Introduction

This Teacher’s Guide offers support for teachers using the Nelson International Mathematics course in the pre-school year(s) (Kindergarten).

The Kindergarten Workbook is the first component in the series. The materials for Stage 1 to Stage 6 are all endorsed by the Cambridge International Examinations board and they follow the curriculum outlined in the latest Cambridge Primary Mathematics Framework. The primary levels offer Workbooks, Student Books, Teacher Guides, Assessment CDs and Homework notes for parents for use in years 1 to 6. The Kindergarten course is more generic, covering the skills and concepts that students need to have in place when they enter Stage 1. Different countries and different schools call this stage different things (pre-school, reception, foundation class, and so on), but generally the skills taught at this level are consistent across curricula.

The Kindergarten Workbook is slightly different from the other components of the course in that it is not intended to be a stand-alone component that students work through in groups or on their own. Instead, it is intended as a record of work and achievement that students will work in once they have engaged with the mathematical concepts being taught in concrete and practical ways. At this level of schooling, the teacher plays an integral role (especially as students may yet not be able to read or write) and, as such, the methodology and approach needs to encourage students to engage with and enjoy mathematics learning so that they develop both the conceptual foundations and positive attitudes that will ensure they become confident and successful in this subject.

Structure of the course

The Teacher’s Guide

The Introduction to this Teacher’s Guide outlines the methodology of the course and provides a bank of activities, games and rhymes for use in the classroom. It also gives suggestions for managing your classroom, involving parents and assessing each student’s progress.

The second part of the Teacher’s Guide offers structured support for the Kindergarten Workbook. This support is presented under the following headings:

• **Concept and skills development** – each section of work is preceded by a table that gives an overview of the topic and lists the key objectives and skills for the section.

• **Vocabulary** – the key terms for each section are highlighted. The list of vocabulary words shows the terms that you should use in your teaching. By using and modelling the correct terminology yourself, you encourage the students to use the correct mathematical terms and develop sound mathematical thinking and reasoning.

• **Resources needed** – this is a list of the everyday items and apparatus that you and the students can use to explore and develop the concepts being taught.
• **Key concepts** – this outlines in more detail the focus for the section and the approach used.

• **Teaching ideas** – these are divided into two parts:
  • **Practical activities, games and rhymes** (suggestions for introducing and teaching the concepts), and **Using the Workbook** (notes to assist you as you work through the Workbook materials, including suggestions for class and group work).

• **Assessment strategies** – this suggests strategies and questions that you can ask to assess whether or not students understand the concepts.

• **Common errors and misconceptions** – this gives tips and advice to draw your attention to areas that students frequently find difficult or confusing and suggestions for managing these in the classroom.

**Strands and skills**

As in the Primary Mathematics Framework, the content to be taught is divided into strands:

• **Number** – numbers and the number system, and calculating

• **Geometry** – shapes and geometric reasoning, and position and movement

• **Measure** – money, length, mass and capacity, and time

• **Handling data** – organising, categorising and representing data

• **Problem solving** – using techniques and skills in solving mathematical problems.

In this course, problem solving is not treated as a separate strand because it arises and is used in each of the other strands. For this reason, it is integrated into the materials at all levels.

Each activity page, or cluster of activity pages, can be linked to one or more strand. These strands are not discrete, so students will, for example, work with shapes and count them in order to draw a block graph, or they will draw and colour shapes in order to combine sets and develop simple concepts of addition.

In the Kindergarten course, the main focus is on developing sound number concepts, with the majority of activities (and Workbook pages) dealing with objectives in this strand. Students need to learn to count and to understand how the number system works in order to succeed at mathematics in this and later stages. At the same time, they need to formalise their understanding of shape, space and measures and also begin to explore the concepts involved in data handling.

**Fundamental principles**

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

• Students need concrete (practical, hands-on) experiences 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, while others will understand them quickly and find them easy.

Students learn in a variety of ways; mathematics teaching should provide a rich and wide variety of experiences.

Students will become more mathematically able if they are allowed to develop reliable personal methods of working; the formal recording used by mathematicians comes with time and experience, and you cannot expect young students to understand it or use it themselves before they are ready to do so.

The conventions (formal procedures and methods of setting things out) 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 learned and to relate their mathematics work to other areas of the curriculum and their daily lives.

Students learn mathematics most effectively when they enjoy what they are doing and when they can see the relevance of what they are learning.

This course offers a wide range of mathematical experiences that reflect current thinking about 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 which experience(s) are most appropriate at different stages for their own students. For this reason, it does not impose a rigid, inflexible structure; instead, it provides a wide variety of practical activities, games, rhymes and other activities linked to clearly defined purposes and objectives. As the teacher, you will select from what is on offer to meet the needs of your class as a whole, different groups and/or individuals.

**Individual differences**

Everyone learns at their own pace, and in different ways, although the experiences people have may be common. Adults in the real world bring a wide variety of approaches to their work, often ones they have worked out 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.
Frameworks for teaching

Summary of the approach

The learning framework for this course can be summarised as:

do – talk – record.

Doing

The first step in developing and understanding concepts is to let students manipulate apparatus, play games, investigate patterns and rules using real objects, or model situations and problems using real objects. For example, you may give students a pile of buttons or counters and ask them to place one (or two) objects in each container of an egg carton. Alternatively, you could give students a range of different shapes and ask them to make pictures or patterns with these, or to sort them into two groups using given (or their own) criteria for sorting (for example, put the big shapes into one group and the small shapes into another; put the blue shapes in one group and the shapes that are not blue into another group; put all the shapes that can roll into one group and the shapes that cannot roll into another group).

Talking

Students can make sense of what they have been doing by discussing what they have done, why they have done it and what they have found out. This allows them to generalise concepts and ideas from their particular experiences. Your role as a teacher is to create situations for discussion, to ask open-ended but directed questions and to intervene if students are just chatting aimlessly.

Talking about their learning allows students to develop their mathematical vocabulary (although you will need to model this for them in the early stages).

Recording

Recording and representing concepts is important. Students in a kindergarten class are unlikely to be writing and may not know the numerals or how to form them. Recording may therefore also be in the form of arranging manipulatives (for example, putting a dot on a number line, hopping along a set of numbered squares, moving a shape into a position or putting two dominoes together to show that they both represent the same number of dots) or drawing pictures, diagrams or symbols.

Generally, over time, students will find these methods too time-consuming and as they learn to write more fluently, they will gradually simplify their own representations. Keep track of their recording methods and styles to help them make the transition to more formal recording when they are ready. Make sure, however, that you do not force students into formal and standard methods of recording mathematics before they have fully grasped the process and are confident in applying it.
Using technology

Clearly, at this level, students will not be expected to work with handheld calculators or to use sophisticated measuring equipment or geometry drawing tools. However, you may find that more and more students have access to computers both at school and at home, and so you may want to use some IT-based activities in the classroom.

Computers

The use of a computer can support the 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 technology available, as it is likely that your school will become better 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 mathematics 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 offers a full range of teaching support resources. The free resources (www.primarycorner.com, follow the links to early years/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 mathematics teachers. A wide range of classroom apparatus is available from Nelson Thornes via the BEAM website (www.beam.co.uk).

Exploring and investigating

Primary mathematics has traditionally tended almost exclusively towards short, directed tasks that 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.

Always encourage students 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 that 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 you should 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 they acquire 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.

Use investigations to enrich the introduction of new concepts. There are many different approaches to investigations. Allow students initially to explore freely, but as they develop an investigative approach, help them to become systematic in the way they work. You may wish to intervene periodically to identify and interpret emerging patterns.

Sources of investigation

Many everyday objects can provide rich sources of investigative work, for example:

• exploring patterns in solid and flat shapes, such as identifying 2D shapes in 3D shapes
• exploring the relationship between the size/shape of a container and how much sand/water it can hold
• investigating geometric patterns through explorations of colour arrangements on pin-boards.

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.

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 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, but particularly young children, 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 unstructured or free play, with students exploring the functions and possibilities inherent in the materials. Once they are comfortable with the equipment, you can then formalise the games to ensure that students are developing the concepts you intend to teach.

At home

Part of your role as a teacher is to involve parents and guardians in students’ learning. 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.

Encourage parents 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.

Many 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 may also 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 that demands mathematical skills to be used properly. Many students may even be responsible for their own timekeeping to a limited extent.

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**

All teachers have their own 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 so that students have easy access to it and you can check it periodically. Clearly label all items and encourage students to make their own decisions about what they need. From the very beginning, insist that students pack up and return equipment to the correct storage containers or shelves.

**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 stories, questions and activities.

Both yourself and the students should provide questions and activities for interactive problem solving, for example ‘The answer is 3. What was the question?’, inviting students to draw or 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 students have to discover what has changed, and put it right.

The BEAM organisation offers a wide range of primary mathematics resources including manipulatives (number ‘wash lines’, number spinners, large dice, dominoes), 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 available from Nelson Thornes by clicking on the link from 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 with you, for peer teaching to take place and for the work to be matched to their needs. It enables you 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 you valuable diagnostic and formative information on which to base your 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, you should conduct assessment 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.

Effective assessment is varied and relevant to 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). In the Kindergarten stage, most assessment will be related to performance and you may require students physically to ‘do’ things to show that they understand concepts and have achieved the learning objectives.
Facilitating assessment

• Give students a variety of tasks that require them to apply different skills – for example, 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 also equips you to report back to parents about their child’s progress.
At the start of the Kindergarten year, you will probably need to spend most of your time on practical activities, both to assess the students’ existing knowledge and to provide number, shape and measurement readiness activities before you formally teach the concepts required at this level.

The activities here are general ones that can be used to develop the basic skills and processes that students will use as they learn mathematics. These include:

- identifying and describing items using given and own attributes (characteristics)
- matching
- sorting
- comparing
- ordering three or four objects (using given attributes such as size)
- identifying, completing and making patterns.

Bear in mind that these skills and processes are not discrete and that you may be developing two or more in the same activity.

Activities for developing number readiness and number concepts are given in more detail in the ‘Using the Workbook’ section of this Teacher’s Guide so that they are linked to the actual number range and concepts being taught.

This section contains a range of examples that you can use as written, or adapt to suit your own classroom. It is not possible to provide a definitive set of materials here, so you may need to find additional resources to suit your particular needs.

**Practical activities**

**Identifying and describing activities**

**Containers**

Provide a range of containers of different sizes and shapes, and access to sand and/or water. Allow the students to fill and pour sand/water from one container to another. Ask questions and use the activities to develop the basic vocabulary of weight (mass) and capacity – heavy, light, heavier, lighter, full, empty, nearly full, nearly empty, holds the same, holds a lot, holds a little, holds more than, holds less than, and so on. These activities develop hand-eye coordination skills, as well as vocabulary, and also help students to develop the idea of conservation of measure (for example, to learn that a wide flat container may hold the same as – or more than – a tall, thin container).

**Feely bag**

Prepare a ‘feely bag’ for the classroom. You will need a range of different items (for example, plastic cutlery, stationery items, buttons, combs, keys, coins, feathers) and a bag that you cannot see into. Students take turns to
put their hand into the bag and select an item. They should hold the item and describe it to the class using feel (‘it is big, it is soft, it has sharp points on one side’). The others try to guess what it is. After some discussion, let the student remove the item and show it to the class. He or she should then describe it using its characteristics (including colour, size and shape). For example, ‘This is a comb, it is brown, and long and quite thin, it has sharp teeth on one side and a flat handle for holding it.’ You can include matching in this activity by drawing pictures of the items in the bag, or tracing round their outline. Ask the student to match the chosen item to the correct picture or outline.

**Making collections**

Arrange students in groups. Give each group of students half an egg carton (or any other container with a number of compartments). Ask them to walk around the classroom or school grounds and collect six items that are different to each other. When they have collected six items, the groups take turns to describe the items and say how they are different. For example, ‘This is a big brown seed, it is hard and rough on the outside.’ ‘This is a small green leaf, it is smooth and round.’ You can vary this by giving different instructions, for example ‘Find six items that are all green, but all different in some way.’

**Matching activities**

**Everyday objects**

Do some early matching activities with the class to help develop the idea of one-to-one correspondence. For example, get students to physically match items such as:

- straws to bottles or cups
- children to chairs
- bookbags to hooks/lockers
- students to pencils/books
- buttons to buttonholes
- hats to heads
- socks to shoes.

Provide crayons in different colours and ask students to match them to counters using colour as the matching characteristic. Use this activity to teach the names of the colours if necessary. You can vary this to match any items using colour.

**Shape jigsaws**

Prepare a set of ‘shape jigsaws’ for the classroom. For each ‘jigsaw’ you will need two sheets of card the same size. Divide the sheet up into shape pieces like this:

Vary the shapes to make different puzzle boards.
Leave one sheet intact. This is the guide board for the students. Cut along the lines of the other sheet to make a set of shapes. Store each puzzle (the guide board and the set of shapes) in a zip-lock plastic bag or large envelope. Give the puzzle to individuals or pairs of students and let them make the jigsaw by placing the cut out shapes on their matching outlines. Note that the names and attributes of the shapes are not the focus of this activity, rather the point is to encourage the students to match like-to-like shapes.

**Paint strips**

You can prepare a fun matching activity using the paint colour strips you get from hardware or paint shops. You will need two of each strip for the activity. Use, for example, a strip showing shades of green. Leave one strip intact (or cut out the different shades and paste them in a random order on another sheet of card). Cut the other strip into pieces so that each piece shows one of the shades of green. Store each puzzle in its own zip-lock bag or envelope with the colour written on the outside. Arrange the students in small groups and let them play with the puzzles. They should display the fixed colour strip (or sheet) and have the other pieces face down. They then take turns to pick up a piece and match it to the correct colour on the game board. To extend the activity, ask the students to identify items in the environment that match each shade of green. For example, the leaves on the tree outside are a dark green like this strip. The paint on the classroom wall is a very light green like this strip.

**Unifix cubes**

Prepare sets of Unifix cubes of different lengths (from one to about ten cubes). Cut sets of wool or ribbon to match the sets of cubes. Ask students to match the lengths by comparing and then laying the wool next to the corresponding set of cubes. Extend this by including some pieces of wool that don’t fit. Encourage the students to talk about why these don’t fit, for example ‘This piece is too long for all the sets of cubes.’ ‘This piece is too long for this one, but it is also too short for this one.’

**Egg trays**

Prepare a matching box using egg boxes. Draw or stick one to four stars in each compartment. Ask the students to sort beads or other small objects to match the number of stars (one-to-one correspondence). They do not need to know the numbers or be able to count to do this.

**Numbers**

To develop number sense, include matching activities that involve numbers of items arranged in different ways. For example, prepare cards with one to five items (shapes, dots, squiggles, fruits). Ask students to make pairs of cards with the same number of items. Once you have taught numerals and number names, you can extend this activity to matching the amounts and then matching those to numerals and sorting them in order from fewest to most or vice versa.
Collect pictures of numerals (from 1 to 10 only) in different contexts and styles from magazines, birthday cards, calendars and product labels. Stick the individual numerals onto card and keep them in a box. Give the students a handful of cards and ask them to sort them into groups of symbols that are the same. They do not need to know the number names to do this, they can simply compare the shape and form of the numerals to match and sort them.

**Sorting activities**

*Sorting by type of item*

Provide students with a box of mixed small items (for example, buttons, counters, plastic shapes, pencil crayons, coins, toys, and so on). Arrange students in groups to sort the objects based on your instructions. For example, tell them to find all the counters and put them in one pile. Make sure that your instructions are clear and that the students know what objects you are talking about so that they can decide whether the items in their collection belong in that set or not. You can vary this to sort by size, colour, shape and/or weight.

*Sorting by attributes*

Give the students plenty of practice in sorting items, using one attribute, for example, ‘Sort the red buttons from this set’, ‘Sort this set of counters into big and small counters’, ‘Put all the circles into one set’, and so on. You can use real objects or pictures. (For example, from a set of pictures of animals, the students could sort all the birds into one set.)

Prepare a set of long and short items. Include items that are different in width as well. Ask students to sort these into two groups (long and short items). Then ask them to make a group of short wide (fat) items, or tall thick items, or short thin items.

*Sorting by colour*

Prepare a set of flashcards with the names of colours on them. Display these and ask the students to sort (or find) objects that match each colour. They should come up and place their item next to the correct colour. You can extend this activity to include basic data-handling skills by preparing a large sheet with a table like the one below with the names of the colours. Students then place the items in the blocks next to the correct colours, or they draw the items on a smaller sheet of their own.

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Comparison activities

Everyday objects

Provide a range of different everyday objects from home and classroom and encourage students to talk about them and to compare them in terms of size, weight, shape and colour. Ask them to sort these into groups of say: blue and not blue objects, large and small objects, objects that are heavier/lighter than a pencil, and so on.

Show the class two objects, for example, two toy cars. Ask questions to encourage the class to talk about:

- similarities (‘What is the same?’) – for example, both cars are green; both cars have wheels
- differences (‘What is different?’) – for example, one car has a white roof; one car has two doors, the other has four; that car is smaller than the other one
- size – big, small
- length – longer, shorter, higher, shorter
- position – in front of, next to, behind, under, on top of, on the side, at the front, and so on.

Comparison vocabulary

Prepare a set of flashcards with measurement comparison words on them. For example:

- big
- smaller
- longer
- shorter
- heavier
- lighter
- thicker
- thinner
- wider

Display a pair of comparison words, for example big and bigger. Ask the students to find (or suggest) items that would fit into each group. For example, an elephant is big, a house is bigger. You can vary this in many ways: give an item in one of the categories and ask the students to suggest items for the other category. When students give an item that is bigger, move it into the big category and ask them to suggest an item that would then fit into the bigger category (this is quite fun as they have to keep thinking of bigger and bigger items). You can vary this by moving the item in the big column to the bigger column, but you need to phrase it carefully, saying things like ‘I am putting the elephant into this group: bigger. What is it bigger than?’
Use a computer or photocopier to prepare sets of items for ordering. Choose a picture and reproduce it in three or four different sizes like this:

![Example of different sizes](image)

Cut these out and mix them up. Ask the students to sort them from smallest to largest or largest to smallest. Give them different instructions to reinforce vocabulary, for example ‘Find the shortest crayon. Which ones are longer than this?’, ‘Choose a crayon. Choose another crayon. Is it longer or shorter than the first one you chose?’.

**Pattern activities**

Threading beads helps students to develop the skills of listening and following instructions as well as sorting using a given characteristic, and patterning. Give the students a set of mixed beads and string for threading. Remember that these are young children and you will need to select beads with large holes that are easy to thread. Possible activities include the following:

- **Thread one bead onto your string (for example, a red bead).** Ask the students to string all the beads from their set that are the same as yours (that is, all the red beads).
- **Display a repeating pattern of beads on your string (for example, one red, one blue, one red, one blue).** Ask the students to make the same pattern using the beads in their set.
- **Ask the students to make a string of beads using instructions like ‘Make a string of yellow beads.’ ‘Make a string of blue and green beads.’ ‘Make a string of big beads.’** and so on. The instructions you use will depend on what the beads look like.

As students work with the beads, teach and reinforce the vocabulary of colour, comparison (big, small, round, not round), shape and size with the class.

You can also use beads to reinforce one-to-one correspondence and basic comparison of number. Show, for example, two yellow beads. Ask the students to make a set that is the same as yours. Extend this by asking them to make a set that is different, that has more beads, or fewer beads.
Data activities

Prepare a ‘graph’ on a large sheet of paper by writing the names of some colours on the horizontal axis. For example:

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<tbody>
<tr>
<td>Black</td>
<td>White</td>
<td>Blue</td>
<td>Green</td>
<td>Red</td>
</tr>
</tbody>
</table>

Give all the students a small square of card and ask them to colour it to show their favourite colour (from the colours you have given them on the graph). They then come up and stick their squares in the correct column on the graph. Once they have done this, ask questions such as ‘Which colour is the favourite?’ (the one with most squares), ‘Which colour was chosen by the fewest students?’ (the one with the fewest squares), ‘Which colours were chosen by the same number of students?’ (if appropriate), and so on. Once the students can count, you can adapt this to include actual numbers. For example, ‘How many students like red?’, ‘How many more students chose green than blue?’ and so on.

Games

A game is different to a teaching activity because there is an element of luck and chance in a game, sometimes leading to a winner. Some games are played alone and students try to improve on their own results, while other games are played in pairs or groups.

Make sure that the students understand the rules of the game before they start playing. If they don’t, they may do the wrong things and this can result in conflict with others. Students should learn to:

• take turns and wait for their turn
• move their own game pieces only
• help each other if they can.

The students also need to learn that in games involving luck, players don’t win or lose on the basis of ability. Explain that those players who get the best luck in a particular game win; those who lose were just less lucky. Winning graciously, as well as losing and playing fairly, are important life skills.

When students play games in class, do not keep a record of who wins and who loses. If the students like a game, encourage them to play it in their free time and to take it home and play with family members if possible.
I spy

Play ‘I spy’ in the classroom to reinforce vocabulary and concepts. For example, say things like ‘I spy something green. What could it be?’ Students then take turns to guess. Vary this by displaying items such as a pencil. Say, ‘I spy something longer than this pencil. What could it be?’

Dominoes (matching dots)

If you have sets of dominoes, let the students play the traditional game where they have to join the dominoes by matching the number of dots. Arrange the students in pairs or threes and deal seven dominoes to each student. If a student cannot play, he or she must pick up a domino. If this domino can be played, he or she must play it; if not, it is the next person’s turn. The winner is the first student to get rid of all his or her dominoes.

Clip toss

Prepare a ‘clip toss’ matching game. You will need a large set of counters (or any small objects), a paperclip for each group and an A4 sheet divided into sections like this:

You can adapt the numbers of dots to suit the stage that the students are at. Arrange the students in groups of three or four. They take turns to toss a paperclip onto the sheet. (If it lands on a boundary line, they toss again. The aim is to get it into one of the compartments.) When the paperclip lands in a compartment, the student takes that number of counters (he or she may need to place the counters on the dots to match the amounts in the early stages, but later they will probably count them). The winner is the student with most counters after two rounds. The students can decide who wins by lining up the counters and visually working out who has most.

Simon says

The game ‘Simon says’ is ideal for teaching students to listen to and follow instructions, as well as for teaching position words. The premise is that
you call out an instruction, for example ‘Simon says stand in front of your desk’. The students have to obey the instruction, and those who get it wrong have to sit down. Keep up a reasonable speed to maintain interest. Once the students are confident in the game, add the rule that they only do the action if it is preceded by ‘Simon says’. For example, if you say ‘Simon says sit on your chair’, students must sit down, but if you say just ‘Sit on your chair’, they must not sit down.

**Memory games**

Show a set of items (for example three differently coloured blocks). Now ask the students to close their eyes. Remove one item and ask the students to look again and say what is missing.

Vary this by adapting ‘I spy’. Go round the class and ask the students to say what they can spy, adding a new item each time. For example, the first student says, ‘I spy a chair.’ The second student says, ‘I spy a chair and a book.’ The next student says, ‘I spy a chair, a book and a pencil.’ If a student gets the order wrong, that student is out. See how long they can keep going.

**Find the pairs**

Prepare sets of cards with matching pairs (these can be anything related to your teaching or themes in the classroom, including amounts shown as dots and numerals once the students have learned these). Arrange the students in small groups. Shuffle the cards and deal them out on the table face down. The students take turns to turn over two cards. If the cards match, the student keeps that pair. If not, he or she turns the cards face down again and it is the next person’s turn. The game is over when the last pair is drawn and the winner is the person who collected most pairs.

**Snap**

Use objects, shapes, colours or numbers to prepare sets of cards for playing snap. (You can use the same cards as the ‘Find the pairs’ cards above.) Arrange the students in small groups. Deal an equal number of cards to each student. Students take turns to place a card face up on the pile. When a card is played that matches the card already on the top of the pile, the students must call ‘snap’ and place a hand over the pile. The person whose hand is down first gets the snap and takes all the cards. The game is over when one person loses all his or her cards.

**Musical chairs (or squares)**

Place chairs in a row and ask the students to sit down. When you start singing or playing music, the students get up and walk around the chairs (in one direction). When the music stops, each student must find a chair as quickly as possible. Repeat this, but remove one chair each time the music starts. The student without a chair after each round must sit out. The winner is the student who manages to get the last chair (when only two students are left). You can also play this outside using hoops or squares on the ground, which students have to stand in when the music stops.
Rhymes and songs

One little finger

One little finger, tap, tap, tap
Point to the window
Point to the door
Point your little finger down to the floor

Three little kittens

Three little kittens climb up a tree
See them jump down, one, two, three

Mary at the kitchen door

Adapt this by inserting local names.

One, two, three, four
Mary’s at the kitchen door
Five, six, seven, eight
Charlie’s at the garden gate

One elephant

One elephant went out to play
Upon a spider’s web one day
He found it such enormous fun
That he called in another one

Two elephants went out to play
Upon a spider’s web one day
They found it such enormous fun
That they called in another one

Continue with three, four and five elephants as necessary.
At the last number – change the rhyme to:

Five elephants went out to play
But the spider’s web broke and they all fell away

Mangoes on a tree

One, two, three, mangoes on a tree
Four, five, six, very long sticks
Seven, eight, nine, those mangoes are mine

Clap, clap, clap your hands

Sing to the tune of Row, row, row your boat.

Clap, clap, clap your hands
Slow as slow can be
Clap, clap, clap your hands
Clap them now with me (clap slow and rhythmically)
Clap, clap, clap your hands
Fast as fast can be … (clap faster and faster)
Ten little apples

Ten little apples up on a tree (hold both hands up high)
Five for you and five for me (dangle one hand then the other)
The wind comes and shakes the tree just so (shake body)
And ten little apples land down below (drop hands)
One, two, three, four, five, six, seven, eight, nine, ten (count fingers)

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, start again

Once I caught a fish alive

Once I caught a fish alive
Six, seven, eight, nine, ten
Then I let it go again
Why did you let it go?
Because it bit my finger so
Which finger did it bite?
This little finger on my right

The beehive

Here is a beehive
Where are the bees?
They are all inside
Where nobody sees
Here they come flying
Out of the hive
One, two, three, four and five
Bzzzzzzzzzzzzzzzzzz

All about me

I’ve got one head
One nose too
One mouth, one chin
So have you
I’ve got two eyes
Two ears too
Two arms, two legs
And so have you
I’ve got two hands
Two thumbs too
Two feet and two big toes
And so have you
**Five little ducks**

Five little ducks went swimming one day  
Over the pond and far away  
The mother duck said, ‘Quack, quack, quack’  
But only four little ducks came swimming back  

Four little ducks went swimming …

*Continue counting down till you get to one duck, ending with ‘But no little ducks came swimming back.’*

No little ducks went swimming one day  
Over the pond and far away  
The mother duck shouted, ‘Quack, quack, quack’  
And five little ducks came swimming back

**Ten green bottles**

Ten green bottles sitting on a wall  
Ten green bottles sitting on a wall  
And if one green bottle should accidentally fall  
There’ll be (pause) nine green bottles sitting on the wall  

Nine green bottles …

*Continue counting down to no green bottles.*

**Ten in the bed**

There were ten in the bed  
And the little one said  
‘Roll over! Roll over!’  
So they all rolled over and one fell out  

There were nine in the bed …

*Continue counting down to none in the bed*
Using the Workbook

Remember that at this level, the Workbook functions more as a formal record of what the students are able to do than as a textbook in the traditional sense. It is not intended to be a teaching text and you will need to engage the students in practical activities and oral discussions as outlined on pages 14 to 25 to introduce and teach concepts before turning to the Workbook. Once the students have grasped these, you can use the Workbook pages to check their progress and level of understanding.

1 Number – counting and writing numerals to 3

<table>
<thead>
<tr>
<th>Concepts and skills</th>
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<tbody>
<tr>
<td>Counting 1, 2 and 3 objects</td>
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<tr>
<td>Recognising groups of 1, 2 and 3</td>
</tr>
<tr>
<td>Writing numerals 1, 2 and 3</td>
</tr>
</tbody>
</table>

Vocabulary
One, two, three, colour, draw, write, circle, how many.

Resources needed
Items for counting (including counters and stones), trays or containers for making sets, egg boxes, pictures of sets of items, cards showing numerals, large numerals for classroom display, sand, paint and paper for writing numerals, crayons.

Key concepts
Sound number concepts and a good grasp of numeration are critical for students to build a strong foundation in mathematics. At this level, they explore number concepts using a low number range (1 to 5 initially, expanding to 6 to 10 later in the year). It is not suggested that you should move beyond the number range of 10 in Kindergarten, as numeration above 10 (in fact even the understanding 10 itself) relies on place value and is beyond the scope of this level.

At the beginning of the year, students work with numbers from 1 to 5. The focus is on rational counting (counting in which objects are matched to numbers, as opposed to rote counting where students simply chant...
numbers to develop a sense of order and patterning). It is very important that the students know that when you say ‘one’ you mean one item. In order to develop rational counting, students must practise matching items to amounts. Body parts are useful for basic counting (‘How many eyes do I have?’) and fingers are especially helpful for young students learning to count to five and then ten.

Counting strategies should focus on one-to-one correspondence so that students can learn to assign one item with each number. They will also begin to realise that the last number counted is the total number of items. Over time, students will begin to develop a sense of mathematical literacy that will allow them simply to look at small groups of objects and say how many there are (this is called subitising).

Students will need to learn the names for numbers and also to form numerals. The general approach to teaching counting should include:

- linking counting numbers to real items (including fingers) as well as movement along a number line (when appropriate), so that students realise that counting numbers are attached to increasing quantities (or decreasing quantities when counting back)
- modelling strategies to help students keep track of the items as they count them, for example touching the heads of students as you count them into groups, moving counters one by one across a table to make sets of a given amount, and physically putting objects into a container as you count them
- including games and other activities that rely on counting, for example a hopscotch grid with numbers on it, counting students as they line up to form groups, playing snakes and ladders or other games in which the moves are dictated by the numbers on dice, or playing ‘hide and seek’ where you have to count to ten before you start looking
- using traditional songs and rhymes (in whichever language you chose) to encourage counting skills.

**Practical activities, games and rhymes**

*Before you start dealing with counting in any formal sense, you need to spend time developing the concept of one-to-one matching. Select suitable activities from the practical activities section on pages 15 to 17 of this guide.*

You need to spend a lot of time providing concrete counting activities before students move to working on paper. Provide a range of different items for counting: counters, blocks, Unifix cubes, beans, sticks, stones, toys, coins, bottle caps and school stationery items (pencils, crayons, books, stickers, etc.) are all useful for counting. You also need to provide each student with a tray (for example egg boxes or polystyrene or tin foil food trays), plate or container for making sets of a given amount. Give instructions such as ‘Count out one/two/three red blocks.’ Observe students to see who counts
all the blocks (one by one), who touches the objects as they count them, who
scans the set and who recognises three immediately. Show groups of objects.
Ask how many there are in the set. Show two sets of items (for example,
three cubes and two pencils). Ask, ‘Which set has more items? How many
does it have?’, ‘Which set has fewer items? How many does it have?’.

Use Unifix cubes (or any plastic items that fit onto a finger). Provide a large
number of cubes per group of students. Say a number. Ask the students to
take that number of cubes and put them on their fingers. They should then
hold up the fingers to display the number of cubes. Bear in mind that if a
student puts a cube on a finger on each hand to show two, this is perfectly
acceptable. This also shows that two items don’t need to be next to each
other to still amount to two. (In addition, it shows that $1 + 1 = 2$, but
students will not know that at this stage.)

Count out students to make groups of three. You could ask the students to
line up and then have the class assist as you count out groups of three. If
this is not practical, call up six students to the front of the class. Divide them
into two equal groups. Ask a volunteer to count the number of students in
each group. You can vary this by using four or five students at this stage, and
larger numbers as you progress up the number range.

Make sets of items. The sets can contain a mixture of one, two and three
items. Let the students take turns to point to all the sets with one item, and
so on. Vary this by changing the sets and/or the instructions, for example
‘Which sets have two items?’, ‘Show me a set with three items’, ‘How many
items in this set?’, ‘Find me another set with the same number of items as
this one’, and so on.

Provide pictures with certain numbers of the same items (within the range
in which you are working) and get the students to count different items, for
example ‘Count the red flowers. How many are there?’

Show pictures of one, two or three items and ask the students to use their
own counting apparatus to make a set with the same number of items. Ask
them to count their items and say how many there are in the set.

Prepare an egg box with different amounts in three of the compartments
down one side (one, two or three items in any order at this stage). Then ask
the students to pick items and place them in the adjacent compartments to
make equal sets.

Play a game in which the students make a grab from a pile of stones. When
they open their hand they should count the stones to say how many they
grabbed. Focus on one, two or three at this stage, but allow for students who
know the higher numbers to say them, and also allow for those who may not
know them to say ‘more than three’ if they get more than three.

Make sure that the students understand the concept of conservation of
number. Form sets, allowing the students to count the items (for example,
two dolls). Then move the items and ask them how many there are. You want
them to realise that they do not have to count again, because the total number
remains the same no matter how you arrange the items. This is easy with the
lower numbers, but some students may struggle with higher numbers.
You need to teach the number names and numerals so that students can say them and recognise the symbols used to record number. A classroom display ‘wash line’ with numerals pegged onto it is useful for teaching the numerals. Display the numerals in order, placing one on the wash line at a time. Say the number name as you display the numeral. Once you’ve done some work on this, mix up the numerals and ask the students to sort them in order from 1 to 3.

Give each student a pack with six counters (one in one colour, two in another colour and three in a third colour). Display one of the numerals 1, 2 or 3 but do not say its name. Ask the students to count out the appropriate number of counters to match the numeral.

Use appropriate songs and rhymes from your own collection or those on pages 24 to 25 of this guide to teach and reinforce number names and counting in an appropriate range.

Forming and writing numerals can be difficult for young children. You need to model how to write each numeral correctly. Let the students follow your model by forming the number first in the air and then on their desks with their index finger. In the beginning, allow the students to ‘write’ numbers in sand, draw them in paint or form them using modelling clay. Provide large blank sheets of paper and let the students use paint, felt-tipped markers or crayons to draw the numerals. Tracing numerals and making patterns with numerals can also help students at this level. There is opportunity in the Workbook for writing numerals. However, as you teach each one, provide lots of practice for the students to consolidate their writing skills.

Using the Workbook pages

The Workbook pages 2–4 are not intended to be used in one sitting. You may choose to work with the pages one by one as you develop a concept of that number. Alternatively, you could do the first activity on each page to reinforce and assess counting to three, and then do the second activity on each page at a different time to check that students can make sets of a given number. You should only ask the students to attempt the writing numerals activities at the bottom of the pages once you’ve taught this skill to the class.

Note that the top of each page can be used as a teaching tool – the numeral, number name, quantity (domino dots) and finger counting for each number is included in the header strip.

Assessment strategies

Many of the teaching activities in this section can be used to assess learning. In addition, some performance-related activities for assessing counting, creating sets to three and writing numerals are provided below. These are best done with small groups of students so you can see how each student responds.

Give each student a pile of counters. Present one numeral on a card (for example, 2) to the student. Ask him or her to count out the correct number of counters and place them on the card. Ask the student to say how many items there are.
Make a number of sets of one to three items. Use different items while doing this to check that students realise that the attributes of the items don’t affect how many there are. Prepare three large cards with the numerals 1 to 3 written on them. Ask students to sort the sets by moving them and placing them on or next to the correct number. Ask them to say the numbers. Alternatively, use smaller cards and ask the students to place the correct numeral against each set. Observe carefully to see which students can subitise the sets (simply look at the items and say how many there are) and which have to remove the items and count them all to get a total.

Hand students a number card (1 to 3 at this stage) and ask them to draw a set to represent that number and then have them write the numeral next to their set. Use this to assess how well they can form numerals from 1 to 3.

**Common errors and misconceptions**

You may find that many of the students already know the number sequence from one to ten. However, you need to assess each student carefully to find out whether they understand the quantity associated with each number. Do not rely on them simply showing you one finger when they say one, for example, as this may just be a mirroring of what they’ve seen at home when they were taught the numbers.

Some students may struggle to understand that attributes such as size do not affect how many items there are in a set. They may, for example, say that three large sweets is ‘more than’ three small sweets. Similarly, they may struggle with the idea that the order in which you count the items does not affect the total number of items. For example, counting a set of shoes from left to right will give the same total as counting the same set of shoes from right to left. Practical counting tasks in which students actually handle items and count backwards and forwards will help to resolve these misconceptions.

Some students may wonder (and question) why a house number might be 3 but there is only one house. You may need to explain that some numbers (called nominal numbers) are just labels. Telephone numbers, house numbers and even PIN codes on bank accounts are not linked to actual amounts. If the children do not question this, it is unwise and possibly confusing to mention it in the classroom as the main focus here is on cardinal numbers and later on ordinal numbers (1st, 2nd and 3rd).
2 Shape and space – repeating patterns

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<thead>
<tr>
<th>2: Shape and space – repeating patterns</th>
<th>Kindergarten Workbook p. 5</th>
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**Concepts and skills**

- Identifying shapes with the same attributes
- Colouring shapes to match a key
- Recognising and making repeating patterns

**Vocabulary**

- Yellow, red, green, blue, colour, match, shapes, pattern, repeat (plus shape names as necessary for reference – square, triangle, circle, rectangle).

**Resources needed**

- Crayons, cut-out shapes, suitable small objects for sorting, containers, mats or trays for sorting, stickers, cubes, buttons, patterned fabric and other items to make repeating patterns, cards showing patterns, cards showing shapes (squares, rectangles, circles, triangles).

**Key concepts**

The concept of patterning relies on, and is related to, sorting. To make a pattern, the students have to group and then repeat elements that have the same attributes. The first step in this process is sorting using common attributes. When students sort items, spend time talking about the ‘rule’ they used to sort them. Similarly, when they identify a pattern, ask them to say what ‘rule’ was used to make it.

The students need to distinguish between repeating and non-repeating patterns. They also need to be able to copy patterns and describe them before they are asked to extend the patterns or make patterns of their own. In this section, the focus is on describing and reproducing patterns.

**Practical activities, games and rhymes**

Select any of the sorting activities from the activity bank on page 17 of this guide to develop the concept of sorting items using one and/or two attributes. It is important for students to have a good conceptual understanding of sorting for later patterning and geometry work.

Demonstrate a repeating rhythmic pattern to the class. For example, stamp a foot, then clap your hands. Repeat this at a fairly brisk tempo (stamp, clap,
Stamp, clap, stamp, clap ...). Let the students join you in making the pattern. Continue stamping and clapping for about a minute. This gives students enough time to get into the rhythm and to develop a feel for the pattern. Discuss the pattern using the word ‘repeat’.

Play some games involving repeating actions in a pattern, for example put hands up, hands down or sit, stand. Discuss the pattern. Ask the students to describe it. Encourage them to use the word ‘repeat’, but at least make sure that they can verbalise that the pattern does repeat using words of their own.

Make a number of colour patterns, for example red, blue, red, blue. You can build these using Unifix cubes. Vary them so they are not just one-to-one patterns, for example, blue, blue, yellow, blue, blue, yellow. Let the class chant the colours to get a sense of the patterns. Then ask them to reproduce the patterns, first by building them using cubes as you have done, then by making coloured dots or stripes on a piece of paper.

Build some shape patterns or identify these in the environment. Tiles are often a good example of this. Use the correct names for the shapes when you describe them. For example, square, triangle, square, triangle or big square, small square (including measurement attributes of size). You can also build patterns using linear measurements, for example, long stick, short stick or big bead, small bead.

Draw some number patterns for example 1, 2, 1, 2, 1, 2. Ask the students to copy these either using paint or crayons, or simply in pencil in their books. This has the added advantage of getting them to practise writing numerals.

Prepare some task cards with a pattern on them. For example, draw a shape pattern. Ask the students to copy the pattern using manipulatives. When they have done this, get them to talk about and describe the patterns.

Play ‘I spy’ using patterns, for example ‘I spy a pattern on Amira’s scarf. Can you tell me what the pattern is?’

Show the class patterned fabric. Ask the students to point out and describe patterns they can see. If they struggle to find patterns, point them out and ask the students to say how each one was made.

Show the class two towers made from cubes. One should be a repeating pattern, the other not. Ask which one shows a pattern. Let them verbalise why the other is not a pattern.

**Using the Workbook page**

Begin by making sure that students know what to do. Read the instruction to the class and have them colour the shapes in the key using the colour words. You may need to make sure that they all have a yellow crayon and then have them colour the first shape (the square). Explain that they have to colour all the shapes that are the same as this one in yellow. Ask students how they will decide whether a shape is the same as the yellow one they have coloured. They should begin to say that it is a square, all the sides are the same length or that it looks like a square. Point to the rectangle
(the green shape) and ask them how this shape is the same/different to the yellow shape. Let the students verbalise how they will decide whether to colour a shape yellow or green. If they struggle, hold up a range of different-sized squares and rectangles (you can draw these on cards) and ask them to say whether they would colour each one yellow or green. Let the students complete the colouring activity independently and then check to see that they have managed to do so. Spend some time describing the patterns in different ways.

Assessment strategies

Create a repeating and a non-repeating pattern using stickers or counters. Ask each student to say which set shows a pattern. Get him or her to explain why it is a pattern as well as why the other is not a pattern.

Demonstrate a repeating rhythmic or action pattern, for example sit, stand, sit, stand, sit, stand. Ask students to describe and then repeat the pattern.

Prepare a number of cards showing patterns made from a range of different manipulatives (depending on what you have available in the classroom). Hand these out to the students for them to build a copy of the pattern and then ask them to describe it to you.

Show the students a tower of cubes arranged in a repeating pattern. Ask them to build a copy of the pattern.

Use shapes to build a pattern. Ask the students to describe and/or copy the pattern.

Common errors and misconceptions

With pattern work, you need to make sure that you show the students enough iterations (repeating bits) of the pattern for them to identify it. For example, in a repeating red-blue-red-blue pattern, you may need to show three repeats of red, blue, before the students see that the colours (two elements) are the pattern. Allowing students to build and describe patterns of their own will help them develop the idea of a repeating pattern.

Although the focus of this activity is sorting (shapes with the same attributes) and patterning, the context is 2D shapes. Many of the errors and misconceptions around shapes arise because students are not given time to play with concrete apparatus through free play (making their own pictures out of shapes) or focused play (building specific pictures or patterns following instructions). When students only work with printed sheets or diagrams of shapes and/or shape patterns, they do not develop sound geometrical reasoning skills. For example, if you always draw shapes on the board some students will develop the mistaken idea that squares are always found in a ‘horizontal’ position, or that all triangles are found resting on a horizontal base. They will also not begin to realise that quadrilaterals are all related (for example, a square is also a rectangle: it’s just a rectangle with four equal sides).

Be careful with colour and vary the choices that you make so that students don’t begin to think that all circles are red, or all blue shapes are triangles.
### 3 Measurement – time

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**Concepts and skills**

- Day and night
- Identify activities that take place at different times

**Vocabulary**

Day, night, sun, moon.

**Resources needed**

Pictures of daytime and night-time activities, flash cards for ‘day’ and ‘night’, a large sheet of paper to make a chart, drawing materials, glue to paste activities on the chart.

**Key concepts**

You will introduce the terms ‘day’ and ‘night’ in this section as indicators of time. Time is a unit of measure, but it is also an abstract concept that the students may find difficult because they cannot physically handle it (as they can with heavy and light objects, for example). Students are likely to have some common-sense knowledge of time in relation to daily routines, and external factors like sunrise, morning, afternoon and night-time. Because time is unlike other (concrete) topics in measure, it is useful to introduce standard vocabulary right from the outset, for example, day and night, days of the week and months of the year (although students do not have to memorise and order days and months at this level).

**Practical activities, games and rhymes**

Let different students role play the things they do during the day and at night. Ask the other students to guess what their classmates are acting out and say whether it happens during the day or at night. Many of the activities that students act out may be either day or night activities, for example watching TV or going to the cinema could be done during the day and at night. Use flash cards to introduce and teach the words ‘day’ and ‘night’.

Make a large classroom display of daytime and night-time activities. Draw up a large table with two columns (this links to organising data). Ask the students to draw an activity that they do during the day or during the night. Let the students decide where to paste their picture on the table.
Arrange the students in groups. Give each group pictures showing different activities (for example, eating breakfast, lunch or dinner, shopping, going to school, riding in a bus, playing sport, watching TV, going to church/mosque or temple, and so on). Ask the students to place the pictures in a sequence and tell a story of what happened to an imaginary character during the space of a day. You may need to teach words like ‘before’ and ‘after’ to help the students tell their story in a sensible way.

Using the Workbook page

Spend some time discussing the pictures with the class before asking the students to complete the page. Let them explain why they have chosen the sun or moon symbols for the different activities.

Assessment strategies

Display the words ‘day’ and ‘night’ and ask the students to give examples of activities they do only during the day or only at night.

Common errors and misconceptions

Students are not likely to confuse the times day and night, but they may not be sure when daytime ends and night-time begins. The concepts of light and dark may not work as an explanation in all places. Be aware of local conditions, for example students in Iceland or Canada may experience 18- to 22-hour days during summer and very long dark ‘nights’ during winter. At this early level, it may be best to define daytime as the time when most people work and go to school and night-time as the time we rest and sleep.

4 Number – counting and writing numerals 4 and 5

Concepts and skills

Recognising groups of 4 and 5
Counting 4 and 5 objects
Writing numerals 4 and 5

Vocabulary

One, two, three, four, five, count, colour, draw, write, circle, how many.
Resources needed
Items for counting, trays or containers for making sets, egg boxes, pictures of sets of items, cards showing numerals, large numerals for classroom display, sand, paint and paper for writing numerals, crayons.

Key concepts
This section builds on the concepts and skills taught in Section 1 by extending the formal teaching of counting and writing numerals to five.

Practical activities, games and rhymes
Adapt some or all of the activities described in Section 1 to include the higher number range. It is useful to repeat the smaller numbers (1 to 3) at the same time in order to build up the number sequence in a cohesive way.

Using the Workbook pages
Like the earlier number work, Workbook pages 7–9 are not intended to be used in one sitting. You may choose to work with the pages one by one as you develop a concept of that number. Alternatively, you can do parts of pages 7 and 8 as you teach the numbers 4 and 5. The students should only attempt the writing numerals activities at the bottom of the pages once you’ve taught this skill to the class.

Workbook page 9 contains all of the numbers from 1 to 5. Use this to check that the students are able to count and colour any number of shapes in this range.

Note that the top of each page can be used as a teaching tool – the numeral, number name, quantity (domino dots) and finger counting for each number is including in the header strip.

Assessment strategies
Many of the teaching activities you used in this section can be used to assess learning. In addition, some performance-related activities for assessing counting, creating sets to three and writing numerals are provided below. These are best done with small groups of students so you can see how each student responds.

Give each student a pile of counters. Present one numeral on a card (for example, 2) to the student. Ask him or her to count out the correct number of counters and place them on the card. Ask him or her to say how many items there are. Work in the range of one to five.

Make a number of sets of one to five items. If possible, use different items to check that the students realise that the attributes of the items don’t affect how many there are. Prepare large cards with the numerals 1 to 5 written on them. Ask the students to sort the sets by moving them and placing them on or next to the correct number. Ask them to say the numbers. Alternatively, use smaller cards and ask the students to place the correct numeral against each set. Observe carefully to see which students can subitise the sets (simply look the items and say how many there are) and which have to remove the items and count them to get a total.
Hand each student a number card (1 to 5 at this stage) and ask him or her to draw a set to represent that number and then write the numeral next to the set. Use this to assess how well each student can form numerals from 1 to 5.

**Common errors and misconceptions**

Continue to assess each student carefully to find out whether they understand the quantity associated with each number. Do not rely on students simply showing you four fingers when they say four, for example, as this may just be a mirroring of what they’ve seen at home when they were taught the numbers by rote.

Some students may still struggle to understand that attributes such as size do not affect how many items there are in a set. They may, for example, say that three large sweets is ‘more than’ three small sweets. Similarly, they may struggle with the idea that the order in which you count the items does not affect the total number of items. For example, counting a set of shoes from left to right will give the same total as counting the same set of shoes from right to left. Practical counting tasks in which the students actually handle items and count backwards and forwards will help to resolve these misconceptions.

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5: Shape and space – 3D shapes around us

<table>
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<td>Counting shapes</td>
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<td>Naming 3D shapes</td>
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<table>
<thead>
<tr>
<th>Vocabulary</th>
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<tbody>
<tr>
<td>Box, cube, ball shape, can shape, sphere, cylinder, cone, cuboid, flat, round, curved, count, sort.</td>
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<table>
<thead>
<tr>
<th>Resources needed</th>
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<tbody>
<tr>
<td>Everyday objects in the shape of spheres, cylinders, cubes, cuboids and cones, pictures showing different shapes, modelling clay, crayons, bag that you cannot see into.</td>
</tr>
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</table>
Key concepts

In this section, students will identify, match, name and count objects of the same shape.

A good understanding of 3D shapes and their properties provides a good foundation for later work on properties of shapes. When you choose activities at this level, try to include opportunities for students to see and feel shapes, to build them and take them apart and to sort and group them using given and their own rules. Construction blocks are very useful to have in the kindergarten classroom, particularly sets that contain a variety of shapes.

Discussion of shapes should include how they are the same and how they are different, as well as mention of attributes such as flat sides, sharp corners, round shape, able to roll, can be stacked on top of each other, and so on.

Students do not need to formally learn the mathematical names for shapes at this level (sphere, cube, cuboid, cone and cylinder), but they will benefit by being exposed to the correct names of shapes even at this early stage. It is perfectly acceptable for them to talk about ball shapes, box shapes and can or tin shapes. The word ‘cone’ is often fairly accessible as students have seen traffic cones and ice-cream cones.

Working with real objects (3D solids) gives students the opportunity to touch and explore shapes, developing their understanding of solids. It also allows them to learn about 2D shapes, which can be harder to understand than the 3D solids that are encountered in everyday life. For example, cuboids can be used to identify squares and rectangles, or cylinders and cones to identify circles.

Number work and counting (to five) will be revised as the students work with solids.

Practical activities, games and rhymes

Arrange the students in groups. Hand each group a range of objects in the shape of balls, boxes, cones and cylinders. Ask them to identify the objects and have a general discussion about what you can do with different objects (roll them, bounce them, throw them, stack them, store things in them, drink from them, and so on). Teach the terminology ‘ball’, ‘box’, ‘cone’ and ‘can’ to the class.

Give each student some modelling clay. Display an object shaped like a ball. Ask the students to make a similar shape using their clay. Repeat this for different shapes. Ask them to use some or all the shapes they have made to build a tower. Discuss which shapes work well for this and which do not. Encourage the students to say why, for example, a ball doesn’t work well when you are building a tower. (It has no flat surfaces, so it rolls away.)

Provide a range of 3D objects for each group. Ask them to sort the objects into those that can roll and those that cannot roll. Talk about why some shapes can roll while others cannot.
Give the students a set of mixed 3D shapes. Ask them to sort these into groups and then ask them to explain their sorting criteria (‘What rule did you use to decide if a shape fitted into a group or not?’). Challenge them to find a different way to sort the same shapes.

Display two sets of 3D objects that you have sorted using particular attributes (These can be shape attributes such as ‘has only flat sides’, ‘has flat and round sides’, or measurement attributes such as big or little shapes; or non-mathematical attributes such as colour.) Ask the class to say how the objects in each set are all the same. Discuss how the objects in one set are different from the objects in the other set. Ask the students to suggest another way of dividing the objects into two groups. They should say what rule they are using to do this.

Display a 3D shape such as a cuboid. Go round the class and ask the students to name things in their home or environment that are the same shape as the one you are displaying.

Adapt the ‘I spy’ game to include 3D objects. For example, you can say things like ‘I spy with my little eye, an object that looks like this box’ (display a particular solid). Let the students take turns to play as well.

Arrange the students in pairs to play a ‘mystery shape’ game. Give both students a small 3D shape or object. Tell them not to let their partner see it. They then give their partners information about the shape to help them try to guess what it is.

Relate 3D shapes to 2D pictures of them by asking the students to find examples of objects shaped like a box in a picture or photograph. Show them a 3D shape, for example a cuboid. Students should be able to say that a block of flats is shaped like a box or that a water tank is shaped like a cylinder, and so on.

Make a set of 3D objects with shared attributes, for example a range of different-sized cuboid boxes. Insert one shape into the set that does not fit. Ask the students to say which shape does not fit and to explain why.

Take the students on a shape walk around the school. Ask them to point out different shapes as they go.

**Using the Workbook pages**

Workbook page 10 requires the students to draw lines to link everyday objects to generic shapes. Once they have linked the shapes, they need to count how many there are of each and record this on the page. Read through the instructions and make sure that the students know what to do before allowing them to complete the page independently. Note that some students may struggle to draw the lines; do not judge their work on this, but focus rather on whether or not they can correctly match the objects.

Workbook page 11 works on the ‘odd one out’ principle. The students have to decide whether a shape matches the given shape or not and to colour those that do. Make sure that they understand that they are to count how many shapes they have coloured (and not just count all the shapes). Spend some time asking students to explain why they decided not to colour particular shapes.
Assessment strategies

You can adapt the teaching activities above to assess understanding of 3D shape.

Display a set of the 3D shapes you have worked with (aim to have one cube, one cuboid, one cone, one sphere and one cylinder). Put one object into a bag (that the student cannot see into) and ask the student to feel the shape in the bag and point to the matching shape in the set. Alternatively, let the students take turns to ‘feel’ the shape and then describe it to the class so that they can guess which one it is. As an extension, ask the students to give examples of everyday objects that are the same shape as this.

Prepare a set of shapes with some shared attributes. Ask the students to say how the shapes are the same as well as to point out any differences between them.

Describe an unseen shape to the student and get him or her guess which one you are describing. For example, for a cylinder you might say, ‘This shape has two flat faces (sides). If you put it on its other face, it can roll. We buy food and cold drinks in containers that are this shape.’

Common errors and misunderstandings

Students generally find working with 3D shapes at this level fairly easy. They may get confused by names, but this is not so important at this stage. Also, they do not have the vocabulary to talk about shapes in a mathematical way. You can assist with this by modelling the correct language. For example, you may say things like ‘Look at this part of this shape. Can you see that this part is flat? On this shape, one part is curved’, and so on.

Make sure that the students realise that changing the orientation of a 3D object does not change its shape. For example, a cylinder on its side (length) can be moved to sit on one of its flat faces, yet it remains a cylinder. Students who understand conservation of shape will know this, others may need to work with real objects and to discuss what they are learning (perhaps with your guidance).
6: Number – counting and writing numerals to 5

Concepts and skills

Recognising groups of up to 5 objects
Most and least
Depicting amounts

Vocabulary

One, two, three, four, five, colour, draw, write, circle, how many, more, most, least.

Resources needed

Counters and other concrete apparatus as needed by the students, dominoes for reference, crayons, sand for writing numerals (if necessary).

Key concepts

There are no new concepts in this short section. The aim is to revise and consolidate counting to five on a regular basis so that students develop confidence before moving onto a higher number range.

Practical activities, games and rhymes

Use some or all of the activities, games and rhymes from Sections 1 and 4 to revise and consolidate counting to five before moving onto the Workbook.

Using the Workbook page

There are three separate tasks on Workbook page 12. The first one involves counting the eggs. Observe students to see which ones touch and count all the eggs, which have to model the sets with counters and which can simply look at the set and say how many eggs there are.

Revise the terms ‘most’ and ‘least’ as necessary. Ask the students which nest has most eggs. When they have decided, let them colour those eggs blue. Ask which nest contains the fewest or least eggs. Let them colour these eggs green. Finally, show the class some dominoes to show them what one, two, three, four and five dots look like. Use the dominoes that are blank on one half for this. Then ask the students to draw their own sets of dots to complete the tasks on this page.
**Assessment strategies**

Use any of the strategies described in Sections 1 and 4 to assess counting ability and performance.

**Common errors and misconceptions**

Students who are still struggling with number concepts will need additional activities and time to practise.

Students who are still struggling to write the numerals correctly should be given more practical activities in which they trace numbers with their finger or write them in sand. It is very important to consolidate these skills before moving onto higher numbers, otherwise students will experience a sense of failure and become frustrated and disinterested.

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### 7 Shape and space – position

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</thead>
<tbody>
<tr>
<td>Vocabulary of position – in front of, behind, next to, near</td>
<td></td>
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</tbody>
</table>

**Vocabulary**

In front of, behind, next to, near.

**Resources needed**

An object or small toy to move into different positions, larger object.

**Key concepts**

Students learn how to describe the position of one item in relation to another, and also about changing positions using real-life examples.

Students will already have some experience of position. For example, they know that the book is on the desk or that their shoes are under the bed. This section encourages them to build on what they already know by making their experiences explicit and by providing the vocabulary they need to talk about and describe position.

**Practical activities, games and rhymes**

The game of ‘Simon says’ (page 21) can be easily adapted to include position changes and instructions relating to position. You can play the game using
the students’ own positions in relation to their desks or you can ask them to place a pencil case on the desk and to move a smaller item in relation to it.

Place a large object (such as a book bag) on your table and place a smaller item (such as an eraser or pen) behind it. Teach the terms ‘behind’, ‘in front of’, ‘next to’ and ‘near’ using the pen and the book bag, moving the pen into different positions to teach the terms. Make sure that students understand that ‘next to’ can relate to any of the four ‘sides’ of the bag, and also let them move position to help them realise that the terms ‘in front of’ and ‘behind’ are relative to where you are. Vary the references you use to describe position. For example, say; ‘The pencil is in front of the book bag. The book bag is behind the pencil.’

Arrange the students in pairs or groups. They should take turns to place a smaller item in relation to a bigger one and then describe it. They can also say things about the position. Encourage them to describe the position of each item relative to the other.

Let students take turns to choose and move to a position in the classroom. Get other students to take turns to describe the position, for example ‘Anil is behind the door.’

**Using the Workbook page**

Read through the position words at the top of the page. Let the students say which positions are represented by the diagrams in the first column of the table (in front of, behind, next to, near). Then ask them to discuss which one matches and colour it.

**Assessment strategies**

Use any concrete objects. Move them and ask the students questions such as:

- Where is the toy car?
- Where is the box?

Give the students an item and ask them to place it in a particular position, for example ‘Put this eraser near your Workbook’, ‘Put your pencil behind your pencil case.’

**Common errors and misconceptions**

Some students may struggle with the language of position, particularly if their first language is not English. Continue to model the correct language so they become more familiar with it.

Students may be confused by relative position and struggle to understand that if object A is in front of object B, then object B is behind object A. As with most concepts at this level, they will benefit from more opportunities to explore and discuss position using concrete objects, including their own bodies, in relation to other items in the environment.
8 Number – combining groups and making a total

<table>
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<th>Concepts and skills</th>
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</thead>
<tbody>
<tr>
<td>Counting to combine groups</td>
</tr>
<tr>
<td>Adding objects to a set to reach a given total</td>
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</table>

Vocabulary
How many, altogether, make, combine, count.

Resources needed
Counters in different colours, other small objects for counting, dominoes (with totals to five), strips of paper showing five blocks.

Key concepts
In previous work on counting, students have counted sets of objects without really considering that a set of say five, could be comprised of two and three, or four and one. Understanding that a number, even a small number, can be partitioned into two (or more) smaller sets is an important concept in mathematics and early work on addition and subtraction relies on students understanding this. (Students are not formally learning addition here, just exploring the idea that you can ‘add’ items to a set to get a given total, and that you can count the items in two sets to get a total.)

At this early stage, students will rely on counting to combine sets, or to find the missing elements in a set. Students usually begin by counting all the objects; in other words, they start with one and count each object progressively to get a total. They will progress (possibly at different times) to counting on. In other words, they will see that the first set has three items and count on from three to get the total of both sets. Over time, and as they work with larger numbers, students will learn to break up and recombine numbers to add.

Practical activities, games and rhymes
Arrange the students in pairs. Give each pair a handful of Unifix cubes or counters. Instruct them to take one or two cubes/counters. Ask them how many they have taken altogether. Vary this by giving a number from 1 to 5. Ask them to each take some cubes so that they have the number you gave in
total (bear in mind that if you say 1, then one student should have a block and the other should take none).

Provide the students with a number (5 or less) and a selection of red and blue counters or cubes. Instruct them to use two colours to make the given number. Let the students tell the class how they made the number (for example, ‘I made four using one red cube and three blue cubes’). When one student has given his or her answer, ask whether anyone else had a different solution and let him or her tell the class what it was.

Use dominoes to combine sets. Ask the students to describe a domino by saying how many dots are on each half (you can say part or side) and how many altogether. Ask them how they worked out how many there were altogether. Let the students find different dot combinations that make the same amount. For example, one and four, two and three, five and nothing all make five.

Play a game in which the students give each other a ‘high five’ (they both hold up a hand to meet the other’s hand). Then challenge them to do high fives using both hands. At first, don’t worry if the fingers match or not. In other words, one student can use one finger and four fingers, while the other has two and three fingers as long as they both have five. Next, challenge them to make five per pair of hands. They’ll need to think quickly and coordinate, so if one student puts up two fingers on one hand and three on the other, their partner will need to have three on the hand matching two and two on the hand matching three.

Use counters and challenge students to find different ways of combining two sets to make four or five. For example, to make four they could produce one and three, two and two, as well as three and one. Students who grasp the concept of zero might also make zero and four.

Display a number of counters. Ask the students to count out the same number. Then ask them to add more counters to get to four/five. Spend some time verbalising what they have done, for example ‘We started with two counters. We added another two to make four in total.’

Using the Workbook page

In the first activity, observe the students to see who counts all the objects, who still needs to model the counting using apparatus and who subitises the first set and then counts on to get the total. Also note which students have difficulty recording the numerals so that you can give them more practice in doing this if necessary. In the second activity, the students have to work out how many objects to add to the set to make five. Allow and encourage them to model the sets using counters before they draw the missing items. Focus on the number of items drawn rather than whether or not the items are drawn correctly.

Assessment strategies

Use any of the practical teaching activities in pairs or individually to assess students’ performance and ability to combine groups.
Give students a strip of paper with rows of five blocks. Ask them to colour the blocks to make different combinations to five.

**Common errors and misconceptions**

Some students may lose count of objects or miscount them. Remind them to match each object to a number as they count them. Encourage them to physically move objects as they count them to help them keep track.

Some students may still be developing their fine motor coordination skills and they may not be forming numerals properly or drawing shapes neatly. Allow for this in your assessment and provide additional opportunities for practice as students need it.

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**9 Shape and space – matching shapes**

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<tr>
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<td></td>
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<td>Introducing the names of shapes</td>
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</table>

**Vocabulary**

Yellow, red, green, blue, colour, match, shape, square, triangle, circle, rectangle.

**Resources needed**

Crayons, a range of cut-out shapes in different sizes and colours, sand, paint and paper for making shapes, mat

**Key concepts**

No fundamentally new concepts are developed here. Students build on what they have already discovered about the attributes of common 2D shapes and use these attributes to classify shapes (by colouring those that share the same attributes in the same colour). They need to recognise that the size of a shape does not change its attributes. For example, a tiny circle and a large circle are both circles. An ‘upright’ rectangle and a ‘horizontal’ rectangle are both rectangles.
Practical activities, games and rhymes

You can adapt any of the general sorting and matching activities from those on pages 15 to 17.

Revise the attributes of shapes informally by showing the students a shape and asking them to draw three different shapes ‘like this one’ in sand or using paint on a large sheet of paper. Vary the size and orientation of the shapes you show the class. Use the names of shapes when you think the students can deal with them.

Arrange the students in groups and give each group a set of mixed shapes. The sets should be random and differ from each other. Play a game of ‘shape bingo’ with the class. Show a shape (for a few seconds only) and give the students a chance to see whether they have a matching shape in their set. If so, they should remove it and place it in a row in front of them. The winner of the game is the first group to match five shapes correctly and call ‘bingo’. Keep a record of the shapes you have shown the class (laying them out as you show them is an easy way to do this), so that you can check whether the group that calls bingo has correctly chosen the shapes.

Using the Workbook page

As in Section 2, complete the first colouring activity as a class to make sure that the students colour the shapes correctly and that they understand the instructions. Once they have completed the key, let them work independently to colour the shapes in the diagram. There is an element of problem solving involved here as there are overlapping shapes in some parts (a circle in a triangle, for example). Allow some discussion about this and let the students suggest how they would colour these sections. The most sensible suggestion would be to colour the smaller inside shape as necessary and then use the correct colour for the remainder of the outer shape.

Assessment strategies

Use a set of mixed shapes in a range of sizes and colours. Pick one shape and place it on a mat. Ask the student to find a shape that matches this one. Then ask what he or she looked for to choose the shape.

Show two different triangles to the student. Aim for a size difference, a difference in colour and also a difference in type of triangle. Ask him or her whether the shapes are the same or not. Let the student explain how they are the same as well as how they are different.

Common errors and misconceptions

Many of the errors and misconceptions around shapes arise because students are not given time to play with concrete apparatus through free play (making their own pictures out of shapes) or focused play (building specific pictures or patterns following instructions). When students only work with printed sheets or diagrams of shapes and/or shape patterns, they do not develop sound geometrical reasoning skills. For example, if you always draw
shapes on the board some children will develop the mistaken ideas that squares are always found in a ‘horizontal’ position, or that all triangles are found resting on a horizontal base. They will also not begin to realise that quadrilaterals are all related (for example, a square is also a rectangle, it is just a rectangle with four equal sides).

Some students may still struggle to distinguish squares from rectangles. Give these students additional opportunities to handle, draw and draw around both shapes.

### 10 Number – counting and writing numerals to 7

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<td>Writing numerals 6 and 7</td>
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### Vocabulary

One, two, three, four, five, six, seven, colour, draw, write, circle, how many, left over.

### Resources needed

Items for counting, trays or containers for making sets, egg boxes, pictures of sets of items, cards showing numerals, large numerals for classroom display, sand, paint and paper for writing numerals, crayons.

### Key concepts

This section builds on the concepts and skills taught in Sections 1 and 4 by extending the formal teaching of counting and writing numerals to seven.

### Practical activities, games and rhymes

Adapt some or all of the activities described in Sections 1 and 4 to include the higher number range. It is useful to repeat the smaller numbers (one to five) at the same time to build up the number sequence in a cohesive way.
Using the Workbook pages

Like the earlier number work, Workbook pages 16 and 17 are not intended to be used in one sitting. You may choose to work with the pages one by one as you develop a concept of that number. Alternatively, you can do parts of pages 16 and 17 as you teach the numbers 6 and 7. The writing numerals activities at the bottom of the pages should only be attempted once you’ve taught the class how to form 6 and 7.

Workbook page 17 requires the students to count out and then encircle groups of seven. Show them how to use a set of seven counters, placing them one by one over the flowers to keep track of their count. Once they’ve draw a ring round that set, they can remove the counters and use them to count the next set. The students can also use counters to count the flowers that are not grouped at the end.

Note that the top of each page can be used as a teaching tool – the numeral, number name, quantity (domino dots) and finger counting for each number is included in the header strip.

Assessment strategies

Many of the teaching activities you used in this section can be used to assess learning. In addition, some performance-related activities for assessing counting, creating sets to seven and writing numerals are provided below. These are best done with small groups of students so you can see how each one responds.

Give each student a pile of counters. Present one numeral on a card (for example, 6) to the student. Ask him or her to count out the correct number of counters and place them on the card. Ask him or her to say how many items there are. Work in the range 1 to 7.

Make a number of sets of one to seven items. It is advisable to use different items to check that students realise that the attributes of the items don’t affect how many there are. Prepare large cards with the numerals 1 to 7 written one them. Ask the student to sort the sets by moving them and placing them on or next to the correct number. Ask him or her to say the numbers. Alternatively, use smaller cards and ask the student to place the correct numeral against each set. Observe carefully to see which students can subitise the sets (simply look the items and say how many there are) and which have to remove the items and count them all to get a total.

Hand the student a number card (1 to 7 at this stage) and ask him or her to draw a set to represent that number. Then ask him or her write the numeral next to the set. Use this to assess how well the student can form numerals from 1 to 7.

Common errors and misconceptions

Continue to assess students carefully to find out whether they understand the quantity associated with each number. Do not rely on them simply showing you six fingers when they say six, for example, as this may just be a
Some students may still struggle to understand that attributes such as size do not affect how many items there are in a set. They may, for example, say that three large sweets is ‘more than’ three small sweets. Similarly, they may struggle with the idea that the order in which you count the items does not affect the total number of items. For example, counting a set of shoes from left to right will give the same total as counting the same set of shoes from right to left. Practical counting tasks in which the students actually handle items and count backwards and forwards will help to resolve these misconceptions.

**Concepts and skills**

Counting to combine groups

**Vocabulary**

Black, white, how many, altogether, make, combine, count.

**Resources needed**

Counters in different colours, other small objects for counting, dominoes (with totals to six and seven), strips of paper showing seven blocks, crayons.

**Key concepts**

This section builds on the work students did in Section 8. Remember that students will rely on counting to combine sets. Students usually begin by counting all the objects. In other words, they start with one and count each object progressively to get a total. They will progress (possibly at different times) to counting on. In other words, they will see that the first set has three items and count on from three to get the total of both sets. Over time, and as they work with larger numbers, students will learn to break up and recombine numbers to add.

**Practical activities, games and rhymes**

Arrange the students in pairs. Give each pair a handful of Unifix cubes or counters. Instruct them to take one or two cubes/counters. Ask them how
many they have taken altogether. Vary this by giving a number from one to seven. Ask them to each take some cubes so that they have the number you gave in total (bear in mind that if you say one, then one student should have a block and the other should take none).

Provide the students with a number (7 or less) and a selection of red and blue counters or cubes. Instruct them to use two colours to make the given number. Let the students tell the class how they made the number (for example, ‘I made four using one red cube and three blue cubes’). When one student has given his or her answer, ask whether anyone else had a different solution and let him or her tell the class what it was.

Use dominoes to combine sets. Ask the students to describe a domino by saying how many dots are on each half (you can say part or side) and how many altogether. Ask them how they worked out how many there were altogether. Let the students find different dot combinations that make the same amount. For example, one and six, two and five, three and four, and seven and nothing all make seven.

Use counters and challenge students to find different ways of combining two sets to make six or seven.

**Using the Workbook page**

Allow the students to use counters to combine the sets and count the total number of shapes if they need to. Continue to note which students have difficulty recording the numerals so that you can give them more practice in doing this if necessary.

**Assessment strategies**

Use any of the practical teaching activities in pairs or individually to assess students’ performance and ability to combine groups.

Give students a strip of paper with rows of six or seven blocks. Ask them to colour the blocks to make different combinations to seven.

**Common errors and misconceptions**

Some students may lose count of objects or miscount them. Remind them to match each object to a number as they count. Encourage them to physically move objects as they count to help keep track.

Some students may still be developing their fine motor coordination skills and they may not be forming numerals properly or drawing shapes neatly. Allow for this in your assessment and provide additional opportunities for practice as students need it.
12: Shape and space – identifying 2D shapes

Kindergarten Workbook
p. 19

### Concepts and skills

- Identifying shapes with the same characteristics
- Colouring shapes to match a key
- Introducing the names of shapes (informally and without requiring students to memorise them)

### Vocabulary

- Yellow, red, blue, colour, match, shape, square, triangle, circle, rectangle.

### Resources needed

- Crayons, a range of cut-out shapes in different sizes and colours, mat.

### Key concepts

No fundamentally new concepts are developed here. Students will need to count and draw shapes following a given instruction. The Workbook uses the names of shapes, but includes a diagram next to the name so that students can identify the shapes even if they don’t know the names.

### Practical activities, games and rhymes

You can adapt any of the general sorting and matching activities from those on pages 15 to 17 as well as the more specific shape-related activities suggested in Sections 5 and 9.

Revise the attributes and names of shapes informally by showing the students sets of shapes and asking them to describe these by shape and by colour, for example ‘This set has four red circles and a yellow triangle.’ Vary this by asking the students to pick shapes and make sets that you describe to them.

Arrange the students in groups and give each group a set of mixed shapes. The sets should be random and differ from each other. Play a game of ‘shape and colour bingo’ with the class. Show a shape (for a few seconds only) and give the students a chance to see whether they have a matching shape in their set. They need to match the shape and the colour (but not the size or orientation). If they have a match, they should remove it and place it in a
row in front of them. The winner of the game is the first group to match five
shapes correctly and call ‘bingo’. Keep a record of the shapes you have shown
the class (laying them out as you show them is an easy way to do this) so
that you can check whether the group that calls bingo has correctly chosen
the shapes.

Using the Workbook page

Read the instructions to the class. If the students’ reading levels are low,
have them colour the shape diagrams to match the colours in the instruction
as this will provide them with enough information to complete the task.
They should recognise the numerals. Let them draw and colour the shapes
on their own. Then ask them to check their completed work with a partner.

Assessment strategies

Use a set of mixed shapes in a range of sizes and colours. Pick one shape and
place it on a mat. Ask the student to find a shape that matches this one. Ask
what he or she looked for in order to choose the shape.

Show the student two different triangles. Aim for a size difference,
difference in colour and also difference in type of triangle. Ask the student
whether the shapes are the same or not. Get him or her to explain how they
are the same as well as how they are different.

Common errors and misconceptions

Many of the errors and misconceptions around shapes arise because students
are not given time to play with concrete apparatus through free play
(making their own pictures out of shapes) or focused play (building specific
pictures or patterns following instructions). When students only work with
printed sheets or diagrams of shapes and/or shape patterns, they do not
develop sound geometrical reasoning skills. For example, if you always draw
shapes on the board some children will develop the mistaken ideas that
squares are always found in a ‘horizontal’ position, or that all triangles are
found resting on a horizontal base. They will also not begin to realise that
quadrilaterals are all related (for example a square is also a rectangle, it’s
just a rectangle with four equal sides).

Some students may still struggle to distinguish squares from rectangles.
Give these students additional opportunities to handle, draw and draw
around both shapes.
13 Measurement – comparing size and length

Concepts and skills

Big and small, comparisons of size
Short and long, comparisons of length

Vocabulary

Big, small, bigger, smaller, short, long, shorter, longer.

Resources needed

A selection of large and small objects as well as pairs of long and short objects (long and short ribbons, long and short pencils, long and short straws, long and short strips of paper, and so on), stories about size, cards with the words ‘big’/‘small’/‘long’/‘short’, Unifix cubes, crayons.

Key concepts

Students may already have some real-life experience of measuring, for example they may have a height chart at home where their carers mark off their growth, and they probably already know the terms ‘big’ and ‘small’.

At this level, you will not deal with units of measurement (informal or formal), but rather use direct comparisons to decide whether items are, for example, bigger, smaller or almost the same size as a given item. As with most concepts at this level, students need lots of experience working with concrete items to complete practical measuring tasks if they are to develop good understanding and the language they need to talk about different measurements.

The concept of a baseline for measuring is important. Not all students will realise that they have to line up one end of objects being compared to see which is longer or shorter.

Before you start dealing with this topic, check that the students grasp conservation of length. Place two items of the same length side by side against the edge of a table (two pencils or two lengths of ribbon will work for this). Ask whether they are the same length. (Most students should say yes.) Then move one object away, and in the case of a ribbon, allow it to bend or move. Ask them if the items are still the same length. A student who has grasped conservation of length will say that they are, a student who does not yet understand this will say no and you may need to work further with
the items (comparing and then moving them) to help the students grasp this important developmental and cognitive understanding.

**Practical activities, games and rhymes**

There are many children’s books and stories that deal with measurement in terms of size. Goldilocks and the three bears is a good starting point for discussing big and small items.

Give each student a card with either ‘big’ and ‘small’ written on it. Select students to move around the classroom and use their card to label an item in the classroom. Spend some time talking about how they decide whether an item is big or small. You can adapt this activity to ‘long’ and ‘short’ when you are dealing with length.

Show a pair of big and small items (such as a football and a tennis ball, a small and large bowl, a large and a small square) to the students. Check that the students know the terms ‘big’ and ‘small’ by asking them to say whether the item is the big ball or the small ball. Teach the comparative terms ‘bigger’ and ‘smaller’. Show the students the bigger ball and say, ‘This football is bigger than the tennis ball.’ Then show them the tennis ball and say, ‘This tennis ball is smaller than the football.’ Continue like this using different pairs of objects, but allow the students to make the comparisons. Make sure that the students understand that when one item is bigger than the other, then the other item is smaller than the first one.

Repeat the activity above using pairs of items of different lengths to teach ‘longer’ and ‘shorter’.

Prepare a set of five different-coloured lengths of ribbon (or strips of paper). Choose five students and give each one a length of ribbon. Ask the students to come to the front of the class in different pairs. As each pair comes forward, they should show their ribbons to the class. The other students must guess which strip is longer and which is shorter. Allow the pair of students to align one end of each ribbon and check that the class guesses are correct. Repeat this for a few turns with different students.

Arrange the students in pairs to compare body lengths. They can compare foot lengths, lengths of different fingers, lengths of outstretched arms.

Display a length of ribbon, rope or cardboard. Choose different objects in the classroom and ask the students to say whether they think the chosen item is longer or shorter than the length on display. Allow them to compare as needed.

Arrange the students in groups. Ask each student to make a ‘tower’ of Unifix cubes based on the number of letters in his or her name (Jason = five cubes, Sanjita = seven cubes). Then ask students to compare their towers with others in their group to say whether their name is longer or shorter than those of other members of the group.
Using the Workbook pages

Workbook page 20 deals with the terms ‘big’ and ‘small’ as well as the comparative terms ‘bigger’ and ‘smaller’. Use the first activity to assess whether the students understand the terms ‘big’ and ‘small’. Use the second and third activities once you have taught them to compare items using the terms ‘smaller’ and ‘bigger’.

Workbook page 21 deals with the terms ‘short’ and ‘long’ as well as the comparative terms ‘shorter’ and ‘longer’. Students have to draw shorter and longer items than those shown. Focus on the length of the items they draw rather than the correctness of their representations. If they need to compare to do this, let them draw on strips of paper, which they can put on the same baseline as the objects being drawn and then paste the strips into their books.

Assessment strategies

Display two objects (either bigger and smaller, or longer and shorter, depending on which concept you want to assess). Ask the student questions such as:

• Which of these two is bigger? Tell me why you chose that one.
• Which of these two is shorter? Show me how you decided.
• Are these two the same length? How could you decide?

Ask the students to identify objects in the classroom that are bigger or smaller/longer or shorter than a particular object (a pencil, a ruler, a tower built from Unifix cubes). Allow them to use the object you have selected to do a direct comparison before deciding on the answer.

Common errors and misconceptions

Some students may not understand the need for, or use, a baseline when directly comparing the length or height of two (or more) objects. Teach them that the objects need to be lined up at one end (for length) or both placed on the same surface (a floor or desk for height). Demonstrate this each time you compare items and stress its importance.
14: Number – combining groups up to 10

Kindergarten Workbook pp. 22–23

Concepts and skills

One more
Counting to combine groups
Adding objects to reach a given total

Vocabulary

How many, altogether, make, combine, count, add, total.

Resources needed

Counters, Unifix cubes and other objects for making sets and counting, a ladder or number line showing the numbers from 1 to 10, a die, coins.

Key concepts

In this section, the students will continue to combine sets to find the total number of objects, but they will also begin to explore the very important mathematical concept of ‘one more’. It is crucial that the students make the connection between counting up to the next number and ‘one more’. This will help them to internalise the idea that counting on is a form of addition.

Practical activities, games and rhymes

You can adapt and use any of the activities you used in Sections 8 and 11 to teach the students to represent a total as two sets and to combine two sets to get a total.

Use the number line or number ladder to play a game of ‘hop one more’. Roll a die to get a number from 1 to 6. Get a student to move that number up the ladder or along the number line, counting to show each hop along the line. Say, for example, ‘Nisha made four hops. She landed on the number 4.’ Tell the class that the student is going to ‘hop one more’. Ask what number she will land on. Say, for example, ‘Nisha is on 4, she is going to hop one more. What number will she land on?’ Let Nisha make one more hop and say, ‘4 and one more is 5.’ Repeat this activity with different students and different starting numbers.

If you have space, you could play this outside. Draw a large chalk number line in the playground and call out a starting number. The children then hop
to that point and then hop one more, chanting their moves (or example, 7 and one more is 8).

Play grab games where the students take turns to grab a number of cubes, count these and say how many they have, and then add one more. Repeat this several times.

Use classroom activities such as sitting down to consolidate the idea of one more. For example, ask a group of six students to stand up. Point to the students one by one. As you point to them, they should sit down. Say, ‘One student is sitting, now one more sits. How many are sitting now?’, and so on.

Make small amounts using coins. Ask questions such as ‘I have five cents, I need one more cent to buy a sweet. How many cents do I need altogether?’

Stringing beads is also an appropriate activity for reinforcing the idea of ‘one more’. Give instructions such as ‘String two beads. How many are on the string?’ (Two) ‘String one more bead. How many are on the string now?’ Allow the students to count all the beads to check the total if they need to.

Using the Workbook pages

Workbook page 22 can be used to check that students have grasped both counting objects in a set and the idea of adding one more. Read the instructions to the class and do the first example together as a class to make sure they understand what to do.

Workbook page 23 consolidates what the students have learned previously. To complete the table, they have to count the number of each item that they can see in the picture (make sure that they understand this). They then have to choose the correct numeral to represent that amount and circle it in the table (this links to collecting and organising data skills). They then have to use the information in the table (you may have to teach them how to do this, or they will simply recount the items in the picture) to complete the combining sets ‘additions’ in the second part. Observing how students work through this page will help you see whether they are developing more sophisticated counting and combining skills or whether they are still operating at the base level.

Assessment strategies

Use a number line. Place your finger on a number. Ask the student to say the number. Then ask, ‘If I move one more hop along the line, what number will I land on?’

Make a set of cubes (say three). Ask the student to make a set with one more cube.

Common errors and misunderstandings

Some students might struggle to grasp that the next number is one more. Help them by developing some activities in which they move their fingers along a number line, saying ‘one more’ and the number they land on, and by counting cubes as you hand them out, one by one.
15 Number – one fewer

Concepts and skills

Counting
Taking away one (one fewer)

Vocabulary

How many, one less, fewer, take away.

Resources needed

Counters, Unifix cubes and other objects for making sets and counting, a ladder or number line showing the numbers from 1 to 10, a die.

Key concepts

In this section, students begin to explore the very important mathematical concept of ‘one fewer’. It is crucial that they make the connection between counting back to the previous number and ‘one fewer’. This will help them to internalise the idea that counting back is a form of subtraction.

Practical activities, games and rhymes

Counting rhymes and songs that involve counting down are useful for developing the idea that one fewer is the next lowest number (‘Ten green bottles’, ‘There were ten in the bed’, and so on).

Begin this topic by revising counting backwards using a number line or ladder. Ask the students to count down as you point to the numbers. Start at different points on the line each time.

Use classroom activities such as taking a pencil from each member of a group to establish the idea of ‘taking away one’. Hand each student a pencil. Let the group count them to say how many there. Then take the pencils away, one at a time. Say things like ‘There are six pencils. I take away one, how many are left?’ Allow the students to count to check as they need to. Verbalise the results, saying, for example, ‘Six take away one is five. Five is one fewer than six.’

Play a game using towers of cubes or grabs of counters. Students build a tower (up to ten cubes) or take a grab. Say, ‘Take away one’ a number of times. The winner of the game can be the first to have none left, or the one with the most
left when you’ve called a few times, or the ones with a given number after a
few calls (for example, anyone who has three left gets a point).

Adapt the ‘hop one more’ activities from the previous section to reinforce
and teach the idea of one fewer.

**Using the Workbook page**

Read the instructions to the class. Show them how to model each set using
counters and then physically remove one to see how many they will have if
they have one fewer. They then draw this amount.

**Assessment strategies**

Use counters and other objects, taking one away and having the students
answer questions to see that they understand the ideas.

Tell the student a ‘story problem’ and ask him or her to say what the answer
is. For example, ‘Mary put four biscuits on a plate. One fell off, how many
were left?’, or ‘Mika bought a pack of six mangoes. He ate one, how many
were left?’

**Common errors and misconceptions**

As with the concept of ‘one more’, some students might struggle to grasp
that the previous number is one less. Help them by developing some
activities in which they move their fingers backwards along a number line,
saying ‘one less’ and the number they land on, and by counting blocks as you
remove them, one at a time.

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**16 Measurement – comparing mass**

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**Vocabulary**

Heavy, light.
Resources needed

Some objects for students to hold to determine whether they are heavy or light, pictures of heavy and light items.

Key concepts

This section introduces the concept of mass, using the simple terms ‘heavy’ and ‘light’. The students are not expected to use units or to compare mass using a balance or scales at this stage. They can decide whether small real-life items are light or heavy by physically holding them (or trying to pick them up). Students also need to understand that some small items (for example, fishing weights, dumb bells and golf balls) may be heavy while some large items (for example, a tissue box, balloon or feather duvet) may be light.

Practical activities, games and rhymes

Pass a fairly heavy item (a bag of fruit, a brick or a large bag of rice) round the class. Let the students feel its weight and say, ‘This (name of item) is heavy.’ Repeat this using a fairly large light item such as a roll of paper towel or a bag of cotton balls. Let the students feel its weight and say, ‘This (name of item) is light.’

Display a number of items and ask the students to arrange them into two groups, heavy and light. They can compare the mass of the objects by lifting them or they can guess. If it is not possible to have real objects, use pictures of heavy and light items.

Use a small brick and a tissue box (or two other similar-sized items where one is heavy and the other is light). Show them to the class. Discuss their size. Ask the class which is heavy and which is light. Let them explain how they decided. Explain that two items can be the same size but that one can be heavy and the other can be light. Also explain that some small items can be heavier than some bigger items.

Go round the class and let the students take turns to name heavy/light items. If they are able, you could do this in increasing heaviness or lightness. For example, start with a car. Go round the students with the first one saying something lighter than a car, for example a horse. The next student then says something lighter than the horse. Allow them to explain their reasoning if there is disagreement.

Make a class display with pictures of heavy and light items. Explain that the students can bring pictures from magazines and advertisements for this display.

Using the Workbook page

Arrange the students in pairs. Ask them to decide which of the items in the pictures are heavy and which are light. You may need to name the items to help the students refer to them. In the second activity, ask the students to cut and paste pictures instead of drawing if you prefer. If they are drawing,
ask them what they have drawn to judge whether they have drawn a heavy or a light item, rather than judging what the drawing looks like.

**Assessment strategies**

Observe the students as they discuss items to see that they have understood and can use the terms ‘heavy’ and ‘light’.

Choose a few items or pictures of items and ask the student to point to them and to say ‘heavy’ or ‘light’. Alternatively, ask the student to place the items into groups of heavy and light items.

**Common errors and misconceptions**

Some students may incorrectly judge mass by size. Make sure that you use a range of larger, lighter objects to show that bigger items can be lighter than smaller items. Also try to show that items of the same size can weigh different amounts.

### 17 Shape and space – copying 2D shape patterns

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### Vocabulary

Pattern, yellow, red, green, blue, colour, match, shape, square, triangle, circle, rectangle.

### Resources needed

Crayons, cut-out shapes, suitable small objects for sorting, containers, mats or trays for sorting, stickers, cubes, buttons, patterned fabric and other items to make repeating patterns, cards showing patterns, cards showing shapes (squares, rectangles, circles, triangles).

### Key concepts

The concept of patterning relies on, and is related to, sorting. To make a pattern, the students have to group and then repeat elements that have the same attributes. The first step in this process is sorting using common
attributes. When the students sort items, spend time talking about the ‘rule’ they used to sort them. Similarly, when they identify a pattern, ask them to say what ‘rule’ was used to make it.

The students need to distinguish between repeating and non-repeating patterns. They also need to be able to copy patterns and describe them before they are asked to extend patterns or make patterns of their own. In this section, the focus is on reproducing patterns.

**Practical activities, games and rhymes**

You can repeat or adapt any of the practical activities from Section 2 to revise and consolidate patterning.

Make a number of colour patterns, for example red, blue, red, blue. You can build these using Unifix cubes. Vary them so they are not just one, one patterns, for example blue, blue, yellow, blue, blue, yellow. Let the class chant the colours to get a sense of the patterns. Then ask them to reproduce the patterns, first by building them using cubes as you have done, then by making coloured dots or stripes on a piece of paper.

**Using the Workbook page**

Begin by making sure that the students know what to do. In this case, they have to copy the given pattern into the blank spaces on the right-hand side of the page. Once they have done this, they need to colour the shapes at the bottom of the page according to the given colour and then colour the matching shapes in both patterns using this colour key. Once they have coloured, it is easier to see whether they have drawn the correct patterns or not.

**Assessment strategies**

Prepare a number of cards showing patterns made from a range of different manipulatives (depending on what you have available in the classroom). Hand these out to the students and ask them to build a copy of the pattern and then describe it to you.

Show the students a tower of cubes arranged in a repeating pattern. Ask them to build a copy of the pattern.

Use shapes to build a pattern. Ask the student to describe and/or copy the pattern.

**Common errors and misconceptions**

Some students may struggle to copy the given patterns correctly because they can’t draw small objects well or because they reverse the shapes in the given pattern. Give these students additional practice building the patterns using the shapes. Copy the Workbook page and cut out the strips of the pattern. Let the students place these alongside in the correct order. Alternatively, give them small shapes and ask them to build each row, helping them and correcting as needed.
Concepts and skills

Recognising groups of 8, 9 and 10
Counting 8, 9 and 10 objects
Writing numerals 8, 9 and 10

Vocabulary

Number names to ten, colour, draw, write, circle, how many.

Resources needed

Items for counting, trays or containers for making sets, egg boxes, pictures of sets of items, cards showing numerals, large numerals for classroom display, sand, paint and paper for writing numerals, crayons, counters.

Key concepts

This section builds on the concepts and skills taught in earlier sections by extending the formal teaching of counting and writing numerals to 10.

Practical activities, games and rhymes

Adapt some or all of the activities described in Sections 1, 4 and 10 to include the higher number range. It is useful to repeat the smaller numbers (1 to 7) at the same time to build up the number sequence in a cohesive way.

Using the Workbook pages

As in the earlier number work, Workbook pages 27–29 are not intended to be used in one sitting. You may choose to work with the pages one by one as you develop a concept of that number. Alternatively, you could do parts of each page as you teach the numbers. The students should only attempt writing numerals activities at the bottom of the pages once you’ve taught the class how to form 8, 9 and 10.

Workbook page 27 requires the students to count items and then colour groups of eight. Show them how to use a set of counters, placing them one by one over the dots to keep track of their count. Once they’ve decided that a group has eight dots, they should remove the counters and colour the
group. You could also ask the students to write the numerals in ascending order inside the dots to count the number in each group. This gives them additional practice forming the numerals up to 8.

Note that the top of each page can be used as a teaching tool – the numeral, number name, quantity (domino dots) and finger counting for each number is included in the header strip.

**Assessment strategies**

Many of the teaching activities you used in this section can be used to assess learning. In addition, some performance-related activities for assessing counting, creating sets to ten and writing numerals are provided below. These are best done with small groups of students so you can see how each one responds.

Give each student a pile of counters. Present one numeral on a card (for example, 6) to the student. Ask him or her to count out the correct number of counters and place them on the card. Ask the student to say how many items there are. Work in the range of 1 to 10.

Make a number of sets of one to ten items. It is advisable to use different items to check that students realise the attributes of the items don’t affect how many there are. Prepare large cards with the numerals 1 to 10 written one them. Ask the student to sort the sets by moving them and placing them on or next to the correct number. Ask him or her to say the numbers. Alternatively, use smaller numeral cards and ask the student to place the correct numeral next to each set.

Hand the student a number card (1 to 10 at this stage) and ask him or her to draw a set to represent that number and then write the numeral next to their set. Use this to assess how well each student can form numerals from 1 to 10.

**Common errors and misconceptions**

Continue to assess each student carefully to find out whether they understand the quantity associated with each number.

Some students may still struggle to understand that attributes such as size do not affect how many items there are in a set. They may, for example, say that three large sweets is ‘more than’ three small sweets. Similarly, they may struggle with the idea that the order in which you count the items does not affect the total number of items. For example, counting a set of shoes from left to right will give the same total as counting the same set of shoes from right to left. Practical counting tasks in which the students actually handle items and count backwards and forwards will help to resolve these misconceptions.
19 Shape and space – continuing 2D shape patterns

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**Vocabulary**

Pattern, yellow, red, green, blue, colour, match, shape, square, triangle, circle, rectangle.

**Resources needed**

Crayons, cut-out shapes, suitable small objects for sorting, containers, mats or trays for sorting, stickers, cubes, buttons, patterned fabric and other items to make repeating patterns, cards showing patterns, cards showing shapes (squares, rectangles, circles, triangles).

**Key concepts**

This section builds on earlier work on patterning. Students have previously described patterns and copied patterns. Now they will need to continue a given pattern to show that they can see the pattern and reproduce it.

Students will also be required to build on their previous experiences involving matching and attributes of shapes to work out which shape is missing from a given set, organised in a different way.

**Practical activities, games and rhymes**

Adapt any of the patterning activities in Sections 2 and 17 to include continuing the pattern. Encourage students to describe the pattern and then to say why they have continued it in the way they have.

Play a ‘What is missing?’ game with the class. Use a set of five or six everyday items such as a pencil, pen, book, cup, eraser, toy, glue. Display these and let the students look at the set and memorise what is in it. Ask them to close their eyes (or put up a barrier to prevent them seeing) and remove one item. Ask them to work out which item is missing. Initially, leave
the items in the same order. Then, after a few games, remove an item and move the other items around.

**Using the Workbook pages**

On Workbook page 30, you may need to discuss the patterns with the class and ask them to verbally say which shapes come next before asking them to continue the patterns. At the bottom of the page, the students work out which shapes are the same, and colour these the same colour. If you like, they can use these colours to colour the matching shapes in the patterns as well.

On Workbook page 31, the students need to work out which shape is missing from the first four sets. In the last one, there are two shapes missing. Let the students work this out by themselves using counting and comparison of sets.

**Assessment strategies**

Prepare a number of cards showing patterns made from a range of different manipulatives (depending on what you have available in the classroom). Hand these out to the students for them to copy and continue the pattern.

Provide the student with a tower of cubes arranged in a repeating pattern. Ask him or her to continue the pattern.

Use a version of the ‘What is missing?’ game to assess whether or not students can work out what is missing from a given set.

**Common errors and misconceptions**

With pattern work, you need to make sure that you show the students enough iterations (repeating bits) of the pattern for them to identify it. For example, in a repeating red-blue-red-blue pattern, you may need to show three repeats of red, blue, red, blue, red, blue before the students see that the colours (two elements) are the pattern. Allowing students to build and describe patterns of their own will help them develop the idea of a repeating pattern.
Vocabulary
First, second, third, fourth, last.

Resources needed
A set of stairs (if available), a ladder or number line with no numbers written on it, sets of five different-coloured items, toy cars, strips of paper with numbers on.

Key concepts
Ordinal numbers are used to describe the position of items in a set or row. Students may already know first, second, third and last from school sports or track and field events on TV. Students need to learn to work effectively with ordinal numbers in terms of position of items in a set.

Practical activities, games and rhymes
Take the class outside to a set of stairs. If you cannot find a set of stairs, draw a large graded number line on the ground. Ask the students to line up in groups of five. Ask who is first in each row and who is last. Using one group after another, say the ordinal position of each student. Have them repeat their position as you say it. Choose one group and give the students instructions to rearrange themselves using ordinal numbers. For example, ‘The person who is last, move to third position. Who is last now?’ ‘The person who is second, swap places with the person who is third.’, and so on.

Give each student a set of five different-coloured items (cubes, cards, counters or even crayons). Give the class instructions to form a set, for example ‘Place the red crayon first.’ ‘Put the green crayon last.’ They check that their sets are correct by looking at each other’s sets.

Use a set of toy cars. Place them in a row. Ask the students to say which car is first, which is third, and so on.

Using the Workbook page
Use the snails and the labels at the top of the page to revise the names of the positions and also to show how ordinal numbers are written in real life (with small letter abbreviations to show the order). (If your classroom is computerised, you can show them that a word-processing programme will usually automatically format those numbers. Type in ‘1st’ and the students will see how the computer places the ‘st’ above and to the right of the 1.) Read the instructions through with the class and then have them complete the page in pairs or small groups.

Assessment strategies
Use a strip of paper or number line with the numbers 1 to 5 on it. Give instructions such as ‘Colour the first number blue.’ ‘Draw a line under the last number.’, and so on. You can also do this with a row of five dots or any combination of five items.
Common errors and misconceptions

Check that students are starting in the correct place when they give ordinal positions. For example, if they view a line from left to right, then the left-hand item is first, if they are viewing it the other way, then the right-hand item is first. Be aware of this difference and ask students to explain any odd choices before deciding whether they are making a starting-point error or whether they genuinely don’t understand ordinal numbers.

21 Shape and space – recognising triangles

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<td>Colouring shapes that are the same</td>
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Vocabulary

Pattern, yellow, colour, match, shape, square, triangle, circles, rectangle.

Resources needed

Yellow crayons, cut-out shapes.

Key concepts

Students will build on what they have already learned about matching and the attributes of shapes to find and colour all the triangles in a set. They will then use the coloured items to trace a path through a grid.

Practical activities, games and rhymes

Repeat and adapt any of the general matching and sorting activities from those on pages 15 to 17 as well as the more specific shape-related activities suggested in Sections 5, 9 and 12 to revise the attributes of shapes.

Using the Workbook page

Make sure that the students know what to do. Read the instruction to the class. You may need to make sure that they all have a yellow crayon. Explain that they have to colour all the shapes that are the same as the one in the instruction (the triangle) in yellow. Let the students complete the colouring activity independently and then check to make sure that they have managed to do so. Then work as a class to follow and describe the route through the shapes.
Assessment strategies

Give the student a set of mixed shapes. Show one shape. Ask the student to find all the shapes that are identical to the one you are showing. Let the student explain how he or she decided whether a shape was the same as yours or not.

Common errors and misconceptions

Many of the errors and misconceptions around shapes arise because students are not given time to play with concrete apparatus through free play (making their own pictures out of shapes) or focused play (building specific pictures or patterns following instructions). When students only work with printed sheets or diagrams of shapes and/or shape patterns, they do not develop sound geometrical reasoning skills. For example, if you always draw shapes on the board some students will develop the mistaken ideas that squares are always found in a ‘horizontal’ position, or that all triangles are found resting on a horizontal base. They will also not begin to realise that quadrilaterals are all related (for example, a square is also a rectangle; it’s just a rectangle with four equal sides).

Be careful with colour and vary the choices that you make so that students don’t begin to think that all circles are red, or all blue shapes are triangles.

22 Measurement – capacity

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<tr>
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<tr>
<td>Full and empty</td>
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Vocabulary

Full, empty, container.

Resources needed

Containers of different shapes and sizes, water and/or sand for filling the containers, two bottles (one full, one empty).

Key concepts

Students will use direct measurement and visual cues to explore the concept of capacity. At this level, the focus is on the terms ‘full’ and ‘empty’. However, in real life a container may be filled to any level in between. For
our purposes, ‘full’ means that it can’t hold any more and ‘empty’ means there is nothing in it.

In order to develop the concepts of capacity and volume, students need to understand the terms ‘full’ and ‘empty’. You will need to make sure that the students have plenty of experience filling, emptying and transferring the contents of containers. Transferring the contents from a small to a large container and vice versa as well as filling different-shaped containers with the same capacity helps them to see that containers hold different amounts as well as the fact that different containers can hold the same amount.

Technically, the capacity of a container is how much it can hold. When there is something in the container, we can measure the volume of the contents. The capacity of a 2-litre bottle remains 2 litres, whether the bottle is full or empty. The volume of liquid in the bottle can change from 0 to 2 litres and any measurement in between.

**Practical activities, games and rhymes**

Use some or all of the readiness activities described on page 14 before working through this section.

Teach the terms ‘full’ and ‘empty’ to the class. Display a full bottle and an empty bottle. Ask them to say which is full and which is empty. Label the bottles with the terms to teach the words.

Arrange the students in groups of three. Give each student a container and suitable items for filling it (sand, rice or water, depending on your environment and classroom conditions). Instruct the groups to put sand (or rice or water) in their containers so that they have an empty container, a full container and a container that is neither full nor empty. Get them to order these from empty to full.

Prepare a table with a series of containers. Some should be full, some empty and some not full or empty. Make three areas and mark them ‘full’, ‘not full or empty’ and ‘empty’. Get the students to physically move the containers to group them correctly.

Talk about how the words ‘full’ and ‘empty’ are used in everyday life. For example, a bus is full when it cannot take any more passengers, and empty when there are no passengers (even though it still contains seats and other items). Explain that people say things like ‘My stomach is empty’ when they are hungry, or that they are full when they’ve had enough to eat. An empty room is one that contains no people. People also use ‘empty’ to talk about things that are not being used (an empty chair, for example) and to show they did not get what they wanted (empty-handed). ‘Full’ is used to indicate no space: ‘The concert was full.’ It is also used to request details, for example ‘your full name and address’. Advertisers may use the term ‘full-bodied’ or ‘full of flavour’ when they talk about food products and when people see a round moon, they call it a’ full moon’.
Using the Workbook page

Start by getting the students to label the glasses full and empty. Then ask them to complete the first part of the activity. If they find it difficult to circle the full containers, let them colour the containers instead. Complete the last part by circling the empty containers.

Assessment strategies

Prepare a set of containers, some full, some empty and some containing in-between amounts. Ask the student to point out the full/empty ones.

Ask the student to explain how he or she knows that a container is full.

Common errors and misconceptions

Students are unlikely to have difficulty with the concepts of ‘full’ and ‘empty’. They are more likely to have difficulty with conservation of volume, so they will say that a full short wide container and a full tall thin container do not hold the same amount. As this is not the focus of this section, don’t address this beyond practical experience activities at this stage.

23 Data handling – block graphs

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<td>Block graph – one-to-one correspondence</td>
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Vocabulary

Count, colour, block, graph.

Resources needed

Although students have collected and organised data previously using tables and sorting frames, this is the first formal introduction to basic graphs. Students will simply be expected to count items and colour blocks using a one-to-one correspondence to produce a block graph.

Through the activities in this section, students will learn how to organise information (data) in ways that make it easy to interpret and use.

Practical activities, games and rhymes

Arrange the students in groups of four or five. Give them a mixed pile of stacking cubes in different colours (one colour per student, but different amounts of each colour). First, ask the students to sort them into colours.
Then, have each student choose a colour and build a tower using the cubes of that colour. Let them place these next to each other (a virtual bar graph) and then ask questions about the ‘graphs’. For example, ‘Which colour is there most of?’ ‘Which colour is there least of?’ ‘These two bars are the same length. What does that tell us?’

Draw symbols for different kinds of weather in a horizontal row across the top of the board (sunny, cloudy, windy, rainy, snowing). Choose conditions that match your local weather. Ask the students which type of weather is their favourite. Let them take turns to come up and make a dot in the column below their favourite weather. When you have done this, ask them questions about the display, for example ‘Which weather do most students like? How can we tell this by looking at the board?’ Make sure that they understand that one dot represents one person’s choice.

Adapt this activity to different topics. For example, choose five letters and ask students whose names start with each letter to come up and make a dot. Alternatively, write five colours/foods/TV programmes/days of the week and ask students to choose their favourite, or the one they like the least.

Use sticky notes to make a ‘block graph’ showing in which month students were born. Write the months down one side (vertically) and get the students to come up and stick a block (note) in the correct row to show when they were born.

Depending on your resources, you could take a digital photograph of each child in the classroom. Print these and paste them onto card. Use these as the ‘blocks’ in a series of graphs showing, for example, different modes of transport to school. Let the students come up and stick their photo in the correct place on the chart. This reinforces the idea that one block (or symbol) represents one person.

You can also use normal class activities to build up block graphs. Draw a chart with days of the week down one side, and then colour blocks to show absenteeism on different days.

**Using the Workbook page**

You need to make sure that the students understand that there are three different kinds of blocks shown – bus, car and scooter. You may want to spend some time colour coding these to make it easier for the students to count them; alternatively, let them use counters and place them on all the buses one by one to count those. Once they have done that, they can colour one block per bus on the graph. Repeat this for all three rows. Discuss the results as a class, using similar questions to those you used during the practical activities.

**Assessment strategies**

Draw a simple block graph and ask the student to complete it and/or answer questions about it. The topic will depend on what you are dealing with in the classroom. Some possibilities are favourite stories, favourite pets, names beginning with (a letter), and so on.
Common errors and misconceptions

Students may have difficulty answering interpretive questions because they don’t realise that the blocks on the graph can be counted and that they ‘tell’ us what people have chosen. You can help such students by talking through what you are doing and by modelling the solutions with reference to the graph.

24 Shape and space – colour patterns

### Concepts and skills
- Continuing a given pattern
- Colouring shapes that are the same
- Generating a pattern of your own

### Vocabulary
Pattern, yellow, red, green, blue, colour, match, shape, square, triangle, circle, rectangle.

### Resources needed
Crayons, beads and strings, cards showing patterns.

### Key concepts
This section builds on earlier work on patterning. Students have previously described patterns and copied patterns. Now they need to continue a given pattern involving coloured shapes to show that they can see the pattern and reproduce it.

Students will also be given the opportunity to produce a pattern of their own.

### Practical activities, games and rhymes
Adapt any of the pattern activities from those on page 19 as well as the more specific activities from Sections 2, 17 and 19 to include continuing the pattern. Encourage the students to describe the pattern and then to say why they have continued it in the way they have.
Do some beading activities with the class. Encourage the students to string eight to ten beads in a pattern of their own choosing. Select different students to show and describe their patterns.

**Using the Workbook page**

You may need to read the colours to the class and ask them to verbally say which colours come next before asking them to complete the patterns. Note that there are different options depending on how students view this. The first pattern – red, yellow, red – could continue with yellow, red, and so on. However, some students may choose red, yellow, red, blue, red, yellow, red, blue or red, yellow, red, red, yellow, red.

The second activity allows students to use colours to make their own patterns. Note that they do not need to stick to same colours for the same shapes, and that they could make a two-colour pattern, relying on the colour rather than the shapes to carry the pattern. Accept different approaches, but ask individual students to explain their decisions to the class.

**Assessment strategies**

Prepare a number of cards showing patterns made from a range of different manipulatives (depending on what you have available in the classroom). Hand these out to the students and let them copy and continue the pattern. Provide the students with cubes of different colours. Ask them to create a repeating pattern.

**Common errors and misconceptions**

With pattern work, you need to make sure that you show the students enough iterations (repeating bits) of the pattern for them to identify it. For example, in a repeating red-blue-red-blue pattern, you may need to show three repeats of red, blue, red, blue, red, blue before the students see that the colours (two elements) are the pattern. Allowing students to build and describe patterns of their own will help them develop the idea of a repeating pattern.
**Vocabulary**

How many, altogether, make, combine, count, add, total.

**Resources needed**

Counting apparatus (counters, beads, Unifix cubes) as needed.

**Key concepts**

This section revises and consolidates earlier work on representing numbers as two sets, and adding numbers to get a given total.

**Practical activities, games and rhymes**

Repeat and adapt any of the activities in Sections 8, 11 and 14 on partitioning numbers and combining sets to revise and consolidate the concepts.

Do some practical counting activities to match value to numerals. Give each student a set of counters. Say, for example, ‘Your number is 3. Make a set of three.’ Check that they can do this and allow them to check each other’s count. Now say, ‘Use that set to make five. How many counters did you need to make five?’

Use beads and cubes to reinforce addition. For example, prepare strings with different numbers of beads on them (one, two or three). Ask the students to count and say how many. Tell them you want to have six. Ask them to string more beads to make six. Also, give the students strings and beads and ask them to string different amounts. You can vary this by saying things like ‘String four red beads. Now string some yellow beads to get six. How many yellow beads did you string?’

**Using the Workbook page**

Allow students to use counters to make the amounts before asking them to draw the missing shapes. Again, focus on the correct number of shapes being drawn rather than on the accuracy of the shapes. Make sure that the students know that they have to write down how many they drew, not how many are in the box in total (that information is given in the instruction).

**Assessment strategies**

Adapt the assessment tasks in Section 14 to assess students’ performance. Ask verbal questions, but allow the student to model the solutions. For example, ‘I have two, but I want five. How many more do I need?’

**Common errors and misconceptions**

It may be difficult for students to recognise the number of elements in bigger groups by sight. Encourage them to count the elements using counters to make it easier for them to match items to numbers.
### 26 Shape and space – position

**Concepts and skills**

Vocabulary of position – in, on, under, next to

**Vocabulary**

In, on, under, next to.

**Resources needed**

A box, an object or small toy to move into different positions.

**Key concepts**

This section builds on the concepts and skills taught in Section 7, extending how to describe the position of one item in relation to another to include further vocabulary.

The students will already have some experience of position. For example, they know that the book is on the desk or that their shoes are under the bed. This section encourages them to build on what they already know by making their experiences explicit and by providing the vocabulary they need to talk about and describe position.

**Practical activities, games and rhymes**

Adapt the activities in Section 7 to include the terms ‘in’, ‘on’, ‘under’ and ‘next to’.

Let the students take turns to choose and move to a position in the classroom. Invite other students to take turns to describe the position, for example ‘Sue is under her desk.’

**Using the Workbook page**

Read through the position words in the table. Arrange the students in pairs to discuss which position word matches each object and then draw lines from each object to the correct position word.

**Assessment strategies**

Use any concrete objects. Move them and ask questions such as:

- Where is the toy car?
- Where is the box?
Give students an item and ask them to place it in a particular position, for example ‘Put this eraser under your Workbook’, or ‘Put your pencil in your pencil case.’

**Common errors and misconceptions**

Some students may struggle with the language of position, particularly if their first language is not English. Continue to model the correct language so they become more familiar with it.

Students may be confused by relative position and struggle to understand that if object A is on object B, then object B is under object A. As with most concepts at this level, they will benefit from more opportunities to explore and discuss position using concrete objects, including their own bodies, in relation to other items in the environment.

### 27 Number – combining groups and counting on to add

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<tr>
<td>Adding objects to reach a given total</td>
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</tbody>
</table>

**Vocabulary**

How many, altogether, make, combine, count, add, total.

**Resources needed**

Counting equipment as needed.

**Key concepts**

No new concepts are introduced here. Students revise and consolidate earlier work on counting to combine sets and find the total.

**Practical activities, games and rhymes**

Repeat and adapt any of the activities in Sections 8, 11, 14 and 25 to revise the concepts.
Using the Workbook page

By this stage, the students should be starting to read simple instructions. Allow them to read them on their own and ask them to say what they need to do before allowing them to tackle the work. Allow the students to use counters as necessary to model the sets and find the total. Observe the students to see who is counting all, and who has begun to count on from the first set. Those students who start with the larger set show a good understanding of the operation.

Assessment strategies

You can use the Workbook activity itself to assess competence at this level.

Common errors and misconceptions

Some students will miscount or lose count, particularly when the set has more than three elements. Encourage these students to model the sets and to touch or move the counters as they count.

28 Number – taking away to subtract

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</thead>
<tbody>
<tr>
<td>Removing objects to subtract</td>
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Vocabulary

Take away, how many left.

Resources needed

Counters, Unifix cubes.

Key concepts

No new concepts are taught here. The concept of taking away builds on earlier work on ‘one fewer’. The challenge is for students to see that removing two will take you back two numbers.
Practical activities, games and rhymes

Counting rhymes and songs that involve counting down are useful for developing the idea that one fewer is the next lowest number (‘Ten green bottles’, ‘There were ten in the bed’, and so on). Adapt the lyrics to subtract two each time.

Revise counting backwards using a number line or ladder. Ask the students to count down as you point to the numbers. Start at different points on the line each time.

Use classroom activities such as handing out a pencil to each member of a group to establish the idea of ‘taking away two’. Hand each person a pencil. Let the group count them and say how many there are. Then take the pencils away, in twos. Say things like ‘There are six pencils. I take away two, how many are left?’ Allow the students to count to check as they need to. Verbalise the results, saying, for example, ‘Six take away two leaves four.’

Play a game using towers of cubes or grabs of counters. The students build a tower (up to ten Unifix cubes) or take a grab. Say, ‘Take away two’ a number of times. The winner of the game can be the first to have none left, or the one with the most left when you’ve called a few times, or the ones with a given number after a few calls (for example anyone who has three left gets a point).

Using the Workbook page

Read the instructions to the class. Show them how to model each set using counters and then physically remove items to see how many they will have left. They can draw their results and write the answers.

Assessment strategies

Using counters and other objects, take one or two away and ask the students questions to see that they understand the ideas.

Tell the student a ‘story problem’ and ask him or her to say what the answer is. For example, ‘Mary put four biscuits on a plate. Two fell off, how many were left?’, or ‘Carlos bought a pack of six mangoes. He ate two, how many were left?’

Common errors and misconceptions

As with the concept of ‘one more’, some students might struggle to grasp that the previous number is one less. Help them by developing some activities in which they move their fingers backwards along a number line, saying ‘one less’ and the number they land on, and by counting blocks as you remove them, one at a time.
Vocabulary
Double, how many, altogether, make, combine, count, add, total.

Resources needed
Dice, set of dominoes (except 5–6 and 6–6).

Key concepts
In this section, the students are introduced to the idea of doubling. They need to understand that doubling a number means adding the same number to itself. Students may already understand this concept in terms of dice games where they have to roll a double to start, and so on.

Practical activities, games and rhymes
Arrange the class in groups and give each group two dice. Let the students take turns to roll the dice. Ask the groups what they rolled. When a group rolls a double, use this to teach the idea of a double. Say something like ‘Both dice have the same score. This is called a double. When we roll a double, we have to get two numbers the same.’ Then let the students roll again and ask, ‘Who rolled a double?’ If any groups rolled a double, ask which double they rolled. Ask them to say what their total score is (for example, if they rolled double 2, they get 4). Keep track of the number of doubles that each group rolls. At the end of the game, the group that rolls the most doubles is the winner.

Place a set of dominoes in a box or bowl. Arrange the students in groups to play a grab game. Play some music – when you stop, the students must all grab one domino. If it is a double, they can keep it, otherwise they put it back. The winner is the student with most doubles at the end. Vary this so that students who get a double have to sit out the next round, or get an extra grab.
Using the Workbook page

Explain to the class that they have to draw doubles. In other words, each butterfly wing must have the same number of dots. Ask them to complete the drawing and then find and write the totals.

Assessment strategies

Show the student a set of ten dominoes. Ask him or her to pick out the doubles and tell you the ‘score’ of each double.

Common errors and misconceptions

Because young children cannot always tell how many dots there are (especially if there are more than three), they may take a little time to work out whether a result is a double or not. Allow them to count the dots and make sure before they commit. This is perfectly normal at this stage.

30 Shape and space – generating 2D shape patterns

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<table>
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<th>Vocabulary</th>
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<tbody>
<tr>
<td>Pattern, yellow, red, green, blue, colour, match, shape, square, triangle, circle, rectangle.</td>
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<table>
<thead>
<tr>
<th>Resources needed</th>
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<tbody>
<tr>
<td>Crayons, cut-out shapes, stickers, cubes, buttons and other items to make repeating patterns.</td>
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<table>
<thead>
<tr>
<th>Key concepts</th>
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<tbody>
<tr>
<td>The students build on what they already know about shapes and repeating patterns to create their own patterns.</td>
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</table>
Practical activities, games and rhymes

Revise patterning using any of the practical activities you used in Sections 2, 17, 19 and 24. Spend some time allowing the students to make patterns using cut-out shapes or stickers and let them explain how their pattern works.

Make a large classroom display of shape patterns. These can be made with cut-out shapes, by painting or by using stickers.

Using the Workbook page

Begin by making sure that the students know what to do. Explain that they have to use the given shapes but that they can do what they like with them. Encourage the students to use plastic or cardboard cut-out shapes to explore and experiment before they draw their patterns. Plastic shape stencils are useful for this kind of work as well.

Assessment strategies

Give out shapes to build a pattern. Ask the students to describe how they made the pattern.

Common errors and misconceptions

Some students may not build in the repetition element to their pattern work. Remind them that a pattern must repeat in some way.

31 Measurement – capacity and volume

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Concepts and skills

Showing less and more in a container

Vocabulary

Full, empty, container, more than, less than.

Resources needed

Containers of different shapes and sizes, water and/or sand for filling the containers.
Key concepts

Students use direct comparison and visual cues to further explore the concepts of capacity and volume. At this stage, you only need expect them to compare the capacity of two containers to say which contains more than the other and which contains less.

Practical activities, games and rhymes

Use some or all of the readiness activities described on page 14 before working through this section.

Allow students to investigate capacity by filling one container and pouring the contents into another to say which holds more. They should begin to use the terms ‘holds more’, ‘holds less’, ‘holds the same’, as well as to continue using the terms ‘full’ and ‘empty’, which they learned in Section 22.

Provide containers of different shapes and sizes. Let each group choose two containers to compare the capacity. Ask questions such as:

- Which container holds more?
- Which container holds less?
- Does this container hold more or less than this one? How did you find out?

Display two identical containers (for example, two litre bottles). Place sand, rice or water (depending on your environment and classroom conditions) in the containers so that one clearly contains more than the other. Ask students questions such as ‘Which bottle holds more sand/less sand? Can you show or tell me how you know this?’

Arrange the students in groups. Give each group three containers and aim for these to be similar shapes and sizes. Partly fill one of the containers, leaving the other two empty. Instruct the groups to put sand (or rice or water) in the other two containers. Tell them that each container must get more/less than the one they have already. Let them describe how they worked to make sure that they had more/less in their containers. Ask them to arrange their containers in order from most full to most empty.

Using the Workbook page

Read the instructions to the class before asking the students to complete the page independently. Allow them to check each other’s work and then discuss why this activity did not produce the same answers.

Assessment strategies

Prepare a set of containers, some full, some empty and some containing in-between amounts. Point to a container. Ask the student to select a container that has more/less than the one that you are pointing to. Let the student manipulate the containers if he or she needs to.
Common errors and misconceptions

Students are unlikely to have difficulty with the concepts of ‘more’ and ‘less’. They are more likely to have difficulty with conservation of volume, so they will say that a full, short, wide container and a full, tall, thin container do not hold the same amount. As this is not the focus of this section, you do not need to address this beyond practical experience activities at this stage.

32 Number – counting and ordering

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<tr>
<td>Review of counting to 6</td>
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Vocabulary

Number names to six.

Resources needed

Counting apparatus as needed.

Key concepts

This is a revision section in which the students will need to demonstrate that they can match amounts to numbers.

Practical activities, games and rhymes

Repeat any of the matching and counting activities you have used previously to consolidate this topic.

Using the Workbook page

Read through the instructions with the class if necessary. Let students work on their own to complete the activities.

Assessment strategies

Use the Workbook page as an informal assessment tool to check that the students can count to six, match quantities to numerals and form numerals correctly.
Common errors and misconceptions

Some students may still be struggling to write numerals correctly. Be aware of this and continue to give those students additional patterning and writing work to improve in this area.

33 Data handling – block graphs

<table>
<thead>
<tr>
<th>Concepts and skills</th>
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<tbody>
<tr>
<td>Block graph – one-to-one correspondence</td>
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</tbody>
</table>

Vocabulary

Count, colour, block, graph.

Resources needed

A large block graph for classroom display (for example the weather chart, favourite colours chart or birthday month chart that you developed earlier in the year), sticky notes, counters, crayons.

Key concepts

Students will revise and consolidate how to count items and colour blocks using a one-to-one correspondence to produce a block graph.

Through the activities in this section, students will learn how to organise information (data) in ways that make it easy to interpret and use.

Practical activities, games and rhymes

Repeat any of the practical activities on graphing in Section 23.

Using the Workbook page

You need to make sure that students understand that there are three different kinds of shapes shown – circle, triangle and square. You may want to spend some time colour coding these to make it easier for the students to count them. Alternatively, let the students use counters and place them on all the triangles one by one to count those. Once they have done that, they can colour one block per triangle on the graph. A further option is to let the students write numerals on the shapes as they count them to reinforce writing numerals at the same time. Repeat this for all three columns.
Discuss the results as a class, using similar questions to those you used during the practical activities.

**Assessment strategies**

Draw a simple block graph and ask the student to complete it and/or answer questions about it. The topic will depend on what you are dealing with in the classroom. Some possibilities are favourite stories, favourite pets, names beginning with (a letter), and so on.

**Common errors and misconceptions**

Students may have difficulty answering interpretive questions because they don’t realise that the blocks on the graph can be counted and that they ‘tell’ us what people have chosen. You can help such students by talking through what you are doing and by modelling the solutions with reference to the graph.

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### 34 Number – counting to 10

<table>
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<tr>
<th>34: Number – counting to 10</th>
<th>Kindergarten Workbook p. 46</th>
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**Concepts and skills**

Review of numerals and number names to 10

**Vocabulary**

Number names to ten.

**Resources needed**

No special resources.

**Key concepts**

This section aims to assess students’ mastery of counting to ten, matching amounts to numerals, and matching numerals to number names.

**Practical activities, games and rhymes**

You don’t need to repeat practical counting activities in this section as the aim is to assess progress. However, if you wish, you could repeat some of the counting and matching activities from earlier sections as revision before you use the Workbook page.
Using the Workbook page
Use this page as an informal ‘test’ to check that the students have mastered counting and number sense to ten.

Assessment strategies
Use the Workbook task to assess progress and performance in counting and number sense to ten.

Common errors and misconceptions
It is unlikely that students will have problems with numbers and number sense to ten at this stage. If a student genuinely cannot do this, you will need to have him or her assessed to make sure that there is not an underlying cognitive difficulty or disability.

35 Measurement – comparing size and length

<table>
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<tr>
<th>Concepts and skills</th>
<th>Kindergarten Workbook p. 47</th>
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<tbody>
<tr>
<td>Big and small, comparisons of size</td>
<td></td>
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<tr>
<td>Short and long, comparisons of length</td>
<td></td>
</tr>
</tbody>
</table>

Vocabulary
Big, small, bigger, smaller, short, long, shorter, longer.

Resources needed
Crayons.

Key concepts
This section aims to assess students’ mastery of measurement in terms of comparative size and length.

Practical activities, games and rhymes
You don’t need to repeat practical measuring or comparing activities in this section as the aim is to assess progress. However, if you wish, you could repeat some of the measuring and comparing activities from earlier sections as revision before you use the Workbook page.
Using the Workbook page

Use this page as an informal ‘test’ to check that the students have mastered and understood the concepts of ‘bigger’ and ‘smaller’ as well as ‘longer’ and ‘shorter’.

Assessment strategies

Use the Workbook task to assess progress and performance in measurement.

Common errors and misconceptions

It is unlikely that students will have problems with the comparisons at this stage, although they may still be struggling to draw the items neatly. If a student genuinely cannot do this task, you will need to have him or her assessed to make sure that there is not an underlying cognitive difficulty or disability.

36: Number – combining groups and counting on to add

Kindergarten Workbook p. 48

Concepts and skills

One more
Counting to combine groups
Adding objects to reach a given total

Vocabulary

How many, altogether, make, combine, count.

Resources needed

No special resources are needed for this section.

Key concepts

This section aims to assess students’ mastery of counting to ten and the concept of one more being the next number.
Practical activities, games and rhymes

You don’t need to repeat practical counting activities in this section as the aim is to assess progress. However, if you wish, you could repeat some of the counting and matching activities from earlier sections as revision before you use the Workbook page.

Using the Workbook page

Use this page as an informal ‘test’ to check that the students have mastered counting and that they can add one more item and find the total by counting on or counting all.

Assessment strategies

Use the Workbook task to assess progress and performance in counting and addition of one.

Common errors and misconceptions

If a student genuinely cannot do this task, you will need to have him or her assessed to make sure that there is not an underlying cognitive difficulty or disability. Students who have not mastered counting to ten or who cannot add one and find a total at this stage are unlikely to be ready for Stage 1 mathematics.