Oxford International Primary

3

Maths

Teacher's Guide

Second edition

OXFORD

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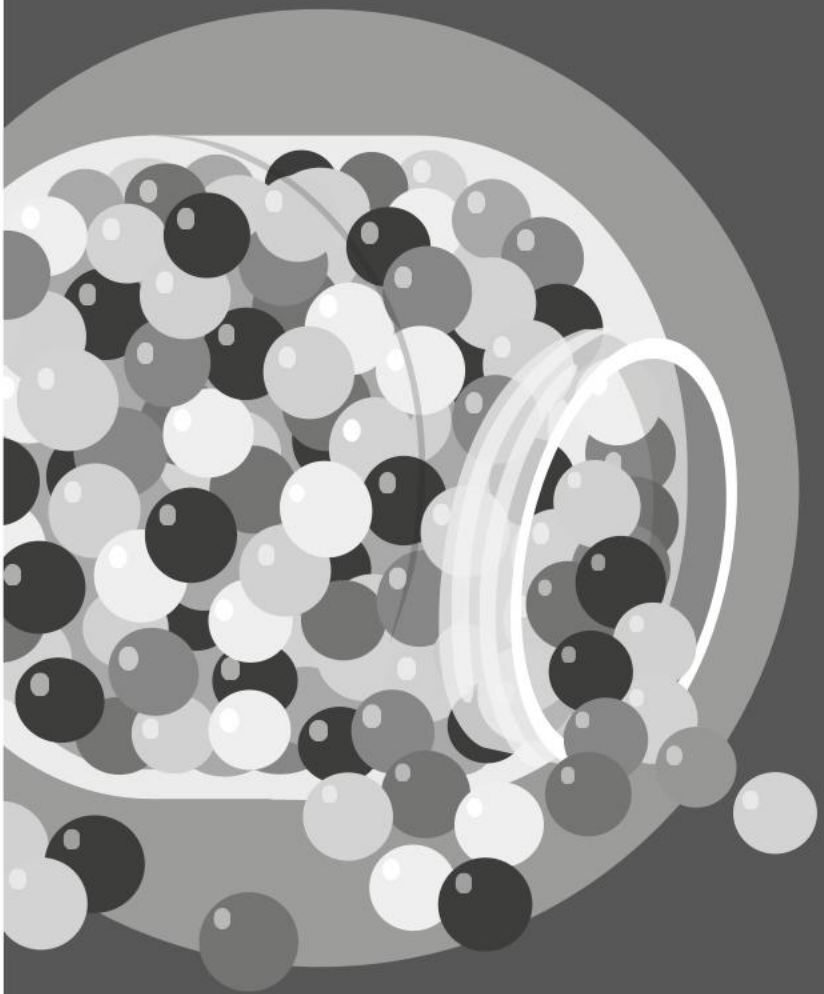
Teacher's Guide



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Contents

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Introduction

The joy of learning maths

We are living in an ever-changing world, where the way we work, live, learn, communicate and relate to one another is constantly shifting. In this climate, we need to instill in our learners the skills to equip them for every eventuality so they are able to overcome challenges, adapt to change and have the best chance of success. To do this, we need to evolve beyond traditional teaching approaches and foster an environment where students can start to build lifelong learning skills for success. Students need to learn how to learn, how to problem solve, be agile and work flexibly. Going hand-in-hand with this is the development of self-awareness and mindfulness through the promotion of wellbeing to ensure that students learn the socio-emotional skills to succeed.

With *Oxford International Primary Math*s, students develop lifelong learning skills as well as mathematical skills. The course promotes the development of real-world skills including financial literacy. The activities in the Student Books and Practice Books offer numerous opportunities to think creatively and develop interpersonal skills. Fundamentally, *Oxford International Primary Math*s promotes students' self-development as critical thinking and motivation are at the heart of the problem-solving approach in the course.

This series is based on the English National Curriculum Programme of Study for Primary Maths. The *Oxford International Primary Maths* books for each stage meet all the learning objectives from the curriculum. Each lesson includes the learning objectives and a summary of the key teaching points. A full mapping grid identifying the unit and lesson where each objective can be found is available online at www.oxfordowl.co.uk

Oxford International Primary Maths: A problem-solving approach

In this second edition of *Oxford International Primary Maths*, there is a strong focus on using a problem-solving approach. While mathematical facts are important, it is unlikely that simply giving students the information they need will result in them understanding the mathematics and being able to apply their learning in new problem-solving situations. This is often described as a move from 'surface learning' to 'deep learning'.

Many people remember mathematics lessons as places where the teacher stood at the front of the class writing on the board. Students wrote down the information, maybe worked through a couple of examples with the teacher and then proceeded to complete a series of exercises to practise the skill that they had been taught. This can be described as a *didactic* approach and it relies on the idea that direct instruction is the appropriate strategy to adopt. The authors of this series would argue that *heuristic* strategies encourage students to explore the mathematics for themselves supported by the teacher. 'Heuristic' derives from the Greek word meaning to discover, and in mathematics learning, heuristic strategies are ones where students engage in exploration and discovery to solve a problem. Heuristic strategies include making a visual representation of a problem, making a calculated guess or estimate, simplifying a problem or following a known method. This results in a deeper understanding.

When faced with any problem in mathematics, there are recognised stages to go through in order to solve the problem, and these have been developed and agreed by many researchers. One version that summaries the problem-solving process comes from Georg Polya.

1. Understand the problem.

2. Devise a plan.

3. Carry out the plan.

4. Check the reasoning.

In following these stages, students use a number of skills that support problem solving, such as using trial and improvement, working systematically, pattern spotting, visualising, conjecturing and generalising.

Embedding a mastery approach

In recent years, the term 'mastery' has been used in conjunction with mathematics learning. It has been drawn from teaching approaches in countries where mathematics performance is deemed to be very high. The essence of mastery is to produce students who have deep conceptual understanding and procedural fluency through learning in a collaborative and problem-solving context. Mastery learning incorporates use of manipulatives, exposure to different methods of solving a problem, dialogue and explanation.

Following a Concrete Pictorial Abstract (CPA) approach

One of the more successful approaches to learning was provided by Jerome Bruner in his model of enactive, iconic and symbolic modes. This has been developed in recent years to form the CPA approach. CPA stands for concrete, pictorial and abstract, each of which aligns with Bruner's modes. The concrete phase involves students making use of physical manipulatives to help understand the learning, before moving to record the learning in pictorial form as individuals. As the learning develops, students will begin to recognise how to record their learning in a more general and abstract way. The CPA approach is not necessarily sequential, and students might move between the different modes as they work through a problem.

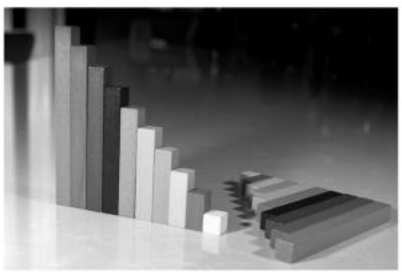
Oxford International Primary Maths and the use of manipulatives

Throughout the series, students are encouraged to use manipulatives, or concrete objects, to model addition, subtraction, multiplication and division. These manipulatives include:

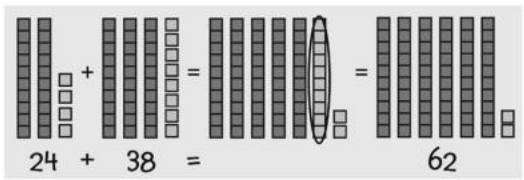
- base-ten equipment (ones-cubes, tens-rods, hundreds-flats and thousands-cubes)

- place-value counters

- number rods.



Such manipulatives are used to explain to students how the written methods 'work', for example by modelling exchanging 10 ones-cubes for 1 tens-rod in an addition.



Differentiation

There are several ways that you can differentiate learning in the classroom. These include differentiation by:

- task
- outcome
- support
- grouping.

It has been traditional in some schools to offer up to three different levels of tasks for each lesson. This is differentiation by task. It is important that all students are exploring the same area of mathematics as they can collaborate and discuss their mathematics in a way that is not possible if students are engaged on different activities. This approach has been extensively researched and published by Jo Boaler of Stanford University, California. For example, she has outlined projects that gave students in different schools either a differentiated approach in lessons, or lessons where everyone worked on the same task (Boaler, J., 2005. *The Elephant in the Classroom.* Souvenir Press). Where all abilities worked on the same task, every student made and sustained 'better than expected' progress, and performed better on statutory tests and exams. The Education Endowment Foundation teacher's toolkit suggests that collaborative learning can result in a five-month acceleration in students' learning. (See https://educationendowmentfoundation.org.uk/resources/teaching-learning-toolkit.)

The expectation in this series is that all students will be offered the same starting point. The activities are carefully designed to be accessible to all students in your class and the teacher's notes for the activity offer differentiated outcomes for students. It is also important that you offer differentiated support to different students. You will mainly do this through the sort of questioning that you engage in and support you offer. You will ask challenging questions and supporting questions to help all students access the task. For example, when engaging in a simple counting activity with some students you might model the action of counting by placing a finger on each object as you count and emphasise the last number you say to model that the last number you say gives the number of objects in the set. You might ask other students engaged in the same activity to compare two sets, or to find one more or one less than the set they are counting.

Grouping students to promote a growth mindset

When engaging in learning mathematics, it is expected that you will use a variety of student groupings. This may be a change for some teachers who have previously grouped students by prior attainment in their classroom. Research has shown that grouping students 'by ability', which usually means grouping students using test results, can have a negative impact on their future attainment. It is more effective to use a range of ways of grouping students. You will decide on the most appropriate way of grouping depending on the activity. You are also given advice in the teacher's notes.
It is important that the teacher is active in deciding which form of grouping is appropriate. It is also important that students learn how to operate in a range of different groups and with a range of different students so that they get used to working in a variety of ways and with different people.

The three main ways of grouping students are based on:

- friendship
- ability/prior experience
- mixed attainment.

Friendship groups, are most appropriate for activities in which the students have been given some element of choice. Perhaps they are carrying out some research for a data handling project or exploring data on animals to develop their understanding of measurement. This grouping is the default if teachers do not actively group students.

Ability groups, or groups based on students' prior experience, may be helpful if the lesson requires a very specific prior knowledge. You can group together the students you know have this knowledge and they can then work with minimal guidance from you, which allows you to focus on groups who need additional support.

Mixed-attainment groups are encouraged for the majority of the activities. This form of grouping is also favoured by those following a mastery approach. Working in collaborative, all-attainment groups also supports students' wellbeing and promotes a growth mindset, as described in research by Carol Dweck. She found that students who were grouped by ability tended to stay in those groupings throughout their school life, and regard themselves as having a fixed ability that could not be changed. This has dire consequences for students in middle or lower sets. When placed in mixed-ability groups, all students can develop a growth mindset which enables them to believe they can learn and improve, whatever their starting point (Dweck, C., 2007. 'The Perils and Promise of Praise'. *Educational Leadership.* October 2007, 65(2), 34–39). A growth mindset is promoted when students do not feel that their future success is predicated on prior achievement. This kind of grouping is particularly helpful for students new to English. Mixed-attainment groups allow students who are less confident in English to hear more-confident peers using mathematical vocabulary. Research has shown that mixed-attainment groups benefit both high attainers, who become more secure in their mathematics knowledge through explaining their thinking to peers, and those less secure in their mathematical knowledge as peer teaching has been shown to be effective.

Whatever form of grouping you choose, it is helpful to assign roles to individuals in the group. Some teachers use 'role cards' to remind members of the group of the role they should play. Here are some examples of roles.

- Leader: You should make sure everyone has a chance to speak and focus the discussion around the task.
- Time keeper: You should encourage the group to stay on task. Announce when the time is half way through and when time is nearly up.
- Recorder: You should write down group members' ideas or draw a collective graphic. You will write on the board during the presentation.
- Presenter: You will present the group's findings to the whole class at the end of the session.
- Resource organiser: You will make sure that group members have all the resources they need during the task.

Assessment

Assessment is the process of establishing how individual students are progressing and what they have achieved, or a means of measuring their learning. Assessment is usually carried out in two main ways – assessment of learning and assessment for learning.

Assessment of learning is sometimes called summative assessment, and takes place at the end of a lesson, a unit, a term or even a year. It measures what students know at that point as a summary of their learning to that point. In *Oxford International Primary Maths*, summative assessment opportunities are provided in the Review lesson at the end of each unit in the Student Book, while half-termly summative assessment opportunities are provided through printable resources, available online.

Assessment for learning is an approach brought to prominence by Paul Black and Dylan Wiliam and is based on the notion that students have a full, clear sense of what they are learning, where they have reached in their learning and what they need to do to improve further. It is carried out during lessons and gives teachers continuous data on each student's learning, as well as allowing students to track their own learning, which provides greater motivation. (Black, P., Harrison, C., Lee, C., Marshall, B., and Wiliam, D. 2004. 'Inside the Black Box: Assessment for Learning in the Classroom'. *Phi Delta Kappan.* (86)1, 8–21).

It is suggested that there are five key strategies for assessment for learning. These are outlined below with suggestions of how you can do this in your classroom.

1 Being clear about learning objectives and success criteria with the students.

Each activity has at least one learning objective. At the beginning of a lesson, share the activity's learning objective with students. This should be more than simply stating the objective. You should make sure that students understand the objective and how you will measure success. For example, you might say: *I know that you can all count 10 objects* and all count to 10 as a class. Then you point to 20 on a number line and ask: *Does anyone know what this number is?* If a student knows it is 20 praise them, if no-one knows, tell them it is 20 and say: *By the end of the lesson I will be able to listen to you count to 20.*

2 Planning student discussions that give you evidence of their learning.

Every activity plan in the Teacher's Guide offers the opportunity for small-group or whole-class discussion. There are also examples of probing questions that you can ask to assess students' current understanding. For example, if a group has been counting two sets of objects you can ask: *Were there more or less in the second group? How do you know?*

3 Giving students feedback that helps them move forward.

This allows students to know whether or not they are meeting the success criteria and what they can do next to move their learning on. Developing the example above, if a group has been comparing two sets and understands the concept of 'more' and 'less' you could ask them to make sets that are one more and one less, or even two more and two less.

4 Activating students to act as instructional resources for each other.

Collaborative group work in mixed-attainment groups, as described by Jo Boaler in her research (see under Differentiation earlier), gives students the opportunity to operate both as learners and teachers, with peer learning being highly effective. Not only is understanding of the mathematics enhanced, but students can support each other in assessing their progress.

5 Activating students as owners of their own learning.

The key point here is to listen carefully to the students and adapt your questioning to support individual development and to follow individual interests.

Questioning is key

The most skilled mathematics teachers can ask open questions to elicit students' current understandings. Skilful open questioning also allows students to articulate their current understanding carefully and though this process either consolidate their understanding or come to realise where they have made a mistake. The list below offers a series of open questions that can be used whatever mathematics you are teaching.

- *How are these the same/different?*
- *About how many/how long/many more … do you think there will be?*
- *What would happen if …?*
- *How else could you have done that?*
- *Why did you ….?*
- *How did you …?*
- *How do you know that is correct?*

If you want students to check their solutions and consolidate their learning it is helpful to ask them to explain how they reached their solution to a friend. Similarly, to support students in reflecting on their learning you might ask the following.

- *What mathematics did you use to solve the problem?*
- *What new mathematics did you learn?*
- *What key words did you use?*
- *What was the most challenging part of the activity?*
- *What did you do when you got stuck?*
- *What other questions could you ask?*
- *Did this remind you of any other areas of mathematics?*

In *Oxford International Primary Maths*, there is an opportunity to ask these reflective questions, and for students to reflect on their learning, at the end of each unit in the Review lesson of the Practice Book.

Word problems

Word problems are useful as an assessment of children's understanding of the correct mathematics to use in any given situation. In *Oxford International Primary Maths* word problems are included throughout the units and on every Student Book Review page as part of the end-of-unit assessment. Many teachers find teaching word problems a challenge. This area is particularly challenging for students with a limited English vocabulary as word problems are tightly bound to linguistic ability. We have to decode and understand what the problem is asking us to do before we can begin to apply our mathematical knowledge. Some teachers have found the following acronym helpful when working with students on solving word problems.

R: Read the problem carefully.

U: Understand what the problem is asking you to do.

C: Choose the mathematics or arithmetical operations that you need to use to solve the problem.

S: Solve the problem.

A: Answer the problem.

C: Check that the answer is accurate and reasonable.

It is often helpful for students to underline key facts and write down the operations they are going to use before they solve the problem. For example:

> Tony rode his bicycle 7 miles to school with his friend. On his way home he took a short cut which was only 5 miles. How far did he cycle altogether?
>
> *This will be an addition calculation.*

It is a useful activity for students to annotate word problems and write down the operation(s) they will use without carrying out the calculation as this focuses on the skill of understanding the problem and choosing the operations appropriately.

Another activity that helps students to become skilled at solving word problems is asking them to write their own word problems based on a picture or a set of objects. Here is an example.

- How many black cubes are there? (3)
- Two friends took three cubes each. How many were left? (2)
- If I take out the black cubes, how many are left? (5)
- If I share the cubes equally between two people, how many do they each get? (4)

Wellbeing and *Oxford International Primary Maths*

It is thought that students learn more and feel more connected to their learning when they are active in their lessons. *Oxford International Primary Maths* has active learning at its heart. Most lessons start with a whole-class session that usually includes a range of physical or active

activites. You will see this signified by a 'star-jump' icon in the Teacher Guide.

Many adults and children have felt anxious about their learning of mathematics at some stage. This anxiety is reduced by working collaboratively in all-attainment groups. There is also a reflective session at the end of each lesson and the formative assessment activity in the Practice Book asks students to reflect on their learning across the unit.

Wellbeing is also supported by effective questioning to support and stretch students and by planning group work carefully. These areas have already been discussed above.

Language support

The challenges

Ministries of Education at both local and national level are increasingly adopting the policy of English Medium Instruction (EMI), for either one or two subjects or across the whole curriculum. The rationale for doing so varies according to the local context, but improving the levels of achievement in English is an important factor.

In international schools an additional reason is likely to be that students do not share a mother tongue with each other or perhaps the teacher. English is, therefore, chosen as the medium for instruction so that all students are in the same position and to provide the opportunity to develop proficiency in an international language.

This does not mean that the mathematics teacher is now being asked to replace the English teacher, or to have the same skills or knowledge of English (though in many primary schools one teacher may indeed teach both). What it does mean, however, is that mathematics teachers have to view their role differently: they have to become much more language aware. It is this recognition of the need to ensure that the delivery of the content is not negatively impacted by the use of the second language that informs the planning and methodology of EMI.

This raises significant challenges, including:

- the teacher's knowledge of English
- students' level of English (which may vary considerably in international schools)
- resources that provide appropriate language support
- assessment tools which ensure that it is the content and not the language that is being tested
- differentiation that acknowledges different levels of proficiency in both language and content.

Meeting the challenges positively

Perhaps lack of confidence in their own English proficiency is one of the most common concerns among teachers. However, while it is a factor, success in EMI is not necessarily linked to teachers' proficiency in English. Teachers who have English as their mother tongue may well lack the sensitivity to, or awareness of, the language that a non-native speaker has acquired through learning and studying the second language. Developing this awareness and demonstrating it in both materials and method is the key to effective EMI.

Classroom language/Teacher Talk

Often non-native-speaker teachers are more concerned about their ability to run and manage the whole class in English than they are about the teaching of the mathematics concepts, as the resources or textbook should help them with the latter. However, this use of English in the class is very important as it provides exposure to the second language, which plays a valuable role in language acquisition. It is also true that the Teacher Talk for purposes such as checking attendance and collecting homework does not have to be totally accurate or accessible to students. When teaching the mathematics concepts, however, it is essential that the Teacher Talk is comprehensible. Some basic strategies to ensure this include:

- simplify your language
- use short, simple sentences and project your voice
- paraphrase (say in a different way) as necessary
- use visuals, write or draw on the board, gestures and body language to clarify meaning
- repeat as necessary
- plan before the lesson
- prepare clear, simple instructions and check understanding.

Creating a language-rich environment

Primary teachers often excel at providing a colourful and engaging physical environment for students. In the EMI classroom, this becomes even more important. Posters, 'word walls', lists of key structures, students' work, English signs and notices all provide a backdrop that provides the opportunity for language exposure and language acquisition.

Planning

When planning, look carefully at each stage of the unit and identify the language demands. This means thinking about what language students will need to understand or produce, and deciding how best to scaffold the learning to ensure that language does not become an obstacle to understanding the concept. This involves providing language support and goes beyond the familiar strategy of identifying key vocabulary.

Support for listening and reading

Listening and reading are receptive skills, requiring understanding rather than production of language. If you are asking students to listen to or read texts in English, ask yourself the following questions when you are planning the unit.

- Do I need to teach any vocabulary before they listen/read?
- How can I prepare them for the content of the text so that they are not listening 'cold'?

- Can I provide visual support to help them understand the key content?
- How many times should I ask them to read/listen?
- What simple question can I set before they listen/read for the first time to focus their attention?
- How can I check more detailed understanding of the text? Can I use a graphic organiser (e.g. tables, charts and diagrams) or gap-fill task to reduce the language demands?
- Do I need to differentiate the task for those students who find reading/listening difficult?
- Could I make the tasks interactive (e.g. jigsaw reading, when students access different information before coming together then share information)?
- How am I going to check their answers and give feedback?

Support for speaking and writing

Speaking and writing are productive skills because students doing these need to produce language. They are different from the receptive skills of listening and reading where students receive language from other sources. These skills may require more input from the teacher.

When you plan to use a task that requires students to *produce* English (speak or write), you need to think about how to help them do this.

This means that you have to think in detail about what language the task requires (Language Demands, LD) and what strategies you will use to help them use English to perform the task (Language Support, LS).

You need to ask yourself the following questions.

- What *vocabulary* does the task require? (LD)
- Do I need to teach this before they start? How? (LS)
- What *phrases/sentences* will they need? Think about the language for learning mathematics (e.g. predicting and comparing). What structures do they need for these language functions? (LD)
- Will they be able to produce these sentences or should I provide some *scaffolding* [e.g. sentence starters/sentence frames/gapped sentences (see below)]? (LS)

  A square has ____ sides.

  A triangle has ____ sides.

  A quadrilateral has ____ sides.

  A pentagon has ____ sides.
- While I am *monitoring* this task is there any way I can provide further support for their use of English (especially for the less-confident students)? (LS)
- What language will students need to use at the *feedback* stage (e.g. when they present their task)? Do I need to scaffold this? (LD, LS)

Teaching vocabulary and structures

Vocabulary

Learning the key mathematics vocabulary is central to EMI and 'learning' means more than simply understanding the meaning. Knowing a word also involves being able to *pronounce* it accurately and *use* it appropriately. Below is a list of strategies that could be useful.

- Avoid writing the list of vocabulary on the board at the start of the unit and 'explaining' it. The vocabulary should be introduced as and when it arises. Word boxes are provided on each page of the Student Books and Practice Books with the key words for the lesson. This helps students associate the word or phrase with the concept and context.
- Before the lesson, check that you are confident with the pronunciation and spelling of the vocabulary that will be used. Write the vocabulary clearly on the board when you first introduce it in the lesson. If you think students may struggle to pronounce words, decide how best to model the pronunciation.
- Give students a chance to say a word once they have understood it. The most efficient way to do this is through repetition drilling.
- Use visuals whenever possible to reinforce students' understanding of the word.
- Ensure that students are recording the vocabulary systematically in their glossaries, at the back of their Student Books, and, if possible, use a word wall that lists the vocabulary under unit or topic headings.
- Remember to use and revise the vocabulary.

Structures

In order for students to talk or write about their mathematics, they will need to go beyond vocabulary: they will also need to use those phrases and sentence frames that a particular task requires.

For example, they may need the following expressions in mathematics.

X is the same as Y.

The sides are the same length.

The next number in the sequence.

I predict that X will happen.

If X happens, then Y happens.

The next step is …

You need to build up banks of common mathematics phrases and encourage students to record them. This is an important part of identifying the language demands and providing the necessary support. You do not have to focus on grammar as the language can be taught as phrases rather than specific grammatical structures.

Using this Teacher's Guide

Every unit of the Teacher's Guide begins with useful background information that includes the following.

The Big idea: The main mathematical concept covered in the unit is outlined.

Look out for: This section focuses on tricky concepts that may need explaining prior to any learning taking place.

Common misconceptions: Common errors that students make, or misunderstandings that students have, are identified. This section offers advice on how to deal with these misconceptions.

Key vocabulary: This is a list of the key mathematical words used in the unit.

Coverage in lessons: The English National Curriculum objectives covered in the unit are listed.

Every lesson in the Student Book and Practice Book has corresponding lesson notes in the Teacher's Guide. These comprehensive lesson notes include the following.

A mini reproduction: This shows the relevant pages from the Student Book.

Global skills: These are the skills that aim to foster a classroom environment where students develop the skills for success. The skills are: *creative skills* where students are problem solving, investigating or exploring new maths content; *real-world skills* where students are taking part in research, or presenting and interpreting information, or if they are dealing with money and developing their financial literacy; *interpersonal skills* where students are practising their teamwork and communication, often through working in pairs or larger groups; and *self-development skills* where students have the opportunity to reflect on their learning and talk about what went well and what they are still uncertain about.

The key vocabulary and resources: Key vocabulary used in the lesson, and the concrete resources required for the activity, are listed.

Language support: This includes a range of strategies, including card sorts and card games, word walls, team games to define or explain words, use of similar words to explain meaning and exploration of the origins of words.

The key principles underpinning the language support are listed below.

Words should be introduced and explained carefully.

Words should be explained in context.

Repetition is vital.

Words should be linked to pictures or actions.

Students should develop their own glossaries.

The learning of mathematics vocabulary should be fun.

Language should not be a barrier to effective learning of mathematics.

Detailed lesson notes: Comprehensive lesson notes include an introduction activity and main activity. These notes refer to the Student Book and Practice Book, where relevant. The notes include probing questions for formative assessment, which are italicised. Icons are used to suggest the groupings that should be used at each point of the activity (whole class, small group, pairs, individual). A separate 'star-jump' icon indicates that the activities give students an opportunity for physical movement (standing up, jumping, moving around) rather than doing activities sitting down.

Differentiation: The Teacher's Guide offers strategies for you to *support* those students who may have difficulty accessing the task; to *consolidate* the learning for those students who need a little more practice; and to *extend* the learning for those who need more challenge.

The Teacher's Guide also offers differentiated outcomes. These outcomes are listed in the form of:

All students

Most students

Some students

Stretch zone: Each activity in the Student Book and the Practice Book has a stretch zone question to support deeper learning. The Teacher's Guide provides additional notes on these activities.

Reflection time: Suggestions are made on how to bring the class back together to reflect on the learning and share ideas.

Answers: Answers to all the Student Book and Practice Book activities are provided.

Review pages: The Teacher's Guide has notes on the Review pages of the Student Book (summative assessment), with answers to the assessment questions, and the Practice Book (a formative, reflective review).

Digital resources: Where it is appropriate to use digital resources in a lesson, such as sharing the interactive Student eBook page on an interactive whiteboard (IWB), suggestions are embedded in the lesson plan.

Resources sheets: These photocopiable resources can be used with some of the main activities. They are referenced in the resources section of the lesson plan and are available on the Oxford Owl website (www.oxfordowl.co.uk).

Tour of a typical unit

Engage lesson

The 'Big question' provides a discussion stimulus about the key idea of the unit.

1 Numbers and counting

How do we use numbers?

In this unit you will:

- count, read and write numbers to 100
- count in twos, fives and tens
- know and make numbers using objects and pictures
- use words such as equal to, more than, less than (fewer), most, least
- read and write numbers from 1 to 20 in words.

Learning objectives are stated clearly at the beginning of every unit.

Engage

Which numbers can you see in the classroom?

Which numbers can you see on your way to school?

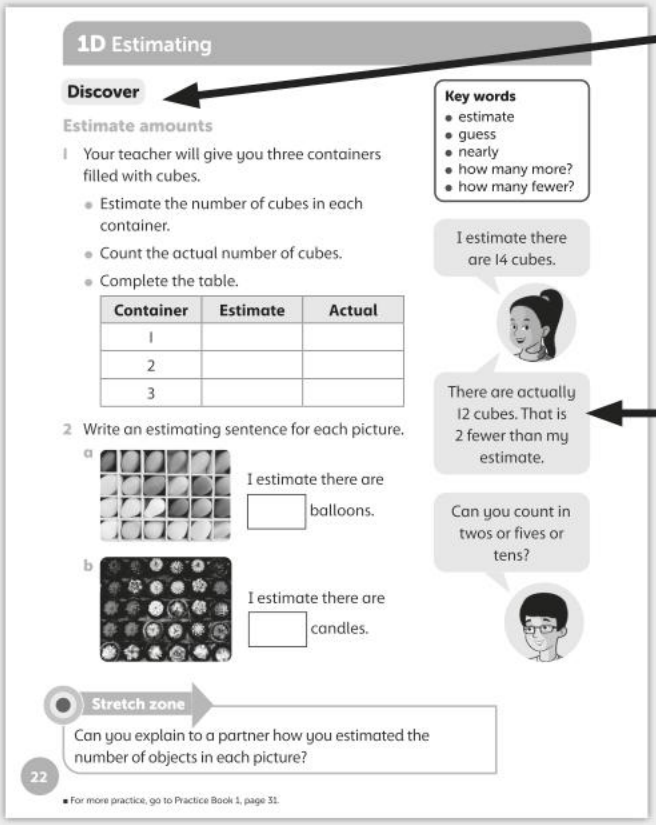
What is the biggest number you have ever seen?

Further questions allow students to develop communication skills.

6

The Engage spread is bright and colourful, with artwork or photos to spark interest in young students and provide discussion points.

Student Book Discover and Explore



Each Discover lesson introduces mathematics skills and concepts. These lessons often involve a practical activity or use of concrete resources.

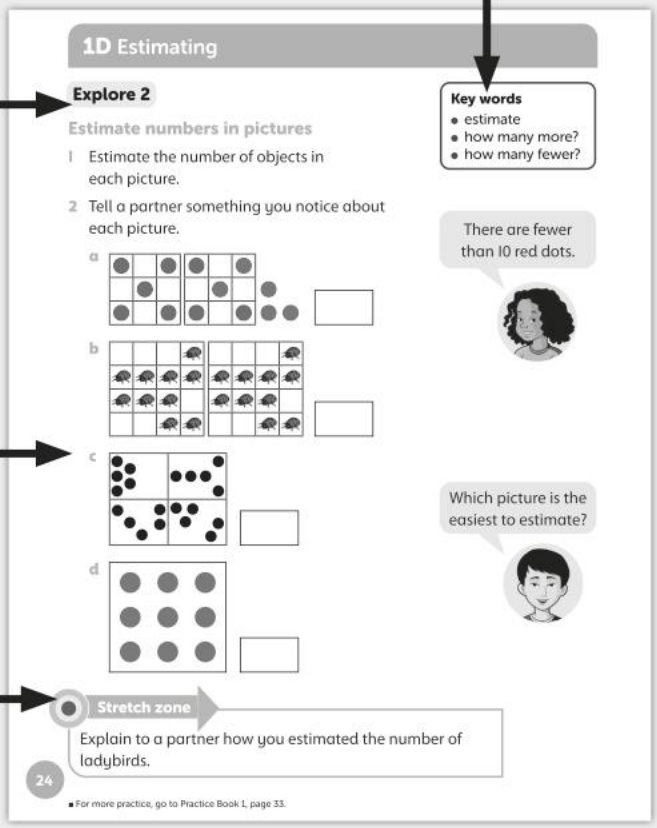
The speech bubbles provide useful hints, probing questions, or examples of how to complete a question. These help students who need a little extra support with the language or the mathematics.

The key words for the lesson are included on each page so they can be introduced in the context in which they are used.

Each Explore lesson allows students to practise the skills they learned in the Discover lesson. In these lessons, students are more likely to work independently or in pairs.

Step-by-step instructions guide students through the activities they will undertake.

Extension activities provide challenge for the most confident students.



Connect lesson

The Connect lesson makes links between the different areas of mathematics in the unit.

1 Numbers and counting

Connect

Make a number poster

Work as a group.

1 Collect some magazines. Talk about which magazines might have numbers in them. What do the numbers tell us?

Connect activities are often set in real-life contexts to make the link between mathematics and the real world.

2 Cut out pictures that have numbers.

3 Make a poster to display in class.

4 Talk in your group about the numbers you have found.

Stretch zone

Take photographs of numbers on the way home from school. What job are the numbers doing? Explain your ideas to a partner.

A further extension activity provides a challenge for the most confident students.

We use numbers to count or to say how many of something there are.

The 'Big idea' sums up what students have discovered in the unit. It answers the Big question on the Engage page.

What is the biggest number on your poster?

What is the smallest number on your poster?

Review lesson

Students' progress is assessed through the questions and tasks at the end of each unit. In Student Books 2 and 6, these questions reflect the style of the SATs (national Standard Assessment Tests).

1 Numbers and counting

Review

1 Draw the beads and write the numbers in the spaces.

Beads	Numbers	Words
	5	
		sixteen
		
		three
		
	12	
		nineteen
	1	
		four
	14	
		twenty

2 Samir has a bracelet with 19 beads. Lina's bracelet has one more bead than Samir's. How many beads are on Lina's bracelet? ☐

Celine's bracelet has 10 more beads than Lina's. How many beads are on Celine's bracelet? ☐

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A word problem is always included on the Review page.

Practice Book Discover and Explore

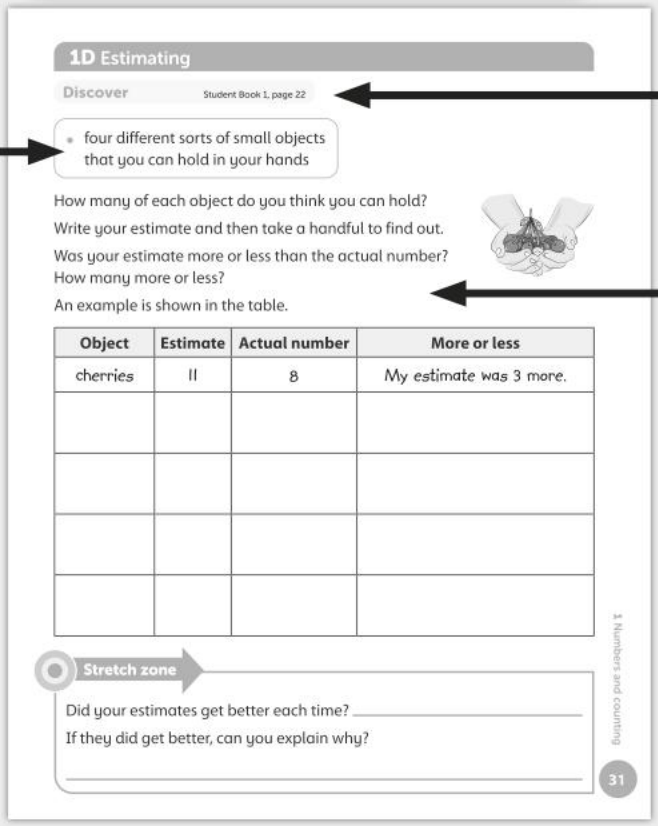
Practice Book activities can be completed in the school lesson or as homework.

Most of the Discover and Explore lessons in the Student Book have a corresponding page in the Practice Book. These activities provide opportunities for students to consolidate and deepen their learning.

Step-by-step instructions guide students through the activities they will undertake.

If students require concrete resources, these are listed in a box at the top of the page. This is particularly useful if students are completing the activities at home.

Extension activities provide challenge for the most confident students.



1D Estimating

Discover Student Book 1, page 22

- four different sorts of small objects that you can hold in your hands

How many of each object do you think you can hold?
Write your estimate and then take a handful to find out.
Was your estimate more or less than the actual number?
How many more or less?
An example is shown in the table.

Object	Estimate	Actual number	More or less
cherries	11	8	My estimate was 3 more.

Stretch zone

Did your estimates get better each time? _____
If they did get better, can you explain why?

1 Numbers and counting

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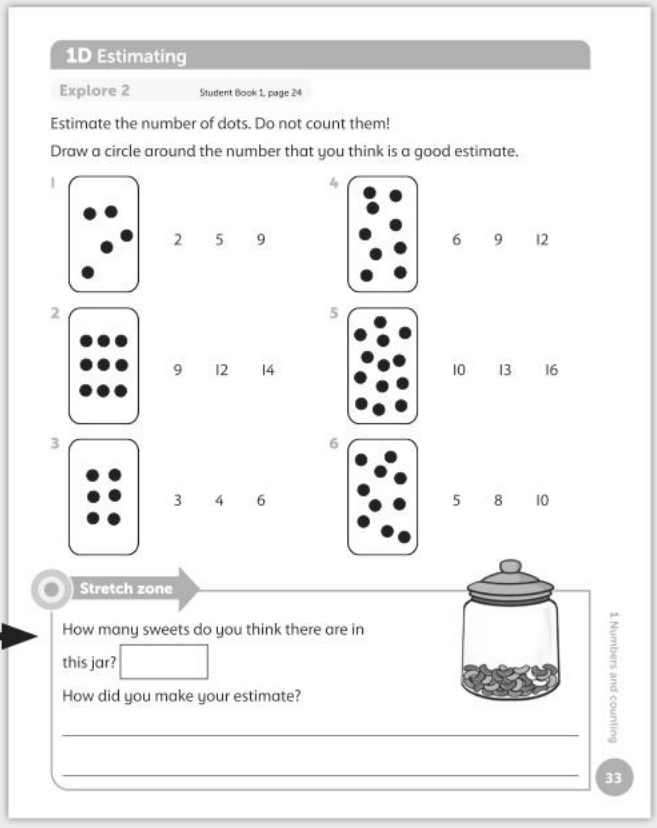

1D Estimating

Explore 2 Student Book 1, page 24

Estimate the number of dots. Do not count them!
Draw a circle around the number that you think is a good estimate.

1 2 5 9

2 9 12 14

3 3 4 6

4 6 9 12

5 10 13 16

6 5 8 10

Stretch zone

How many sweets do you think there are in this jar? ☐

How did you make your estimate?

_____

_____

1 Numbers and counting

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Practice Book Review

Each Review page in the Practice Book includes a reminder of all the topics learned in the unit.

1 Numbers and counting

Review

1 Draw a face next to each bubble to show how you feel about your learning.

counting objects

reading and writing numbers

counting in twos, fives and tens

estimating quantities

2 Tell a partner about one thing you did really well in this unit.

3 Draw or write about things you found easy, challenging or really hard.

Self-assessment activities help students to reflect on their learning.

What work did you feel confident doing?

What work was challenging?

Is there any work you might need some extra help with?

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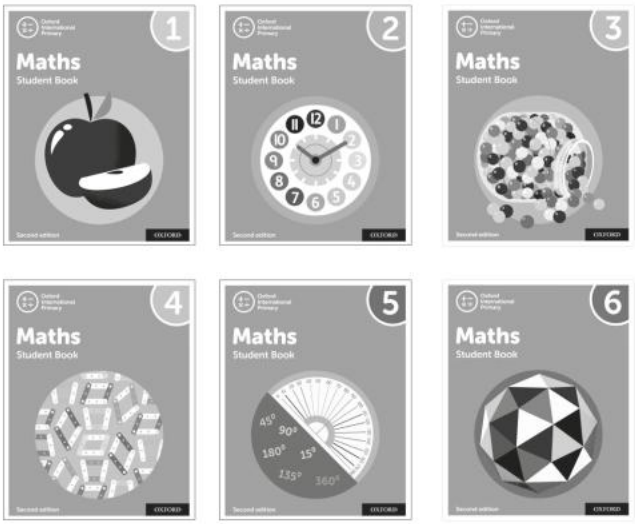
Component overview

The Student Books

The Student Books are write-in textbooks for students to read and use. There are six Student Books: one for each school year at primary school. The Student Books introduce learning through a mixture of practical, discussion and independent activities.

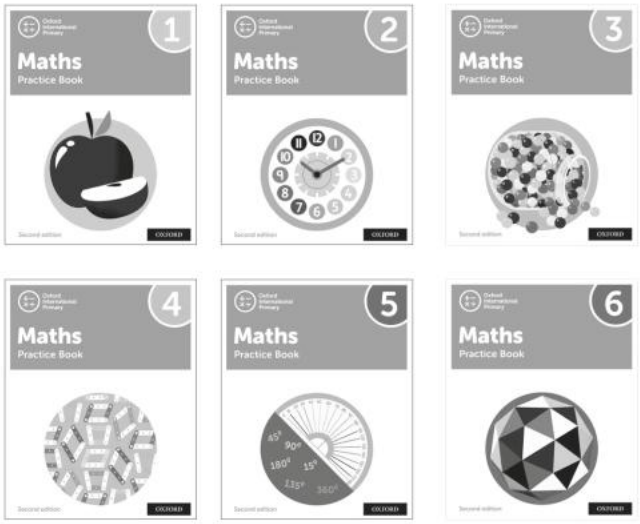
Student Book	Typical student age range
Student Book 1	Age 5–6
Student Book 2	Age 6–7
Student Book 3	Age 7–8
Student Book 4	Age 8–9
Student Book 5	Age 9–10
Student Book 6	Age 10–11



The Practice Books

The Practice Books are write-in workbooks for students to read and use. There are six Practice Books: one for each school year at primary school. The Practice Books provide deeper learning opportunities through a range of independent activities, which can be completed in school or at home.

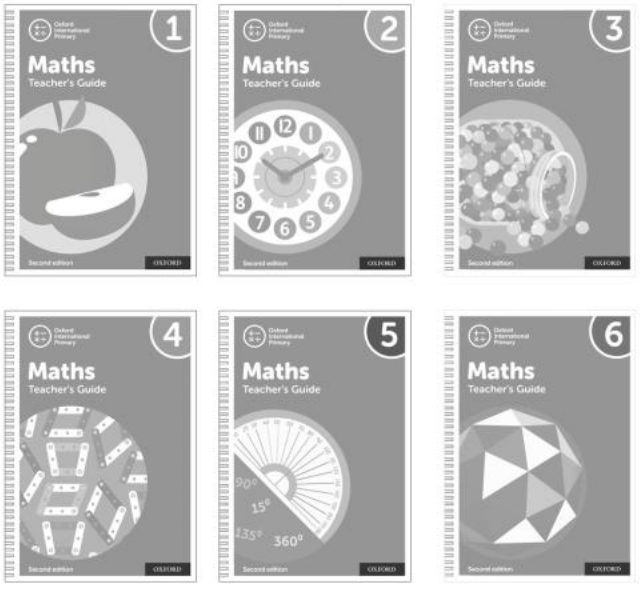
Practice Book	Typical student age range
Practice Book 1	Age 5–6
Practice Book 2	Age 6–7
Practice Book 3	Age 7–8
Practice Book 4	Age 8–9
Practice Book 5	Age 9–10
Practice Book 6	Age 10–11



The Teacher's Guides

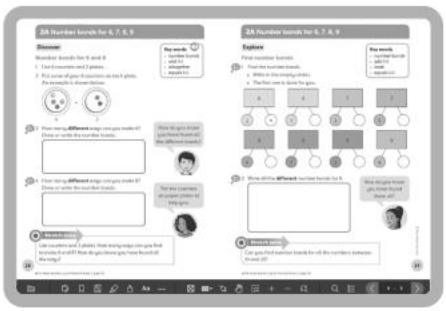
There are six Teacher's Guides: one for each school year at primary school. Each Teacher's Guide includes:

- an introduction with advice about delivering mathematics in primary schools using *Oxford International Primary Mathematics*
- a unit overview, giving advice on teaching each unit, including common misconceptions and how to deal with them
- a lesson plan for every lesson in the Student Book and corresponding pages in the Practice Book
- model answers to each question in the Student Book and Practice Book.



Digital resources

Interactive eBooks



For the teacher

Teachers can access the Student Books, Practice Books and Teacher's Guides online in eBook format, on the Oxford Owl website (www.oxfordowl.co.uk).

The enhanced eBooks show the course content on screen, making it easier for teachers to deliver engaging lessons.

For the students

Teachers can allocate an eBook version of the Student Books to students for use at home. The Student eBooks include interactive activities, worksheets and audio of all the key vocabulary,

Assessment resources

The downloadable assessment materials offer you additional opportunities to assess students' progress. The materials include:

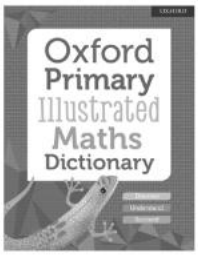
- end-of-unit summative assessment
- end-of-year summative assessment.

Every test comes with everything you need to assess and record progress including:

- answers
- mark schemes and guidance on assessment.

Oxford Primary Illustrated Maths Dictionary

The *Oxford Primary Illustrated Maths Dictionary* gives comprehensive coverage of the key maths terminology students use in the course. Entries are in alphabetical order, and each includes a clear and straightforward definition along with a fun and informative colour illustration or diagram to help explain the meaning. The dictionary is suitable for Students with English as an Additional Language.



The curriculum

The Oxford International Curriculum offers a new approach to teaching and learning focused on wellbeing, which places joy at the heart of the curriculum and develops the global skills students need for their future academic, personal and career success.

Through six subjects – English, Maths, Science, Computing, Wellbeing and Global Skills Projects – the Oxford International Curriculum offers a coherent and holistic approach to ensure continuity and progression across every student's educational journey, equipping them with the skills to shape their own future. Through this approach, we can help your students discover the joy of learning and develop the global skills they need to thrive in a changing world.

1 Number and place value

Overview

Big idea

Students have previously been introduced to numbers up to 100. In this unit, students draw on their knowledge of place value up to 100 to build their understanding of numbers up to 1000. The key knowledge is to understand what each digit in a number represents and to realise that the value of a digit is 10 times greater than the same digit one place to its right. This will help students understand the effect of multiplying by 10, which they will do in later units.

Students need to continue to use 100-squares and number lines to develop their mental images of the number system. Place-value cards and base-10 equipment will also help them come to understand how they can partition numbers up to one thousand.

Look out for

- **Students who read numbers as a series of digits. For example, they read 503 as five, zero, three (or, as five, 'oh', three), rather than five hundred and three.** Encourage students to say the place-value names, so this would be 'five hundred and three'. Likewise, students might read 348 as 'three, four, eight'. Encourage them first to read this as 'three hundred', 'forty' and 'eight' and to then combine these to say 'three hundred and forty-eight'.
- **Students who use a 100-square incorrectly. When they come to the end of a row, they move directly down to the next row and read from right to left.** Cut out the individual rows of a 100-square and lay the rows end-to-end to model how a 100-square can be seen as one long number track. Point out that, on a 100-square, each new row is therefore read from left to right.

Possible misconceptions

- **Students think of numbers as a sequence of digits, and so do not realise the value of each digit.** Much like reading numbers as a series of digits, this is a misunderstanding of the individual value of each digit within a number. To overcome this, model numbers using base-10 equipment and by writing numbers in a place-value grid, including using 0 as a place holder where necessary.
- **Students write numbers as they say them. For example, they write 423 as 400203.** Model how 0 is used as a place holder in numbers. Use base-10 equipment to make the numbers and then write out the number to represent each part of the base-10 model. Demonstrate the 0 is only used when there are no hundreds, or tens or ones.

Key vocabulary

- number names from zero to one thousand
- count to 100 in ones, twos, threes, fours, fives, count on/back
- How many? How many more/less/fewer?
- place value, ones, tens, hundreds, thousands
- exact, approximation, estimate, group
- digit, 1-, 2-, 3-, and 4-digit number, what does that digit represent?
- equal to, greater than, more than, smaller than, less than, biggest, smallest, closest to, 1 more, 10 more, 100 more, 1 less, 10 less, 100 less, compare, order, size
- number line, 100-square
- round, to the nearest, multiple of 10, multiple of 100
- first, second, third, … twenty-first, twenty-second, …

Coverage in lessons

Learning objective	Engage	1A	1B	1C	1D	Connect	Review
Count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number.		✓			✓		
Recognise the place value of each digit in a 3-digit number (hundreds, tens, ones).		✓	✓	✓	✓	✓	✓
Compare and order numbers up to 1000.	✓	✓	✓	✓	✓		✓
Identify, represent and estimate numbers using different representations.		✓	✓	✓	✓	✓	✓
Read and write numbers up to 1000 in numerals and in words.	✓	✓	✓				✓
Solve number problems and practical problems involving these ideas.	✓	✓	✓	✓	✓	✓	✓

1 Number and place value

Engage Student Book page 6

Big question

- How can I count large numbers of objects?

Global skills

- **Creative skills:** problem solving
- **Real-world skills:** interpreting information
- **Interpersonal skills:** communication

Key vocabulary

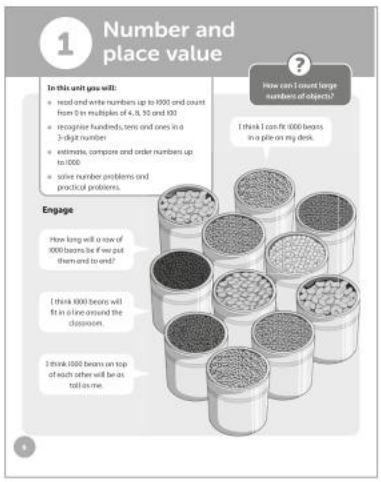
- ones, tens, hundreds, estimate, compare, exact, approximate

Resources

- beans (dried beans or pulses), rulers, metre rules, calculators

Language support

Ask students whether they remember what 'estimate' means and whether they can think of familiar situations to put it into context, for example: *Estimate how many people were at the park on Saturday. How did you estimate? Did you visualise the people in groups?* For example, there were 16 playing football, 4 pairs flying a kite, around 12 people walking their dogs.



Introductory activity

Give each student a small packet of beans (or raisins) either in a packet or as a handful.

Ask them to **estimate** how many there are without counting. Students feed back to you how many beans they estimate are in the packet. Then ask them to count the beans. Notice those students who count by 'grouping'. When everyone has counted their beans, ask who grouped to count and discuss the different ways of grouping. Ask all students to group in **tens** and **ones**. Use this to calculate how many beans there are, altogether, in the class.

Main activity

Look together at page 6 of the Student Book. If you have access to an IWB you could use this. The groups should now look at the speech bubbles in the Student Book and solve the problems or work out whether the statements are correct. Groups may need support in realising that they need to break down the problem. For example, they first work out how much space 100 beans will take up, and then use this to calculate how many beans will fit on the desk altogether.

Students can make a template of the area covered by 100 beans and see how many times this fits on the desk. Students can use similar methods for the other questions. Students can either all work on the problems, or you could ask different groups to work on different problems.

Differentiation

Students should work in mixed-attainment groups so that the less-confident learners can see grouping and counting modelled by their peers.

Supporting: Count with students in ones to 100. Model counting in tens and **hundreds**.

Consolidating: Ask students to justify their estimates to you. *How do you know that this is a sensible estimate?* Encourage them to count in hundreds to 1000.

Extending: Ask students to share their strategies with the rest of the group.

Stretch zone: Ask students to write some tricky problems that they can now work out, using the information they have collected in the main activity. For example, once they know how many beans tall they are, can they work out how high the school is, or how high their house is?

Reflection time

Share answers to each of the problems. Introduce the language of estimation, for example: *Are your answers '**exact**' or an '**approximation**'?*

Ask students for other estimations: *How many beans could you hold in your hands? How many beans would fit in your school bag? How many beans would fit on the teacher's desk?* Ask those students who completed the Stretch zone activity to read out some of their problems.

1A Place value

Discover 1 Student Book page 7 • Practice Book page 14

Specific learning focus

- Read and write numbers to at least 1000.
- Understand what each digit represents in 3-digit numbers.
- Partition 3-digit numbers into hundreds, tens, and ones.

Global skills

- **Creative skills:** exploring
- **Interpersonal skills:** communication

Key vocabulary

- hundreds, tens, ones, order, digit

Resources

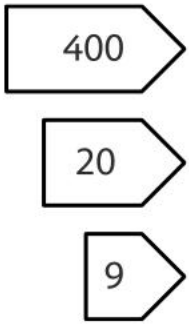
- large place-value cards
- large 0–9 digit cards and smaller sets of 0–9 digit cards for each pair

Language support

Encourage students to say the number names rather than just speak the names of the digits. For example: they should say 'forty-five' and not 'four five'. Use the language of place value, asking: *How many tens are there in 60? How many hundreds are there in 500?*

Introductory activity

Ask three students to come to the front of the class. They should pick a **digit** card each and stand in line in the **order** they came out. For example, if the three students picked 4, 2, 9, the number would be 429. Ask the class to say the number. Make sure that they say 'four hundred and twenty-nine' and not 'four two nine'. Model this number using the place-value cards on the board:



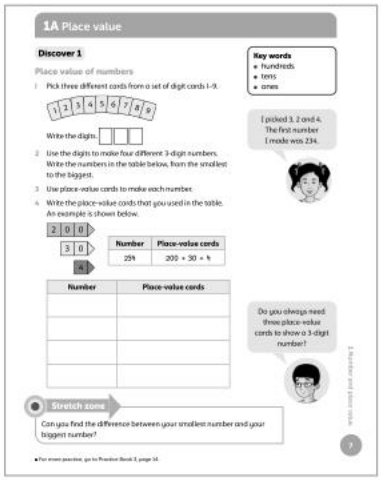
Overlap these cards on the board to form the number 429, and model the language: *the 4 represents four hundreds, the 2 represents two tens, and the 9 represents nine ones.*

Repeat, with three different students picking the digit cards each time.

Main activity

Keep the last set of digit cards visible and now ask students (in their pairs) to rearrange the cards so that they make the largest number possible. Repeat the modelling from the introductory activity, with the place-value cards and the language needed. For example, using the digit cards 4, 2 and 9 say: *In 942, the 9 represents nine hundreds, the 4 represents four tens and the 2 represents two ones*. Finally, ask students to rearrange the cards to make the smallest number possible. Again, repeat the modelling and language using the place-value cards.

Ask students to complete the activities on Student Book page 7. They have their own sets of digit cards and select their own digits to generate 3-digit numbers. Refer students to the second speech bubble: *How can we make a 3-digit number only using two digit cards? What do we need to include?* Discuss the use of zero as a place holder in numbers such as 205 or 230.


1A Place value

Discover 1

Place value of numbers

Key words
- hundreds
- tens
- ones

1 Pick three different cards from a set of digit cards 1–9.

1 2 3 4 5 6 7 8 9

Write the digits.

2 Use the digits to make four different 3-digit numbers. Write the numbers in the table below, from the smallest to the biggest.

3 Use place-value cards to make each number.

4 Write the place-value cards that you used in the table. An example is shown below.

2 0 0
3 0
4

Number	Place-value cards
259	200 + 50 + 9

Number	Place-value cards

I picked 3, 2 and 4. The first number I made was 234.

Do you always need three place-value cards to show a 3-digit number?

Stretch zone

Can you find the difference between your smallest number and your biggest number?

For more practice, go to Practice Book 2, page 14.

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Differentiation

Supporting: Model the number names with students. Say them and ask students to repeat them. Make deliberate mistakes and ask students to spot them.

Consolidating: Ask open questions that encourage students to develop extended responses: *How do you know that is the largest number? Why did you choose to place that digit there?*

Extending: Ask students to think about rounding the number, for example to the nearest hundred. *How close is each number to 500? Which number is closest to 500?*

Stretch zone: *Can you find the difference between your smallest number and your biggest number?*

Check that students have correctly calculated the difference for the numbers they used. *How did you find the difference? What strategy did you use?*

Reflection time

Ask students to share some of the numbers they made and ask them to use the same digits to make the largest/smallest numbers. *How do you know that is the largest/smallest number that you can make?* Ask one student to replace one of the digits in their number with a zero. *How does this change the number? How many hundreds/tens/ones do we have now?* This will allow you to ensure that all students understand the use of zero as a place holder.

Practice Book: Students complete Practice Book page 14. They can do this directly after the main activity, as homework, or as the focus of a separate mathematics session to help students consolidate their learning and build fluency.

Students write the number in words as well as numerals. Use evidence from this work to determine which students need extra support with writing the numbers in words.

Differentiated outcomes	
All students	should understand the effect of place value when making large and small numbers.
Most students	will be able to order a small set of 3-digit numbers from largest to smallest.
Some students	may be able to round a number to the nearest 100.

Answers

Student Book page 7

Observe students while they do the activity and note who can read and say the numbers they make correctly. In the activity on page 7, students complete the table by looking at all the numbers that they made. Check that they have used the correct place-value cards to make the 3-digit numbers they formed.

For example, if they had chosen the digits 2, 3, 7 they could make any of the following numbers: 237, 273, 327, 372, 723, 732. Check that they have four of these in the correct order.

With place-value cards, they would be:

237 = 200 + 30 + 7

273 = 200 + 70 + 3

327 = 300 + 20 + 7

372 = 300 + 70 + 2

723 = 700 + 20 + 3

732 = 700 + 30 = 2

Practice Book page 14

Observe students as they complete the activity. Check that the digits they pick each time are being written correctly in place-value columns and in words. Check that they have completed the sentences about their numbers correctly.

Stretch zone: Check that students have correctly ordered their numbers and have used the < and > signs correctly.

1A Place value

Discover 2 Student Book pages 8–9 • Practice Book page 15

Specific learning focus

- Read and write numbers to at least 1000.
- Understand what each digit represents in 3-digit numbers.
- Partition 3-digit numbers into hundreds, tens, and ones.

Global skills

- **Creative skills:** exploring

Key vocabulary

- hundreds, tens, ones, biggest, smallest

Resources

- large place-value cards
- large 0–9 digit cards and smaller sets of 0–9 digit cards for each pair
- base-10 equipment

Language support

Continue to develop the language of place value by asking: *What is that digit worth? What does that digit represent?* Encourage students to say the worth of each digit aloud and say the whole number.

Introductory activity

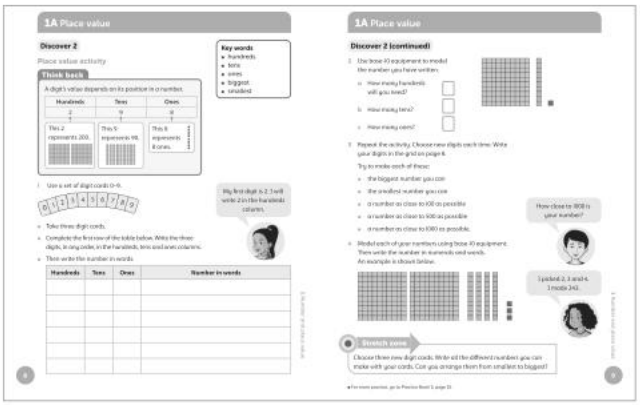
Look together at page 8 of the Student Book. If you have access to an IWB you could use that. Refer students to the Think back, which reminds them of the **place value** of the digits in a 3-digit number.

Write on the board the number 428. Ask a student to say the number aloud. *How many ones in the number? How many tens in the number? How many hundreds in the number?* Then ask for each digit: *What is this digit worth?*

Use base-10 equipment to show what each digit represents. For example, when saying there are four hundreds in 428, show students four of the hundreds-blocks. You can also hold the wrong equipment on purpose, for example holding four of the tens-rods and asking: *Is this 400?*

Main activity

Students should work individually on the activities in the Student Book on pages 8–9. As they work, check that they are writing their 3-digit numbers in words correctly. Ask students to say their numbers as well, so that you can be sure that they are recognising the 3-digit numbers by how they appear in digits, how they are written in words and how they are spoken. Refer students to the question in the speech bubble on page 9. Can they say how many hundreds, how many tens and how many ones they would need to get to 1000?



Differentiation

Supporting: Model the number names with students. Say them and ask students to repeat. Make deliberate mistakes and ask students to spot your mistake.

Consolidating: Ask questions that encourage students to develop extended responses: *How do you know how many hundreds there are in that number? Tell me all the numbers you can make using those three digits. How do you know you have found them all?*

Extending: Encourage students to make numbers that have a zero in them. *What does the digit 0 tell you about the value in a column? How do you say that number name? How do you write that number?*

Stretch zone: *Choose three new digit cards. Write all the different numbers you can make with your cards. Can you arrange them from smallest to biggest?*

Check that students have correctly found all six of the possible numbers, and ordered them correctly.

Reflection time

Ask students to share one of their choices of three digits and explain how they made a number with base-10 equipment, and how they wrote it in words. Ask a student who has used zeros to come to the front of the class and share their answers. This will allow you to ensure that all students understand the use of zero as a place holder.

Practice Book: Students complete Practice Book page 15. They can do this directly after the main activity, as homework, or as the focus of a separate mathematics session to help students consolidate their learning and build fluency.

Students consolidate reading and writing numbers in numerals and in words. If students are not confident writing the words for the numbers, ask them to say the numbers to you and check that they say the full number names. For example, for 245, they should say 'two hundred and forty-five' rather than 'two four five'.

Differentiated outcomes	
All students	should understand place value when making large and small numbers.
Most students	will accurately use number names for numbers with up to three digits.
Some students	may be able to say how many hundreds, tens and ones are needed to reach 1000.

Answers

Student Book pages 8–9

1–2 In the activity on pages 8–9, students complete the table by looking at all the numbers they made. Check that they have identified the correct numbers to meet the description in each row of the table.

3 For example, if they had made the numbers 392, 648, 257, 820, 504, then:

- their biggest number was 820
- their smallest number was 257
- their number closest to 100 was 257
- their number closest to 500 was 504
- their number closest to 1000 was 820

Practice Book page 15

Check that students complete the rows of the table correctly for their chosen digits.

Stretch zone: If students chose, for example, 2, 4, 7, 8, then their sequence of numbers in order could be: 847 > 782 >724 > 482 > 428 > 278 > 248 > 247

1A Place value

Explore 1

Student Book page 10–11 • Practice Book page 16

Specific learning focus

- Find 1, 10, or 100 more or less than any 2- or 3-digit number.

Global skills

- **Creative skills:** investigating

Key vocabulary

- 1 more, 1 less, 10 more, 100 more, 10 less, compare, more than

Resources

- set of 0–9 digit cards per student
- coloured crayons or pens
- a counting stick (these are easily made by using coloured tape and a piece of dowelling or a metre stick), the numbers 8, 57, 85, and 130 on sticky labels that you can attach to the counting stick
- 100-square and a cross of paper to sit over five squares on the grid

Language support

Encourage students to use the language of **1 more**, **1 less**, **10 more** and **10 less** as much as possible. As they make numbers from the digit cards, ask them to say the numbers aloud, and support them to say the names correctly. Encourage students to use their knowledge of place value to say related numbers, for example 'one more than forty-four is forty-five'.

Introductory activity

Stick the label '8' at one end of the counting stick. Ask students to count up in ones from 8 to 18, pointing to each number as you count: eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen. *What do you notice about the finishing number?* (It is 10 **more than** the starting number.) *What do you notice about the digits in the starting number and finishing number?* (The ones are both 8.) Repeat this activity, with starting numbers 57, 85, and 130, counting on ten, in ones, each time. Ask students to look at each starting number and corresponding finishing number. *What is the same? What is different?*

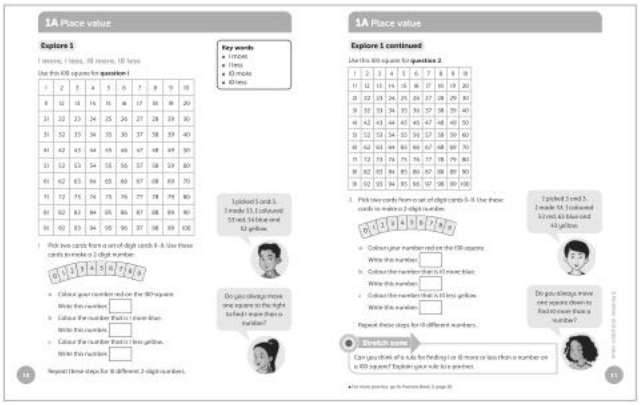
Next, repeat the activity, counting on in tens instead of ones, from each starting number, to the number that is **100 more**. *What to you notice about the digits in each starting number **compared** to each finishing number?*

Finally, repeat the activity, counting up in hundreds (the finishing number will be one thousand more than the starting number). *What to you notice this time about the digits in each starting number compared to each finishing number? What is the same? What is different?*

Main activity

Students should complete the tasks in the Student Book individually. As you move around the class, ask students to talk to each other about the patterns they are noticing. Encourage students to talk about moving up and down the rows of the 100-square or about moving to the left or right across the columns. Ask students whether they can spot any patterns in the numbers as they move up and down or left and right.

Direct students to look at the second speech bubble in the Student Book on page 10, which asks if they always move one square to the right to find 1 more. Use this to start a discussion about what happens at the end of a row.



Differentiation

Supporting: Ask students to read the numbers aloud as they colour them in on the 100-square.

Consolidating: Ask students to predict the outcome before they look at the 100-square.

Extending: Ask students to extend the activity by making 3-digit and then 4-digit numbers using digit cards and to say the number that is 1, 10 or 100 more or less than each of their numbers.

Stretch zone: *Can you think of a rule for finding 1 or 10 more or less than a number on a 100-square? Explain your rule to a partner.*

Ask students to explain their rule.

Reflection time

Use the 100-square and a cross of paper that exactly fits over 5 numbers in the grid. Students describe the relationship between the covered numbers when the cross is placed in different positions on the grid. You can repeat this for different-shaped templates.