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This Teacher’s Guide is designed to support the component parts of Nelson International Mathematics 1. The guide covers Workbooks 1A, 1B and 1C.

Support is presented under the following headings:

- **Concept and skill development** – an overview of the topic, which outlines the objectives covered and the skills students will develop in the section.

- **Vocabulary** – highlights the keywords that you should use in your teaching. Using the correct terminology yourself and encouraging students to use the same, plays an important part in the development of sound mathematical thinking.

- **Resources needed** – a list of the items that you and the students can use for suggested activities.

- **Mental warm-ups** – It is useful to spend about ten minutes each day doing an oral and mental activity so that students get a chance to use known facts, sharpen and improve their mental strategies and practise and consolidate previously learned mental calculation strategies (such as partitioning, compensating or bridging through multiples of ten). You cannot expect the students to recall mental facts quickly unless they have practised and repeated these regularly.

  We have provided a bank of sample mental warm-ups on pages 21–34. In most cases, these activities can be done with the whole class. Students can show answers using place value cards or mini-whiteboards, or write answers in their books or on scrap paper. Alternatively, in some cases, it may be more useful to have different students come up and write answers on the board.

  Some teachers may prefer to choose activities which are linked to the concepts that will be covered in lessons that follow. For example, before teaching the section on ‘ten more’ you may do a mental activity counting in tens or ordering numbers with a difference of ten. However, the mental activities are designed to focus on mental calculation strategies, so they will not always link to new concepts being taught.

- **Teaching ideas** – these are listed under **Practical activities** (suggestions for activities that introduce the topics in a lively and engaging way before students tackle theoretical or written work) and **Using the Student’s materials** (notes to take you through the pages of the Workbooks with suggestions for class and group work).

- **Informal assessment questions to ask** – a list of the types of question that might help you assess the topic, including questions that can stretch higher-attaining students or to give lower-attaining ones more practice.

- **Common errors and misconceptions** – tips and advice to draw your attention to areas that students frequently find difficult or confusing, so you can prepare additional material in advance.
**Key to icons**

In the Workbooks, you will see icons identifying the main syllabus strand covered by a specific activity (or, in most cases, by a cluster of activities).

- 23 Number and calculation
- Shape and space
- Measures
- Organising and using data

Note that some syllabuses identify ‘Problem solving’ as a separate strand. However, because problem solving arises in each of the four other strands, we have simply identified problem solving as one of the different kinds of activity you will find in the Workbooks.

This table gives you examples to show how and where the problem solving objectives from the *Cambridge Primary Mathematics Curriculum Framework* are integrated and included in the Student’s Book and Workbook.

**Problem solving**

Problem solving is integrated throughout the materials. The following table lists the problem solving objectives and gives one or two examples to show where this objective is specifically covered in the Workbooks. However, remember, the students will use problem solving skills throughout this course and that there are many opportunities to meet each objective built into the materials.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Pt1 Choose appropriate strategies to carry out calculations, explaining working out</td>
<td>Throughout</td>
</tr>
</tbody>
</table>
| 1Pt2 Explore number problems and puzzles | 1B 38  
1C 20, 42 |
| 1Pt2 Find many combinations, e.g. combinations of three pieces of different coloured clothing | 1C 21, 30 |
| 1Pt4 Decide to add or subtract to solve a simple word problem (oral), and represent it with objects | 1C 6, 44  
See notes in Teacher’s Guide |
<table>
<thead>
<tr>
<th>Pt</th>
<th>Activity</th>
<th>1B</th>
<th>1C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt5</td>
<td>Check the answer to an addition by adding the numbers in a different order</td>
<td>21</td>
<td>43</td>
</tr>
<tr>
<td>Pt6</td>
<td>Check the answer to a subtraction by adding the answer to the smaller number in the question</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td>Pt7</td>
<td>Describe and continue patterns such as count on and back in tens, e.g. 90, 80, 70</td>
<td>17</td>
<td>6</td>
</tr>
<tr>
<td>Pt8</td>
<td>Identify simple relationships between numbers and shapes, e.g. this number is ten bigger than that number</td>
<td>22, 24</td>
<td>12, 13, 45</td>
</tr>
<tr>
<td>Pt9</td>
<td>Make a sensible estimate of a calculation, and consider whether an answer is reasonable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In this Teacher’s Guide, you will see small icons next to some of the practical activities suggested for each topic. These icons indicate a specific type of activity.

This icon indicates a practical activity, which develops mathematical understanding through the use of manipulatives. Typical manipulatives used at this level include: blocks, dice, abaci, counters, measuring sticks, items used for non-standard measures, for example, paperclips or books for length; bottles or tins for capacity, and so on. Sometimes practical activities do not involve manipulatives, for example, they might instead require students to explore their own movements or actions.

This icon indicates an activity involving construction, building or craft work. For example, students might cut out 2D shapes, build 3D shapes from modelling clay, cut out symmetrical shapes, and so on.

This icon indicates an activity involving discussion, debate or any other oral work. For example, students might talk about which method they found easiest or fastest for solving a specific problem. You may also see the same icon for singing, clapping or any other activities that develop listening and speaking skills.

This icon indicates an activity involving writing or drawing. For example, students might fill in answers to number sentences or questions.

This indicates a problem solving activity.
Fundamental principles

This series makes the following assumptions about the teaching of mathematics:

- Students need concrete experience in order to acquire sound mathematical understanding.
- Like adults, students learn best when they investigate and make discoveries for themselves.
- Students refine their understanding and develop conceptual structures by talking about their own thinking and what they have done.
- Individual students develop at different rates; some will find certain elements of mathematics difficult, others will understand them quickly.
- Students learn in a variety of different ways; mathematics teaching should provide a rich and wide variety of experiences.
- Students will become more mathematically able if allowed to develop reliable personal methods of working; the formal recording used by mathematicians is very difficult for most students to understand.
- The conventions of mathematics should be taught only once students are confident in their own knowledge, concepts and skills.
- Students need plenty of opportunities to apply what they have learnt, and to relate their mathematics work to other areas of the curriculum and to their lives in general.
- Students learn mathematics most effectively when they enjoy and see relevance in what they are doing.

This course offers a wide range of mathematical experiences that reflect current thinking on the most effective ways of teaching and learning mathematics at the primary level. It recognises the professionalism of the teacher, and acknowledges that teachers are the best judges of experience appropriate for their own students. It does not impose an inflexible structure. Instead it provides a wide variety of practical activities, pencil and paper exercises and games linked to well-defined purposes or objectives. The teacher selects from this menu to meet the needs of classes, groups and individuals.

Frameworks for teaching

Summary of the approach

The learning framework of this course can be summarised as: do – talk – record.

Doing

Students develop their skills by manipulating apparatus, playing games, investigating patterns and rules, modelling problems and talking about their ideas with peers before they are expected to record their work.
Talking

Through discussion, students can make sense of what they have been doing. They can then begin to generalise from their experiences. The teacher’s central role is to create such situations and to judge when to intervene.

Most of the activities in this Teacher’s Guide will help you to facilitate discussion, and will encourage students to listen to each other and experiment with different ways of thinking about and solving problems.

Recording

At stage 1, students are not likely to have refined the skills and knowledge or developed the use of strategies for solving problems. They will need to use informal and very personal methods (jottings) of recording steps in a process, or keeping track of what they have done. Jottings are an important step in moving towards non-standard methods of calculation (such as diagrams and jumps on a number line) that give the students a foundation for more concise standard written methods of recording.

It is very important that you allow, and in fact encourage, students to make use of jottings as they work. Here are some possible ways of doing this in the classroom:

• Do jottings of your own as you work out solutions. For example, if you are demonstrating how to add $7 + 8 + 3$ you might jot the following on the board to show how you are thinking:

  \[
  \begin{align*}
  7 + 3 & \rightarrow 10 \\
  10 + 8 & \rightarrow 18
  \end{align*}
  \]

• Talk through the jottings as you make them. For example, ‘It’s easier to add tens, so I’ll add 7 and 3 first.’ This modelling process helps students to see that jottings are important and useful.

• Make space for jottings in the students’ exercise books. You can reinforce the importance of jottings as a means of showing your working by encouraging the students to jot as they work. If you only allow jotting on scrap paper, students may think it is not as important or valuable as their ‘real’ work in their book.

• Limit the use of prepared sheets with boxes for answers and no space for jotting down steps.

• Do activities where jotting is the point of the activity, for example, ask students to represent a calculation visually in as many ways as possible, or ask them to work out problems where they will need to jot down interim steps to keep track of the process: for example, how many different ways can you pay for an item costing 23 cents using coins only?

• Ask students to share their jottings and compare them to show that there are different methods of working. This can help the students to see that some strategies are more efficient than others and, in turn, refine their own thinking. In the coin task above you may find that some children draw coin combinations, others list them and those who are more able and confident may make a table and work more systematically. All of these methods may provide the correct answers, but obviously some will take longer than others.
In the early stages of using apparatus in a new way, recording may take the form of drawings or words and drawings. Some students will gradually find this time-consuming and will simplify their recording independently. Others may need your suggestions and encouragement. As a teacher, you will need to work out carefully when a student is ready to use a standard mathematical symbol or format, so that recording is based on full comprehension.

It is crucial that you do not force children into formal and standard methods of recording calculations before they have fully grasped the process and are confident in the methods.

**Individual differences**

Everyone learns at their own pace, and in different ways, although experiences may be common. Adults in the real world bring a wide variety of approaches to their work, often ones they have devised for themselves despite many years in school learning standard methods. This course recognises individual differences and aims to give students the chance to explore the world of mathematics and solve problems in their own way. The course is also designed to provide equal opportunities to all students who may use it, regardless of their gender or ethnic, cultural or linguistic background.

**Developing mental strategies**

Adults perform many mathematical tasks mentally either because the tasks are simple, or because it is quicker to work things out in the head than use pencil and paper or a calculator. Too much work with paper and pencil can inhibit students from developing the flexibility and range of strategies necessary for efficient mental work.

A central aim in this course is to develop in students the ability to add or subtract numbers mentally, and to use quick recall of multiplication facts. Many of the activities encourage students to move directly from their own strategies with apparatus to working things out in their heads.

Students should be made aware of the role of mental methods as a first resort when a calculation is necessary, and not be led to believe that there is a particular method for a particular type of work, such as vertical presentation for ‘best work’, ‘answers only’ for mental arithmetic, or ‘working out’ only in rough books or on scraps of paper.

This Teacher’s Guide presents many ideas for oral work and suggests alternatives to the standard methods to help promote the development of effective mental methods. All arithmetical problems in this course are presented horizontally to encourage students to choose and use their preferred method.

One of the most significant changes to the Cambridge Primary Mathematics Curriculum Framework for 2012 onwards is the inclusion of a specific set of objectives under the category of Mental Strategies. These objectives aim to ensure that students are encouraged to use number facts and a range of mental strategies to add, subtract, multiply and divide. The idea is that these mental strategies are developed and used across all stages, and that students will continue to use them alongside more formal written methods as appropriate.
Mental calculation is important for both school-level mathematics and daily life, not least because it is often the most effective and simplest way to get an answer. At stage 1 in the primary school, it is usually the most effective method for solving most of the problems that students are faced with. Teaching, and encouraging the use of, mental strategies helps students to realise that numbers are quantities (rather than just seeing them as separate digits). This in turn allows them to take advantage of the particular properties of the actual numbers involved in a problem and to decide which strategy lends itself best to solving it. Mental strategies also allow students to develop a good sense of equivalence in mathematics. At a basic level, this could be simply saying $5 + 6 = 5 + 5 + 1 = 11$, but it forms the basis of algebraic manipulation and the more abstract functions that students will have to deal with at higher levels.

Here are some of the reasons that researchers around the world give to support the idea that mental computation should be included at all stages in school curricula:

• Mental calculations account for more than 80% of the calculations that adults do in daily life.

• Mental calculation is essential for estimation. This is an important skill because many of the calculations we do in daily life do not require an exact answer. For example, these pies cost $1.90 each, can I buy three with $5? ($2 \times 3 = 6$, so no.) These pies are $1.90 each, I’m buying six and the seller is asking for $15, that can’t be right!

• You often need to do some mental calculation before you can use a calculator, and you need to have some idea of how big or small the answer will be to check that you have used a calculator correctly.

• When students have a range of mental strategies, they are able to find the easiest way of doing calculations.

• Mental strategies rely on basic number relationships and they build on counting work from earlier grades, so they provide an excellent way for students to develop good number sense.

• Many of the patterns and relationships that make up the study of mathematics are numerical, but they are too vast and numerous to learn by heart, so it makes sense to develop a concept of how these work, so that you can transfer the skills to solve previously unseen problems in creative ways. To make sense of this, you just have to think about place value and counting. Once students learn the rules for making numbers, they can read and write any number. We would not, for example, teach every single number from 10 000 to 100 000 in a rote way. Instead, we expect the students to apply their knowledge to make, read and write numbers in this range.

In the sections that follow, we will explore what it means to develop mental strategies both in theory and in the classroom. Then we will present a general approach to teaching mental calculation strategies, with some examples to show how this might work. The actual strategies themselves are dealt with in more detail in the Student’s materials and teaching guidance by topic in this Teacher’s Guide.
What are mental strategies?

Essentially mental strategies are the individual methods we use to solve problems ‘in our heads’.

As an example, try to answer this question without doing any pen and paper calculation: how many 45c tickets can you buy with $10?

Once you have an answer, think about what you did to find the answer. Did you think in any of these ways?

- You can buy two 45c tickets with 1 dollar, so you can buy about 20 with $10.
- Ten 45s are 450. 450 and 450 is 900, that’s 20 tickets. You have one dollar left, so you can get two more, 22.
- 45 is almost 50, two 50s are $1, so I can buy about 20.

Very few adults will solve this problem by doing formal long division (1000 divided by 45) in their heads. This illustrates an important point about mental strategies – they do not involve simply visualising formal algorithms in your head and solving them without writing them down. Rather, mental strategies are the ways in which we use number facts that we have learnt by heart together with the relationships that exist between numbers and operations in order to solve problems. When you are teaching mental strategies for calculation, it is therefore crucial to focus on the mental processes that students use to get to the correct answer.

Recall of number facts is an important element of mental mathematics because other strategies use and depend on these. At stage 1, students should know addition and subtraction facts to 10 by heart. They should also know doubles to at least double five, and use known doubles to find near doubles. The daily mental mathematics time can be used to consolidate these facts. In general, if a student can give the answer to a known fact such as $5 + 6$ within 2–3 seconds then you can tell that he or she has memorised and internalised it.

Implications for classroom practice

The Nelson International Mathematics series has the key mental strategies for each stage built into the student’s materials. There is additional support included in the Teacher’s Guide in terms of the teaching activities section for each topic as well as the sample daily mental maths activities to allow students to practise and refine their skills. In addition, we offer a series of parent cards that explain the approach and suggest how parents can support it in the home. The provision of these materials makes it easy for teachers to meet the objectives of the revised framework. However, the materials do not stand alone – your classroom methodology and the ways in which you teach, support and encourage students to use mental strategies are of utmost importance in implementing these objectives.

In a classroom where mental strategies are given their due importance, the teacher’s role would include:

- being flexible in recognising and accepting whichever strategies the students use (including allowing them to choose their own strategies as well as to work in different ways)
• using different mental strategies yourself and modelling them for the class so that they can compare them with the ones they are using
• helping students to think about their own strategies so that they can refine them and work towards more efficient strategies.

These examples demonstrate how the teacher’s behaviour and actions can support or hinder this approach. Note that these are general examples which may not apply specifically to stage 1 objectives.

A class is given the following subtraction: $33 - 27$ (finding a small difference between pairs of two-digit numbers).

Note that the problem is given horizontally. This is the first element of a flexible approach because it does not force the students into thinking that they have to do vertical subtraction in columns with carrying.

Here are four students’ workings.

<table>
<thead>
<tr>
<th></th>
<th>33 – 27</th>
<th></th>
<th>33 – 27</th>
<th></th>
<th>33 – 27 = 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>+3 +3</td>
<td>B</td>
<td>37 – 27 – 4</td>
<td>C</td>
<td>30 + 3</td>
</tr>
<tr>
<td></td>
<td>36 – 30 = 6</td>
<td></td>
<td>10 – 4</td>
<td></td>
<td>27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 + 3</td>
</tr>
</tbody>
</table>

Student A has used a strategy that involved adding the same amount to each number to get numbers that are easy to subtract.

Student B has added 4 to the first number to get a number that is easy to subtract from and then subtracted 4 again at the end using knowledge of bonds to ten.

Student C has decomposed the larger number into $30 + 3$ and then subtracted the 27 before adding the 3 back.

Student D has used an empty number line and done the subtraction in parts, subtracting 20 first, then subtracting 3 to bridge to 10 before subtracting the last 4.

The teacher in this classroom has several options, for example:

• He or she can ask the class to put their hands up to give the answer. This focuses on the answer and ignores the processes by which the students worked the answer out. It also makes it difficult for those students who are still trying to work things out, because the quicker students put up their hands and try to get the teacher’s attention, distracting them and making it difficult to think.

• Similarly, the teacher can ignore how these students have worked and do a column subtraction to show the class how to get to the answer.
Both of the above choices are counter-productive as they do not help the students develop confidence and in fact, moving straight to the ‘old fashioned’ algorithms has been shown to undo students’ understandings of place value.

When you value mathematical thinking and reasoning, you must make time to discuss how students got to their answers. This may involve modelling their solutions on the board and having the students verbalise and explain what they did. The students will learn from these explanations and showing them different options allows them to compare their own methods and strategies with those of others and to decide whether to move to a strategy they find more efficient. Modelling solutions and explaining thinking also makes the mathematics visible to students who may not have grasped it. When you just give students an answer, the mathematical strategies are invisible to them – they cannot see how you worked it out.

Teaching mental calculation strategies

The general approach to teaching strategies for mental calculation can be seen as three steps:

1. Introduce the strategy
2. Reinforce the strategy
3. Assess students’ mastery of the strategy

Each of these steps is discussed in more detail below.

Introducing the strategy

One method of teaching a strategy is to give the class an example of a calculation for which the strategy would be useful and then to ask the students to find the answer to see whether any of them select and use the strategy. For example, you want to teach them how to add multiples of ten by counting on or back in tens.

- Start by writing 37 + 40 on the board.
- Ask the students how they could find the answer.
- If one of the students suggests viewing it as 37 + 10 + 10 + 10 + 10 ask them to explain the strategy to the class with your help
- If no one suggests this, model the strategy yourself. Your modelling could include concrete materials (such as place value charts or a diagram showing that 40 = 10 × 4). At the demonstration phase, your modelling should include jottings to show the steps in the process.
- Discuss the thinking behind the strategy as you model it. For example, it may be difficult to add 40, but it is easy to count on four tens. I’m going to ignore the unit to start with and count on four tens: 40, 50, 60, 70. Then I’ll add back the units. My answer is 77.
- Next, do some more examples using appropriate numbers to demonstrate the logic of the strategy and discuss when it would be useful (i.e. what numbers would it work with?). If you like, you can show the students examples of when this would not be the most useful strategy.
example, if the calculation is 3 + 90, it will be much more efficient to count on 3 from 90 than to count 9 tens on from 3. Remind the students that the choice of strategy depends on which methods they prefer and which numbers they find easiest to work with.

Reinforcing the strategy

The key components for reinforcement are:

- Providing lots of similar examples to practise the strategy in isolation and develop competence in using it. You will find that the Workbooks provide examples for specific strategies as they are developed.
- Getting students to talk about and explain their thinking and methods as they use them. As they become more confident in using a strategy, they may find shorter and more efficient methods.
- Allow (and in fact encourage) jottings and pen and paper workings as you develop mental methods.

The activities you use to reinforce a strategy should be varied in type and presentation, so that students do not treat it as a rote activity, and structured in ways that encourage maximum participation. You will find suggestions to help you do this in the teaching guidelines section for each topic.

When you introduce a strategy you will need to allow sufficient time for the students to explore it and become comfortable with how it works. As they become more competent in using it, you can reduce the time spent on different activities.

Once most of the class are using the strategy confidently, your role is to help them integrate the strategy with others that they use. One method of doing this is to provide activities that include a mix of calculations, some of which are not suited to the particular strategy. It is often useful to present a mixed exercise, ask the class to look at the problems and then spend some time discussing which strategies students think will work best for different problems. Encourage them to identify the properties of the numbers that suggested each strategy to them.

Assessing whether students can use the strategy

Assessing mental strategies should take a variety of forms. However, the main aim of you classroom assessment is to see whether the students can work efficiently and accurately by choosing an appropriate strategy rather than to test the use of a particular strategy. So, for example, you may use ‘timed’ tests in which the students compete against themselves to recall facts and do mental calculations over a set period (such as a test a day for five days) in order to improve their own time and/or accuracy.

You can also play games to assess mental computation skills. Games that the students play in pairs offer an opportunity for you to observe the students as they work and to record any observations that you make.

One method of assessing whether the students can recall facts and use mental strategies is to gauge the time it takes them to respond to a question. As mentioned earlier, response time for known facts should be 3 seconds or less. With the other mental strategies, a good response time is 5–10 seconds.
(depending on how difficult the problem is). Bear in mind though, that is a goal to work towards rather than a strict guideline. When students are beginning to use a strategy, you would allow them as much time as they need to apply it and answer the problem.

Talking to students in small groups or one-to-one is also important for assessing their competence, particularly if what they jot down is unclear or incomplete. Asking questions about how they were thinking will allow you to see whether they understand the strategy and whether or not they can use it.

**Computers**

The use of a computer can support students’ learning of mathematics in a variety of ways. Obviously, your use of computers will depend on the resources available at your school. However, it is useful to know about the range of technologies available, as it is likely that your school will become increasingly well resourced as time goes on.

- **CD-Roms** are disks that contain electronic files with plenty of reference information. They may include an array of printable materials such as worksheets and practice sheets, tests, resources such as graph paper, maps, and so on.

- **Games** enable students to apply their mathematical skills through fun, interactive activities. Many educational games are designed to develop specific skills. If you have these available at your school, try to build in the use of games regularly each week. Find games that reinforce the specific areas of mathematics in which your students need regular practice. If there are specific games your class is particularly keen to spend a lot of time playing, you may want to use game time as a reward for completing classwork or homework.

- **The Internet** is a rich resource for teaching suggestions as well as a source of much reference material. Keep a list of maths teaching websites that you use regularly. If you find articles of particular interest, download and print them, and add them to your resource files.

The BEAM mathematics project website. ([www.beam.co.uk](http://www.beam.co.uk)) offers a full list of all their teaching support resources as well as a range of free resources (click on the ‘free resources’ tag). The free resources include downloadable worksheets for classroom or extension use and discussion papers and articles related to developments in primary mathematics to support professional development of maths teachers.

You can also find a wide variety of materials to support your planning, teaching and assessment of Cambridge Primary Mathematics on [www.cie.org.uk](http://www.cie.org.uk).

There are interesting articles, research and activities on the [Plus Magazine website of the University of Cambridge](http://plus.maths.org).

**Exploring and investigating**

Primary mathematics has traditionally tended almost exclusively towards short, directed tasks which result in ‘right’ or ‘wrong’ answers. The activities in this course provide a balance between short, fairly self-contained activities and open-ended investigations that can be returned to and developed over a long period of time.
Most of the activities are designed to develop students’ awareness of the range of mathematical possibilities open to them when tackling a mathematical task. As much as possible, allow students to take control, make decisions and explore the many avenues that can arise from a simple starting point.

Students should always be encouraged to ask ‘What if?’ and ‘Why?’ when investigating. These questions may lead to uncharted territory, new challenges, fresh understanding and the development of new skills.

Many investigations have no final solution or easily accessible generalisation for the students. Some have a simple pattern or rule which may be discovered and explained. However, many students will want to know why certain patterns repeat, and offer explanations about the rules which govern them. This is the first step towards generalisation, and teachers can encourage this by asking questions such as: ‘Why is the same number added each time?’ or ‘Can you guess what will happen next?’

The value in investigations lies in students pursuing them to the limits of their ability, and in the new skills that are acquired on the way. For some students, the early, often concrete, experimentation is enough to give them confidence, and increase their enjoyment of using already acquired skills.

There are many different ways of recording investigative work. Students should initially be allowed to explore and note their discoveries freely. Teachers may wish to intervene periodically to help them organise the results so that emerging patterns are identified and interpreted.

**Sources of investigation**

Many everyday objects can provide rich sources of investigative work. The hundred square, addition square and multiplication square all contain many fascinating patterns. Students can also explore patterns in solid and flat shapes, such as the relationships between faces, edges and vertices of 3D shapes, and the relationships between sides, corners and angles of 2D shapes.

Use investigations to enrich the introduction of new concepts. For example, you can introduce number patterns through developing number chains and introduce geometric patterns through explorations of colour arrangements on geo-boards. Students can explore the relationship between area and perimeter, and between volume and the dimensions of cuboids.

As they develop an investigative approach, help students to become systematic in the way they work. This will help them to understand the structure and formal approaches of mathematical theory.

**Mathematics in real life**

Some students may struggle to understand the relevance of mathematics in their everyday lives. This course places great emphasis on making students aware of the relevance of mathematics to their own real lives.

In this Teacher’s Guide, you will find ideas for using the student’s own environment as a stimulus for mathematical activities. The Workbooks frequently require students to look at the mathematics in the classroom, the playground and their own homes. Each set of activities and problems
requires new skills and fresh understanding. Many questions are open-ended or have no exact solution, and students are asked to make predictions, generalisations and estimates, and to evaluate their own answers. Encourage this skill in all areas of the curriculum.

Students use their understanding of mathematics at home and at school, in situations such as sorting toys or books, working out the times of television programmes, making patterns, helping to prepare food and playing board or card games.

**In school**

In school, there are many opportunities for you to teach mathematics through familiar situations, so that the students experience its usefulness and appreciate the order and sense that mathematics gives to life. For example, students can identify the date each day, as well as the time at various points throughout the lesson. Registration, dinner money, timetables, sorting and putting away equipment will provide a range of relevant experience in data work, measures and shape and space as well as number.

**Play**

Students of all ages should have opportunities to play both in and out of school. This offers them the freedom to explore new situations, to make discoveries for themselves and to be creative. Unfamiliar mathematics equipment should be introduced through play, with the students exploring the functions and possibilities inherent in the materials. A good example of this is to experiment with pairs of compasses by drawing patterns and pictures before using them as mathematical instruments.

Construction kits offer students the opportunity to explore shapes and inverse operations, through building and dismantling.

**At home**

Part of the teacher’s role is to involve parents and guardians in the students’ learning. Parents need not be limited to supervising their children’s homework. There are many activities that can involve the parent actively in the child’s learning, and that can provoke mathematical discussion and language at home.

Parents can be encouraged to extend their children’s mathematical understanding through playing board and card games and by encouraging them to help with normal home activities such as cooking, gardening, cleaning and organising the home, drawing up plans and measuring when redecorating, and estimating how many or how much when shopping.

The Nelson International Mathematics scheme offers a set of parent cards (available on the website) that explain the approach taken in the series and suggest how parents can support it in the home. You can guide parents to these online resources, or you may like to print these out and send them home with the students.

Many of the students will also voluntarily help and encourage younger brothers and sisters in games and getting organised.
Family visits and holidays give students the opportunity to see environments different from their own, and to experience time and distance. They are also likely to be budgeting pocket money, saving for special things and predicting how long it will take them to afford treats.

Students may have computer games that require them to use a variety of mathematical skills. They are likely to see and use a wide range of electronic equipment at home, which demands mathematical skills to be used properly. Many students will also be responsible for their own timekeeping and have a degree of responsibility for others.

Some homes will not actively encourage girls to use construction kits, computers or calculators, and some parents will not be confident of their own mathematical skills or understanding. As a teacher, you can help a great deal by making explicit the mathematical content of everyday experiences and activities.

This book contains many suggestions for investigations, problems and research that students and parents can work on at home. Games made from suggestions in the scheme could become the core of a ‘lending library’ of games for students to take home for a period of time, to play with parents, or brothers and sisters. This would not only link home and school but also give parents and teachers a basis for discussion.

**Organisation**

**The classroom**

Each teacher will have preferences about how best to organise the available space. However, here are some useful guidelines for any classroom, irrespective of how it is arranged.

**Storage**

Always store equipment in such a way that students have easy access to it and can check it periodically. Clearly label all items and encourage students to make their own decisions about what they need.

**A mathematics centre**

This may or may not be where the equipment is stored, but it will be a part of the classroom that is bright and attractive with displays of students’ work and other mathematical stimuli. The centre is a place for students to go at odd moments in the day, to be challenged with mathematics-related questions and activities.

Questions and activities should be provided by both teachers and students for interactive problem solving, for example: ‘The answer is 15.2. What was the question?’, inviting students to write out their suggestions. A number pattern or sequence, on a series of cards organised by the students, may be ‘secretly’ altered by the teacher, and the students have to discover what has changed, and put it right.

The BEAM organisation offers a wide range of primary mathematics resources including manipulatives (place value cards, large dice, dominoes, fraction grids and spinners), games and online resources that are a useful
and enriching addition to any classroom mathematics centre. You can see the full range of BEAM products on their website www.beam.co.uk or you can request a catalogue from your local Nelson Thornes representative.

The students

Class teaching
At times it is efficient to work with the class as a whole, perhaps when introducing a new topic. The course offers plenty of ideas for this kind of approach. The planned work needs to be suitable for all students, with individual needs and ability taken into account in subsequent group or individual follow-up activities.

Group work
You can group students in similar or mixed-ability groups, to suit the purpose of the work. This offers students the opportunity to collaborate, to discuss their work with each other and the teacher, for peer teaching to take place and for the work to be matched to their needs. It enables the teacher to work simultaneously with a number of students and this minimises the need for repeated explanations to individuals. Group teaching is an effective form of classroom organisation for both teacher and students.

Working individually or in pairs
At times it may be appropriate for students to work as individuals or in pairs, to provide extra help to students who need it, or to stimulate and challenge the higher-attaining students. Working individually gives students the opportunity to concentrate on their own thinking, to develop this through investigations and problem solving, to work quietly and in private, and to experiment with materials. Students working in pairs have the opportunity to develop collaborative skills, to play games together and to share ideas in an investigation.

Assessment and record keeping
A significant part of a primary school teacher’s day is spent on the informal evaluation of a student’s or group’s learning, and in deciding what the next learning experiences should be.

Assessment can be both formal and informal, and can serve a number of functions. Ongoing observations and discussions with students can give teachers valuable diagnostic and formative information on which to base their teaching. Students’ written and practical work can yield valuable insight into the current stage of their conceptual development and the extent to which they are developing effective skills.

Ideally, assessment should take place throughout the year and its goal should be to support students as they learn and develop their mathematical skills. For this to happen, students need to be actively involved in both their own learning and their assessment. This means that they should understand how they are going to be assessed and how their success will be measured; they need to begin to evaluate themselves, to set targets for themselves and to reflect on their own learning, so that they become more and more self-confident in mathematics.
For assessment to support the development of learning, assessment styles must be varied and relevant to the students. The programme of assessment should present opportunities for students to talk about and demonstrate what they have learned (through oral work, worksheets, exercises, tasks, projects, tests and other activities).

**Facilitating assessment**

- Give students a variety of tasks that require them to apply different skills – for example, writing tasks, using concrete apparatus or working with money. In this way students are able to show what they know in different and exciting ways.
- Think about the most appropriate way to assess a task or activity and identify the skill that you need to assess. This will help you to decide what assessment technique is most suitable at any time.
- Develop your own observation sheets to use as students work through the activities in a topic and use this to observe and assess skills and learning.
- Watch, observe and ask students questions as they work through topics, rather than only assessing the final product. This will allow you to see where they have difficulty and to address problems that may impact on understanding.
- Use a range of different contexts for assessment (individual, peer, group, oral, written) and keep clear and well-organised records of your observations and any marks you allocate. This is not only useful for your own purposes, but is also equips you to report back to parents about their child’s progress.
Mental warm-ups

You should aim to do a mental maths activity that takes about ten minutes each day. At stage 1, many of these activities will be related to counting and building number sense through games, rhymes, chants and puzzles.

This section contains some examples that you can use as is, or adapt to suit your own classroom. We have tried to provide a range of different types of activities (factual recall, games, grids, tables, problem solving and puzzles) to show some of the ways in which you can approach the mental maths part of the lesson. However, this is not a definitive list and some activities will appeal more to some classes and teachers than others. If you need additional ideas and suggestions, there are several useful websites for teachers which give ideas and resources. Type ‘mental maths warm-ups’ into your search engine and you will be directed to a range of sites covering this topic. Many of these sites offer a range of maths activities many of which can be used with electronic whiteboards or screen projectors attached to the computer.

Arrow cards

Many place value and calculation activities can be demonstrated and/or answered using place value arrow cards. Arrow cards are a set of place value cards with an ‘arrow’ or point on the right-hand side. Students can organise the cards horizontally or vertically to represent numbers in expanded notation. They can overlap cards and line up the arrows to form multi-digit numbers.

These are an important teaching and learning resources and it would be useful to have a set available for each student. In stage 1, the students only need to work with numbers to 100, so you only need to prepare tens and units cards. At higher levels these can be extended to as many places as needed and also to the right to show decimal places.

Copy and enlarge the card templates. Print them onto stiff paper or card. Cut along the diagonal line from top to bottom to form the arrow. If possible, laminate the cards to make them more durable. (If you are making a set for each student, you may like to send the cards home for parents or carers to cut out.)
A basic set of tens and units arrow cards consists of:

- **Introducing the cards to the students**
  - If the students have not previously worked with arrow cards, you will need to teach them how to use them.
    - Begin by pointing out the arrows on the cards. Explain that these arrows always go on top of each other when you are making a number.
    - Get the students to sort their cards into units and tens.
    - Once students have sorted the cards, ask them to show you some numbers starting with numbers that only use one card. For example: show me 3, 6, 7, 10, 40 or 60.
    - Next, show the students how to put the cards together to build numbers. You may need to demonstrate. For example, this is how we make 15. Watch the students to see that they don’t try to put the 1 and 5 card together to do this (if they do, remind them that the arrows need to go on top of each other).

- Check that the students can build different numbers by calling out some numbers and having them show you.
- As students build numbers they will begin to make connections and observations. For example, they may notice that building the numbers is the same as adding numbers. For example, $10 + 5 = 15$. This is an
important observation that forms the basis for partitioning numbers and written methods at later stages. Encourage the students to share their observations with the class.

There are ideas for using the arrow cards in different ways in the mental maths activities section that follows as well as some suggestions for practical activities in the related chapter notes for each workbook.

As you read through the activities remember:

- Most of these activities can be repeated by simply using different values. Many of them can also be adapted to make them simpler or more difficult.
- Many of these activities can be done with no resources. However, some require you to prepare grids and/or game boards or to supply students with apparatus such as dice or cards. We suggest that you keep the materials you develop and use them to build up a mental maths resource bank of your own. For example, when you prepare grids or tables with missing values, or magic squares with a wrong number, do this on card and, if possible, laminate the card so that it can be re-used. Lamination also means that students can use dry-wipe markers on the cards and these can be cleaned easily. Another option is to prepare apparatus on computer and to print these out onto overhead transparency sheets. These can be stuck onto white card to make a re-usable resource that can be wiped clean.

To make it easier for you to select activities to match what you are doing and that meet your students’ needs at different times, we have organised them into five sections:

1. Place value and number sense
2. Rounding and estimating
3. Mental problem solving
4. Calculation skills
5. Shape, space and measures (including time).

1. Place value and number sense

Counting circles and counting games can be used as mental warm up activities. Place students in a circle. Point to a student. Say a number. Let the students continue round the circle counting in ones from that number. When you clap your hands, let them count back. Repeat this for different starting numbers and maintain a fairly quick pace. As the students become more confident you can vary this to count in twos or tens.

Choose any number for the day. For example 12. Display the number and have the students read and say it. Use the number as a starting point for counting on and back. Then have the class make up some facts about the number. For example, it is bigger than 10, it is smaller than 15, it has one ten and two ones, you can make it by adding 10 + 2 and so on.

Tell the class you have chosen a number (write it on a card and stick it face down on the board so they cannot see what it is). Give the class information about the number (you can vary this based on what you have or have not taught at this stage), for example: it is between 4 and 8; it is an odd number;
it is 2 less than 9. The students should guess what number it is and write it down. You can vary this by letting the class ask questions about your chosen number to try and guess what it is.

Ask the students to choose two or three numbers between 1 and 10 and write them in their books. Say facts about numbers. For example, this number is one more than 5. If the students have that number, they can cross it out. When students have crossed out both (or all) of their numbers they can call ‘bingo’.

Early in the year you could use the mental maths slot to reinforce and revise number names and numerals to 100 using flashcards.

- Show a series of cards with number names on them, such as ‘eighteen’ or ‘thirty-five’. Read the name and display each card for a few seconds and have the students write the number in figures. Check the answers as a class by displaying the correct numerals.
- If you write these on the back of the cards you can simply display them. You can then also use the cards to test number names by showing the numeral and having the students take turns to say the number you are displaying.

As the students become more familiar with counting and numbers to 100, you can vary the work with cards to include ordering and finding numbers more or less than a number as well as numbers between the given numbers. For example:

- This is the number 23. Write the number that is 1 more than this number.
- I’m going to show you a number. Write down the number that is one less than this number.
- Write the number that is 10 more/10 less than the number I am showing you.
- Here are two numbers. Which is greater?
- Here are three numbers. Which is smallest?
- Here are two numbers. Write a number that is between these two numbers.

Use arrow cards to build numbers. Say a number and then have the students build it. Say ‘show me’ and have them display their numbers.

Use arrow cards and spend some time building inverse numbers such as 39 and 93 and 19 and 91 to make sure the students understand that the position of the digit is important. Discuss the value of the digits in the numbers that the students build. Do this by building a two-digit number (for example 53) using arrow cards and ask the students to say what the 5 and the 3 represent (50 and 3).

Play some games with the arrow cards to challenge the students to listen and think carefully. For example:

- Make a number equivalent to two tens and three ones, four tens and no ones, no tens and nine ones.
- Build 45 and 54. Which is smaller (and similar)?
- Build 19 and 21. Which is larger (and similar, varying the order in which you give the larger and smaller numbers)?
- Build a number between 13 and 16 (and so on).
• Build three different numbers whose digits add up to ten (73, 64 and so on).
• How many numbers smaller than 100 can you build with 4 in the tens position?
• I am a number between 40 and 60 with one five. What number could I be (and similar)?
• Build a number that reads the same from back to front.
• Build a number whose name rhymes with nine (fine). (Other rhyming numbers could rhyme with bun (one); you (two); me (three); door (four); alive (five); sticks (six); heaven (seven); late (eight).)

You can also use the arrow cards to reinforce counting activities. These activities are useful because they require the students to physically build numbers and then partition them to replace digits and this helps them make sense of calculations involving two-digit numbers. Some activities are:
• Build a number that is 10 more than 17.
• Build a number that is 10 less than 23.
• Build a number that is 3 less than 14.
• Build a number that is 5 less than 20.

Display six sequences of two-digit numbers each with some numbers missing. Point to a missing number and let the students guess what it is. Repeat for each missing number.

Choose a two-digit number and display it. Ask the students to read it, identify how many tens and units it has and then count on and back in steps of ones or tens from the number.

Display a place value table marked with tens and units columns. Like this:

<table>
<thead>
<tr>
<th>Tens (T)</th>
<th>Units (U)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Make a large (laminated if possible) copy of this table for each student and then have them play a game in pairs. They should take turns to toss a die and write the number facing up in one of the places. For example, if they get a 6, they may write it in the T or U place. Change the aim of the game so that sometimes the winner is the student who makes the biggest number and other times it is the student that makes the smallest number. You can vary this by using dice marked with numbers other than 1–6 and you can include 0 as a challenge.

Make sets of five or six different one- and two-digit numbers on small cards (you’ll need enough for each group or pair of students). You can easily make 100 cards by enlarging and then cutting up the 100 square. Shuffle them and put them into envelopes for use. Distribute the sets of numbers and let the students arrange them in order (from biggest to smallest or vice versa). You can also use these cards to sort into odd and even numbers, or numbers greater than 20 and numbers less than 20 and so on.
Play ‘Guess the number’ either as a class or in groups. Let students take turns to choose a two-digit number and make them jot it down. The group then takes turns to ask questions to try to guess the number. The student who has the number may only answer ‘yes’ or ‘no’.

Do a range of activities in which the students have to count in given steps. Vary these according to what you are doing in class and the number range that the students are working in.

- Count from 39 to 55.
- Count back in twos from 50 to 30.
- Count in tens from 15 to 55.

You can also prepare a series of charts like these to use as a mental warm-up. Students can answer orally or in writing.

<table>
<thead>
<tr>
<th>10 less</th>
<th></th>
<th>10 more</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>99</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Between</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>56</td>
<td></td>
</tr>
</tbody>
</table>

Ask questions based on counting back and forwards using a number line marked from 0 to 100 in intervals of 10. Some possible questions are:

- What is 10 more than 45?
- What is 10 less than 90?
- What is 10 more than 60?
- What is 10 less than 12? (and so on)

Do lots of activities using place value charts. For example:

Here is a place value chart showing the number 85

```
10  20  30  40  50  60  70  80  90
1   2   3  4   5   6   7   8   9
```
What number is shown on this chart? (52)

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>

Write the number in words. (Fifty-two)

If you make a large chart and laminate it, you can use wipe-dry pens to underline or circle the numbers each time. If you are using an electronic chart you can highlight the boxes you are referring to, as we have done above. Let the students say each number in words, and then write it in numerals.

2. Estimating

Students do not need to round numbers at this stage, so the focus is on estimating quantities.

Play grab games with the students. Let them grab a number of items (paperclips, stones, seeds, beads, counters, unifix blocks). They should estimate how many they have grabbed and then count to check. Vary the size of the items so they begin to develop the idea that when they make a grab of bigger items, they will have fewer items and when they grab smaller items they will have more.

Prepare an estimation jar. Use a small glass jar or plastic container and fill it with items such as beans. Stay in the number range 0–30 at this stage. Let the students jot down how many beans they think there are in the jar (to the nearest ten). Then, show them a smaller container filled with the same items and tell them how many there are. For example, this jar has ten beans in it. How does that affect your estimate? Discuss how their estimates would change if you used larger/smaller items to fill the jar. Discuss how you could, check the estimates and then count the items in groups of tens or other appropriate groups.

You can also tell the students that a jar holds an amount. For example, this jar holds 80 marbles.

Tell the class that some have been taken out and ask them to estimate how many are left, and/or how many were taken out. Discuss how they reached their estimates.
Prepare a set of cards with a number of large dots or shapes on them. For example:

Display these and get the students to estimate how many objects there are on the cards. Spend some time discussing how they reached their estimate. For example, the dots are in groups of about 5 and there are six groups, so I estimated 30. (You may need to flash the cards for a few seconds and then remove them to avoid students trying to count. Remind them that you are asking them to estimate.)

3. Mental problem solving

Use grids like the one below to do mental calculations on a regular basis. Students can copy and complete them if they are able to do so quickly, or you can display them, give the students time to jot their answers or build them using arrow cards. Then either ask the whole class to show you the answer, or choose different students to say and show their answers.

<table>
<thead>
<tr>
<th>4</th>
<th>2</th>
<th>3</th>
<th>7</th>
<th>6</th>
<th>1</th>
</tr>
</thead>
</table>

Give clear instructions for finding the second row. For example:
- the number that is one more than this one
- the number that is one less than this one
- this number with 2 added to it
- subtract 1 from this number to get the new number
- the number that is ten more than this one
- double this number.

Test understanding of mathematical terms and vocabulary by posing worded problems to be solved mentally. For example:
- What is the sum of 5 and 5?
- I have 7, how many more do I need to have 10?
- Mike has 5 marbles, Jessie has 2 more. How many does Jessie have?
- I have 8c and 2c, how much is that altogether?
- I have four 2c coins. What amount of money do I have?
- I bought two items costing $10. What did I pay?
- Half of a group of 8 students wears glasses. How many students is this?
- There is a difference of 10 between two numbers. If one number is 19, what could the other number be?
• The total of three numbers is 12. What numbers could they be?
• I shared 10 cakes equally among 2 children. How many did they each get?
• What is 7 less 4?
• What is the difference between 10 and 2?

And so on.

You can also ask the students to pose problems for each other. Developing their own worded problems is one of the problem solving objectives for this stage. They can write these down and exchange problems to try and solve each other’s problems.

Reinforce recall of addition and subtraction facts to 10 by posing worded problems using measures and money amounts. For example:
• I had 10 lengths of rope. I used 9 lengths. How much is left?
• I paid for a $5 toy with a $10 note. How much change will I get?
• I mixed 2 buckets of sand with 8 buckets of cement. How much did the mixture weigh?
• A bucket can hold ten bottles of water. If it already has 2 bottles of water in it, how many more bottles can I pour in before it is full?
• Mandy and Sally have 10 dollar coins between them. How many dollars could they each have? (List all the bonds to 10.)

And so on.

Display some target boards, stick moveable counters onto them and ask the students to work out the total score for each board (adding several small numbers). Repeat with the counters on different numbers. For example:

Write a number on the board. For example 8. Ask, how could you put 8 things into two equal groups? How many things would be in each group? How do you know? Repeat for other small amounts.

4. Calculation skills

Prepare a set of ‘target’ numbers. For example 9 and 10. Ask the students to write as many calculations as they can to get to each number. You may want to limit this to focus on particular operations. For example, write as many addition sentences as you can with this answer. Or you can leave it open ended and challenge the class to find as many different operations as possible.
Prepare some number machine charts and let the students complete them:
For example:

\[ \times 2 \]

\[ 1 \quad 3 \quad 6 \quad 7 \]

Use the true or false strategy to test vocabulary and also to apply calculation skills. Give students a statement and have them say whether it is true or false. Discuss how they decided. For example:

- 1 plus 7 is 8
- double 3 is 6
- the difference between 6 and 10 is 4
- the sum of 3, 4 and 6 is 13
- 5 taken away from 10 is 5
- four lots of 2 are 8
- half of 12 is 6
- 9 tens are 19
- 42 is ten more than 52.

Prepare some simple number puzzles, such as magic squares.

Give the students a set of two-digit numbers and challenge them to use pairs of the numbers that meet certain criteria. For example, find a pair of numbers with a difference of 10, find two number where the one is 3 more than the other, and so on. Select the numbers carefully so that they work for the problems you are setting, for example:

| 29 | 12 | 39 | 15 | 17 |

Prepare sections of addition tables and display them for students to complete as quickly as possible. For example:

\[
\begin{array}{ccc}
+ & 1 & 4 & 7 \\
2 & & & \\
5 & & & \\
10 & & & \\
\end{array}
\]

\[
\begin{array}{ccc}
+ & 3 & 6 & 2 \\
5 & & & \\
2 & & & \\
10 & & & \\
\end{array}
\]
Prepare a ‘dartboard’ like this one with a 10 in the centre.

Tell the students that each sector adds up to 10 (the number in the centre) and ask the students to find the missing score on the outer ring. You can adapt this by writing a small number (1–5) in the middle and then saying that the outer ring minus the inner ring will give this result. Ask the students to find the missing numbers. Vary the task by sometimes providing the outer ring, sometimes providing the inner ring and sometimes providing some inner and some outer numbers.

Arrange the students in small groups. Give each group a pack of playing cards with the picture cards (jacks, queens and kings) removed. Tell them that the ace represents 1. Each group should shuffle the cards and place them face down on a table (or on the floor). The aim of the game is to make sums that add up to 10. Let the students take turns to turn over two cards. If they add up to 10, the player removes and keeps them. If they add up to less than 10, the player can pick a third card (if that makes 10, he or she removes the cards and keeps them). If the sum is not 10, or greater than 10, the cards are turned face down and the next student gets a turn. The game is over when no more tens can be made. The player with most ‘sums of ten’ wins. You can add zero as an option by including the jokers. You can also use the jokers and allow the students to give them any value if they are turned over (wild cards).

Test listening skills and computational fluency by reading instructions. Students can jot them down and they should record the answers and put up their hands when they have them. Adapt the tasks to the skill levels of the class and what you have covered at that stage of the year. Here are some sample activities:

- Tell the students ‘I’ll say a number and you double it’ (use easy numbers to start with). Then include an addition or subtraction, for example: ‘I’ll say a number. You double it and then add (or subtract) 1 (or 10).’ Then, adapt the task, for example, ‘I’ll say a number, add 1 to it and then double it.’

- Make the calculation a chain calculation. For example, start with 2, double it. Add 1. Then subtract 2. Add 3 and then find the number 1 less than that.
• Give the answers and have the students make up a matching calculation. State the operation. For example, in an addition, the answer is 9. Give me two numbers. Increase the number range and the numbers, for example, the answer is 12. Give me three numbers that add up to 12. Change the target number regularly.

4. **Shape, space and measures (including time)**

Prepare a time quiz to test knowledge of units and vocabulary. Students can either say or write the answers. Here are some sample questions.

• Which is longer: a minute or a second?
• How many days in a week?
• How many months in a year?
• What is the sixth month of the year?
• Which is longer: a month or a year?
• Which month comes before September?
• Which day is before Monday?
• Which month comes after November?
• What day will it be tomorrow?
• What day is two days after Thursday?
• What is the first day of the week?

Ask students to show or tell the time using a clockface:

• at 1 o’clock, at 7 o’clock, etc.
• an hour before 2 o’clock
• an hour after 1:00.

Pose some questions related to mass. For example, say which item weighs the most in each pair:

• an apple or a brick
• a pencil or an apple
• a kilogram of apples or your shoe
• a litre of cola or a glass of water
• a basketball or a tennis ball
• an empty cup or a full cup.

You can adapt these questions to work with length and capacity.

Ask students to write estimates of the lengths of various familiar items in appropriate units. For example, a shoe, your book, a desk, a pin, a pencil, the door of the classroom and so one. Discuss what a reasonable estimate might be in each case.
Display a number of 2D shapes. Give the students each a set of flashcards with the names of the shapes. Show each one for a few seconds and ask the students to select and show the name of the shape. Vary this by saying the name and having the students select the correct shape from a selection of plastic or cardboard shapes.

Say the name of a shape and ask the students to write down how many sides it has.

Show the class the name of a 3D shape, for example cuboid. Let them tell you what real objects are that shape. See how many you can list on the board.

Use the mental warm-up session as an opportunity to explore solids and shapes used in buildings. You can find pictures of homes, places of worship and/or murals and decorative patterns from a range of sources. Display these and spend some time identifying and naming the shapes used in construction, symmetrical and other properties. If the students struggle with 2D representations of 3D objects, show them real items such as dice, a soccer ball, a cereal box and let them name these, and then find pictures of them to make the connection between the real item and its representation.

Display a number of 2D shapes (or 3D objects) labelled A to F. Display the correct names of the shapes in a mixed order and ask the students to match them up.

Use plastic shapes, or prepare and laminate cards with coloured shapes on them. Distribute these to the class so each student has at least two different shapes. Play a game in which you call out commands such as ‘show me a red square’. All students with that shape should then hold it up. Repeat for different shapes, moving quickly to make the children react quickly. If they hold up a wrong shape or colour, they have to put it down. Once they’ve lost their shapes, they can’t play anymore.

Display a number of shape patterns and have the students draw or show the next shape. For example:

```
[
  [●, ●, ●, ●, ●, ●],
  [●, ●, ●, ●, ●, ●],
  [●, ●, ▲, ▲, ▲, ▲],
  [▲, ▲, ▲, ▲, ▲, ▲],
  [▲, ▲, ▲, ▲, ▲, ▲],
  [▲, ▲, ▲, ▲, ▲, ▲]
]
```

Encourage the students to tell each other how they decided what the next shape would be.
You can also display a set of shapes on a grid. For example:

```
  □ □ □
 △ □ △ △
 □ □ □ □
```

Ask questions such as:
Which shape is in the top right corner?
What shape is above the red triangle?
Which shape is left of the green triangle?
Which shape is below the blue circle in the second row?
And similar.
Workbook 1A

1 Measurement – language

<table>
<thead>
<tr>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1M1 Compare lengths and weights by direct comparison, then by</td>
</tr>
<tr>
<td>using uniform non-standard units.</td>
</tr>
<tr>
<td>1M2 Estimate and compare capacities by direct comparison, then by</td>
</tr>
<tr>
<td>using uniform non-standard units.</td>
</tr>
<tr>
<td>1M3 Use comparative language, e.g. longer, shorter, heavier, lighter.</td>
</tr>
<tr>
<td>Note that weight is covered in Workbook 1B and all objectives</td>
</tr>
<tr>
<td>are revisited later in the course.</td>
</tr>
</tbody>
</table>

Vocabulary
Big, bigger, small, smaller, long, longer, short, shorter, thick, thicker, thin, thinner, wide, wider, widest, narrow, narrower, narrowest, full, empty, some, more, most, less, container, holds, fill, pour, amount.

Resources needed
Collections of big and small objects for comparing; long sticks and short sticks; straws cut into long and short sections. Lots of blocks; boxes; cylinders; cardboard; glue; chart paper; blindfolds; cut-out rectangles of the same length but differing widths; tall and narrow containers; bucket and toilet roll; modelling clay rolled into thicker and thinner sections; items of different thicknesses, e.g. books, crayons and pencils, plastic containers and tins of different sizes; water or sand; six bottles or glasses.

Mental warm-up activities
Select suitable activities from the mental warm-up activity bank.

Concepts that may be unfamiliar in this topic
Comparative language: big, small, long, short
It is important that you help the students to understand that things can be both big and short, and long and small. It is also helpful to isolate the concept of linear measure by comparing similar items, such as long and short sticks or rulers rather than comparing a long skirt and a short pencil,
for example. The concept of ‘tall’ is also important for understanding length and height. Students need to understand that ‘tallness’ is length measured from top to bottom. They are not expected to measure formally yet, but they are expected to visually estimate in order to compare and order lengths.

The concepts of wide and narrow, or thick and thin, can be taught in the same way as the other opposites (big and small, long and short). Essentially the children are still dealing with the concept of linear measure, but they need to develop the vocabulary to talk about different aspects of this. Thickness is likely to be fairly familiar to them; width is often a more difficult concept to grasp, especially as it is variable.

**Capacity**

In order to develop the concept of capacity, the students need to understand the terms ‘full’ and ‘empty’. They also need to be able to compare quantities held in a container to develop the concept that a container can be full, empty and many states in between. You will need to make sure that students have experience of filling and pouring. Use a range of containers and allow them to fill and empty them and to pour from one to the other. This is important and it can help the children to develop the concept of conservation of measure when they pour from a tall narrow container into a deep wide one because they see the different impressions but realise that they hold the same amounts.

**Teaching ideas**

**Practical activities**

Begin by revising the concept of big and small and comparing objects generally by size. Give each student an object. Make sure some of the objects are big and some are small. For example, big balls, small balls, big books, small books, big blocks, small blocks, big crayons, small crayons, etc. Give the students time to explore their object and to decide whether it is big or small. Tell them to exchange their object for another object the same size (i.e. if theirs is big, for another big one, if theirs is small, for another small one). Then ask them to exchange that object for an object of the opposite size.

Have two students come to the front, one with a large object, one with a small object. Use them to teach the terms ‘larger than’ and ‘smaller than’. Let the children practise using these terms by comparing their objects with those of others in the groups.

Get the students to draw an object or shape in their exercise books. They then draw an object or shape that is smaller than the first and one that is bigger than the first. Next they can draw an object that is the same as the first one and an object that is different to the first one.

Teach the words ‘short’ and ‘long’ to the class. You can do this using a long stick and a short stick, or any two objects that are very different in length. Explain that we talk about short people but that we say ‘tall’ people and not ‘long’ people. Ask the children to arrange themselves in a line from shortest to tallest. Let them try to work out for themselves who is the shortest and who is the tallest. Try
not to intervene unless they are really not managing. When they are standing in position, have each student say, ‘I am shorter than . . . , I am taller than . . .’. Introduce the terms ‘shortest’ and ‘tallest’ using the students in the line.

Give each student one piece of straw (some long, some short). Put the students in groups of three and have them arrange the straws in order, from shortest to longest.

Show the children one thick block of wood and one thin one. Point out which one is which. Have a discussion about things that are thick and things that are thin. Divide the class into pairs. Give each pair one thick block and one thin block and a blindfold. Have them take turns to wear the blindfold, feel the blocks and identify the thick one and the thin one.

Use a range of items. Start with pairs. Ask the students to say which is thicker in each pair. Repeat several times to teach the word ‘thicker’. Do the same for thinner. Next, place three or four on your table at a time. Have different students point out which is the thickest and which is the thinnest. Repeat this until you are sure the students understand the terms ‘thickest’ and ‘thinnest’.

Give all the students a range of thick and thin objects, glue and string, sticky tape and other building materials. Let them build a tower out of thick and thin objects. Their tower should not fall down.

Let the students find a number of thick and thin objects in the classroom and arrange them in order from thickest to thinnest.

Paste a row of cut-out rectangles on the board like this:
Ask the students to say how the shapes are different. Teach the words ‘wide’ and ‘narrow’ using the more familiar terms ‘fat’ and ‘thin’. Write the words on the board to reinforce the vocabulary. Ask the students to sort the shapes into two groups – wide and narrow. They will need to decide how to do this and this will help them to see that the terms are used comparatively. Once you have grouped them, have the children arrange them in order from narrowest to widest.

Show the students the top opening of a bucket and the opening of the cardboard cylinder of a toilet roll. Discuss which is wide and which is narrow. Explain that a bucket is wide because it has a big opening and that a toilet roll is narrow because it has a small opening. Have a discussion about other things that are wide and narrow in the environment and draw some of these.

Play some movement games in the schoolyard. Get the students to make a wide circle. Then have them make it narrow. See how wide they can spread their arms or legs and how narrow they can make them, and so on.

Use modelling clay to demonstrate the terms ‘thick’ and ‘thin’ and how we can change something thick to something thin. For example, you can show a thicker length of modelling clay, and a thinner one, and have the students say which is thicker. Then roll it out thinner and ask which is now thicker. You can also show pairs of items that we might compare using these terms (such as books of different thicknesses, crayons and pencils of different thicknesses, and so on).

Explain that we usually use ‘wide’ and ‘narrow’ to describe openings such as doorways, passages, tubes and pipes, the neck of a bottle, and so on. Ask the students to think of different examples at school and say which is wider/narrower.

Show the students an empty container and a full container. Ask them to say which is which. Label the two containers ‘full’ and ‘empty’. Make a chart for full and empty.

Divide the class into small groups. Give each student a container. Ask them to put water (or sand) in their containers. One student should have a full container, one should have an empty container, the others should have containers that are somewhere between full and empty. Having done this, let them arrange the containers in order from empty to full.

Display a set of six bottles or glasses. Place the same amount of liquid or sand in three pairs but mix the order. Ask the students to put the containers with the same amounts next to each other. Discuss whether the others hold less or more than the middle set.
Using the Workbook

- Revise the words ‘shorter’ and ‘longer’ before asking the students to complete pages 3 and 4. Let them check each other’s work.
- Revise the words ‘thick’, ‘thin’, ‘wide’ and ‘narrow’. Have the students complete page 5 independently. Observe them as they work to make sure they are circling the thinner objects.
- Similarly, explain the instructions then have them complete page 6 independently.
- Students work independently to complete page 7.

Assessment questions to ask

• Which object is bigger/larger?
• Which object is smaller?
• Which object is big and round?
• Which object is long and blue?
• Which object is tall and yellow?
• Which object is shorter?
• Which object is as short?
• Which object is longer?
• Who is tallest?
• What is the tallest thing at our school?
• What is the shortest thing at our school?
• What is the longest thing at our school?
• Which is wider?
• Which is narrower?
• Which is thicker?
• Which is thinner?
• Name three thin objects.
• Name three thick objects.
• Of these three, which is widest?
• Find the widest object in this group.
• Which container is full?
• Which container is empty?
• Which container holds more?
• Which container has the most water in it?
• Which container has the least water in it?
• Which containers have the same amount?

Common errors and misconceptions

Some students find size terms confusing, and the comparative terms even more so. It is important to start with the simple terms such as ‘big’ and
‘small’ before moving onto the comparisons. It is also important to use objects which are clearly very different in size to start with, in order to prevent confusion.

At this level you may also find that some students have a very clearly defined, sophisticated conceptual understanding, while others do not. You may need to adjust the activities to challenge higher-attaining students. For the students who find the concepts difficult, it is useful to spend more time at the concrete level, letting them handle big and small objects and talk about them.

Some students find it difficult to conceptualise the relativeness of length and will find it hard to decide what is short and what is long with no sense of comparison. For this reason, it is important to start with two items that are vastly different in length to teach the terms.

Students may also find it difficult to order similar lengths. Give them plenty of practice with straws and have them verbalise what they are doing. For example: ‘This is the shortest, this is the longest.’ Or, ‘This one is short, this one is shorter, this one is the shortest.’

Students may find it difficult to grasp the relativeness of the terms. For example, the widest of their group of narrow rectangles is still narrower than the narrowest of the wide rectangles. This apparent inconsistency may lead to some difficulties and the students should not be expected to manage the use of these terms immediately. However, it is important to make them aware of the vocabulary so that they gain confidence from using it over time and in different ways.

Lower-attaining students may have difficulty understanding that a tall narrow container can hold the same amount of water as a deep, wide container. You will need to give them lots of practical experience so that they can develop their concept of conservation of measure.

### 2 Revise counting (0–10)

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Workbook 1A pp 8–15</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Nn1</td>
<td>Recite numbers in order (forwards from 1 to 100, backwards from 20 to 0).</td>
</tr>
<tr>
<td>1Nn2</td>
<td>Read and write numerals from 0 to 20.</td>
</tr>
<tr>
<td>1Nn3</td>
<td>Count objects up to 20, recognising conservation of number.</td>
</tr>
<tr>
<td>1Nn8</td>
<td>Use more or less to compare two numbers, and give a number which lies between them.</td>
</tr>
<tr>
<td>1Nn9</td>
<td>Order numbers to at least 20 positioning on a number track; use ordinal numbers.</td>
</tr>
</tbody>
</table>
Vocabulary

Number names, count, how many?, more than, less than, one more, one less, numeral, number line, number track.

Resources

A number line with clear numerals 1–10; flashcards with numerals 1–10 on one side and the number names on the reverse; seeds, counters; egg boxes, interlocking cubes; a classroom chart showing the numerals from 1 to 10 with associated number names and pictures: For example:

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>one</td>
<td>two</td>
<td>three</td>
<td>four</td>
<td>five</td>
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<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
</tr>
</tbody>
</table>

Mental warm-up activities

Select suitable counting, ordering and number sense activities from the mental warm-ups activity bank to support the work in this section.

Concepts that may be unfamiliar in this topic

Counting objects and knowing that the last number counted is the amount (cardinality)

Many students are able to count by rote. This does not mean they understand what they are counting. It is important that when students say ‘one’ it means one object, and that when they say ‘two’ it means two
objects, and so on. This number knowledge requires matching things to amounts. Students need to be given the opportunity to count things in their environment, including the parts of their bodies. Fingers are especially helpful for learning to count.

Students should be able to recognise and write the numerals 1 to 9 at this stage and match them to the correct number name and set. They also need to be able to demonstrate cardinality by matching the number names to sets and making sets of one to ten objects.

**Writing numerals**

At this early stage, some students may struggle with writing and forming numbers. Forming the numerals needs careful teaching and instruction – students need to know where to start when they form the numeral and how to ‘write’ each one. There are many different methods for teaching this. Some ideas that you might find useful are:

- forming the numerals in the air, in sand or in paint
- using a finger to trace over a big numeral
- using tracing paper to copy or trace the numeral
- completing worksheets with dotted versions of the numerals
- copying rows of numerals
- making patterns with numerals.

**Teaching ideas**

**Practical activities**

🔍 You can use rhymes and songs such as these to reinforce counting:

**One, two, buckle my shoe**

One, two,
Buckle my shoe

Three, four,
Shut the door

Five, six,
Pick up sticks

Seven eight,
Lay them straight

Nine, ten,
Do it again!

**Ten green bottles**

Ten green bottles
Standing on the wall
Ten green bottles
Standing on the wall
And if one green bottle
Should accidentally fall
There'll be nine green bottles
Standing on the wall

Nine green bottles
Standing on the wall
Nine green bottles
Standing on the wall
And if one green bottle
Should accidentally fall
There'll be eight green bottles
Standing on the wall

[Continue counting down]

One green bottle
Standing on the wall
One green bottle
Standing on the wall
If that one green bottle
Should accidentally fall
There'll be no green bottles
Standing on the wall

Revise counting to five. Get the whole class to stand at the back of the room. Have them come forward one by one, counting them as they do so. Place them in groups of five at the front. Each time you get to five, start again from one. Have the members of each group count themselves off as they go back to their seats.

Ask all the students to fold down their fingers and to count with you. As you say each number, they should raise another finger (start with the thumb). Shake your hand when you get to five. Repeat this pointing to the numerals on the number line. Next, point to the numerals but don’t say the numbers – get the students to raise their fingers in order as they watch you. Do this in order a few times.

Make a counting circle. Have the students sit in a circle (at this stage, you can make each circle any size up to 10). Say things like:

- If Rajesh is five, who will be eight?
- Start at Nicky, she is number nine. Count back to ten.
- If Anna is five, count on three from her.
Divide the class into groups. Give each group the correct number of sweets so that each student can have one. Ask them to share them out so that everyone gets one. Ask them how many sweets are left over. (Expect the answer zero or none.) Repeat the sharing activity using counters but vary it so that sometimes there is nothing (zero) left over, sometimes there is something left over. You can also vary how many each student is to receive in order to reinforce the number concepts 1–10.

Make sure the students can write the numeral 0 and the word zero. Display sets of objects on the board. Have some with no objects. Get the students to come up and write the number of objects and say the number name.

Use the number line. Point to any number. Select a student and ask him or her to clap that number of times. The rest of the class must count the claps and check that he or she is correct. Repeat this several times using a range of numbers.

Choose a starting number. Get a student to clap the correct number of times. Ask the class ‘What is the next number?’, and point to it. Have the whole class clap that number of times. Repeat this using all the numbers as starting points. Then do it again in order from one to ten.

Give each group a set of interlocking cubes and have them build rows or towers that match a given set of numerals and/or number names. For example, give a group cards with the numerals 3, 6 and 9 on them and they have to build matching towers. You can then ask the students to put the towers in order from smallest number of cubes to largest.

Use the egg cartons together with seeds and/or counters to give practice in counting out different amounts. Label the compartments with different amounts and let the students count these amounts and place the objects in the compartments. When they have done so, let them exchange with a partner and recount the objects to check their partner was correct.

Give the groups a set of numeral cards for 1 to 10 shuffled so they are not in order. Let them re-arrange the cards in order from 1–10 and backwards from 10–1.

Display a flash card with a numeral on it. Ask questions such as:

- What number is one more than this one?
- What number is one less than this one?
- Which number comes before this one?
- Which number comes after this one?
As the students become more competent, you will need to make sure they can work with mixed groups and identify the number of elements in any set, whether it is spread out, arranged or clumped together – this concept of conservation of number is very important. For example, you could play games where the students make a ‘grab’ of some stones and then say how many they have taken. They can count them out to check.

**Continue working in a concrete fashion with the students until you are sure that they are able to count in sequence, that they recognise and can name the numbers from 1 to 10, that they have a concept of these numbers and that they are aware of the conservation of number.**

Before moving onto the workbook, use practical activities to check that the children are able to:

- Identify the set with more objects and say how many objects there are.
- Display a sense of number conservation by identifying sets with the same number of objects and write the matching numeral.
- Draw a set with fewer objects than a given one and write the matching numeral and number name.
- Write the numerals 1–10 in order.

If students are unable to do any of these activities, spend time with them in small groups with concrete apparatus to reinforce the concepts and develop the necessary skills.

**Using the Workbook**

You can work through page 8 orally with the students. Have them count aloud and then write the number. Note which students struggle to form the numerals and who can or cannot count to five. If the students cannot do this, you will need to make some interventions to help them count confidently. (See the *Nelson International Mathematics Kindergarten Teacher’s Guide* for some ideas on how to do this.)

Let the students work independently to complete page 9 once you have done some practical counting activities to 10.

Use page 10 to assess whether or not the students understand the concept of zero and to check that they can write the numeral 0.

Let the students work on their own or in pairs to complete page 11.

Use page 12 to check that the students can count and order the numbers from 1 to 10 on a number track.
Once you have introduced the terms less and more, have the students work independently to complete page 13. Let them check each other’s work.

Students can work independently to complete page 14. They do not need to copy the objects accurately, rough drawings are good enough.

Make sure the students understand that they have to count the dots on both sides of the dominoes before asking them to complete page 15.

**Assessment questions to ask**

- What number is this (pointing to it)?
- How many am I holding?
- What is one more than . . . ?
- What is one less than . . . ?
- Say the next number.
- What number comes after . . . ?
- What number comes before . . . ?
- What is this number’s name?
- Draw this many.
- How many are left?
- What number is this (pointing to it)?

**Common errors and misconceptions**

It is important to make sure students develop a sense of the value of each number. For that reason, when you are initially writing numerals, you should also display the amount represented by the numeral, for example:

<table>
<thead>
<tr>
<th>*</th>
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</tbody>
</table>

Some students have difficulty writing numerals, because we use one stroke to make the numeral 1, they expect to use two strokes to make 2, and so on. You must explain that numerals are simply a short way of writing number names, a code if you like.

Zero can be a difficult concept for students. It is best introduced as a situation in which there are, for example, two sweets, and both of these get eaten so that there are ‘none’ or ‘nothing’ left. This is more meaningful and it will allow them to develop the concept of an empty set containing no members or 0.
Objectives

| 1Gs1 | Name and sort common 2D shapes (e.g. circles, squares, rectangles and triangles) using features such as number of sides, curved or straight. Use them to make patterns and models. |

Vocabulary

Circle, square, rectangle, triangle, sides, pattern, straight, curved, table, sort.

Resources needed

Cut out shapes (or use plastic, wooden or cardboard shapes), flashcards with names of shapes and diagrams of shapes, crayons and paints for making patterns.

Mental warm-up activities

Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic

Names of shapes

Students may not know (or remember) the names of 2D shapes. You will need to teach these and reinforce them as you work through the activities. Using and modelling the correct names will help the students remember them. At this stage we are only dealing with the basic 2D (flat shapes): circles, squares, triangles and rectangles.

Concept of a pattern

Students will have done some work on repeating patterns previously, but they may not fully grasp the idea that a pattern is a repeating sequence, and that when you work with shapes, the pattern can be made by different shapes, varying the colour of the same shape, changing the size or orientation of the shape, and so on. Lots of practical activities in which the students make, draw and describe patterns will help them develop this important concept.

Sorting and classifying shapes using properties

Students may not previously have sorted shapes using the properties of the shapes (number of sides, whether the sides are straight or curved) having
focused on colour and size. Guided activities and discussion about the shapes will help them to see that shapes can be grouped into categories of the same shape. The sorting activities in this topic can also be used to teach students how to keep track of their sorting by crossing out shapes as they count them and by making simple tally marks to record each count.

Teaching ideas

Practical activities

Divide the class into groups and give each group a set of shapes to sort. Make sure that each group has a range of different shapes. Ask the groups to tell the class how they sorted their shapes (some may have sorted by size, others by colour, others by shape).

Stick a number of different shapes in random order on the board. Explain that we can sort shapes into groups by name. Draw a large table like this one:

<table>
<thead>
<tr>
<th>Circles</th>
<th>Squares</th>
<th>Rectangles</th>
<th>Triangles</th>
</tr>
</thead>
</table>

Read and say the names of the shapes. Put one shape of each type into the correct place in the table. Then, take the shapes one by one. Ask different students to say the name of the shape and to show you where it should be placed in the table.

Use the sorted shapes to talk about the properties of each type of shape. Get students to describe what each type of shape looks like. For example, circles are round shapes; triangles have three straight sides.

Reinforce the shape names by asking questions such as:

- Who can see a rectangle somewhere in the classroom?
- How do you know it's a rectangle?
- What shape is this brick? How many sides does it have?
- This shape has three sides; what is it called?

You can extend sorting shapes to include flat shapes from the environment. Note that triangles are generally the hardest to find. Get the students to collect pictures of things such as tablecloths, scarves, rugs, etc. (rectangles and squares), CDs, wheels, counters, coin, etc. (circles), handkerchiefs or tissues, pages of a calendar, adhesive notes, CD boxes/covers, picture frames, etc. (squares) and pennant flags, earrings, floor tile designs, logos on T-shirts, etc. (triangles). Use the pictures or objects to make a classroom display of different shapes.
Give the students a set of cards or stickers and have them label flat shapes in the classroom. This will give them practice in writing the names of shapes (if they can’t do that, then give them a set of pre-printed names).

Use a ‘feely bag’. Let students take turns to put their hand into the bag and feel a shape without looking at it. They should try to guess what it is before removing it from the bag.

Reinforce shape names by making a set of snap playing cards using shapes. Some should have drawings of shapes, other should have names. Give each group a set of cards and have them deal them out. The students can then play a game of ‘snap’ using the cards. They take turns to play a card. If the same shape, or the matching name is played, the player can call ‘snap’ and take the cards. The player with the most cards at the end of the game wins.

Set out a simple pattern using coloured squares: red square, blue square, red square, blue square, red square. Ask, ‘Which colour square do you think I am going to put down next?’ (They should answer ‘blue’.) Ask the students to explain how they know. They should explain the pattern in their own words.

Ask a student to come up and set out a different colour pattern using two different colours of blocks. Ask another student to come up and continue the pattern. Again, have the second student explain the pattern in their own words. Repeat the exercise using three colours. Then repeat it using different sized squares (first two shapes, then three).

Lay out different sequences of shapes, ask the students to say which shape will come next in the sequence and to give a reason why.

**Using the Workbook**

Write the instructions and make sure the students colour each ‘key’ shape correctly (using the colours on the pencil icons) before asking them to colour the shapes in a larger mixed group on page 16. Once they have coloured them, it should be easy for them to count the number of each shape. Let the students work in pairs to sort and colour the shapes by number of sides. Allow them to decide what to do with shapes that do not fit either category, and discuss as a class why these don’t fit.

Once you have done some practical work on shape patterns, have the students complete page 17 independently. Ask students to describe the patterns during a class feedback session to reinforce both the names of shapes and the patterning concepts.
Use the table on page 18 together with real life examples to show the students straight and curved sides. Teach them how to mark off the shapes (by ticking or colouring them) as they count them and to tally if necessary to keep track of their count.

**Assessment questions to ask**
- What shape is this?
- What shapes have four sides?
- What shapes are round?
- What shape has three sides?
- What shape/number/colour block comes next? How do you know?
- What other way could we arrange these colours/numbers/blocks in a pattern?
- Make a pattern where you use the same shape but turn it in different ways each time.
- Make a pattern using triangles and squares.

**Common errors and misconceptions**
Some students may struggle to tell the difference between a square and a rectangle, particularly if the rectangle is not very elongated. Give them plenty of opportunity to handle both shapes and encourage them to turn the shapes – a square will look the same if you turn it, the rectangle shape will look ‘taller’ than it is wide. At this stage, the students simply need to know that a rectangle is more oblong or elongated than a square, but they do not need to grasp the very sophisticated concept of all squares being ‘special’ rectangles in which all sides are equal in length.

You may find that some students easily pick up certain patterns, but have difficulty with others. For shape patterns, they should look at the shapes and work out what changes and what stays the same to work out the rule for the pattern.

### 4 Ordinal numbers

<table>
<thead>
<tr>
<th>4: Ordinal numbers</th>
<th>Workbook 1A pp 19–20</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td></td>
</tr>
<tr>
<td>1Nn9</td>
<td>Order numbers to at least 20 positioning on a number track; use ordinal numbers.</td>
</tr>
</tbody>
</table>
Vocabulary

First, second, third, fourth, fifth, sixth, seventh, eighth, ninth, tenth; position.

Resources needed

Flashcards with the ordinal numbers and names for display, for example:

| First 1st |

Mental warm-up activities

Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic

Ordinal numbers

This is a new concept, although the students may already know some ordinal numbers from real life. For example, they may know who comes first in a race or competition. It is not a very difficult concept, but the students do need to know how to count and order numbers in order for it to make sense to them.

Teaching ideas

Practical activities

Place ten students in a line. Use their position to teach the ordinal numbers 1st to 10th. (You may want to include last as well.) Once you have done so, ask questions like:

- Who is first in line?
- Who is third in line?

And so on.

Ask the line of students to turn around (so first is now last). Repeat the questions for the new order. The aim is for the students to see that ordinal position is always given in relation to the situation.

Use the ordinal number flashcards. Hand them out randomly to 10 different students. Get the students to line up in the correct order. Ask questions about the order, for example:

- In which position is Naadira?
- Who is fifth in line?
Display a row of shapes. Write 1st next to the left-hand shape. Ask the students to point to shapes in different positions and to say their names. For example, Kesia, point to the third shape. Nick, what shape is Kesia pointing to? (This reinforces the shape names taught in the previous lessons.)

Draw a horizontal or vertical set of ‘boxes’ on the board. For example:

```
  _____  _____  _____  _____  _____  _____
```

Indicate which box is first. Give the students instructions to place shapes/numbers/letters in the boxes. For example, ‘Jabu, come up and stick a red triangle in the third box.’

Display a word such as Mathematics. Ask questions related to the position of the letters. For example:

- Which letter is in the second position?
- What is the fourth letter of this word?
- In which position is the letter ‘e’?

And similar.

Discuss where we use ordinal numbers in real life. For example, in queues, in sports, in order of children in the family and so on.

**Using the Workbook**

- Let the students work in pairs to complete page 19. They can draw a line or write the letter. Check their work to make sure they understand the concept.

- Use page 20 to reinforce the written element of ordinal numbers. Display the flashcards in the classroom for reference at this stage.

**Assessment questions to ask**

Adapt any of the questions you asked in the practical activities and the Workbook activities to assess understanding of this concept.

**Common errors and misconceptions**

If students cannot count and order numbers they will struggle with ordinal numbers. They may also struggle with ‘before’ and ‘after’ positions. Help them to make sense of this by giving instructions and having the student follow them, for example: ‘Here are five beads. Pick up the fourth bead. Is this before or after the third bead? What colour is the bead before the second bead? What position is this?’ And so on.
5 Handling data

Objectives

1Dh1 Answer a question by sorting or ordering data or objects in a variety of ways, e.g.
– using block graphs and pictograms with practical resources; discussing the results
– in lists and tables with practical resources; discussing the results
– in Venn and Carroll diagrams giving different criteria for grouping the same objects.

Note: block graphs and pictograms are in WB 1C; Carroll diagrams are in WB 1C.

Vocabulary

Sort, classify, table, inside, outside, tick, column, Venn diagram.

Resources needed

Collections of different objects for practical sorting tasks; examples of fruits for display.

Mental warm-up activities

Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic

Sorting using given criteria

In this unit the students are dealing with the concept of sorting objects by characteristic (in this case the shape in which each number is shown), but, at the same time, the arrangement of the objects on the page provides the basis of future work on pictographs. By sorting objects students show that they can state the common properties of an object in a set and decide whether a new object belongs in a set or not.

The process of looking for commonalities between things is useful in statistics, but also in other areas of mathematics. These thinking skills will be used later in problem solving and investigation work.

Venn diagrams

At this stage, the students will work with non-overlapping circles in a Venn diagram to sort objects using one criterion at a time. The most important concept for the students is that anything they place inside a circle must meet
the conditions for that circle. For example, when they sort shapes, a circle may have the condition ‘red shapes’ and they need to understand that only red shapes can go into that circle.

**Teaching ideas**

**Practical activities**

Use everyday opportunities to get students to do sorting and classifying tasks in the classroom. For example:

- sort books by size or colour on the bookshelf
- sort the crayons into colours to make complete sets
- sort counters
- sort plastic shapes by type or colour.

Get the students to go outside and make a collection of objects. They can choose stones, leaves or bottle tops. Get them to sort their collection by colour, size or shape and display it on the desk.

Show the class a selection of different fruit. This will depend on what is available locally. Discuss how you could sort them into groups (by type, by colour, by what we like to eat, etc.). Spend some time arranging the fruits in rows according to the categories that the students suggest. Ask questions about the arrangement.

Show the class that we can arrange the sorted fruit differently. Make loops of rope or use hula-hoops to make ‘groups’ for different fruits. Place fruit inside the circles according to different criteria. Explain that this type of sorting is called a Venn diagram in mathematics.

**Using the Workbook**

The activity on page 21 deals with sorting items according to which belong outside and which belong inside. More importantly, however, this activity gets students familiar with the conventions of using columns and rows in a table, and ticking to indicate matching categories. Make sure they understand the instructions, then have them work through the activity independently.

Discuss the activity on page 22, then have the students work through it independently.

Let the students work on their own to complete page 23. Once they have done so, have them compare their results with others in their groups. Have a class discussion about why there are differences in the students’ diagrams. Make sure they realise that what is similar is that all the diagrams meet the conditions even though some shapes may be bigger, smaller or even a different shape to those drawn by others.

Let students work in pairs to complete page 24. Discuss the last question as class. Students may suggest that those letters with both straight and curved lines could go in the box outside the circles, this is
a reasonable answer. Some students may work out that if the letter has both characteristics, it must be in both circles and that in order to do so, the circles need to overlap.

**Assessment questions to ask**
- How can we group the fruit?
- Which fruits are round? Which are not round?
- Which fruits have seeds you can eat? Which have seeds you cannot eat?
- Which fruits have to be peeled? Which do not have to be peeled?
- What other ways can we sort them?
- Can I add this shape to this circle on the Venn diagram? Why or why not?

**Common errors and misconceptions**
The most likely confusion at this stage is to do with language, symbols and understanding instructions. For example, do the students understand what you mean by sorting (rather than counting)? ‘Sorting’ means grouping items according to a particular category or characteristic. So if we group fruit according to size, we may have two groups: large and small. Or we may have three groups: large, medium and small. There are many different ways of grouping any particular collection of items.

On page 21, students need to understand the meanings of the words ‘outside’ and ‘inside’ in order to complete the activity.

Similarly, students need to understand that the shapes in the first column of each table on page 22 represent the shape in which each number appears. This is a symbolic use of shape, and they will need to understand that the shapes in the table correspond to the shapes in each collection.

### 6 Counting and combining sets

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Workbook 1A pp 25–31</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Nn1</td>
<td>Recite numbers in order (forwards from 1 to 100, backwards from 20 to 0).</td>
</tr>
<tr>
<td>1Nn2</td>
<td>Read and write numerals from 0 to 20.</td>
</tr>
<tr>
<td>1Nn3</td>
<td>Count objects up to 20, recognising conservation of number.</td>
</tr>
<tr>
<td>1Nn8</td>
<td>Use more or less to compare two numbers, and give a number which lies between them.</td>
</tr>
<tr>
<td>1Nn10</td>
<td>Use the = sign to represent equality.</td>
</tr>
<tr>
<td>1Nc8</td>
<td>Understand addition as counting on and combining two sets; record related addition sentences.</td>
</tr>
<tr>
<td>1Nc14</td>
<td>Begin to use the +, – and = signs to record calculations in number sentences.</td>
</tr>
</tbody>
</table>


Vocabulary
Number names from one to twenty, count, total, one more, forwards, backwards, before, after, between, smallest, biggest, one more, one less, count on, altogether, sum, total, how many, add, equals, plus.

Resources needed
Number line (0–20), number track (0–20), number cards with numbers 1–20; counters for those students who need them; number cards; egg boxes; a box of stones or other counters; two lids or shallow dishes; dice with a sticker over the six and a zero written on them (one per group); a chalk number line on the ground outside; two sets of cards with dots and numerals 1–20 on them; cards with + and = on them; a number line for each student.

Mental warm-up activities
Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic
Numbers to 20
In this section, the number range for counting and ordering numbers is extended to 20. The students may already know how to rote count to 20 and beyond, but they need to be able to correctly recognise and name numerals from 11 to 20 and to count objects to match each number. Oral counting work continues to be important to teach the number names and to help students recognise the patterns of the teen numbers.

Addition (and symbols + and =)
Students may already know the words ‘and’ or ‘more’ and use them to talk about adding or joining groups. In mathematics, addition is an operation that requires the putting together of numbers, it is indicated by a + sign.

On a number line, we can show addition by counting on, or moving forward a number of places. Physically moving the students on a number line outside will help to reinforce this concept. In the classroom, physically combining sets will form the basis for creating and writing number sentences to represent addition bonds.

Students learn to put together the members of different sets to get a total. In other words, they find the cardinality of two sets of numbers. This is an informal introduction to addition, and also provides a basis for patterning and conservation of number by representing quantities in different ways.

Teaching ideas
Practical activities
Count to 20 by physically counting out books, pens and other objects. You may also count 20 students, touching or pointing to each student as you count.
Display the number track from 0–20. Point to each numeral in turn and say its name. Ask the students to do the same. Once you have taught the number names, say a number (for example, fourteen) and ask a student to point to it. You can also point to the numerals and ask different students to say the number name.

Use the number line and number track to reinforce the order of numbers to 20. Ask questions such as:

- What number comes after ten?
- What number comes before fifteen?
- What number is between fourteen and sixteen?
- What number have I covered up? (Place a card or your hand over a particular number.)
- Which numbers have a 0? (0, 10 and 20)
- Which numbers have a 5? (5 and 15)

Spend some time writing the numbers from 10 to 20. Bear in mind that the students may initially space out the numbers too much and reverse the digits (writing 51 instead of 15 for example). The numbers should remain on display in the classroom for students to refer to (and you’ll find this is done in the Workbook too). Give instructions for writing numbers to reinforce the counting and ordering aspect as well. For example:

- Write the number that comes before 14.
- Write the number after 16.
- Write the number between 10 and 12.

Give the students a jumbled set of number cards from 0 to 20. Let them arrange these in order and then recite the numbers, forwards and backwards.

Do some practical counting activities to match value to numerals. Give each student a set of counters. Say for example, your number is 11. Make a set of 11. Check they can do this and allow them to check each other’s count. Adapt this by saying things like: ‘Make a set of 13. Take out a counter. How many do you have left?’

Use beads and blocks to reinforce counting. For example, prepare strings with different numbers of beads on them. Ask the students to count and say how many. Also, give the students strings and beads and ask them to string different amounts. You can vary this by saying things like: ‘String 4 red beads, now string three yellow beads, add 5 blue beads. How many do you have now?’

Show two different number cards. For example, show 15 and 18. Say, ‘This card shows fifteen, what does this one show? Show me where this number would go on the number chart?’ And so on.
Repeat some of the practical counting and ordering activities from pages 42–45 using the higher number range as necessary to supplement this work.

Teach the class how to count on and back on the number line using the large example. Physically point to, or move a counter along it, to do this. You can also play a game with the class. Give each student a number strip 0–20. Let them follow a set of fairly quick instructions by moving their finger. For example: start on 10, go back two, go forward three, go back one, go forward 2, what number are you on? Is this more or less than 14? And so on.

Give each student a set of number cards with a range of five numbers on them (for example 10–14 or 15–19). He or she takes turns to shuffle them and then sort them in order. Let the students work in pairs with the number cards. One student should remove a card without showing his or her partner what number it is.

The partner should arrange the cards in order and say what number is missing. You can then extend this by having the students remove two cards, or three cards.

Use an egg box. Place a target number card in each compartment and get the students to fill that compartment with the correct number of counters.

Give each group two lids and a pile of stones. Two students must take turns to grab a few stones and put them into one of the lids. Explain that they are going to ‘add’ them to find out how many there are. They discuss how to do this and find ways of working out what the total is. Get them to check by counting the stones one by one.

Take the class outside to work with the number line on the ground. Let them take turns to stand at different positions on the line. Throw the die to get a number from 0 to 5. Have the student say where they think they are going to end up. Let them move that number of steps on the line to check. Include zero.

Give each student a set of counters. Instruct the class to make groups. For example, start with 10 counters. Add two more. How many do you have? Repeat this several times with different numbers. Include zero when the students are ready.

Give each group a die, a pile of stones and two lids. They must toss the die to get a number from 1 to 6. Then they should find ways of making the number they have tossed with two groups of stones. For example if they throw 3, they can make it as 1 and 2 or 2 and 1.

Have a class discussion about how you can write down what you are doing. Model writing a number sentence such as three add one equals four. Get the students to make and combine several groups and to write number sentences to record their working.
Introduce the signs + and =. Teach the class that these are mathematical symbols that we use to write things in a short form. Give each group a + and = card. Let them use stones or other counters to model sums. They must decide where the + and = signs go. Walk around and check that they are doing this correctly.

Prepare pattern sheets using the plus and equals sign to reinforce writing these signs.

Give the students more practical examples of combining groups and let them record their working using + and = signs in the correct way.

**Using the Workbook**

Let the students work on their own to complete the grid activity on page 25. Check their colouring to see which numbers they don’t know. Reteach these as necessary. Let the students count the objects and write the correct numbers. Check they write the numerals correctly.

Use page 26 to see which students are confident in counting and writing numbers to 20.

Let the students work on their own to complete page 27. Check this work to make sure they can all count to 20 and that they can position numbers correctly on part of a number track.

Once you have done some practical activities with counting one more and one less using a number track, have the students work independently to complete page 28.

Use page 29 to reinforce and consolidate the practical activities using counting on.

Observe the students as they work through page 30 to see which students count on to get the total and which count all the objects individually. Model counting on as the most efficient strategy when you check the work.

Use page 31 to check that students can count on to combine groups and that they can write their combinations as number sentences. Be aware that some students may instinctively and automatically count on from the bigger number and that they may write their addition sentences that way round (for example, they may write 3 + 2 = 5 rather than 2 + 3). This is correct and it shows understanding, but you do not need to address this formally at this stage.

Encourage the students to use their number tracks or number lines to help them complete page 32. Bear in mind that some students may still need the re-assurance of counting each object to find the total. Allow this, but model the counting on strategy when you work with the class.
Assessment questions to ask

- What number is this?
- Say these numbers.
- Count from 15 to 20.
- Count back from 19 to 11.
- What number comes after ...?
- What number comes before ...?
- If I start here and count on 3, where do I end up?
- What is one more than 11?
- What is one less than 15?
- How many are there altogether?
- What and what makes . . . ?
- How many do I get if I add . . . and . . . together?
- How many do I have now?
- What happens if I add . . . more?
- What numbers can I add to get . . . ?

Common errors and misconceptions

It may be difficult for students to recognise the number of elements in bigger groups by sight. For this reason, we have grouped and ordered the elements of each set in the Workbook, so you may like to encourage students to do this with their stones and other counters to make it easier in the classroom as well.
Workbook 1B

1 Counting, ordering and place value

<table>
<thead>
<tr>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Nn1</td>
</tr>
<tr>
<td>1Nn2</td>
</tr>
<tr>
<td>1Nn3</td>
</tr>
<tr>
<td>1Nn6</td>
</tr>
<tr>
<td>1Nn7</td>
</tr>
<tr>
<td>1Nn9</td>
</tr>
<tr>
<td>1Nn11</td>
</tr>
</tbody>
</table>

Vocabulary

Number names to 100, compare, order, greater, smaller, estimate, count, tens, ones, place, plus, arrow cards.

Resources needed

1–100 chart for the classroom, number tracks and number lines, cards with empty tens and units boxes; arrow cards, counters, stones or buttons; small clear packets (sandwich bags) for making tens; counting abacus; counters, bundles of ten sticks or straws and loose straws, or matches or blocks.

Mental warm-up activities

Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic

Numbers to 100

Students need to be able to recite the numbers to 100 in order. At this level, the focus is on the number order and the recognition of how the numbers beyond 20 follow the same pattern. The 1–100 number chart is an important tool for teaching and reinforcing numbers to 100 and you should have one on display in the classroom for reference.
**Estimation**

Students need to be able to estimate how many objects there are in groups (up to 30) and to check their estimates by counting. It is quite difficult for young children to estimate and many children get anxious when asked to do so because they think if they estimate the wrong number they have made a mistake. You can alleviate some of this by estimating yourself – for example, I want to give each student ten counters, I estimate I will need this many (taking a grab); and by modelling the fact that your estimate was too high or too low (rather than wrong). For example, I need some more, my estimate was too low.

**Place value**

Students may well be able to count beyond 20 by rote, but they probably do not yet have an understanding of the way two-digit numbers are composed. These pages introduce the concept of place value. Bear in mind that students will work consistently with place value throughout stages 1 to 6, so this is only an introduction.

**Teaching ideas**

**Practical activities**

Adapt and repeat any of the practical counting and ordering activities for numbers to 20 from pages 56 to 58 as necessary before moving onto counting to 100. You may also need to revise the use of ordinal numbers so that you can use them when you are talking about ordering numbers (which number comes first, which number goes second? and so on).

Explain that you have previously counted to 20 and that now you are going to count higher numbers. The students should be aware that there are other numbers, so the idea itself will not be new to them. Display the 1–100 chart. Get the class to count aloud to 20. Stop when you get to 20. Show them that one more than 20 is 21, emphasising the number name. Count as a class from 20 to 29. Teach the number 30. Count from 30 to 39. Repeat this till you have covered all the ‘tens’. Count as a class from 1 to 100. Point to each number on the chart as you count.

Show the class how to count forwards and backwards on the 1–100 chart. Make sure they understand that when you get to a multiple of 10 (for example 20) that you have to go to the next row to count forward. Model several counting sequences with the class and return to this regularly over the next few lessons to consolidate the numbers and the use of the chart.

Use stones, counters, buttons and other concrete objects to model estimating. Point out that an estimate is not just a wild guess, but that you need to judge how many based on what you do know. Play grab games where the students make a grab, estimate how many they grabbed and then count to check.
Make a group of ten counters. Count to ten slowly with the class. Show one more counter. Ask, ‘What do we get if we add 1 to 10?’ Write the number and number name on the board. Do the same with the numbers 12 and 13, writing the numbers underneath each other like this:

10
11
12
13

Ask the students what pattern they notice. They should notice that each number has a 1 in the first place, and that second digit numbers start from 0: 0, 1, 2, 3.

Count out 11 counters again, and when you get to ten, set aside ten counters in a clear plastic packet. Say, ‘This is a group of ten. Now I am adding one to my ten. Ten and one makes 11. Or 1 ten and 1 one.’

Show a place value card. Put the packet of ten counters under the first (tens) column, and the single counter under the second (ones) column. Say aloud: ‘One ten and one one.’ Draw a place value chart on the board like this:

<table>
<thead>
<tr>
<th>tens</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Then ask: what if we add one more? What is the number after 11? (12) Show the number represented in the same way: ten and two counters; numerals on the place value chart. Again, write up the number name on the board.

For each number, demonstrate how we fill in a place value chart. Let the students practise completing examples on the board.

Have the students count out 20 counters and say how many tens there are (2 tens). Then ask, ‘What do we get if we add 1 more counter?’ (21) Have the students arrange 21 counters in a place value box. Ask ‘How many tens and how many units are there?’ (2 tens and 1 unit) Then ask what happens if we add 20 + 2 (22). Keep going up to 30. Write each number up on the board. Emphasise the number of tens and units, and give students opportunities to represent the numbers in place value charts as they go.

Show the class how to make two-digit numbers using arrow cards. Ask them to build numbers. For example, build a number that has 1 ten and 4 ones; build a number that has 2 tens and 9 ones. Repeat this for many different numbers. Ask the students to explain what they have done: for example, I made twenty-five, I used the 20 and
the 5, this is the same as 2 tens and 5 ones. Observe the students to make sure they can use the cards and that they can explain what they are doing.

**Using the Workbook**

- Let the students work independently through page 3 to fill in the numbers and number names of each group.

- Page 4 gives students practice in comparing and ordering numbers up to 20. Again, you will need to gauge the level of confidence in your class. Some students may be comfortable to work through this page independently; others may need you to work through the activity with them.

- Once students are familiar with the numbers to 20, they should be able to work through page 5 independently. You may wish to leave a number line up on the board so that they can easily count on and back from each number.

- Work through page 6 with the class. Make sure they are able to read and make sense of the 1–100 chart as this will be fundamental to future work.

- Once students are familiar with the concept of estimating collections of counters, you can provide them with groups of buttons to estimate and count for the activity on page 7.

- Page 8 gives students an opportunity to relate place value charts to addition of tens and ones. Work through the page with the class.

- Page 9 gives students an opportunity to write numbers in place value charts. Once you have demonstrated an example or two on the board, the class should be able to work independently through this activity.

  Students should count each set of items, identify how many tens and ones they have counted, then write the number.

- Page 10 gives students an opportunity to represent each number in different ways. Work through a few similar examples on the board, then have the students work through the page independently.

**Assessment questions to ask**

- What number is this (pointing to it)?
- How many am I holding?
- What is one more than . . . ?
- Say the next number.
- What number comes after . . . ?
- What number comes before . . . ?
- What is this number’s name?
• Draw this many.
• Which number is 1 more than 11/12/13 . . . ?
• Which number is 1 more than this?
• Which number is 1 less than this?
• How many tens does this number have? How many units?
• Can you make the number 35? Tell me what you’ve done.

**Common errors and misconceptions**

Sometimes with the bigger number range students find it difficult to work out the number before or after without counting from one again. Address this by using sections of the number line.

When students count larger amounts they sometimes do not touch or move them. This can be confusing as they are then not sure which ones they have counted and which ones they have not yet counted. Remind them to touch the objects and move the ones they have counted to one side.

At first, students may have difficulty grasping the concept of numeric place value. They may think the 1 in 13 represents 1 rather than 10. Keep returning to the place value charts so that they can see that the arrangement of the numbers is significant.

Students may also get confused with the names of the numbers 11 to 19. Number names which follow the -teen convention (sixteen, seventeen, eighteen) may confuse students into wanting to use ‘eleventeen’ or ‘oneten’ for 11, ‘twelveteen’ or ‘twoteen’ for 12, and so on. Practising rote counting along a number line will gradually consolidate the correct English names for these numbers.

Students may be confused by 20 because it doesn’t follow the same pattern as the other numbers. Give them lots of chances to say and use the number names.

Students may also make wild guesses when asked to estimate these larger amounts. Assist them by giving them a number range to work in. Say things like, ‘I’ve grabbed more than 10 stones but fewer than 15, how many do you think I have?’

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### 2 Measurement – weighing

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Workbook 1B pp 11–14</th>
</tr>
</thead>
<tbody>
<tr>
<td>1M11</td>
<td>Compare lengths and weights by direct comparison, then by using uniform, non-standard units.</td>
</tr>
<tr>
<td>1M13</td>
<td>Use comparative language, e.g. longer, shorter, heavier, lighter.</td>
</tr>
</tbody>
</table>
Vocabulary
Heavy, light, heavier, lighter, heaviest, lightest, up, down, balance, as heavy as, units.

Resources needed
A range of objects for measuring; a simple balance scale; marbles to use as mass pieces; plastic bags containing different amounts of sand; a bunch of bananas, some books, a pencil case, a bottle of water.

Mental warm-up activities
Select suitable activities from the mental warm-up activity bank. You may want to choose activities that focus on counting to 100 to consolidate that work.

Concepts that may be unfamiliar in this topic
Comparative language for weight (heavier, lighter)
As with other measurement tasks, it is important to start with concrete activities in which the students physically handle objects to decide whether they are heavy or light and to decide whether they are heavier or lighter than each other.

Measuring weight using non-standard units
You can use any uniform items as mass pieces to find the weight of small objects. Crayons, marbles, paper clips, unifix cubes and other small identical items are suitable for classroom use. You will need to show the students how to use a balance scale like this one:

If you don’t have a balance scale, you can make one using a plastic coat hanger and two plastic bags. Hang the coat-hanger on a hook and suspend the items in the plastic bags attached to the ends.

Teaching ideas
Practical activities
Choose one student. Ask him or her to hold the bag of sand. Ask whether the bag of sand is quite heavy or quite light. Write the word ‘heavy’ on the board to reinforce the spelling and reading. Pass the
bag around the class so that everyone can feel how heavy it is. Next give one student a tissue. Ask whether it is heavy or light. Again write the word on the board and pass the tissue around. Discuss which is lighter and which is heavier.

Find two stones which are similar in weight. Ask students to come up and decide which is heavier and which is lighter. Discuss how we could check to be sure. Demonstrate the use of the balance beam. Reinforce the idea that the pan which goes down contains the heavier object.

Choose a few pairs of items that are different in weight. Pass them around and let the groups estimate which is heavier in each pair. Let them take turns to use the balance beam to check. Discuss what would happen to the balance beam if the two items weighed the same amount. Demonstrate this using two bought items of the same weight.

Get the students to find and draw: five things that are lighter than a pencil case; five things that are smaller than a shoe but heavier than a shoe; five things that are heavier than a shoe but lighter than a brick; and so on.

Discuss how you could compare the weight of two items using marbles. Demonstrate using the balance beam and record the results. For example, the pencil weighs the same as one marble, the tennis ball weighs the same as four marbles. Give the students plenty of practical experience of comparing things using the balance scale and marbles as weights. Let them estimate and record the weight of different items.

Give each group a range of items and have them estimate their weight in marbles and then order them from heaviest to lightest using their estimates. Then they should measure and check.

Display a selection of objects. Get the students to take turns to pick up pairs of objects and to say whether they are heavy or light. They should then compare the weight of the two objects by holding one in each hand. Introduce the words ‘heavier’ and ‘lighter’. Learner estimations of which object is heavier or lighter can be checked by placing the objects on the balance scale. Point out that the heavier object makes the pan go down. Switch the objects around so that the students can see that this happens no matter which side the heavier object is placed.

Give each group a balance scale and pairs of objects to weigh. They should estimate which object in each pair will be heavier and then weigh them to check their estimates.
Give each group a selection of plastic bags containing different amounts of sand. Let them discuss and decide how they could arrange them from heaviest to lightest. Then discuss what suitable informal units you could use to weight the bags of sand. Do the activity as a class and record the weights, focusing on recording the units used as well. For example, Bag A = 5 stones.

Let the students find four things that are heavier than a pencil, a chair, a brick, and so on. Repeat this, but finding four things that are lighter than the objects in question.

**Using the Workbook**

- Once you have familiarised the students with the terms ‘heavy’, ‘light’, ‘heavier’, ‘lighter’, they can work through pages 11 and 12 independently.

- After students have had some experience using a balance beam (or the improvised balance scale described above), they can complete the activity on page 13. They should realise that the heavier object always sits lower in relation to the lighter object.

- Use page 14 as the basis for practical class activities using the balance scale. If you do not have the same items shown in the pictures, let the students draw alternative pairs of items in their exercise books and use those for the activity.

**Assessment questions to ask**

- What will be heavier than this?
- What will be lighter than this?
- What will be as heavy as this?
- Which is the lightest of these?
- Which is the heaviest of these?
- Are these all heavy or light?
- How do I know which item is heavier on a balance scale?
- How many marbles will be as heavy as three pencils? (and so on)

**Common errors and misconceptions**

Students may find it difficult to understand that weight is not necessarily related to the size of an object. Give them many activities in which they deal with small heavy things and large light things to reinforce this idea.

Students may also find it confusing to work out that the lightest object goes up on a balance beam. Make sure they experiment with this and that they are aware of what is happening and are given a chance to verbalise what they observe.
3: Addition

<table>
<thead>
<tr>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Nn10</td>
</tr>
<tr>
<td>1Nc2</td>
</tr>
<tr>
<td>1Nc8</td>
</tr>
<tr>
<td>1Nc11</td>
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<tr>
<td>1Nc14</td>
</tr>
<tr>
<td>1Nc15</td>
</tr>
<tr>
<td>1Nc17</td>
</tr>
</tbody>
</table>

**Vocabulary**

Count on, add, more, answer, total, altogether.

**Resources needed**

Number line, counters as needed.

**Mental warm-up activities**

Select suitable activities from the mental warm-ups activity bank.

**Concepts that may be unfamiliar in this topic**

**Addition is commutative (can be done in any order)**

Some students may have worked out that it is more efficient to count on from the larger number when you add and realised that addition can be done in any order. However, for some students this will be a new idea. You will formally show them that adding 1 + 5 is the same as adding 5 + 1 using the number line and concrete objects as necessary to teach this important concept. For small numbers it may seem unimportant, but when students need to add numbers like 3 + 45, we would want them to count on 3 and not count on 45.
Teaching ideas

Practical activities

You can adapt any of the practical activities combining groups and counting on from pages 56–58 for this topic.

Model problems involving finding the missing number (such as those on page 20 of the Workbook) using real counters. Start with a given number. For example, six counters. Count these with the class so they can all see you have six. Explain that you are going to hide some of the counters. Remove one or two counters (don’t let the class see how many you are removing). Place these under a cloth or in your pocket. Let the class see the remaining counters and ask them how they can work out how many you removed. Show them that they can count on from the number they can see to get to six and use this to work out how many are missing. Model it on the number line like this:

I had 6.
Now there are 4.
Start at 4, count on to get to 6.
I made two jumps, so there are 2 counters hidden.

Using the Workbook

Work through page 15 with the class. Let the students make the jumps and write the number sentences, checking each one as they work.

Encourage students to use the number lines on pages 16–19 to work out the answers.

Students can work independently to complete page 16. Let them compare answers with a partner.

Let students work through pages 17–19 independently. Check each page as they complete it. You may want to make a chart of addition facts for each number for classroom display.

Let the students work in pairs to complete page 20. Discuss how they worked out their answers.

Work through page 21 with the class. Once you have done so, discuss what they have learned from this page. Make sure they can all see that addition can be done in any order and that you will get the same answer no matter which order you use.
Assessment questions to ask

- How many are there altogether?
- What and what makes . . . ?
- How many do I get if I add . . . and . . . together?
- How many do I have now?
- What happens if I add . . . more?
- What numbers can I add to get . . . ?

Common errors and misconceptions

Students may struggle with the idea that you can add in any order and get the same result. Continue to demonstrate this using concrete apparatus and the number line to help them internalise this idea.

4 Measurement – time

<table>
<thead>
<tr>
<th>Objectives</th>
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<tbody>
<tr>
<td>1Mt1</td>
</tr>
<tr>
<td>1Mt3</td>
</tr>
</tbody>
</table>

Vocabulary

Morning, afternoon, evening, day, night, before, now, during, after, first, next, long time, short time, week, day, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday, today, tomorrow, yesterday.

Resources needed

Pictures of daytime and night-time, pictures showing different daily activities; flashcards with the names of the days of the week (enough for one day per student); tape or other adhesive.

Mental warm-up activities

Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic

Time as a measurement

Time is a measure. However, it is difficult for young children to grasp this and express it in words, because time is an abstract concept and we cannot hold it, touch it or handle it. The students will have some experience of time
as it relates to their daily routines and they should know some of the words related to day and night times. Sequencing events in terms of time requires the students to use and apply the vocabulary before, after, and earlier and later than.

**Days of the week**

One method of measuring the duration of time is in days. As young children sometimes get the days of the week confused, they are taught and consolidated formally here.

**Teaching ideas**

**Practical activities**

- Get each student to act out an activity that happens either at night or during the day. The class should guess what is being acted out and whether it happens during the day or during the night. Discuss activities that are done both during the day and at night.

- Make a classroom chart for daytime and night-time activities. Draw a sun at the top of the daytime chart and a moon and stars at the top of the night-time chart. Ask each child to draw one activity either for day or night. Stick the night-time activities onto the chart. Before placing the daytime activities on the chart, discuss whether they take place in the morning or the afternoon. Place them in two groups on the chart.

- Give each group a set of pictures showing daily activities. Have them place them in the order in which they think someone would do these things in a day. Let them make up a story about that person’s day and share it with the rest of the class.

- Write the terms ‘before school’, ‘at school’ and ‘after school’ on the board. Ask the students to talk about what they do at each of these times. Get them to draw three pictures – each should show one thing they do before, at and after school. Let the students come and stick their pictures under the correct headings. Demonstrate how they should talk about the events. For example, before school I go to the bus stop, then I catch the bus. At school I play with my friends, after that I play basketball.

- Teach the days of the week using the flashcards. Hand them out in order starting with Monday. Say the name of each day as you hand them out. Once each student has a card, ask them to get into groups of the same day. Say the names of the week in order. As you say them, have the students in that group jump up. Repeat this several times.

- Ask a student from each group to come to the front. Stick the flashcards on the board in the correct order. Read them through again as a class.
Teach one or more of the following rhymes and recite them regularly to reinforce the order of the days:
Every week has seven days,
seven days, seven days.
Every week has seven days,
can you name them all?
Sunday, Monday, Tuesday, Wednesday,
Thursday, Friday, Saturday.
Sunday, Monday, Tuesday, Wednesday,
Thursday, Friday, Saturday.
Every week has seven days.

Sneeze on Monday, sneeze for danger;
Sneeze on Tuesday, kiss a stranger;
Sneeze on Wednesday, get a letter;
Sneeze on Thursday, something better;
Sneeze on Friday; sneeze for sorrow;
Sneeze on Saturday; go to bed sick on Sunday.

Solomon Grundy,
Born on Monday,
Named on Tuesday,
Married on Wednesday,
Took ill on Thursday,
Worse on Friday,
Died on Saturday,
Buried on Sunday,
That was the end of Solomon Grundy.

Spend some time dealing with the order of the days using the flashcards stuck on the board. Point to the day it is today. Ask the students to say what day it was yesterday and to say what day it will be tomorrow. This is also good practice for later work on number lines. You can also ask questions like, ‘What day was it two days ago?’, and so on.

You might like to prepare a display for the classroom showing events that happen regularly on each day. Get the students to draw pictures and display them beneath the appropriate days. This will help to reinforce the names of the days.

You could also make a favourite day of the week chart to introduce the concept of a picture chart. Draw up a table like the one below on a large sheet of paper. Get the students to come up one by one and to draw a face in the row next to their favourite day. Keep this for use later on in the year when you deal with charts.
Our favourite day of the week

<table>
<thead>
<tr>
<th>Monday</th>
</tr>
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<tbody>
<tr>
<td>Tuesday</td>
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<tr>
<td>Wednesday</td>
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<tr>
<td>Thursday</td>
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<tr>
<td>Friday</td>
</tr>
<tr>
<td>Saturday</td>
</tr>
<tr>
<td>Sunday</td>
</tr>
</tbody>
</table>

**Using the Workbook**

Once students are familiar with the terms ‘before’ and ‘after’, work with them through the activity on page 22. Alternatively, they can work in pairs or small groups on this activity. They should look at each set of pictures, and describe what is happening in each picture. Then they need to work out what happened first, second and third. After this, they can number the sequence in order. Go through the activity with the class afterwards and discuss how they knew what came first, second or third. Emphasise the words ‘before’ and ‘after’ as you work through this page.

Discuss with students the days of the week. Ask them what day it is today, what day it was yesterday, and what day it will be tomorrow. You can also ask questions such as: ‘What day comes after . . . (Monday/Tuesday, etc.)?’ ‘What day comes before . . . ?’ Once they are comfortable with the days of the week, have them work through the activity on page 23. You can leave the names of the weekdays written on the board to help them. You may also need to coax some students to find activities that they do on each given day.

Work through page 24 with the class. Use the second activity to introduce some of the other units of time that people use in daily life.

**Assessment questions to ask**

- What time of the day do we . . .?
- What takes the longest time: tying your shoelaces or eating lunch? (and others like it)
- When do we . . . ?
- What did you do before school?
- What will you do after school?
- What day is it today?
- What day was it yesterday?
- What day will it be tomorrow?
• What day comes before Monday?
• What day will it be in two days’ time?
• What day do you go to church/mosque/etc.?

Common errors and misconceptions

Young children may find it difficult to sequence events in terms of earlier and later when they happen far apart. Help them by pointing out that events which took place, for example, in the previous week, happened a week earlier, and so on.

Students sometimes find it difficult to remember the days of the week in order. You can help them to remember these by constantly reinforcing the order and by using lots of songs and rhymes.

5 Subtraction

<table>
<thead>
<tr>
<th>5: Subtraction</th>
<th>Workbook 1B pp 25–28</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td></td>
</tr>
<tr>
<td>1Nc9</td>
<td>Understand subtraction as counting back and ‘take away’; record related subtraction sentences.</td>
</tr>
<tr>
<td>1Nc10</td>
<td>Understand difference as ‘how many more to make?’</td>
</tr>
<tr>
<td>1Nc11</td>
<td>Add/subtract a single-digit number by counting on/back.</td>
</tr>
<tr>
<td>1Nc14</td>
<td>Begin to use the +, – and = signs to record calculations in number sentences.</td>
</tr>
</tbody>
</table>

Vocabulary

Less, take away, removed, remain, minus, subtract, equal.

Resources needed

A large display number line, number cards with numbers 1 to 5; counters for those students who need them; number cards; egg boxes; a box of stones or other counters; two lids or shallow dishes; a die with a sticker over the six and a zero written on it (one per group); a chalk number line on the ground outside; two sets of cards with dots and numerals 1 to 5 on them; cards with + and = on them; a number line for each student.

Mental warm-up activities

Select suitable activities from the mental warm-ups activity bank.
Concepts that may be unfamiliar in this topic

Subtraction as taking away

Students practise removing objects physically from a set and learn to work abstractly with subtraction as counting backwards. Taking away is an action. You can emphasise this by showing the students many practical examples and by physically exaggerating the motion of taking away.

Subtraction as counting back

Subtraction as counting back is a more abstract concept and the students need to have a good understanding of how the number line works to fully understand this concept. You will need to stress the idea that counting back is the same as ‘taking away’ by matching what you do on the number line to concrete examples.

Teaching ideas

Practical activities

Give each group five stones. The students must take turns to grab a few stones from the pile to make a new pile. Explain that they are going to ‘take away’ this amount to find out how many there are remaining. They discuss how to do this and find ways of working out what the remainder is. Get them to check by counting the stones that are left over.

Take the class outside to work with the number line on the ground. Let them take turns to stand at the end of the line. Explain that they are going to move backwards on the line. Throw the die to get a number from 0 to 5. Have the students say where they think they are going to end up. Let them move that number of steps on the line to check. Include zero.

Give each student ten counters. Instruct the class to make groups. Demonstrate subtraction, for example, start with five stones. Take away one. Ask, ‘How many do you have left?’ Repeat this several times with different numbers. Include zero when the students are ready.

Give each student a number line from zero to five. Play games where you tell them the starting point and how many places to move. They should shout out where they will land and then make the moves to check. Repeat this several times with many different starting points including zero. You can also say move zero places to introduce the concept of subtracting zero.

Give each group a die, a pile of stones and two lids. They must toss the die to get a number from 1 to 5. Then they should make the number they have tossed with a pile of stones in one lid. They then
repeat this with the other lid and take the numbers away from each other. Have a class discussion about how you can write down what you are doing. Model writing a number sentence such as ‘three take away one equals two’. Get the students to make and subtract several groups and to write number sentences to record their working.

Introduce the signs – and =. Teach the class that these are mathematical symbols that we use to write things in a short form. Give each group a – and = card. Let them use stones or other counters to model subtractions. They must decide where the – and = signs go. Walk around and check that they are doing this correctly.

Prepare pattern sheets using the subtraction and equals signs to reinforce writing these signs.

Give the students more practical examples of combining groups and let them record their working using – and = signs in the correct way.

Using the Workbook

Page 25 is a subtraction exercise that focuses on the relationship between subtracting 1 and counting back. You may wish to show the students a number line and let them practise counting back one in order to subtract. Once they are comfortable doing this, let them complete the activity on their own.

Page 26 is a more general subtraction exercise. Students should not need to model the groups, as they should use drawing and crossing out in lieu of modelling.

Work through page 27 with the class modelling the counting back process as you go. Discuss the answers as a class and let the students come up and show you how they got their answers.

Let the students work in pairs to complete the activity on page 28.

6 Measure – capacity

<table>
<thead>
<tr>
<th>6: Measure – capacity</th>
<th>Workbook 1B pp 29–30</th>
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</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td></td>
</tr>
<tr>
<td>1MI2</td>
<td>Estimate and compare capacities by direct comparison, then by using uniform, non-standard units.</td>
</tr>
</tbody>
</table>
Vocabulary
Capacity, units, more than, less than, cups.

Resources needed
Different-sized containers; sand or water; litre and two half-litre bottles (or two 1-litre and one 2-litre bottles).

Mental warm-up activities
Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic
Measuring capacity in non-standard units
The students have already explored filling and pouring using different containers. In this unit they will solve problems to measure capacity using informal units of measurement. They will need to perform practical tasks to consolidate their skills and to learn to compare capacity and use the correct vocabulary. The introduction and use of informal units allows the students to ask and answer more complex mathematical questions such as, ‘How many small cups does this bottle hold?’ This will help them to understand the need for standard units at a later stage.

Teaching ideas
Practical activities
Revise capacity vocabulary with the class. Choose two different containers and hold them up. Ask the students to say which one they think will hold the most. Ask them to point to the one they think will hold the most. Explain that we can check by filling one container and pouring it into the other. Fill the smaller container. Explain that it is ‘full’. Pour the contents into the bigger container and show the class that it is ‘not full’. This means that it can hold more. If necessary, repeat this a few times with different pairs of containers.

Demonstrate filling a large container using a smaller container. Keep count of how many small containers you use. You could get a student to do the filling and the others to keep count. Discuss which container holds more and what would happen if you poured water from the larger container into the smaller one. Give the students many opportunities to fill larger containers and to record how many units they use. Let them use smaller cups, spoons, small tins, smaller bottles, etc.

Get the students to look in magazines or newspapers for pictures of containers. Let them cut out the pictures and order them from those that hold, least to those that, hold most or vice versa. Make class posters.
Get the students to find three things that hold less than a cup and draw them. Similarly, you can ask them to find three things at home that hold more than a bucket and draw them.

Create some practical measuring tasks for the students. For example, you could ask them to find out things like: ‘How many cups can you fill from this bottle?’ ‘How many bottles does it take to fill this bucket?’ ‘How many spoonfuls of sand can fit in a matchbox?’, and so on.

Show the children the bottles you have brought to class. Discuss whether the big one holds the same, more or less than the two small ones. Let them suggest how you could find out.

Using the Workbook

Let the students complete the practical activity on page 29 on their own. Bear in mind that if students are using water and/or sand this will be messy, so you may want to do this outside. Check their results as a class. Discuss how you could resolve any differences of opinion (by measuring and comparing).

Complete page 30 as a guided class activity using apparatus where possible.

Assessment questions to ask

- Which container is biggest?
- Which container holds less?
- Which container is smallest?
- Which container holds least?
- Which container holds more?
- Which container holds most?
- How many of these containers would I need to fill this one?
- What would happen if I poured this into this container?

Common errors and misconceptions

Some students are slow to grasp the concept of capacity and you will need to set up activities and allow for discussion that will reveal their misconceptions. For example, fill a bottle with water and then pour the water into a wide basin. Refill the bottle with water and ask, ‘Which has the most water, the bottle or the basin?’ Students who have grasped the concept of conservation will be able to say that both containers have the same amount. Those who haven’t may think the bottle holds more because the water level is higher in the bottle. Those who do not understand conservation are not ready for activities in which they have to find out which container holds more or less than another, and need more concrete work at this stage.
7: Addition and subtraction

Objectives

- **1Nn10**: Use the = sign to represent equality.
- **1Nc1**: Know all number pairs to 10 and record the related addition/subtraction facts.
- **1Nc2**: Begin to know number pairs to 6, 7, 8, 9 and 10.
- **1Nc11**: Add/subtract a single-digit number by counting on/back.
- **1Nc14**: Begin to use the +, – and = signs to record calculations in number sentences.
- **1Nc15**: Understand that changing the order of addition does not change the total.
- **1Nc17**: Recognise the use of a sign such as [ ] to represent an unknown, e.g. $6 + [ ] = 10$.

Vocabulary

Add, total, sum, facts.

Resources

Number lines and counters as required.

Mental warm-up activities

Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic

The concept of addition should be familiar to the students, but they may not understand that there are a set of addition facts for every number. The importance of learning the facts to 10 may be a new idea for them as well.

Teaching ideas

Practical activities

You can re-use any of the practical addition activities on pages 56–58 as necessary for this topic.
The BEAM organisation has a set of giant dominoes with number pairs from double blank to double 9. These are very useful for teaching addition facts and you might like to explore using these in the classroom. You can find details at www.beam.co.uk or from your Nelson Thornes representative.

**Using the Workbook**

- Use page 31 to revise basic addition facts. Observe the students as they work to see whether they need additional teaching and practical activities.

- Use page 32 as preparation for teaching the addition facts to 10. It is important that the students realise the number 10 can be decomposed into different number pairs, all of which give a total of 10 when added together.

- Let the students work through page 33 on their own.

- Work through page 34 with the class. Spend some time quizzing them afterwards to help them memorise the number facts to 10. Explain that they will use these over and over again at all levels to do calculations.

**Assessment questions to ask**

- How many are there altogether?
- What and what makes . . . ?
- How many do I get if I add . . . and . . . together?
- How many do I have now?
- What happens if I add . . . more?
- What numbers can I add to get . . . ?

**Common errors and misconceptions**

Students may find adding a bigger number to a smaller number difficult, for example 1 + 9, but if you give them lots of practice, they will discover that it is the same as 9 + 1 which is much easier. This is called the ‘commutative property of addition’ and if students discover and accept that the order of addition is not important through experience, they greatly reduce the number of ‘facts’ they need to learn.

Students may also find addition of zero quite confusing. You must stress that it means adding ‘nothing’. When the answer is 0, they may forget to write it down, so you may need to remind them.
Vocabulary
Flats, round, roll, pointed, small, smaller, large, larger, thin, thinner, thick, thicker, on top, below, next to, like, different, same as, cube, cuboid, sphere, cone, cylinder, face.

Resources
Balls; boxes; cylinders; cones; flashcards with pictures and names of 3D shapes on them; waste materials and containers for making a model; modelling clay for making shapes.

Mental warm-up activities
Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic
Names of solids
Students may not know (or remember) the names of common solids. You will need to teach these and reinforce them by displaying the shapes with their names for reference. Try always to use the correct names yourself so the students become familiar with them and feel confident using them.

Properties of different solids (including number and shape of faces)
Students may previously have considered solids only in terms of what they could do (for example, roll or not roll). Now they will begin to look at them more closely to see that different shapes have characteristics that define them. For example, a solid cone will always have a flat face and one pointed end. The term face is important at this stage, but the other parts are not formally required.
Teaching ideas

Practical activities

Hand out a range of balls, boxes, cones and pyramid shapes to each group. Let the students sort the objects into groups and have a general discussion about what we can do with the objects, such as roll them, bounce them, stack them, put one on top of the other, and so on.

Give each student some modelling clay. Hold up the sphere shape. Ask the students to say whether it is flat or round. If necessary teach the words. Let them describe the shape and then model it making the clay. Repeat this for the other shapes. When they have made all of the shapes, have them try to make a tower by stacking the shapes in such a way that they do not fall down.

Show the class a range of familiar objects on flashcards, for example an ice cream cone. Let them select one of their own shapes to match the object. Repeat this for different items. Teach the names of the shapes as you do so.

Make a model out of waste packaging. The robot in the picture below is a good example. Ask the students to say what shapes have been used to make it. They do not need to use the formal names for shapes at this stage, although some students may know them.

Give each group a range of waste packing materials and allow them to build their own models. If a robot is too ambitious, have them build houses using geometric shapes.
Pick up one of the shapes, for example a sphere. Ask the students to find another shape that is the same as the one you are holding. They can do this by physically locating shapes, or identifying them on pictures. Next, ask them to find a shape that is different to the one you are holding. Let them explain why it is different, for example, this sphere is different to that one because it is bigger (size); this cube is different to the sphere because it is not the same shape (shape); this sphere is the same size and shape but it is a different colour (characteristic).

Challenge students to identify solid shapes in the environment. Initially, this could be restricted to the classroom or school but it could also be developed into a homework task. Students should be asked to explain the shapes of some things.

Students could carry out a survey of the school to identify different solid shapes and explain how they are being used.

Students work in pairs. One student describes the shapes of the faces of a solid and the other student has to name the solid.

Students can make a scrapbook by sticking pictures of solid shapes, cut from magazines and other publications, into a book. Students should be asked to bring magazines to school prior to this activity.

Using the Workbook

Let the students work independently to complete page 35.

Revise the names of the shapes then have the students complete page 36. Go through the objects with the class and ask them to say what shape each one is.

Use page 37 to assess whether the students can correctly name the shapes and whether they can use facts about shapes to identify them.

Assessment questions to ask

- What is the same about these solids?
- What is different about these solids?
- How many faces does it have?
- Which other solid has the same number of faces?
- Find an edge.
- How many edges does this solid have altogether?
- What shape is the face of this solid?
- What flat shape matches this face?
• Show me a corner on this face.
• How many corners does this shape have altogether?
• Find me another shape with the same number of corners.

**Common errors and misconceptions**

Students may find it difficult to move from the concrete 3D representation of solid shape to the pictorial representation. Lots of work with real objects and pictures of real objects will help to overcome these difficulties and develop visual discrimination skills.

### 9 Doubling numbers

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Workbook 1B pp 38–40</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Nc5</td>
<td>Know doubles to at least double 5.</td>
</tr>
<tr>
<td>1Nc6</td>
<td>Find near doubles using doubles already known.</td>
</tr>
<tr>
<td>1Nc19</td>
<td>Double any single-digit number.</td>
</tr>
</tbody>
</table>

**Vocabulary**

Double, equal, nearly double.

**Resources needed**

Counters, dice.

**Mental warm-up activities**

Select suitable activities from the mental warm-ups activity bank.

**Concepts that may be unfamiliar in this topic**

**Doubling**

This is the first time the concept of doubling is introduced and taught. Students may know about ‘doubles’ from board games and dice are useful for teaching this concept. Doubling is the basis for addition by 2 (and its inverse, halving is the basis for division by 2), so it is important that students grasp the concept at this early stage.
Teaching ideas

Practical activities

Give each student a set of counters. Instruct them to count out a certain number of counters (for example 4). Have pairs of students combine their counters. Explain that they have doubled the counters and that they now have twice as many. Ask how many counters they have now (8). Let them count to confirm if they need to. Say double 4 is 8. Repeat this procedure with other numbers from 1 to 10. Stress that they are doubling the amount and record the doubles.

Give each student a small number of counters. Ask them to double their number and write it down. Allow them to model this with other counters if they need to, but show them that they can count in twos to find the answer quickly.

Let the students work in pairs to toss one die. They should say the number and work out (in their heads or by modelling) what double the number is. For example, I rolled 2, double 2 is 4. If the students find this easy, you can challenge them by asking them to roll two dice. They should add the totals on the two dice to get a score (for example 3 + 5 = 8) and then work out what double the score would be (double 8 is 16).

Using the Workbook

Let the students complete page 38 independently. Note who is able to confidently double numbers to 6.

Let the students work in pairs to complete page 39. Note that they have to effectively find half of the total to do this work, but that they can rely on the doubles they know to find the answers.

Work through page 40 with the class. Make sure they understand that they can use the doubles they know to quickly find the answers to additions involving near doubles.

Assessment questions to ask

• What is double ...?
• I rolled a double and scored 10, what double did I roll?
• What is 4 + 5?

Common errors and misconceptions

Students may not initially see the value of recognising near doubles. Tell them that recognising doubles can help them add faster and do several drill activities with the class to demonstrate this.
1 Counting and numbers

<table>
<thead>
<tr>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1Nn1</strong> Recite numbers in order (forwards from 1 to 100, backwards from 20 to 0).</td>
</tr>
<tr>
<td><strong>1Nn2</strong> Read and write numerals from 0 to 20.</td>
</tr>
<tr>
<td><strong>1Nn5</strong> Count on in twos, beginning to recognise odd/even numbers to 20 as ‘every other number’.</td>
</tr>
<tr>
<td><strong>1Nn8</strong> Use more or less to compare two numbers, and give a number which lies between them.</td>
</tr>
<tr>
<td><strong>1Nn9</strong> Order numbers to at least 20 positioning on a number track; use ordinal numbers.</td>
</tr>
<tr>
<td><strong>1Nc12</strong> Find two more or less than a number to 20, recording the jumps on a number line.</td>
</tr>
<tr>
<td><strong>1Nc21</strong> Try to share numbers up to 10 to find out which are even and which are odd.</td>
</tr>
</tbody>
</table>

**Vocabulary**

Number names to 100, before, after, skip count, pairs, two more, two less, even, odd.

**Resources**

Number lines, abacus; counters, buttons, stones.

**Mental warm-up activities**

Select suitable activities from the mental warm-ups activity bank.

**Concepts that may be unfamiliar in this topic**

**Skip counting**

Although the students may have informally grouped items to count them, this is the first time they are formally taught to make jumps greater than 1 on the number line. They will use the concept of counting in twos as the basis for counting and for adding and subtracting 2 from any number, but also as the basis for developing the 2× table later on.
Odd and even numbers

The terms odd and even are introduced in this topic. It is very easy for students to see which numbers are odd and which are even if they use counters (or other objects) and group them in twos. Odd numbers will always have one counter left over.

Teaching ideas

Practical activities

Use the hundred chart and number line to orally revise counting and ordering numbers to 100. You can repeat any of the counting activities on pages 62–63 as you work through this topic.

Play a game in which the students have to join every second dot in order to produce a picture or simple pattern.

Draw a large number line outside. Get the students to make hops of two along it starting at different numbers you call out.

Give each group an egg tray with 12 compartments and a pile of seeds. Instruct them to count out 10 seeds. Then have them make sets of two, putting two in each cup. Discuss how many sets you can make. Repeat this for nine seeds and discuss the fact that you will have one seed left over. Ask the students which other numbers will make groups of two and which will leave one seed over.

Draw a diagram to represent a street with houses on either side. For example:

![Diagram of a street with houses on either side]

Ask the students how people who visit can tell which house is which. Explain that houses (and apartments) are numbered to make it easier to give people your address. You may like to discuss who would need to use house numbers: postal workers, ambulance drivers in case of emergencies, delivery companies and so on. Number the houses with odd numbers on one side and even numbers on the other like this:
Explain that one side of a street has even numbered houses while the other has odd numbered houses. Count along the houses on either side of the road. Ask the students question such as:

- Is house number 3 an odd or even number?
- Is your home address an odd or even number? (You may need to help children decide if their addresses are in a high number range.)
- If we add two more houses at the end of the street what would their numbers be?

Give pairs of students a group of ten counters. Ask them to share the counters. Ask:

- How many counters do you each get?
- Do you each get the same amount?

Put the counters back together and tell the students to remove one counter from their set of ten. Ask them to share the counters again. Discuss what happens. (They cannot share them evenly, there is one left over.) Ask the class: ‘Why are all doubles even numbers?’ (they are made up of two equal groups).

Record the sharing for the class like this:

```
10
  □□□□□□□□□
  5
  5
  even

9
  □□□□□□□□□
  5
  4
  odd
```

Explain that even numbers can be divided into two equal groups (grouped in twos) while odd numbers cannot.

**Using the Workbook**

- Let the students work independently to complete page 3. Use their answers to informally assess their counting skills and confidence working with numbers to 100.

- Once you have done some practical activities counting in twos, have the students work in pairs to complete page 4.

- Let the students work on their own through page 5. Check to see which students count each shoe and which are comfortable counting in twos and using the number line to hop in twos.

- Work through page 6 with the class reminding them that moving to the right on the number line gives us ‘more’ and moving to the left gives us ‘less’. Point out that if you hop two numbers then you will land on a number that is two more or two less than that starting number. Do one flow diagram activity with the class to show them how to work and then have the students complete the others independently.
Use page 7 to assess how well students have grasped the concept of odd and even numbers.

**Assessment questions to ask**
- Which number comes after . . . ?
- Which number comes before . . . ?
- Count on in twos from . . .
- Count back in twos from . . .
- Which of these two numbers is greater?
- Which of these two numbers is smaller?
- What is double 5? Double 3? Double 7, etc.?
- How much must you add to 5 to get 7?
- How much must you take away from 7 to get 5, etc.?
- Is 5 an odd or even number? How can you tell?
- Can you tell me how you can work out whether any number is odd or even?

**Common errors and misconceptions**
Some students may get confused about which direction they are to move along the number line to find more or less than a number, especially if they are still struggling with the concept of left and right. Point out that the numbers increase in one direction and decrease in the other and show them that moving one way gives us ‘more’ and the other gives us ‘less’ by physically modelling what you are doing as you jump along the line.

### 2 Measurement – time

<table>
<thead>
<tr>
<th>2: Measurement – time</th>
<th>Workbook 1C pp 8–10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td></td>
</tr>
<tr>
<td>1Mt1</td>
<td>Begin to understand and use some units of time, e.g. minutes, hours, days, weeks, months and years.</td>
</tr>
<tr>
<td>1Mt3</td>
<td>Order the days of the week and other familiar events.</td>
</tr>
</tbody>
</table>

**Vocabulary**
- Morning, afternoon, evening, day, night, before, now, during, after, first, next, long time, short time, week, day, names of days of the week, names of months, today, tomorrow, yesterday.

**Resources**
- Large calendar for display purposes.
Mental warm-up activities
Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic

Time in hours
The hour is introduced as a unit of time at this level. You can use the duration of lessons to indicate how long an hour is at this level. This will help the students to work out whether events take more or less than one hour.

Names of the months
Students have already learned the names of the days and sequenced everyday events. In this topic we introduce the names of the months and the order in which they appear.

Teaching activities

Practical activities

You can adapt and re-use any of the earlier practical activities on time as you work through this topic.

Show the students a calendar. Ask them to identify their birthday month on the calendar. Then have them read out the names of the months of the year. Discuss with the class what happens at each time of year. You might ask: ‘In which month of the year did we start school this year?; ‘In which month of the year was . . .’s birthday?’; ‘In which month of the year will we close for Christmas/ Eid/ Diwali, etc.?’

Display the months of the year on flashcards and spend some time ordering and re-ordering them with the class.

You may want to teach the class this rhyme and use it to help them remember the months and the order in which they appear:
January, February, March, April, May.
These are the months that are easy to say.
June, July, August, September.
Repeat them with me and you will remember.
October, November and lastly December.
The months of the year are easy to remember.

Using the Workbook

Revise the terms ‘before’ and ‘after’ and then have the students work on their own to complete page 8.

Work through page 9 with class to reinforce the unit ‘hour’. There will be different answers, for example, some students may spend more than one hour reading and less than one hour watching TV. You may like to ask the students to estimate how long they spend on each activity.
Revise ordinal numbers as necessary before asking the students to work in pairs to complete page 10.

**Assessment questions to ask**
- What takes the longest time: tying your shoelaces or eating lunch? (and others like it)
- When do we . . . ?
- What takes a short time?
- What takes a long time?
- What did you do before school?
- What will you do after school?
- What day is it today?
- What day was it yesterday?
- What day will it be tomorrow?
- What day comes before Monday?
- What day will it be in two days’ time?
- What day do you go to church/mosque/etc.?
- What month are we in now?
- What month was it last month?
- What month will it be next month?

**Common errors and misconceptions**
Students sometimes find it difficult to remember the days of the week and the names of the months in order. You can help them to remember these by constantly reinforcing the order and by using lots of songs and rhymes.

### 3: Place value and counting in tens

**Workbook 1C pp 11–13**

<table>
<thead>
<tr>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Nn4</td>
</tr>
<tr>
<td>1Nn6</td>
</tr>
<tr>
<td>1Nn7</td>
</tr>
<tr>
<td>1Nc7</td>
</tr>
<tr>
<td>1Nc13</td>
</tr>
</tbody>
</table>
**Vocabulary**

Tens, ones, ten more, ten less, place value.

**Resources needed**

Large 1–100 chart, arrow cards, unifix blocks, 10c coins.

**Mental warm-up activities**

Select suitable activities from the mental warm-ups activity bank.

**Concepts that may be unfamiliar in this topic**

**Skip counting in tens**

The students have previously counted on in ones and twos, now they are going to work with the 1–100 grid to develop the skill of counting in tens. Students find it easy to count in multiples of ten (10, 20 ... 100) but they may not find counting on in tens from any number as easy at first (21, 31, ... 91). Using the chart and moving down the columns is a good visual aid for this work and it helps the students to develop the idea that only the tens digit changes when you add ten to a number. Moving up and down a column on the chart will also help them to develop the mental strategy of finding ten more and ten less than a number.

**Teaching ideas**

**Practical activities**

- Revise place value in two-digit numbers using some of the activities on pages 62–63. Include some activities with arrow cards to remind the students how to make numbers using tens and units cards.

- Use the 1–100 chart to teach the students how to count in tens. Chant the numbers starting with the multiples of 10.

- Give each group a set of 10c coins and ask them to count them. If this is not possible, do this as a class activity (counting ten cents or ten dollars at a time). Introduce the idea of ten more and ten less in relation to the money you are counting. For example, say things like: ‘Let’s count Amira’s coins: 10, 20, 30, 40, 50. So, Amira has 50c.’ ‘Jossi has 10c more, how much does he have?’ ‘Nisha has 10c less, how much does she have?’

- Ask a student to suggest any number between 20 and 30. Then ask: ‘How much is 10 less than that number?’ Show the class a number line and let the class work it out by counting back. Write the new number on the board. Demonstrate to the class that the new number is the same as the old one, but with 1 instead of 2 in the tens’ place. Repeat with some other numbers. Move onto the 1–100 chart to show the students how to find ten less by moving up a column. Point out that this is a faster method than counting back in ones.
Do the same with numbers between 10 and 20, but ask, ‘What is the number that is 10 more?’

Again, demonstrate that the new number has one more ten in the tens’ place. Make sure that students understand this principle before they work through the Workbook activities. Move to the 1–100 chart as before.

Using the Workbook

- Let the students work through page 11 on their own to revise place value and to assess how well they can partition numbers.

- Use page 12 to consolidate oral work on the 1–100 chart. The students can work on their own or in pairs.

- Once you have done some practical activities on 10 more and 10 less, have the students complete page 13 on their own.

Assessment questions to ask

- How many tens does this number have? How many units?
- Count in tens from 20 to 80? (And similar)
- Start at 34, count on in tens.
- What number is one more/one less than . . . ?
- What number is 10 more/10 less than . . . ?

Common errors and misconceptions

Some students find it difficult to count on, so they have to count the first set in each case. You can address this when you deal with concrete materials by counting on from the first set so that it seems like a natural process to continue from that number of objects.

4 Position and movement

<table>
<thead>
<tr>
<th>4: Position and movement</th>
<th>Workbook 1C pp 14–17</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td></td>
</tr>
<tr>
<td>1Gp1</td>
<td>Use everyday language of direction and distance to describe movement of objects.</td>
</tr>
</tbody>
</table>

Vocabulary

On top of, underneath, behind, next to, in front of, over, through, around, up, down, under, forwards, backwards, sideways.
Resources needed

A jungle gym or materials for an outdoor obstacle course (large pieces of plastic piping, bins, traffic cones, bean bags, and so on); chairs and tables; flashcards with each of the vocabulary items listed above.

Mental warm-up activities

Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic

Language of position

Students learn to describe position and give directions using the terms ‘up’, ‘over’, ‘around’, ‘through’, ‘under’, and so on. At this level, work on position and movement is always rooted in a real-life context. However, it forms important preparation and grounding for later geometric work involving transformations: slides (translations), turns (rotations) and flips (reflections).

Teaching ideas

Practical activities

Take the students outside. Set up an obstacle course involving obstacles for them to go over, under, around, through, and so on. Divide the students into two teams. One student from each team must go through the obstacle course at a time. As the first team member finishes, the next one starts, so the obstacle race gets completed as a relay. The rest of the team should shout directions to encourage their team member.

Back in the classroom, pull up a chair in front of the class. Ask someone to stand next to the chair. Ask someone else to stand in another position that could be ‘next to’ the chair. Do the same with different directions and positions: ‘under the chair’; ‘on the chair’; ‘behind the chair’, and so on, until you are satisfied that the students understand the vocabulary of position and direction.

Have the students work in groups of three. Have one group volunteer to demonstrate positions and directions. Hand out five flashcards to individual students in the rest of the class. Have them read out their flashcards. For each word, the demonstrating group must form a position and say who is in the given position. For example, someone might read out ‘over’. The demonstrating group could put their hands over each other and say ‘Amina’s hand is over Rehana’s’; ‘Rehana’s hand is over Joanne’s’, and so on.

Using the Workbook

Let the students work through page 14 on their own. If they struggle to write the words, you may want to do this orally instead.
Let the students work in pairs to complete pages 15 and 16 orally. Share some of the directions with the class, asking students to follow them to make sure they are correct.

Use page 17 to teach and consolidate the terms backwards and forwards.

**Assessment questions to ask**
- Am I in front of the chair or behind it?
- Am I underneath the chair or on top of it?
- Who is sitting next to Garth?
- Who is sitting next to Mohammed?
- Show me an arrangement where one person is underneath the chair and another person is next to it.
- In your groups, show me one person going around the others.
- On the jungle gym, which parts can you go over?
- Where can you go up?
- Where can you go down?
- Put the book on top of the chair.
- Which way am I facing?

**Common errors and misconceptions**

Positions are not absolute, they are relative. For example, when you create a tower of bricks, most of the bricks are on top of one brick and beneath another. It is therefore important always to ask positional questions in context, for example, ‘What is underneath the table?’, ‘What is on top of the cupboard?’, ‘If I pile up these books like this, which one is on top?’, ‘If I rearrange them like this, which one is on top now?’, and so on.

### Addition strategies

<table>
<thead>
<tr>
<th>5: Addition strategies</th>
<th>Workbook 1C pp 18–20</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td></td>
</tr>
<tr>
<td>1Nc2</td>
<td>Begin to know number pairs to 6, 7, 8, 9 and 10.</td>
</tr>
<tr>
<td>1Nc8</td>
<td>Understand addition as counting on and combining two sets; record related addition sentences.</td>
</tr>
<tr>
<td>1Nc11</td>
<td>Add/subtract a single number by counting on/back.</td>
</tr>
<tr>
<td>1Nc15</td>
<td>Understand that changing the order of addition does not change the total.</td>
</tr>
<tr>
<td>1Nc16</td>
<td>Add a pair of number by putting the larger number first and counting on.</td>
</tr>
<tr>
<td>1Nc18</td>
<td>Begin to add single- and two-digit numbers.</td>
</tr>
</tbody>
</table>
Vocabulary
Add, order, bigger, count on, total, equals.

Resources
Number lines.

Mental warm-up activities
Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic
The concepts in this topic are not new, but the students are expected to apply what they already know about addition and counting on to work in a higher number range. They are also expected to formalise some of the ideas they have already explored, for example, they are taught that the order of addition does not matter, and that it is more efficient to count on from the higher number.

Teaching ideas

Practical activities
Adapt any of the previous counting on and addition activities for this topic.

Using the Workbook
Let the students work through page 18 on their own to consolidate the idea that addition can be done in any order and to demonstrate that it is faster to count on from the larger number in an addition. Use a number line to show answers and to demonstrate that it is faster to count on from the larger number.

Let the students work independently to complete page 19. Check as they work that they are using the number line. The larger number is given first in the sums, so they should automatically count on from it. Make sure they don’t start counting at 0 and count both numbers (if they do, point out that this is very inefficient and unnecessary).

Let the students work through page 20 on their own or in pairs. Encourage them to use the 1–100 chart or a number line to support their addition. Discuss the answers and the strategies they used as a class.

Assessment questions to ask
• Look at these two sums. Which one is easier to add? Why?
• What is five more than …?
• I have 21, what number is 3 more?
• I have 4, what number is 25 more?
  And similar.
Common errors and misconceptions

For calculations involving addition and subtraction, we can teach strategies for adding and subtracting more efficiently. However, you may find that students may stick to less efficient methods or even have their own strategies that they employ for faster working. Allow them to use and justify their own choices even if they do not match your chosen strategies.

6 Sorting shapes

<table>
<thead>
<tr>
<th>6: Sorting shapes</th>
<th>Workbook 1C pp 21–23</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td></td>
</tr>
<tr>
<td>1Gs1</td>
<td>Name and sort common 2D shapes (e.g. circles, squares, rectangles and triangles) using features such as number of sides, curved or straight. Use them to make patterns and models.</td>
</tr>
<tr>
<td>1Gs2</td>
<td>Name and sort common 3D shapes (e.g. cube, cuboid, cylinder, cone and sphere) using features such as number of faces, flat or curved faces. Use them to make patterns and models.</td>
</tr>
<tr>
<td>1Dh1</td>
<td>Answer a question by sorting and organising data or objects in a variety of ways, e.g. in Venn or Carroll diagrams giving different criteria for grouping the same objects. Note tables and lists, block graphs and pictographs are covered elsewhere.</td>
</tr>
</tbody>
</table>

Vocabulary

Circle, square, rectangle, triangle, cuboid, cone, cylinder, cube, face, flat, curved, sort, table.

Resources needed

No special resources are needed for the activities, however, if you are using any of the previous practical activities you may need resources (as listed on those pages) for those.

Mental warm-up activities

Select suitable activities from the mental warm-ups activity bank.
Concepts that may be unfamiliar in this topic

There are no new concepts introduced in this topic. Students will consolidate what they already know about 2D and 3D shapes to identify and name shapes as well as what they already know about classifying shapes to sort them using tables. Note that Carroll diagrams are generally presented as two-way tables, but at this level, the focus is on one criterion for sorting, so simple tables with ‘have’ and ‘have not’ criteria are good enough. Similarly, Venn diagrams with overlapping circles (more than one criterion, and shared criteria) are dealt with in Grade 2 and onwards.

Teaching ideas

Practical activities

If necessary, repeat some of the practical activities on 2D and 3D shapes and/or sorting objects from previous topics.

Using the Workbook

Use page 21 to assess whether students know the names of 2D shapes and that they can identify rectangles from a collection of squares and rectangles. Use the last activity to check that they can read and follow instructions using the position words they learned earlier.

Some students may ask whether a square is also a rectangle. Remember that in mathematics, a rectangle is a quadrilateral with four right angles and opposite sides which are equal in length. As a square conforms to this definition, it is technically also a rectangle. We call it a square because it is a ‘special’ rectangle which has all four sides equal in length. If the students do not raise this, you may want to leave the topic as is for now.

Use page 22 to assess whether students know the names of 3D shapes and that they can identify cubes and cuboids. Use the last activity to check that students understand the concept of a flat face. All of the shapes except the sphere have at least one flat face.

Page 23 deals with sorting and classifying shapes using the concept of having a characteristic or not having it. Make sure students understand they have to sort the set of shapes in five different ways and that they only need to write the letters of the shapes, and not draw the shapes.

Assessment questions to ask

• What do we call this shape?
• Is this a square or a rectangle? How do you know?
• Is this a cube or a cuboid? How do you know?
• Point to the curved faces on this shape.
Point to the flat faces on this shape. How many are there?
What shape is this face?
Which of these shapes have flat faces?
Which of these shapes do not have curved faces?
And similar.

Common errors and misconceptions
Students may not realise that they can answer questions about the set of shapes based on the tables (Carroll diagrams) rather than going back to shapes. For example, if you ask which shapes have no curved faces then they can find the answer from the table. Display tables only and insert letters or shapes and ask questions about them to illustrate this fact and to teach the students how to read and make sense of simple data tables.

7 Further addition strategies

<table>
<thead>
<tr>
<th>Objectives</th>
<th>7: Further addition strategies</th>
<th>Workbook 1C pp 24–26</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Nc1</td>
<td>Know all number pairs to 10 and record the related addition/subtraction facts.</td>
<td></td>
</tr>
<tr>
<td>1Nc3</td>
<td>Add more than two small numbers, spotting pairs to 10, e.g. $4 + 3 + 6 = 10 + 3$.</td>
<td></td>
</tr>
<tr>
<td>1Nc4</td>
<td>Begin using pairs to 10 to bridge 10 when adding/subtracting, e.g. $8 + 3$, add 2, then 1.</td>
<td></td>
</tr>
<tr>
<td>1Nc11</td>
<td>Add/subtract a single number by counting on/back.</td>
<td></td>
</tr>
<tr>
<td>1Nc15</td>
<td>Understand that changing the order of addition does not change the total.</td>
<td></td>
</tr>
</tbody>
</table>

Vocabulary
Add, subtract, total, pairs, group, add in parts, bridge ten.

Resources needed
Counters and unifix blocks as required, number lines.

Mental warm-up activities
Select suitable activities from the mental warm-ups activity bank.
Concepts that may be unfamiliar in this topic

Adding more than two numbers

In this topic students will be formally introduced to the strategy of adding pairs of numbers to make tens in order to add three numbers. It is likely that the students already understand that they can add more than two numbers (as they’ve technically added lots of numbers by counting on in steps using a number line). The important concept here is that you can add the numbers in different steps and that you can make ‘sets of ten’ to make the addition easier. This is an important concept and students will use it for mental strategies involving higher numbers as they progress through the stages.

Bridging tens

The strategy of adding numbers in parts to bridge 10 is one of the most useful strategies for later calculation work. Students need to understand that they can add in parts, for example, to add 7 and 5, they may reason that if you add 3 to 7 you get 10, and then you still have 2 (of the 5) to add, so you get 12. This understanding is particularly important for subtraction calculations such as 13 – 7 where the units in the number being subtracted are higher than those in the number you are subtracting from. When students use bridging strategies, this is much easier for them because they simply think 13 – 3 is 10 and 10 – 4 is 6.

Teaching ideas

Practical activities

- Do some practical activities in which the students have to combine three groups of objects (stick to a small number range) to demonstrate that we can add three numbers.

- Use unifix blocks in different colours to show how you can add three numbers by counting on. Relate the work you are doing with the blocks to the number line. For example, show a stick of 2 red, 3 green and 4 yellow blocks. Count them one by one to show that this gives us 9 blocks. Then show how we can jump the number of blocks on the number line to get the same total. Start at 2, then show a jump of 3, then show a jump of 4 to land on 9. Repeat with different examples until you are sure the students understand.

- Use small value coins to practise adding three numbers.

- Teach the students that a calculation can be simplified by changing the order of the numbers. Remind them that they know all the pairs of numbers that add up to 10 and revise these facts as necessary.
Show them that finding a pair (or pairs) of numbers that add to 10 can make the addition easier. For example:

\[4 + 9 + 6\]

\[= 10 + 9\]
\[= 19\]

Lead on from this to the idea that we can use 10 as a bridge or stepping stone when we add numbers in our head. Use the example of 6 + 7 and explain that we can think of this as 6 + 4 + 3. Demonstrate on a number line like this:

Repeat this using different examples to make the concept clear. Be aware though, that some students may find it more efficient to think of a sum like 6 + 7 as double 6 plus 1 and get to 13 using near doubles. Encourage the students to discuss and share their methods to make it clear to the class that there is no one correct method for doing the calculations and that your choice will depend on what the numbers are and what facts you find easiest to remember.

**Using the Workbook**

- Let the students work independently to complete page 24. Observe them as they work to see which students rely on counting the blocks and which count on and use mental strategies to add the numbers mentally.

- Work through the teaching example on page 25 with the class. Let the students explain how they add sets of numbers in their heads. Let them complete the calculations and spend some time in class asking students to explain how they added the numbers. Allow for different methods and thinking.

- Let the students work independently to complete page 26. Encourage them to use number lines and mental strategies, but allow those who are still struggling to model the calculations if they need to. Discuss how the students worked as you check the answers.

**Assessment questions to ask**

- What is 2 + 3 + 8? (And similar)
- If I want to add 6 and 8 and 4, which two numbers can I add first to make it easier?
What is 7 + 8? (and similar to bridge 10)
Can you show me how you added these two numbers?

Common errors and misconceptions
When students move into a higher number range they sometimes make mistakes when they bridge multiples of ten (for example by saying 13 + 28 = 31 or 13 + 28 = 51) because they don’t properly understand the concept. Lots of repetition and discussion of what they are doing at this stage will help prepare them for working at a higher number range later on.

8 Money

<table>
<thead>
<tr>
<th>8: Money</th>
<th>Workbook 1C pp 27–30</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td></td>
</tr>
<tr>
<td>1Mm1</td>
<td>Recognise all coins and work out how to pay an exact amount using small coins.</td>
</tr>
</tbody>
</table>

Vocabulary
Money, currency, coins, notes, value, units, dollars, cents, names of your currency, front, back (heads and tails), pay, amount, total.

Resources
Coins from your own country for reference or images of these coins for display and discussion (you should be able to find images of coins on government websites); coins and notes from other countries if possible for comparison.

Mental warm-up activities
Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic
The concepts in this topic should not be new to the students. Most students demonstrate a fairly sophisticated understanding of money and may be able to work in a much higher number range with money amounts than they can with ordinary calculations.

Handling money is an essential life skill; we all need to recognise the value of coins and notes in our own currency. At this stage, this is the only aspect of money we will deal with, although students will do some simple money calculations. You may want to revise adding three small numbers by making pairs that add to ten as well as strategies for bridging tens before the students add coin amounts together.
Teaching ideas

Practical activities

Encourage students to talk about their own experiences with money. This allows you to introduce or reinforce the terms ‘coins’ and ‘notes’ and to see how much they already know. Ask them to say what they think is a large amount of money and what they think is a small amount of money.

Have examples of each coin in your local currency to show the students. Pass the coins around and get them to describe the coins as they handle them. For example, this is a 1c coin, it is brown and it has a picture of a hummingbird on it. Repeat this for all the cent coins giving different children a chance to describe the coins. Use the words ‘cents’ and ‘coins’ regularly. Make sure they can read the word ‘cents’ (or whichever units is used locally) on the coins and that they can find the name of your country on the back of the coin. Talk about the symbols used on the coins and discuss how they help us to recognise our own money.

Do some coin rubbings. Place a piece of paper over the coin and shade it lightly with a pencil. If you like, the students can cut these out and make pretend coins to use in class.

Introduce the notes. Discuss how the colour and symbols help us to recognise the different amounts and stress that different notes have different values. At this stage, students do not need to know the notes. If possible, have a box of mixed currency available to show the class. If not, use the internet to download pictures of currencies from different territories. Explain that each country has its own money and that another name for this is ‘currency’. Let the students take turns to select a note or coin from the box (or choose a picture from your display), examine it and then decide whether it is from your country or not. They should tell the class the reasons for their decision.

Show the students how to draw a rough sketch of a coin. Encourage them to draw round coins to get the right shape and size, and then have them write or draw only the main image or amount shown on the coin. It is really not important that the students make accurate drawings, rather that they know what values coins have in the local currency. Simple circles with the values written on them are good enough for this purpose.

Using the Workbook

On page 27, students draw coins from their country. Have them work independently to draw each coin. If there is not enough space on the page, they should continue in their exercise books. Remind them to make rough sketches or have them stick coin rubbings into their workbooks.
Give the students sets of coins. As you hold up each set of coins, they must draw or write the amounts in the left-hand column on page 28. Then give them time to add up the total value of the set and enter it in the right-hand column. Continue with another set that they can write/draw in the next row.

Before students complete pages 29 and 30, have them role-play simple buying and selling situations. You can use fictional prices. Focus on different ways of making amounts using local coins. Once they are comfortable with the concept of paying an amount in different coins, have them work through page 29 and 30 with a partner. Discuss the coin combinations they use as a class and try to establish whether you have made all the possible combinations.

**Assessment questions to ask**
- What coin is this?
- Is this coin from our country? How do you know?
- How much is it worth?
- What can I buy with it?
- What can I buy with . . . ?
- I have . . . cents. What can I buy?
- How much is in my hand?
- What coins can I use to pay 12 c? (and similar)

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**9 Folding shapes: symmetry**

<table>
<thead>
<tr>
<th>9: Folding shapes: symmetry</th>
<th>Workbook 1C pp 31–32</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td></td>
</tr>
<tr>
<td>1Nn12</td>
<td>Find halves of small numbers and shapes by folding, and recognise which shapes are halved.</td>
</tr>
<tr>
<td>1Gp3</td>
<td>Recognise basic line symmetry.</td>
</tr>
</tbody>
</table>

**Vocabulary**

Whole, part, equal, half, halved.

**Resources**

Paper shapes and pictures of objects that can be folded; a mirror.

**Mental warm-up activities**

Select suitable activities from the mental warm-ups activity bank.
Concepts that may be unfamiliar in this topic

Half as one of two equal parts

Students may already use the word half in everyday life, however, mathematically the concept of a half is specific (it is one of two equal shares of the whole) and young children sometimes find the idea of a half difficult to understand. For this reason, the students need lots of practical experience of folding shapes to find half and of dividing groups to make two equal sets or halves of the group. Note that the fractional notation $\frac{1}{2}$ is not required at this stage, nor are other fractions.

Basic line symmetry

At this level, students are only required to recognise basic line symmetry. The important concept here is that when an item is folded along a line of symmetry, the two halves fit onto each other exactly (and match up piece for piece). It is very useful to use mirrors to show this concept.

Teaching ideas

Practical activities

Show the students a range of shapes and/or pictures that can be broken into parts. For example, a cake can be cut into parts, a square can be cut into parts, a picture can be cut into parts. Explain that the parts can be put together again to make a whole. Make sure the students understand the terms part and whole.

Explain that sometimes the whole can be divided into two equal parts. These parts are called halves. Show the students some example of items that can be divided into halves. For example:

Explain that shapes can also be divided into halves. You can use these shapes as templates for folding. Prepare cut-out versions for the groups and have the students fold the shapes along the dashed lines to produce two halves.
Write the words ‘one half’ on flashcards and use these to label the fractions of shapes. Use the labelled shapes to make a classroom display. Make sure the students understand that each whole shape is made up of two equal (identical) halves.

Make some puzzles for the students. Cut a range of shapes into halves. Let the students spend some time finding the matching halves and putting them together to show the whole shape.

Explain to the class that some things are symmetrical. This means that we can draw a line of symmetry which divides the shape into two equal parts (halves) however, it also means that when you fold the shape along this line, the two halves fit exactly onto each other because they are mirror images of each other. Use a mirror to demonstrate this.

If you have time, give the students a sheet with a symmetrical butterfly outline on it. You can use this one as a template:

Get them to fold the sheet to make two symmetrical halves. Then, have the students colour the butterfly so that the same colours fit onto each other when it is folded.

**Using the Workbook**

Let the students work on their own to complete page 31. Discuss their answers and let them explain how they knew that the diagram showed half or not half of the shape.

Once you have done some practical folding work on symmetry, let the students complete page 32 on their own. Check their work to see that they can recognise line symmetry.

**Assessment questions to ask**

- Is this half of this shape?
- Are these two parts the same? How do you know?
- Can you point to the shape that has been divided into halves?
- Is this leaf (or similar) symmetrical? How do you know?
Common errors and misconceptions

Students may use the term half very loosely, as it is used in real life. Make sure that you model the correct use of the term and that you continue to point out that half of a shape or object is one of two equal parts.

Students may not always recognise symmetry. Help them to see whether a shape or picture is symmetrical by using a mirror to show them the reflection.

10 Measurement: time

<table>
<thead>
<tr>
<th>10: Measurement: time</th>
<th>Workbook 1C pp 33–35</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td></td>
</tr>
<tr>
<td>1Mt2</td>
<td>Read the time to the hour (o’clock) and know key times of the day to the nearest hour.</td>
</tr>
</tbody>
</table>

Vocabulary

Time, clock, long (minute) hand, short (hour) hand, o’clock.

Resources needed

Analogue clock face with movable hands.

Mental warm-up activities

Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic

Telling time on the hour

In this unit, students will learn to tell the time to the hour on analogue clock (clocks with hands). The unit also provides opportunities to develop students’ vocabulary using words and phrases which relate to the passage of time and to specific activities that they do at different times of the day.

Teaching ideas

Practical activities

Show students the positions of the hands on an analogue clock at 1 o’clock, 2 o’clock, etc. to 12 o’clock. Give them opportunities to move the hands to specific times, and to read the time when you move the hands to specific times on the hour.

Students could make large clock faces (20 cm in diameter) using:
• a paper party plate or a tin lid as a template from which to cut a cardboard disc
• a strip of cardboard from which to make the hands
• a paper clip to hold the hands in place.

Students work in pairs. One student says a time and the other student has to move the hands on a clock face to show the time on the hour, an hour later, and an hour earlier. Alternatively, one student sets the time on a clock face and the other student has to say the time.

Using the Workbook

Once you have taught time on the hour, have the students first say each time on page 33 and then work on their own to write it.

Page 34 will be more difficult for most students. Allow them to work in pairs and to use a real clock face to model the times to help them draw the hands in the correct position. Discuss the fact that the minute hand (the long hand) is always pointing to 12 when the time is on the hour (something o’clock).

Use page 35 to assess whether students can read time on the hour and relate that to daily activities. Make sure they understand they need to write the letter of each picture in the table and draw the picture or the clock.

Assessment questions to ask

• What time is it on a clock when the big hand points to 12 and the little hand points to 3?
• What time is this?

Common errors and misconceptions

On some clocks, it may be difficult for students to distinguish between the hour hand and the minute hand. Make sure that they understand that the long hand is the minute hand and the short hand is the hour hand.

11 Finding half (division)

<table>
<thead>
<tr>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Nn12</td>
</tr>
<tr>
<td>1Nc20</td>
</tr>
<tr>
<td>1Nc22</td>
</tr>
</tbody>
</table>
Vocabulary
Half, share, equal groups.

Resources needed
Items for counting and sharing, domino cards with dots on one half only.

Mental warm-up activities
Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic
The concept of half is extended here to half of a group of objects. This is the basis of division by two and halving numbers later on. Remind the students that they already know that a half is one of two equal parts and explain that sometimes the whole is a group (rather than one thing) but that it can still be halved.

Teaching ideas

Practical activities

Spend some time halving sets of objects to share them equally into two pans, between two students or into two equal sets.

Revise doubling numbers to 10 using a die, or counters. Explain that when we double an amount we are actually making another equal group. Point out that halving is the inverse of doubling. In other words, if double 2 is 4, then half of 4 is 2.

Give the students a printed sheet or a laminated set of domino cards with dots on one side only. For example:

Include all the numbers from 1 to 8. Tell the students that half the dots have been wiped off each domino, so only half are left. Ask them to draw the other half.

Make up some story sums involving halves. For example, I have $8. I want to give my sister half of the money. How much should I give her? I have 10 sweets. I want to share them with my friend so we each get half. How much should we each get?
Using the Workbook

Let the students work independently through page 36 and check their work to see that they can find half of a small group. Discuss how they worked out what a half was.

Let the students discuss page 37 in pairs before asking them to individually complete the page.

Assessment questions to ask

- What is half of …?
- Can you give me half of these counters please?
- Can you share these sweets equally among two students?
  And similar.

12 Handling data: tables, lists and diagrams

<table>
<thead>
<tr>
<th>12: Handling data: tables, lists and diagrams</th>
<th>Workbook 1C pp 38–41</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td></td>
</tr>
<tr>
<td>1Dh1</td>
<td>Answer a question by sorting or ordering data or objects in a variety of ways, e.g.</td>
</tr>
<tr>
<td></td>
<td>– using block graphs and pictograms with practical resources; discussing the results</td>
</tr>
<tr>
<td></td>
<td>– in lists and tables with practical resources; discussing the results</td>
</tr>
<tr>
<td></td>
<td>– in Venn and Carroll diagrams giving different criteria for grouping the same objects.</td>
</tr>
<tr>
<td></td>
<td>Note: block graphs and pictograms are in Chapter 14.</td>
</tr>
</tbody>
</table>

Vocabulary

Kittens, rabbits, fish, birds, animals, bowls, brushes, same, different, sort, hot, cold, girls, boys.

Resources needed

Pictures of animals; pictures or examples of different kinds of leaves; some examples of different items of clothing.
Mental warm-up activities

Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic

There are no new concepts in this topic. Students will apply what they already know about sorting and classifying in a different context to reinforce and consolidate their skills in this area.

Teaching ideas

Practical activities

You can repeat any of the activities described on page 54 of this guide as necessary to reinforce the topic.

Develop a practical activity in which students make their own collections of leaves and sort them according to particular characteristics (big leaves and small leaves; pointy leaves and round leaves; green leaves and other coloured leaves). Students can work in pairs to sort their collections and explain how they sorted them. Alternatively, you could have the class make a large display or poster incorporating the whole class’s leaves sorted in different ways. Use your own discretion as to what will be most practical and enjoyable for your class.

In preparation for page 39, show the class your collection of different items of clothing. Ask them to identify which are for women/men/girls/boys/either. Then ask them to suggest other ways we could sort the clothing (tops and bottoms; warm and cool clothing; casual and smart clothing; according to colour, and so on).

Using the Workbook

Students complete page 38 independently. They need to count each animal or item, then fill in the boxes to summarise the information shown in the picture.

Page 39 gives students the chance to sort, then re-sort, a collection in different ways. They may need to draw another table in their exercise books if they wish to sort the clothing in different ways, e.g. according to colour:

Page 40 is a practical measuring task involving capacity, but the focus is on using a table to record your findings. Work through one or two examples with the class before letting the students work in small groups to complete the activities and record their results in the table.

Revise how to sort objects using a Venn diagram before asking the students to complete the first activity on page 41. Work through the second activity with the class. This is a two-way Carroll diagram and the aim is to introduce the idea that objects can be sorted using two different properties.
Assessment questions to ask

- How many kittens are there in the picture?
- How many rabbits/fish/birds?
- How many bowls/brushes?
- How many round leaves did you find?
- How many long leaves did you find?
- What kind of leaf is this one? This one? This one?
- How would we categorise this leaf (showing one that is not round or long or curly)?
- What other ways could we put the clothes in groups?
- Do all the clothes fit easily into these groups? Why or why not?

Common errors and misconceptions

Make sure that students understand that some items may not fall easily into a particular category, and that we may need to invent categories such as ‘other’ because of this.

13 Mixed calculation and problem solving

<table>
<thead>
<tr>
<th>Objectives</th>
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</thead>
<tbody>
<tr>
<td>1Nc1</td>
</tr>
<tr>
<td>1Nc3</td>
</tr>
<tr>
<td>1Nc4</td>
</tr>
<tr>
<td>1Nc15</td>
</tr>
<tr>
<td>1Nc16</td>
</tr>
<tr>
<td>1Nc19</td>
</tr>
</tbody>
</table>

Vocabulary

Double, number sentence, operation, count on, skip count, sum, difference, rule.
Resources needed
Dice (two per student or group of students).

Mental warm-up activities
Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic
This section does not deal with new skills. However, students use their existing calculating skills to explore the relationships between numbers and calculations in different ways. For example, they investigate how to reverse an operation (subtraction to reverse addition, and vice versa).

Teaching ideas

Practical activities
You can use any of the practical counting and calculating activities as needed as you work through this topic.

Using the Workbook
Page 42 gives students an opportunity to practise calculating skills – adding, subtracting and doubling, and making number sentences. If you think they need to revise any of these skills before playing the game, go through some examples of sums on the board. They can work in pairs. For each number sentence, a student must throw the dice. They then fill the dice numbers into the empty boxes in a given number sentence. Where there is a subtraction sentence, it is important that they subtract the smaller number from the larger one.

Page 43 asks students to revise and consolidate the relationship between addition and subtraction facts. Each image represents a number composed of two smaller numbers, for example a strip made up of 1 block in one colour and 3 in another colour. Students explore how to use these numbers to make up two subtraction sentences and two addition sentences. Emphasise the relationship between the facts: if you take away 1 from 4, how much is left? How much do you have to add to get back to 4?

Page 44 reinforces addition and subtraction work in a real-life context. Assist students with reading the problems if necessary, but allow them to complete the number sentences as independently as possible.

Page 45 invites students to test mathematical rules. Encourage them to try out examples that test each rule given in the left-hand column.

Assessment questions to ask
• What is double 5? Double 3? Double 7, etc.?
• What is half of ten? Half of 12, etc.?
• How much must you add to 5 to get 7? How much must you take away from 7 to get 5, etc.?
• Look at these two sums. Which one is easier to add? Why?

Common errors and misconceptions

For calculations involving addition and subtraction, we can teach strategies for adding and subtracting more efficiently. However, you may find that students have their own strategies that they employ for faster working. Allow them to explain and justify their own choices even if they do not match your chosen strategies.

14 Handling data: graphs

<table>
<thead>
<tr>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Dh1 Answer a question by sorting or ordering data or objects in a variety of ways, e.g.</td>
</tr>
<tr>
<td>– using block graphs and pictograms with practical resources; discussing the results</td>
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<td>– in lists and tables with practical resources; discussing the results</td>
</tr>
<tr>
<td>– in Venn and Carroll diagrams giving different criteria for grouping the same objects.</td>
</tr>
</tbody>
</table>

Vocabulary

Presentation, data, chart, block graph, pictogram.

Resources needed

Favourite day of the week chart; shape pictogram worksheet for each student.

Mental warm-up activities

Select suitable activities from the mental warm-ups activity bank.

Concepts that may be unfamiliar in this topic

Data can be presented as a graph

Students will now work with data presented in simple charts. They learn to read and interpret information from charts and also to collect data and display it using a simple chart of their own.
Tell the class that in everyday life we use symbols to avoid long descriptions and to make it easy to compare things. We also use tables to display information in ways that make it easy to read.

Activities at this level require the students to ‘read’ the information presented in a chart and to gain experience in organising their own data into different categories.

**Teaching ideas**

**Practical activities**

Revise the concept of a chart using the favourite days of the week chart. Ask questions such as, ‘Which day did most students like?’ ‘Which day did least students like?’ ‘How many students liked Monday?’ ‘How many more students liked Tuesdays than Wednesdays?’ and so on.

Make a horizontal display on the board. Write the letters of the alphabet in a horizontal row across the top of the board. Get the students to put up their hands to show what letters their first names begin with. Draw a stick figure below the relevant letters to represent each student (or have the students write their names on a sticky note and come up and stick them under the correct letter. Do this systematically, for example say, ‘Everyone whose name starts with A put up your hand.’ As you draw each student, let them sit down. Use the words ‘chart’ and ‘information’ in context to reinforce their meaning. Ask the students questions about the chart.

Repeat this type of activity with a range of different horizontal and vertical picture charts until you are satisfied that the students can read and understand both types of chart. Revise the use of the words ‘rows’ and ‘columns’ if necessary. Discuss the characteristics of the charts as you display them – make sure the students understand that the pictures are the same size, that they are spaced equally and that the axis is labelled.

**Using the Workbook**

- Work through page 46 with the class. Make sure they know what to do before asking them to complete the graph on their own.

- Let the students work in pairs to discuss the questions on page 47. They should each complete the answers on their own.

- Let the students work in pairs to discuss and complete page 48.
Assessment questions to ask

Any of the questions suggested for the practical activities above can be adapted to the charts to assess how well the students understand them.

Common errors and misconceptions

Some students may forget to label the parts of the graph. Show the class examples of graphs without clear labels and let them experience how difficult it is to read them to highlight how important labelling is.