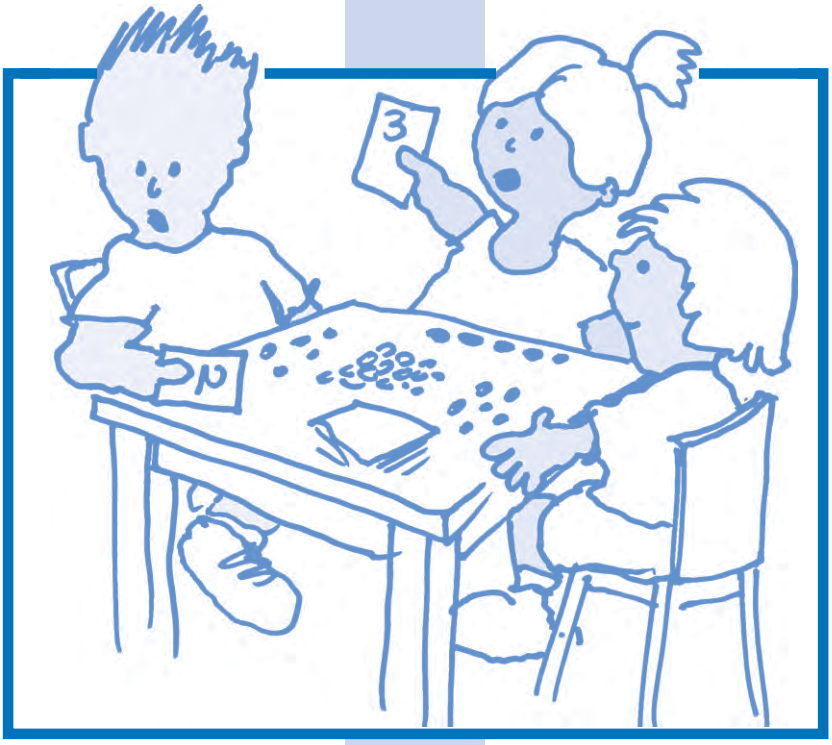
Developing efficient numeracy strategies



Stage1

Department of Education and Training
2002

Acknowledgement

Board of Studies, NSW: for permission to reprint *Mathematics K–6 Outcomes and Indicators,* © 2002, Board of Studies, NSW.

Developing efficient numeracy strategies

Reprinted in 2002 by Professional Support and Curriculum Directorate to reflect the changes in K–6 syllabus outcomes

Design and layout

Materials Development Team
Training and Development Directorate
Lewisham

ISBN 0 7313 8199 8

SCIS 1110201

Additional copies are available for sale from:

Sales Section
PO Box 22
Bankstown 2200
Telephone: (02) 9793 3086
Facsimile: (02) 9793 3242

Foreword

Laying strong foundations in students' early numeracy learning is critical. As Napoleon noted, the advancement and perfection of mathematics are intimately connected with the prosperity of the State.

Students' methods for solving number problems can be diverse, even in the early years of school. Counting is a surprisingly complex and powerful procedure. The order in which the number words must occur, the one-to-one relationship which the number words have with items being counted and the realisation that the last number in a count tells us how many objects are in a set, are all part of counting.

Developing efficient numeracy strategies – Stage 1: Number provides clear directions for supporting student learning in number. The teaching activities within this book build upon the students' current methods of solving arithmetical problems. The focus for teaching changes from looking solely at students' answers to the strategies which each student uses to solve the problem.

The three questions:

What do my students currently know?

What do I want them to know? and

How will I help them to learn this?

are fundamental to teaching and are evident in each section of this book. This document is a practical resource to support the purposeful teaching of number strategies. It enables teachers to manage the teaching process so that it addresses the leading edge of each student's current knowledge.

I commend this document to you as a resource that will support the day-to-day teaching of number.

Robert Randall
Director, Professional Support and Curriculum

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About this book

Numbers surround us each day of our lives. Young children encounter numbers in play, in nursery rhymes and as a recurring theme in conversations, e.g. "How old are you?" Yet counting as a procedure is far more complex than learning a telephone number or the alphabet. The process of counting develops from initial attempts to string together a sequence of number words to using counting in sophisticated ways to solve addition, subtraction, multiplication and division problems.

Developing a powerful and flexible understanding of how numbers are used is one of the goals of early mathematics learning. *Developing efficient numeracy strategies, Stage 1* provides teachers with a resource for programming activities in number to achieve this goal.

Many of the activities outlined in this book have been developed and trialled in the early numeracy project, *Count me in too*. This project used a learning framework in number, initially developed by Professor Bob Wright, to support observations of children's strategies for solving arithmetical problems.

All of the activities in this book have been designed to build upon students' current methods of solving arithmetical problems. The activities support and encourage students in using increasingly efficient strategies when completing arithmetical tasks.

The organisation of the material in this book emphasises both direction and purpose in the teaching of mathematics. The sections are sequenced to reflect development from emergent understandings of number through to efficient use of counting on strategies. Similarly, within each section the activities have been arranged to answer the fundamental questions of teaching mathematics:

What do my students currently know?

What do I want them to know?

How will I help them to learn this?

How to use this book

The layout of *Developing efficient numeracy strategies* is based on four central groups of early arithmetical strategies: emergent counting, perceptual counting, figurative counting and counting on. An overview of the key features of each of these groups of strategies is provided at the start of each section.

The main groups of strategies which students use can be organised into a progression. This progression of strategies is described within this book by four stages.

1. ### Emergent counting stage

   The student knows some number words but cannot count visible items. The student either does not know the correct sequence of number words or cannot coordinate the words with items.

2. ### Perceptual counting stage

   The student can count perceived items but not those in concealed collections. Perceptual counting includes seeing, hearing or feeling items.

3. ### Figurative counting stage

   The student can count concealed items but counts from one rather than counting on. Has a "figurative" notion of numbers and does not need to count perceived items, but counts from one to construct a number in additive situations.

4. ### Counting on stage

   The student can use advanced count-by-one strategies. Counts on rather than counting from "one", to solve addition tasks or tasks involving a missing addend.

These stages of number development provide the titles of each section.

Developing efficient numeracy strategies is organised into four main sections which mirror the above groups of strategies.

Each section contains:

- *Where are they now?*
- *Where to next?*
- *How?*
- *Why?*
- *Syllabus references.*

Where are they now?

Describes the types of approaches which students may use in attempting to solve problems.

Where to next?

Provides direction for teachers in determining where students are headed. It makes explicit the next level of sophistication in students' solutions.

How?

Outlines activities designed to assist students' arithmetical development. These activities are not sequenced within each section. You are free to modify the activities to suit the needs of your students.

Why?

Provides the purpose of the activities.

You will need initially to assess your students' current problem-solving strategies and counting skills. This assessment will support you in programming appropriate teaching activities.

Each section of this book is introduced by *The nature of the learner* and *Teaching considerations.*

The nature of the learner provides a summary of strategies which students typically demonstrate at each stage of arithmetical development.

Short, practical assessment tasks are included at the end of each section. These tasks provide ideas for assessing your students' development and will enable you to determine if students have progressed to the next stage.

Other key features include *Teaching points* and *Three–minute lesson breakers*. These are identified by the following icons:

The *Teaching points* will help you organise the activities or provide further detail as to what to look for in students' responses.

The *Three–minute lesson breakers* are short whole-class activities requiring little or no equipment. They can be used to consolidate and practise the skills at each stage.

Icons are used throughout the book to indicate whether the activities are appropriate for individuals, partners, small groups or the whole class.

individuals

partners

small groups

whole class.

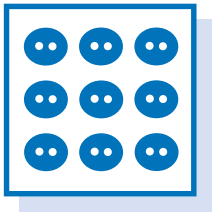
Introduction

Strategies for solving arithmetical problems

In becoming effective users of mathematics, students develop and use a range of methods of solving problems. These strategies tend to become more sophisticated as better ways of determining the answer are developed.

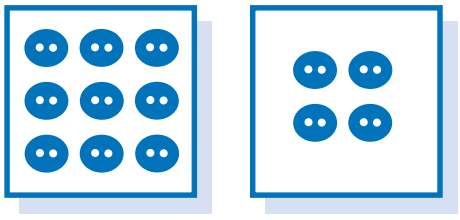
The range of strategies which students use to solve problems in mathematics is best described through an example.

Teacher: *How many buttons?*



Children learn the forward sequence of number words initially in the same way as they learn the alphabet, as a continuous string. To find the answer to this question they need to know the correct sequence of number words, to match the count to the objects and to recognise that the last number stated signifies the total.

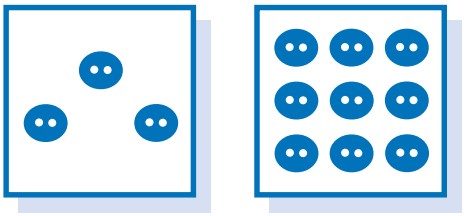
Teacher: *Now I have added some more buttons. How many altogether?*



A child who counts them all but starts again from one is using a less sophisticated strategy than a child who counts on from nine. To be able to count on from nine, children need to be able to cope with the forward sequence of number words. If you ask children what number comes after nine, they will often initially count from one to find the answer. In developing the ability to count on, students need to know the sequence of number words well enough to continue counting from any number.

Typically, students move through developing knowledge of the sequence of number words, to combining and counting all the objects they can see, to counting on and eventually to using addition facts.

Teacher: *If I have 3 buttons and I add 9 more, how many altogether?*



When approaching addition questions using a counting on strategy, a more sophisticated student will always count on from the larger number. Similarly, in answering 3 + 9, many students will often "bridge to ten", saying: "1 plus 9 is ten and I have 2 more, making 12".

The purpose of this example is to demonstrate the range of strategies students use and to emphasise the need to help them to develop sophisticated strategies. One of the difficulties with inefficient strategies is that, although they are slower, they still work. A student asked to find 8 + 3 can count out 8 then count out 3, and finally count all the objects to obtain an answer. If this strategy persists, the amount of mental effort needed to obtain the answer makes it difficult to achieve further learning.

It is important to learn to use addition facts automatically, as it allows the student to attend to other features of problems. Basic strategies can persist even after students develop more sophisticated approaches. Competent adults will occasionally revert to using their fingers to count on at times, because this strategy achieves the correct answer and doesn't require as much thinking as using addition facts.

As well as developing efficient "counting strategies" students need knowledge of the place value of numbers. This is aided by a growing understanding of ten as a unit. Many of the processes needed in addition and subtraction require students to "see" the ten in such numbers as 24. Understanding 24 as two tens and a four is essential in using the place value structure of numbers in addition and subtraction. Teaching activities, such as the Trading Game, emphasise the nature of tens and hundreds in numerals. As students trade up or trade down, they build the idea that each ten is a composite unit made up of ten ones. This same idea of forming a unit made up of smaller pieces is also of fundamental importance in measurement and in multiplication.

The notion of units within units is supported by such processes as combining and partitioning. Combining refers to bringing parts together; partitioning refers to separating the parts while maintaining a sense of the original number. It emphasises part-whole (sometimes called part-part-whole) number relations. That is, students see both the parts and the whole.

Can you see the 3, the 2 and the 5? 

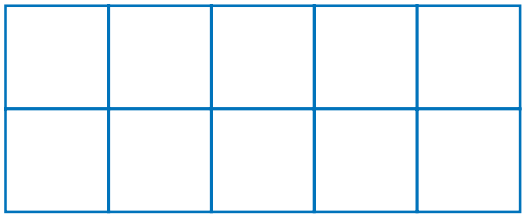
Interpreting number in terms of part-whole relationships makes it possible for children to think about a number as being composed of other numbers.

We often recognise the number associated with a particular pattern straight away, even before we have had time to "count" the items. This normally applies to small numbers of items.

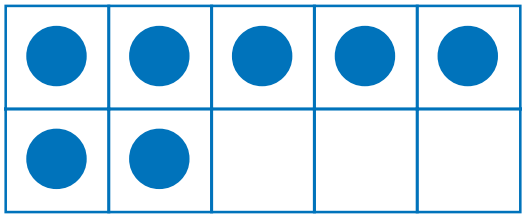
The process of immediately recognising how many items are in a small group is called subitising. This name comes from the Italian word *subito* which means "immediately" or "right now". When playing a game with dice we normally recognise the number of dots immediately.

The process of subitising can also be used with seeing parts in the whole. If you look at the dot pattern for five you become aware of seeing it also as four and one or three and two. Developing a rich knowledge of numbers such as five helps children to understand how each number is made up of other numbers.

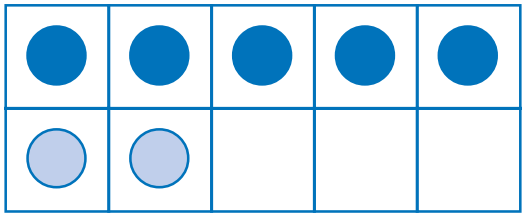
To assist students in forming a clear understanding of the base ten structure of numbers we can use organisers such as ten frames.



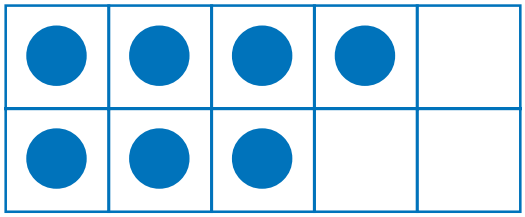
When these are used in conjunction with counters, students can model combining and partitioning in a structured way. Three counters and four counters can be combined to show the total of seven counters.



The ten frame also provides a visual link between seven and ten. Students can see that three more counters are needed to make ten. That is, the "negative image" is visible as well as the "positive image". It is also possible to use ten frames to explore partitioning numbers. If you ask students what they see when they look at the seven counters in the ten frame some will notice that seven is made up of five and two.



Indeed all the different number combinations or partitions of seven can be explored from the ten frame. If the ten frame is filled from the left it can be used to build students' knowledge of doubles and near doubles. For example, seven can be seen as one more than six (double three).



This knowledge of number combinations is very useful with addition and subtraction questions. To add 27 and 5 we often break the five into 3 and 2 to find the answer. This process of breaking numbers into parts is noticeable in mental calculations.

Just as ten is essential to our understanding of operations on numbers, five often acts as a base for mental calculation. This is due to students' early use of finger strategies with arithmetic. The ten frame is organised as five squares and five squares, which replicates the first organised material which students use, namely, two hands with five fingers on each.

An understanding of the framework of strategies which students use in early arithmetic enables teaching decisions to be based on knowledge of children's understanding of mathematics. The components of this framework are interrelated and interdependent. As an introduction to the nature of the framework, however, each component will be presented separately.

Students at the emergent counting stage

Students at the emergent counting stage

The nature of the learner

Students working within the emergent counting stage may be able to say some number words and may relate those words to the process of counting. However, the students cannot consistently reproduce the correct forward number word sequence (FNWS) or backward number word sequence (BNWS) between 0 and 10, when they are asked to count forward or backward.

Students at this stage are unable to correctly count collections of up to ten objects. They do not know all the number words and cannot coordinate the number words they know with items when asked to count a collection. That is, they cannot consistently match one number word to one item in the collection.

Students may be able to identify and name some numerals. However, they cannot consistently identify or name the numerals 0 to 10 or beyond.

Students at the emergent counting stage are yet to develop the skills required for true counting. That is, they are unable to correctly use counting to state the number of items in a collection and identify or name the numeral in order to label that collection.

Students at the emergent counting stage are working towards

- counting collections
- identifying numerals
- labelling collections.

Teaching considerations

When developing explicit number programs for students working at the emergent counting stage, you need to consider:

Identifying or naming

Identifying a numeral, when the name (in verbal form) has been provided for the student, is a different skill from naming a numeral which has been presented visually to the student.

Some students working within the emergent counting stage may have particular difficulty with naming numerals compared to identifying them.

You should ensure that students are given opportunities to consider and master both aspects.

The distinction between identifying and naming is emphasised in the following example.

Compare a student's response to being asked to point to the card with the numeral five on it and asking the student to say the number word when shown a numeral card.

In the first task the students need to identify the numeral in response to its spoken name, whereas in the second task the student needs to be able to name the written numeral.

Developing strategies

Students working within the emergent counting stage often rely on a single strategy when dealing with number activities.

Students might, for example, have developed knowledge of the forward number word sequence (FNWS) from 1 to 5. When asked to count collections, they would use their knowledge of the FNWS if the collection is limited to five items.

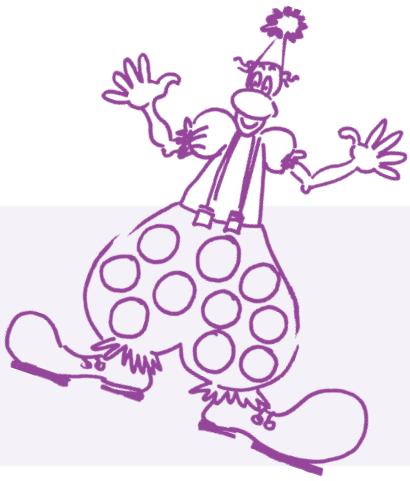
To support the development of numeral recognition, teachers should ensure that numeral cards are not always presented in sequence. When asked to identify the numeral 5, students working within the emergent counting stage often rely on their knowledge of the FNWS and count the

numeral cards to find the fifth one, rather than spontaneously identifying the numeral.

Scaffolding

To assist students at the emergent counting stage, scaffolding or support will be necessary. The following ideas assist in supporting the learner.

- Allow the students to work alongside other more capable students in the class.
- Model the activity before students are expected to complete the task independently.
- Allow extra time for the student to complete tasks.
- Develop tasks which repeat a concept using a variety of resources, thus providing revision.
- Limit the range of numerals being presented.



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Where are they now?

- When asked to count from one, students produce some number words.
- They may have some knowledge of number words, but not in the correct sequence.

Where to next?

Students :

- count orally to ten in the correct order
- name the number word before or after a given number
- match each number word to one, and only one, object when counting.

Outcomes

The following activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

ELFM 4:	demonstrates one-to-one correspondence
NES1.1	Counts to 30, and orders, reads and represents numbers in the range 0 to 20
NES1.3	Groups, shares and counts collections of objects, describes using everyday language and records using informal methods
WMES1.2	Uses objects, actions, imagery, technology and/or trial and error to explore mathematical problems
WMES1.4	Uses concrete materials and/or pictorial representations to support conclusions.

LFN reference*

Emergent counting
Forward number word sequence
Numeral identification

** Learning framework in number*

How?

Feather drop

Display to the students a row of canisters, such as empty film containers. Begin with three canisters and build up to five or beyond. Tell the students you have three feathers and then place them, one at a time, into the canisters. The students repeat the process of placing the feathers into the canisters.

Extend this activity by counting the feathers as they are dropped into the canisters. It is important to build the process of assigning one number word to one object.

Feathers from brightly coloured feather-dusters are suitable for this activity.

Egg carton drop

This activity is similar to Feather drop. For this activity replace the feathers with counters and ask students to drop them into an egg carton, matching one counter to each cup. Cut the egg carton into parts, one part containing three cups, one containing four cups and one with five cups.

These activities are used to develop one-to-one correspondence. As this skill develops, introduce the sequence of number words when completing the activity.

Handful of teddies

Organise students into pairs. The students take turns to pick up a handful of teddy bears and estimate how many they have picked up. One student then counts out the teddies to the other. The partner can check the count and repeat the process.

Follow this with one of the partners placing his or her teddies in a row. The second student then places a handful of teddies in a line, next to the partner's row. Encourage the students to compare the two rows of teddies and determine who has the greater number of teddies. This activity could be extended by having the students determine how many more teddies are in one line than are in the other line.

Paper cup drop

Place a row of paper cups on the floor or on a table. Encourage the students to count the empty cups. Ask the students to drop one counter into each cup and to count the counters as they are dropped into the cups. Direct the students to empty the counters from the cups and count the group of counters.

You may extend the activity by asking students to match numeral cards with the total number of counters.

Why?

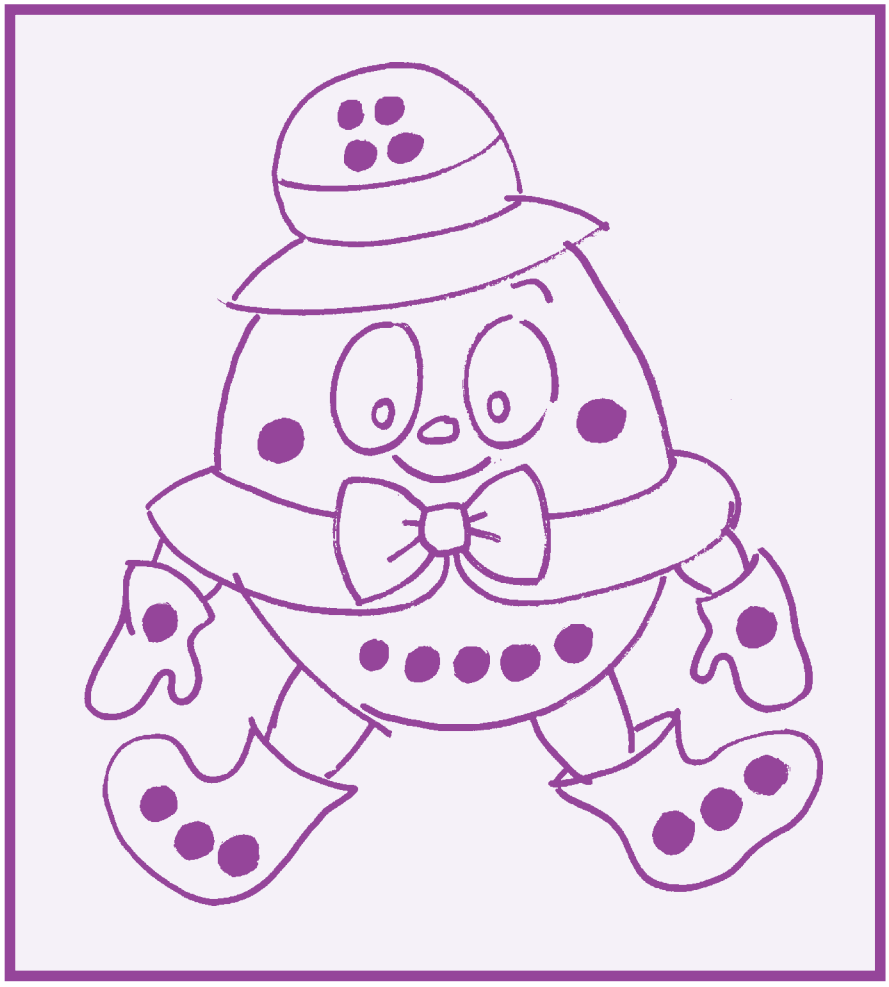
Students need to know that a set number of objects has the same numerical quantity, no matter how they are arranged.

Counting patterns

Lead the students in oral counting to ten. Coordinate body actions, such as clapping, clicking or stamping, with each number as it is counted. Alternatively, instruct the students to perform various body actions on alternate numbers, for example touching their shoulders on odd numbers and clapping on even numbers. Vary the activity to using voice patterns, such as counting softly on odd numbers and loudly on even numbers.

Egg game

Provide each student with a base board (see blackline masters on pp.58 and 59) displaying an outline of an egg. Cut a second egg outline into pieces to create a jigsaw. The first student rolls a die with a standard dot pattern and selects a piece of the "egg" jigsaw displaying a corresponding dot pattern. This piece is placed on top of the game board. Continue the game until all children have completed their egg.

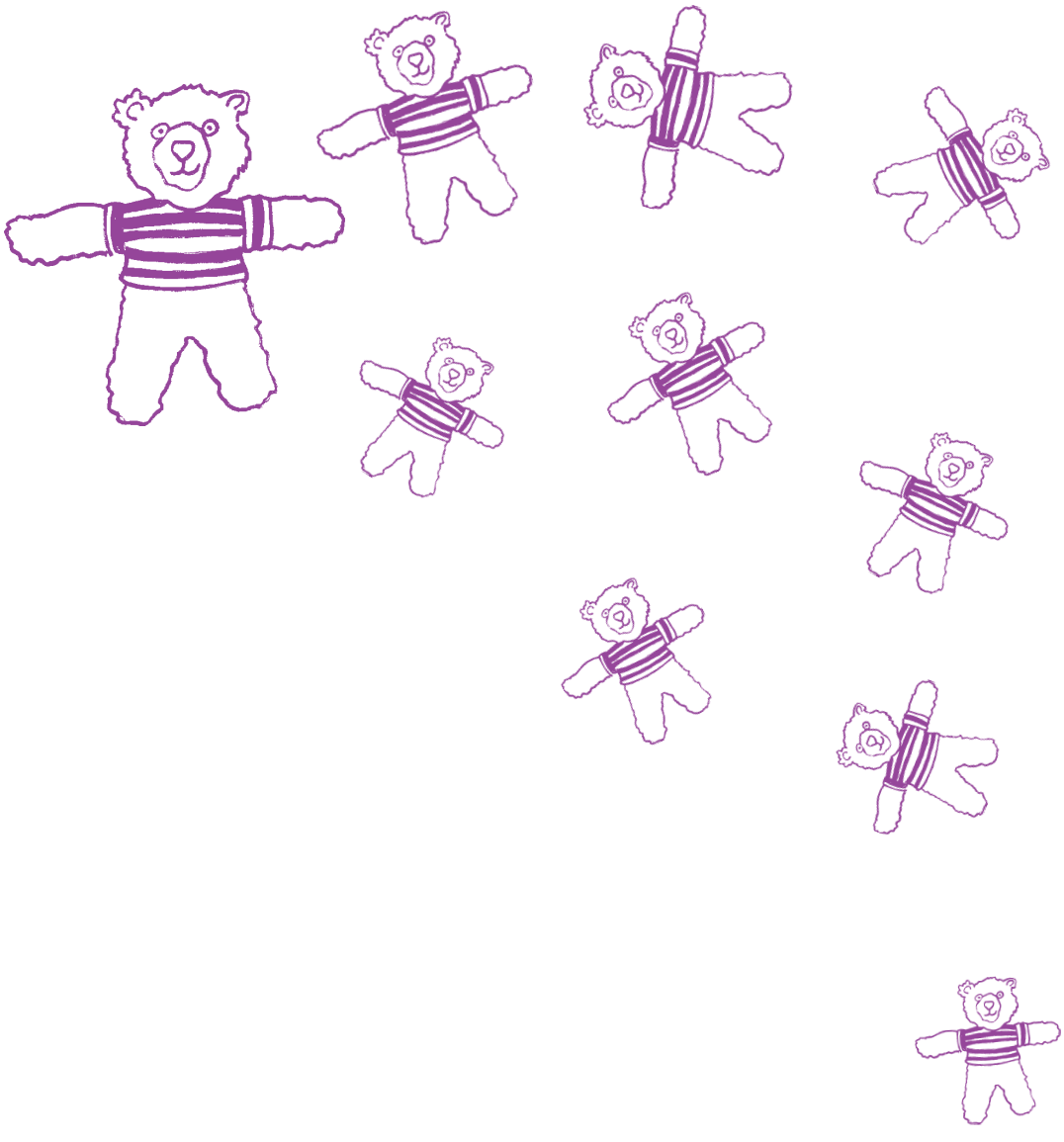


Ten pegs

Provide each student with ten clothes pegs and a length of cardboard displaying ten dots. Students take turns to roll a die and count the dots on the die. After counting the die pattern the student then takes a corresponding number of pegs and attaches them to the cardboard strip, matching each peg to a dot. Play continues until the students have attached pegs to all the dots on their strip of cardboard. They need to roll the exact number needed to finish.

Ten teddies

This activity is similar to "Ten pegs". Change the cardboard strip to show ten teddies in a line (see BLM pp.60 and 61). The student rolls the die, counts the dots and collects the correct number of plastic teddies to place onto the cardboard strip of teddies.



Why?

Students need to be able to match a number word to an object in order to count perceived items.

When introducing the forward number word sequence, concentrate on number words 1 to 5 before moving to 1 to 10.

At this stage concentrate on number words 1-5 when teaching the backward number word sequence.

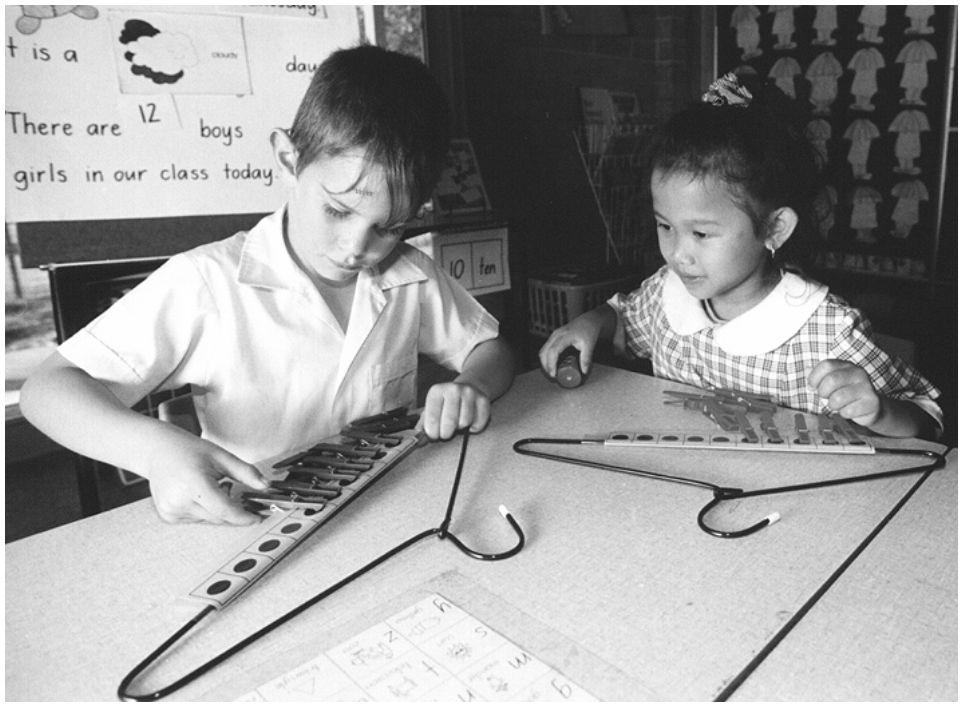
Throw and pin

This activity is similar to "Ten pegs". Substitute a fabric strip displaying ten large dots for the cardboard strip. The students take turns to roll a die. The number of dots on the uppermost face of the die indicates the number of safety pins to pick up. Students then attach each pin to a dot.

This activity should be completed with teacher supervision and attention given to the safety aspects.

Coat hangers

Provide each student with a coat hanger and ten clothes pegs. The students take turns to roll a die displaying dot patterns and attach the corresponding number of pegs to the coat hanger. They continue until all ten pegs are attached to the hanger. The exact number needed to form ten must be rolled to finish.



Ten frames

Provide each student with a ten frame (see BLM p.55) and ten counters. Students take turns to roll a die displaying dot patterns, count the dots and place the corresponding number of counters onto the ten frame. The exact number needed to complete the ten frame must be rolled to finish.

Why?

Instant recognition of dot patterns can lead to strong visualisation or mental images for students. This visualisation will assist them in counting and problem-solving tasks.

Have students fill the ten frame horizontally across the top row first. This emphasises "fives" in the ten frame.

Variation

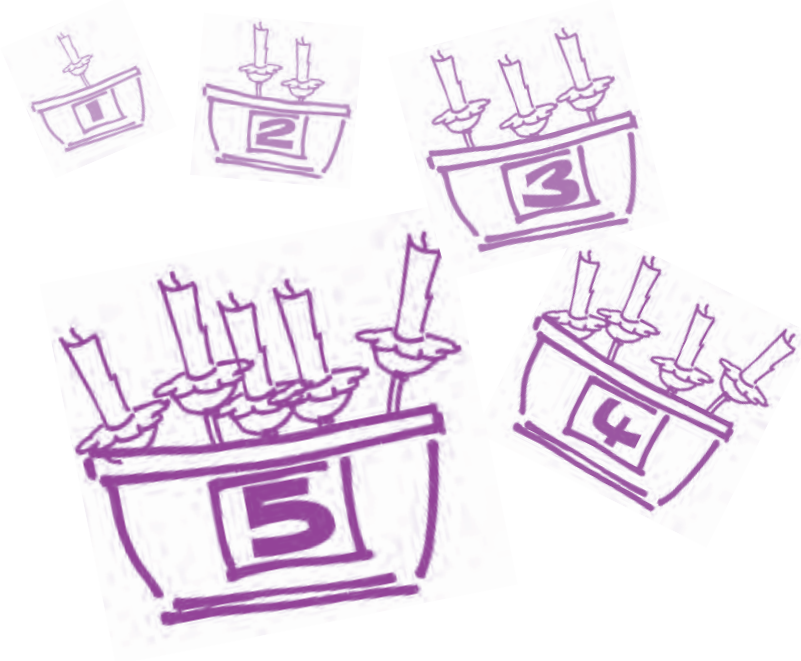
Ten frames

Substitute paperclips for counters. Students roll a die and collect the corresponding number of paperclips. They then slide them onto the ten frame squares (see BLM p.55).

Use the overhead projector to introduce and model ten-frame activities.

Candle holders

Place candle holders upright in six containers. Each container should hold a different number of candle holders within the range of one to six. Students take turns to roll a standard die. After counting the dots on the uppermost face, students count out a corresponding number of candles. Students then find a container with the same number of candle holders and place the correct number of candles in the candle holders. Students continue until candles have been placed in all the holders.



Containers could be made from strawberry punnets or plastic food containers filled with foam, plasticine or playdough to enable the candle holders to remain upright.

Pendulum swing

Construct a pendulum from plasticine and string. The teacher, or a nominated student, holds the pendulum, and the class joins in counting each swing.

Variation

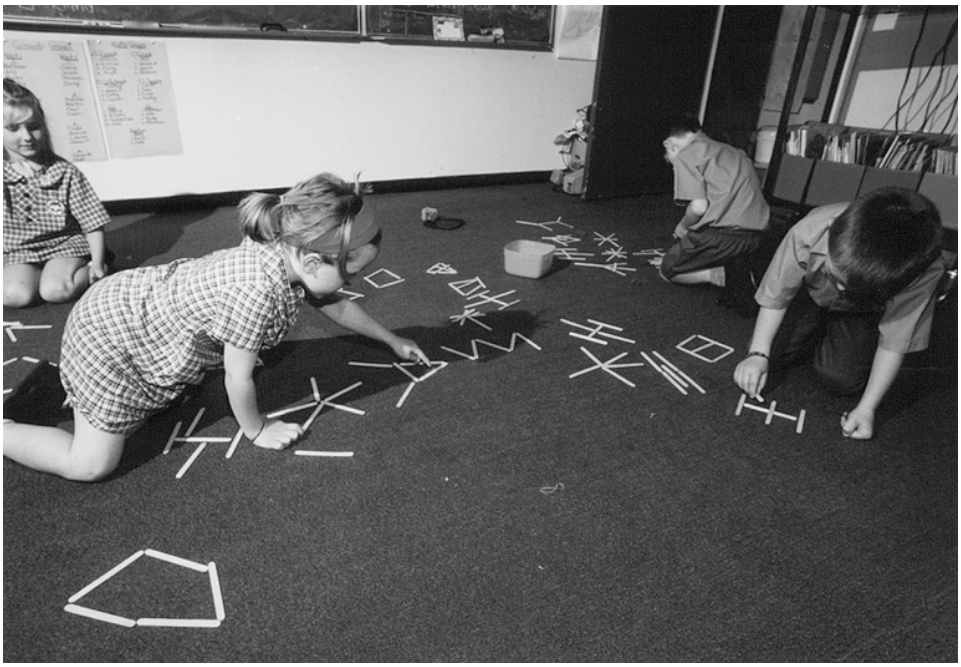
A metronome, if available, could be used to count along with each beat.

Physical activities

Ask individual students to complete such actions as skipping with a rope, bouncing a ball, star jumps or hopping, while the rest of the class counts each action in unison.

Popstick patterns

Distribute a pile of popsticks to the students. Each student is asked to count out five popsticks and use them to make a pattern. Students continue by making different patterns with five popsticks. The students then count the popsticks used for each pattern.



Variation

Use other material such as tiles, coloured paper squares, toothpicks, straws, pattern blocks or unifix blocks to make patterns.

Musical cushions

Place a number of cushions in a circle formation on the floor. Initially, begin with enough cushions so that there is one per student. Ask the students to count the cushions. This activity is played as for traditional musical chairs, with students skipping to music around the cushions. Once the music stops the students quickly sit down on a cushion. After a short period of time allow the students to stand up and then remove one of the cushions. Ask the students to count the cushions prior to playing the music. Continue the music and allow students to skip around the cushions again. Each time the music stops, the students find a cushion to sit on. Any student unable to find a cushion is out of the game.

Pose questions to the students which will encourage predicting and counting skills. For example, present the same number of cushions as children and ask the students to predict what will happen when the music stops.

Encourage determining the number before and after.

Why?

Students need to be proficient in forward number word counting to move to counting on strategies.

Where are they now?

Students are unable to identify and name all numerals 1-10.

Where to next?

Students automatically recognise numerals 1-10.

Outcomes

The following activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

ELFM 4: demonstrates one-to-one correspondence

NES1.1 Counts to 30, and orders, reads and represents numbers in the range 0 to 20

NES1.3 Groups, shares and counts collections of objects, describes using everyday language and records using informal methods

PAES1.1 Recognises, describes, creates and continues repeating patterns and number patterns that increase or decrease

WMES1.1 Asks questions that could be explored using mathematics in relation to Early Stage 1 content

WMES1.4 Uses concrete materials and/or pictorial representations to support conclusions.

LFN reference

Numeral identification
Forward number word sequence

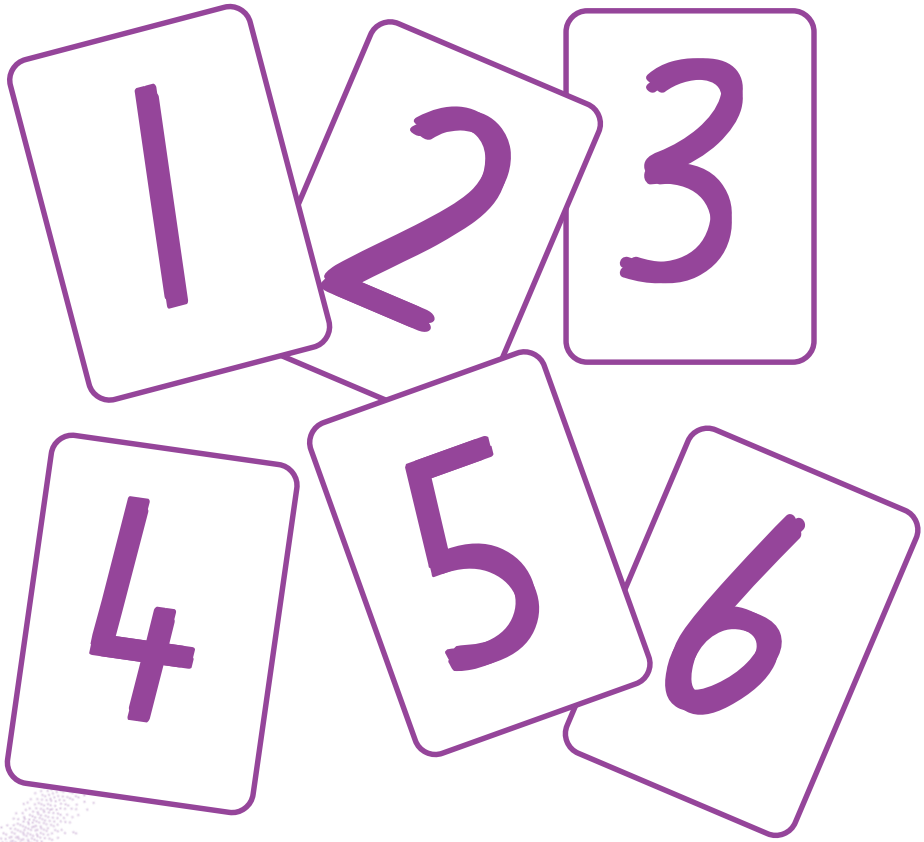
How?

Posting blocks

Label containers with numerals 1 to 5, one numeral for each container. Instruct students to drop the correct number of blocks into each container as indicated by the label on the outside. As the students become proficient in the range 1-5, extend the activity to numerals 1-10.

Take a numeral

Provide the students with a set of numeral cards for the numbers one to six (see BLM p.57). Arrange the numeral cards face up on the floor in front of the students. The students take turns to roll a standard die and select a corresponding numeral card. If the card has already been taken the student forfeits a turn. Play continues until all cards have been taken.



Make multiple copies of each card as they will be used for many of the suggested activities.

Mothers and babies

Duplicate and cut out cards displaying a set of bear cubs in the range one to ten (see BLM pp.62,63). Construct a second set of mother bear cards displaying numerals in the range 1-10. Students select a "cub card", count the cubs and match the card to a corresponding mother bear card. Students continue until all cards have been matched.

These activities are suitable for either partners or individuals. However, it may be beneficial to have a more competent student paired with a student at the emergent counting stage to support effective peer tutoring.

Beehive

Construct base boards displaying beehives with numerals written on them (see BLM pp.64,65). Create a supply of cut-out bees. Students state the numeral written on the hive and collect the correct corresponding number of bees. They then attach the bees to the hive, using paperclips or fold-back clips. Other students in the group should count the bees to confirm that the number of bees matches the numeral on the hive.

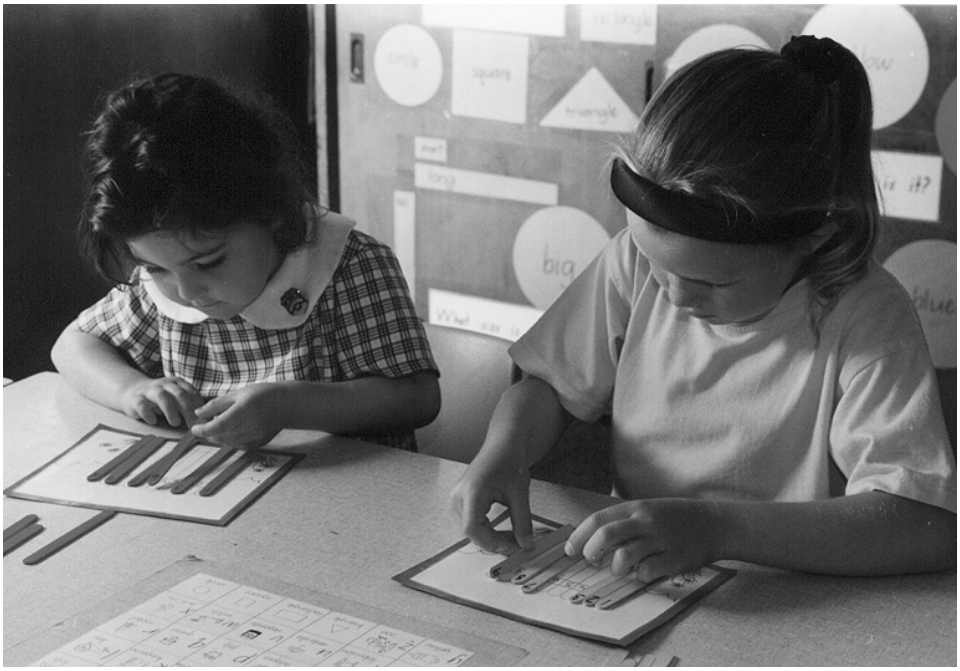
Concentration

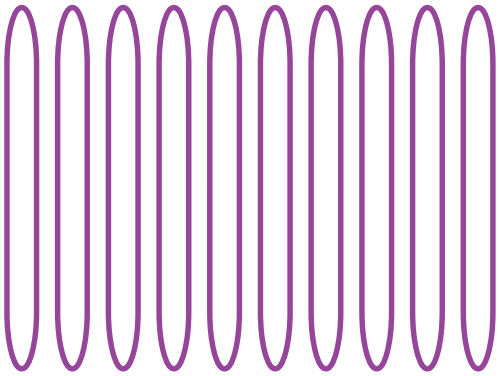
Make two sets of cards containing the numbers one to five. One set of cards should display dot patterns for each numeral and the other set display the numerals. Place the two sets of cards face down on a table forming two rows. Students take turns to turn over two cards. If the cards match, that is a dot pattern and a numeral card for the same number, the student keeps the pair. If the cards do not match, the student turns the cards back over. The game continues until all cards have been matched.

It is easier if the dot cards are on cardboard of a different colour from the numeral cards.

Fences

Construct sets of fence base boards using the BLM on p.56 and popsticks displaying numerals in the range 1 to 10 for each student or pair of students. Students match the numerals on the popsticks with the numerals written on the base boards. Extend this activity by constructing base boards displaying blank fences. The students sequence the numbered paddle pop sticks along the fence.





Why?

Students need to name and identify numerals in order to record their mathematics.

Students need to be able to use the corresponding numeral for a set of objects.

Hang it on the line

Hang a washing line (nylon rope or similar) across the chalkboard or between two chairs. Ask the students to peg numeral cards in the correct sequence onto the washing line. Vary this activity by having students peg the cards in a backwards sequence or by displaying some numeral cards on the line and asking students to replace the missing cards correctly.

Sandwich boards

Attach coloured shoelaces to large numeral cards so they can be hung around the students' necks. Provide each student with a numeral card. Students move around the room to music. Once the music stops the students arrange themselves into a line in a correct forward or backward number sequence.

Variations

Provide each student with a numeral card. Students collect the correct number of objects from around the room to match their card. For example, a student with the numeral card "three" might collect three pencils.

Distribute all but one of the numeral cards. Students organise themselves into a line to sequence their number cards and discover which numeral is missing.

The price is right (higher/lower)

For this activity a leader thinks of a secret number. Display a vertical number line on the chalkboard to indicate the range in which the secret number lies. The leader asks the group to try and guess the "secret" number. The leader responds to the groups' guesses by stating if the secret number is higher or lower than the suggested number. Attach two pegs to the vertical number line. As the group make their guesses the leader can move the pegs to indicate the range in which the secret number lies.

Guess the number

Display a number line in the range 1 to 10 on an overhead projector. Select a number in the range. Students attempt to guess the "secret" number. If the guess is incorrect, cover the numeral on the number line with a counter. Continue the activity until the students are able to identify the number correctly. As the students become more competent, extend the range of numerals.

Count and classify

Construct numeral base cards and collections of objects for each number indicated on the numeral card. For example, for the numeral cards one to five collect one toy boat, two plastic cars, three rocks, four lids and five buttons. Students classify the objects. Ask the students to match the correct numeral card to the set.

Commercially produced kits are available.

Numeral flip strip

A flip strip is a hinged cardboard strip. The hinge, usually a plastic spiral, joins two cardboard strips along the top edge. In this way the top cardboard strip can be lifted to reveal the bottom cardboard strip. The top piece of cardboard is cut into vertical strips. Numerals are written on the bottom piece of cardboard or on another piece of cardboard which can be attached between the two hinged strips.

Conceal a number line between the flaps of the flip strip. Direct students to determine the missing numerals, before, after, or between nominated numbers on the flip strip, by lifting the strips. Then answers can be verified.

Vary the beginning number on the numeral line so students do not memorise the numeral by its position. For example, you may begin with the numeral three instead of one.

Teacher:	If I lift this flap tell me the number you can see.
Students:	Three!
Teacher:	Well, can you work out which number will be under this flap?
Students:	Five!
Teacher:	Let's lift the flap and check. Were you right?
Students:	Yes!
Teacher:	Now let's count on from three.
Students:	Three, four, five.

The number dance

Allow students to dance freely around the room to music. By using a prearranged signal, such as tapping a tambourine, indicate to the students that you are holding up a numeral card. The students then form groups with the number of people indicated by the numeral card and continue to dance in the group.

Why?

Students need to know the corresponding numeral for a set of objects.

What's in the square?

On a large sheet of cardboard construct a 5 x 6 grid. Along the top row of the grid write the numerals one to five, starting from the second column. Down the first column, starting from the second square, draw a different symbol in each square. Students complete the grid by drawing the correct number of shapes onto each blank square.

Alternatively, provide the students with cut-out shapes corresponding to those drawn in the first column. The students count out the correct number of shapes and place them appropriately on the grid.

	1	2	3	4	5
▲					
●					
★					
■					

Commercially produced kits are available.

The number train

Construct a train from Lego® blocks or cut-off milk cartons. Display a numeral on each carriage of the train. Students place the correct number of items, such as Lego® people, counters or blocks, into each carriage. Instruct partners to count the items in each carriage to confirm that the collection of items corresponds with the numeral.

Make a zoo

Construct clear plastic containers, such as strawberry punnets, displaying numerals in the range one to five and collections of zoo animals for each number indicated on the containers. For example, one elephant, two camels, three tigers, four zebras and five monkeys. Direct students to sort the animals and place each group into a plastic container, ensuring that the number of animals matches the numeral card on the container.

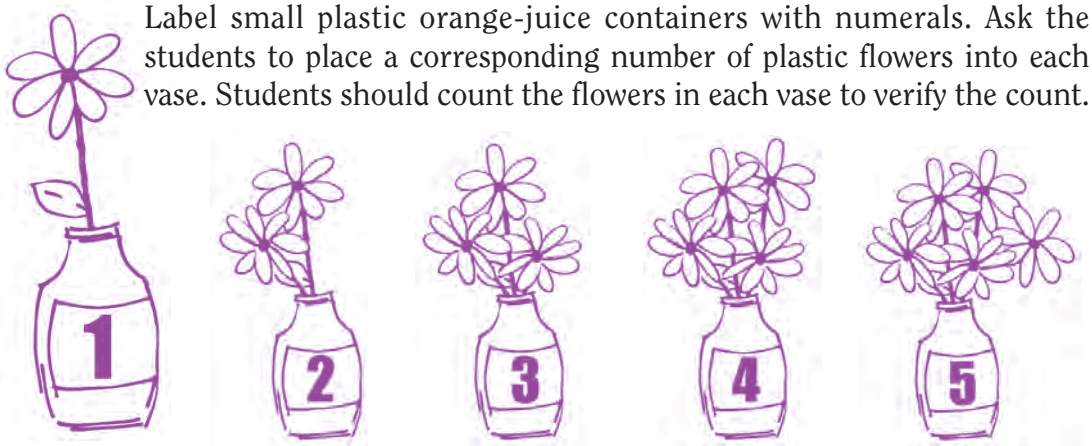
Paperclip cards

Ask students to slide the correct number of paperclips onto numeral cards. Place the numeral cards in either a forward or backward counting sequence.

Vary this activity by asking students to form a chain of safety pins and attach it to the fabric strip with the corresponding numeral. This activity will need to be completed under teacher supervision and attention paid to safety aspects.

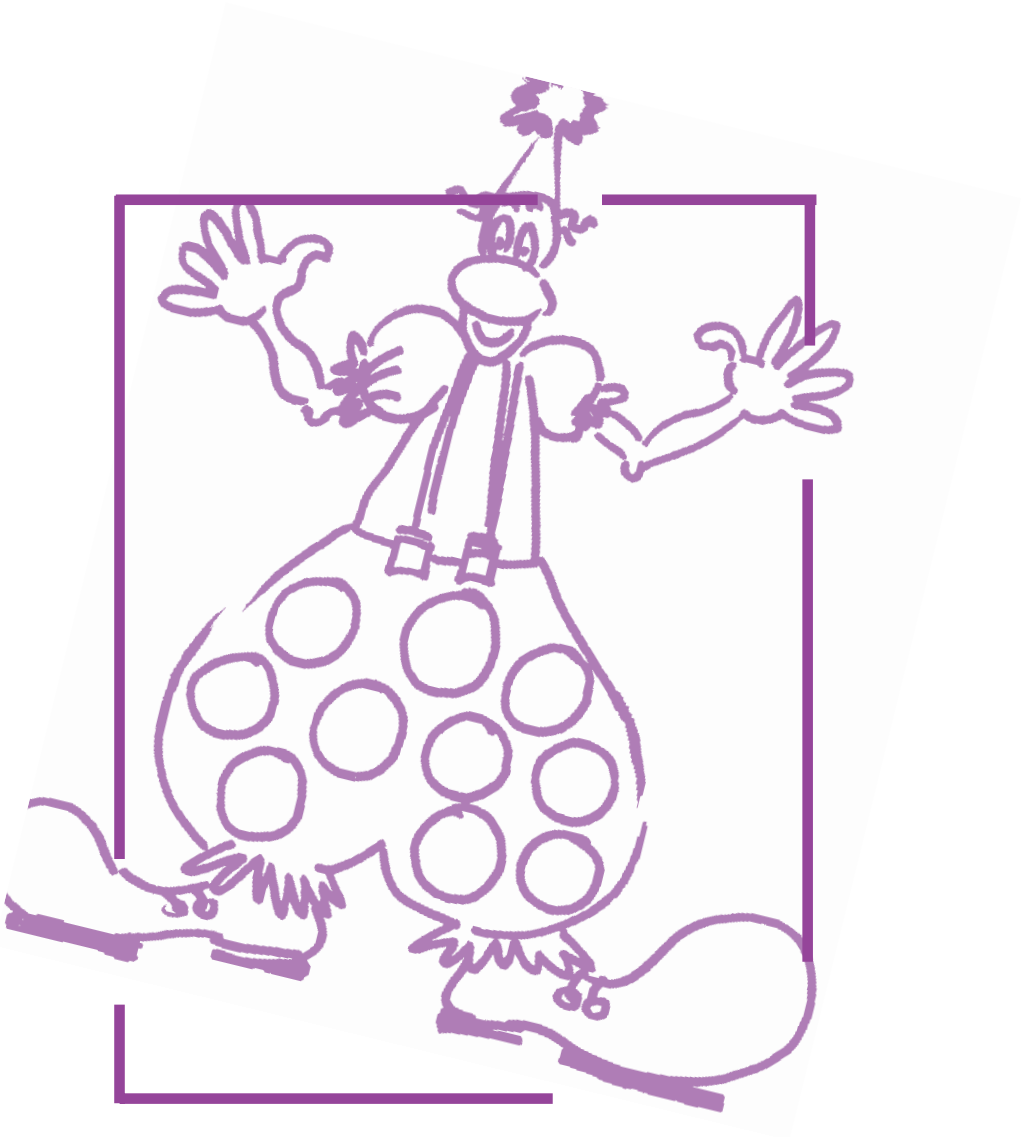
Flowers in the vase

Label small plastic orange-juice containers with numerals. Ask the students to place a corresponding number of plastic flowers into each vase. Students should count the flowers in each vase to verify the count.



Colourful clowns

Construct base boards with an outline of a clown wearing oversized trousers (see BLM p.72). Ten circles are drawn on the trousers. Students roll a die and collect a corresponding number of counters. The counters should all be of the same colour. Instruct the students to place the counters onto the circles on the clown's trousers. On the next roll the student repeats the process, using counters of a different colour. The process continues until all circles are covered. To finish, students must roll the exact number needed to cover all the circles. When all circles are covered, students make statements about their clown's trousers. For example, "My clown has three red circles, five green circles and two yellow circles on his trousers."



Hidden treasure

Collect boxes to represent treasure chests and label them with numerals. Randomly place the "treasure chests" on the floor. Ask students to close their eyes while a "secret treasure" is hidden under one of the boxes. Students ask questions to determine which "chest" contains the treasure. For example, "Is the treasure under chest number four?" As a student nominates a chest, another student locates the chest displaying the nominated numeral and looks to see if the secret treasure is under the box.

Peg boards

Construct ten frames from cardboard and punch a hole in the centre of each square large enough for golf tees to pass through without the head of the tee falling through the hole. Provide ten golf tees with each ten frame for the student. Students select a numeral card and place a corresponding number of tees into the ten frame.

Variations

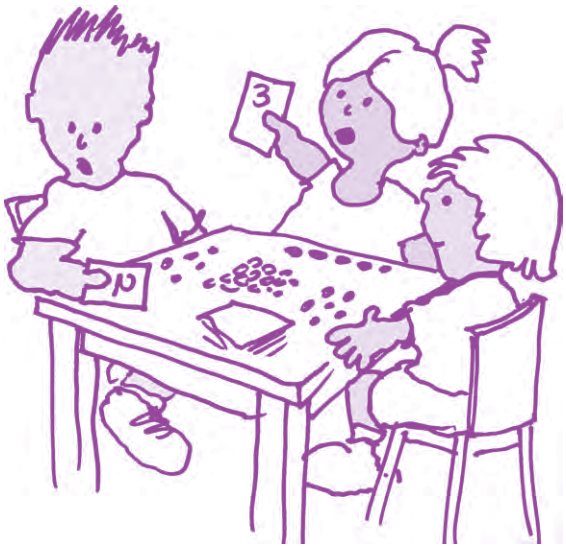
Students roll a die, collect the correct number of tees and place them into the ten frame.

Attach numeral tags to the end of each ten frame card.

Students read the numeral tag, then place the correct number of tees into the ten frame.

Pick up chips

Construct a deck of dot pattern cards for numbers one to six with four of each pattern. Distribute five counters to each player and place 100 counters in a central pile. Shuffle the cards and place them face down in the centre of the table. Students take turns to take a card from the pile and pick up a corresponding number of counters from the central pile to add to their collection. That is, a student who draws a "three card" collects three counters from the central pile. The activity continues until all cards have been drawn. The student with the most counters wins. Vary the game by adding "magic numbers". For example, if a "magic two" is drawn, the child takes two counters from all other players. If a "crazy five" is drawn, the player puts five counters back into the central pile. A player who runs out of counters is out of the game.



I feel

This activity is designed for a pair of students. Instruct one partner to sit opposite a row of numeral cards. The other student stands behind the partner and taps him or her on the shoulder a certain number of times. The student who is sitting counts the number of taps and picks up the numeral card which corresponds to the number of taps.

Numeral chairs

Attach numeral cards to the seats of chairs. Give each student in the group a card illustrating a group of objects. Students count the objects and, on a given signal, sit on the chair displaying a corresponding numeral card.

King or queen for a day

Construct a crown for a student who will be the class Queen or King. Attach a numeral card to the crown. Other students present a collection of items to the Queen or King, corresponding to the numeral card.

Object hunt

Construct picture cards showing different objects found in the classroom. The teacher should display the picture card and direct nominated students to move from the point where they are standing in the classroom to the actual object. The class counts the number of steps it takes the student to reach the object.

Teddy bear race

Construct playing boards for each pair of students using the BLM on p.66. Line up plastic teddies at the start of the playing board, so that one teddy is on each numeral. Students take turns to roll a die and move a teddy one space each time its corresponding numeral is rolled. Play continues until all teddies reach "home" on their playing board.

Patty papers

Present a collection of patty papers to the students. Write a numeral in the range one to ten on the inside of each patty paper. Instruct the students to place the correct number of items, such as counters, shells, beans or rocks, into each patty paper according to the numeral that is written on the bottom.

Why?

Students need to recognise and identify numerals in order to record their mathematics.

Students need to know the corresponding numeral for a set of objects.

Where are they now?

Students are unable to recognise and state the number of dots arranged in a standard die pattern for numbers one to six without counting the dots.

Where to next?

Students automatically identify and name a number when shown standard dice patterns.

Outcomes

The following activities provide opportunities for students to demonstrate these outcomes. A student:

ELFM 2: demonstrates an awareness of pattern

NES1.1 Counts to 30, and orders, reads and represents numbers in the range 0 to 20

WMES1.3 Describes mathematical situations using everyday language, actions, materials and informal recordings

WMES1.4 Uses concrete materials and/or pictorial representations to support conclusions.

LFN reference

Subitising and spatial patterns

How?

Look and say

Hold up dot pattern cards for approximately one second each. Students state the number of dots that were shown on the card. This should be a fast "drill" activity to encourage automatic responses in students rather than the counting of dots.

Look and say (overhead)

Make a pattern with transparent counters on the overhead projector and turn the light on for only a second. The students call out the number of dots they see. Switch the light of the projector back on to allow students to check their answer.

Look and snap

Place numeral cards in front of the group of students about to play this game. Briefly flash a dot pattern card to the students in the group. The aim of the game is for the students to recognise the dot pattern, say the number of dots they see and locate the corresponding numeral card. Students "snap" the correct card by quickly placing their hand on the card. The first student to snap the correct card keeps it. The student with the most cards at the end of the game wins.

Feel and find

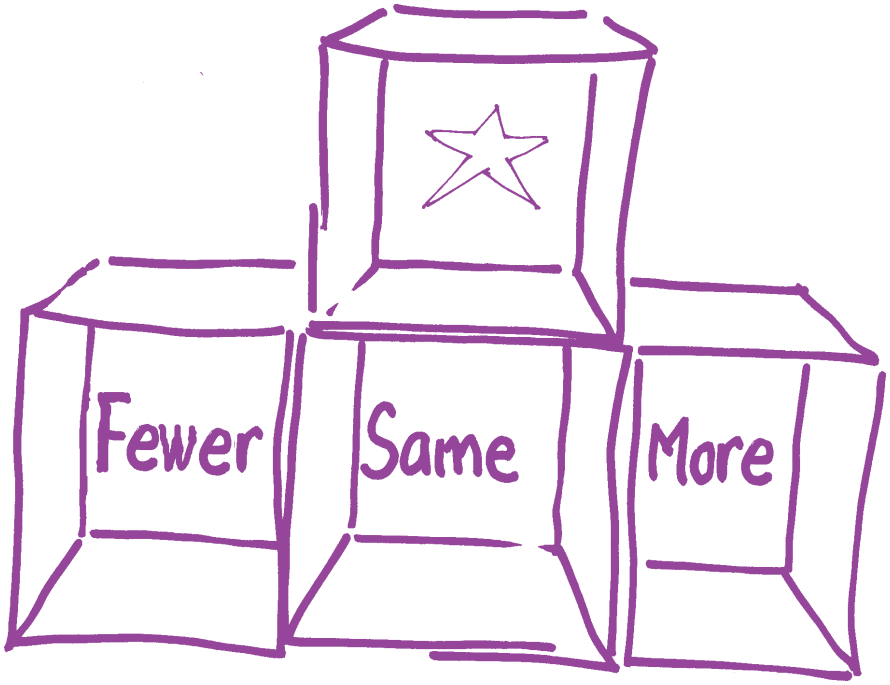
Construct a set of dot pattern cards with raised dots. Using a scarf or other appropriate item, blindfold a student. Select one of the dot cards and show the card to the remainder of the group. Hand the card to the blindfolded student, allowing him or her to feel the card for a short period of time. Return the dot pattern card to the set. Remove the blindfold from the student and ask him or her to identify the dot pattern card previously held.

More, fewer or the same?

Provide students with a pack of cards displaying dot patterns and a sorting tray (see diagram). Students draw one card from the pack and place it at the top of the sorting tray indicated by a star. As each successive card in

the pack is drawn the student places it into an appropriate box in the sorting tray. To do this the student will need to determine if the drawn card has the same number of dots, more dots or fewer dots than the one at the top of the tray.

This activity can be modified to be more specific by sorting cards into one-more-than or one-fewer-than the card at the top of the tray.



Speedy dominoes

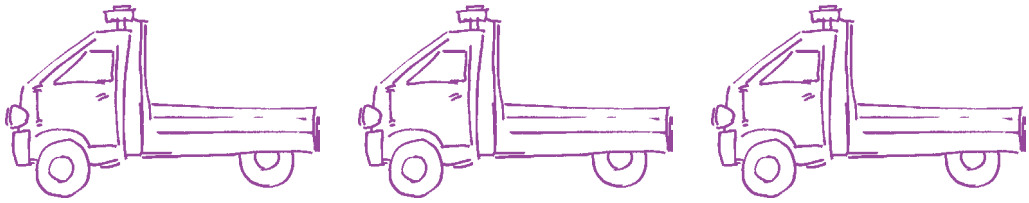
Distribute domino pieces to the players. This activity is played in the same way as regular dominoes, except that there is no turn taking. As soon as players see the opportunity to place a domino in the game, they may do so. The first player to correctly place all dominoes is the winner.

Robot race

Provide each student with a set of ten dot pattern cards for numbers one to ten and a playing base board (see BLM pp. 68 and 69). A nominated person shuffles the cards and places them face down on the "YOU WIN" robot. Students then take turns to draw dot pattern cards from the pack and place them on a robot outline displaying a corresponding numeral. The first student to correctly place all cards and reveal the "YOU WIN" sign on the base board is the winner.

Load the trucks

The same instructions apply as those used with Robot race. The truck base board is used instead of the robot base board (see BLM pp.70 and 71. BLM on pp. 67 may also be used).



Snap

Construct a set of dot pattern cards with multiple copies of each pattern. A nominated person distributes the cards among the students. Students then take turns to place a card down to form a central pile. Instruct the students to place the cards face up so the group can easily see the card. As soon as matching pattern cards are placed one on top of the other, any student may "snap" the pile by placing a hand over the pile of cards. The first to "snap" the cards wins the pile and the game continues until one player has all the cards.

Make a pattern

Provide students with ten counters and ask them to place them on the desk in front of them. Display a dot pattern using transparent counters on the overhead projector and flash the pattern to the students for approximately one second. The students quickly make the same pattern using the counters on their desks. Discuss the number of counters used to make the pattern.

Why?

When introducing children to numbers in the range one to five we want them to develop strong mental images for those numbers. We want children to automatically recognise a group of five counters, for example.

When children instantly recognise a set of objects and are able to associate a number word with the set, the need for the child to count from one is eliminated.

Assessment tasks

Task	Student response	Assessment
T: "Start counting from one and I'll tell you when to stop."	S: States the forward number word sequence from one to ten accurately.	Does the student know the FNWS?
T: "Count backwards from ten to one."	S: States the backward number word sequence from ten to one accurately.	Does the student know the BNWS?
T: Displays a set of numeral cards from 0 to 10. T: "Point to numeral ..... (Do not place numeral cards in order. Do not ask numerals in sequence.)	S: Points without hesitation to the correct numeral as it is given by the teacher.	Can the student identify any or all of the numerals from 0 to 10?
T: Holds up numeral cards in the range from 0 to 10. "Tell me the name of this numeral."	S: Without hesitation says the correct name of the numeral being displayed by the teacher.	Can the student name any or all of the numerals as they are displayed?
T: Holds five counters and openly displays them to the student. "How many counters do I have here in my hand?"	S: As s/he touches each counter s/he says a number word in correct sequence from one to five.	Does the student know and name the FNWS? Does the student have a one word, one counter match?
T: Displays a container of approximately 20 counters to the student. "Give me six counters from the pile."	S: Takes counters from the container and correctly says the FNWS until six is reached.	Does the student: • know the FNWS? • have a one word, one counter match? • stop at six? • have a concept of the number of items in a collection?
T: Displays a set of numeral cards from 0 to 10 and a large container of counters. Points to various numerals and each time says to the student: T: "Make a pile of this many counters".	The student makes the correct collection of counters to match each numeral in the set displayed.	Does the student: • know the FNWS? • have a one word, one counter match? • have a concept of the number of items in a collection?

Three-minute lesson breakers

- As students complete a lesson, have them count the number of steps they take in returning to a central position in front of the teacher. Teachers may then direct students to find another student who counted the same, one less, or one more step, than they did.

- The teacher, or a nominated student, leads the class in a game of Simon says, where a number has been nominated. For example, if the number three has been nominated, then every Simon says action should be done three times.

- The teacher nominates a number and students must look for a collection with that number of items. This should be played quickly so that students are encouraged to identify collections visually.

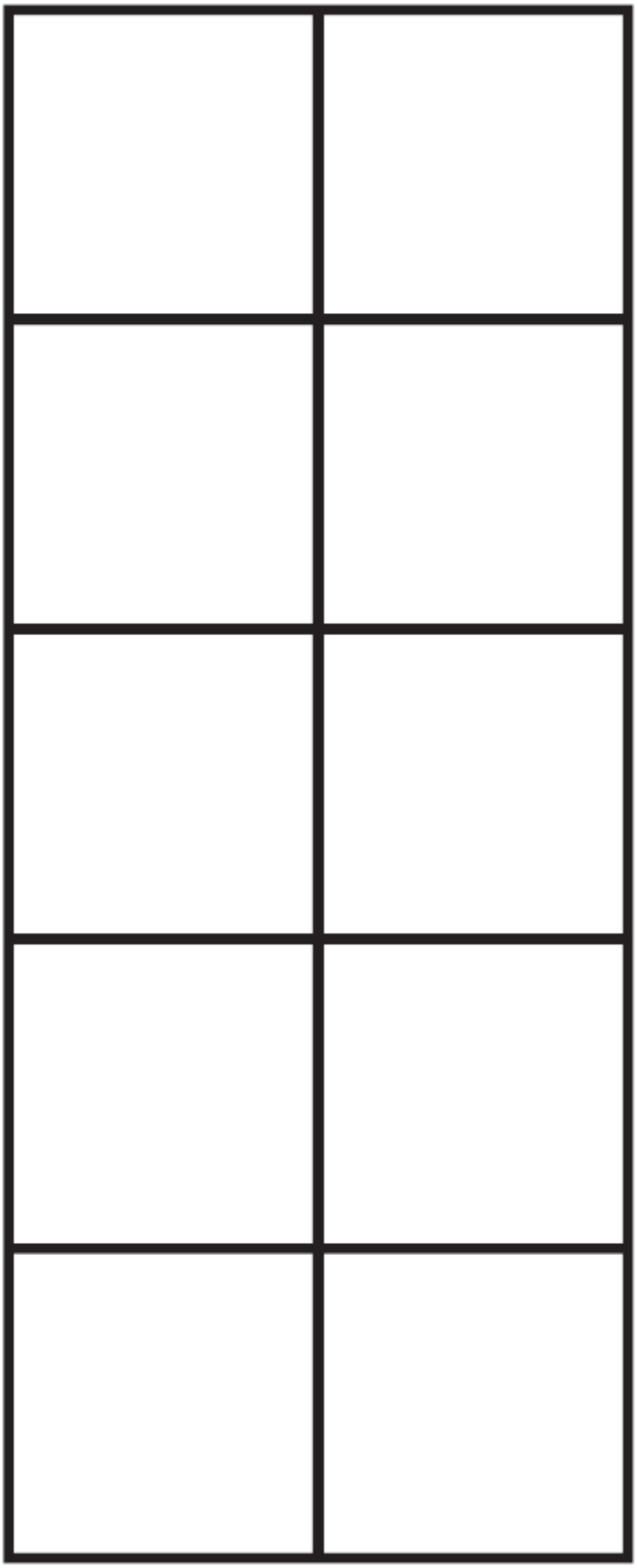
- Use routine classroom activities involving the calendar and roll marking, for example, counting the number of boys and girls at school and the number of students altogether.

- Students sit in a circle. A nominated student draws a numeral on another student's back. The second student must recognise the numeral and draw it on the back of the next student. This continues around the circle until the last student writes the numeral on the blackboard.

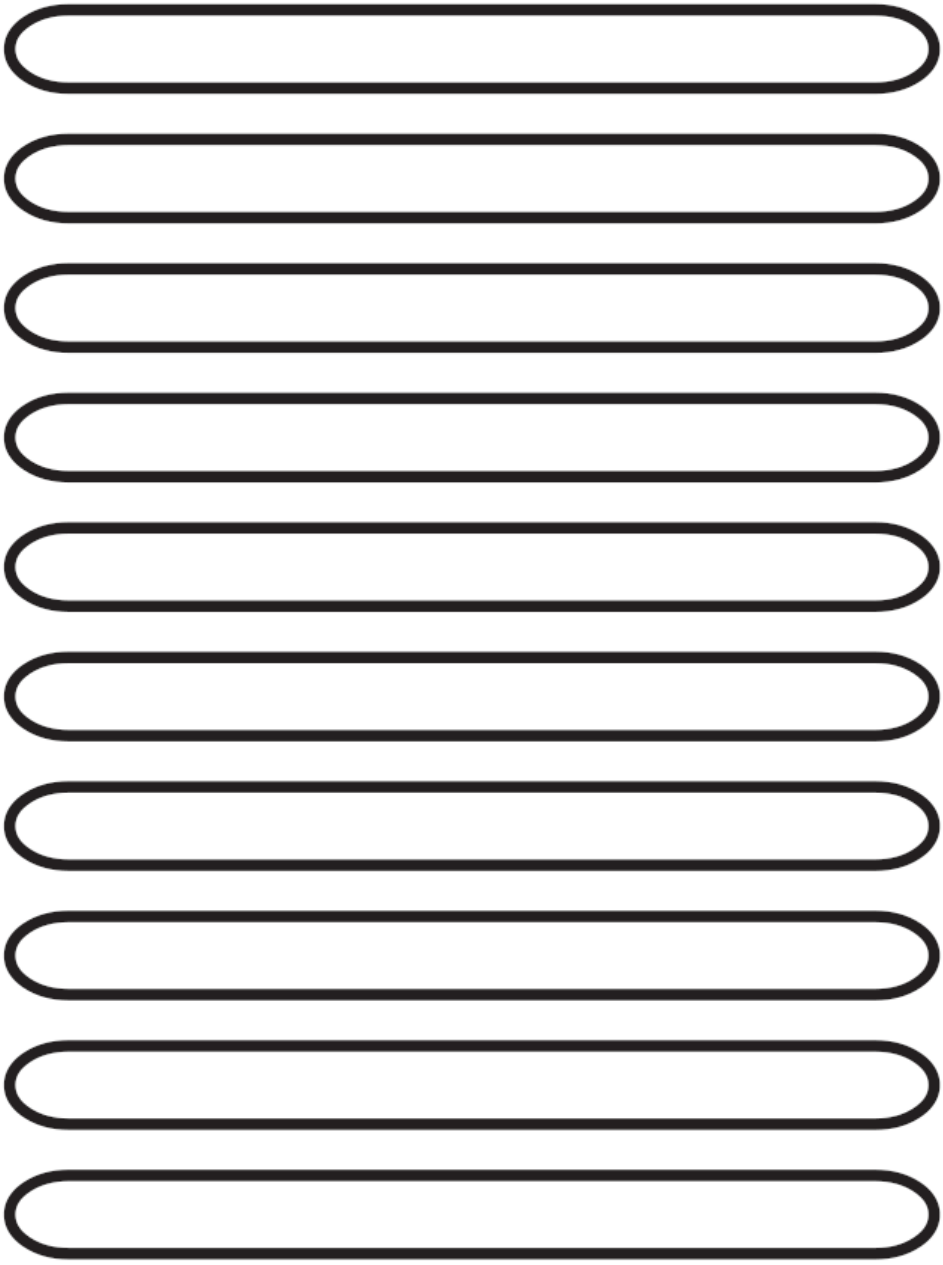
- Class counting from one by ones. Record the highest number the class can reach. For example: "Today we counted to ..."

Blackline masters
Emergent counting stage

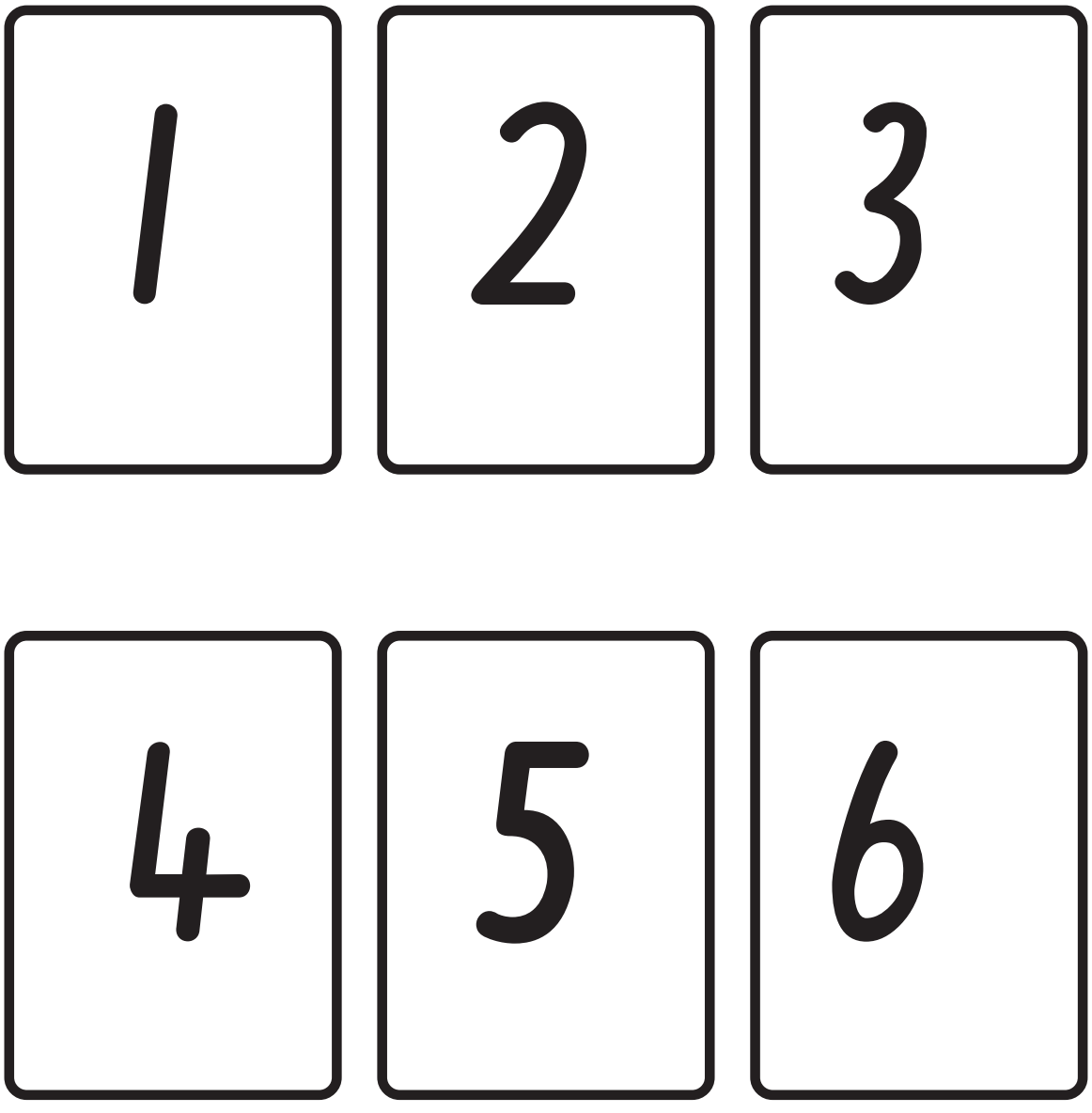
Ten frames



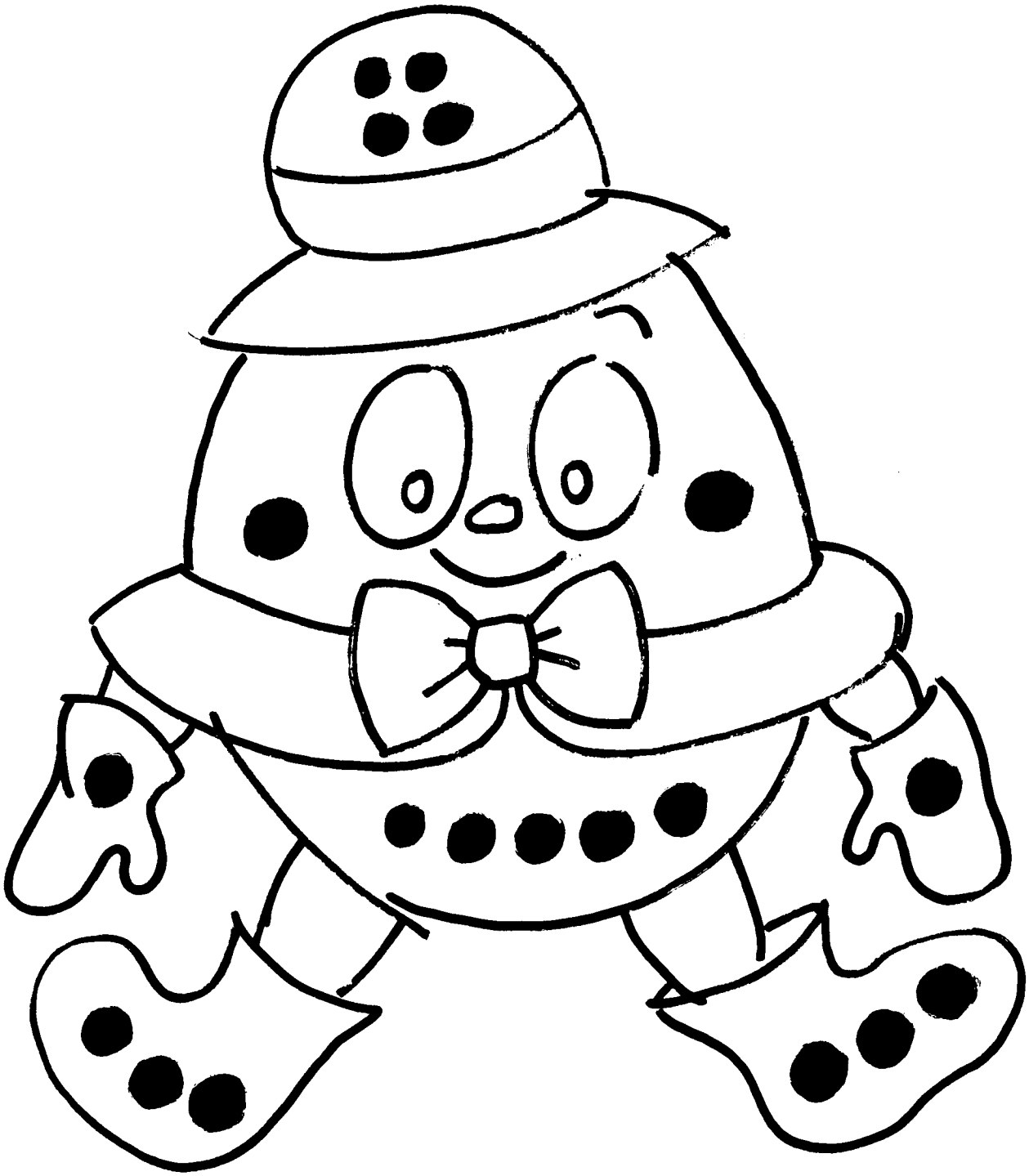
Fence



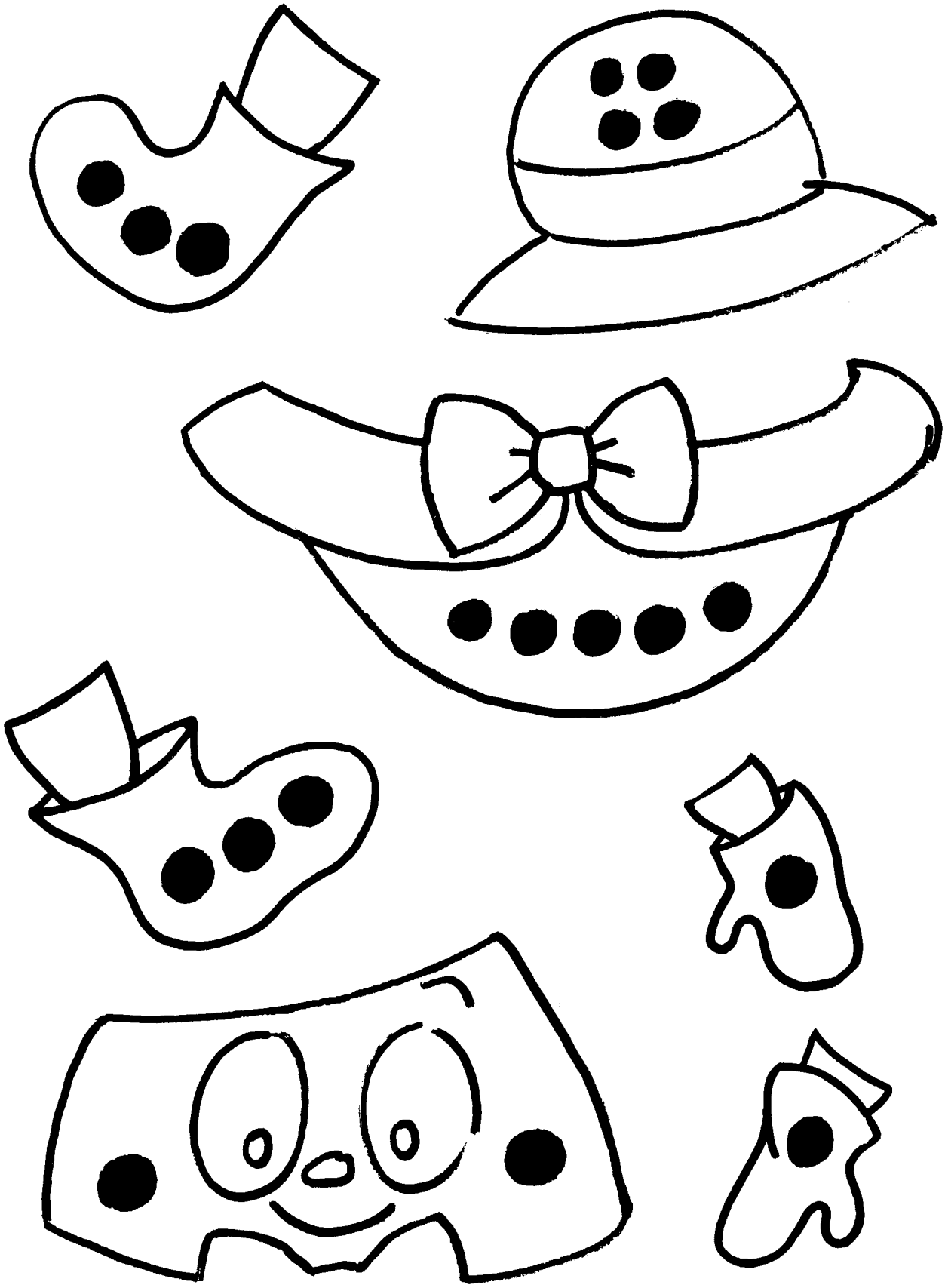
Cards 1-6



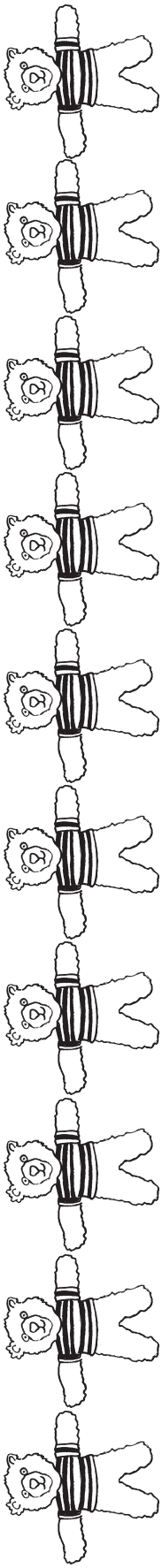
Egg



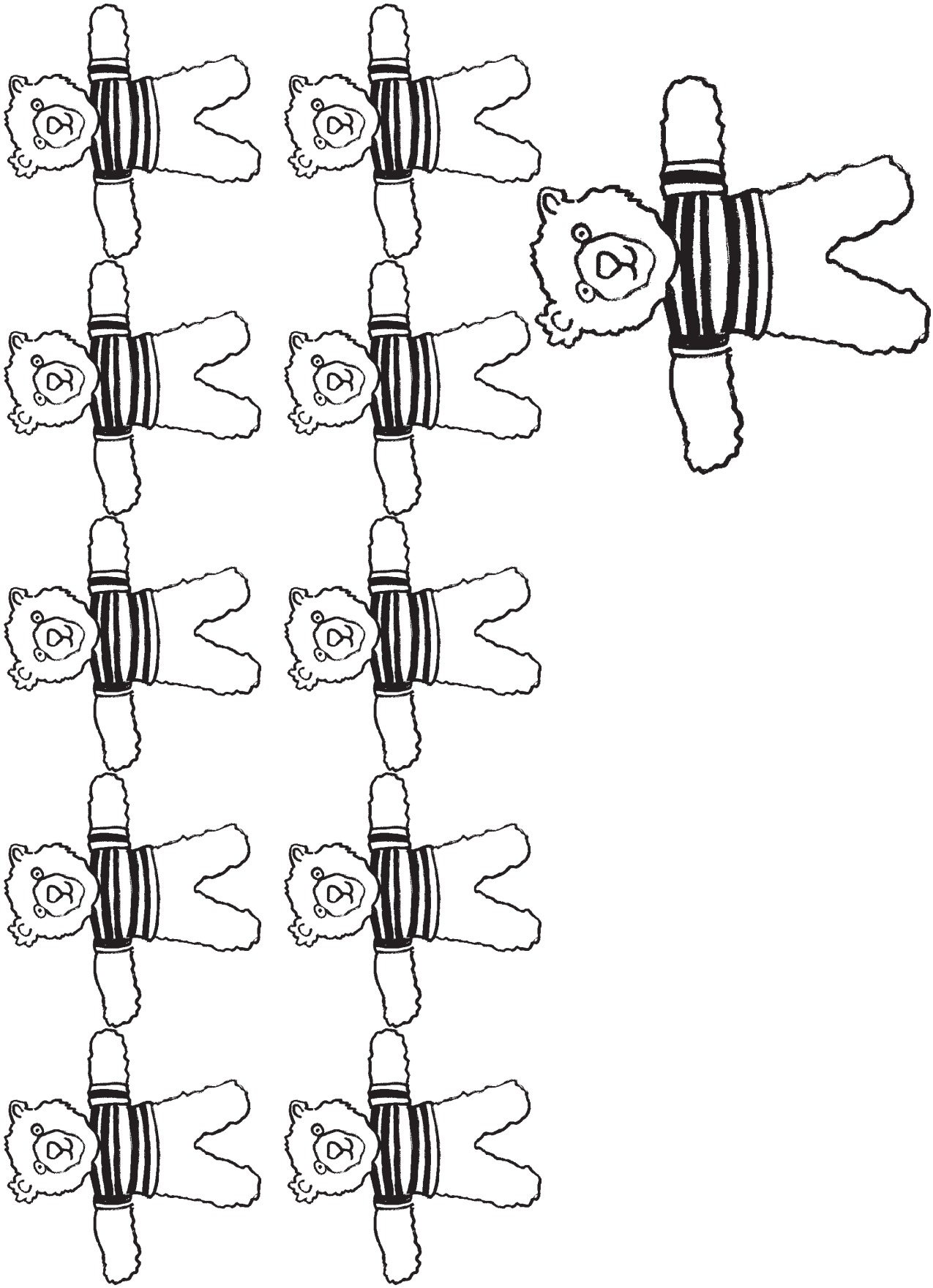
Egg pieces



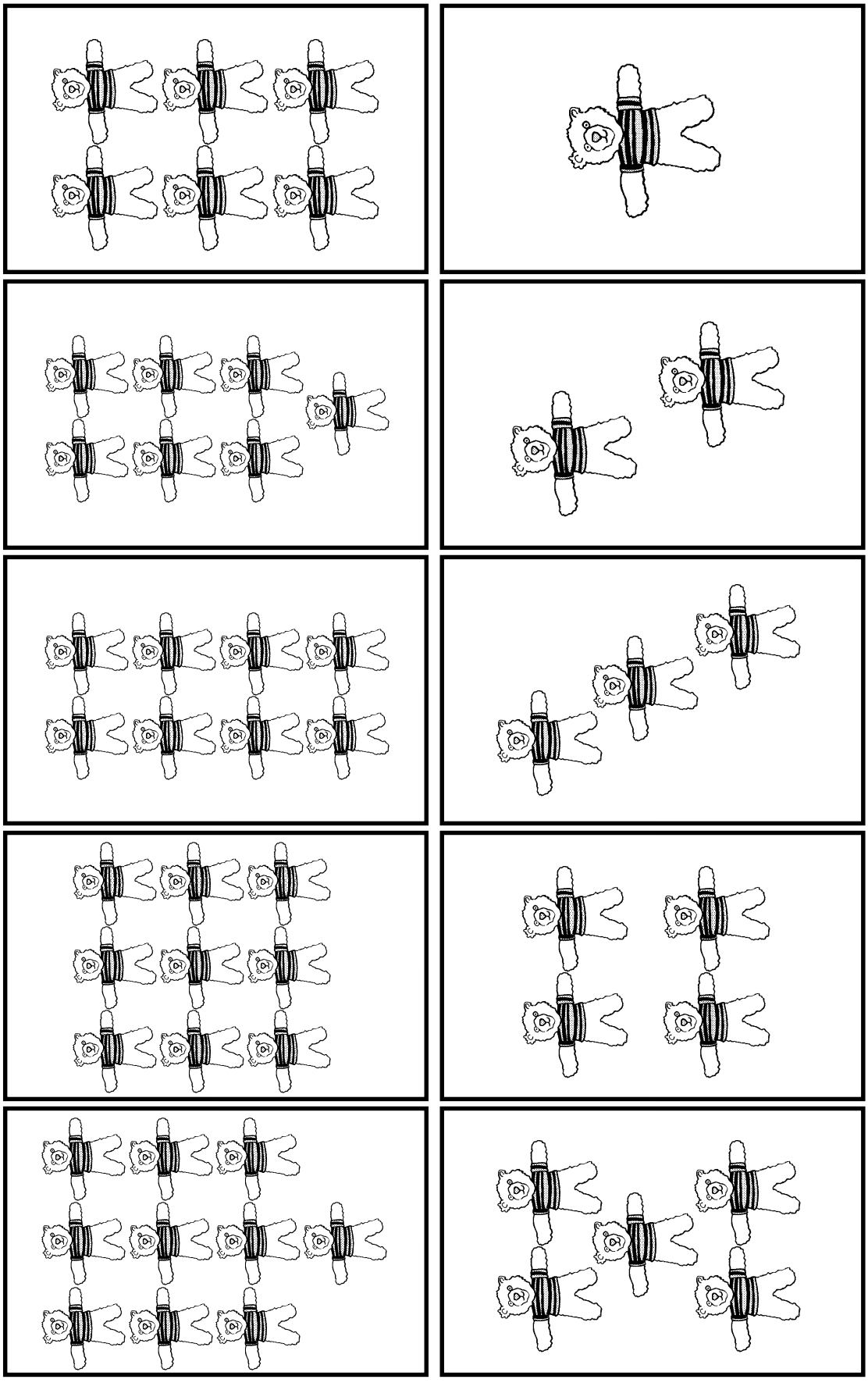
Ten teddies



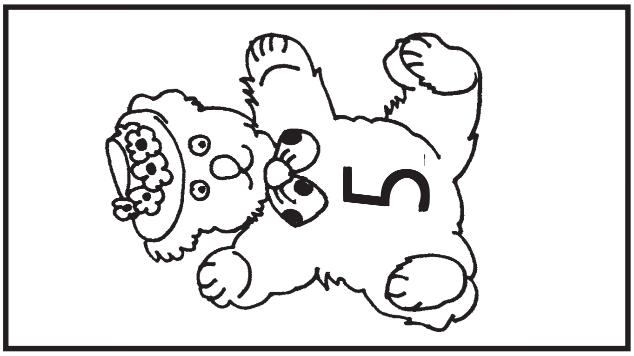
Ten teddies

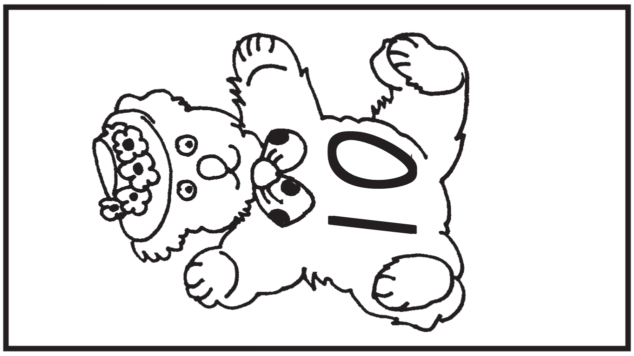


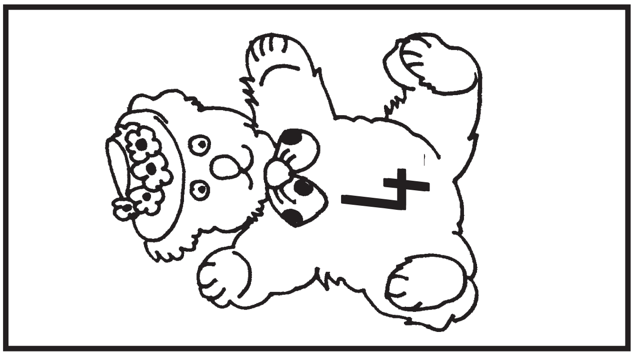
Baby bears

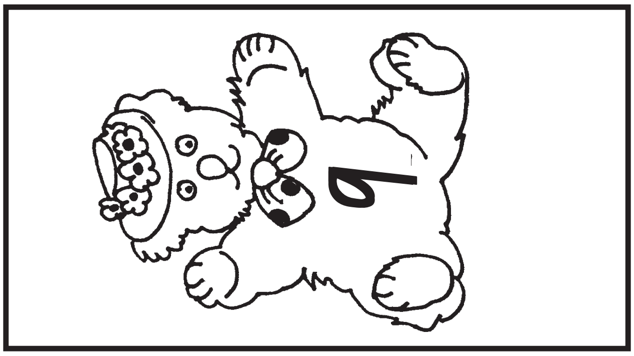


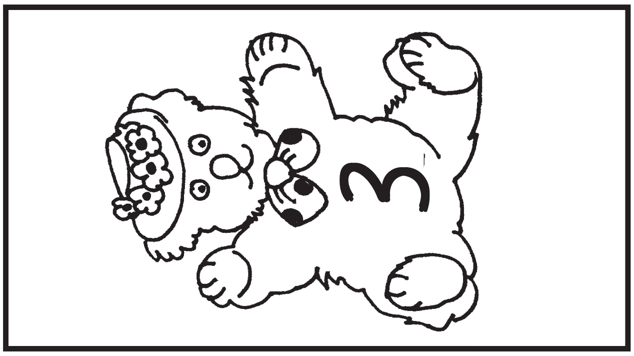
Mother bears

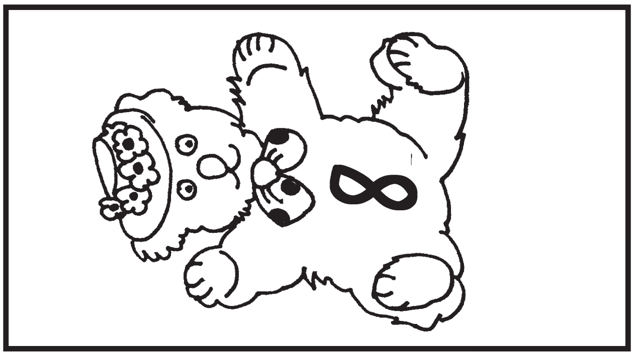


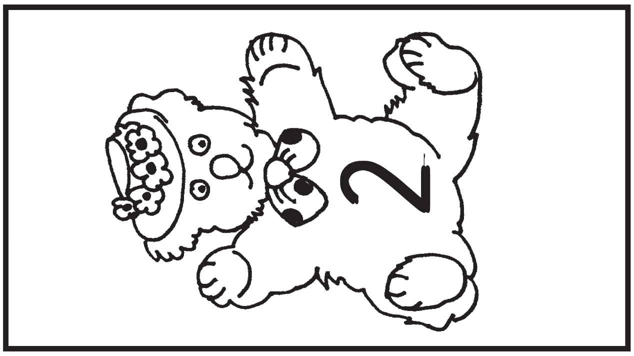


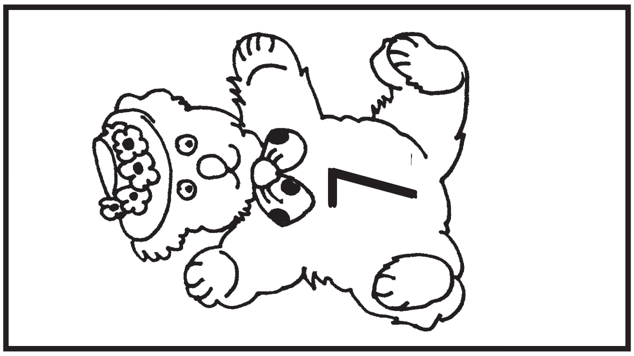


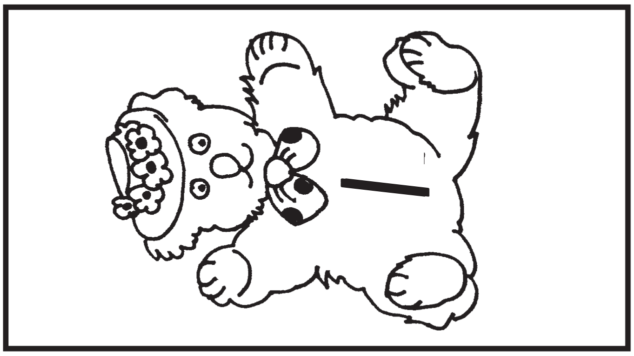


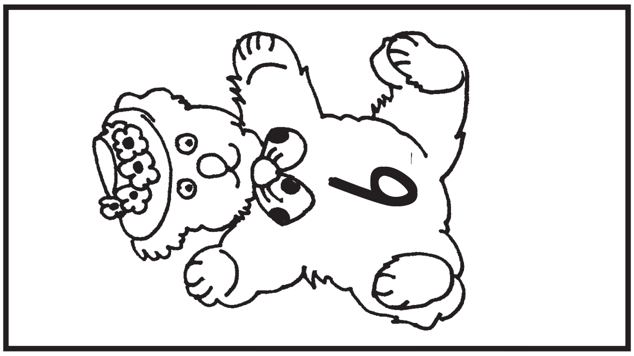












Beehive

Bees

Teddy bear race

Teddy bear race

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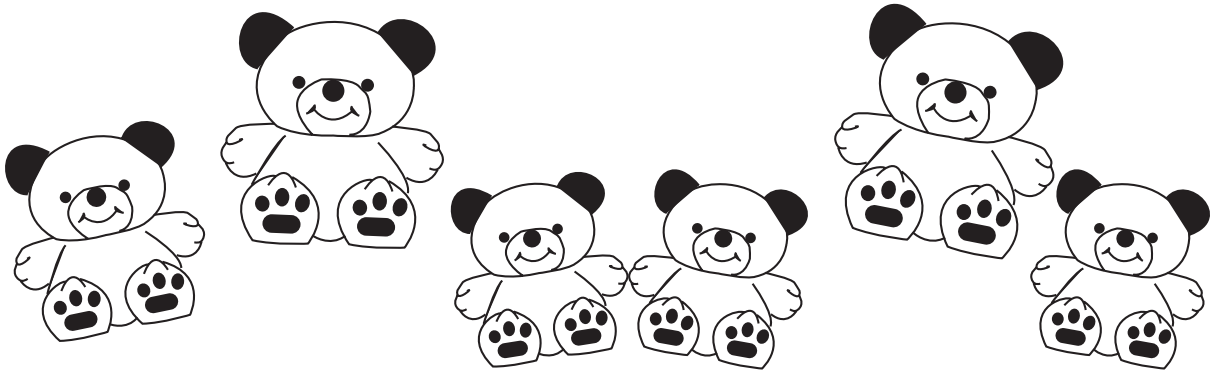
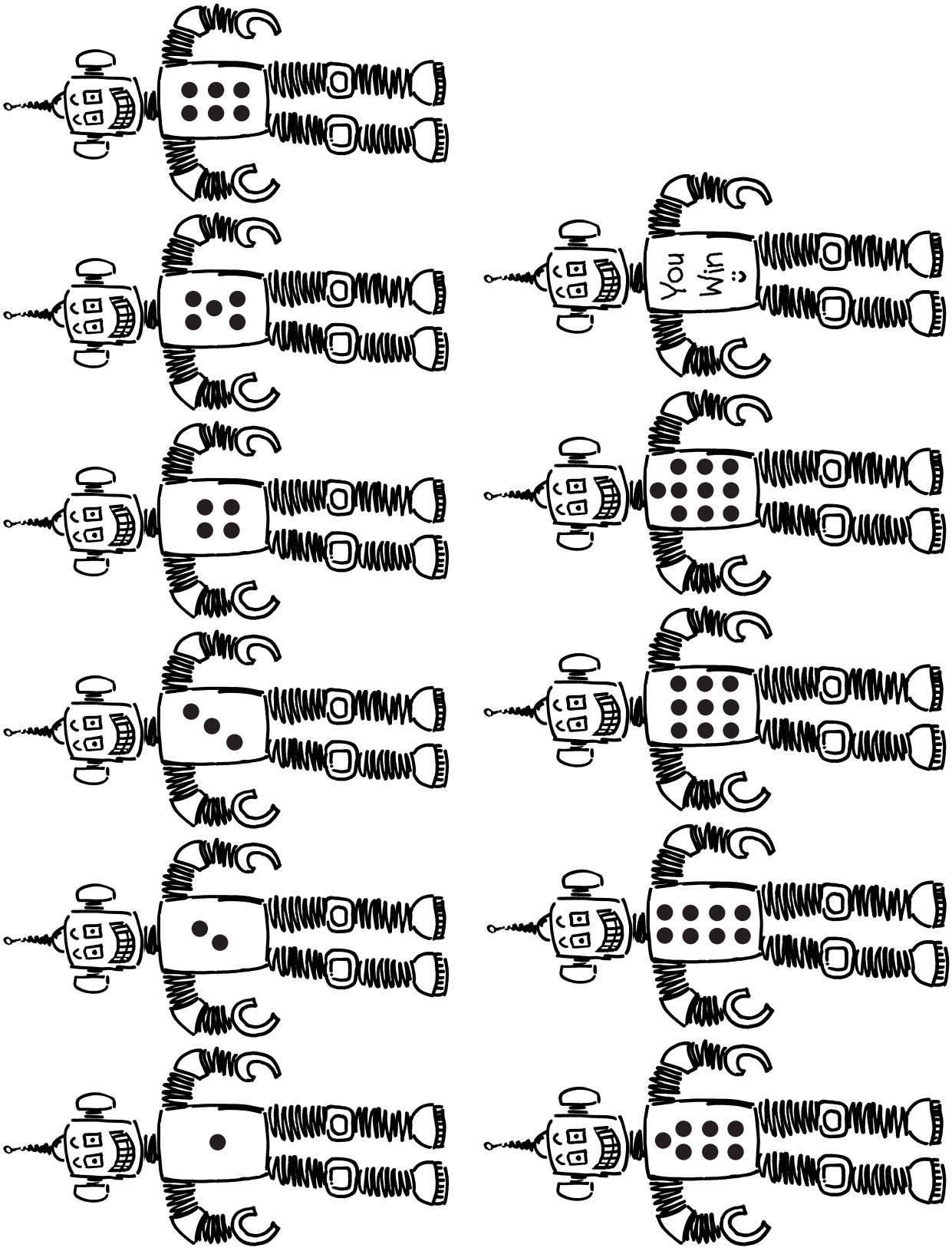
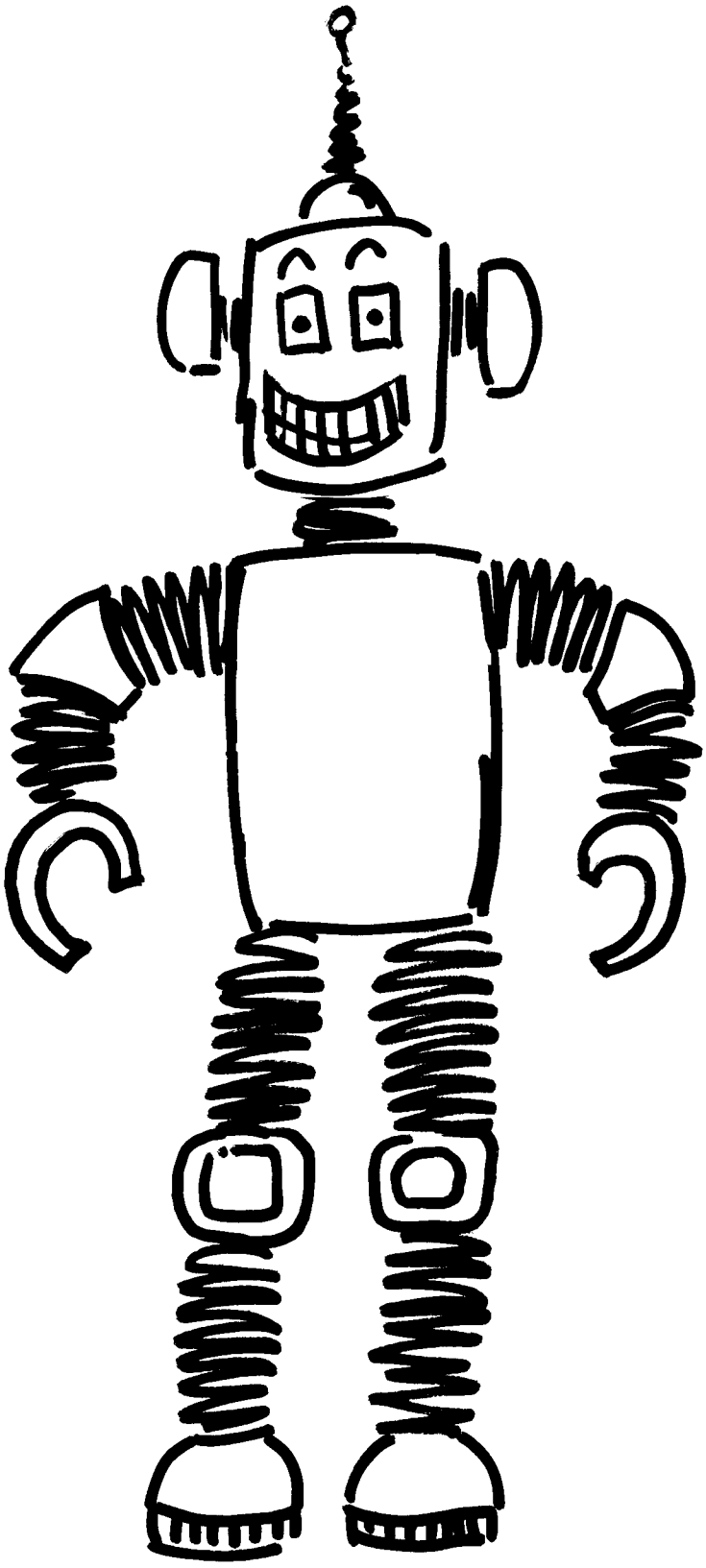


Teddy game

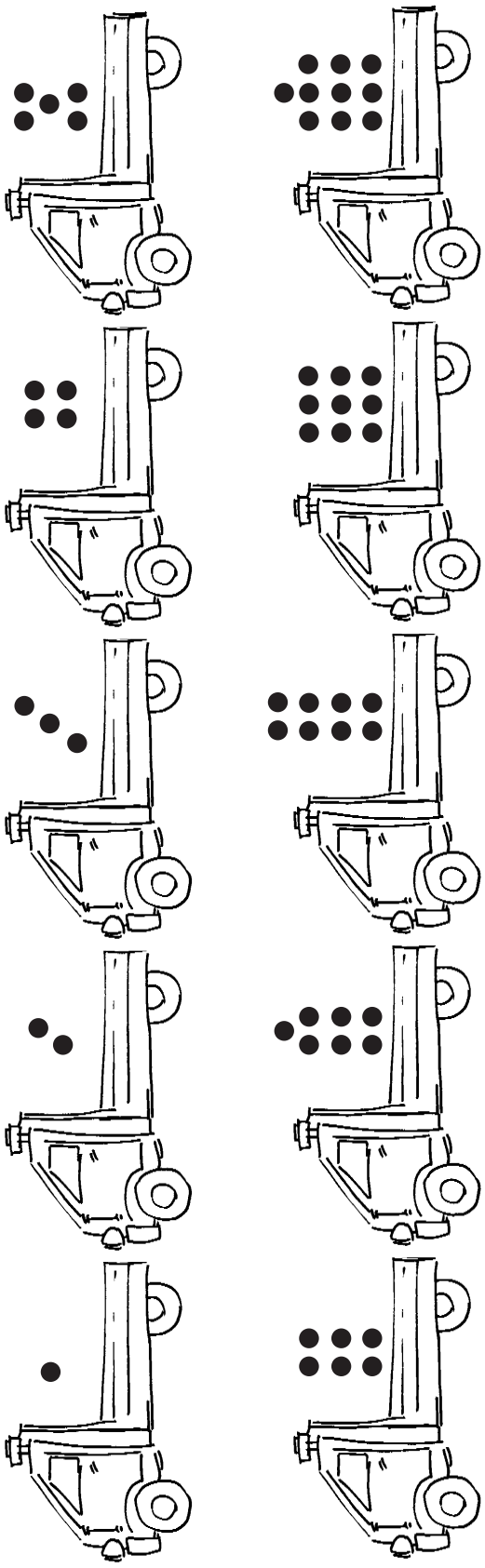
Robot race

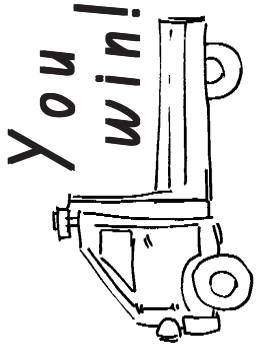


Robot race

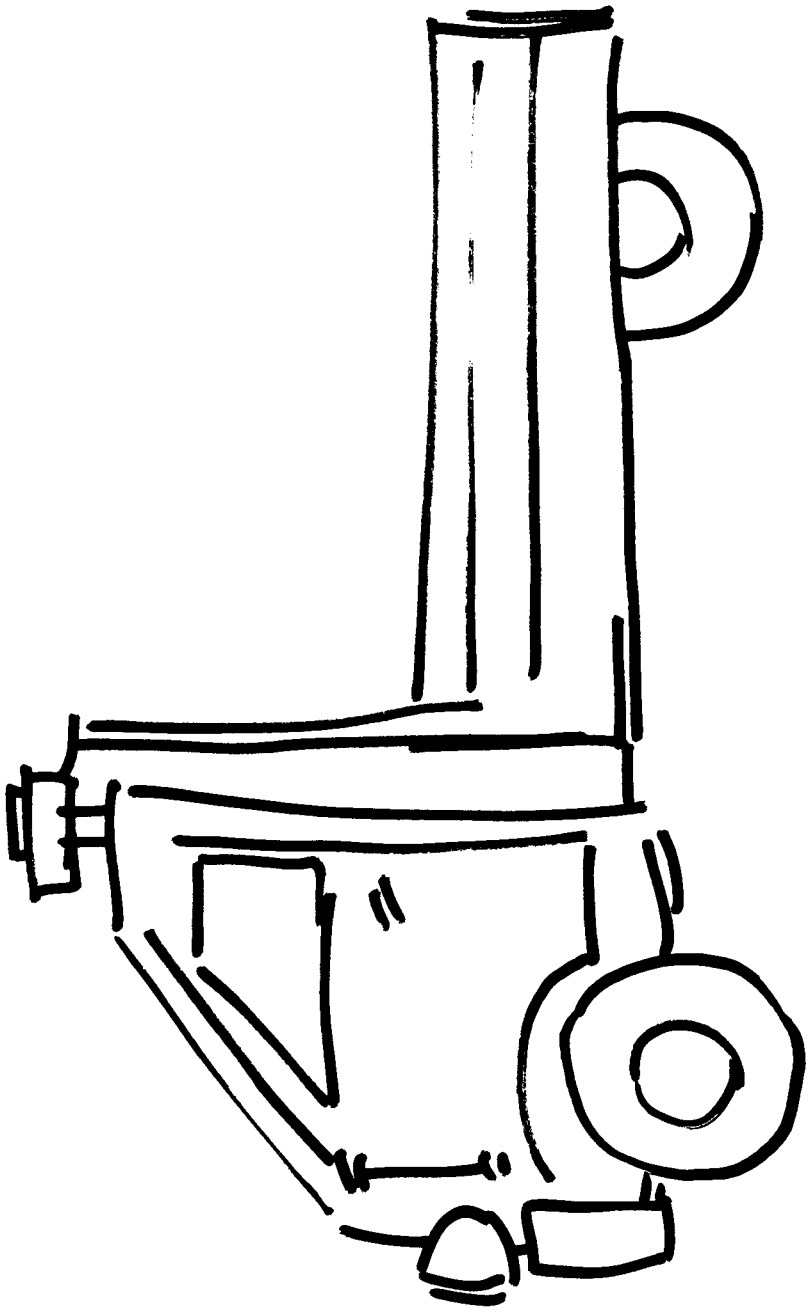


Load the trucks

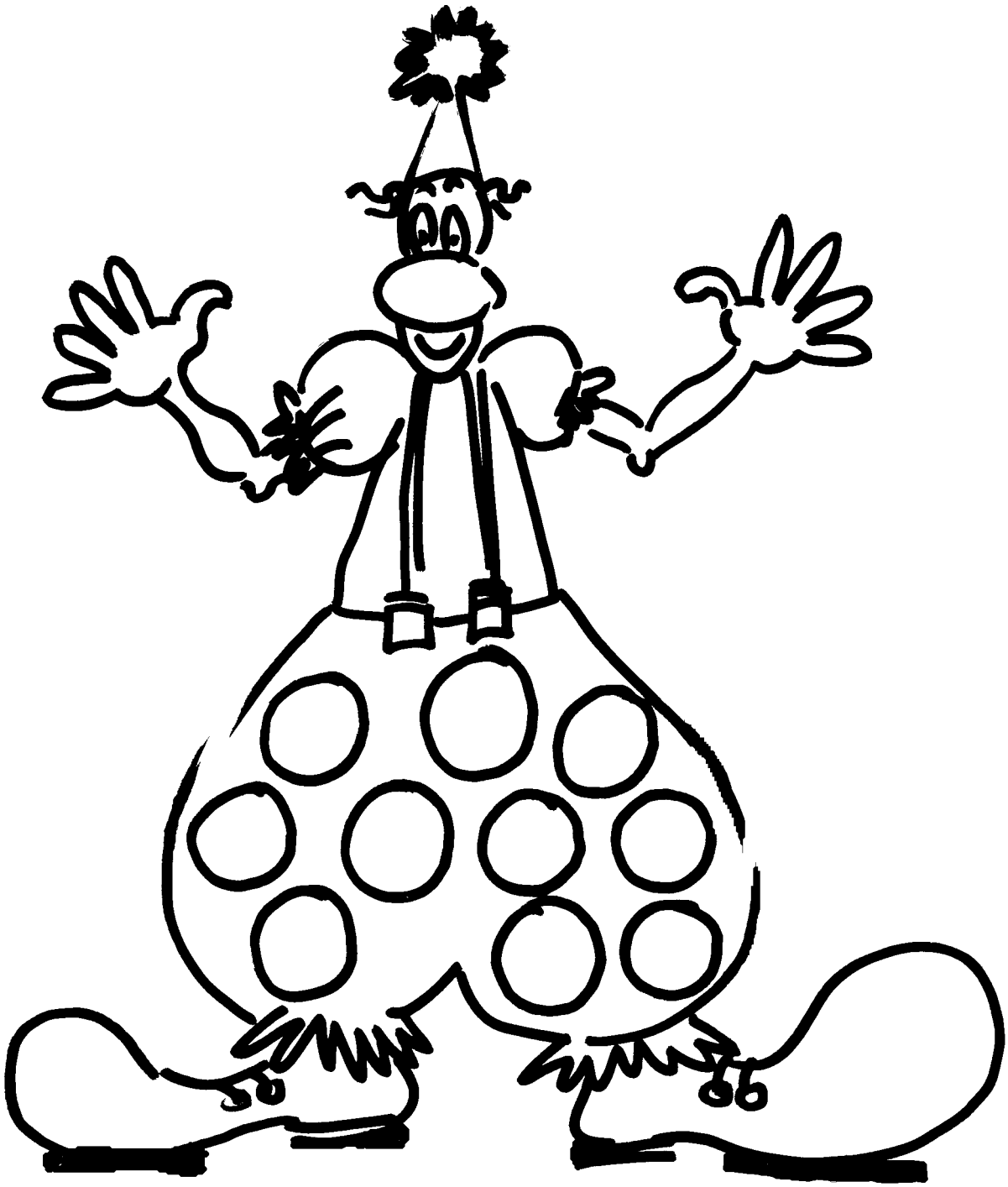




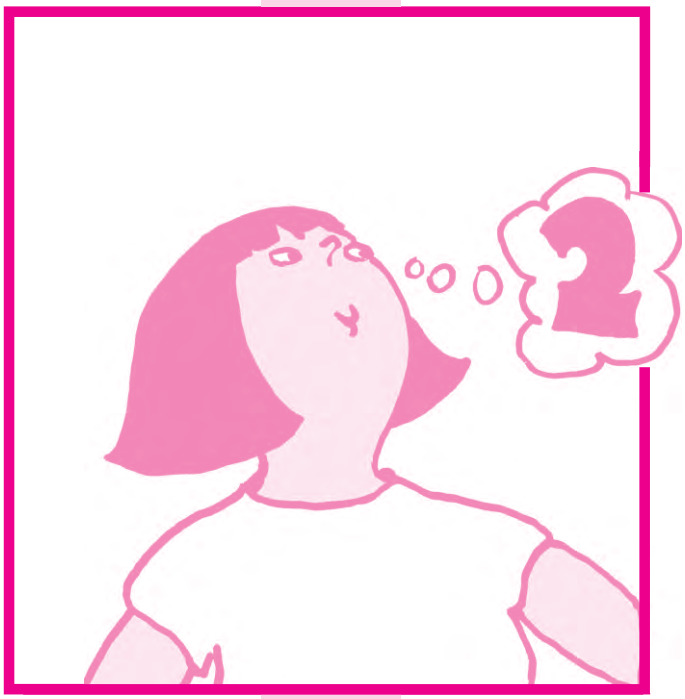
Load the trucks



Clown



Students at the perceptual counting stage



Students at the perceptual counting stage

The nature of the learner

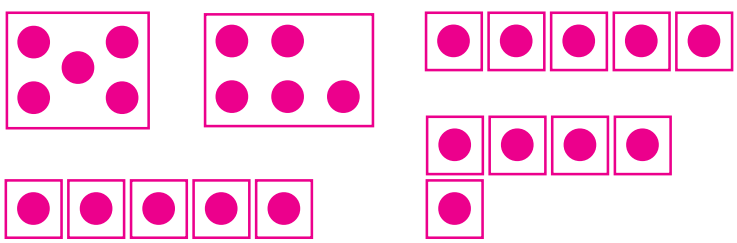
Students working within the perceptual stage of counting are able to count collections of objects that they can see, hear or feel. They rely on concrete representations of numbers.

Students consistently apply the one-to-one principle of matching one number word to each object. They demonstrate their understanding of the numerical value of a collection by counting and labelling collections from zero to ten and beyond. The size of the collection they are able to count will be dependent upon their knowledge of the forward number sequence, that is, how far they can count in sequence.

Students at this stage rely on the strategy of counting by ones and always begin at one when they count. This is the determining factor in how they find the number before or after a specified number. Typically, these students count from one when determining the number before, or the number after, a nominated number. Students confidently produce the forward and backward number sequences in the range zero to ten, but they always begin at one when counting forward.

At the perceptual stage students are able to identify and name numerals from zero to ten, or beyond, but may not necessarily be able to identify and name all the numerals to twenty.

Students at this stage are developing the ability to recognise number patterns and know that numbers can be represented by a variety of combinations. For example, the number “five” can be represented in a variety of ways, including the following diagram:



Students at the perceptual stage are working towards:

- adding two collections of items
- counting without relying on concrete representations of numbers
- visually recognising standard patterns for a collection of up to ten items without counting them
- consistently saying the forward and backward number word sequences correctly.

Teaching considerations

When developing teaching and learning programs for students at the perceptual counting stage, teachers need to consider:

- ### Strategy development

  Students working at the perceptual counting stage have limited strategies for solving number problems. Teachers should provide a wide range of activities which encourage students to develop more sophisticated strategies. Short, engaging activities can be used to encourage students to develop visual recognition skills which may lead to automatic recall of facts.

  Teachers should ensure that students working at the perceptual counting stage are not hindered in the development of strategies because they have a limited range of understandings in other number areas, such as forward number word sequence, backward number word sequence or numeral identification.

- ### Language development

  Students at the perceptual counting stage need to be taught the explicit mathematical language to enable them to describe the activity and the strategy. Additionally the naming of number words in the "teens" can be difficult for all students and particularly for students from non-English speaking backgrounds. For example, number words such as *fourteen* and *forty* sound very alike. As the names for many of the "teen" numbers start with the "units" value, such as *seventeen*, reversals are very common.

- ### Numeral identification

  Activities for developing numeral identification can be modified to cater for the student at the perceptual stage by limiting the range of numerals targeted. Explicitly teaching the naming system of the "teen" numbers may help many students.

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Where are they now?

Students say the forward number word sequence and backward number word sequence to ten correctly.

Where to next?

Students say the forward number word sequence and backward number word sequence to twenty or beyond correctly.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.1 Counts to 30, and orders, reads and represents numbers in the range 0 to 20

PAES1.1 Recognises, describes, creates and continues repeating patterns and number patterns that increase or decrease

WMES1.4 Uses concrete materials and/or pictorial representations to support conclusions.

LFN reference

Backward number word sequence: levels 2-4

Forward number word sequence: levels 2-4

How?

Zap

Arrange students so that they are standing in a circle. Instruct students to count backwards from twenty down to zero. Each student calls out one number in the sequence. When the number sequence reaches zero, the student who should say "zero" calls out "zap!" and sits down. Continue the activity with the students commencing the backward count from twenty again. This process continues until one student remains standing.

Variations

- The students count from one in a forward number word sequence to twenty. When the number sequence reaches twenty, the student who should say "twenty" calls out "zap!"
- Students who are out remain in the circle and continue to say "zap!" whenever it is their turn. The following student continues the count from the number after the number that would have been said instead of "zap".

Why?

Students need to know the correct forward and backward counting sequences in order to count on or count down from a number to solve addition and subtraction problems.

Where are they?

Students:

- can say the forward number word sequence from one to ten
- can not say the number word just after a given number word in the range of one to ten. Students may be able to count beyond ten.

Where to next?

Students:

- are able to say the number word just after a given number word in the range one to ten
- are able to say the forward number word sequence to twenty or beyond.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.1 Counts to 30, and orders, reads and represents numbers in the range 0 to 20

WMES1.1 Asks questions that could be explored using mathematics in relation to Early Stage 1 content.

Syllabus reference

Perceptual counting
Forward number word sequence
Backward number word sequence

How?

Maths tipping

Students stand in a space in the room. Ask individual students to say the number before, or after, a given number. The students must answer within a designated time, for example, three seconds. A correct response allows the student to take one step in any direction to attempt to touch another student on the shoulder. If tipped, the student must sit down. If a student states an incorrect answer to the question, he or she must also sit down. Continue the process until one student remains standing.

Why?

Students need to know the correct forward number word sequence in order to state the number after a given number. This is also necessary for counting on strategies.

PERCEPTUAL

Where are they now?

Students can identify numerals to ten.

Where to next?

Students can identify numerals to twenty.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.1 Counts to 30, and orders, reads and represents numbers in the range 0 to 20

WMES1.3 Describes mathematical situations using everyday language, actions, materials and informal recordings.

LFN reference

Numeral identification: level 2

How?

Number flowers

Construct cardboard or paper cut-outs of flowers consisting of a stem and the flower centre. Write a numeral on the centre of each flower. Provide students with a supply of cut-out petal shapes. Students place a number of petals around a flower centre, corresponding to the displayed numeral.

Pairs

Construct pairs of shoe-shaped cards. On one card, write a numeral in the range eleven to twenty. On a matching card, draw a corresponding dot pattern to match each numeral. Display dot patterns as two rows of five to represent ten, and a common dot pattern for the remaining units. Place cards face up and have students match each dot pattern card with the correct numeral card.

Why?

Students need to be familiar with the forward and backward counting sequences in order to count on and count down from any given number.

Where are they now?

Students can identify numerals to ten.

Where to next?

Students can identify numerals to twenty.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.1 Counts to 30, and orders, reads and represents numbers in the range 0 to 20

WMES1.3 Describes mathematical situations using everyday language, actions, materials and informal recordings.

LFN reference

Numeral identification: level 2

(Pairs)

Variations

- Turn both sets of shoe-cards face down. Students turn over two shoe-shaped cards at a time. If the two cards match, the student keeps the cards. If the cards do not match, the student turns the cards back over. Continue until all cards are matched.
- Turn up either all of the dot shoe-cards or all of the numeral shoe-cards. Place the other set of cards face down. Students turn over one shoe-card at a time to find a matching pair.

Egg flip

Number sections of an egg carton using any numerals in the range of one to twenty. Place a counter inside the carton, close the lid and shake the carton. Instruct the students to open the lid and find which cup the counter has landed in. Provide students with a number chart to match the numerals written inside the egg cartons. Students mark off a numeral on the chart, corresponding to the numeral the counter lands on. Students continue until all numerals have been marked off on the chart.

Variation

Provide the students with a pile of counters. After shaking and opening the egg carton, the students take a corresponding number of counters from the central pile to the number the counter lands on. The winner is the student with the largest total of counters after a specified number of plays.

Why?

Students need to be familiar with the forward and backward counting sequences in order to count on and count down from any given number.

Where are they now?

Students are able to say the forward number word sequence and backward number word sequence to ten.

Where to next?

Students:

- are able to identify numerals to twenty or beyond
- can say the forward number word sequence and backward number word sequence to twenty or beyond.

To simplify this activity use charts where the students have to identify one number before and one number after the given number.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.1 Counts to 30, and orders, reads and represents numbers in the range 0 to 20

WMES1.4 Uses concrete materials and/or pictorial representations to support conclusions.

LNF reference

Forward number word sequence: level 2, 3

Backward number word sequence: level 2, 3

How?

Teen bingo

Construct bingo cards using numerals in the range eleven to twenty. (The cards may contain a numeral more than once.) Place a set of numeral cards, which correspond to the numerals on the bingo cards, into a container. The teacher, or a nominated student, draws out the numeral cards one at a time and calls out the drawn number. Students cover the corresponding numerals on their bingo cards with counters as the numbers are called. The winner is the first to cover all the numerals on his or her card.

Before and after

Prepare "before and after" charts for each pair of students as shown in the diagram.

Numerals are written down the centre column of the chart. These numerals should be within an appropriate range for the students. Students are given numeral cards to sort and place on the chart in either the "number-before" or "number-after" spaces to form number sequences.

		13
		17
		19
		16
		14

Why?

Students need to be familiar with the forward and backward word sequences to count up to or count down from any given number.

Where are they now?

Students are able to say the forward number word sequence and backward number word sequence to ten.

Where to next?

Students:

- are able to identify numerals to twenty or beyond
- can say the forward number word sequence and backward number word sequence to twenty or beyond.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.1 Counts to 30, and orders, reads and represents numbers in the range 0 to 20.

WMES1.4 Uses concrete materials and/or pictorial representations to support conclusions.

LNF reference

Forward number word sequence: level 2, 3

Backward number word sequence: level 2, 3

How?

Teen memory

Construct two sets of numeral cards for the numbers eleven to twenty. Place the cards face down in rows between two students. Have the students take turns to flip over two cards and say the numbers as they are revealed. If a pair of cards showing the same number is revealed, the student keeps the cards. If the cards do not match, the student places the cards face down again. Continue until all cards have been matched

Children playing *Before and after* (see p. 87)

Why?

Students need to be familiar with the forward and backward word sequence to count up to or count down from any given number.

Where are they now?

Students:

- can identify numerals one to ten
- are able to say the forward number word sequence and backward number word sequence to ten.

Where to next?

Students:

- are able to identify numerals to twenty or beyond
- are able to say the forward number word sequence and backward number word sequence to twenty or beyond.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.1 Counts to 30, and orders, reads and represents numbers in the range 0 to 20

WMES1.1 Asks questions that could be explored using mathematics in relation to Early Stage 1 content.

LFN reference

Numeral identification: level 2
Forward number word sequence: level 2, 3
Backward number word sequence: level 4

How?

Numeral cards

Construct large numeral cards suitable for students to wear around their necks. The cards should display numerals in the range of eleven to twenty.

Call out a number within the range. The students then line up in sequence behind the student wearing the numeral card which matches the number called. For example, if "twelve" is called, students with numeral cards thirteen to twenty line up. Count the number sequence aloud from the nominated number.

Variations

- Students step forward, bow, sit or perform an alternative action when their number is called.
- As a number is called all students line up, in random order, behind the student wearing the nominated number.
- Distribute to the students numeral cards which can be worn around the neck. Have the students form a circle. Stand in the centre of the circle, hold a bean bag and call out a number corresponding to one of the numeral cards. As the number is called, throw the bean bag into the air. The student wearing the nominated numeral card runs into the centre of the circle and attempts to catch the beanbag. If successful he or she moves to the centre to become the next caller. This activity may be incorporated into daily fitness or physical education lessons.

Why?

These activities provide opportunities for students to identify numerals.

Students need to recall the forward number word sequence and be able to identify numbers that follow given numbers in order to develop counting on strategies.

Where are they now?

Students:

- can identify numerals to ten
- can say the forward number word sequence and backward number word sequence to ten.

Where to next?

Students:

- can identify numerals to twenty or beyond
- are able to say the forward number word sequence and backward number word sequence to twenty or beyond.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.1 Counts to 30, and orders, reads and represents numbers in the range 0 to 20

PAES1.1 Recognises, describes, creates and continues repeating patterns and number patterns that increase or decrease

WMES1.2 Uses objects, actions, imagery, technology and/or trial and error to explore mathematical problems

WMES1.4 Uses concrete materials and/or pictorial representations to support conclusions.

LFN reference

Numeration identification: level 2
Forward number word sequence: level 2, 3
Backward number word sequence: level 2, 3

How?

Numeral flip strip

A flip strip is a hinged cardboard strip. The hinge, formed by tape or plastic spiral binding, joins two cardboard strips together. The top piece of cardboard is cut into vertical strips. Numerals are written on the bottom piece of cardboard so that, as each top strip is lifted, a numeral is revealed. The sequence of numerals used can be varied by replacing the numeral strip between the two cardboard pieces with another strip containing a different range of numerals.

Variations

- Uncover one numeral and ask the student to identify the numeral.
- Ask the students to:
  - state the numbers before and after the revealed numeral
  - state the number two or three spaces from the revealed numeral.
- Uncover all the numerals except one. Ask the students to identify the hidden numeral.
- Hide all numerals except one and ask the students to find a given number.
- Ask students to identify all the odd and all the even numbers along the number line.

Students then use this information to count by twos, starting from an odd or an even number.

Why?

Developing proficient counting strategies will assist students to solve number problems.

Where are they?

Students:

- can say the forward number word sequence from one to ten.
- can not say the number word just after a given number word in the range one to ten. Students may be able to count beyond ten.

Where to next?

Students:

- are able to say the number word just after a given number word in the range one to ten.
- are able to say the forward number word sequence to twenty.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.1 Counts to 30, and orders, reads and represents numbers in the range 0 to 20

WMES1.4 Uses concrete materials and/or pictorial representations to support conclusions.

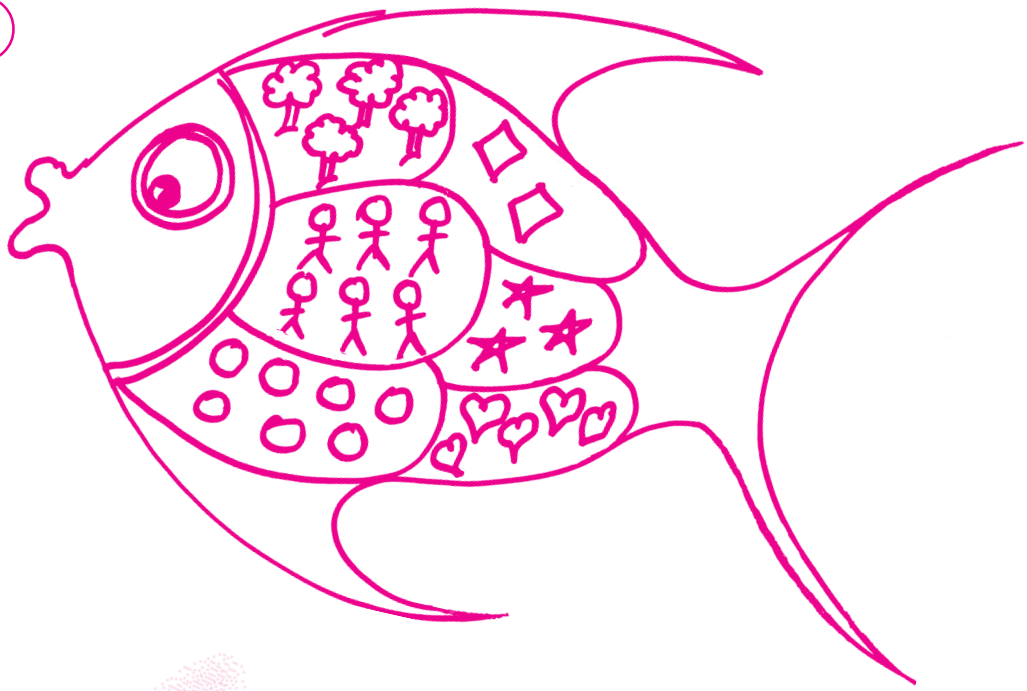
Syllabus reference

Perceptual counting
Numeral identification: level 2
Forward number word sequence
Backward number word sequence

How?

Fish chart

Construct a chart in the shape of a fish. Draw large scales on the body of the fish and in each scale draw or paste pictures of collections of items. Construct a matching set of scale-cards which will fit exactly on top of the scales on the chart. Write a numeral on each card to correspond with the collection of items in each "scale". Students match a numeral card to the correct collection of items. Construct fish charts for numbers one to five, one to ten or ten to twenty.



Why?

Students need to be able to count correctly in a forward number word sequence in order to state the number after a given number. This is necessary for counting on strategies.

Where are they?

Students:

- can say the forward number word sequence from one to ten.
- can not say the number word just after a given number word in the range one to ten. Students may be able to count beyond ten.

Where to next?

Students:

- are able to say the number word just after a given number word in the range one to ten.
- are able to say the forward number word sequence to twenty.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.1 Counts to 30, and orders, reads and represents numbers in the range 0 to 20

WMES1.4 Uses concrete materials and/or pictorial representations to support conclusions.

LFN reference

Perceptual counting
Numeral identification: level 2
Forward number word sequence
Backward number word sequence

How?

Caterpillars

Construct a chart depicting a caterpillar. Use one circle to represent the head and ten circles to represent the body. Construct a set of ten cardboard circles, the same size as the segments of the caterpillar's body. On each cardboard circle write a numeral from one to ten. Attach one side of a velcro dot to the circles and the other side to each segment of the caterpillar's body. Students sequence the numerals by attaching the numbered circles to the caterpillar. Alternatively students locate numbers before or after a nominated number. As the students become proficient with the numerals one to ten, vary the range to include numerals from eleven to twenty.

Variation

Numerals can be written on the caterpillar's body as well as on the circles. The activity then becomes a simpler matching task for those students at the Emergent counting stage.

Why?

Students need to be able to count correctly in a forward number word sequence in order to state the number after a given number. This is necessary for counting on strategies.

Where are they now?

Students:

- can say the forward number word sequence from one to ten
- can not say the number word just after a given number word in the range one to ten
- may be able to say the forward number word sequence beyond ten.

Where to next?

Students:

- say the number word just after a given number word in the range one to ten, then one to twenty and beyond
- are able to say the forward number word sequence and backward number word sequence to twenty.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.1 Counts to 30, and orders, reads and represents numbers in the range 0 to 20

WMES1.1 Asks questions that could be explored using mathematics in relation to Early Stage 1 content.

LFN reference

Numeral identification

Perceptual counting

How?

Bingo: The number after

Construct bingo cards for each student using the BLM on p.140. Hold up a numeral card so that all students can see it. Begin with numerals in the range of two to eleven and then progress to numerals in the range of two to twenty-one. Have students check their bingo card, and if it contains a numeral which is one after the number displayed, they cover the numeral with a counter. The winner is the first student to cover all the numerals on the bingo card.

Variations

- Identify the numeral before the one shown, two after or two before.
- Extend the range of numbers.

Why?

For children to progress to using the strategy of counting on, they need a good knowledge of the forward number word sequence. If students are able to automatically state the number after a given number word they will not have to rely on counting from one as a strategy.

Where are they now?

Students:

- can identify numerals to ten
- are able to say correctly the forward number word sequence and backward number word sequence to ten.

Where to next?

Students:

- are able to identify numerals to twenty
- are able to say the forward number word sequence and backward number word sequence to twenty.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.1 Counts to 30, and orders, reads and represents numbers in the range 0 to 20

WMES1.1 Asks questions that could be explored using mathematics in relation to Early Stage 1 content

WMES1.4 Uses concrete materials and/or pictorial representations to support conclusions.

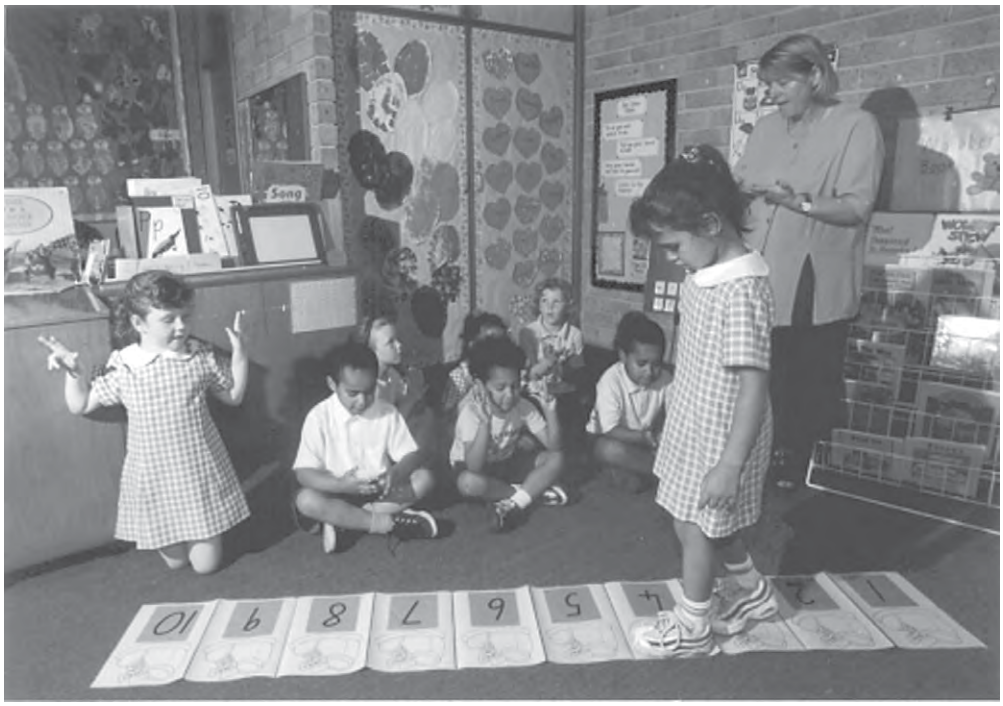
LFN reference

Numeral identification: level 2
Forward number word sequence: level 2, 3
Backward number word sequence: level 2, 3

How?

Floor walking

Draw a large number line, from one to twenty, with chalk on the carpet or asphalt. Direct the students to walk along the number line to a nominated number greater than ten. The students count each step as they land on a numeral.



Why?

Students need to be familiar with the forward and backward counting sequence in order to count down to or down from a number.

Where are they now?

Students:

- can identify numerals to ten
- are able to say correctly the forward number word sequence and backward number word sequence to ten.

Where to next?

Students:

- are able to identify numerals to twenty
- are able to say the forward number word sequence and backward number word sequence to twenty.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.1 Counts to 30, and orders, reads and represents numbers in the range 0 to 20

WMES1.1 Asks questions that could be explored using mathematics in relation to Early Stage 1 content

WMES1.4 Uses concrete materials and/or pictorial representations to support conclusions.

LFN reference

Numeral identification: level 2
Forward number word sequence: level 2, 3
Backward number word sequence: level 2, 3

(Floor walking)

Variations

- Students walk, and count backwards, from a nominated number along the number line.
- Display the number line as footprints on the floor. Students count as they step on each footprint.
- Place numbered footprints in random order on the floor. Students find the correct path to step along to form a forward counting sequence.
- The numeral line can be replicated on the playground by tracing around students' footprints using chalk on the asphalt. Write a numeral on each foot outline.
- Display a washing line made from nylon rope across the chalkboard or between two chairs. Collect old socks. Write numerals on the socks in the range of one to twenty. Students take turns to sequence the socks in correct numerical order along the washing line.

Why?

Students need to be familiar with the forward and backward counting sequence in order to count down to or down from a number.

Where are they now?

Students:

- can count visible items but not those in concealed collections
- raise their fingers sequentially when asked to show a number from one to ten using their fingers. That is, they need to count each finger as it is raised.

Where to next?

Students:

- are able to count items without relying on visual representations
- automatically raise the correct number of fingers when asked to show a number from one to ten.

As a preliminary activity concentrate on numbers one to five using one hand to demonstrate.

Many students will already have a strong sense of the number five and use their fingers to demonstrate the number five. However, they may not have a true understanding of the number five.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.2 Combines, separates and compares collections of objects, describes using everyday language and records using informal methods

WMES1.1 Asks questions that could be explored using mathematics in relation to Early Stage 1 content.

LFN reference

Finger patterns

How?

Rabbits' ears

Ask students to put their hands above their head. Then ask them to show various numbers by raising the correct number of fingers. This is best done in random order, first in the range one to five and then six to ten. For example, "Show me the number four,… two,…five,…three." The aim is for the students to raise their fingers simultaneously rather than sequentially. Students may verify their count by bringing their hands down and counting their fingers.

Teacher: "Show me the number five."

Why

Developing a strong sense of "five" as a base, and later "ten" as a base, is useful for children as this will reduce their reliance on count-by-one strategies.

Where are they now?

Students:

- can count visible items but not those in concealed collections
- raise their fingers sequentially when asked to show a number from one to ten using their fingers. That is, they need to count each finger as it is raised.

Where to next?

Students:

- are able to count items without relying on visual representations
- automatically raise the correct number of fingers when asked to show a number from one to ten.

Outcomes

These activities provide opportunities for the students to demonstrate progress towards the following outcomes: A student

NES1.2 Combines, separates and compares collections of objects, describes using everyday language and records using informal methods

WMES1.4 Uses concrete materials and/or pictorial representations to support conclusions.

LFN reference

Finger patterns

Teacher: "Now let's check we are correct."

Students: "One, two, three, four, five"

Teacher: "Let's do that again. However, this time start from the number three. Now let's count on from three to five."

Student: "Three, four, five".

Why

When demonstrating numbers in the range six to ten, children are developing concepts of partitioning or part-whole number relationships.

Continued practice with part-whole number relationships provides a basis for learning basic addition and subtraction facts.

Where are they now?

Students:

can count visible items but are not able to visualise the set when the concrete materials are removed.

Where to next?

Students:

- are able to picture items mentally for a given number
- are able to recognise instantly the dot patterns for the numbers one to six.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.1 Counts to 30, and orders, reads and represents numbers in the range 0 to 20

WMES1.4 Uses concrete materials and/or pictorial representations to support conclusions.

LFN reference

Spatial patterns

Subitising

How?

Dot flash

With the overhead projector light turned off, place counters on the projector in a standard dot pattern. Vary the number of counters from two to ten. Instruct the students to look at the screen carefully while you switch the light on for a brief period of time. Have the students use their own counters to make the pattern shown on the overhead or draw the pattern they saw. Alternatively, use flash cards or paper plates with dot patterns on them. Ask the students to make statements about the patterns they saw as well as combinations of parts for the pattern. For example, for a pattern of five dots the child may see the combination "two and three"or "four and one".

Variations

- Construct two sets of dot pattern cards for the numbers one to ten. Place one set of cards in a pile and display the other set in a row. Students take turns to select a card from the pile and try to find a dot pattern card from the row which has the same number of dots as the card chosen. Alternatively instruct the students to find a card which has one dot more or one dot less than the card chosen.

- "The process of instantaneous recognition of number patterns without counting is known as ***subitising***. Piaget found that children, by the age of four, are capable of instantaneously recognising groups of one, two, three and four objects. Children develop strong mental images of these patterns. Constant exposure to the number names used to describe the arrangements helps children form pattern-name associations. Utilising this natural capacity can provide a basis for developing number relations and devising strategies to learn basic facts". (Bobis, 1993)

Why?

When students are able to instantly recognise a set of objects, such as a pattern of dots, and are able to associate a number word with the set, the need for the student to count all of the objects from one is eliminated. Students need to be able to recognise that a set can be a set in its own right and, simultaneously, a part of a larger set.

Where are they now?

Students are able to count perceived items but are not able to visualise the group when the concrete material is removed.

Where to next?

Students instantly recall number combinations to ten. They have a visual image of a set of items for a given number.

Luncheon plates are a good size for students to manipulate.

Expose students to a variety of dot patterns for each number so that they do not associate only one pattern with a number.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.2 Combines, separates and compares collections of objects, describes using everyday language and records using informal methods

WMES1.1 Asks questions that could be explored using mathematics in relation to Early Stage 1 content

LFN reference

Spatial patterns

Partitioning and combining

How?

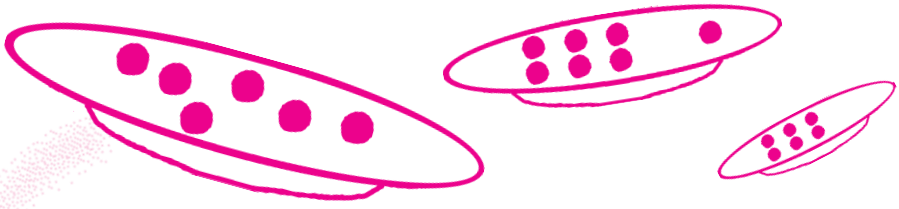
Paper dot plates

Construct several sets of paper dot plates which display random dot patterns for numbers from one to ten, die patterns and various dot combinations to ten.

Flash a paper dot plate and ask the students to make, using counters, a pattern that is one more, or one less, than the pattern shown on the paper plate. Extend this activity to two more or two less than the paper plate pattern.

Variations

- Provide students with two sets of plates with dot patterns. Ask the students to find a pair of plates which combine to have as many dots as another nominated plate. Extend this activity by asking the students to then attach corresponding numeral cards to each paper plate.
- Display a finger pattern for a nominated number to the students. Have the students copy the finger pattern. Encourage instant demonstration rather than students raising their fingers sequentially. If necessary, the students may lower their hands to count and confirm they raised the correct number of fingers. Students then find a plate to correspond with the number. Students may check they have the correct plate by matching their raised fingers with the dots on the plate.
- Flash a plate for one to two seconds to the students. The students call out the number of dots they see.



Why?

Students need to develop instant recognition of small groups of items and associate a number word with the group. This will eliminate the need to count each group from one.

Where are they now?

Students are able to count perceived items but are not able to visualise the set when the concrete material is removed.

Where to next?

Students instantly recall number combinations to ten. They have a visual image of a set of items for a given number.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.2 Combines, separates and compares collections of objects, describes using everyday language and records using informal methods

WMES1.2 Uses objects, actions, imagery, technology and/or trial and error to explore mathematical problems

WMES1.5 Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Early Stage 1 content.

LFN reference

Perceptual counting
Spatial patterns
Combining and partitioning procedures
Quinary based strategies
Base 10

How?

Ten frames

Model the use of *ten frames* on the overhead projector by filling the frame with two different-coloured transparent counters.

Encourage students to discuss the number combinations they see on the ten frame.

Variations

- Provide individual ten frames for students and allow them to make their own patterns. Have students discuss in pairs the combinations they have made on their ten frame. Students could record their combinations by copying the patterns onto a stencil of blank ten frames or by writing the number combinations.

- Ask your students to close their eyes and imagine a number pattern in their mind. Then have students make the pattern with counters on individual ten frames.

- Using an overhead projector, arrange a nominated number of counters into different patterns on the ten frame. Discuss which patterns were the easiest to see.
- Using an overhead projector and counters, display a pattern for a number in the range of one to ten on a ten frame. Remove or add one counter to the ten frame. Flash the ten frame again and ask the students to state how many counters there are now.

Why?

Developing strong visual images of patterns and combinations for numbers will assist students to recall number facts.

Where are they now?

Students are able to count perceived items but are unable to visualise the set when the concrete materials are removed.

Where to next?

Students are able to instantly recall number combinations to ten. They have a visual image of a set of items for a given number.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NES1.2 Combines, separates and compares collections of objects, describes using everyday language and records using informal methods

WMES1.2 Uses objects, actions, imagery, technology and/or trial and error to explore mathematical problems

WMES1.5 Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Early Stage 1 content.

LFN reference

Perceptual counting
Spatial patterns
Partitioning and combining
Quinary based strategies

How?

Dot patterns

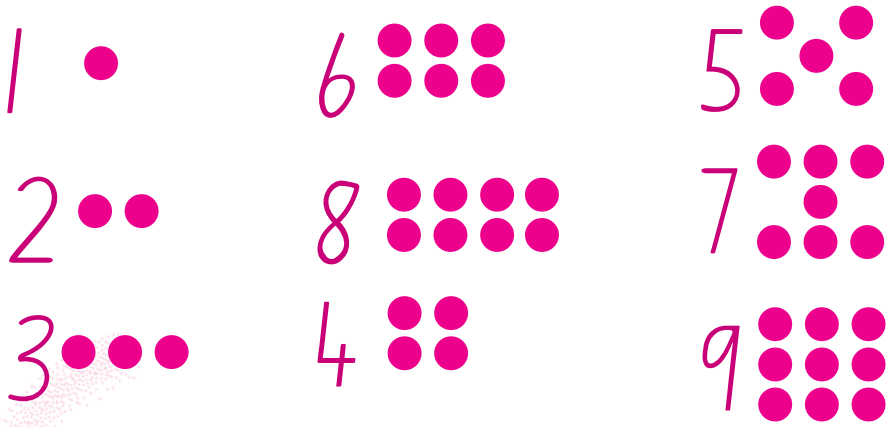
Make a dot pattern with up to five counters on the overhead projector. Use random patterns as well as die patterns. Encourage discussion relating to the patterns and combinations of parts to make a whole. Have the students copy the patterns with their own counters or draw the patterns. Allow other students to make a different pattern with counters on the overhead projector. Repeat this activity, using up to ten counters.

Flash cards

Give flash dot-pattern cards for numbers up to ten to the students. (See BLM on page 141). Provide students with a collection of counters so that they can construct the same pattern as on the dot-pattern card.

Variations

- Show a dot pattern to the students. Cover some dots and ask students to find a dot card to match the hidden dots.
- Flash the dot pattern to the class and then cover some dots. Ask the students how many dots could be seen and how many are hidden if there are ten altogether. This would be more easily done on an overhead projector, using transparent counters.



Why?

Frequent practice with dot patterns, combining groups to form patterns and partitioning collections, leads to visualisation of numbers. This assists the understanding of number relations and the knowledge of basic number facts.

Where are they now?

Students are able to count objects they can see, hear or feel. They are not able to visualise the set when the concrete materials are removed.

Where to next?

Students represent a number in a variety of ways and support their knowledge of number patterns through partitioning and combining.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
PAS1.1	Creates, represents and continues a variety of number patterns, supplies missing elements in a pattern and builds number relationships
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Perceptual counting

Combining and partitioning

How?

Windows

Construct cardboard window frames covered with cellophane paper.

Show a numeral card and ask the students to make a row using that number of teddy bears. Ask the students to place their window frame after a nominated group of teddies. For example, with ten teddies, ask the students to show three teddies outside the window. (Students place the frame after the third teddy.) Instruct the students to look through the window and state how many teddies are inside the window.

Variations

- Have the students record the number combinations they make, such as 3 + 7.
- Ask the students to state how many teddies will be on the other side of the window before checking.

Why?

Frequent practice with combining and separating groups to form patterns may lead to strong mental images of numbers. This assists students' understanding of number relations and automatic recall of number facts.

Where are they now?

Students:

- are able to count visible items but are not able to visualise the set when the concrete materials are removed
- demonstrate the meaning of subtraction by taking an object or groups of objects from a group of objects.

Where to next?

Students:

- are able to complete tasks with hidden or screened items
- demonstrate the difference between two groups of objects by using the language of comparison.

Encourage students to discuss their actions when completing the activity.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2 Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers

WMS1.2 Uses objects, diagrams, imagery and technology to explore mathematical problems.

LFN reference

Perceptual counting

How?

Diffy towers

Organise students into pairs and provide each pair with a die and a supply of Unifix blocks. The first student rolls a die, takes a corresponding number of Unifix blocks from a central pile and builds a tower with them. The second student rolls the die and repeats the process. They then compare the two towers to see who has the most blocks and determine the difference between the two towers. The player with the larger number of blocks keeps the difference and all other blocks are returned to the central pile. The activity continues until one student accumulates a total of ten blocks.

Why?

Frequent practice in combining and separating groups may lead to visualisation of numbers and number patterns. Strong visualisation of numbers enables students to solve problems without relying on concrete materials.

Where are they now?

Students:

- are able to count visible items but are not able to visualise the set when the concrete materials are removed
- demonstrate the meaning of subtraction by taking an object or groups of objects from a group of objects.

Where to next?

Students:

- are able to complete hidden tasks with hidden or screened items
- demonstrate the difference between two groups of objects by using the language of comparison.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2 Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers

WMS1.1 Asks questions that could be explored using mathematics in relation to Stage 1 content.

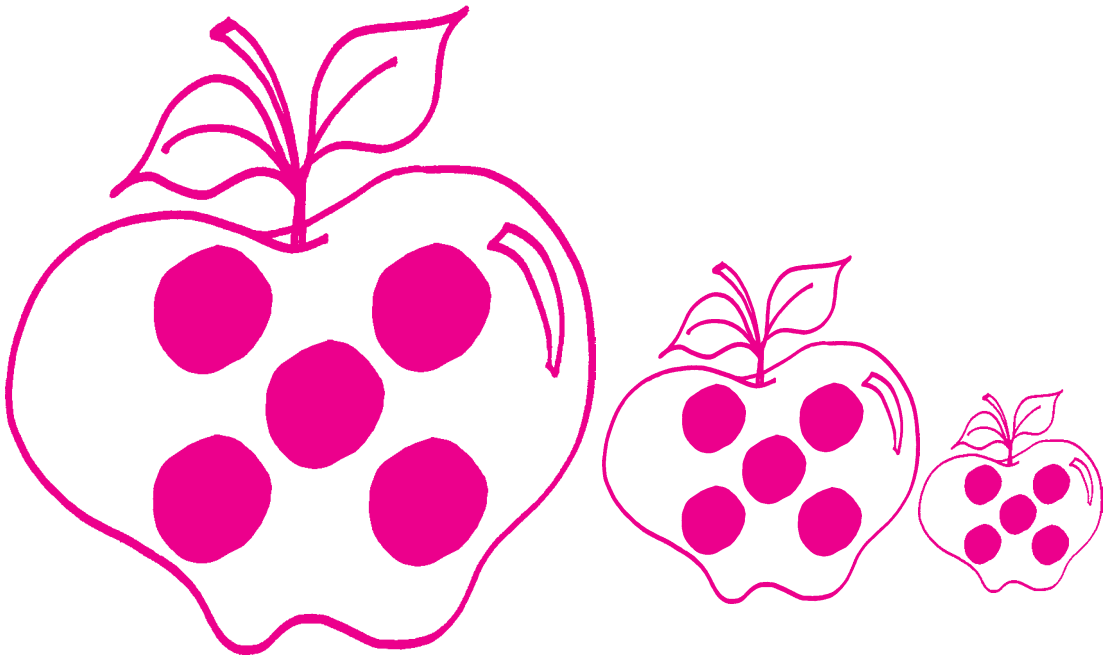
LFN reference

Perceptual counting

How?

Apple turnovers

Construct four sets of cards with dot patterns for the numerals 1 to 6. Cards could be made in the shape of apples. Give fifty counters to each pair of students. Shuffle the cards and place them face down on the table. Both players take a card from the pile of cards. The players determine the difference between the two numbers on the apple cards. The player with the larger number takes the difference in counters from his or her partner's pile of counters. Continue until all cards have been turned over. The player with the most counters is the winner.
(See BLM on page 139 for dot patterns.)



Variation

The player whose turned-up card shows fewer dots takes the difference in counters from the other player.

Why?

Frequent practice with combining and separating groups develops students' visualisation of numbers and number patterns. Strong visualisation of numbers enables students to solve problems without relying on concrete materials.

Where are they now?

Students need visual or tactile clues to complete arithmetical tasks. They can find the total of groups of objects when completing simple multiplication tasks, but count objects by ones.

Where to next?

Students see a group as a countable unit.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.3	Uses a range of mental strategies and concrete materials for multiplication and division
PAS1.1	Creates, represents and continues a variety of number patterns, supplies missing elements in a pattern and builds number relationships
WMS1.1	Asks questions that could be explored using mathematics in relation to Stage 1 content.

LFN reference

Early multiplication and division

How?

Find a group

Demonstrate making equal groups of objects from classroom items.

Ask the students the following questions:

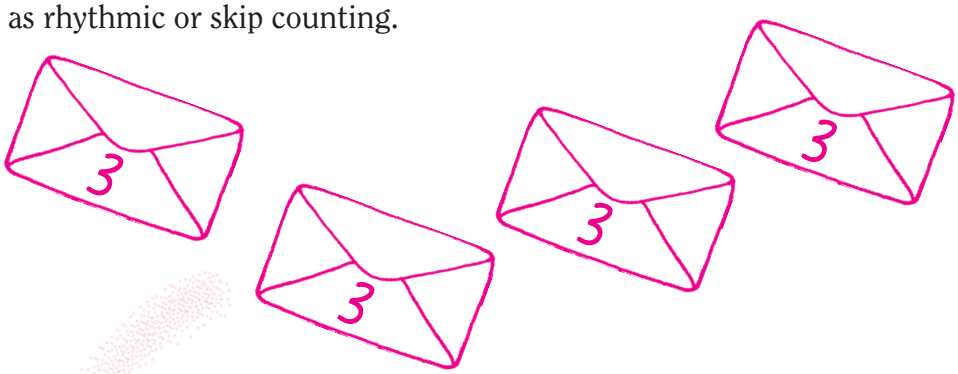
- How many objects in each group?
- How many objects are there altogether?

Trains

Construct train carriages from milk cartons or similar materials. Instruct the students to place equal numbers of Lego® people, or similar items, into each of the carriages. Ask questions similar to those outlined in *Find a group*.

Mail sort

Pin a row of four envelopes to a board. Ensure the board allows students easy access as they will need to be able to reach the envelopes to complete this activity. Write a numeral, for example three, on the outside of each envelope in the row. Instruct students to cut out pictures from magazines which they will use to "post" into the envelopes. Students "post" the correct number of items into the envelopes according to the numeral written on the outside. Discuss with the students the number of groups and the total number of items posted. Model methods of counting multiples, such as rhythmic or skip counting.



Why?

Students need to view a group of items as one countable item to develop multiplication and division concepts.

Where are they now?

Students are able to share items into equal groups using one-to-one dealing.

Where to next?

Students demonstrate a knowledge of skip counting as a preliminary use of multiples.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
NS1.3	Uses a range of mental strategies and concrete materials for multiplication and division
WMS1.3	Describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Early multiplication and division

How?

Rhythmic counting

As a class or in small groups, collect items to form a specified number of equal groups. Lead the students in counting the total of the groups. Emphasise the multiple count. For example, when counting groups of three, count 1, 2, ***3***, 4, 5, ***6***, 7, 8, ***9***, stressing each multiple of three.

Body percussion

Using body actions, accentuate the multiple count when finding the total number of specified groups. For example, to stress the count for multiples of three, direct the students to tap their heads for the first count, tap their shoulders for the second count and click their fingers for the third. Then repeat the pattern while counting.

Why?

The development of counting in multiples supports the understanding of the concepts of multiplication and division.

Where are they now?

Students are able to share items into equal groups using one-to-one dealing.

Where to next?

Students demonstrate a knowledge of skip counting as a preliminary use of multiples.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.3 Uses a range of mental strategies and concrete materials for multiplication and division

WMS1.3 Describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols

LFN reference

Early multiplication and division

Percussion instruments

This activity is similar to *Body percussion*. Use percussion instruments to stress the beat and count.

With the two above activities, begin by demonstrating the procedure using word patterns rather than the number sequence. For example, say the following pattern while completing actions or tapping an instrument: "Soft, soft, loud, soft, soft, loud."

After the students have practised this procedure with word patterns, model oral counting and then have the class join in the counting sequence.

As the students become competent at rhythmic counting, voice the stressed numbers only in the count. Students could, for example, complete the following pattern. For the first and second count they tap their heads. For the third count they call out "three". They then continue the pattern, voicing only the numbers which are multiples of three.

Students form a double circle, with both circles facing each other. One circle stands still and chants a number sequence, accenting the numbers which are multiples of a nominated number. The other circle takes sideward steps in one direction to the beat of the count. On the accented count the students who are moving clap hands with the partner opposite at that count.

Why?

The development of counting in multiples supports the understanding of multiplication concepts.

Where are they now?

Students share items into equal-sized groups using one-to-one dealing.

Where to next?

Students can use the structure of groups to find the total number of items.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.3 Uses a range of mental strategies and concrete materials for multiplication and division

WMS1.1 Asks questions that could be explored using mathematics in relation to Stage 1 content.

LFN reference

Early multiplication and division

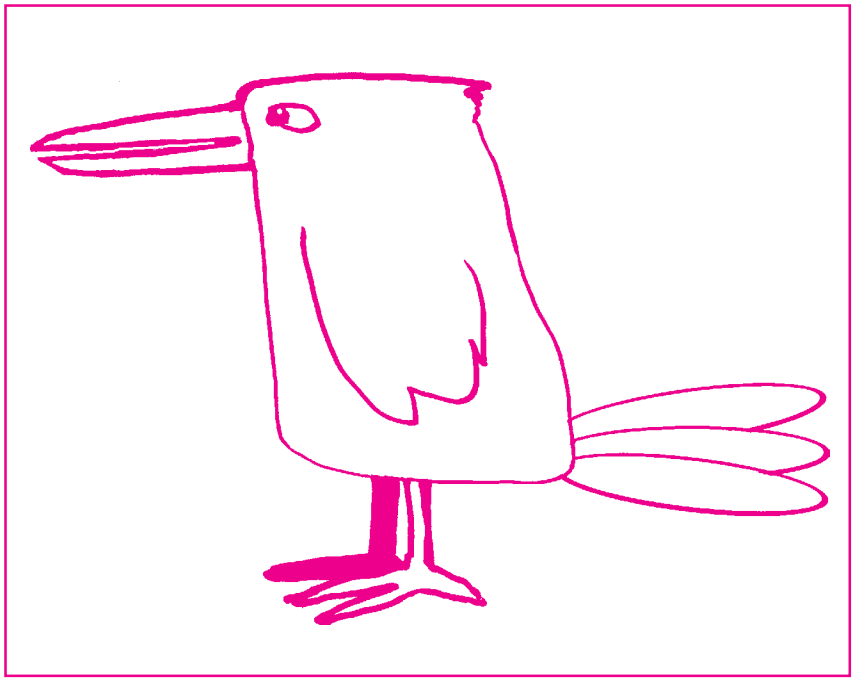
How?

Canisters

Provide the students with a group of objects such as feathers, counters or popsticks. Ask the students to estimate how many items they would put into each canister to make the groups equal. Allow students to check their estimations by using the concrete material to solve the problem.

Kookaburras

Provide a collection of feathers. Instruct the students to place equal groups of feathers onto cardboard outlines of birds. Ask the students to determine the total number of feathers, using rhythmic counting.



Why?

Students need to develop concepts of making and counting equal groups to solve multiplication and division problems.

Where are they now?

Students share items into equal-sized groups using one-to-one dealing.

Where to next?

Students can use the structure of groups to find the total number of items.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
NS1.3	Uses a range of mental strategies and concrete materials for multiplication and division
WMS1.1	Asks questions that could be explored using mathematics in relation to Stage 1 content.

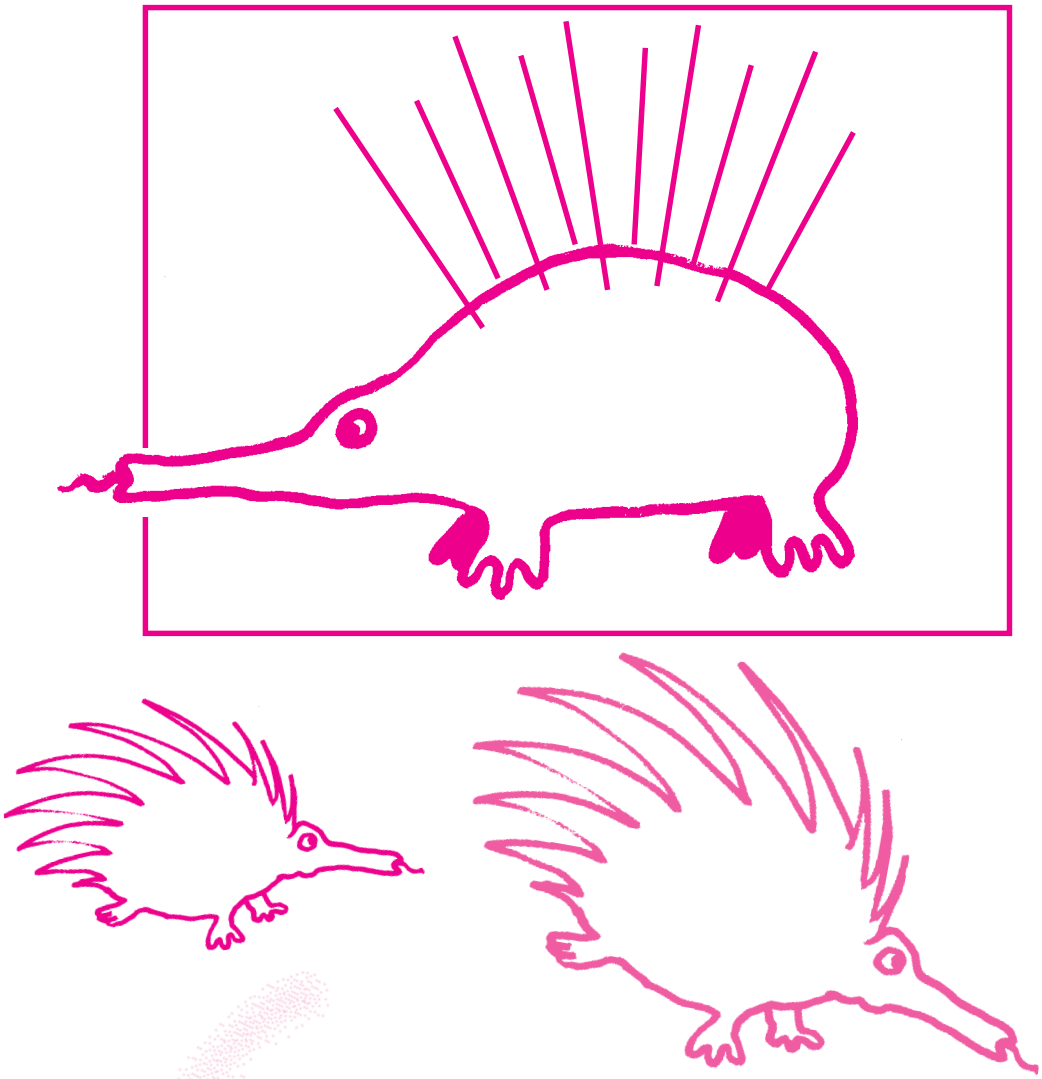
LFN reference

Early multiplication and division

How?

Echidnas

Make three or four echidnas from clay or plasticine. Provide the students with a collection of toothpicks. Have the students place equal groups of toothpicks into each echidna. Ask the students to determine the total number of toothpicks, using rhythmic counting.



Why?

Students need to develop concepts of making and counting equal groups to solve multiplication and division problems.

Where are they now?

Students share items into equal-sized groups using one-to-one dealing.

Where to next?

Students can use the structure of groups to find the total number of items.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
NS1.3	Uses a range of mental strategies and concrete materials for multiplication and division
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

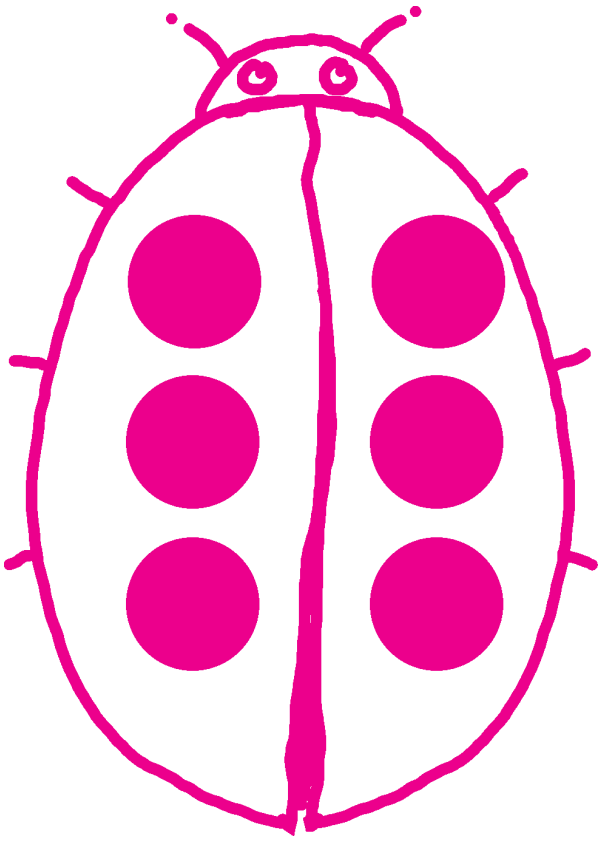
LFN reference

Early multiplication and division

How?

Ladybirds

Provide students with outlines of ladybirds and a supply of dot strips. Ensure there are enough dot strips to provide two for each ladybird. Each dot strip should display the same number of dots. Students place two dot strips onto each ladybird. They then determine the total number of dots.



Model the process of counting by twos. Present a pile of counters to the students. Have the students drag down two counters at a time from the pile. Encourage students to use skip counting by twos to determine the total number of counters.

Why?

Students need to develop concepts of making and counting equal groups to solve multiplication and division problems.

Assessment tasks

Task	Student response	Assessment
T: "Count from one until I tell you when to stop."	S: States the forward number word sequence correctly from one to twenty.	Does the student know the forward number word sequence to 20?
T: "Say the number after..." e.g. 8.	S: Correctly states the number one more than the number given e.g. "The number after 8 is 9."	Did the student count from one to find which number came next?
T: "Count backwards from 23. I'll tell you when to stop." (Say stop when the student reaches 16.)	S: States the backward number word sequence from 23 to 16.	Does the student know the backward number word sequence? Is the student able to count backwards correctly from "twenty" to the "teens"?
T: "Tell me the number before...? e.g. 8	S: Correctly states the number one less than the number given, e.g. "The number before 8 is 7."	Did the student count up from one?
T: Displays 4 counters and hides 2 counters in palm of hand. "I have 6 counters altogether; 4 are here. How many are hidden in my hand?"	S: Determines the missing addend.	Does the student use a strategy of "counting up from" or "counting down to"?
T: Displays 5 counters: "There are 5 counters here. How many more do I need to make 7?"	S: Determines the missing addend.	Did the student count on from 5?
T: Displays 7 counters: "There are 7 counters here. I am taking some away and there are 4 left. How many are in my hand?"	S: Determines the missing addend.	Does the student count on from 4? Did the student use a forward number word sequence or a backward number word sequence?e.g. 7, 6, 5, 4 or, 4, 5, 6, 7

Three-minute lesson breakers

- "Hold your hands up and quickly form finger patterns representing numbers. You may flash a finger pattern for a single-digit number or make a two-digit number by flashing ten fingers as many times as necessary, followed by a pattern representing a single digit." The students silently add the numbers and call out the answer.

- Display a jar containing a collection of items. Students may either guess the number of objects or record their guesses and submit them for a raffle-style draw at the end of the day. The collection, or number of items, should be changed on a regular basis.

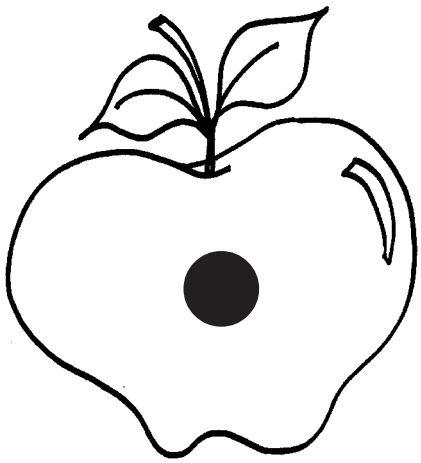
- Call out a number and have the students form groups of that number and sit as a group. Any students left standing nominate the next number.

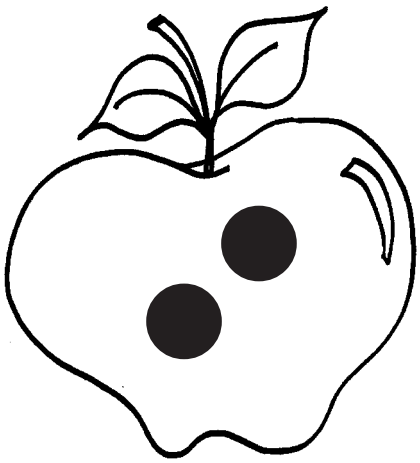
- Count aloud as classroom equipment is given out or collected.

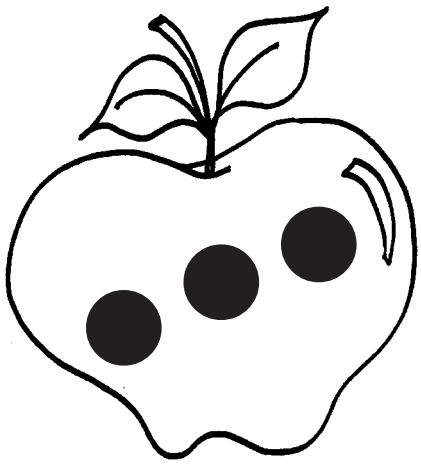
- A number is nominated during aerobics activities and each exercise must be completed that many times. That is, if the number is 10, each student must complete 10 star jumps, 10 knee bends, 10 toe touches, etc.

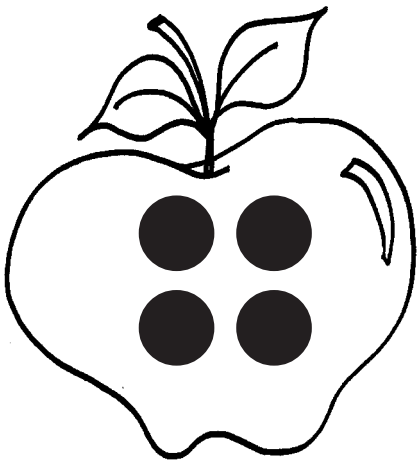
Blackline masters
Perceptual counting stage

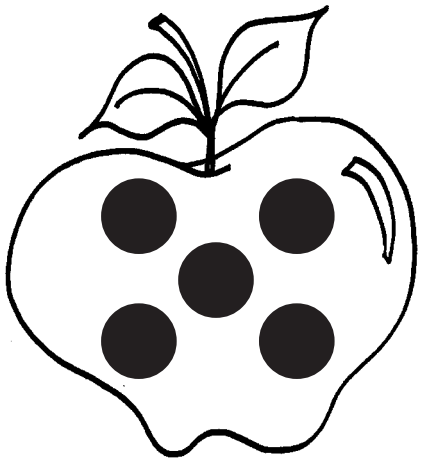
Apple dot patterns

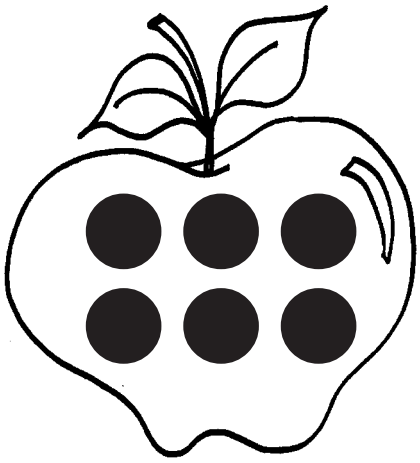












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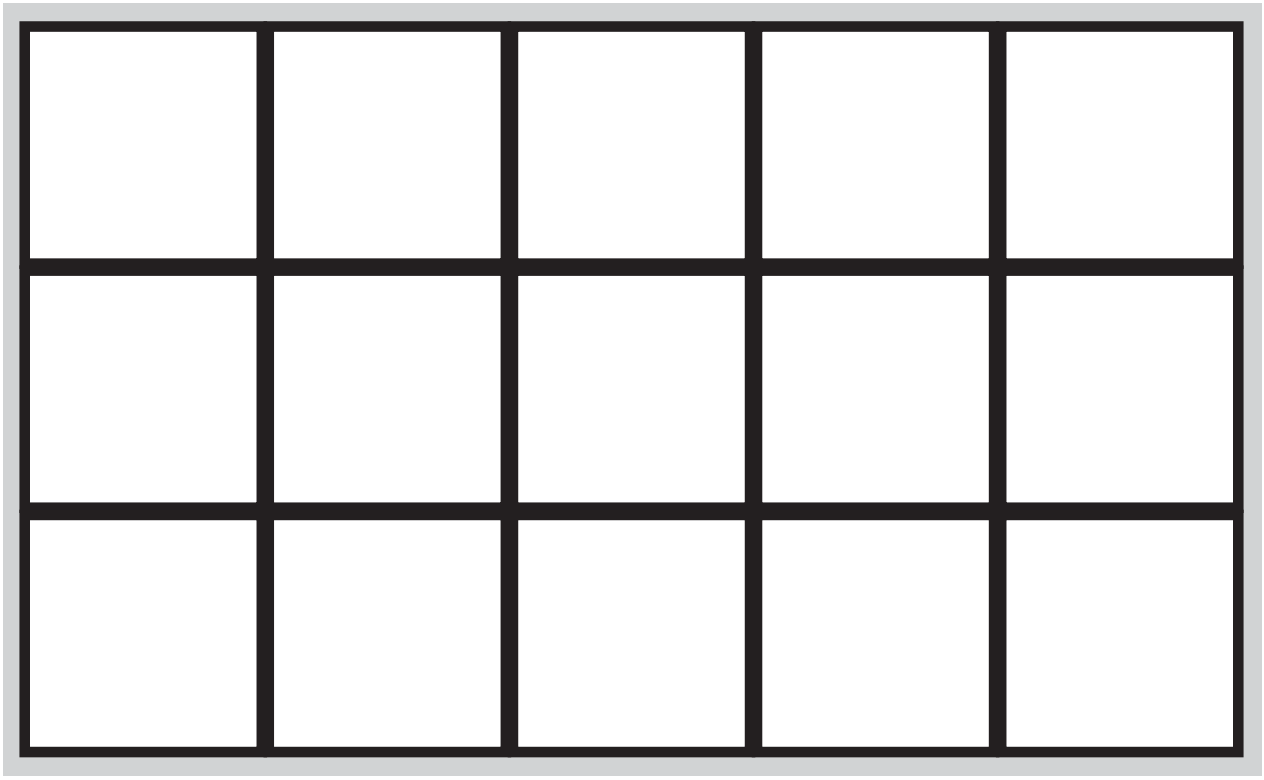

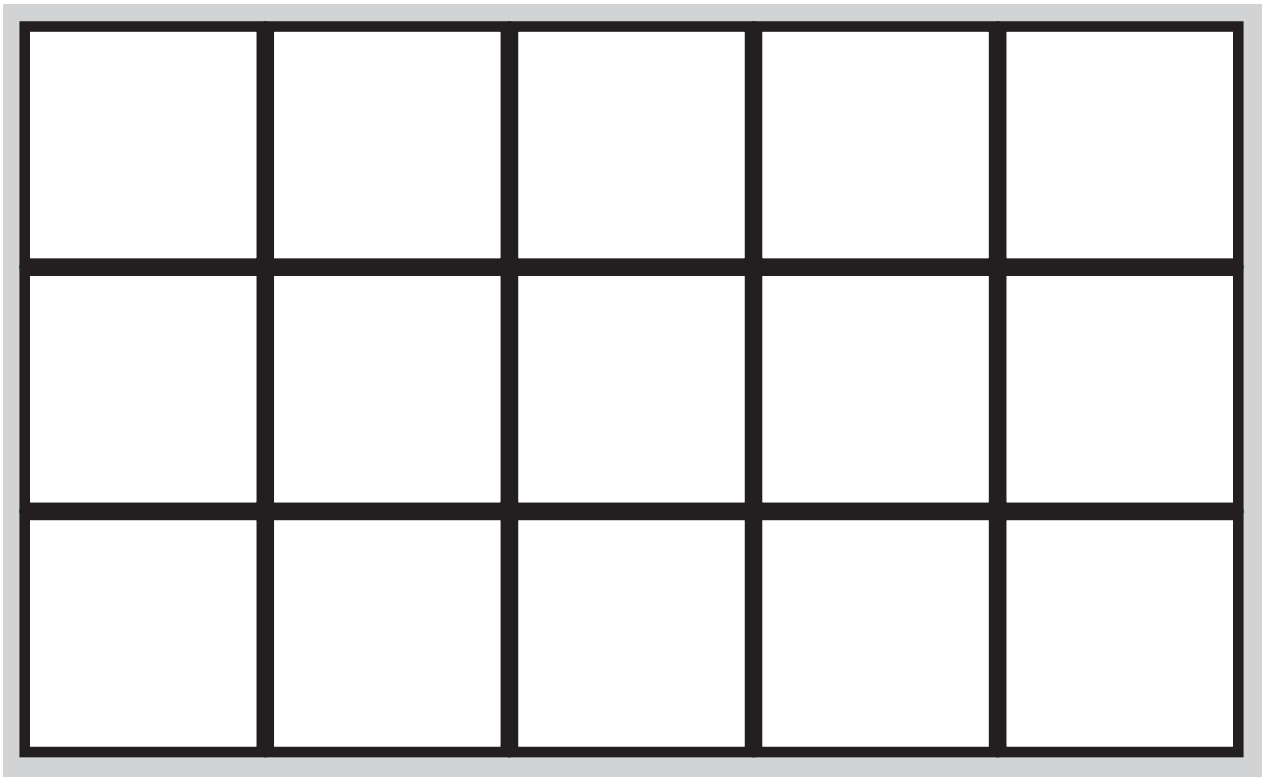

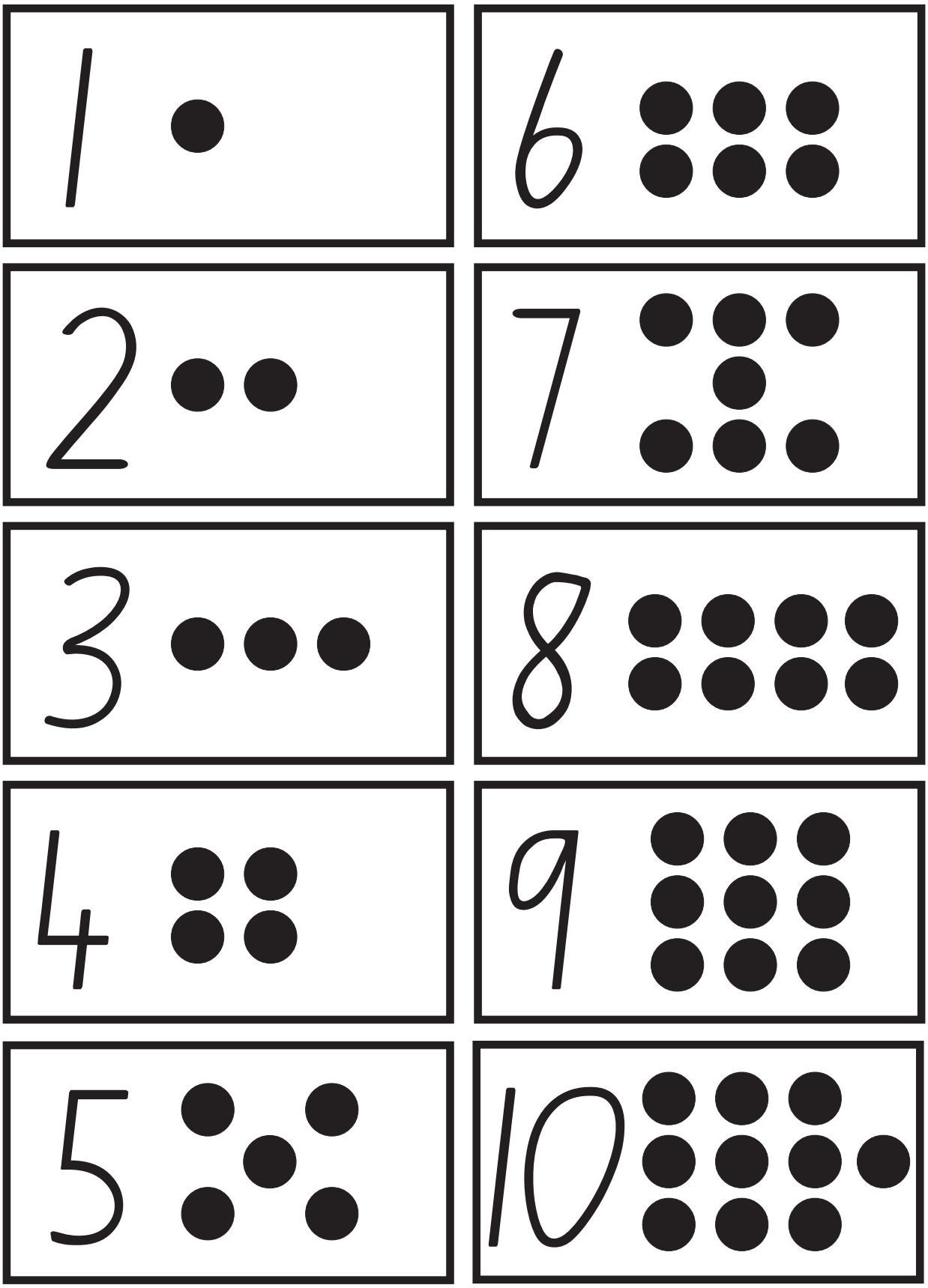
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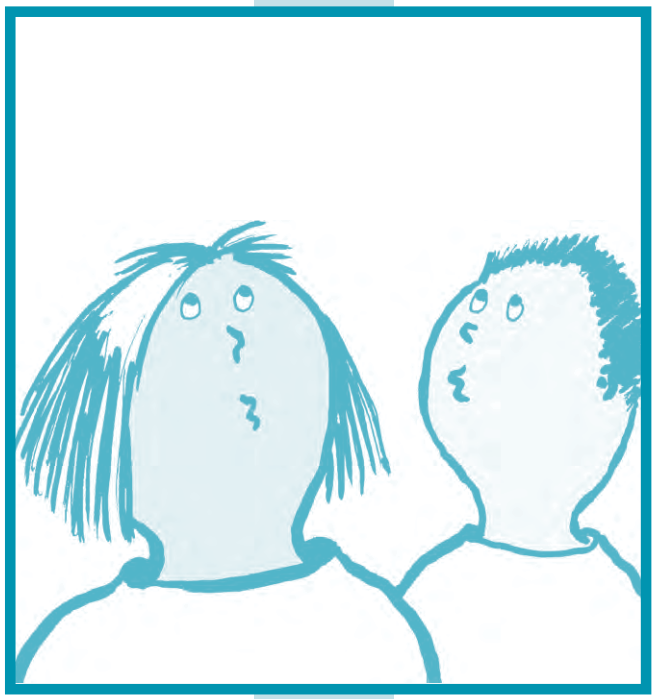
Students at the figurative counting stage



Students at the figurative counting stage

The nature of the learner

Students using figurative strategies to aid counting are able to count collections which are totally or partially concealed. They do not need to see, feel or hear the items in a collection to be able to count the collection. However, typically they rely on the simple strategy of counting by ones, starting from one to find a total. For example, when asked to count a collection of six items and a collection of three items which are both concealed from view, the student would be able to count the nine items often using fingers to represent the items. At the figurative counting stage students have an understanding of numbers as entities. For example, to form six using fingers, a student at this stage will raise six fingers simultaneously. By comparison, at the perceptual counting stage, a student will construct six using fingers by raising them one at a time as they count to six. The total of six and three, however, is still found at the figurative stage by counting from one.

Students at this stage demonstrate an understanding of the conservation of number and can represent a number in a variety of ways through such strategies as separating (partitioning) and combining.

Students are able to consistently produce the correct forward and backward number word sequences in the range from zero to twenty. Many may be able to go beyond this range. They are able to use their knowledge of forward and backward number word sequences to produce the number before and the number after a nominated number.

Students demonstrate their understanding of the numerical value of numbers by naming numerals and labelling collections of up to twenty items.

Students at the figurative counting stage are working towards

- using counting on to solve addition tasks
- using counting down to solve subtraction tasks
- developing base ten knowledge
- forming equal groups and finding their total.

Teaching considerations

When developing teaching and learning programs for students working at the figurative counting stage, teachers need to consider:

- ### Strategy development

  Students working at the figurative stage of counting are unable to draw from a wide range of strategies to solve number problems. Therefore there is a need to model effective strategies. At this stage the main focus for teaching should be on developing the counting on procedure. This will also be a major indicator when assessing students' abilities.

  Ensure that students are given opportunities to practise the strategy of counting on in small-group, pair and individual activities. Be aware that students who demonstrate the ability to use counting on may revert to the strategy of counting from one when they are presented with difficult tasks.

- ### Language development

  As students develop additional problem-solving strategies, ensure that they are taught the explicit mathematical language needed to explain their solutions. Vocalising the procedures used enables students to clarify their thinking and reinforces concepts.

- ### Numeral identification

  Whilst using the arithmetical strategies associated with the figurative stage, students may exhibit different levels of knowledge of numerals. The identification of numerals does not develop uniformly. Students may be able to identify some of the numerals beyond twenty before they can identify all the numerals up to twenty.

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Where are they now?

Students do not see ten as a countable unit. The student's focus is on the individual items that form a unit of ten. In addition or subtraction tasks involving tens, students count forwards and backwards by ones.

Where to next?

Students see ten as a unit composed of ten ones and are able to use the unit to count. However, they are dependent on visual representations of ten, such as strips of card showing ten dots or using ten fingers.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained

LFN reference

Base ten: level 1.

How?

Collections

Present students with a large collection of items, such as counters, pebbles, or buttons, a supply of containers, such as patty papers or cups, and a large sheet of cardboard. They will also need two sets of numeral cards ranging from zero to nine. Divide the chart into a "tens" and a "ones" column. Present the collection of items to the students and allow them to count the items. Each time ten items are collected, the students place the items into a container and move the container to the left-hand side of the chart, that is, onto the "tens" column. Students then place a numeral card above the "tens" column, indicating how many groups of ten have been collected. As succeeding tens are collected, students continue to add them to the left-hand side of the chart and replace the numeral card accordingly. Remaining items are placed on the right-hand side of the chart, in the "ones" column. Students then place a corresponding numeral card above the "ones" column to form a two-digit number.

Why?

Developing an understanding of tens and ones will assist students in using strategies other than counting by ones to solve problems.

Where are they now?

Students do not see ten as a countable unit. The student's focus is on the individual items that form a unit of ten. In addition or subtraction tasks involving tens, students count forwards and backwards by ones.

Where to next?

Students see ten as a unit composed of ten ones and are able to use the unit to count. However, they are dependent on visual representations of ten, such as strips of card showing ten dots or using ten fingers.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1 Counts, orders, reads and represents two- and three-digit numbers

WMS1.4 Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Base ten: level 1.

How?

Bundling

Present the students with large collections of popsticks. Have the students bundle the popsticks into groups of ten and place any remaining popsticks to the side of the bundles. Encourage students to count by tens to find the total and add on any remaining popsticks. Students should then label the collection using numeral cards. Interlocking blocks, such as Multilink, Unifix or Centicubes, could also be used.

Trading game

Supply students with a collection of base ten material. The students take turns to throw a die and take a corresponding number of base ten "shorts" from a central pile. On succeeding throws of the die, students add appropriate numbers of "shorts" to their collection. As the students collect ten "shorts" they swap or trade them for one base ten "long". Continue the activity until one, or all students, can trade ten "longs" for a base ten "flat".

Counting on

Prepare numeral cards in the range eleven to nineteen and place them face down on the floor. Provide the students with two collections of counters. One collection should consist of bundles of ten counters, all of the same colour. The second collection should consist of single counters of assorted colours. Students take turns to select a card. They then collect a corresponding number of counters, using the bundles of ten and single counters. Encourage students to count on from the bundle of ten. This activity may be varied by extending the range of numbers or by using ten strips (made of ten dots on strips of card) instead of counters.

Why?

Developing an understanding of tens and ones will assist students in using strategies other than counting by ones to solve problems.

Where are they now?

Students do not see ten as a countable unit. The student's focus is on the individual items that form a unit of ten. In addition or subtraction tasks involving tens, students count forwards and backwards by ones.

Where to next?

Students see ten as a unit composed of ten ones and are able to use the unit to count. However, they are dependent on visual representations of ten, such as strips of card showing ten dots or using ten fingers.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
WMS1.1	Asks questions that could be explored using mathematics in relation to Stage 1 content
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Base ten: level 1.

How?

Popsticks

Make a base board by folding a piece of paper or cardboard in half to form two columns. Label the columns as “units” and “tens”. Construct a set of numeral cards for the range one to nine on white cards. These cards will be used to represent numerals in the “tens” column on the chart. Construct a second set of numeral cards in the range zero to nine on coloured card. These will be used to represent numerals in the “ones” column . Provide bundles of ten white popsticks and a pile of coloured popsticks. Shuffle the two decks of cards separately. Place the cards face down between the students. The students take turns to turn over a white card and a blue card to form a two-digit numeral and place the cards onto the chart. The students then read the numeral they have formed and collect a corresponding number of sticks, using the bundles of white popsticks and the coloured popsticks. Students then place the popsticks next to the numeral cards and allow others to verify that the number of popsticks used is correct.

Why?

Developing an understanding of tens and ones will assist students in using strategies other than counting by ones to solve problems.

Where are they now?

Students do not see ten as a countable unit. The students' focus is on the individual items that form a unit of ten.

Where to next?

Students see ten as a unit composed of ten ones and are able to use the unit of ten when counting, aided by visual representations of ten, such as ten strips.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Backward number word sequence
Forward number word sequence
Numeral identification
Base ten strategies: intermediate concept of ten.

How?

Flip and see

Provide each student with a large collection of popsticks and a base board divided into a "tens" and a "ones" column. Place numeral cards in the range zero to nine face down on the floor. The students take turns to flip over two numeral cards and place one card in the tens column and one card in the ones column on their base board. Students then bundle popsticks into tens and place the correct number of bundles and units onto their base board to match the numeral cards. Discuss how many tens and ones were made.

Variations

- Students complete the above activity and then swap the numeral cards from the tens column to the units column and vice-versa. They then repeat the activity.
- Construct two sets of numeral cards in the range zero to nine. Flip over two numeral cards and ask the students to select identical numeral cards from the second set of cards. Ask students to place their cards in the tens and ones column so that they form the largest and the smallest number possible.
- Organise students into pairs and provide each pair of students with a set of numeral cards in the range zero to nine. The students shuffle the cards and place them face down on the floor. They then take turns to select two numeral cards. Using the two cards selected, each student forms the largest two-digit number possible. The two students then compare their numbers and the player with the larger number scores ten points. Continue playing until one player gains a score of one hundred.

Why?

Developing an understanding of tens and ones will assist students in using strategies other than counting by ones to solve problems.

Where are they now?

Students:

- are able to automatically represent a number on their fingers. They can usually produce the number word after a given number word in the range of one to twenty.
- are able to find the total of two groups of objects without touching the objects but need to start from "one".

Where to next?

Students:

- are able to count on from a given number to find the total of two groups
- automatically produce the number word after a given number within the range of one to thirty
- are able to count forwards to thirty and backwards from thirty or beyond.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.1	Asks questions that could be explored using mathematics in relation to Stage 1 content
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems.

LFN reference

Forward number word sequence
Backward number word sequence
Counting on

How?

Bucket count on

Drop a small collection of blocks one by one, into a bucket. Ask students to count aloud as each block is added to the container. After dropping the blocks, show the students the contents of the bucket. Then hold the bucket above the eye level of the students. Ask the students to state how many blocks would be in the bucket if one more block was added. Repeat the question, changing the number of blocks to be added to two and three blocks. Encourage the students to count on from the number of blocks already in the bucket to find the total.

Variation

Ask the students to pretend there are a nominated number of blocks in the bucket. Drop additional blocks into the bucket. Students count on to find the total sum of the blocks in the bucket.

Why?

These activities encourage students to count on from a given number and assist in developing their knowledge of the forward sequence of number words.

Where are they now?

Students:

- can produce the number word that follows a given number word, in the range of one to twenty
- can say the backward number word sequence from "twenty" to "one"
- can say the number word just before a given number word, but may drop back to counting from "one" when doing so.

Where to next?

Students:

- are able to count on from a given number
- automatically recall number facts for ten
- automatically say the number word before or after a given number.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2 Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers

WMS1.1 Asks questions that could be explored using mathematics in relation to Stage 1 content.

LFN reference

Figurative counting
Base ten strategies
Quinary strategies

How?

Blocks on a bowl

Place a container, such as an empty ice-cream container, between a pair of students. Turn the container upside down and place five Unifix blocks on top. Instruct students to look away while their partner takes away some, or all, of the blocks from the top of the container and hides them under the container. The first student turns back to see how many blocks are left on top of the container. Using this information, the student determines how many blocks were placed under the container. The student may then lift the container to confirm the answer.

Variation

As students become competent with five blocks, ten and then twenty blocks could be used.

Why?

Providing students with opportunities to solve tasks involving hidden or screened items may encourage them to use "counting on" as a problem solving strategy.

Where are they now?

Students :

- are able to identify numerals in the range of one to twenty
- are competent in saying the forward number word sequence to twenty.

Where to next?

Students:

- are able to identify one- and two-digit numerals
- are able to say the forward number word sequence to 100.

Ensure squares on the 10 by 10 grid are large enough to easily accommodate the size of a counter.

FIGURATIVE

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
PAS1.1	Creates, represents and continues a variety of number patterns, supplies missing elements in a pattern and builds number relationships
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.3	Describes mathematical situations and methods using everyday language and some mathematical language, actions, materials, diagrams and symbols.

LFN reference

Numeral identification

How?

Hundred chart

Display a large hundred chart. Ask students to identify, and explain to the group, any number patterns they can see on the hundred chart. After practice with the large hundred chart, give the students small hundred charts to work with. Cut the charts into strips so that numerals are grouped into tens. Students then sequence these numeral strips to recreate the hundred chart. Students then use these hundred charts to discover and record their own number patterns. Provide the students with calculators to confirm the number patterns.

Variations

- Provide students with a 10 by 10 grid to represent a hundred chart and fifteen counters, each displaying a different numeral in the range of one to one hundred. Students place the counters onto the grid in the correct numerical position. It may be necessary to provide a "key" numeral amongst the fifteen counters, for example the numeral 50.
- Cut groups of numerals on a hundred chart into a square formation. For example, cut the chart so that the numerals 1, 2, 11 and 12 are together. Alternatively, cut the hundred chart in a random pattern similar to a jigsaw design. Students then restore the hundred charts.
- Display a blank hundred chart on an overhead projector. Students call out numbers up to one hundred. The teacher, or a student, writes the nominated numerals onto the chart as they are named.
- Provide students with individual hundred charts. Blank out some of the numerals on the chart. Have the students write the missing numerals in the spaces.
- Allow opportunities for students to practise oral counting forwards and backwards as well as skip counting by twos, fives and tens.

Why?

These activities assist students in developing their knowledge of the relative size of numbers to 100.

Where are they now?

Students are able to complete addition tasks, but count from "one" to find the total, rather than counting on from the larger group.

Where to next?

Students use counting on as a strategy to solve addition problems.

FIGURATIVE

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.3	Describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained

LFN reference

Counting on

How?

Add two dice

Construct a set of numeral cards in the range of two to twelve. Place them face up on a table, or on the floor. Taking turns, the students are to roll two dice and find the total. Encourage the students to count on from the larger number rolled. After adding the two dice the student takes a numeral card corresponding to the total. The game continues until all the cards have been taken. If a player rolls a number that has already been taken, the player's turn is forfeited.

Why?

Students need to be encouraged to use increasingly efficient strategies to solve addition tasks.

Where are they now?

Students are able to complete addition tasks, but count from "one" to find the total, rather than counting on from the larger group.

Where to next?

Students use counting on as a strategy to solve addition problems.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.3	Describes mathematical situations and methods using everyday language and some mathematical language, actions, materials, diagrams and symbols.

LFN reference

Counting on

(Add two dice)

Variations

- Use a variety of dice to extend the range of numbers. For example, construct a dodecahedron (12 faces) from plastic polygon shapes and attach numerals to each face of the construction. Modify the set of numeral cards to the appropriate range of numbers.
- Provide the students with three dice and with numeral cards for three to eighteen. This activity is then played like *Add two dice*. Students roll the three dice and find the total. This provides opportunities for introducing strategies other than counting by ones to solve addition tasks.
- Allow students to construct their own die and attach numerals of their choice. If large numbers are written on the first die, then modify the second die to display only the numerals 1, 2 and 3. A calculator may be used to confirm the additions.
- Another variation of the activity is achieved by instructing the students to write five numbers, within a nominated range, on a strip of paper. Students take turns to roll two dice and find the total. They then tell the group the total. As the totals are called, students cross off any corresponding numerals on their paper strip. The game continues until one student has crossed off all five numerals on his or her paper.

Why?

Students need to be encouraged to use increasingly efficient strategies to solve addition tasks.

Where are they now?

Students are able to solve addition problems up to ten or beyond, but they count from one to do so.

Where to next?

Students automatically recall addition number facts to ten.

Outcomes

This activity provides opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.3	Describes mathematical situations and methods using everyday language and some mathematical language, actions, materials, diagrams and symbols.

LFN reference

Figurative counting

Finger patterns

How?

Rabbits' ears

Instruct the students to make two fists and rest them on their heads, so that their hands are out of their direct line of sight. Ask the students to raise a given number of fingers on each hand and to add them together. Students may bring their hands down to confirm the answer.

Doubles

Instruct the students to use two hands to demonstrate double numbers from 1 to 5. For example, "Show me double four. How many altogether?" In this example the students would raise four fingers on each hand and call out the answer. Students may bring their hands down to count and confirm the total.

Doubles plus one

This activity is played in a similar way to *Doubles*. Instruct the students to raise their fingers for a nominated double combination and then add one more finger to find the total. Alternatively, play *Doubles minus one*. For this activity students raise their fingers to represent a nominated double and then subtract one finger to find the total.

Why?

Students use finger patterns to support their early understanding of numbers. Understanding that numbers are made up of other numbers allows students to move to strategies which don't involve counting by one. Using doubles and near doubles is a common early use of number facts.

Where are they now?

Students:

- instantly recognise die patterns to "six"
- are able to add two screened groups after being told the amount in each group, but count the total starting from "one".

Where to next?

Students:

- use the strategy of counting on from the larger group when adding two groups to complete addition tasks
- recall number facts to "ten".

Encourage students to predict which number will need to be to found to make a total of ten, before turning over the second card.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

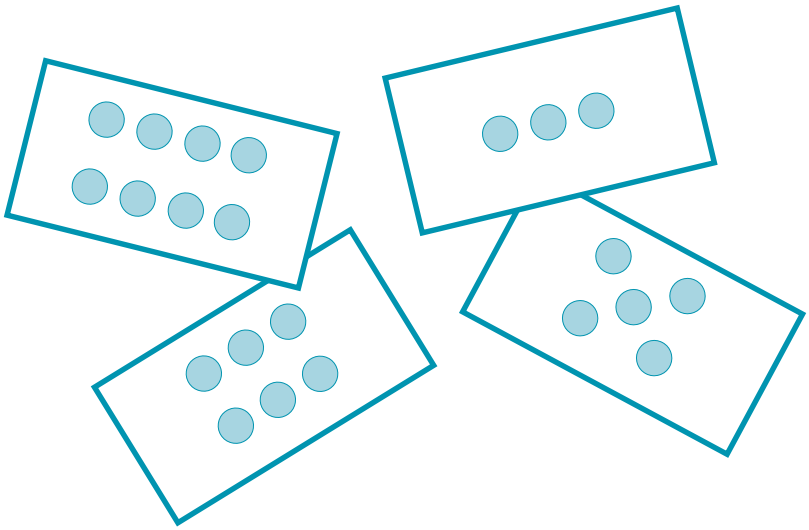
Counting on Subitising

FIGURATIVE

How?

Dot pattern cards

Construct dot patterns for numbers one to nine, with two copies of card 5. Place the cards face down on a table between pairs of students. The students take turns to turn over two cards and add the two cards together. If the total is "ten" the student keeps the two cards. If the cards do not equal "ten" they are returned to the table. Encourage students to count on from the larger number.



Variations

- Use numeral cards instead of dot pattern cards.
- Use five numeral cards and five dot pattern cards.
- Use ten frame cards.
- Extend the total to 15 or 20.

Why?

Students need to develop a range of strategies to solve number problems. Strategies such as "counting on", "counting down to" and "counting up to" may be an efficient method of solving a problem. However this is dependent upon the task and the student knowing which is the most appropriate strategy.

Where are they now?

When adding two groups, the students count from "one" to find the total.

Where to next?

Students use the strategy of counting on from the larger group when adding two groups.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Counting on

How?

Posting counters

Provide the students with a container similar to a money box. Instruct the students to "post" a nominated number of counters through the slot in the container. Encourage the students to count each counter as it is dropped through the slot. Students then pause and state the total number of counters that are now hidden in the container. Instruct the students to post an additional number of counters into the container, counting on from the original number. Alternatively, ask students to pretend there are a specified number of counters in the container. Students count on as additional counters are posted through the slot.

Two-dice toss

Provide each pair of students with two dice and a pile of counters. Have the students take turns to throw the dice and add the total, counting on from the larger number. Students then take the corresponding number of counters from a central pile. The game continues until all the counters have been removed from the central pile.

Why?

Students need to develop strategies other than counting all items in groups, starting from one, when solving addition tasks. Counting on is a more efficient strategy.

Where are they now?

Students add two groups by counting from "one" rather than counting on from the larger group.

Where to next?

Students use the strategy of counting on from the larger of two groups to solve addition tasks.

Teachers may take this opportunity to model addition using counting on procedures.

Outcomes

These activities provide opportunities to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
PAS1.1	Creates, represents and continues a variety of number patterns, supplies missing elements in a pattern and builds number relationships
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.3	Describes mathematical situations and methods using everyday language and some mathematical language, actions, materials, diagrams and symbols.

LFN reference

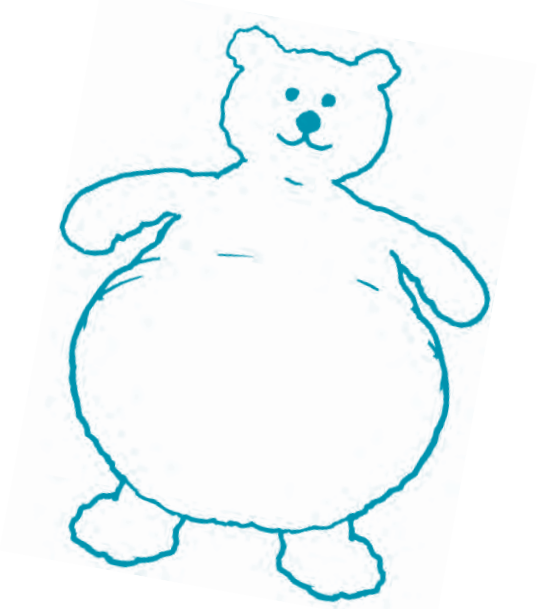
Counting on

Combining procedures

How?

Teddy tummies: addition

Prepare base cards using BLM on page 212. Provide each pair of students with ten counters and the appropriate base board. The students take turns to distribute the counters between the two teddies by placing the counters on the teddies' tummies. Pairs of students then discuss the number combinations formed with the ten counters. The students continue the activity, investigating the possible number combinations for the ten counters.



Variations

- The students record the number combinations for "ten" as they are discovered. Allow opportunities for the students to demonstrate their "discoveries" to the rest of the class.
- Substitute the "teddies" blackline master with BLM on page 213 displaying two trucks. Provide pairs of students with ten plastic teddies to complete the activity in a similar way to *Teddy tummies*.

Why?

Students need opportunities to use counting on as an addition strategy and to develop knowledge of the numbers that combine to make ten.

Where are they now?

Students demonstrate their understanding of the process of addition by joining two groups. They are able to find the total of the two groups by counting all of the items, starting from "one".

Where to next?

Students automatically recall number facts to 10.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
PAS1.1	Creates, represents and continues a variety of number patterns, supplies missing elements in a pattern and builds number relationships
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.3	Describes mathematical situations and methods using everyday language and some mathematical language, actions, materials, diagrams and symbols.

LFN reference

Counting on

Partitioning and combining strategies

How?

Friends of ten

Construct two sets of numeral cards in the range of one to ten. For this activity it is necessary to attach string or shoelaces to the numeral cards so they can be worn around the students' necks. It is also more manageable if each set of cards is a different colour. Distribute one set of numeral cards to ten students. These students leave the room or turn away from the remaining students. Distribute the other set of numeral cards to the remaining students. Ask the students in the first group to return to the class (or turn around) and find a partner who is wearing a card which, when added to their own card, will equal ten.

Variations

- Increase the range of numbers on the numeral cards.
- Change the cards so that one set displays numerals and the other set displays dot patterns.

Why?

Knowing the basic number combinations that form ten allows students to use a range of strategies for addition, for example, knowing that 7+3 is the same as 8+2, and introduces the idea of compensation (one up, one down).

This activity develops the concept that addition may be an appropriate strategy for solving a subtraction problem.

Where are they now?

Students demonstrate their understanding of the process of addition by joining two groups. They are able to find the total of the two groups by counting all of the items, starting from "one".

Where to next?

Students automatically recall number facts to 10.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
PAS1.1	Creates, represents and continues a variety of number patterns, supplies missing elements in a pattern and builds number relationships
WMS1.3	Describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained

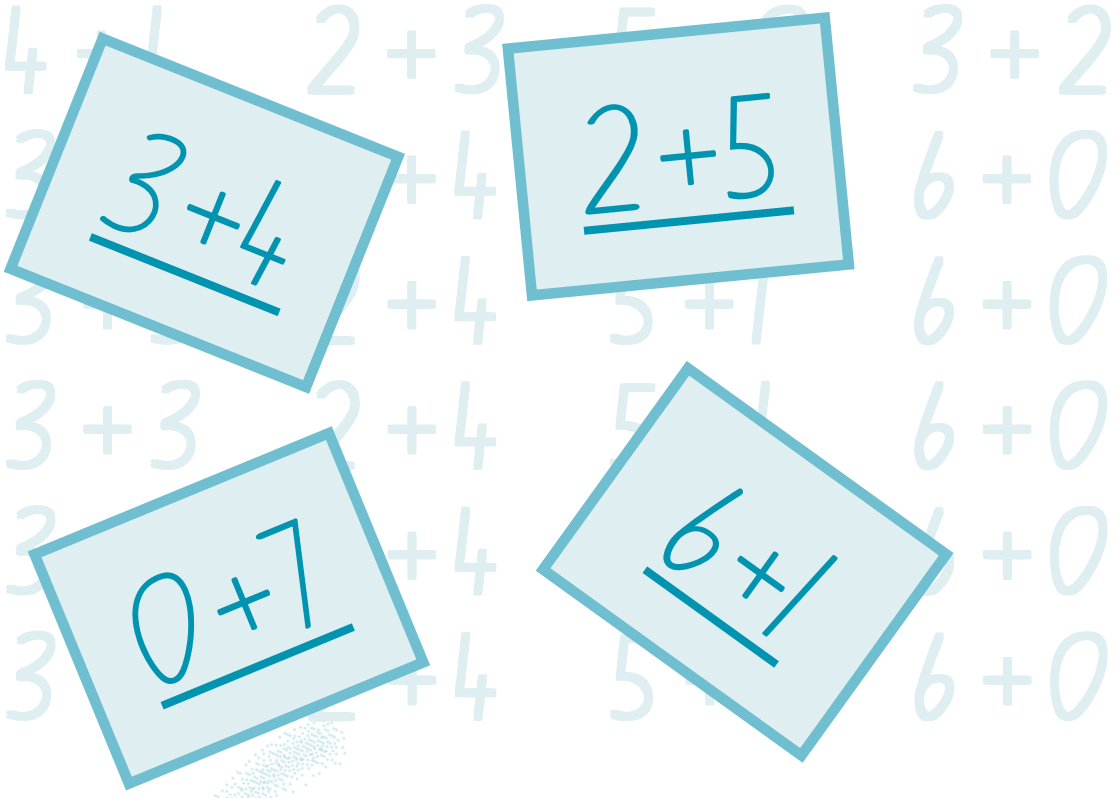
LFN reference

Counting on

Partitioning and combining strategies

Fishing addition

Construct six sets of four cards, with each card in any one set displaying a basic addition fact for the same number in the range one to ten. Each set of cards should have a unique sum. Shuffle the cards and deal five cards to each player. Place the remainder of the cards face down on the floor. Instruct the students to look at their dealt cards and take turns to discard any pairs of cards that add up to the same total. After discarding any pairs of cards, the first player asks his or her partner for a card which equals a specific number. For example: "Pass me an eight". If the partner holds a card totalling the nominated number, it must be handed over. If the partner does not have the nominated card, the person who asked takes a card from the central pile. In both cases, if a pair of cards is formed, the student discards them. The winner is the player who discards all of his or her cards first.



Why?

Knowing basic number combinations that form ten allows students to use a range of strategies for addition, for example, knowing that 7+3 is the same as 8+2, and introduces the idea of compensation (one up, one down).

This activity develops the concept that addition may be an appropriate strategy for solving a subtraction problem.

Where are they now?

Students:

- can identify numerals from one to twenty
- are able to say the forward number word sequence to twenty
- confidently repeat the backward number word sequence from twenty.

Where to next?

Students:

- can identify numerals to 100 or beyond
- are able to say the forward number word sequence to 100 or beyond, confidently crossing into the next group of ten numbers.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2 Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers

WMS1.2 Uses objects, diagrams, imagery and technology to explore mathematical problems

WMS1.4 Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Numeral identification: level 3

How?

Using technology

Provide the students with at least one calculator for each pair of students.
Instruct the students to:

- enter a given number on the calculator
- enter on the calculator the number which is one before or one after a given number
- use the constant function on a calculator to add on from a given number.

Provide the students with a hundred chart on which they can record the number patterns.

Why?

This activity provides an opportunity for students to develop their knowledge of numbers up to and perhaps beyond 100.

Where are they now?

Students can solve addition tasks but count from one to find the total of two groups. Students are able to solve subtraction tasks when concrete material is available.

Where to next?

Students are able to complete addition and subtraction tasks using the strategies of "counting on" and "counting down from".

Allow students to discover that some numbers cannot be subtracted if they do not have enough counters to begin with.

FIGURATIVE

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.3	Describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Combining and partitioning

How?

Ring that bell

Provide the students with a supply of counters. Ring a bell a number of times, for example, four times. Instruct the students to place the corresponding number of counters on their desk. Hold up a symbol card for addition or subtraction and then ring the bell again, for example twice. Have the students respond by observing the symbol card and adding or subtracting the correct number of counters. Students then state the total number of counters. Encourage the students to discuss their actions and how they arrived at their answers.

Variation

This may be used as a small-group or partner activity, with students rolling a die instead of ringing a bell.

Why?

Students need opportunities to use more efficient number strategies when completing addition and subtraction tasks.

Where are they now?

Students are able to find the total of two groups by counting from "one".

Where to next?

Students:

- use a counting on strategy to solve addition tasks
- count in a forward and backward sequence to 100 and beyond
- have automatic recall of addition and subtraction facts to ten.

Introduce the activity to the whole class before students complete the activity in small groups or with partners.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Figurative counting
Combining
Spatial patterns
Forward number word sequence
Backward number word sequence

How?

How many eggs?

Construct a grid using BLM on page 209 as well as one set of rule cards and a set of numeral cards for each group of students. Rule cards need to display either an addition or subtraction sign, followed by the numeral 1, 2 or 3. For example, a rule card might display: " + 3".

Instruct the students to place the correct number of counters on each column according to the numeral written at the top of the column. Students then take turns to turn over a rule card from the pile. Students follow the rule, to add or subtract counters from each column and determine the new total. As the students determine each total, they place a corresponding numeral card at the bottom of each column.

Variation

Modify the numerals at the top of each column.

Why?

This activity provides an opportunity for students to develop awareness of number patterns and to develop strategies for solving problems other than counting by ones.

Where are they now?

Students are able to solve addition tasks, but count from one to find the total of the two groups.

Where to next?

Students complete addition or missing addend tasks using the strategies of counting on or counting back.

This activity can be demonstrated by the teacher using an overhead projector and transparent counters.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Figurative counting

How?

Ten frames

Provide each student with a blank ten frame and ten counters. Ask students to place a specified number, less than ten, on their ten frame. Direct students to add another specified number of counters to the frame and to find the total.

Variations

- Complete subtraction tasks using the ten frames. For example, arrange nine counters on the ten frame. Ask students to determine how many counters would need to be taken away to leave six. Demonstrate the strategies of counting down to and counting down from a given number.
- Use two ten frames to work with numbers to twenty.

Why?

Ten frames provide students with a visual structure for a number. This encourages students to establish and work with visual images of numbers. Ten frames emphasise doubles and five as part of a number. For example, using a ten frame, 9 can be seen as 5+4, one less than double 5 or one more than double 4.

Where are they now?

Students:

- understand and demonstrate the meaning of subtraction by taking an object, or a group of objects, from a group of objects.
- are able to count in a backward number word sequence from twenty.

Where to next?

Students are able to use addition or to count down from a number to find the answer to a subtraction problem.

A full explanation of the strategies of *Counting down to* and *Counting down from* appear on the opposite page.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.3	Describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

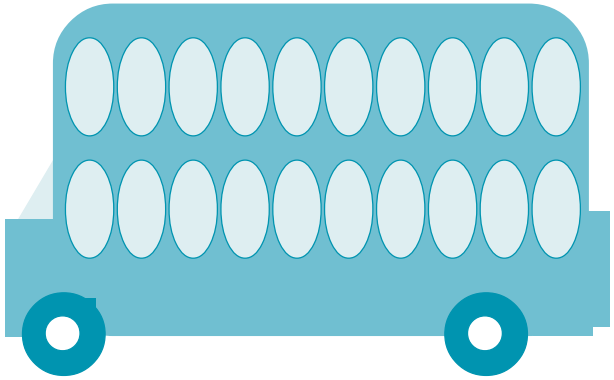
LFN reference

Figurative counting

How?

Subtraction teddies

Provide each student with twenty plastic teddies, a "double decker bus" baseboard (see BLM on page 214) and a strip of paper. Have the students place the twenty teddies on the bus baseboard. Instruct the students to take turns to roll a die and subtract the corresponding number of teddies from the collection of teddies on the bus. The student then records the number of remaining teddies on the strip of paper. The activity continues until one student reaches zero.



Counting down to

The student counts backwards from the larger number when solving subtraction problems where the problem involves a missing addend. For example, when solving 9 - ( ) = 6, the students would count backwards from nine knowing they are counting to the number six and say "eight, seven, six." Students typically hold up fingers as they count and recognise three as the answer.

Counting down from

The student counts backwards from the larger number when solving subtraction problems. For example, when solving 9 - 3, the student counts backwards from nine saying "eight, seven, six...six!"

Why?

This activity is designed to develop students' knowledge of subtraction facts. Automatic recall of addition and subtraction facts allows students to attend to other features when solving problems.

Where are they now?

Students count from "one" to solve tasks involving equal multiples.

Where to next?

Students are able to solve multiplication tasks by counting in multiples.

Encourage students to discuss how they reached their answer. Allow them to verbalise how they counted.

If the students are unable to skip count by threes, encourage rhythmic or stressed counting.

FIGURATIVE

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
NS1.3	Uses a range of mental strategies and concrete materials for multiplication and division
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

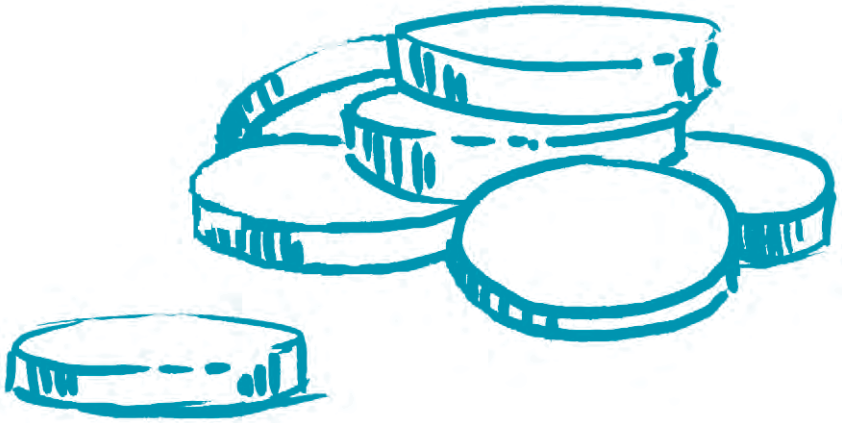
Early multiplication and division

How?

Arrays

Organise students into pairs. Provide the students with a collection of counters. Instruct one of the pair to make a simple array that is no larger than 5 by 5, with counters. The student then briefly shows the array to his or her partner before screening the counters with a sheet of cardboard.

The other student then attempts to construct the same array pattern with counters. The students should then compare the two arrays. Ask the students to find the total number of counters in the array.



Arrays: changing groups

Arrange nine students into three rows with three students in each row.

Pose the following question: "If we add another row of children, how many would there be altogether?"

Continue adding rows of students and encourage students to guess how many children there are altogether, prior to counting the students.

Variation

Change the number of students in each line.

Why?

Early multiplication and division strategies focus on the structure and use of groups of items. Students need to develop strategies where they see a group of items as one unit and no longer need to count each item within the group.

Where are they now?

Students need visible items to calculate the total number of items in a simple square array pattern.

Where to next?

Students are able to calculate the total number of items in a simple square array pattern without relying on visual representations.

Observe and question the students to determine how they are calculating the total in the array.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.3 Uses a range of mental strategies and concrete materials for multiplication and division

WMS1.2 Uses objects, diagrams, imagery and technology to explore mathematical problems

WMS1.4 Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Early multiplication

How?

Guess my square

Organise students into pairs so that they are sitting opposite each other. Provide each student with an equal number of multi-link cubes or pattern tiles and a sheet of cardboard which will be used as a screen. Ask students to take turns to construct a simple array pattern using the material provided. Students should screen the array from their partner until the pattern is completed. The student then briefly shows the array to the partner before screening the array again. The other student constructs the same array pattern from memory. Instruct students to uncover and compare both array patterns. The students then calculate the total number of items in each array.

Variation

Arrange students in pairs. Ask the students to take turns to make an array which is hidden from their partner's view. The student then describes the array to the partner by stating the number of counters in each row and the number of rows. The partner then attempts to make the array. He or she then determines the total number of counters in the array.

Why

The formation of arrays is important in developing strategies of coordinating groups. This coordination of groups can lead to students developing abstract concepts to solve multiplication and division problems.

Where are they now?

The students determine the total number of items within a specified number of groups by counting the total by "ones".

Where to next?

Students use the strategies of rhythmic counting and skip counting to find the total number of items within a specified number of groups.

Literature link

Many traditional folk and fairy tales have a theme based on three, such as The Three Little Pigs and Goldilocks and the Three Bears. Grouping based on these tales can be used in activities.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.3	Uses a range of mental strategies and concrete materials for multiplication and division
PAS1.1	Creates, represents and continues a variety of number patterns, supplies missing elements in a pattern and builds number relationships
WMS1.3	Describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

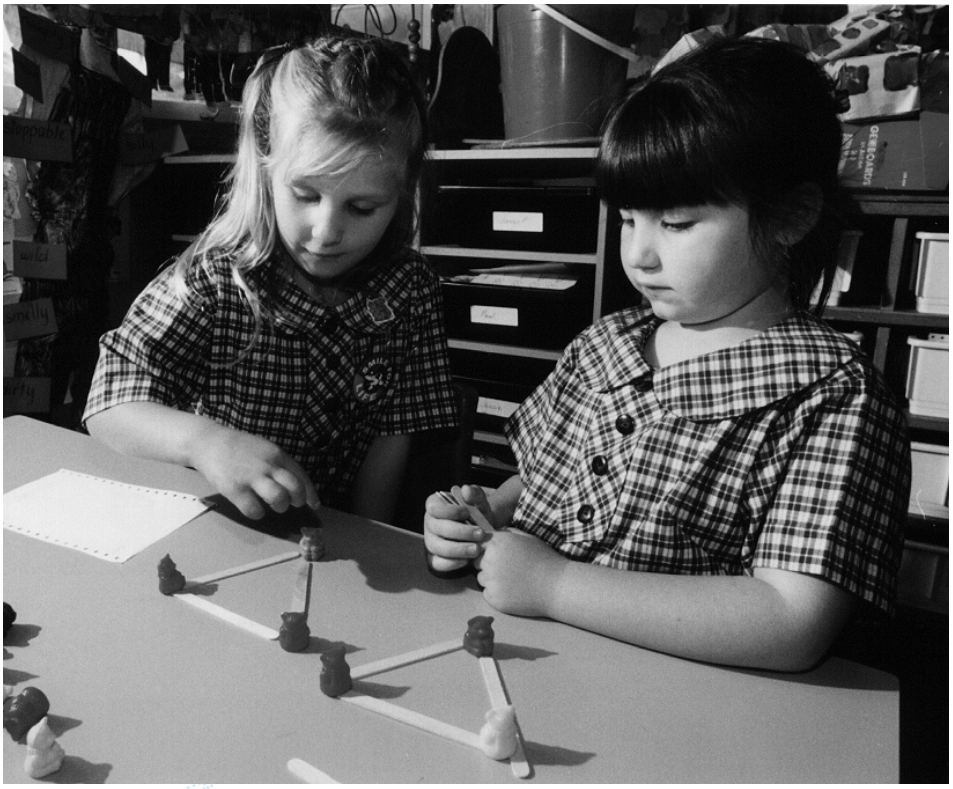
LFN reference

Early multiplication and division

How?

Triangle teddies

Provide the students with a collection of popsticks and a collection of plastic teddies. Instruct the students to make a triangle using three sticks. Ask the students to then place a teddy on each of the corners of the triangle. The students then count and record the number of teddies on the triangle. Have the students repeat the process for a second triangle. The students record the total number of teddies placed on the two triangles. Have the students continue to form additional triangles and record the total number of teddies on the triangles.



Why?

Students need to be able to recall the counting sequences for nominated multiples. Multiplication and division strategies will be limited by students' knowledge of these sequences.

Where are they now?

The students determine the total number of items within a specified number of groups by counting the total by "ones".

Where to next?

Students use the strategies of rhythmic counting and skip counting to find the total number of items within a specified number of groups.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
NS1.3	Uses a range of mental strategies and concrete materials for multiplication and division
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Early multiplication and division

How?

Units for two

Collect or draw items commonly found in pairs, such as eyes, shoes, socks, or legs. Model the method of counting the items, using rhythmic counting, to the students. Model methods for keeping track of the number of groups as well as the total number of items. Allow opportunities for the students to practise the modelled methods. Demonstrate how the total number of items in a specified number of "groups of two" can be found by counting the first number in each pair silently and voicing the second number. Allow opportunities for the students to practise this counting method.

Handprints

Make a handprint to represent a group of five. Repeat printing the handprints across a strip of paper. Ask the students to count the number of hands and to find the total number of fingers using rhythmic or skip counting methods.

Variation

Construct a square using four popsticks to represent groups of four.

Why?

Students need to be able to recall the counting sequences for nominated multiples. Multiplication and division strategies will be limited by students' knowledge of these sequences.

Where are they now?

Students are able to form equal groups of items but find the total number of items in the groups by counting by ones.

Where to next?

Students are able to use rhythmic and skip counting strategies to find the total of equal groups.

Write the instruction cards in two ways, such as four rows of 5 and five rows of 4.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.3	Uses a range of mental strategies and concrete materials for multiplication and division
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

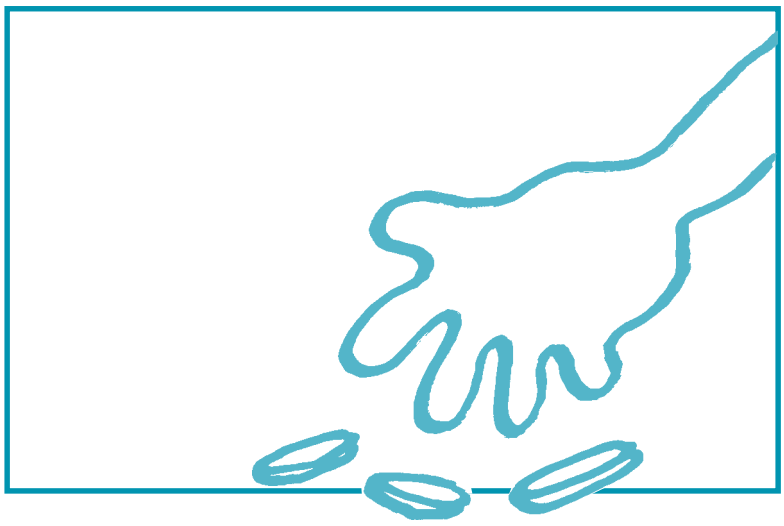
LFN reference

Early multiplication and division: level 2

How?

Turning arrays

Provide each student with a small sheet of cardboard and a supply of counters. Instruct students to form arrays by placing the counters onto the cardboard following instructions, such as "make three rows of five counters". Students then turn the card 90° to show a new array of five rows of three. Discuss with the students the number of rows, the number of counters in each row and the total number of counters for each array pattern.



Variation

Allow the students to form arrays using potato prints, shape prints, thumb prints or adhesive stickers. Provide students with instruction cards for making the arrays.

Why

The formation of arrays is important in developing concepts of groups and coordinating groups. This coordination of groups can lead to abstract concepts of multiplication and division.

Where are they now?

Students are able to form items into equal groups but count by ones to find the total.

Where to next?

Students are able to use the strategies of rhythmic and skip counting to find the total of equal groups.

BLMs could be covered with contact and felt pens used to circle the groups. They can then be erased for later use by others in the class.

FIGURATIVE

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.3 Uses a range of mental strategies and concrete materials for multiplication and division

WMS1.2 Uses objects, diagrams, imagery and technology to explore mathematical problems

WMS1.4 Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Early multiplication and division: stages 1, 2

How?

Calculating groups

Provide students with a stencil displaying a large number of items. Instruct students to draw rings around groups of items on the stencil. For example: "Put a ring around groups of five items." Ask the students to determine how many groups were made and to use rhythmic counting or skip counting to find the total. Ask the students to determine the number of single items remaining on the sheet.

What's in a square?

Construct multiple copies of the grid on BLM on pages 210 and 211 and accompanying picture cards displaying groups of items. Each pair of students will need a copy of the grid, a deck of picture cards and counters of two different colours. Shuffle the picture cards and place them face down before the students. The first player takes a card from the top of the pile and places a counter on the corresponding square on the grid. For example, if a card displaying one item is drawn, the student places his or her counter on the "one group of 1" square at the top left-hand corner of the grid. Players continue to take turns to turn over cards and mark them on the grid. The winner is the first player to make a line of three counters horizontally, vertically or diagonally.

To extend this activity introduce numeral cards which indicate the total number of items on each picture card. After the students place a picture card onto the grid, instruct them to determine the total of the groups and place a corresponding numeral card on top of the picture card.

Why?

Early multiplication and division strategies focus on the structure and use of groups of items. Students need to develop the concept of seeing a group of items as one "unit" and no longer relying on counting each item within the group.

Where are they now?

Students are able to form items into equal groups. They calculate the total number of items in the groups by counting by ones.

Where to next?

Students are able to use the strategies of rhythmic and skip counting to find the total of equal groups.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.3	Uses a range of mental strategies and concrete materials for multiplication and division
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Early multiplication and division: stage 2

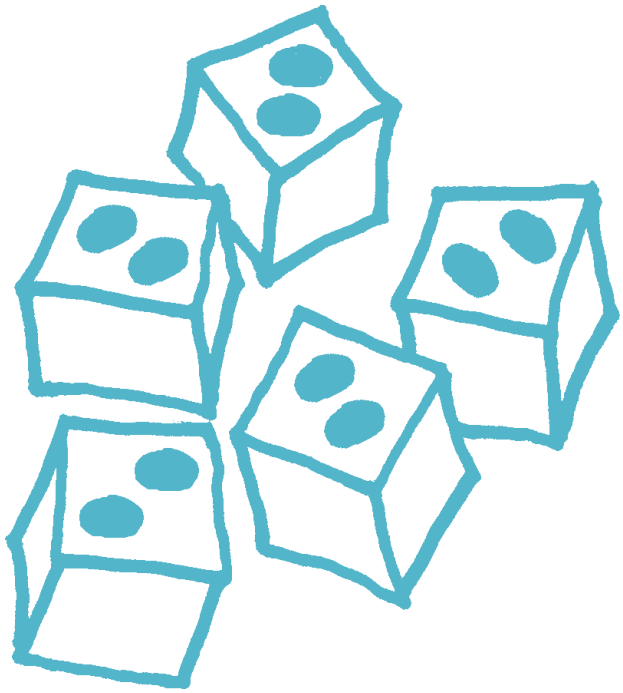
How?

Groupies

Provide the students with a collection of items such as counters, marbles or plastic teddies. Direct the students to form a specified number of equal groups using the items, for example, "Make four groups of three counters". Students use rhythmic or skip counting to find the total number of items in the specified groups.

Variation

Use dot patterns on dice to represent groups, for example, five groups of two.



Why?

Early multiplication and division strategies focus on the structure and use of groups of items. Students need to develop the concept of seeing a group of items as one "unit" and no longer relying on counting each item within the group.

Where are they now?

Students are able to form items into equal groups. They calculate the total number of items in the groups by counting by ones.

Where to next?

Students are able to use the strategies of rhythmic and skip counting to find the total of equal groups.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.3	Uses a range of mental strategies and concrete materials for multiplication and division
PAS1.1	Creates, represents and continues a variety of number patterns, supplies missing elements in a pattern and builds number relationships
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Early multiplication and division: stage 2

Dice and grid game

Construct a 6x6 grid for each player. Write the numerals 1 to 36, in sequence, onto the grid, placing one numeral in each square. Each player will also need six sets of dot pattern cards representing the numbers one to six, a numeral die and a dot pattern die.

In this activity, the "numeral die" is used to indicate the number of equal groups, and the "dot pattern die" indicates the number of items in each group.

Instruct the students to roll the two dice and state the size of each group and the number of equal groups. When the student has stated the size and number of equal groups, ask the student to collect the correct number of dot pattern cards to represent the groups. For example, if the student wishes to make five groups of three, he or she would then select five cards showing three dots on each card.

Students then find the total number of dots by rhythmic or skip counting, and place a counter on the corresponding numeral on the grid. In the above example, the student would place the counter on the numeral 15. The winner is the first to have three counters in a row, horizontally, vertically or diagonally.

Variation

Allow students to use a calculator to determine the total number of dots in the groups. Observe whether the student uses repeated addition or multiplication with the calculator.

Why?

Early multiplication and division strategies focus on the structure and use of groups of items. Students need to develop the concept of seeing a group of items as one "unit" and no longer relying on counting each item within the group.

Assessment tasks

Task	Student response	Assessment
T :"If I have 6 pencils and I get another 3, how many do I have altogether?"	S: Correctly adds the two groups without the use of concrete material.	Did the students count from one, or did they count on from 6?
T: Displays a set of eight counters. "Here are eight counters." Screens the counters. The teacher then displays a set of 5 counters. "There are five counters here". Screens the second group. "How many counters are there altogether?"	S: Demonstrates addition by counting on from the larger number.	Did the student: • count from one? • count on from eight? • know the number fact automatically? If the student was unsuccessful in adding the two groups, the teacher should unscreen the second group and pose the question again. This may encourage the student to count on.
T: "If I have 8 lollies and I eat 3, how many are left?"	S: Completes the subtraction task without the use of concrete materials.	Which strategy did the student use to determine the answer?
T: Displays and then screens a collection of 15 counters. "I'm taking out 6. How many are left?" Displays the six removed counters.	S: Completes the subtraction task without having to see or feel the counters.	Did the student • count on from 6? • attempt to count down from 15? • attempt to count down to 6?
T: Displays numeral cards in the range from 1 to 100, and asks the student to name the numeral being displayed.	S: Correctly names each numeral as the cards are displayed.	Is the student able to name numerals in the range: 1-10? 1-20? 1-100?
T: "Count forwards starting at 55" (and stop at 64).	S: Correctly says the forward number word sequence from 55 to 64.	Does the student: • know the forward number word sequence? • count fluently from one decade to the next? (e.g. 59, 60)

Assessment tasks

Task	Student response	Assessment
T: "Count backwards starting at 93" (and stop at 87).	S: Correctly says the backward number word sequence from 93 to 87.	Does the student: • know the backward number word sequence? • count fluently from one decade to the next? (e.g. 90, 89)
T: "Name the numeral which comes after " (numbers in the range 1 to 100, e.g. the number after 53)	S: Correctly says the numeral which comes after the numerals given by the teacher.	Did the student drop back and count up to find the next number?
T: "Name the numeral which comes before" (a given numeral in the range from 1 to 100, e.g. the number before 53 is 52)	S: Correctly says the numeral which comes before the numerals given by the teacher.	Does the student know the backward number word sequence from 100 to 1? Did the student drop back to a lower decade to determine the answer?
T: Briefly displays 7 counters before screening them. "Here are seven counters. I'm taking some of them out and there are 2 left. How many did I take out?"	S: Determines the missing addend without seeing or feeling the counters.	Does the student model and count the concealed items? Did the student count down from 7 or count down to 2? Did the student count from one, three times?
T: Displays a set of numeral fact cards (addition facts to ten.) "What does this say?" "Can you work it out?" "How did you do it?"	S: Automatically recalls number facts or uses an efficient strategy to solve the task.	Did the student automatically provide the answer to the number fact? If not, what strategy did the student use? Did the student: • count from one? • count on from the larger number?

Three-minute lesson breakers

- Oral counting using the hundred chart.

- Think of a "secret number" and provide the students with clues for guessing the "secret number". Include simple and complex clues.

  For example:

  " The secret number is two more than three."

  " The secret number is more than twelve but less than nineteen."

  " The secret number is an odd number between 10 and 20."

- Provide opportunities for the class to practise oral counting from a number other than one. For example, instruct the students to count from 36 to 50.

- Using one week on a calendar as a visual aid, pose such problems as:

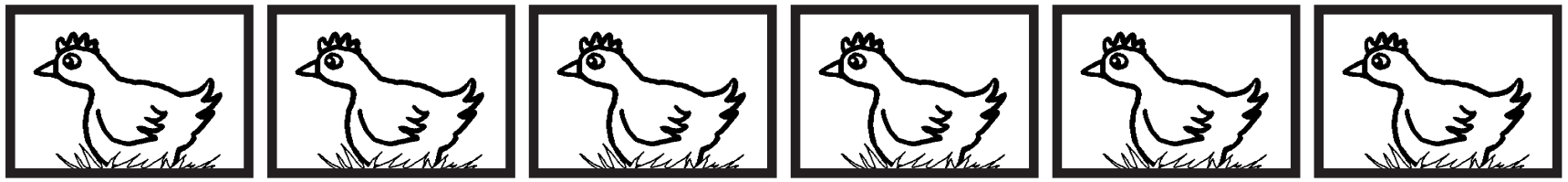
  "Count the number of breakfasts or total meals a person would eat in one week."

  "Count the number of days already spent at school this week and the number of days left until the weekend."

FIGURATIVE

Blackline masters
Figurative counting stage

How many eggs?



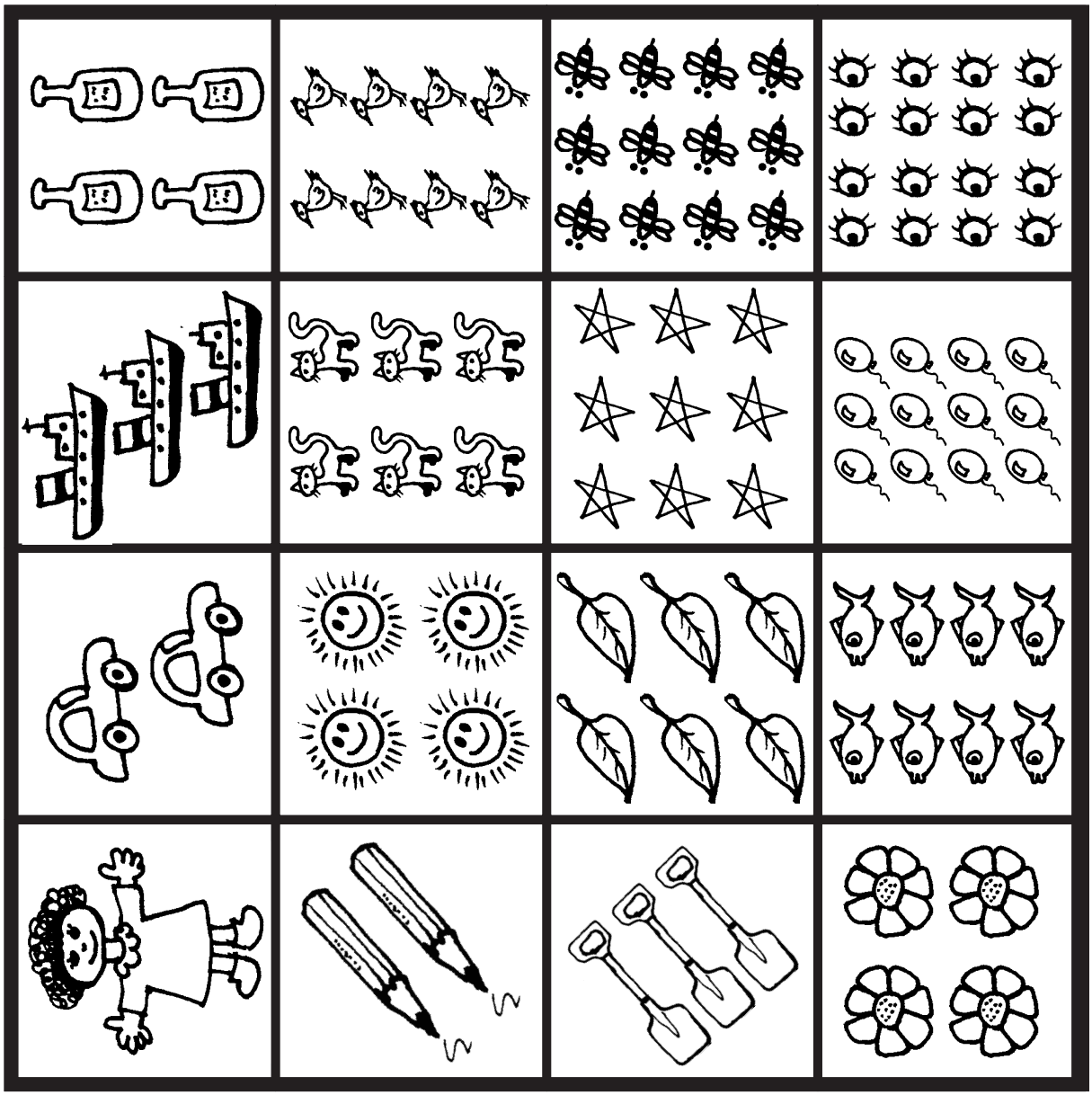
1	2	3	4	5	6

Number of eggs

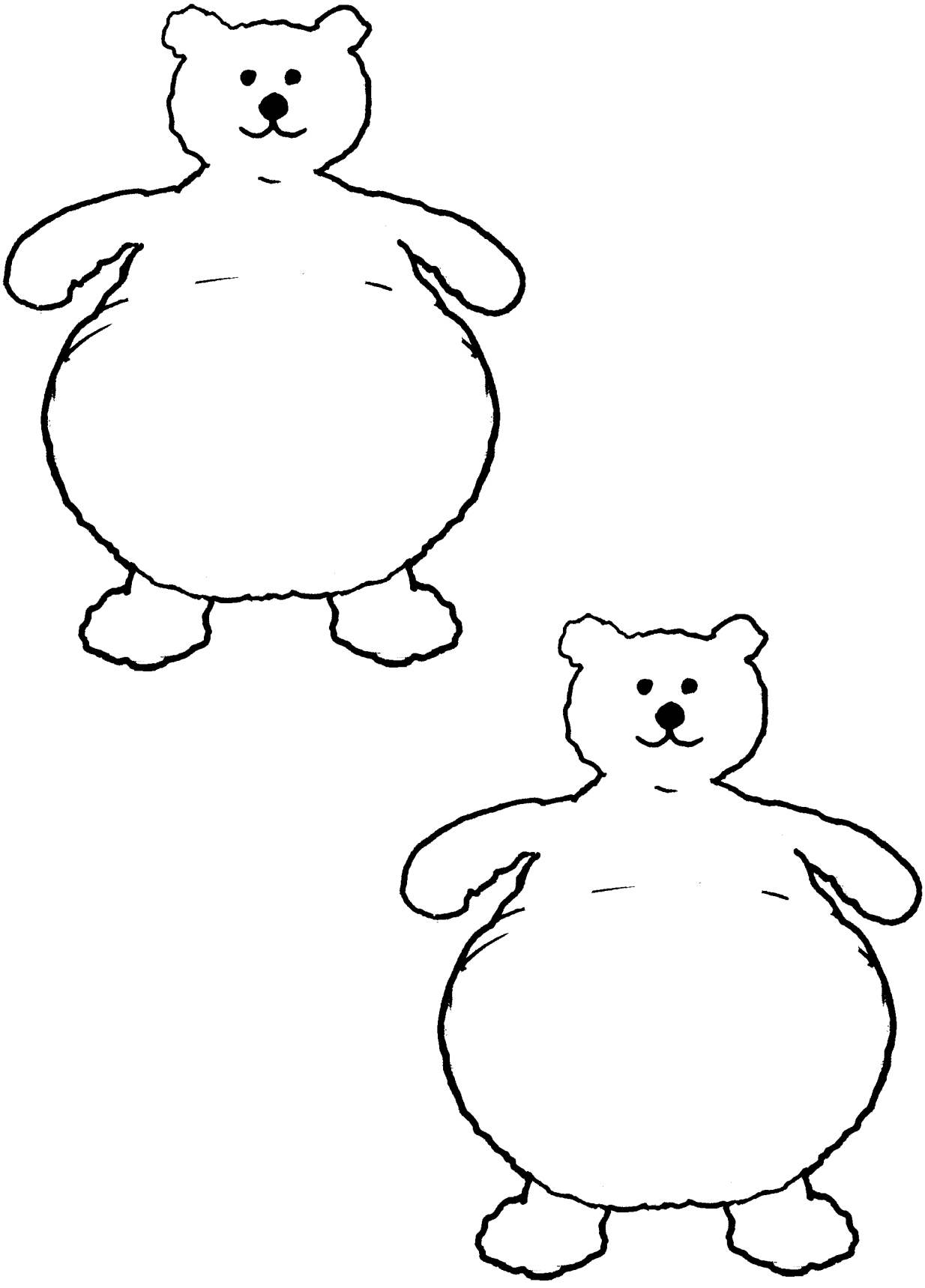
What's in the square?

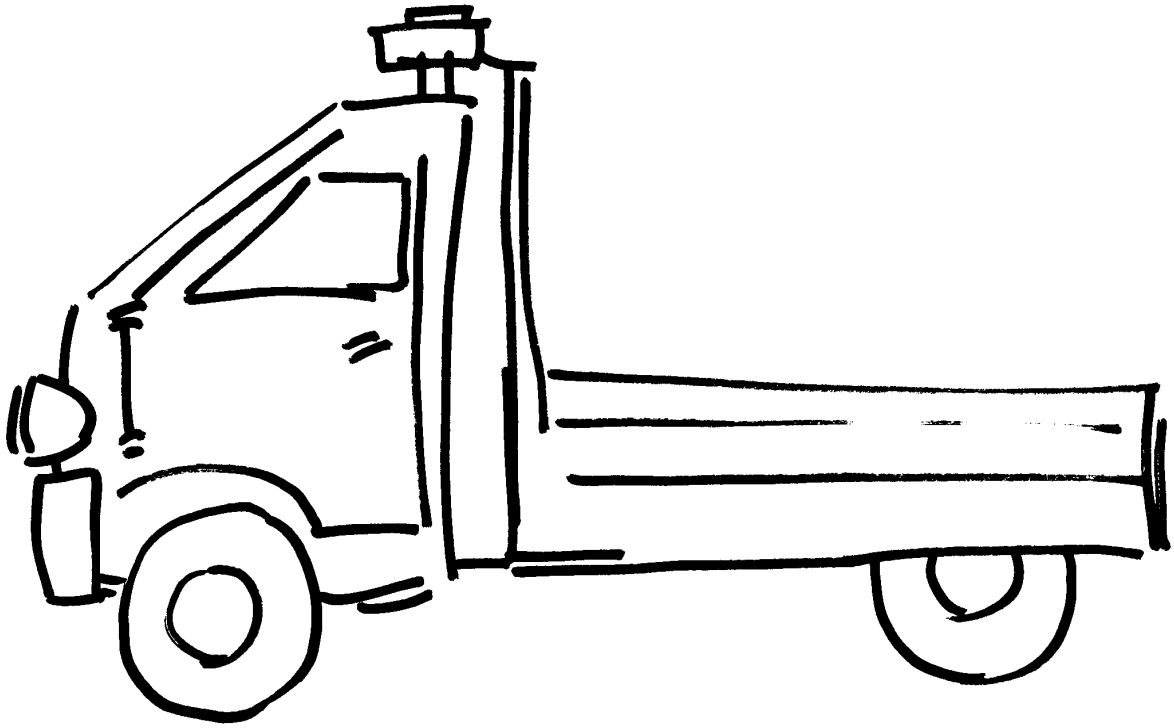
	1	2	3	4
1 group of				
2 groups of				
3 groups of				
4 groups of				

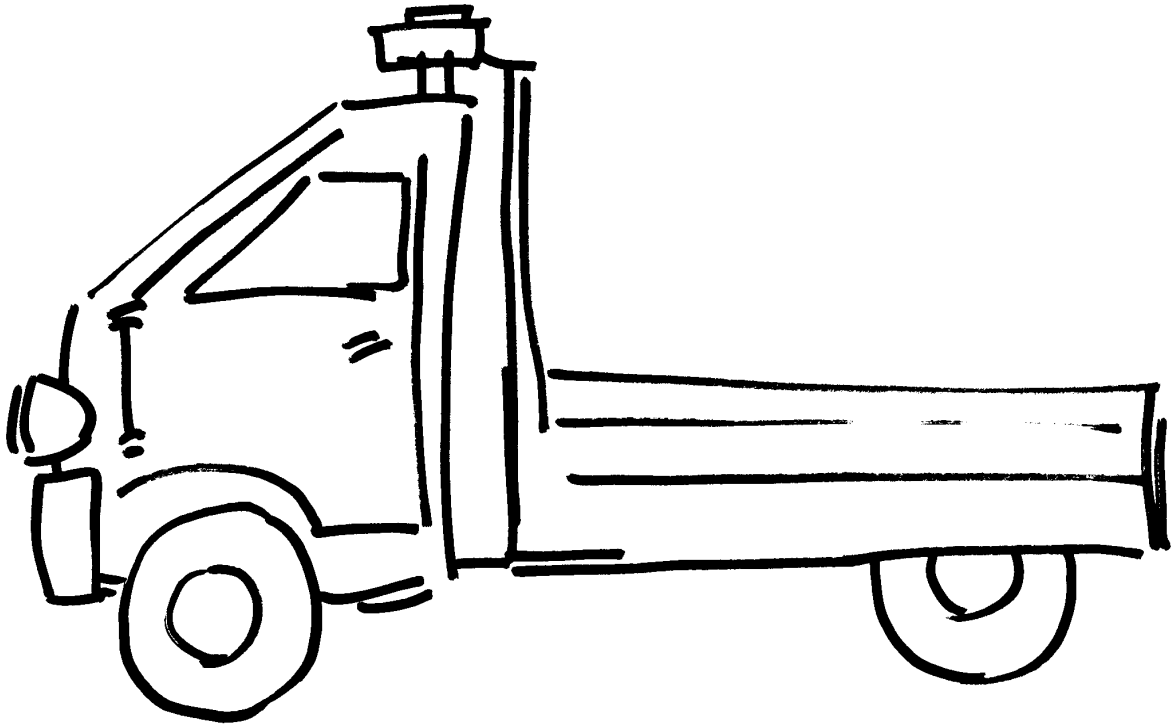
FIGURATIVE BLM



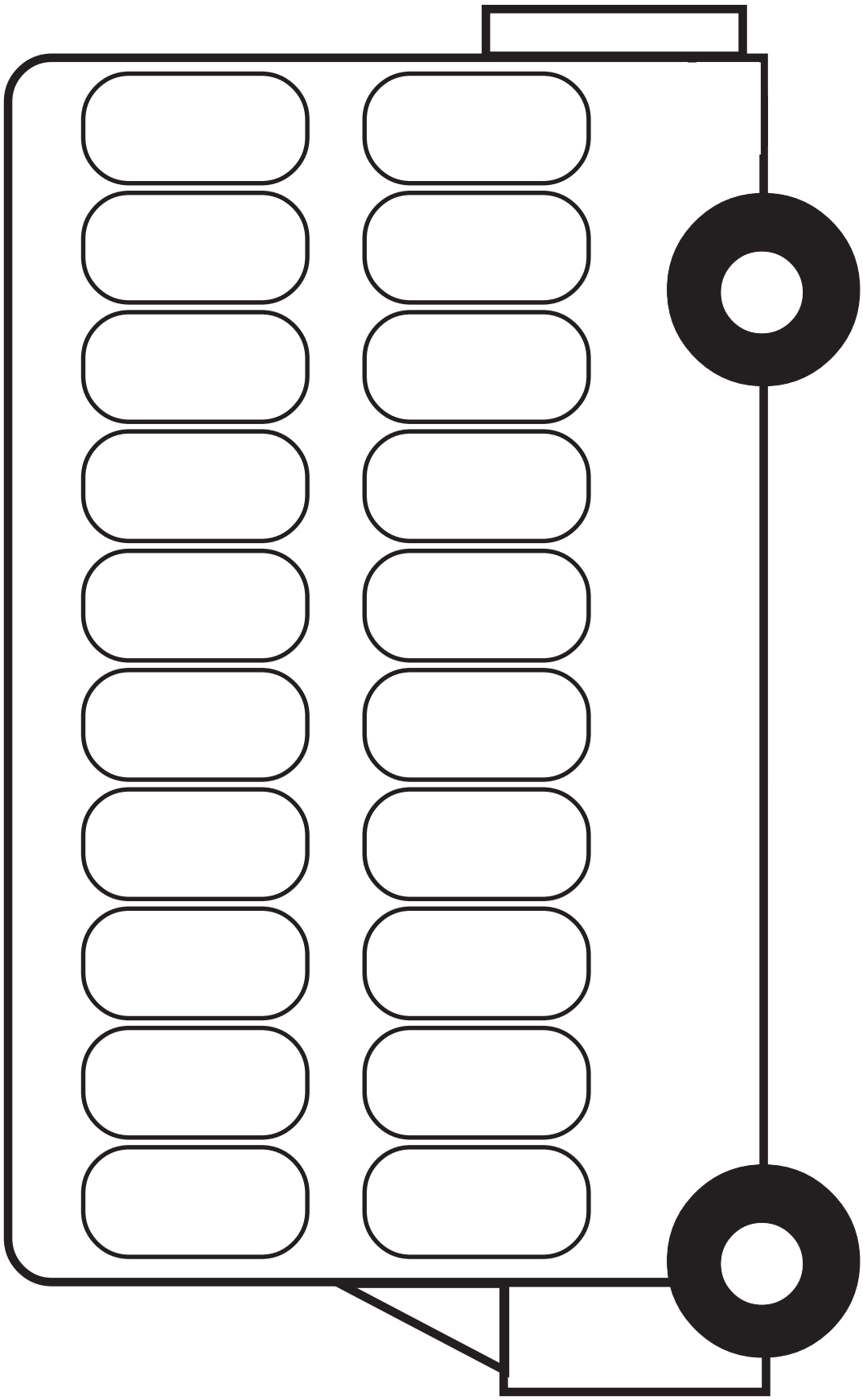
Teddy tummies







Bus



FIGURATIVE BLM

Students at the counting on stage

Students at the counting on stage

The nature of the learner

Students working within the counting on stage are able to use their knowledge of both the forward and backward sequences of number words to solve addition and subtraction questions. The strategies of counting on from a given number and counting down from a given number are confidently used.

The strategies typically used include:

Counting up from

Students count forward from the larger number when finding the total of two numbers. For example, when adding 6 and 3, the student would count from six, and say "seven, eight, nine,... nine!"

Counting up to

Students sometimes use the strategy of "counting up to" in an effort to find the difference between two numbers. For example, when solving the problem 6 + (?) = 9, a student could count from six, knowing he is counting forward to the number nine, and say, " seven, eight, nine." This is often combined with the student holding up fingers to keep track of the count. The answer is obtained from the number of fingers held up after counting.

Counting down from

Counting down from the larger number is another way of finding the difference between two numbers. For example, when solving 9 - 3, a student could count backwards from nine saying, "eight, seven, six...six!"

Counting down to

When counting down to the smaller number to solve subtraction problems, students count backward from the larger number. For example, when solving 9 - (?) = 6, a student could count backwards from nine knowing he or she is counting to the number six, and say, "eight, seven, six". In

this procedure students would often hold up fingers as they count and read the answer from the number of fingers visible at the end.

The distinguishing feature of students at the counting on stage is their use of the number sequence. Students recognise the number sequence as a chain that can be broken. The number six, for example, is the sixth number in this chain. Consequently, to add 6 and 3, it is not necessary to go back to 1 and count up to 6. Instead, the sequence can build on from 6.

Students at this stage are also developing automatic recall of basic addition and subtraction facts. They are able to produce forward and backward number word sequences up to and beyond 100. They can also use their understanding of the base ten number system to solve number tasks, using concrete materials to visually represent the numbers involved.

Students at the counting on stage are working towards:

- applying a variety of strategies other than counting by ones to solve arithmetical tasks
- forming equal groups and finding the total, using skip counting
- developing a concept of ten as a unit.

Teaching considerations

- ### Strategy development

  As students develop a wider range of arithmetical strategies, teachers need to model and explain the appropriate use of these procedures in problem solving. Students need to become competent in selecting and using the most effective strategy.

- ### Language development

  Students working at the counting on stage are developing a wide range of arithmetical strategies. Teachers need to model the mathematical language when explaining classroom activities. Vocalising the procedures used enables students to clarify their thinking and to reinforce the concepts they are developing.

- ### Numeral identification

  Whilst using the arithmetical strategies associated with the counting on stage, students may be working at various levels within the numeral identification aspect of the learning framework in Number.

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Where are they now?

Students:

- know the forward number word sequence and backward number word sequence to 30 or beyond
- understand the use of both cardinal (how many) and ordinal (what comes before or after) numbers.

Where to next?

Students are able to:

- identify numerals to 100 and beyond
- sequence multiples, for example, know that 60 comes after 50
- recognise ten as a unit composed of ten ones.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1 Counts, orders, reads and represents two- and three-digit numbers

WMS1.1 Asks questions that could be explored using mathematics in relation to Stage 1 content.

LFN reference

Numeral identification
Forward number word sequence
Backward number word sequence

How?

Celebrity head

Display a number line showing numbers from 1 to 100 so that all the students in the class can see it. Place movable marker tabs at either end of the strip. One student wears a headpiece to which a numeral card is attached. Ensure that the student does not see the number on the numeral card. Ask the student to have the class help to identify the "secret number". The class, however, can respond only with a yes or no reply to each question. In response to the answers, the selected student then moves the tabs along the number line to indicate the range within which the "secret number" lies. Continue the process until the student is able to identify the number.

Why?

This activity provides practice in recognising and sequencing numbers up to 100.

This will assist students' counting skills.

Where are they now?

Students:

- know the forward number word sequence and backward number word sequence to 30 or beyond
- understand the use of both cardinal (how many) and ordinal (what comes before or after) numbers.

Where to next?

Students are able to:

- identify numerals to 100 and beyond
- sequence multiples, for example, know that 60 comes after 50
- recognise ten as a unit composed of ten ones.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1 Counts, orders, reads and represents two- and three-digit numbers

WMS1.1 Asks questions that could be explored using mathematics in relation to Stage 1 content.

LFN reference

Numeral identification
Forward number word sequence
Backward number word sequence

Variations

The price is right

Display a vertical numeral strip to the students. Ask one student to think of a number on the numeral strip. The remainder of the class take turns to guess the number. After each guess, allow the student to point to the nominated number on the number line. The student then states if the guess is higher or lower than the number being thought of. Encourage the students to use the responses from previous guesses when making the next guess.

Guess my number

Provide a calculator for each pair of students. Ask one student to enter a number into the calculator and hide the screen. Instruct the partner to ask questions which will enable him or her to guess the hidden number on the calculator.

Why?

This activity provides practice in recognising and sequencing numbers up to 100.

This will assist students' counting skills.

Where are they now?

Students are able to identify numerals to 100.

Where to next?

Students are able to identify and sequence numerals beyond 100.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

MS1.3	Estimates, measures, compares and records volumes and capacities using informal units
NS1.1	Counts, orders, reads and represents two- and three-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Strategies other than counting by one
Numeral identification

How?

Grocery grab

Display a collection of grocery packages of varying weight up to 1 kilogram. Allow the students to compare the weight of each item according to the number of grams indicated on each package. Have the students record the weight of each item in grams. Instruct the students to then sequence the items from lightest to heaviest.

Variation

Collect from catalogues pictures of items costing less than $1000 . Ensure the price of each item is clearly indicated. Present the catalogue items to the students and ask them to sequence the items in terms of cost.

Wipe out

Provide each student with a calculator. Ask the students to enter a specific three-digit number into their calculators. Choose one of the digits from the number entered and ask the students to use an arithmetical method to change the nominated digit to zero. For example, have the students enter the numeral 268 in their calculator. Follow this by asking, “How can you change the 6 to 0?”

Why?

These activities provide opportunities for students to further develop concepts of place value.

Where are they now?

Students:

- are able to count on from the larger of two groups to solve addition tasks
- are able to say correctly the forward number word sequence up to 100
- have an understanding of composite units, for example, that one five is composed of five ones.

Where to next?

Students:

- are able to use ten as a countable unit to solve tasks
- have automatic recall of number combinations for use with addition, subtraction and early multiplication tasks.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
PAS1.1	Creates, represents and continues a variety of number patterns, supplies missing elements in a pattern and builds number relationships
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Forward number word sequence
Backward number word sequence
Numeral identification: level 3

How?

Skip counting

Lead the students in oral counting in unison by tens, up to 100, and then backwards from 100. Support the oral counting by pointing to the location of these numbers on the one hundred chart. Cover the multiples of ten on the hundred chart and have a student point to the position of each number as the class counts forwards or backwards by ten. Vary the activity by using other counting patterns, such as counting by twos or counting by fives.

Why?

- Knowing number patterns and counting sequences for multiples will assist students' mental computations.

Where are they now?

Students know that each ten is composed of ten "ones".

Where to next?

Students are able to use the structure of "ten" as a countable unit.

They are able to solve addition and subtraction tasks involving tens and ones without using concrete materials.

It is easier for students to count the groups of ten if each tower is a different colour.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

MS1.1	Estimates, measures, compares and records lengths and distances using informal units, metres and centimetres
NS1.1	Counts, orders, reads and represents two- and three-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems.

LNF reference

Base ten: level 2
Forward number word sequence
Numeral identification

How?

Straw javelin

Place masking tape on the floor to indicate a starting point. Organise the students into a line behind the starting point. Have the students take turns to throw a straw as far as they can. Provide the students with Unifix blocks which have been assembled into towers of ten, as well as single blocks. The students then measure the distance the straw travelled by placing the Unifix blocks along the floor from the starting point to the straw.

Why?

This activity may develop the idea that ten, made up of ten ones, can be used as a countable unit.

Where are they now?

Students know that each ten is composed of ten "ones".

Where to next?

Students are able to use the structure of "ten" as a countable unit.

They are able to solve addition and subtraction tasks involving tens and ones without using concrete materials.

It is easier for students to count the groups of ten if each tower is a different colour.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

MS1.1	Estimates, measures, compares and records lengths and distances using informal units, metres and centimetres
NS1.1	Counts, orders, reads and represents two- and three-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems.

LNF reference

Base ten: level 2
Forward number word sequence
Numeral identification

(Straw javelin)

Variations

- Change the activity from throwing a straw to other actions, such as taking a giant step from the starting point and then measuring the distance of the steps using the Unifix blocks.
- Organise the students into pairs. Provide each pair of students with lengths of string and ask them to use the string to measure their arm span and their height. After the students have completed measuring with the string, they place the string on the floor. Have the students use the towers of ten Unifix blocks to record the length of the string.

Why?

This activity may develop the idea that ten, made up of ten ones, can be used as a countable unit.

Where are they now?

Students rely on the strategy of counting by ones to solve addition tasks.

Where to next?

Students are able to use a range of strategies other than counting by one to solve addition tasks.

Model various strategies for adding three dice.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2 Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers

WMS1.3 Describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols

WMS1.4 Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Facile counting

How?

Three-dice game

Prepare a set of numeral cards for the numbers three to eighteen. Lay the cards face up in a line on the desk or floor. Have the students take turns to roll three dice and add together the numbers rolled, then take a corresponding numeral card. The game continues until all cards have been taken. If the numeral card has already been taken, the player's turn is forfeited.

Variations

- Use a variety of dice, such as dot and numeral dice.
- Provide each student with a set of numeral cards for the numbers three to eighteen. Have the students take turns to roll three dice and find the total. Each time a student states the total of the three dice, all students place a counter on the corresponding numeral card in their set. The game continues until all numerals have been covered.

Why?

These activities provide an opportunity for students to develop strategies other than counting by ones to solve number problems. These strategies may include applying knowledge of doubles, doubles plus one more, number combinations to five and ten, and known addition facts.

Where are they now?

Students automatically recall number combinations to ten.

Where to next?

Students automatically recall number combinations to twenty.

Encourage students to use strategies other than counting by ones to determine the answers.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Counting on
Facile counting
Forward number word sequence
Backward number word sequence

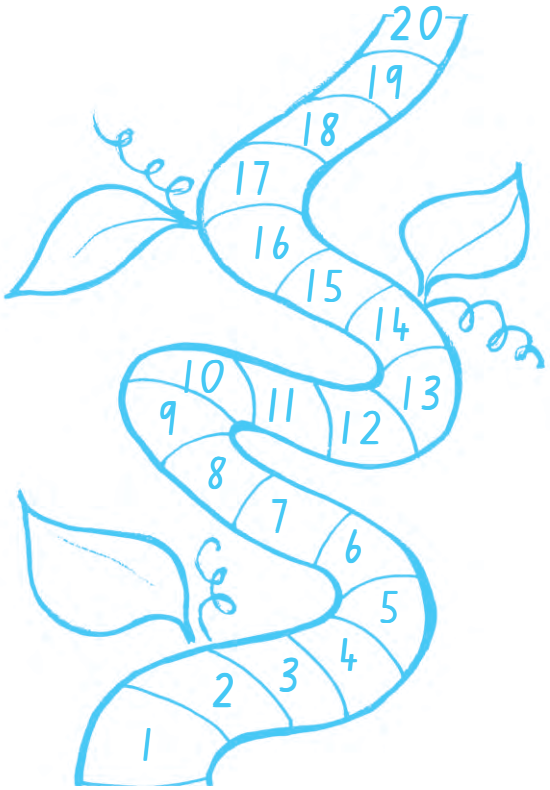
How?

The beanstalk

This activity is best completed with a maximum of five students.

Prepare Beanstalk base board using the BLM on page 291 and a pack of instruction cards. The instruction cards should state the direction in which the student moves along the beanstalk, either up or down, and the number of spaces to move, for example, "go up three spaces."

Commence the activity by instructing each student to place a marker at position 10 on the beanstalk. In turns students take an instruction card, follow the directions and move their marker accordingly along the beanstalk. The winner is the first person to reach the castle at the top of the beanstalk. An option is to have the students record the number sentences.



Why?

Students need to be able to recall number facts automatically. This will allow them to focus on other aspects of problem solving.

Where are they now?

Students automatically recall number combinations to ten.

Where to next?

Students automatically recall number combinations to twenty.

Encourage students to use strategies other than counting by ones to determine the answers.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2 Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers

WMS1.2 Uses objects, diagrams, imagery and technology to explore mathematical problems.

LFN reference

Counting on
Facile counting
Forward number word sequence
Backward number word sequence

Put in, take out

Prepare a set of "start with" cards displaying the numerals from eleven to twenty on coloured card, and a set of "put in" cards displaying the numerals from zero to nine on a different coloured card. Students will also require a large container and a supply of items, such as counters or beads, and writing material. Alternatively, if the students are able to read "start with" and "put in", both sets of cards can be on the same coloured cardboard with the instructions written on them.

Ask the first student to take a "start with" card from the pack, read the numeral and put a corresponding number of items into the container. The student then takes a "put in" card from the other pack, reads the numeral and collects the corresponding number of additional items to add to the container. Encourage the students to say what the total will be before they check by counting on from the first group as each additional item is dropped into the container. Have the students record their actions as number sentences.

Why?

Students need to be able to recall number facts automatically. This will allow them to focus on other aspects of problem solving.

Where are they now?

Students automatically recall number combinations to ten.

Where to next?

Students automatically recall number combinations to twenty.

Encourage students to use strategies other than counting by ones to determine the answers.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

WMS1.2 Uses objects, diagrams, imagery and technology to explore mathematical problems

WMS1.2 Uses objects, diagrams, imagery and technology to explore mathematical problems

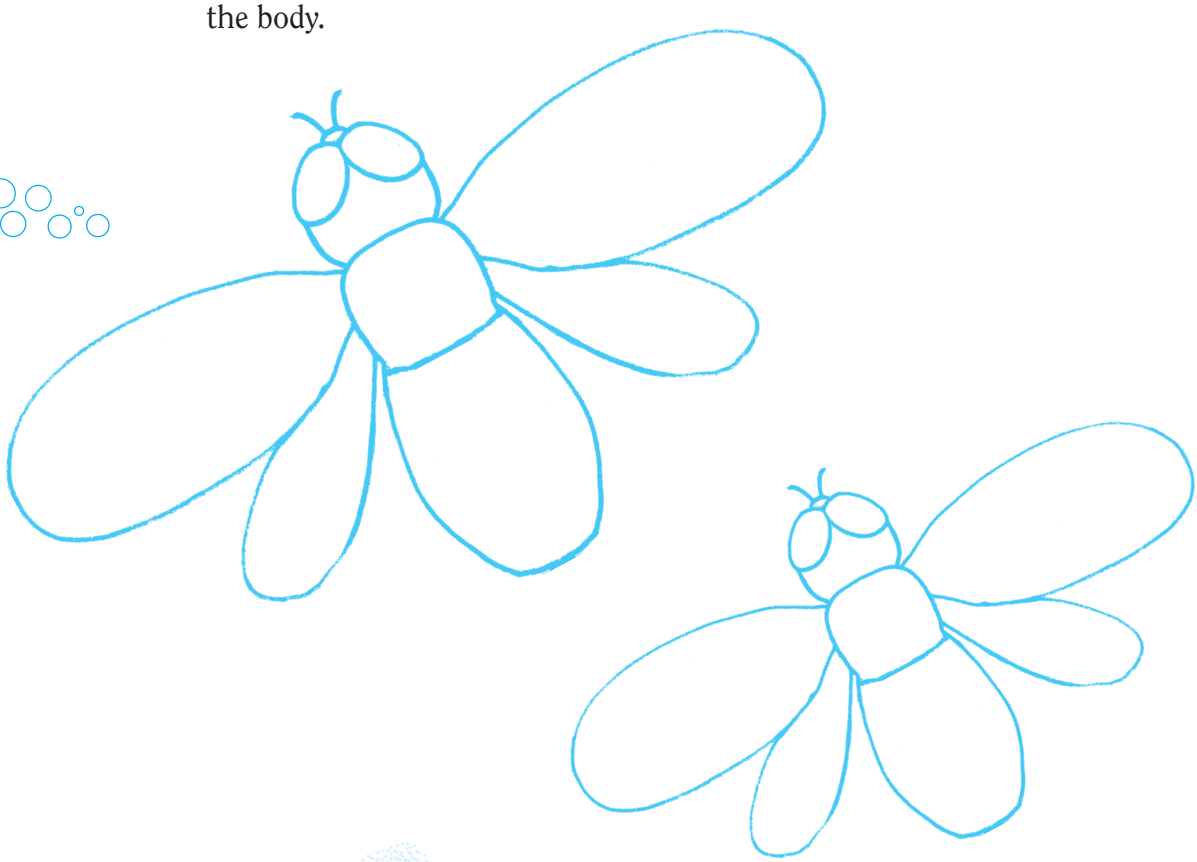
LFN reference

Counting on
Facile counting

How?

Bees

Construct cardboard bees using the BLM on page 283. Write numerals, selected from the range 11 to 20, on the middle section of each bee. On the wings, display dot patterns which, when added together, equal the numeral displayed on the body. The stencil will need to be cut so that the wings and body are in separate pieces. Place the wings and body parts down on the floor in a random arrangement. Ask the students to select one of the bee bodies and to find the correct pair of wings which, when the dot patterns are added together, will equal the numeral written on the body.



Why?

Students need to be able to recall number facts automatically. This will allow them to focus on other aspects of problem solving.

Where are they now?

Students automatically recall number combinations to ten.

Where to next?

Students automatically recall number combinations to twenty.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2 Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers

WMS1.2 Uses objects, diagrams, imagery and technology to explore mathematical problems

WMS1.4 Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Facile counting strategies

How?

Combination trains

Prepare a collection of toy trains and carriages. If toy trains are unavailable, construct trains from Lego®, milk cartons or other suitable material. Attach a numeral card to each engine and carriage. Ask the students to select two carriages and find the total by adding the numerals written on the cards. The students then match the two carriages to an engine displaying the numeral corresponding to the total.

Why?

Students need to be able to recall number facts automatically. This will allow them to focus on other aspects of problem solving.

Where are they now?

Students automatically recall number combinations to ten.

Where to next?

Students automatically recall number combinations to twenty.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2 Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers

WMS1.1 Asks questions that could be explored using mathematics in relation to Stage 1 content

WMS1.2 Uses objects, diagrams, imagery and technology to explore mathematical problems.

LFN reference

Facile counting strategies

How?

Unit squares

Provide the students with thirteen squares of paper. Each square should have one side coloured green and the other side red. Place the cards in a line in front of the students, with the red side face up. Indicate to the students that the squares represent the number sentence: 13 + 0 = 13. Turn one card over to reveal a green side and discuss the number sentence that is now represented by the green and red squares, that is, 12 + 1 = 13. Continue turning over additional cards to reveal the green side. Encourage the students to state the number combinations represented by the red and green squares. Vary the number of coloured squares used.

Dice toss

Provide the students with two dice. Use dice which display a range of numerals other than those on a traditional die. Ask the students to take turns to roll the two dice and add them together to find the total. Provide material for students to record the number sentences.

Combination flip

Construct a number strip displaying numerals in the range 4 to 18. Prepare numeral cards for the numbers 2 to 9 and an additional card with the numeral 9 written on it. Place the cards in order from 2 to 9, face down. Have the students take turns to turn over two cards and add the total. The students then place a counter on the corresponding numeral on the number strip.

Why?

Students need to be able to recall number facts automatically. This will allow them to focus on other aspects of problem solving.

Where are they now?

Students automatically recall number combinations to ten.

Where to next?

Students automatically recall number combinations to twenty.

Encourage the students to verify each other's calculations before completing another problem.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.3	Describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols.

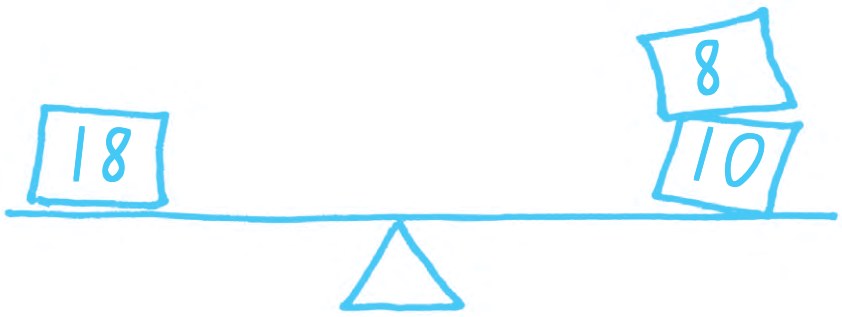
LFN reference

Facile counting strategies

How?

Number balances

Prepare a stencil displaying a balance. The stencil should show one box resting on the left-hand side of the balance and two boxes stacked on the right-hand side of the balance. Prepare two sets of numeral cards, each set on a different coloured cardboard. The first set should contain the numerals 2 to 20 and the second set contain two cards for each numeral from 1 to 10. Have the students select a card from the first set and place it onto the left-hand side of the balance. Students then find two numeral cards from the second set which, when added together, total the numeral on the left side. The students then place the cards on the right side of the balance.



Domino addition

Prepare domino cards which resemble commercially produced dominoes, or use traditional dominoes for this activity. Provide the students with a supply of the domino cards, or dominoes, and writing material. Deal five dominoes to each student in the group. Ask the students to record both dot patterns displayed on the dominoes as addition number sentences.

Why?

Students need strategies other than counting by ones to solve number problems. These strategies may include applying knowledge of doubles, tens and ones and recall of number combinations.

Where are they now?

Students automatically recall number combinations to ten.

Where to next?

Students automatically recall number combinations to twenty.

Encourage the students to verify each other's calculations before completing another problem.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
DS1.1	Gathers and organises data, displays data using column and picture graphs and interprets the results
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems.

LFN reference

Facile counting strategies

How?

Addition lotto

Prepare lotto cards displaying numerals in the range eleven to twenty. Select a student to act as a caller. This student calls out any two numbers in the range one to ten and records the total, out of view of the class. The remaining students add the two numbers that have been called and, if the total corresponds to a numeral on their lotto card, they cover the numeral with a counter. The game continues until one student covers all the numerals on the lotto card.

Five dice

Provide the students with five dice. Have the students take turns rolling the dice and finding the total of all five dice rolled. The first student to roll numbers that add up to twenty is the winner. Students can record their totals for each roll.

Variation

Have the students see if they can get a total of twenty within five turns. The results for each student for the five rolls can be recorded. The data could be used to generate a class graph of the results for the five dice.

Why?

Students need strategies other than counting by ones to solve number problems. These strategies may include applying knowledge of doubles, tens and ones and recall of number combinations.

Where are they now?

Students automatically recall number combinations to ten.

Where to next?

Students automatically recall number combinations to twenty.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Facile counting strategies

How?

Build a tower

Organise the students into pairs. Provide each student with ten Unifix blocks as well as an additional pile of blocks, such as twenty, for each pair of students. Prepare "direction cards" showing either addition or subtraction tasks, for example: + 3. Have the students take turns to draw a "direction card" and follow the instruction by adding or subtracting the correct number of blocks to their tower. The winner is the first to make a tower of twenty blocks.

Ask the students to explain their strategies for solving the problems to their partners.

Why?

Students need strategies other than counting by ones to solve number problems. These strategies may include applying knowledge of doubles, tens and ones and recall of number combinations.

Where are they now?

Students automatically recall number facts to ten.

Where to next?

Students are able to use strategies other than counting by ones to solve number problems. They are able to automatically recall addition facts to twenty.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2 Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers

WMS1.2 Uses objects, diagrams, imagery and technology to explore mathematical problems.

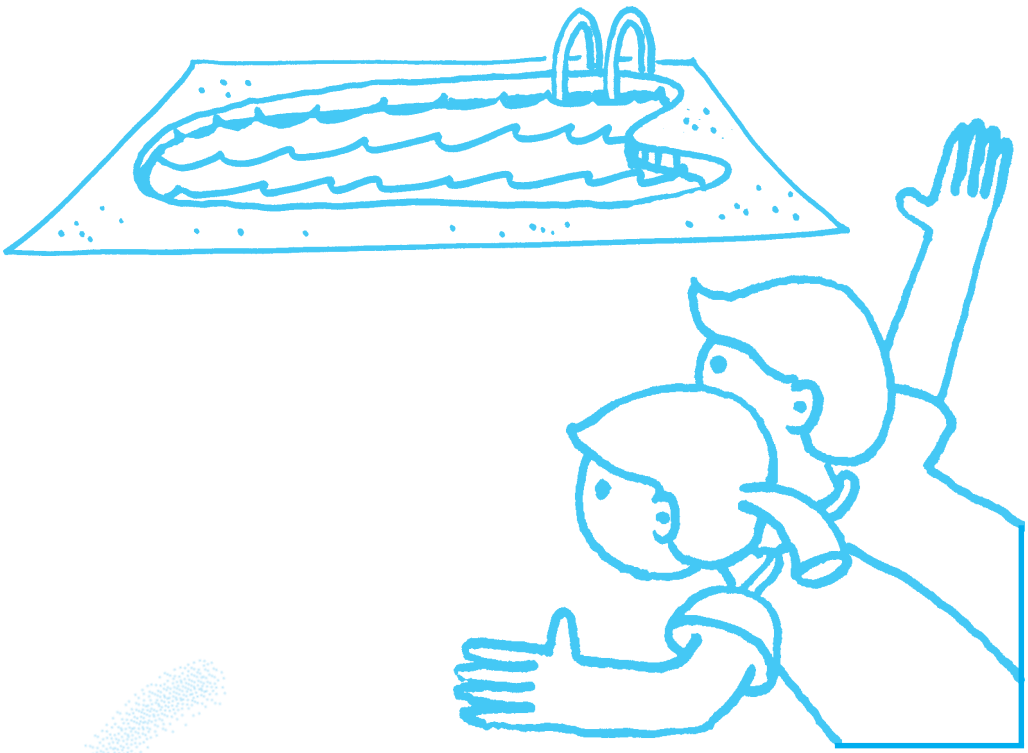
LFN reference

Facile counting strategies

How?

Race to the pool

Prepare an adequate supply of base boards using the BLM on page 284. Organise students into pairs and provide them with two dice and two markers. Have the students place their markers at the starting position on the base board. Ask the students to take turns to roll the dice and add both numbers rolled. The student then moves the marker to the first corresponding numeral on the base board. The first player to reach the "pool" at the centre of the board wins.



Why?

This activity provides opportunities for students to develop a range of strategies for solving addition tasks.

Where are they now?

Students automatically recall number facts to ten.

Where to next?

Students are able to use strategies other than counting by ones to solve number problems. They are able to automatically recall addition facts to twenty.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2 Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers

WMS1.2 Uses objects, diagrams, imagery and technology to explore mathematical problems.

LFN reference

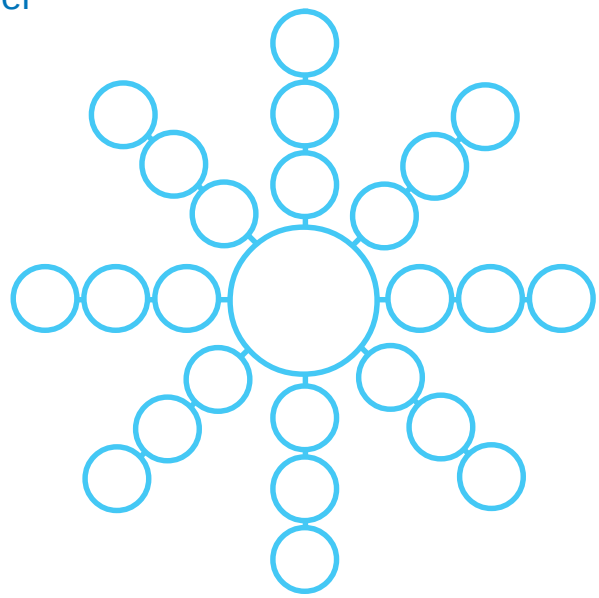
Facile counting strategies

How?

Sentence maker

Provide each student with a collection of numeral cards from zero to ten and a calculator. Call out a number between eleven and twenty. Allow two or three minutes for students to select number cards which add to the nominated number. Encourage the students to find all the possible number combinations for the nominated number. The students should record each number combination. After the allotted time, have the students verify the additions with the use of the calculator.

Addition wheel



Provide students with a copy of the addition wheel stencil. (See the BLM on page 285.) Ask the students to write a number between eleven and twenty on the centre of the wheel. The students then need to determine the number combinations which would equal the number at the centre of the wheel. Have the students record the number combinations within the "spokes" of the addition wheel, radiating out from the centre. Provide the students with calculators to verify their calculations.

Why?

This activity provides opportunities for students to develop a range of strategies for solving addition tasks.

Where are they now?

Students automatically recall number facts to ten.

Where to next?

Students are able to use strategies other than counting by ones to solve number problems. They are able to automatically recall addition facts to twenty.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Facile counting strategies

How?

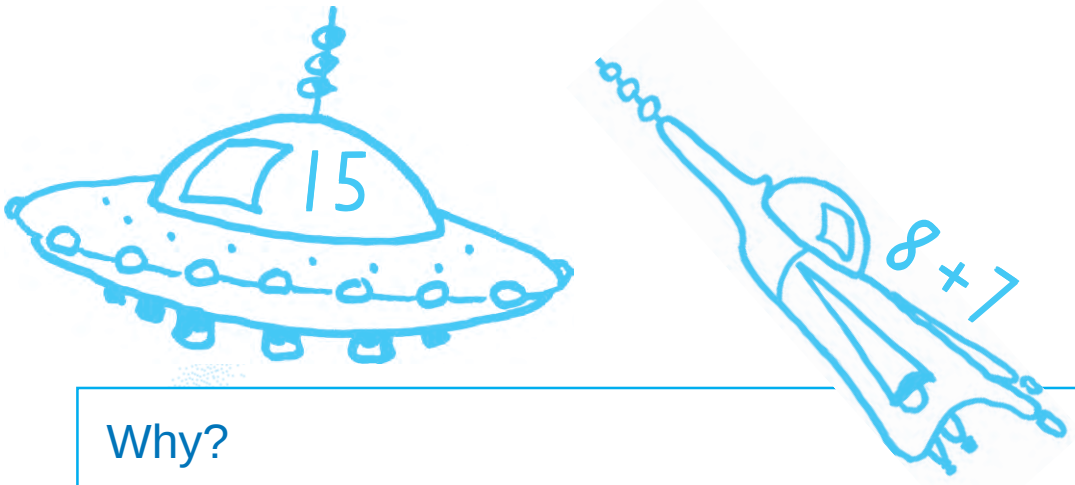
Balancing numbers

Construct number sentence cards where the addends are selected from numbers between 11 and 20. Prepare a chart with a balance beam drawn on it, as shown in the diagram.

Organise the students into pairs. Ask the students to take turns to place a number sentence card on each side of the balance so that the sum of each card is equal. Allow students to confirm their partner's answer.

Return to mother ship

Construct large "mother" spaceships from cardboard. Write a numeral from ten to twenty on each "mother ship". Construct small cardboard spaceships which display addition and subtraction facts resulting in answers from 10 to 20. Ask the students to solve the number problems on each small spaceship and match them to a "mother ship" displaying a corresponding numeral.



Why?

These activities provide opportunities for students to develop a range of strategies for solving addition tasks.

Where are they now?

Students:

- use advanced count-by-one strategies to solve addition tasks
- automatically recall number facts to ten.

Where to next?

Students:

- use a range of strategies other than counting by one
- automatically recall number facts to twenty.

Provide opportunities for oral counting by 5s.

If the students are not competent in counting by 5s use tally marks to record scores.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Strategies other than counting by one

Quinary strategies

How?

Fact matching

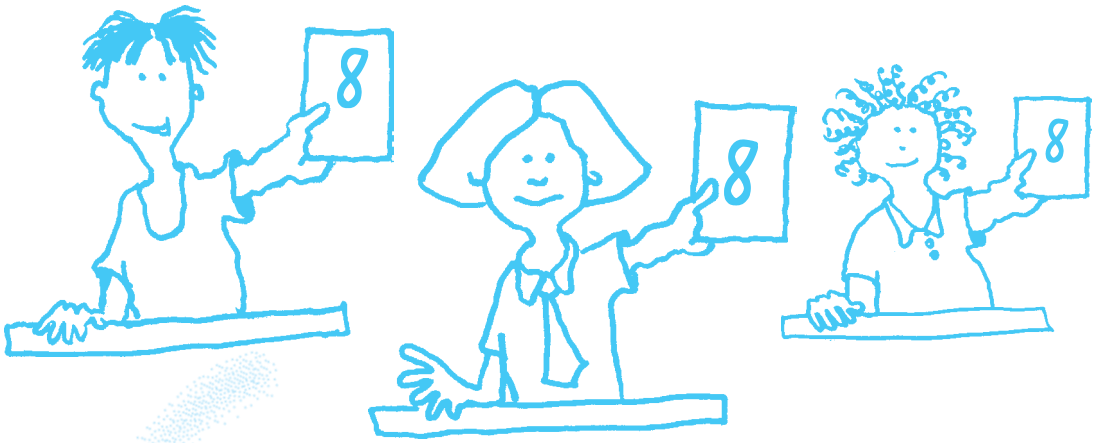
Construct two sets of cards. The first set consists of the "sum cards" and should contain one card for each numeral from 0 to 18. The second set consists of the "digit cards" and should contain four cards for each numeral from 0 to 9. Also provide cards displaying subtraction and addition symbols.

Shuffle the "digit cards" and deal four cards to each student, placing them face up before the student. Shuffle the "sum cards" and place them in a pile, face up.

Ask the students to use their digit cards to make a number fact which will equal the numeral shown on the top "sum card" displayed. For every number combination made, students score five points. After the students have made all possible combinations, ask the students to hand in their cards, shuffle all digit cards and deal four new cards to each player. Turn over a new "sum card" and repeat the process. The winner is the student with the highest score.

Variation

Deal six digit cards to each player. The student gains five points for combining two numbers which equal the "sum card" and ten points for correctly combining three digit cards which equal the "sum card".



Why?

Students need to develop a range of strategies for solving arithmetic problems. Automatic recall of number combinations is an efficient strategy.

Where are they now?

Students are able to solve tasks involving tens and ones but require concrete materials to visually represent the numbers.

Where to next?

Students solve addition and subtraction tasks involving tens and ones without the use of concrete materials.

Provide many opportunities for oral counting by 10s using the hundred chart before playing these games. As students become more proficient, remove the counting materials.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

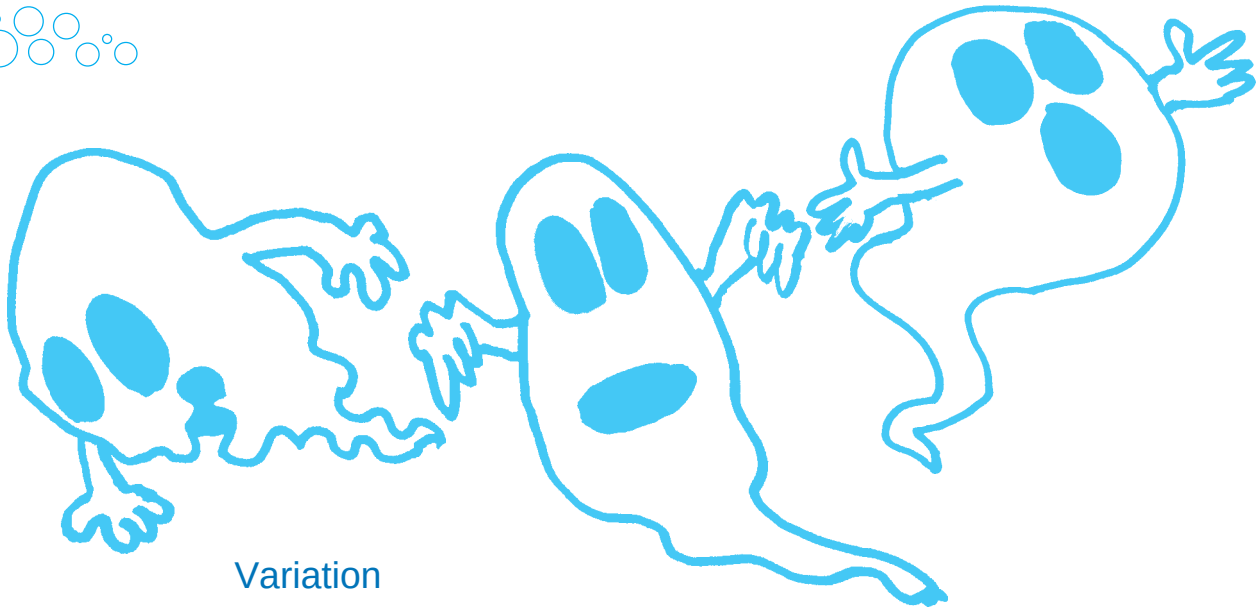
Base ten

How?

Ghost busters

Prepare "Ghost buster" base boards using the BLM on page 288. Write the numerals 0, 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100 on the outlines of the ghosts on the base board. Prepare two dice, one displaying 10, 20, 30, 40, 50, 60 and the other displaying 0, 10, 20, 30, 40. If the second dice has 6 sides, double-up on one of the displayed numerals or add an appropriate variation to the game. Give each student fifteen counters and bundles of ten items, such as ten strips or towers of ten Unifix cubes.

Ask the students to take turns to roll the two dice. Students then add the dice together using the materials to support them with their counting. They then place a counter onto a ghost displaying the corresponding numeral. The winner is the first to cover all the ghosts.



Variation

Change the task to a subtraction one.

Note: The numerals on the base board will need to be changed to 60, 50, 40, 30, 20, 10, 0.

Why?

Developing knowledge of multiples of ten allows students to complete 2-digit addition and subtraction tasks efficiently.

Where are they now?

Students are able to solve tasks involving tens and ones but require concrete materials to visually represent the numbers.

Where to next?

Students solve addition and subtraction tasks involving tens and ones without the use of concrete materials.

Provide many opportunities for oral counting by 10s using the hundred chart before playing this game. As students become more proficient, remove the counting materials.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems.

LFN reference

Base ten

How?

Outdoor bean bag target

Draw a large target on the asphalt with chalk. Write a number which is a multiple of ten on each segment of the target. Organise the students into teams and provide each team with two bean bags. Have the students take turns to throw the bean bags onto the target. Students call out the number that the bean bags land on and then find the total. Organise a "recorder" for each team to keep a record of the team's score. It may be necessary to provide the scorer with a calculator.

Why?

Developing knowledge of multiples of ten allows students to complete 2-digit addition and subtraction tasks efficiently.

Where are they now?

Students use the strategy of counting on to solve addition tasks.

Where to next?

Students use a range of strategies other than counting by ones to solve addition tasks.

Provide opportunities for students to practise doubles through such activities as Rabbits' ears and Ten frames.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.3	Describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols.

LFN reference

Facile counting strategies

How?

Doubles plus one

Demonstrate the following procedure to the students.

Join two equal groups of Unifix blocks to show a double fact, such as 5 + 5. Display a number sentence to the students to describe the action of joining the two groups. Add one block to the second group of blocks. Ask the students to state the total and record the new number sentence. In the above example the new number sentence would be: 5 + 5 + 1 = 11. Separate the two groups again and remove the block just joined. Place it above the second group. Discuss the number combination now formed and its link to the previous combination of numbers, for example:

5 + 5 + 1 = 5 + 6. Explore other doubles plus one combinations.

Doubles plus one bingo

Provide the students with a bingo board displaying a 4x4 grid. Ask the students to place the numbers 5, 7, 9, 11, 13, 15, 17 and 19 randomly into the squares of the grid. Each number will need to be written twice. Call out doubles plus one facts, for example 6 + 7, 9 + 10, in random order. The students determine the answer and place a counter onto the bingo board if they are able to match a numeral to the answer. The first player to complete a line of four counters in any direction is the winner.

Near doubles

Provide the students with a supply of Unifix cubes. Call out an addition sum, such as 5 + 7, where the addends differ by two. Instruct the students to make the two numbers called using the Unifix cubes and to record the number sentence. Ask the students to move one block from the second group (in this example, 7) and place it with the first group (the group of 5). Have the students record the two groups now. Discuss how 6 + 6 = 5 + 7.

Why?

Knowing doubles and near doubles is an effective method for solving some arithmetical tasks and building knowledge of number combinations.

Where are they now?

Students confidently use advanced count-by-one strategies.

Where to next?

Students are able to solve addition and subtraction tasks involving tens and ones.

After setting an addition task, follow up with associated subtraction tasks. For example, ask the question 10 + 3 = (?) followed by: 13 remove 10, and 13 remove 3.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems.

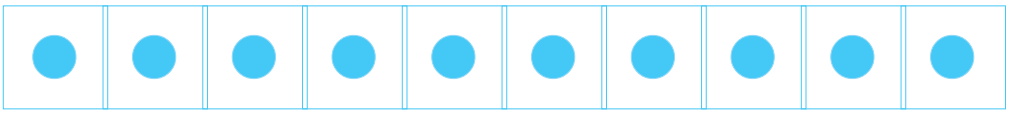
LFN reference

Base ten
Combining and partitioning
Quinary strategies

How?

Ten strips and hundred charts

A ten strip is a line of ten boxes with a dot in each box.



Organise an overhead projector, a supply of ten strips and a strip of four dots all on transparencies. You will also need a large hundred chart.

Display the strip of four dots on the overhead projector. Ask the students: "How many dots?". Place a ten strip below the four dots and repeat the question. After the students determine the answer, indicate the corresponding numeral on the hundred chart. Continue by adding one ten strip at a time and locating the total on the hundred chart.

Variations

- Ask the students to predict the next number if 10 more dots are added, 20 more, and so on.
- Substitute a ten frame for the dot strips.

Double-decker bus

The **"Double-decker bus"** (see BLM on page 214) is made up of ten frames. It can be viewed as two ten frames, two ten strips or four groups of five for reinforcing quinary strategies. Pose problems using the "Double-decker bus", such as, "Eleven passengers were already on the bus, three more got on at the next stop. How many passengers are now on the bus?"

Model both subtraction and addition tasks on the overhead projector. Ask the students to complete the tasks, working in pairs with their own Double-decker bus base boards.

Why?

Students need to develop a variety of related strategies to use when solving number problems. These strategies may include applying base 5 knowledge, their knowledge of tens and ones and recall of number combinations.

Where are they now?

Students confidently use advanced count-by-one strategies.

Where to next?

Students are able to solve addition and subtraction tasks involving tens and ones.

Discuss various strategies that could be used to determine the answers to the subtraction problems, such as "counting down to", "counting down from" or using known addition facts.

Outcomes

This activity provides opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.2	Uses a range of mental strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems
WMS1.3	Describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols.

LFN reference

Partitioning

How?

Orange tree

Provide each pair of students with an outline of an orange tree (see BLMs on pages 286-287) and 20 counters. Instruct the students to place the counters onto the tree. The students then "pick" the oranges from the tree by moving nominated numbers of counters away. Ask the students to determine how many "oranges" are left on the tree and to record the number combinations.

Why?

Students need to develop a variety of strategies to use when solving number problems. Knowing the relationship between addition and subtraction can help students solve number problems.

Where are they now?

Students find the total of a given number of groups by counting by ones.

Where to next?

Students model equal-sized groups and count groups of items to find the totals, using skip counting as a strategy.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.3	Uses a range of mental strategies and concrete materials for multiplication and division
PAS1.1	Creates, represents and continues a variety of number patterns, supplies missing elements in a pattern and builds number relationships
WMS1.4	Supports conclusions by explaining or demonstrating how answers were obtained.

LFN reference

Early multiplication and division

How?

Teddy tummies

Provide pairs of students with a base board of three teddies (see BLM on page 289), 30 counters and a stencil displaying the numerals 1 to 30, which they can write on. Ask the students to place the counters, one at a time, onto each of the teddy tummies. As the students place a counter onto a teddy, ask them to mark the next numeral on the chart with a cross. When the students are able to form equal groups, on each of the teddies, have them circle the next number on the number chart instead of marking it with a cross.

Why?

The strategies students use to solve multiplication and division problems will be dependent upon their knowledge of counting sequences of multiples.

Where are they now?

Students find the total of a given number of groups by counting by ones.

Where to next?

Students model equal-sized groups and count groups of items to find the totals, using skip counting as a strategy.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

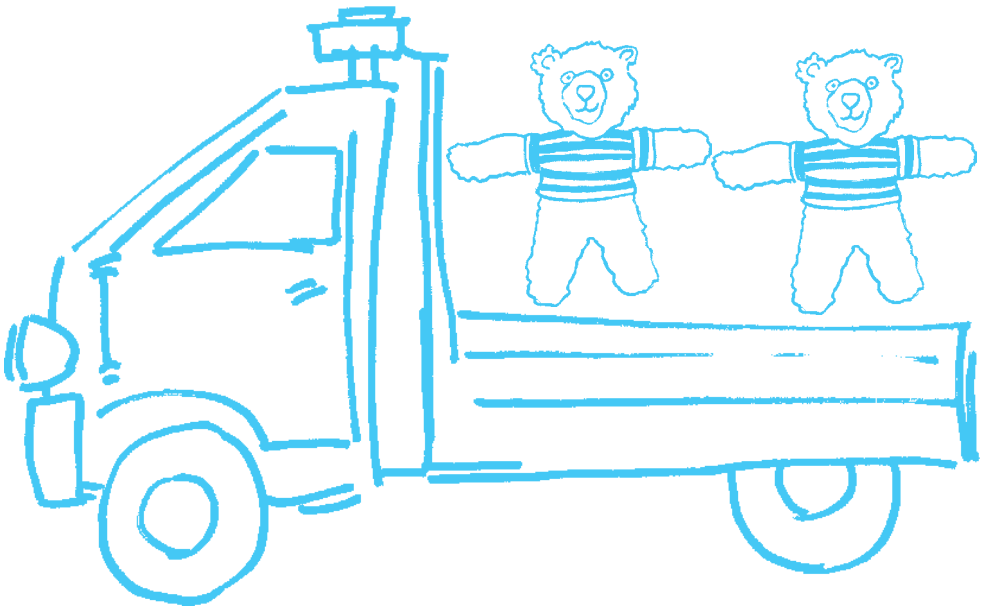
NS1.3	Uses a range of mental strategies and concrete materials for multiplication and division
PAS1.1	Creates, represents and continues a variety of number patterns, supplies missing elements in a pattern and builds number relationships
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems.

LFN reference

Early multiplication and division

Trucking teddies

Complete this activity as for "Teddy tummies". For the Teddy baseboard substitute the BLM on page 290 displaying four trucks. If available, use plastic teddies instead of counters. For this activity the students will require 40 teddies. Instruct the students to place the teddies onto the trucks, one at a time. As the students place a teddy onto a truck, have them cross off the next numeral on the chart. When the students form equal groups on the trucks, tell them to circle the following number on the chart, instead of marking it with a cross.



Why?

The strategies students use to solve multiplication and division problems will be dependent upon their knowledge of counting sequences of multiples.

Where are they now?

Students find the total number of items in a given number of groups by counting by ones.

Where to next?

Students model equal-sized groups and count groups of items to find the totals, using skip counting as a strategy.

Ask the students to begin with a two-part pattern. Then move to a five-part pattern before trying three- or four-part patterns. The students will probably have a better knowledge of the number sequence after counting by twos and fives.

Outcomes

This activity provides an opportunity for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
PAS1.1	Creates, represents and continues a variety of number patterns, supplies missing elements in a pattern and builds number relationships
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems.

LFN reference

Early multiplication and division

How?

Tagging

Organise students into pairs. Provide each pair of students with an ice-cream lid and a supply of coloured cubes. The students will also need a supply of small numeral cards displaying the numbers 2, 3, 4 and 5. Instruct the students to make a 2-, 3-, 4- or 5-part pattern using the coloured cubes and to repeat the pattern around the outside of the lid. Have the students place a numeral card, indicating how many parts to the pattern, above each group of cubes. Ensure all the groups are exactly the same. Have the students calculate how many groups were formed and the total number of cubes.

Hundred chart

Using a hundred chart on an overhead projector, ask the students to determine the multiples of a nominated number. This can be achieved through saying the forward sequences of number words, using a stressed count for the nominated multiple. Colour in the numerals on the overhead transparency as the students call them out. Once the sequence of multiples has been identified, have the class repeat the multiples.

Why?

Frequent opportunities to practise computing, reciting and recording number sequences will assist students to become competent with using multiples in abstract form.

Where are they now?

Students can find the total for a given number of equal groups by counting by ones.

Where to next?

Students can recall, or easily derive, multiplication and division facts to twenty.

Provide ample opportunities for repeating patterns from the hundred chart, such as counting by fives or tens.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
WMS1.3	Describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols.

LFN reference

Early multiplication and division
Forward number word sequence
Backward number word sequence

How?

Buzz game

Organise the students in a circle. Have the students begin counting by ones, each taking turns to call out the next number in the sequence. Each time students arrive at a number which is a multiple of five they call out "buzz" instead of the number. A student who makes an error in counting sits down.

Why?

The strategies students use to solve multiplication and division problems will be dependent upon their knowledge of counting sequences of multiples.

Where are they now?

Students find the total for a given number of equal groups by counting by ones.

Where to next?

Students model equal-sized groups and count groups of items to find the total, using skip counting as a strategy.

Outcomes

These activities provide opportunities for students to demonstrate progress towards the following outcomes: A student

NS1.1	Counts, orders, reads and represents two- and three-digit numbers
NS1.3	Uses a range of mental strategies and concrete materials for multiplication and division
PAS1.1	Creates, represents and continues a variety of number patterns, supplies missing elements in a pattern and builds number relationships
WMS1.2	Uses objects, diagrams, imagery and technology to explore mathematical problems.

LFN reference

Early multiplication and division

How?

Kangaroos

Organise the students into pairs and provide a calculator for each pair of students. Ask the students to calculate the multiples for a nominated number on the calculator. On most calculators this can be determined by entering a numeral, pressing the + sign twice and then repeatedly pressing the equals sign.

Provide each student with a number line equal to ten times the multiple being used. For example, present a number line up to 30 if dealing with multiples of three. Place a movable tab at the beginning of the number line. The tab will represent a kangaroo and should also indicate the number the students will be working with.

Have the students use the calculator to determine the next multiple. The students then move the tab along the number line, landing on each multiple. Have the students circle the multiples on the number line.

The number line can then be used for skip counting practice on later occasions.

Rolling groups

Provide the students with one numeral die showing the numbers 1, 2, 3, 4, 5 and 6 and another die showing dot patterns for 2, 5 and 10. The students will also need a supply of counters. Instruct the students to roll the two dice and construct groups of counters as indicated by the roll of the dice. The numeral die indicates the number of groups and the dot die indicates the number in each group. Encourage rhythmic or skip counting to find the total number of items.

Variation

Replace the dice with a pack of numeral cards and a pack of dot cards. Arrange the students into pairs. Instruct one student to choose two cards as instructions for a partner. The partner then constructs the groups and uses rhythmic or skip counting to find the total.

Why?

These activities provide opportunities for students to recall multiplication facts.

Assessment tasks

Task	Student response	Assessment
T: Displays a card showing 12 + 3. "Can you work this out?" Follows up the student's answer with: "How did you do that?" If the student responds correctly: "Can you tell me another two numbers that can be added together to equal 15?"	S: Completes the sum mentally and states the total.	Did the student use the strategy of compensation for addition or subtraction?
T: Displays a card showing 9 + 3. "Can you work this out?" If the student responds correctly, writes = 12, and asks: "Can you use that answer to work this out?" Displays 9 + 4. If the student responds correctly, writes = 13, and asks: "Can you use that answer to work this out?" Displays 9 + 5. Continues to 9 + 6.	S: Quickly states the answer by using knowledge of known number facts. If unsure as to how the student determined the answer, ask the student to explain the strategy used.	Did the student: • know the initial number fact? • count on to solve the subsequent problem? • recognise the "add one more" pattern to solve the problem?
T: Displays a card: 7 - 5 and asks: "Can you work this out?" If the student responds correctly, writes = 2, and asks: "Can you use that answer to work this out?" Displays 27 - 5.	S: Quickly states the answer by using number facts. S: Identifies the relationship between the two questions and uses his or her knowledge of tens and ones to answer.	Did the student: • know the initial number fact? • count on or count down to solve the problem? • recognise the use of "tens" to solve the problem?

Assessment tasks

Task	Student response	Assessment
continued from p. 278, If the student responds correctly, write = 22, and ask: " Can you use that answer to work this out?" Displays 47 - 5. Continue.		
T: Displays a card: 51 + 24. "Can you read and answer this problem?"	S: Correctly reads and answers the sum. The student explains the strategy used to solve the task.	Did the student use a knowledge of base ten strategies to solve the problem?
T: Displays some numeral cards in the range from 100 to 1000, and asks the student to name the cards as they are displayed.	S: Correctly names the numeral cards.	Did the student know any or all of the numerals that were shown?
T: Displays a strip of 6 dots arranged horizontally. "How many dots are there?" Places a ten-dot strip underneath the six dots. "How many dots now?" Continues placing ten strips and repeats the question: "How many dots now?" (6,16,26,36 ...76)	S: Says the total number of dots each time ten are added without having to add by ones.	Did the student count by tens to determine the total each time or automatically add on ten?

Three-minute lesson breakers

- Organise the students into a circle with all of the students facing into the centre. Lead the group in oral counting chants, for example, counting by 2s, 5s, 10s or odds and evens. Ask a student to nominate a body action which the group can perform with each count.

- Count the total number of body parts in the class by the appropriate number of multiples. For example, count the number of heads by ones, the number of feet by twos.

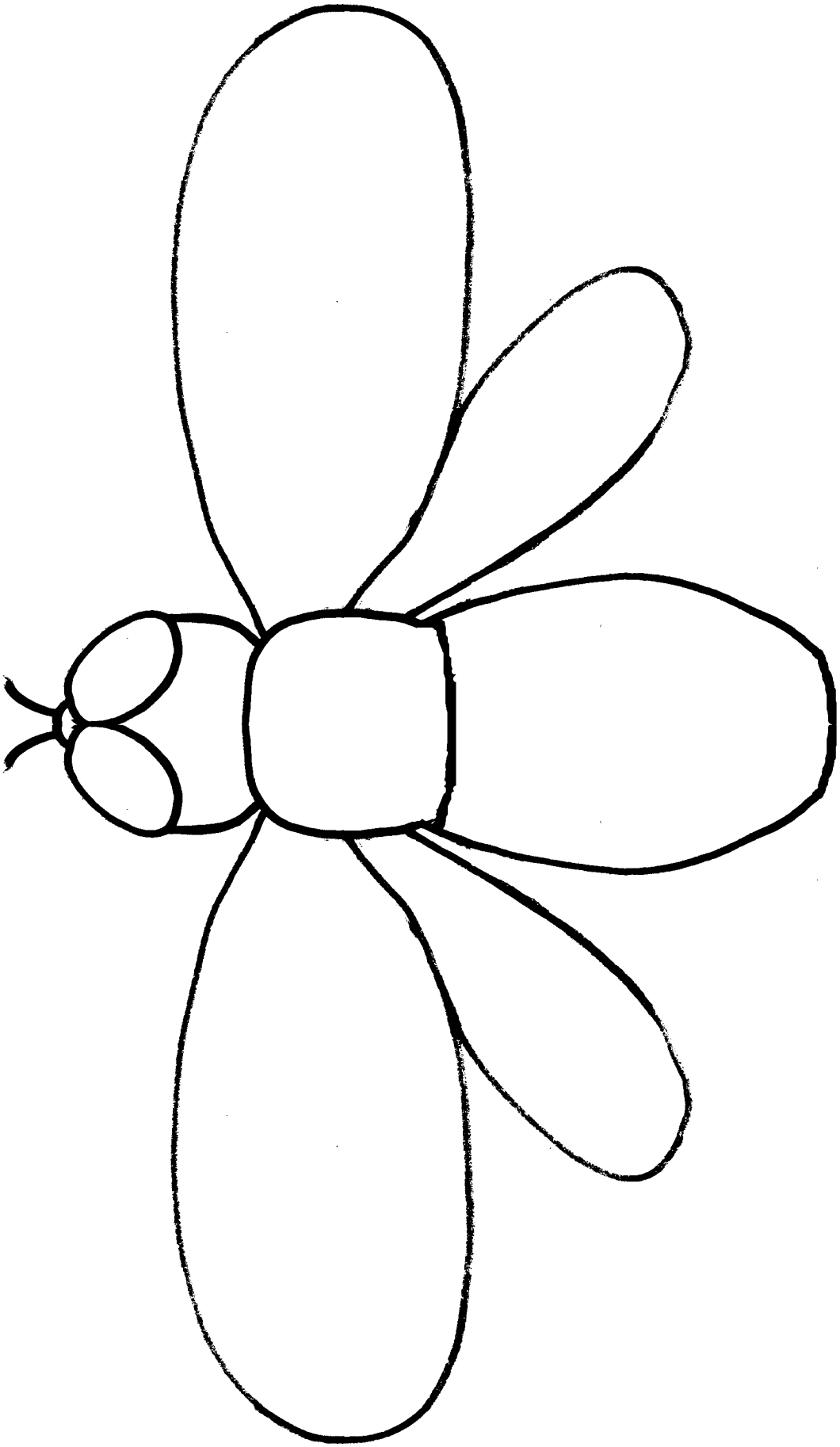
- Lead the class in counting to reinforce multiples of three. On the first number in the sequence, instruct the students to touch their heads and think of the number, that is, not verbalise the number. Repeat the process for the second number in the sequence. On the third number in the sequence, ask the students to touch their knees and say the number out loud.

- Think of a "secret number". Allow the students ten questions in which they have to guess the "secret" number. Respond to the questions by answering yes or no.

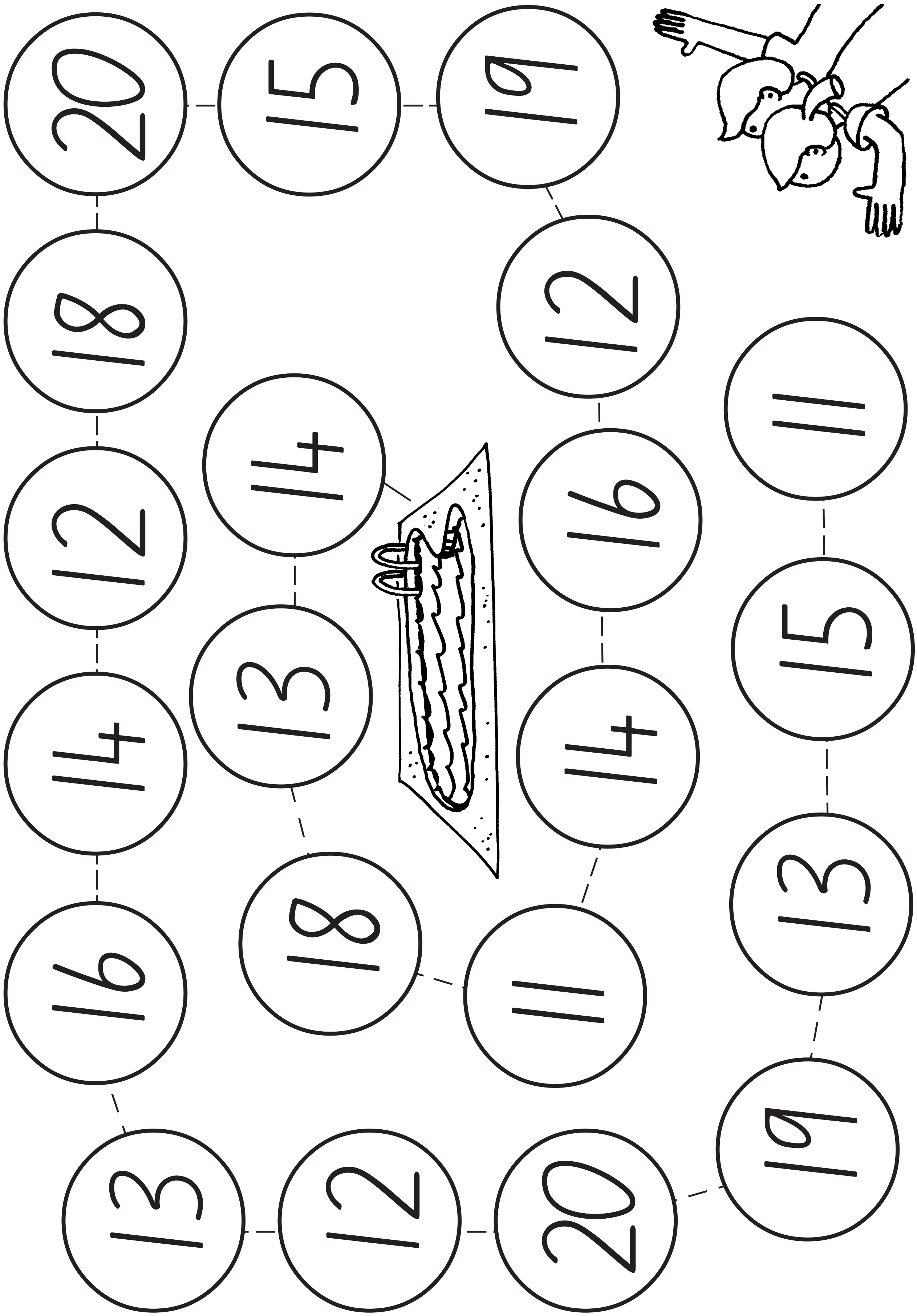
- Display a dot pattern card, for example a pattern to represent the number 8, and say: "I wish I had 12 . How many more do I need?" The students are to use mental strategies to solve the problem.

Blackline masters
Counting on stage

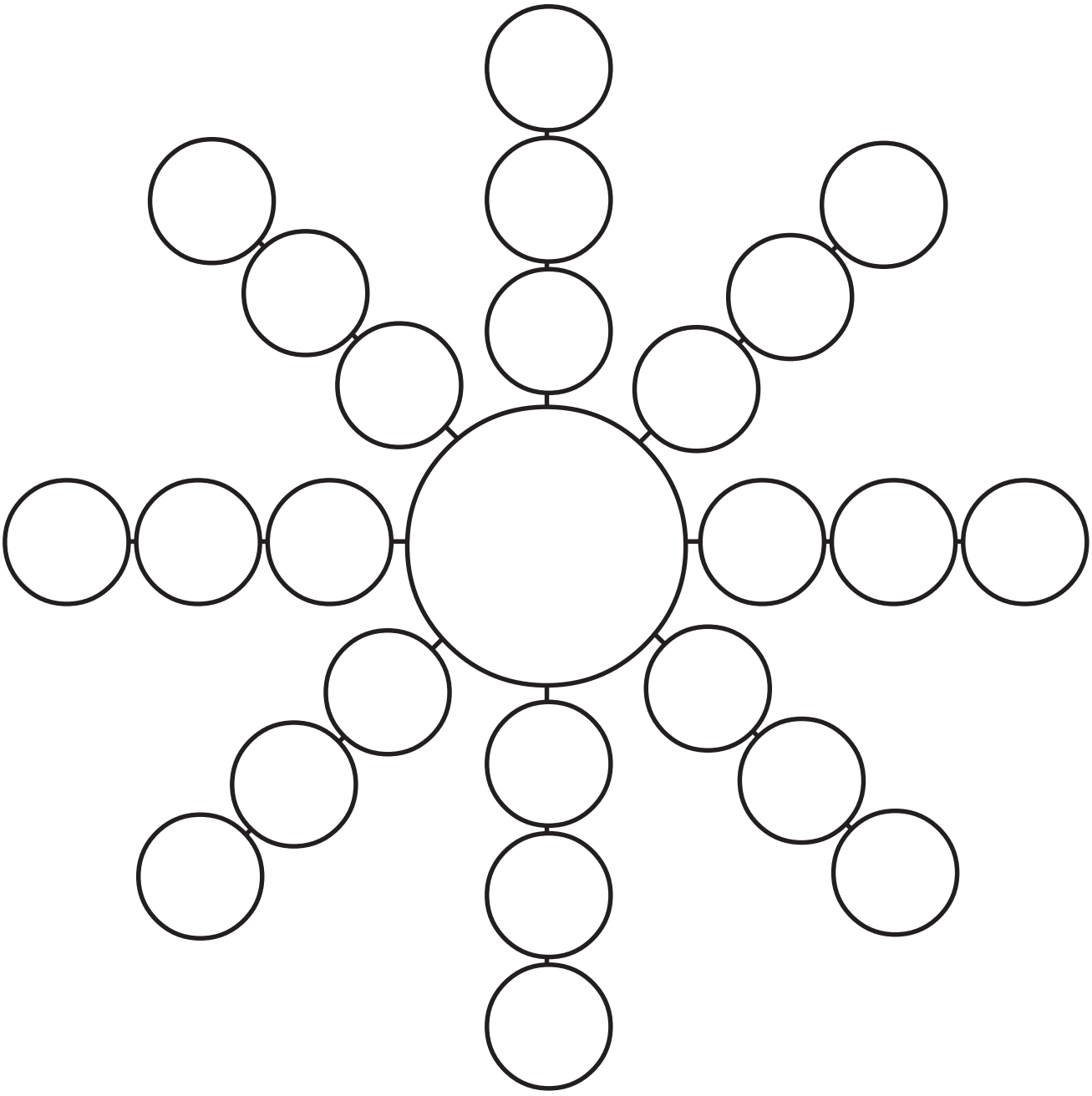
Bees



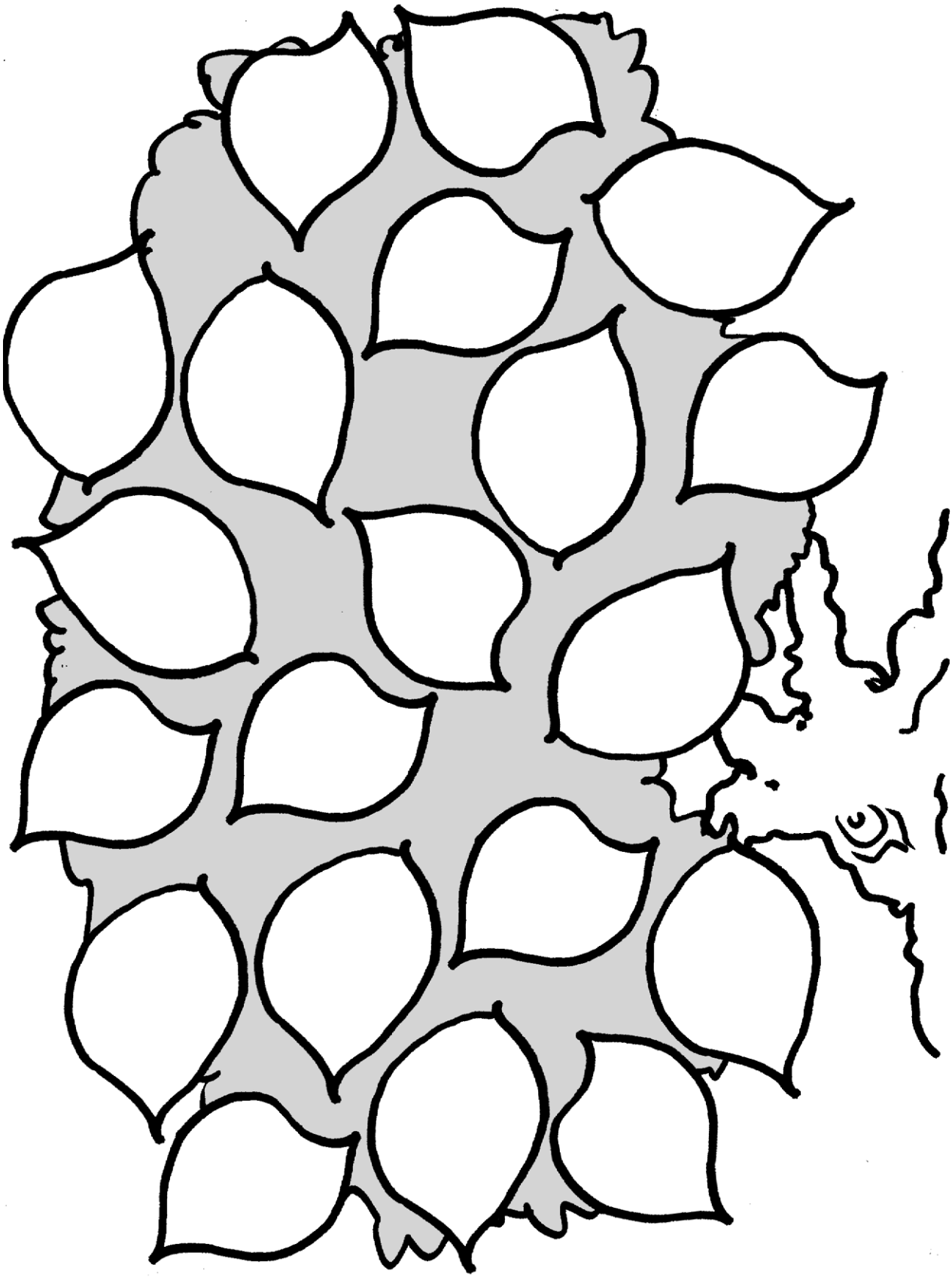
Swimming pool



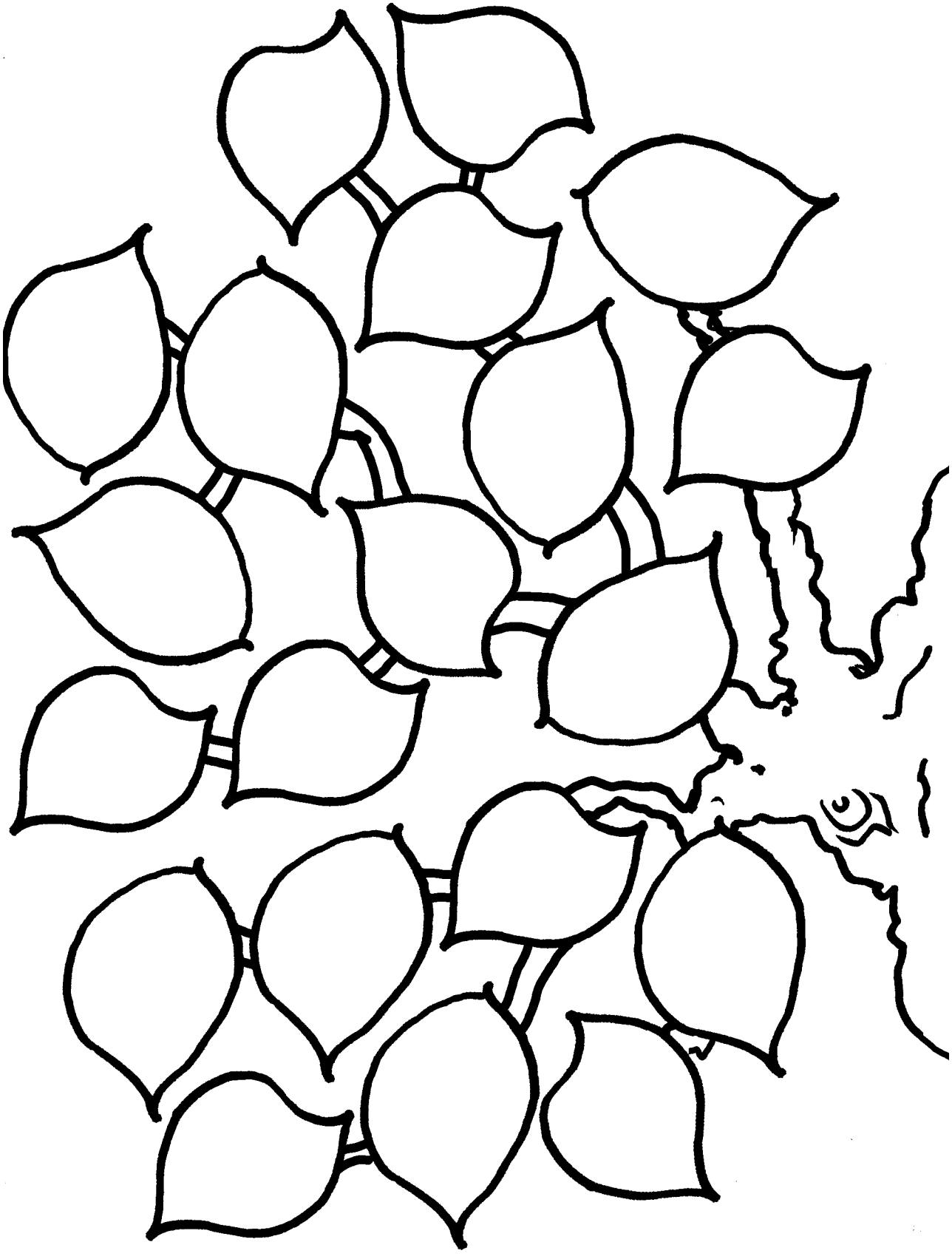
Addition wheel



Orange tree

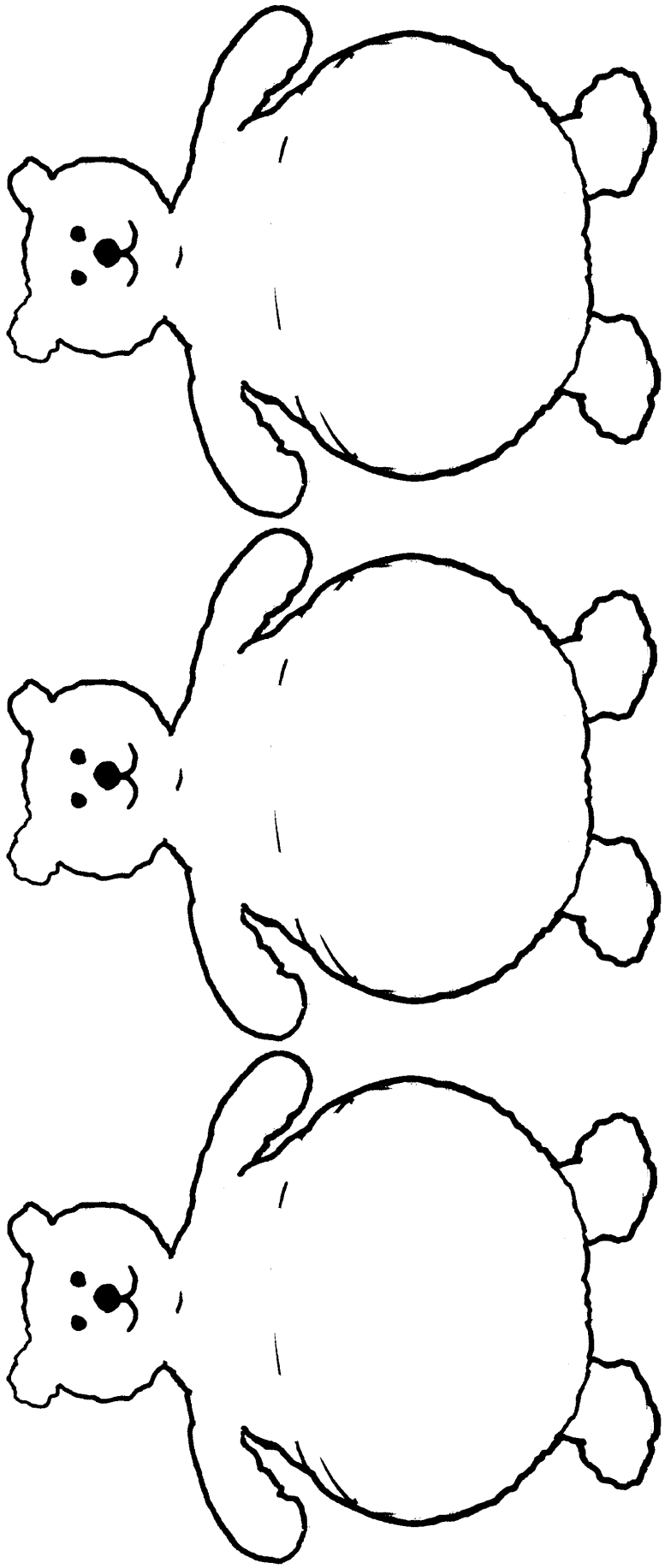


Orange tree

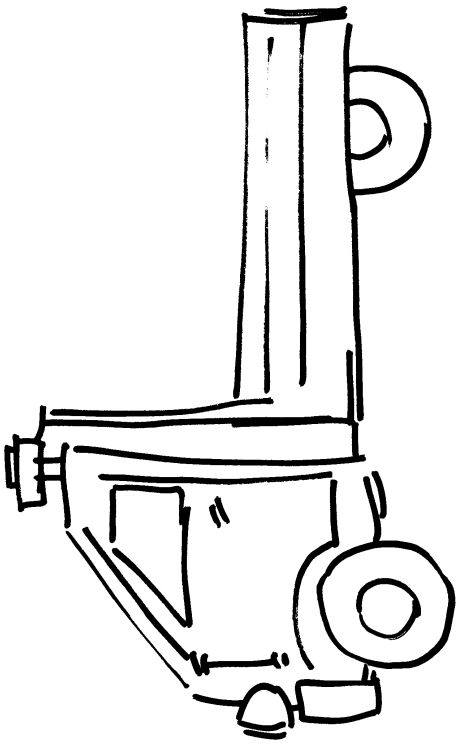


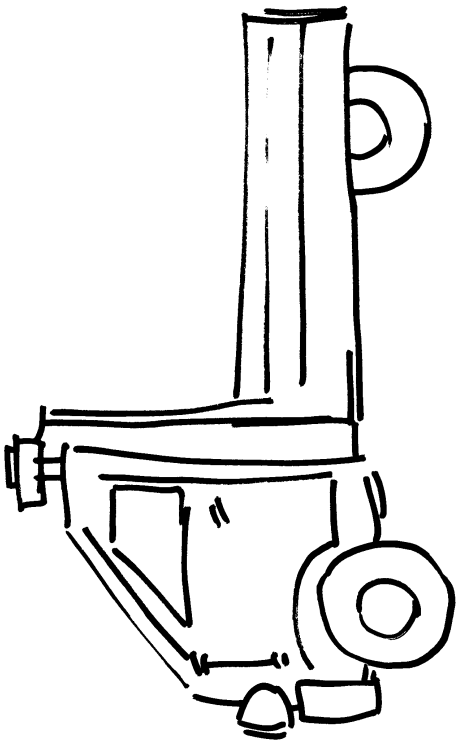
Ghost busters

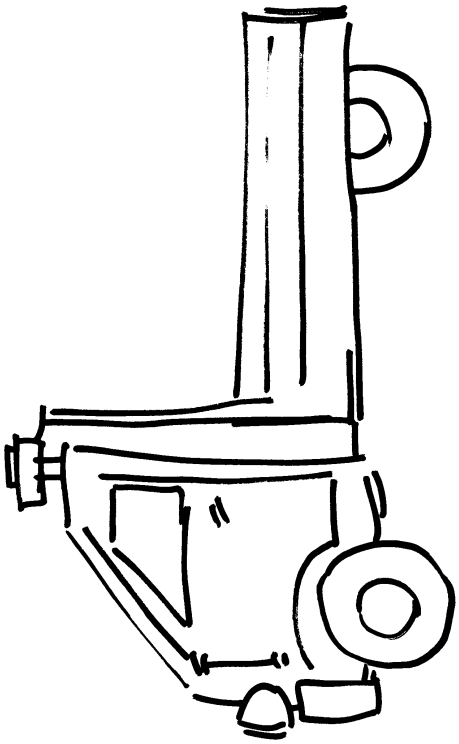
Teddy tummies

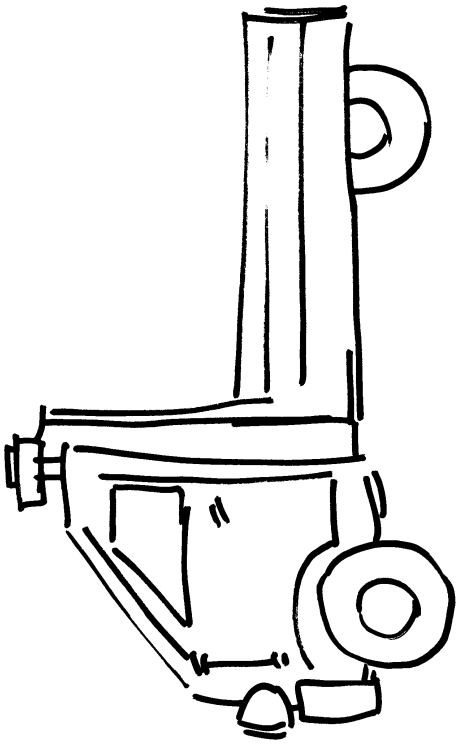


Trucking teddies









Beanstalk