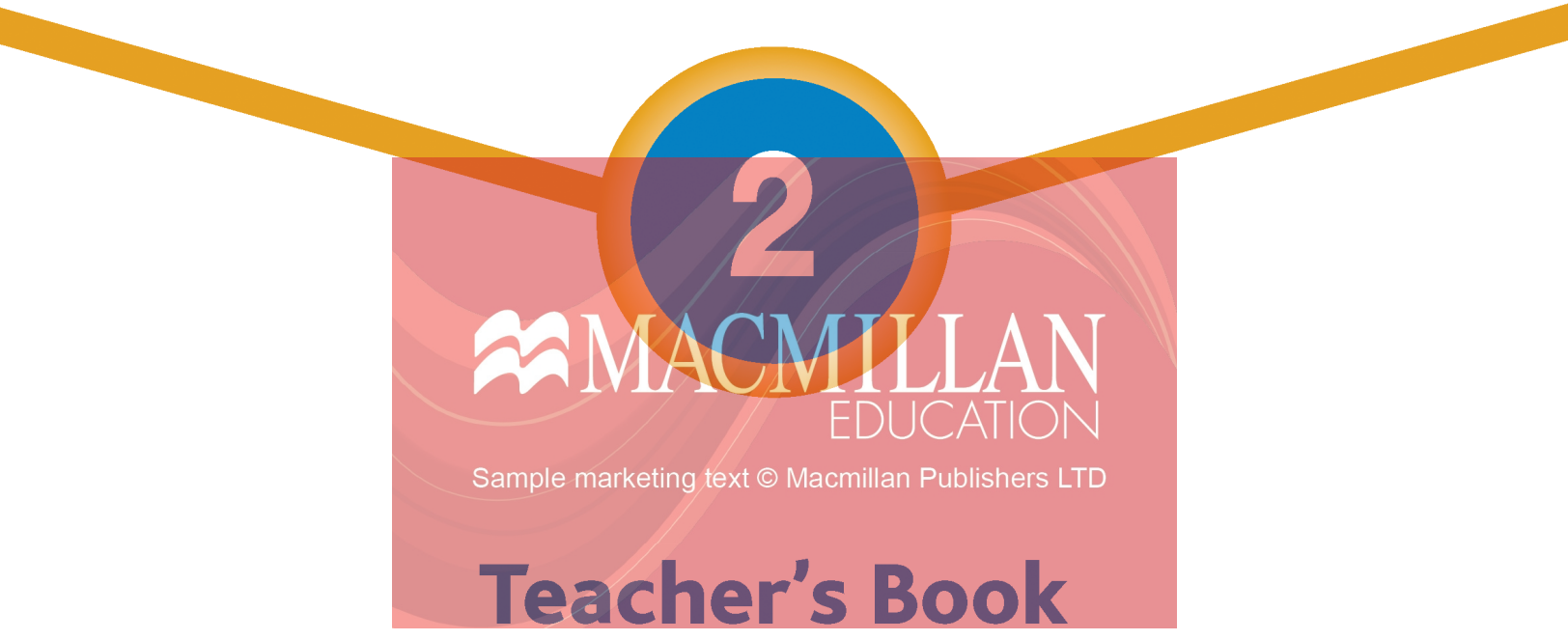
Macmillan Mathematics



Teacher's Book

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MACMILLAN

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Introduction

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

Components

- The **Teacher's Book** gives clear guidance on planning, practical activities and the use of the pupil material for each unit of work.
- The **Pupil's Books** provide 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 year group, the curriculum has been organised into six blocks of work that are progressed over the year. Each block is organised into four teaching units that each covers a week of lessons. Within each unit is contained the set of objectives that guide planning, teaching and pupils' learning. These blocks support an extended period of learning when pupils' progress can be assessed and those pupils who are not keeping up with their peers can receive the additional attention and support they need. The fourth unit in each block is an 'assess and review' unit, allowing teachers to assess and monitor pupils' progress, and their ability to use and apply the skills and concepts learnt in the previous three units.

Teaching sequence

Term 1

September	October	November	December
Block A	Block B		Block C

Term 2

January	February	March	April	May
Block D	Block E		Block F	

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 teachers 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 and look for patterns, rules and properties; direct their 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 the correct use of mathematical vocabulary and the interpretation and use of symbols, images, diagrams and models as tools to support their mathematical thinking and communication.
7 Share the excitement of mathematics, capturing pupils' imagination by teaching creatively and with enthusiasm.

Structure of Teacher's Book

Objectives: The objectives from the syllabus covered by this 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 these 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 possible suggestions for using and applying the mathematics in real life.

End of unit evaluation: Learning outcomes for this unit of work, with key area of assessment linked to the objectives. This 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 maths 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.
- They can be used as a method of 'keeping sharp' the skills and concepts introduced in previous units.
- They reinforce the importance of the language of mathematics, with regular use of the vocabulary.
- They allow you to assess pupils' knowledge of an area you intend to teach in the main part of the lesson.

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

Hands up (reading and writing numbers to 999): Write a set of numbers on the board, e.g. 91, 450, 18, 678, 803, 555, 900. Ask a pupil to point to a given number. Ask the class to raise their hands if they agree. Repeat with other numbers.

Hold up (reading and writing numbers to 999): Ask each pupil to write a given number then hold it up for you to see. Repeat with other numbers.

One more (conservation of number): Ask a pupil to stand at the front. Ask the class 'How many children?' Ask another pupil to the front. 'How many children now?' Encourage them to answer without counting. Repeat, asking 1 more pupil out each time, emphasising that there is no need to count the new group because the previous group number was known, they just need to add 1 more. Ask one pupil at a time to leave the group, the pupils working out 1 less each time.

Zero!: Ask the class to count from 0 to an appropriate number and then count back, clapping with each number.

What's the order? (ordering numbers to 999): Write a set of numbers in random order on the board. Explain that the numbers are 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?' Alter if necessary.

Start here: Ask the class to count on from different starting numbers, e.g. start at 487 and count to 509. Develop to include counting back to the starting number.

Steps: Ask the class to count on from a given starting number in twos and then back. Use different steps as appropriate, e.g. fives, tens, hundreds.

Arrows away (place value to 999): Show a 2- or 3-digit number using arrow cards, e.g. 435. Ask 'What is this number? What does the 4 mean?' (4 hundred). Move the bottom card to reveal 400. 'What does the 3 mean?' (thirty or 3 tens). Move the top arrow card to reveal 30. Replace the top card. 'What is the value of the 5?' (5 ones or units). Repeat with other numbers.

Hidden fingers (addition/subtraction facts within 10): Hold up 2 hands, palms facing you. Ask 'How many fingers (including thumbs) can you see?' Hide a number of fingers by bending them down towards you. 'How many can you see now? How many can't you see?' Repeat with different numbers.

Flash facts (addition, subtraction and multiplication facts): Ask number fact questions (e.g. 5 + 4, 12 + 3, 5 + 8, 17 – 6, 15 – 7, 2 × 7, 5 × 8, 3 × 5) for pupils to answer together or by holding up a number card when you give a signal. Allow a little time before your signal, then reduce the time as confidence increases.

Pairs for sums (addition): Give an appropriate number. Pupils choose 2 numbers which add to that total. They could hold up number cards, write 2 numbers and hold them up, or give individual answers orally.

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

My way (adding and subtracting 2-digit numbers mentally): Write a 2-digit addition or subtraction calculation on the board for pupils to work out mentally. 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 46 + 23 'I added 46 and 20 which is 66' (record 46 + 20 = 66) 'then I added 3 to give 69' (record 66 + 3 = 69).

Name it (identifying shapes from descriptions): Describe a shape using mathematical properties (but don't show the shape), e.g. 'This shape has 3 faces. Two of its faces are circles. It can roll. What shape is it?'

Double it: Give a few numbers for the class to double and respond together, then give a number for an individual pupil to double. Repeat with different numbers.

Halve it: Give even numbers for pupils to halve, as a whole class, individually, or a mixture of both.

Quarter it: Give multiples of four for pupils to quarter, as a whole class, individually or a mixture of both.

Tell me a story: Write a calculation on the board, e.g. 24 – 8 = 16; 14 + 28 = 42; 5 × 6 = 30. Ask pupils to make up a 'number story' for the calculation, e.g. 'We made 24 biscuits. 8 of them have been eaten, so there are 16 left.' Invite a few pupils to tell their stories.

What's the question?: Provide an appropriate number, e.g. 10. Say 'The answer is 10. What's the question?' Pupils give number statements which have 10 as the answer, e.g. 6 + 4, 5 × 2, 12 – 2, half of 20 etc. Record each on the board. Collect as many suggestions as possible within a time limit.

Language (understanding mathematical vocabulary): Give instructions or ask questions using mathematical terms such as: multiply, multiple, plus, total, sum, subtract, difference, fraction, metre, centimetre, litre, kilogram, polygon, line, ray, segment, e.g. 'Multiply 3 by 5. What is the difference between 16 and 36? What is the name of a polygon with 5 sides? Which of these is a ray? Which is a segment?' etc.

In time: Set the teaching clock to o'clock, half past, quarter past and quarter to times. Ask pupils to give the time in both analogue and digital form (e.g. quarter past 10; 10:15). Ask questions such as 'What time is half/quarter of an hour later? What time will it be in 2 hours?'

Pupil's Book 2A

Block A Numbers and addition

Maths Topic	National Standards from Government Guidelines	
Unit	*Curriculum area*	*End of year objectives / success criteria*
1 Numbers to 100	Understanding numbers, methods of displaying them and the relations between them	Develop a primary understanding of counting in tens to 100 and place value up to 99. Read and write numbers composed of units and tens in both numbers (figure) and letter form.
2 Numbers to 999	Understanding numbers, methods of displaying them and the relations between them	Read and write 100 and its multiples up to 900. Develop a primary understanding of counting in tens to 100 and place value up to 999. Read and write numbers composed of units, tens and hundreds in both numbers (figure) and letter form.
3 Addition to 99	Understanding numerical operations and the relations between them Calculate skilfully and make reasonable assessments Use of symbols and shapes to display simple mathematical situations	Understand the meaning of adding 2 or 3 numbers whose sum does not exceed 99, with or without renaming. Choose the basic operation needed to solve a mathematical or everyday problem (word problems). Check the result of any addition problem. Use different and suitable methods for addition like Mental Maths or use of paper and pencil (written). Use approximation in solving addition of numbers. Identify numerical examples showing the properties of addition up to 99, without explicitly naming them.
4 Assess and review	Revision and assessment of previous 3 units – problems, formative and summative assessment. Activities to monitor, assess, evaluate and consolidate pupils' knowledge and understanding.	

During this block of work, pupils will experience:

1 Counting, reading, writing and ordering numbers to 100.
2 Reading and displaying numbers on an abacus.
3 Reading and writing numbers to 999.
4 Understanding place value in numbers to 999.
5 Adding numbers with a sum < 100 without renaming, then with renaming.

Unit 1 **Numbers to 100**

Term 1 Block A
Numbers and addition
Unit 1 Numbers to 100
Unit 2 Numbers to 999
Unit 3 Addition to 99
Unit 4 Assess and review

Objectives
At the end of the unit, students should be able to…
Develop a primary understanding of counting in tens to 100 and place value.
Read and write numbers composed of units and tens in both number (figure) and letter form.

Vocabulary
Names for numbers to 100, tens, units, digits, place value, abacus

Lessons
1 Counting to 20
2 Counting in tens
3 Counting to 100
4 Reading numbers to 99
5 Using an abacus

Oral and mental starters
One more
Zero!
Start here
Hands up
Hold up

Resources
Abacus
A large 10 × 10 grid numbered 1–100 on display
Tens and units apparatus (e.g. ten rods and unit cubes, or bundles of ten sticks and unit sticks)
Arrow cards
Pupil's Book pages 4–13

Prior learning
Counting, reading, writing and ordering numbers to 99
Counting in tens to 100
Understanding place value in 2-digit numbers (Grade 1)

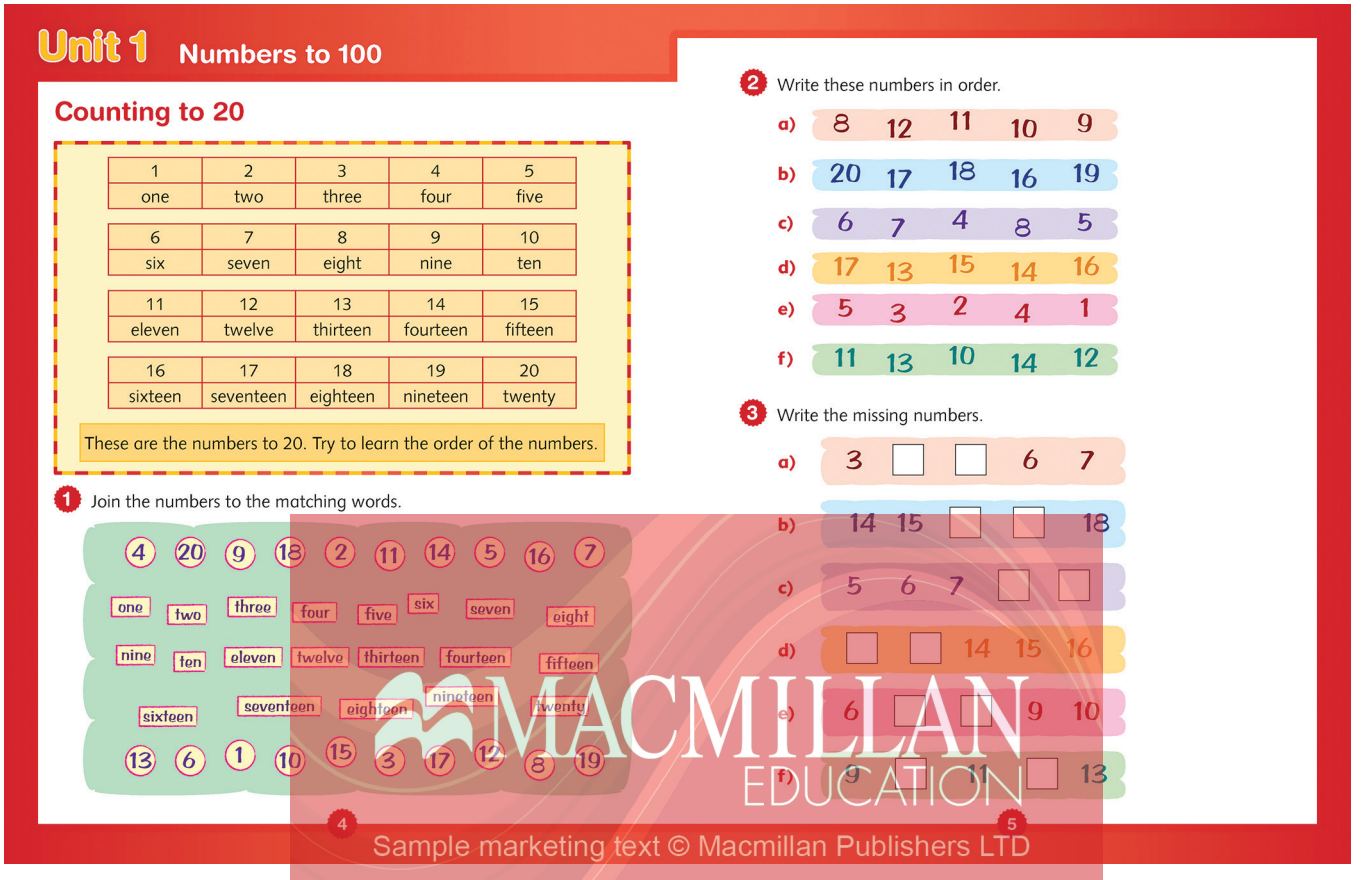
Background notes
This unit revises and consolidates learning undertaken in Grade 1. The concept of place value, which is included in this unit, needs much reinforcement to ensure that all pupils are confident in their understanding and to help to avoid errors in calculation. The use of materials such as an abacus, arrow cards and materials grouped in tens and hundreds are very helpful in the development of this concept.

End of unit evaluation
Check that pupils are able to:
1 Read, write and order numbers to 100.
2 Count in tens to 100.
3 Know the value of each digit in a 2-digit number.

Supporting the topic
Explain that the work in this unit is designed to remind pupils about the numbers they learnt about in Grade 1.
Discuss situations in everyday life when things need to be counted, e.g. the number of pupils in the class, the number of hens in a farmer's field, the numbering of houses or flats for identification.
Use the classroom 1–100 grid whenever appropriate across the curriculum to consolidate understanding.

Lesson 1 **Counting to 20**

Pupil's Book pages 4 and 5 **Oral and mental starter: One more**



Unit 1 Numbers to 100

Counting to 20

1	2	3	4	5
one	two	three	four	five
6	7	8	9	10
six	seven	eight	nine	ten
11	12	13	14	15
eleven	twelve	thirteen	fourteen	fifteen
16	17	18	19	20
sixteen	seventeen	eighteen	nineteen	twenty

These are the numbers to 20. Try to learn the order of the numbers.

1 Join the numbers to the matching words.

4 20 9 18 2 11 14 5 16 7

one two three four five six seven eight

nine ten eleven twelve thirteen fourteen fifteen

sixteen seventeen eighteen nineteen twenty

13 6 1 10 15 3 17 12 8 19

2 Write these numbers in order.

a) 8 12 11 10 9

b) 20 17 18 16 19

c) 6 7 4 8 5

d) 17 13 15 14 16

e) 5 3 2 4 1

f) 11 13 10 14 12

3 Write the missing numbers.

a) 3 ☐ ☐ 6 7

b) 14 15 ☐ ☐ 18

c) 5 6 7 ☐ ☐

d) ☐ ☐ 14 15 16

e) 6 ☐ ☐ 9 10

f) 9 ☐ 11 ☐ 13

4 5

Activities

- Ask the class to count together to 40 as you point to the numbers in turn on the class 1–100 grid. Ask them to close their eyes and count to 20.
- Ask questions such as 'Which number comes after 7? What is 1 more than 12? What is 1 less than 9? Which number comes between 12 and 14?' etc.
- Ask the pupils to count round the class, the first pupil saying 1, the second saying 2 etc until all pupils have had a turn. Ask 'How many pupils are here today?'
- Repeat, starting with the last pupil and finishing with the first. Repeat with pupils in a different order. Prompt any pupils who need help and note them for support during the lesson.
- Look at page 4. Ask the class to say the numbers 1–20 as they point to each in the introduction. Write the names (in words) of some of the numbers on the board and ask the class to read them together, then find them on the grid.
- At the end of the lesson ask individual pupils to read a completed sequence from question 2 or 3.

Answers

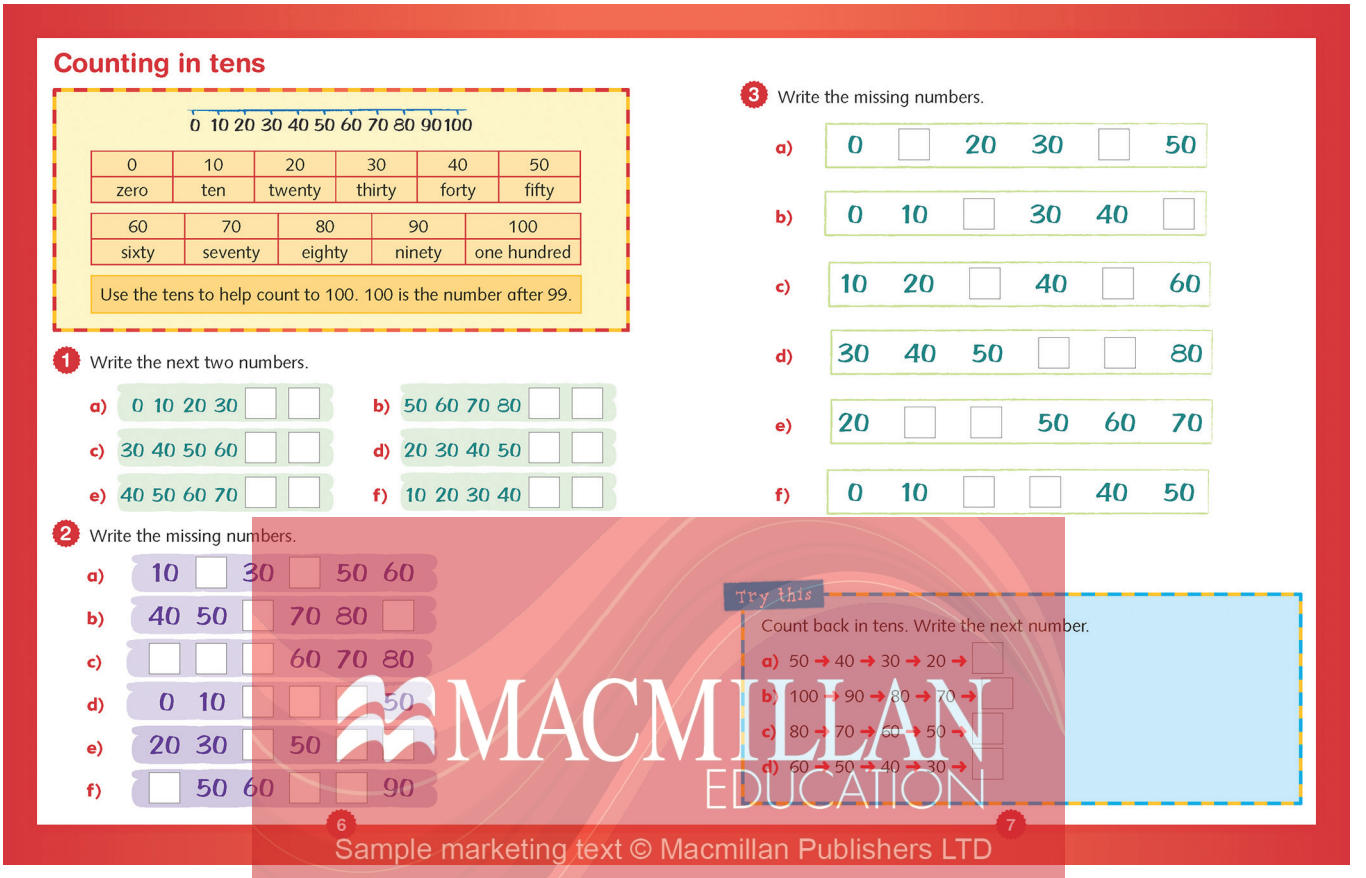
1 1 → one, 2 → two, 3 → three, 4 → four, 5 → five, 6 → six, 7 → seven, 8 → eight, 9 → nine, 10 → ten, 11 → eleven, 12 → twelve, 13 → thirteen, 14 → fourteen, 15 → fifteen, 16 → sixteen, 17 → seventeen, 18 → eighteen, 19 → nineteen, 20 → twenty

2 a) 8, 9, 10, 11, 12 b) 16, 17, 18, 19, 20
c) 4, 5, 6, 7, 8 d) 13, 14, 15, 16, 17
e) 1, 2, 3, 4, 5 f) 10, 11,12, 13, 14

3 a) 4, 5 b) 16, 17 c) 8, 9 d) 12, 13
e) 7, 8 f) 10, 12

Lesson 2 **Counting in tens**

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



Counting in tens

0 10 20 30 40 50 60 70 80 90 100

0	10	20	30	40	50
zero	ten	twenty	thirty	forty	fifty

60	70	80	90	100
sixty	seventy	eighty	ninety	one hundred

Use the tens to help count to 100. 100 is the number after 99.

1 Write the next two numbers.

a) 0 10 20 30 ☐ ☐
b) 50 60 70 80 ☐ ☐
c) 30 40 50 60 ☐ ☐
d) 20 30 40 50 ☐ ☐
e) 40 50 60 70 ☐ ☐
f) 10 20 30 40 ☐ ☐

2 Write the missing numbers.

a) 10 ☐ 30 ☐ 50 60
b) 40 50 ☐ 70 80 ☐
c) ☐ ☐ ☐ 60 70 80
d) 0 10 ☐ ☐ ☐ 50
e) 20 30 ☐ 50 ☐ ☐
f) ☐ 50 60 ☐ ☐ 90

3 Write the missing numbers.

a) 0 ☐ 20 30 ☐ 50
b) 0 10 ☐ 30 40 ☐
c) 10 20 ☐ 40 ☐ 60
d) 30 40 50 ☐ ☐ 80
e) 20 ☐ ☐ 50 60 70
f) 0 10 ☐ ☐ 40 50

Try this

Count back in tens. Write the next number.

a) 50 → 40 → 30 → 20 → ☐
b) 100 → 90 → 80 → 70 → ☐
c) 80 → 70 → 60 → 50 → ☐
d) 60 → 50 → 40 → 30 → ☐

6 7

Activities

- Give ten rods (or a bundle of 10 sticks or straws) to groups of 4 or 5 pupils so that all pupils can clearly see and count them. 'How many cubes are there in your rod (or sticks in your bundle)?' Establish that there are 10.
- Ask one pupil from each group to bring their rod to the front. Ask the first to hold up the rod. 'How many cubes are in this rod?' Indicate the number 10 on the class 1–100 grid. Ask the next pupil to hold up his/her rod alongside the first. 'How many cubes now?' Count on ten from 10 on the class grid, i.e. counting 11 as 1, 12 as 2 etc to illustrate that 10 + 10 = 20. Repeat with the rest of the rods to establish the pattern of counting in tens.
- Ask the class to count in 10s to 100 as you indicate each number on the class grid. 'What is 10 more than 90?' Discuss that 100 has 3 digits. 'What is 10 more than: 10 … 30 … 60?' etc.
- Look at the number track on page 6. Explain that each space from one multiple of 10 to the next represents 10 unit spaces.
- At the end of the lesson ask the class to close their eyes then count in 10s from 0 to 100 and then back.

Answers

1 a) 40, 50 b) 90, 100 c) 70, 80
d 60, 70 e) 80, 90 f) 50, 60

2 a) 20, 40 b) 60, 90 c) 30, 40, 50
d) 20, 30, 40 e) 40, 60, 70 f) 40, 70, 80

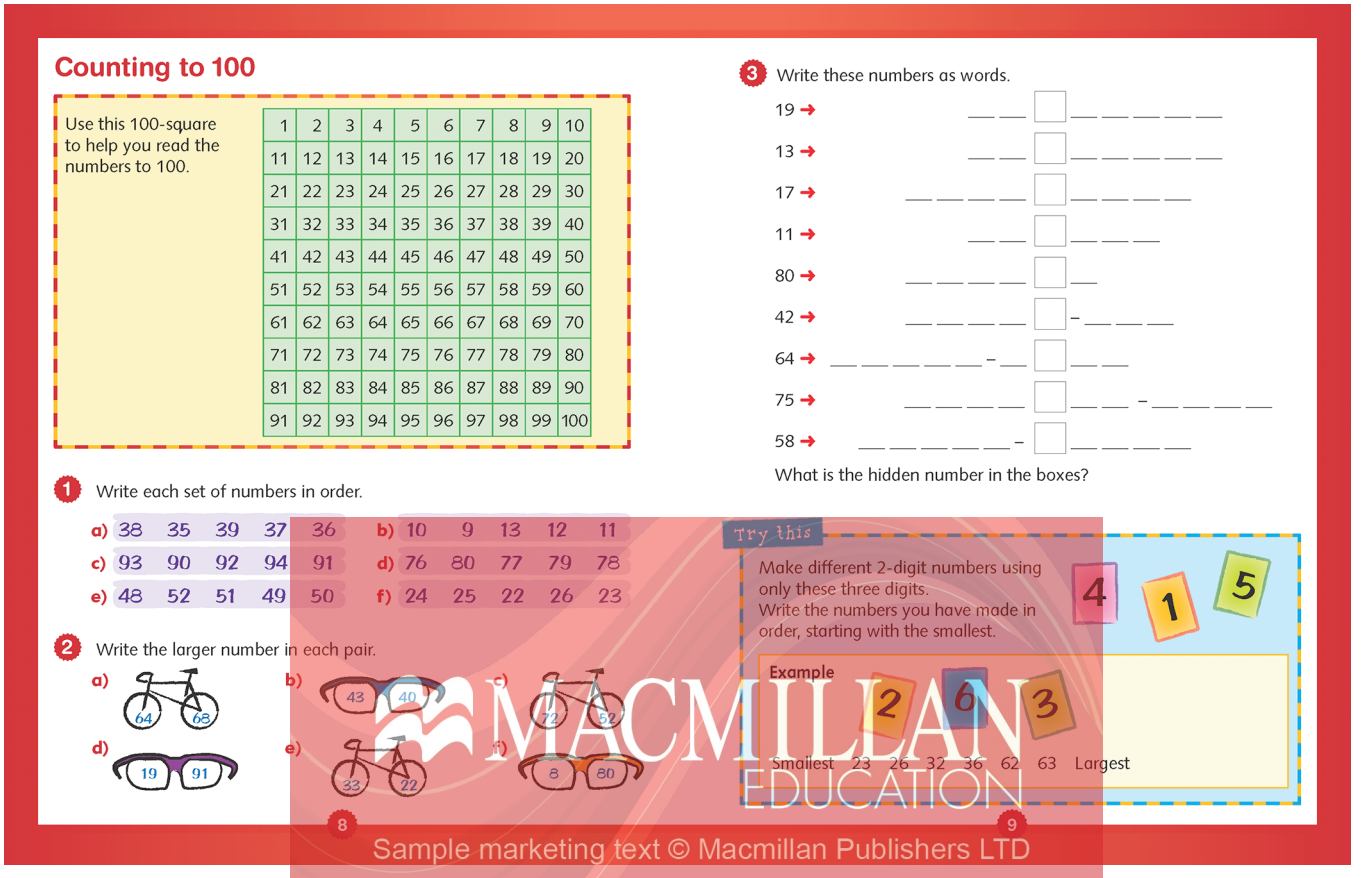
3 a) 10, 40 b) 20, 50 c) 30, 50
d) 60, 70 e) 30, 40 f) 20, 30

Try this

a) 10 b) 60 c) 40 d) 20

Lesson 3 **Counting to 100**

Pupil's Book pages 8 and 9 **Oral and mental starter: Start here**



Activities

- Look at page 8. Talk about the arrangement of numbers on the 1–100 grid, emphasising that they increase by 1 along each row and from the end of one row to the beginning of the next. 'Can you see any patterns? How do they work?' Discuss and clarify pupils' suggestions. Ask pupils to point to a particular number on the grid and count on 5 more numbers. Repeat with other starting numbers.
- Ask pupils to use the grid on page 8 to answer questions such as 'Which number comes after 30? … before 40? … after 62? … between 73 and 75? … before 100?' 'What is 1 more than 52? … 2 more than 29? … 1 less than 81?' etc.
- At the end of the lesson ask for the numbers made in 'Try this' in order, starting with the smallest.

Answers

1 a) 35, 36, 37, 38, 39 b) 9, 10, 11, 12, 13
c) 90, 91, 92, 93, 94 d) 76, 77, 78, 79, 80
e) 48, 49, 50, 51, 52 f) 22, 23, 24, 25, 26

2 a) 68 b) 43 c) 72 d) 91 e) 33 f) 80

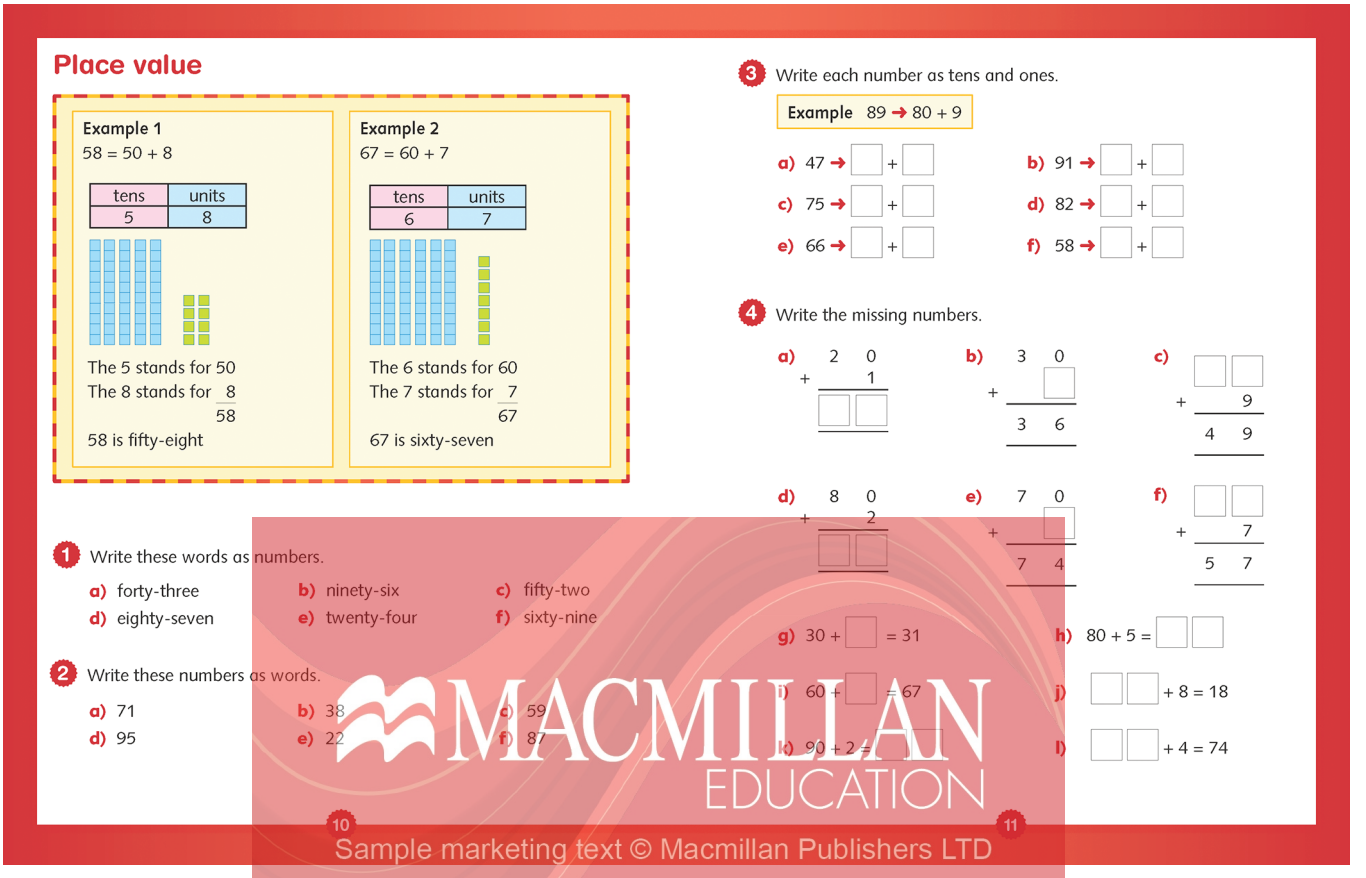
3 nineteen, thirteen, seventeen, eleven, eighty, forty-two, sixty-four, seventy-five, fifty-eight; 91

Try this

14, 15, 41, 45, 51, 54

Lesson 4 **Place value**

Pupil's Book pages 10 and 11 **Oral and mental starter: Hands up**



Place value

Example 1
58 = 50 + 8

tens	units
5	8

The 5 stands for 50
The 8 stands for 8
58
58 is fifty-eight

Example 2
67 = 60 + 7

tens	units
6	7

The 6 stands for 60
The 7 stands for 7
67
67 is sixty-seven

1 Write these words as numbers.
a) forty-three b) ninety-six c) fifty-two
d) eighty-seven e) twenty-four f) sixty-nine

2 Write these numbers as words.
a) 71 b) 38 c) 59
d) 95 e) 22 f) 87

3 Write each number as tens and ones.
Example 89 → 80 + 9
a) 47 → + b) 91 → +
c) 75 → + d) 82 → +
e) 66 → + f) 58 → +

4 Write the missing numbers.
a) 2 0 + 1 = ☐☐
b) 3 0 + ☐ = 3 6
c) ☐☐ + 9 = 4 9
d) 8 0 + 2 = ☐☐
e) 7 0 + ☐ = 7 4
f) ☐☐ + 7 = 5 7
g) 30 + ☐ = 31
h) 80 + 5 = ☐☐
i) 60 + ☐ = 67
j) ☐☐ + 8 = 18
k) 90 + 2 = ☐☐
l) ☐☐ + 4 = 74

10 11

Activities

- Look at page 10. Ask 'Which number is the same as 5 tens?' Illustrate 58 with the set of arrow cards then go through the explanation in the example with the class. Repeat for 67.
- Ask a pupil to say any 2-digit number. 'How many tens are there in that number? How many units?' Record on the board in tens and units boxes as shown in the examples on page 10. Ask another pupil to show the number on the arrow cards. Record the number as a multiple of ten with the units below and a total below that (as in the examples), then write the number in words. Repeat with a few more numbers and pupils.
- Write 37 on the board. Ask 'What is the value of the 3 in 37? What is the value of the 7?' Ask pupils to suggest other numbers which have 7 units and record them on the board, then other numbers with 3 tens.
- Explain that in question 4 the boxes stand for missing digits. Write an example on the board such as

  5 0
  + ❑
  5 4

  and work through it with the class.

Answers

1 a) 43 b) 96 c) 52 d) 87 e) 24 f) 69

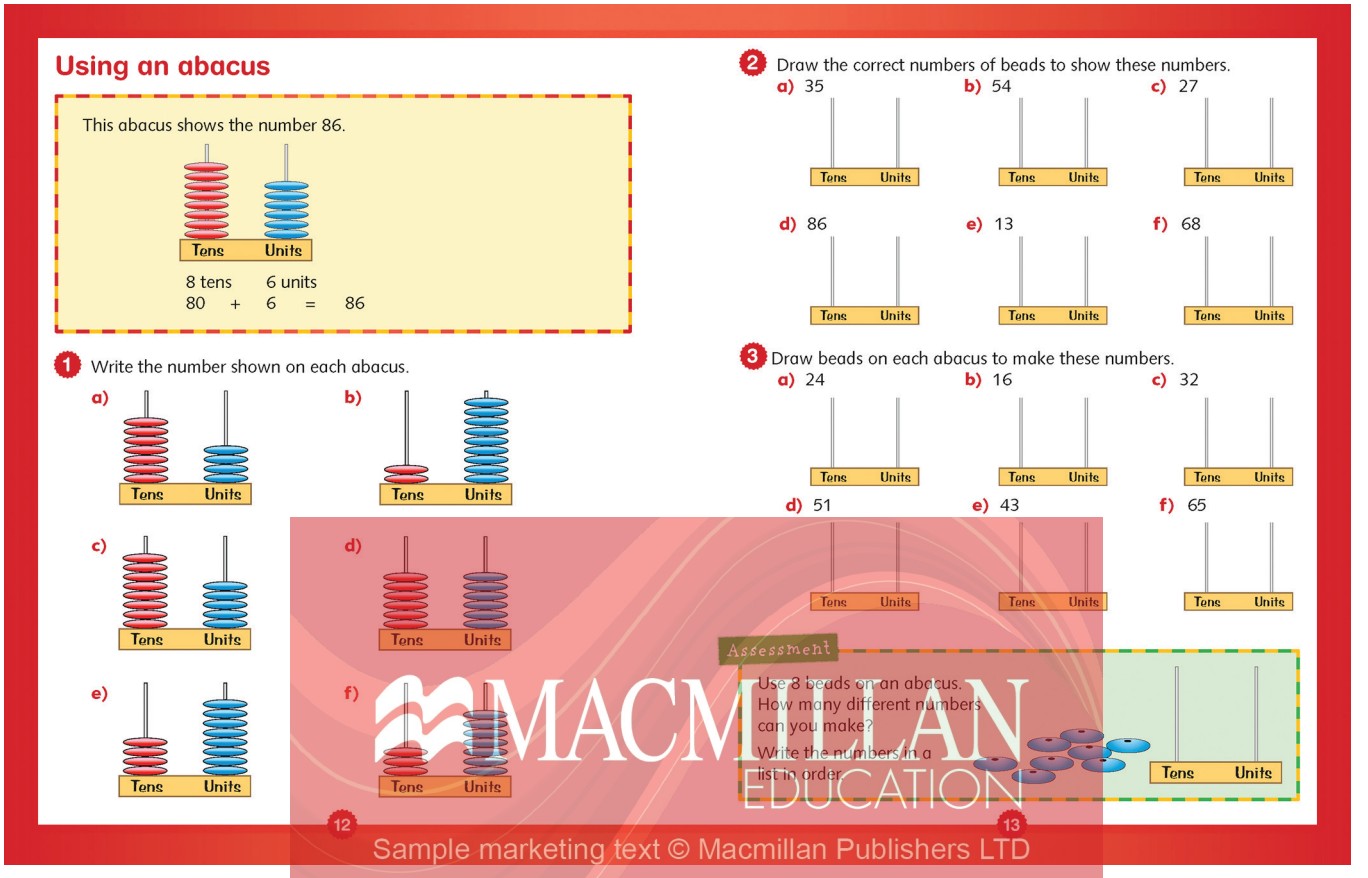
2 a) seventy-one b) thirty-eight c) fifty-nine
d) ninety-five e) twenty-two f) eighty-seven

3 a) 40 + 7 b) 90 + 1 c) 70 + 5
d) 80 + 2 e) 60 +6 f) 50 + 8

4 a) 21 b) 6 c) 40 d) 82 e) 4 f) 50
g) 1 h) 85 i) 7 j) 10 k) 92 l) 70

Lesson 5 **Using an abacus**

Pupil's Book pages 12 and 13 **Oral and mental starter: Hold up**



Activities

- Ask the class to count to 30 as you place one bead at a time on the abacus. After 9 is reached on the units spike, revise that 10 is shown by removing the 9 units beads and placing 1 bead on the tens spike. Reinforce this in a similar way after 19 and 29.
- Place the beads to show any 2-digit number, e.g. 42, and ask pupils to say the number. Repeat with a few more 2-digit numbers.
- Ask pairs of pupils to come to the front, one to say a number, the other to show it on the abacus. Ask the class to raise their hands if they agree.
- Look at page 12. Go through the example in the introduction then draw a similar abacus picture on the board for another number. 'How many tens are there?' Record below the tens spike. 'How many units?' Record below the units spike with a plus sign between the two numbers. 'What is the number?' Record the number.

Answers

1 a) 74 b) 29 c) 85 d) 66 e) 48 f) 37

2 a) 3 + 5 b) 5 + 4 c) 2 + 7
d) 8 + 6 e) 1 + 3 f) 6 + 8

3 a) 2 + 4 b) 1 + 6 c) 3 + 2
d) 5 + 1 e) 4 + 3 f) 6 + 5

Assessment

8, 17, 26, 35, 44, 53, 62, 71, 80