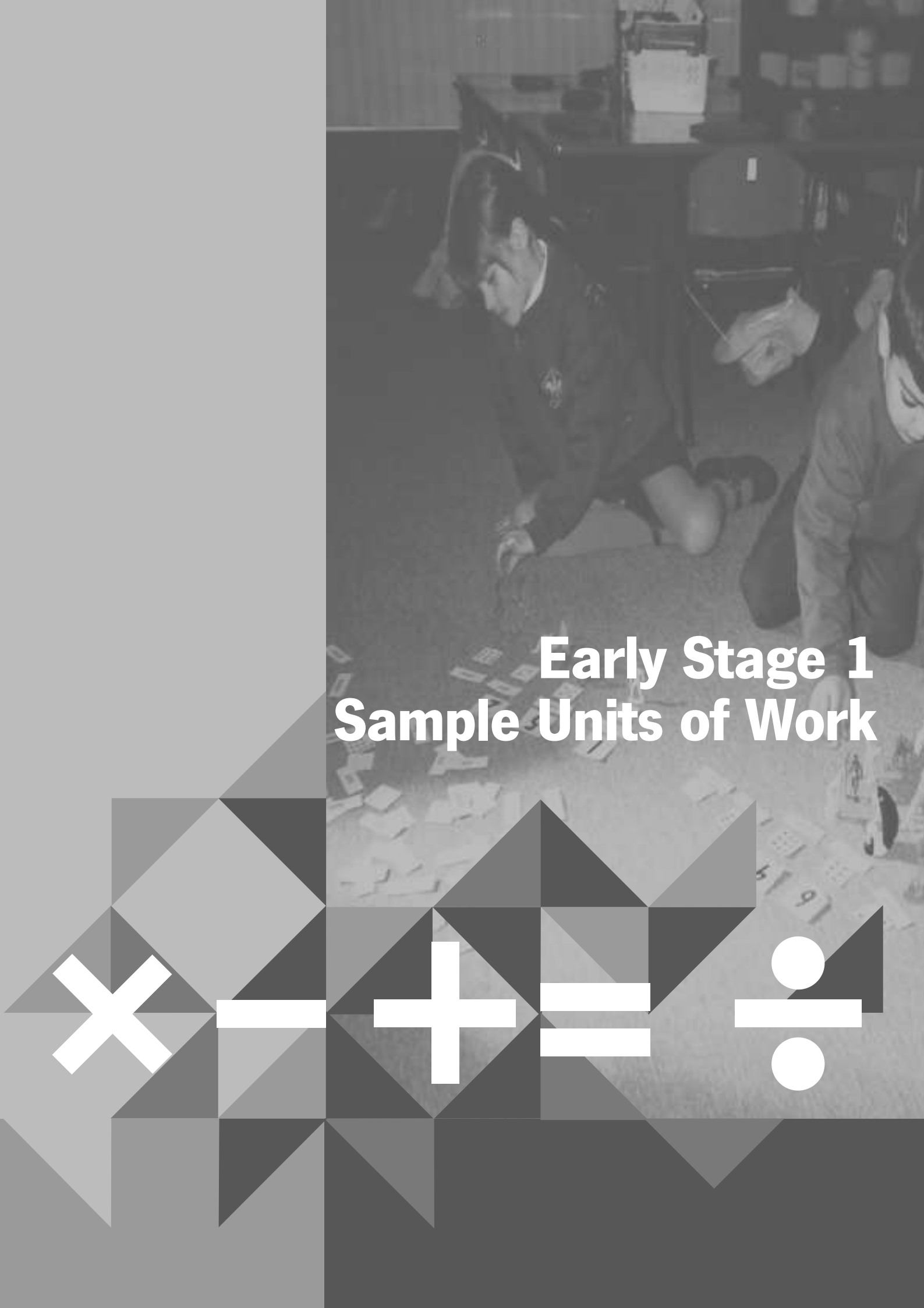


Early Stage 1 Sample Units of Work

3.1 Whole Numbers

Strand – Number

Syllabus Content p 41

NES1.1

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

Key Ideas

Count forwards to 30, from a given number

Count backwards from a given number, in the range 0 to 20

Compare, order, read and represent numbers to at least 20

Read and use the ordinal names to at least 'tenth'

Use the language of money

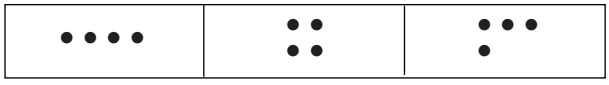
WM Working Mathematically Outcomes

Questioning	Applying Strategies	Communicating	Reasoning	Reflecting
Asks questions that could be explored using mathematics in relation to Early Stage 1 content	Uses objects, actions, imagery, technology and/or trial and error to explore mathematical problems	Describes mathematical situations using everyday language, actions, materials and informal recordings	Uses concrete materials and/or pictorial representations to support conclusions	Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Early Stage 1 content

Knowledge and Skills

Students learn about

- counting forwards to 30, from a given number
- counting backwards from a given number, in the range 0 to 20
- identifying the number before and after a given number
- counting with one-to-one correspondence
- reading and writing numbers to at least 20, including zero
- recognising a dot pattern instantly for numbers up to seven (subitising)
- representing numbers to at least 20 using numerals, words, symbols and objects (including fingers)
- comparing and ordering numbers or groups of objects
- making and recognising different visual arrangements for the same number
  eg



- using 5 as a reference in forming numbers from 6 to 10 eg 'Six is one more than five'
- using 10 as a reference in forming numbers from 11 to 20 eg 'Thirteen is three more than ten'
- reading and using the ordinal names to at least 'tenth'
- recognising that there are different coins and notes in our monetary system
- using the language of money in everyday contexts eg coin, note, cents, dollars

Working Mathematically

Students learn to

- ask questions involving counting numbers to at least 20 eg 'How many pencils are in the tin?' (*Questioning*)
- apply counting strategies to solve simple everyday problems (*Applying Strategies*)
- communicate an understanding of number using everyday language, actions, materials and informal recordings (*Communicating*)
- justify answers by demonstrating the process used (*Applying Strategies, Reasoning*)
- recognise numbers in a variety of contexts, including on classroom charts, a calculator, shop cash register, computer keyboard and telephone (*Reflecting*)
- count rhythmically to identify number patterns eg stressing every second number (*Applying Strategies*)
- estimate the number of objects in a group of up to 20 objects, and count to check (*Reflecting, Applying Strategies*)
- exchange money for goods in a play situation (*Reflecting*)

Learning Experiences and Assessment Opportunities

WM Counting

Students should be given frequent opportunities to count forwards and backwards from various starting points.

Counting experiences could include:

- rhythmic counting eg 1 **2** 3 **4** 5 **6**... (where the bold numbers are said aloud)
- counting individually
- counting off. Students stand as they call their number and when counting backwards students sit.
- circle counting. Students sit in a circle and take turns to count particular groups of students eg the number of students in the class, the students with blue shirts.
- counting with body percussion to emphasise a pattern eg odd numbers hitting knees, even numbers with a clap.

Class Shop

The teacher sets up play situations to allow students to explore coins and notes, and use them in shopping contexts. A selection of items could be available with marked prices.

Students order the items for sale from least expensive to most expensive.

Students role-play buying items at the shop using coins and notes for whole amounts.

Students group the items they could buy with a given coin or note.

The class shop can vary to include businesses such as hairdresser, butcher, baker, trash and treasure, office, restaurant, or bookshop.

WM Wind Up Toy Race

The teacher sets up some toy races in groups of ten. Students race the toys and order them from first to tenth. They then label them with ordinal cards made by the teacher.

Possible questions include:

- who came first?
- who came last?
- what are the words we use to describe where we come in a race?

Peg Cards

In pairs, students are given a set of large numeral cards (eg 0 to 10). The cards are not in order.

Students take turns to read the numeral on each card to their partner and attach the corresponding number of pegs.

The cards are then ordered from 0 to 10 across the floor.

Extension: Students are asked to select two of the numbers from the floor and count from the smallest to the largest, or the largest to the smallest.

Rhymes, Songs and Stories

Students could listen to stories and sing songs and nursery rhymes to develop number concepts eg Three Bears, Five Little Ducks, Ten Little Indians, Ten Fat Sausages.

It is important to use rhymes that involve counting backwards as well as rhymes that involve counting forwards, and to use ordinal numbers.

Teachers could also use stories to teach ordinal names by asking questions such as 'What happened second in the story of the Three Little Pigs?'

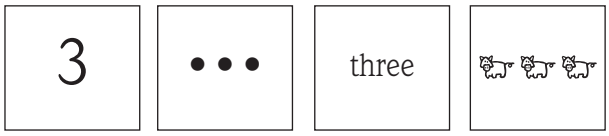
Address Books

Students collect numbers that relate to themselves and collate them into a booklet eg telephone numbers, addresses, birthdays, ages.

These books can be used for discussions about numbers and assessment of writing numerals.

WM Concentration

Students are given a set of cards with numbers represented by numerals, pictures, dots, or words
eg



Cards should be provided within an appropriate range eg 0 to 10, 10 to 20. In pairs or individually, students match the cards.

Using 5 as a Reference

Part A

Students are given an egg carton that has been cut to form two rows of five. Five chicks are placed in the top row and the students use this as a reference for counting numbers up to 10. Students are asked to count numbers up to 10 by placing some chicks in the bottom row of the egg carton. Students compare their arrangements of chicks.

Possible questions include:

- what is the number you have now?
- what is the next number?
- how did you count it?

Part B

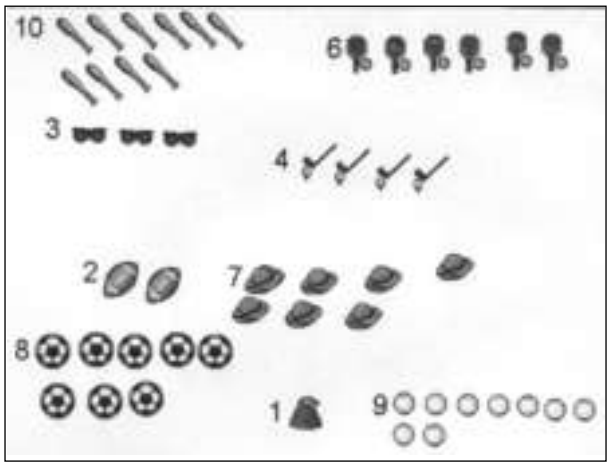
The teacher uses two joined egg cartons to create two rows of 10. Students count beads, buttons or shells into the egg cartons to show ten, ten and one, ten and two, etc. (Starting from 10 should be emphasised.)

Counting into Cups

In small groups, students are given containers such as paper cups, each labelled with a number 0 to 10, (then 0 to 20, 0 to 30). Students are asked to identify the number on the cup and count the corresponding number of popsticks in the cup, and place them in order.

Computer Numbers

In pairs, students use simple computer graphics to represent the numbers 0 to 20. Students are encouraged to discuss how best to arrange the graphics so that each number can be identified quickly.



Race to 10 or 20

In pairs, students are each given a set of consecutive number cards eg 0 to 10 or 0 to 20. They shuffle their cards and place them face down. On 'Go' students race to order their cards, placing them face up.

Variation: The cards are ordered backwards 10 to 0, then 20 to 10.

Possible questions include:

- can you read and order the numbers?
- from 12, can you count forwards to 30?
- can you count backwards from 19 to 0?
(Adapted from CMIT)

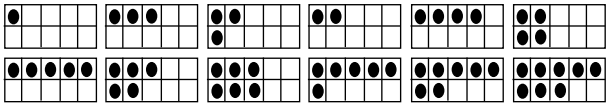
WM Calculator

In groups, students display a number eg 2 on their calculator. They use the 'Clear' button to clear the display. This is repeated for other numbers in the range 0 to 9. Students then make their displayed number from popsticks or similar materials and glue them onto the page. Students then order their popstick numbers with the other numbers made in the group.

Extension: Students display numbers in the range 10 to 19, 20 to 29.

How Many Dots?

The numbers 0 to 10, represented by dots on transparent ten-frames are required for this activity
eg



One frame is selected by the teacher and briefly displayed on an overhead projector.

The students determine and record how many dots are on the ten-frame.

The teacher asks the students 'How did you work out how many dots there were?'

Extension: Two ten-frames are placed on the overhead projector at a time. Students are asked to find the total number of dots and describe their strategies. (Adapted from CMIT)

WM Where's the Number?

Each student is provided with a strip of cardboard that represents a number line, with zero written at one end and ten written at the other.

Using a peg as a marker, the students are asked to locate a particular number on the number line and discuss its

0	10

placement in relation to 0 and 10.

The activity is repeated for other numbers between 0 and 10 eg move the peg to where the number 9 would be.

Extension: The activity could be extended using a 0 to 20 number line. (Adapted from CMIT)

Number Lines

Students write a numeral in a given range on a small square of paper. The teacher selects a student randomly to peg their number on a string hung across the room. Students discuss the placement.

A second student is selected to peg their number on the string considering its placement in relation to the first number.

This is repeated for all students, discussing where each number would go, before placement
eg

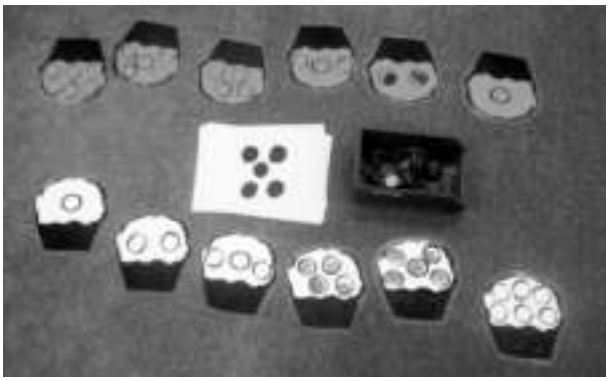
13	14		17

Possible questions include:

- what number comes before/after number 17?
- what numbers go between 14 and 17?
- where do you think number 11 will go?
(Adapted from CMIT)

WM Cup Cakes

The teacher makes 6 cup cakes for each participating student. Each cup cake has a different number of counters ('cherries') in the range of 1 to 6 drawn on it. Students roll a die in turn and are asked to match the number on the die to their cup cake. They put counters on the dot pattern to show they have rolled that number. As this is a subitising game, instant recognition of die patterns is required and the student should be encouraged to say the number immediately without counting. If the student needs to count the dots they do not put 'cherries' on their cupcakes for that turn.



Hidden Number

Students order numeral cards from 0 to 20. The numbers 1 to 19 are turned face down and the numbers 0 and 20 are left face up for students to see. One student is selected to stand on 0 and step forward to a card of their choice.

Possible questions include:

- which card is the student standing on?
- how do you know?

If I turned over the number before/after this number, what number should that be? (The student turns over the selected card for other students to check.)

Variation: The student stands on 20 and steps backwards to select a card. (Adapted from CMIT)

WM Teddy Bear Race

In pairs, students are given six teddy bear counters, a die and a playing board (as shown).

Home					
1	2	3	4	5	6

Students line up the 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.

Extension: As each bear reaches home, students label each bear with its position in the race.

1st	2nd	3rd	4th	5th	6th

Possible questions include:

- which bear will win the race most of the time? Why?
- where did your teddy number one come in the race?
(Adapted from CMIT)

Resources

counters, posting box, calculators, egg cartons, plastic cutlery, cups, saucers, plates, Australian coins and notes, play money, numeral flashcards, string, pegs, pictures of clothing, dice, ordinal flashcards, ten-frames, paper squares, cash register, grocery boxes and containers, game boards, unifix cubes, playdough, cards with dot patterns, paint, glue, magazines, picture cards

Links

Patterns and Algebra

Addition and Subtraction

Language

count, counting, forwards, backwards, zero, one, two, …, twenty, first, …, tenth, money, coin, note, cents, dollars, smallest number, largest number, bundle, before, after, more, fewer, next, match, the same as

3.2 Addition and Subtraction

Strand – Number

Syllabus Content p 46

NES1.2

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

Key Ideas

Combine groups to model addition

Take part of a group away to model subtraction

Compare groups to determine 'how many more'

Record addition and subtraction informally

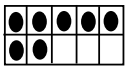
WM Working Mathematically Outcomes

Questioning	Applying Strategies	Communicating	Reasoning	Reflecting
Asks questions that could be explored using mathematics in relation to Early Stage 1 content	Uses objects, actions, imagery, technology and/or trial and error to explore mathematical problems	Describes mathematical situations using everyday language, actions, materials and informal recordings	Uses concrete materials and/or pictorial representations to support conclusions	Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Early Stage 1 content

Knowledge and Skills

Students learn about

- combining two or more groups of objects to model addition
- separating and taking part of a group of objects away to model subtraction
- comparing two groups of objects to determine 'how many more'
- creating combinations for numbers to at least 10
  eg 'How many more make ten?'



- describing the action of combining, separating or comparing using everyday language eg makes, join, and, get, take away, how many more, altogether
- counting forwards by ones to add and backwards by ones to subtract
- recording addition and subtraction informally using drawings, numerals and words

Working Mathematically

Students learn to

- pose 'how many' questions that can be solved using addition and subtraction (*Questioning*)
- use concrete materials, including fingers, to model and solve simple addition and subtraction problems (*Applying Strategies*)
- solve simple everyday problems using problem-solving strategies that include 'acting it out' (*Applying Strategies*)
- use visualisation of numbers to assist with addition and subtraction (*Applying Strategies*)
- apply strategies that have been demonstrated by other students (*Applying Strategies, Reflecting*)
- use simple computer graphics to represent numbers and their combinations to at least 10 (*Applying Strategies*)
- explain or demonstrate how an answer was obtained (*Applying Strategies, Communicating, Reasoning*)
- describe what happened to a group when it was added to or subtracted from (*Communicating, Reflecting*)

Learning Experiences and Assessment Opportunities

Hand Prints

In small groups, students are given a die (numbered 1, 1, 2, 2, 3 and 3), a collection of counters, and a game board made up of two hand prints as shown.

The object of the game is to collect exactly ten counters.

In turn, students roll the die, collect that number of counters, and place them on the game board.

If the student cannot fit the number of counters on their game board, they must remove that number from those on the board.

For example, Paula's game board looks like this.

Paula needs to roll a 1 to finish the game. If she rolls a 3, she has to take 3 counters off the board, leaving her with 6 counters.

WM Rabbit Ears Plus

The teacher models making 'rabbit ears' by putting their fists at the sides of their head, saying a number less than 10 and raising that number of fingers.

Students are asked to:

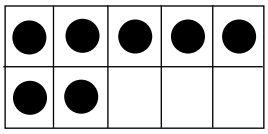
- raise two fingers on one hand and three fingers on the other hand. How many fingers are raised altogether?
- show six rabbit ears. How many fingers have been raised on each hand to make six altogether?
- raise two fingers on one hand. How many fingers need to be raised on the other hand to make four altogether?

Students should be encouraged to raise their fingers while their hands are still at the side of their heads. Then they can check if they have the correct number by looking at and counting their fingers.

Some students may be selected to model and explain their solution eg 'I made 6 with 5 fingers on one hand and 1 more.' (Adapted from CMIT)

WM Ten-frame Subtractions

Students are shown a ten-frame with some counters on it eg



Possible questions include:

- how many counters are on the ten-frame?
- how many squares are full/empty?

Students are asked to imagine three counters jumping off the ten-frame.

Possible questions include:

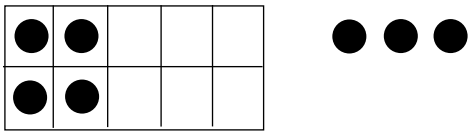
- how many counters are left on the ten-frame?
- how did you work that out?
- how many squares are full/empty?

The three counters are then moved off the ten-frame for students to check their answer.

This activity encourages students to visualise numbers. It should be repeated with other counter combinations. (Adapted from CMIT)

Ten-frame Additions

Students are shown a ten-frame with some counters positioned on it and others beside it
eg



Possible questions include:

- how many counters are on the ten-frame?
- how many counters are off the ten-frame?

Students are asked to imagine the three counters jumping onto the ten-frame.

Possible questions include:

- how many counters are there altogether?
- how did you work that out?
- how many squares are full/empty?

The three counters are then moved onto the ten-frame for students to check their answer. This activity encourages students to visualise numbers. It should be repeated with other counter combinations. (Adapted from CMIT)

WM Domino Count

Students are given a set of dominoes and are asked to count how many dots are on each side of a domino and then how many dots there are altogether. Students are encouraged to:

- work out how many dots there are on each side without counting one at a time
- discuss different strategies they could use to work out how many there are altogether.

The teacher could ask the students to imagine a domino with four dots on one side and one dot on the other. They then discuss with students how many dots there are and strategies that can be used to find out.

The teacher could also pose the problem:

'There are six dots altogether on my domino. How many dots could there be on each side?'

Students record and discuss the possible answers. Some students may require materials such as counters to assist them in solving the problem.

Possible questions include:

- is there a quicker way to find the answer than counting by ones from one?
- is there a quicker or easier way to add?
- is that the only possible answer?

Combinations to Ten

Students are given a container of 10 counters that are all one colour on one side and a different colour on the reverse.

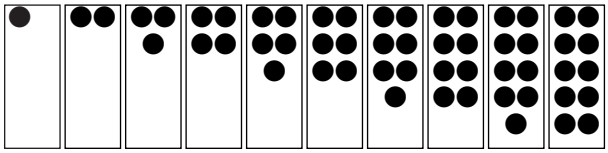
In pairs, students shake the container and roll the counters onto the floor. Students sort the counters into colour groups, depending on which side the counters land. Students should be encouraged to organise the groups so they can see 'how many' at a quick glance
eg

Students determine how many counters are, for example, red and how many are yellow.

Students use drawings and numerals to record their results.

Teen Numbers Plus

The teacher prepares a set of dot cards for the numbers 1 to 10 and a set of number cards from 11 to 19, as shown.



11	12	13	14	15
16	17	18	19	

All dot cards are turned face down, but kept in sequence.

In small groups, a student turns over two of the dot cards and states how many dots there are altogether. If the answer is one of the teen number cards, the student removes the number card and the dot cards are turned face down again.

Play continues in turn until all of the teen number cards have been collected.

WM Hidden Counters

Students are given a small number of counters to count.

The teacher picks up the counters with one hand, puts both hands behind their back, distributes the counters between their two hands and closes their fists.

Students are then shown the two closed fists. One hand is opened and the students see the number of counters in that hand. Students determine how many counters the teacher has in the other hand and explain how they worked it out.

The activity is repeated many times and the number of counters is varied.

Variation: Students play this as a game with a partner. (Adapted from CMIT)

Comparing Towers

In pairs, Student A rolls a die, collects the corresponding number of interlocking cubes and makes a tower. Student B then rolls the die, collects the corresponding number of interlocking cubes and makes a tower. The two students compare their towers and are asked to determine whose tower is taller.

Possible questions include:

- how do you know which tower is taller?
- how many cubes are in each tower?
- how many more cubes are in the taller tower?

The student with the taller tower removes the 'difference' and keeps it. The game continues until students have collected up to 30 cubes.

Students may also use two or three dice, or dice with numbers larger than 6. (Adapted from CMIT)

Addition Posting Box

Students silently count while the teacher drops a collection of blocks into a box one at a time. Students record the total number of blocks, compare and discuss their totals with others.

The teacher adds more blocks slowly (2 or 3). The students count silently and record the new total.

Possible questions include:

- how did you find the total number of blocks?

Students should be encouraged to hold the starting number in their head and count forwards from that number to determine the total. (Adapted from CMIT)

Taking-away Blocks

Students count out 10 objects. They roll a die and take away that number of objects. They determine how many objects are left and record what has been done. The game is repeated for a pre-determined number of throws.

WM Subtraction Posting Box

The teacher holds an opaque container of counters and presents the following scenario:

'There are ten counters in this container. I am going to take some of the counters out, one at a time. Then I want you to record how many counters are left in the container.'

The teacher removes some of the counters (eg four) and the students record the number of counters remaining. Students discuss their strategies.

Possible questions include:

- can you give another example using the same numbers? eg 'I had 10 and then I took away 6 and there are 4 left now.'
- how can you record what you have done? Can you record it in a different way? (Adapted from CMIT)

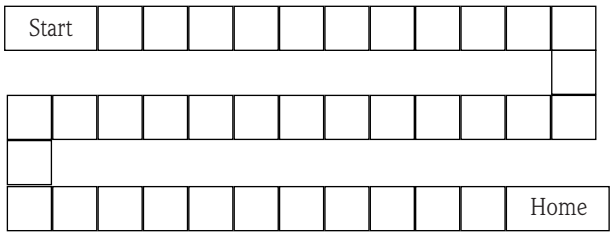
Nim

In pairs, students make a line of eleven blocks between them. In turn, each student chooses to remove one, two or three blocks, using strategies to attempt to make the other player remove the last block. The player who is forced to remove the last block loses.

Students repeat the game many times and could keep score eg the student who wins, takes a counter.

Racing Track Counting

The teacher prepares a game board like the one shown.



Students form pairs. Student A rolls two dice and adds the number of dots shown, moving their marker the corresponding number of places on the board. Student B does the same. Students must roll the exact number of places remaining to move to Home or they miss their turn.

Resources

variety of counters, dice, number cards, paper cups, beads, ten-frame, racing track game board, dot cards, handprints on cardboard, dominoes

Links

Whole Numbers

Length

Patterns and Algebra

Language

add, plus, altogether, makes, equals, is equal to, same as, more, less, fewer, and, join, take away, move them away, take out, leaves, enough, not enough, too many, get how many more, together, took, left, not as many, how many, cover them up.

'I put two marbles with Oliver's three marbles and got five.'

'I joined three blocks and five blocks together and made eight.'

'I took three pencils out of my pencil case and there are five left in my case.'

'I put the line of five red blocks beside the line of three blue blocks and there were two more red blocks.'

3.3 Multiplication and Division

Strand – Number

Syllabus Content p 52

NES1.3

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

Key Ideas

Model equal groups or rows

Group and share collections of objects equally

Record grouping and sharing informally

WM Working Mathematically Outcomes

Questioning	Applying Strategies	Communicating	Reasoning	Reflecting
Asks questions that could be explored using mathematics in relation to Early Stage 1 content	Uses objects, actions, imagery, technology and/or trial and error to explore mathematical problems	Describes mathematical situations using everyday language, actions, materials and informal recordings	Uses concrete materials and/or pictorial representations to support conclusions	Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Early Stage 1 content

Knowledge and Skills

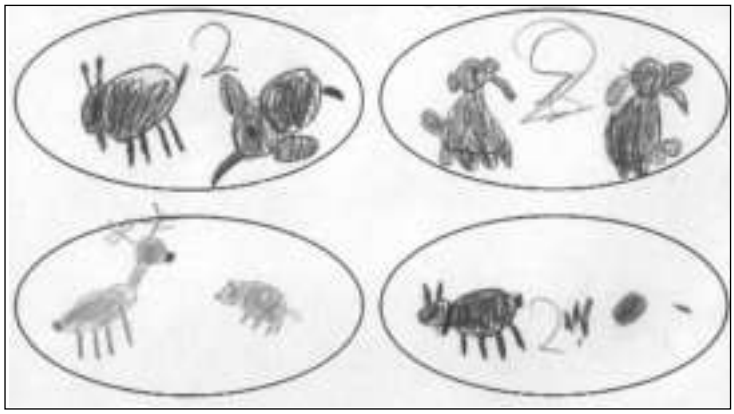
Students learn about

- using the term 'group' to describe a collection of objects
- using the term 'sharing' to describe the distribution of a collection of objects
- grouping and sharing using concrete materials
- modelling equal groups or equal rows
- recognising unequal groups or unequal rows
- labelling the number of objects in a group or row
- recording grouping and sharing informally using pictures, numerals and words

Working Mathematically

Students learn to

- pose problems that can be solved using grouping or sharing (*Questioning*)
- respond to grouping and sharing questions by drawing, making, acting, guessing and checking, and retelling (*Communicating, Applying Strategies*)
- describe grouping and sharing using everyday language, actions, materials and drawings (*Communicating*)
- explain or demonstrate how an answer was obtained (*Applying Strategies, Communicating, Reasoning*)



Learning Experiences and Assessment Opportunities

Groups of Children

Students skip within a given area eg a netball court. The teacher calls out a number and students make groups of that number.

Possible questions include:

- do all groups have the same number of students?
- how can we check this?

Each group checks the number of students in their group and a student is chosen to count the number of groups. Students line up in rows so the groups can be compared.

WM Sorting Objects

Students are given a collection of different-coloured objects to sort into groups. Possible questions include:

- do the groups have the same or a different number of objects?
- can you find a way to make each group equal in number?

Students use drawings and numerals to record their groups.

Groups and Number Cards

In groups of three or four, students sit in a circle. Multiple copies of the number cards 0 to 5 are placed in one pile, face down.

Student A turns over a number card and all players take that number of counters from a pile. Student A counts the total number of counters all players have for that turn. Other players say if they agree with that total number and record their answers. Play continues until all players have had a turn.

Sharing

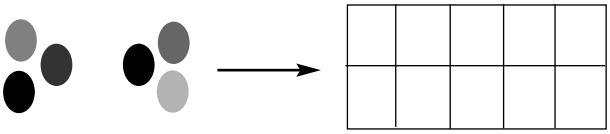
Students are shown a collection of up to 30 objects. They are asked to discuss what sharing means and to explain how they would share the objects.

In small groups, students are asked to select a bag of objects that has been prepared by the teacher. Each bag contains a different number of objects. Students are asked to share the objects between their groups equally and discuss whether it was possible.

Students record their solutions.

Ten-frames

Students make two groups of three counters. They are then asked to place the groups onto a ten-frame.



Possible questions include:

- is there the same number of counters in each group?
- how can you tell without counting?
- how many counters are there altogether?

This activity is repeated using two groups of other numbers up to five.

Variation: Two ten-frames could be joined together to make two groups of numbers up to ten or four groups of numbers up to five.

Students could be given a 5×5 grid and asked to make groups up to five groups of five. (Adapted from CMIT)

WM Rows

Students are given 12 small plastic animals or other small objects.

Possible questions include:

- can you arrange the animals/counters into equal rows?
- how many different ways can you arrange the animals/counters into equal rows?

Students record and share their solutions.

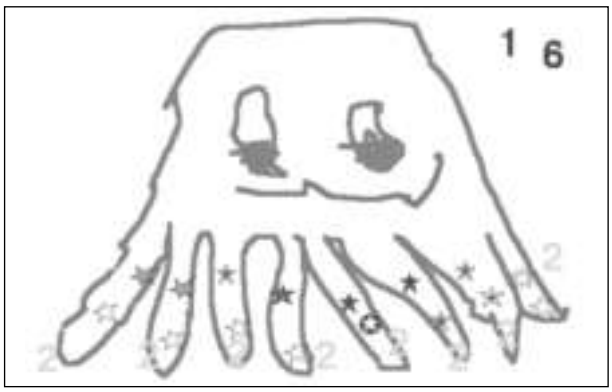
This activity could be repeated with smaller or larger collections of objects.

WM Spotty Henry

The teacher presents the following story:

'Henry is a spotted octopus with 8 legs. He has 2 spots on each leg. How many spots does Henry have?'

Materials are provided for students to work out a way to solve and record the problem.



Extension: Students create and illustrate their own story for others to solve.

Same Number of Groups

Students are asked to make four groups of two objects. It may help some students to have four pieces of paper or a large sheet marked with four squares.

Possible questions include:

- can you replace the four groups of two with four groups of another size?
- can you describe your new groups?

Students use drawings and numerals to record their groups.

An Even Number of Objects

The teacher gives a student an even number of objects and asks the student to share the objects with a friend so that each has the same amount.

Possible questions include:

- can you explain how the objects were shared?
- how did you check that you had the same amount?
- how did you work out which group has more/less?

The activity is repeated using different types of concrete materials and varying the number of objects in each problem.

Pasting Rows

Students cut and paste pictures or use a computer drawing program to create arrays. They are asked to describe their array and use numerals/words to label its features.

Possible questions include:

- is there a different way to make this group?
- what new groups can be made with the same objects?
- how could you check your answer?

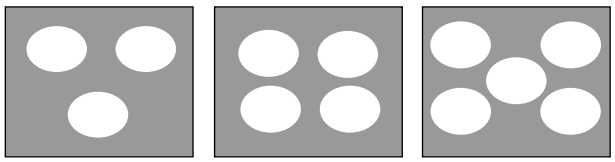
Number Problems

Teachers and students can use current topics of study as a setting for number problems.

For example, if the students are looking at the life cycle of lizards, the teacher might pose the question 'If four lizards each laid four eggs, how many eggs would there be?'

WM Farms

In groups, students are given a place mat with three, four or five ovals on it to represent paddocks. They are also given a collection of plastic animals.



Student A rolls a die and all the students place that number of animals in each paddock. Each student is asked to describe their farm and is encouraged to use numbers in their description. Students record their findings. (Adapted from CMIT)

Continuous Materials

The teacher can stress the concept of equal sharing when considering units in the Measurement strand
eg

- ask students to share out a bottle of water so that there is the same amount in each of a number of glasses
- ask students to cut a piece of paper ribbon so that two people get the same length
- consider the fair allocation of time for students to be in the play area
- ask students to divide a pile of sand into equal amounts.

Fair Share

The teacher shares out some objects unequally among a group of students and asks whether the objects have been shared equally.

In pairs, students are given an odd number of objects and are asked to share them. Students discuss what they can do with the leftover object.

WM Real Life

Students are given examples of sharing that are interesting and are part of their everyday lives
eg

- sharing 16 sandwiches at a party among four people
- sharing 8 marbles between two sisters
- sharing ten football cards among three friends.

The concept of a ' fair share' should be discussed and what to do with the leftovers.

Resources

collections of different objects up to 30, digit cards, array cards, ten-frames, counters, plastic teddy bears, pictures, computer drawing program, scissors, glue, cardboard with ovals on it.

Links

Whole Numbers

Addition and Subtraction

Language

group, row, share, equal, not equal, the same, not the same, more, less, needs more, altogether, fair share, give out, groups, how many, match, share one at a time, two threes, four fives.

'Their groups are the same.'

'Each group has five.'

'Everyone got the same so it was a fair share.'

3.4 Patterns and Algebra

Strand – Patterns and Algebra

Syllabus Content p 73

PAES1.1

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

Key Ideas

Recognise, describe, create and continue repeating patterns

Continue simple number patterns that increase or decrease

Use the term 'is the same as' to describe equality of groups

WM Working Mathematically Outcomes

Questioning	Applying Strategies	Communicating	Reasoning	Reflecting
Asks questions that could be explored using mathematics in relation to Early Stage 1 content	Uses objects, actions, imagery, technology and/or trial and error to explore mathematical problems	Describes mathematical situations using everyday language, actions, materials and informal recordings	Uses concrete materials and/or pictorial representations to support conclusions	Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Early Stage 1 content

Knowledge and Skills

Students learn about

Repeating Patterns and Number Patterns

- recognising, copying and continuing repeating patterns using sounds and/or actions
- recognising, copying, continuing and creating repeating patterns using shapes, objects or pictures

  eg ♦, ∇, ♦, ∇, ♦, ∇, …
- describing a repeating pattern made from shapes by referring to distinguishing features

  eg 'I have made my pattern from squares. The colours repeat. They go red, blue, red, blue, …'
- describing a repeating pattern in terms of a 'number' pattern

  eg ♦, O, ♦, O, ♦, O, … is a 'two' pattern

  Δ, ∇, O, Δ, ∇, O, … is a 'three' pattern

  B, B, X, B, B, X, … is a 'three' pattern
- recognising, copying and continuing simple number patterns that increase or decrease

  eg 1, 2, 3, 4, …

  20, 19, 18, 17, …

  2, 4, 6, 8, …

Number Relationships

- using the term 'is the same as' to express equality of groups

Working Mathematically

Students learn to

- ask questions about how repeating patterns are made and how they can be copied or continued (*Questioning*)
- check solutions to continuing a pattern by repeating the process (*Applying Strategies, Reasoning*)
- record patterns created by using the process of repeatedly adding the same number on a calculator (*Communicating*)
- create repeating patterns with the same 'number' pattern eg A, B, B, A, B, B, … is a 'three' pattern and so is o, Δ, Δ, o, Δ, Δ, ... (*Communicating, Applying Strategies*)
- recognise when an error occurs in a pattern and explain what is wrong (*Applying Strategies, Communicating, Reasoning*)
- make connections between counting and repeating patterns (*Reflecting*)
- create or continue a repeating pattern using simple computer graphics (*Applying Strategies*)
- determine whether two groups have the same number of objects and describe the equality eg 'The number of objects here is the same as the number there.' (*Applying Strategies, Communicating*)

Learning Experiences and Assessment Opportunities

Beginning to Make Repeating Patterns

Part A

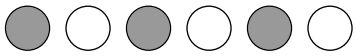
Students are given a set of counters containing two colours and are asked to put the counters in a row. Some students may create a repeating pattern, while others may not. The intention of the activity is to distinguish between those arrangements that are repeating patterns and those that are not.

Possible questions include:

- where do we see patterns?
- what comes next in this pattern? How do you know?
- which part of the pattern is repeated?
- can you describe how to make this pattern?

Part B

The teacher models putting a small collection of counters in a row, making sure that they make a repeating pattern
eg



Possible questions include:

- can you describe your row of counters?
- can you describe my row of counters?
- can you make a row of counters like mine?
- can you make another row of counters that has a pattern?

In pairs, students make new rows of counters, describe them to each other, and record their patterns.

At this early stage, it is preferable to use materials that have only one attribute (eg colour) before using materials with multiple attributes.

Describing Repeating Patterns using Numbers

The teacher makes a repeating pattern using multilink cubes
eg

This pattern is called a 'three' pattern because the pattern repeats after every third cube.

Possible questions include:

- how many cubes are in each group that repeats? (three)
- how many groups are in your pattern? (three)
- what is the total number of cubes in the pattern? (nine)

With teacher guidance, students record the pattern using drawings. They are encouraged to use numbers in their recording.

WM Making Repeating Patterns

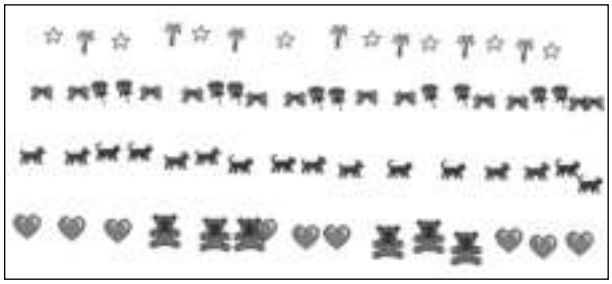
In pairs, students are given collections of materials such as coloured counters, unifix cubes or shells, and are asked to make a pattern that repeats.

Students then use drawings to show what they have done.

Possible questions include:

- can you describe your pattern?
- which parts repeat?
- how many pattern blocks are in each of the parts that repeat?

Students should be encouraged to record this information in their own way on their drawings.



'Two', 'Three' and 'Four' Patterns

Part A

In pairs, students make a 'two' pattern by placing two different-coloured counters/cubes beside each other and repeating these several times.

Students name the pattern as a 'two' pattern, as there are two elements that repeat.

Students are then asked to make a 'three' pattern by placing three different-coloured counters/cubes beside each other and repeating these several times.

Students name the pattern as a 'three' pattern, as there are three elements that repeat.

The students are then asked to make and name a 'four' pattern.

WM Part B

Students make other 'two', 'three' and 'four' patterns, describe what they have done, and record their patterns.

Possible questions include:

- can you create a pattern like this one?
- how many elements will 3 groups of your pattern make?

Pattern Counting in Twos

Students, as a whole class, count while tapping body parts in a pattern.

For example, a 'two' pattern might be to tap your head and then tap your shoulders. This pattern could be repeated with students saying 'one, two, one, two, …' leading to rhythmic counting in twos with an emphasis on every second number: 'one, **two**, three, **four**, five, **six**, …' (where the bold numbers are said aloud).

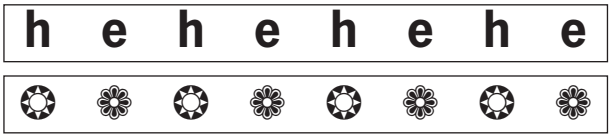
The teacher could stop students and ask what number they will say aloud next.

Students could be invited to make up another 'two' pattern for the students to follow as a whole class.

Creating Patterns with the Same 'Number' Pattern

Part A

The teacher prepares two pattern cards that have 'two' repeating elements.
eg



Students are shown the two cards and are asked to describe how the cards are the same.

WM Part B

In pairs, students are given collections of material such as coloured cubes, buttons, beads, shapes and shells.

They are asked to make other patterns that have two elements that repeat.

Variation: Part A and Part B are repeated with an emphasis on 'three' or 'four' repeating elements.

Different 'Three' Patterns

In pairs, students create 'three' patterns in a variety of ways that could include objects, pictures, sounds, letters, words or numbers
eg

- red, yellow, blue, red, yellow, blue, …
- 1, 2, 3, 1, 2, 3, 1, 2, 3, …
- O, O, Δ, O, O, Δ, …
- A, B, B, A, B, B, …
- snap fingers, clap, clap, snap fingers, clap, clap, …

Students could use simple computer graphics to create a 'three' pattern in a variety of ways.

WM Grouping Patterns

In small groups, students are given a set of repeating pattern cards.

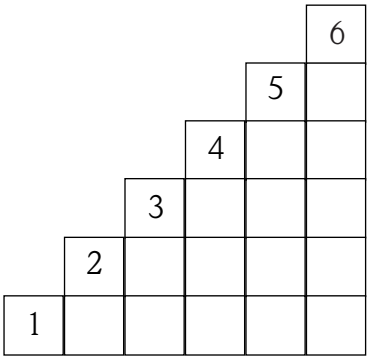
They sort the cards, and explain how they were sorted.

Students are asked to describe each group of cards in terms of a number pattern. Students use materials to create a new pattern for each group.

Staircases

Students build staircases using interlocking cubes eg unifix, multilink, lego or duplo bricks.

Students count aloud as they touch each stair.



Possible questions include:

- can you see a number pattern?
- what number comes next?
- can you continue the number pattern without making more stairs? (this is an increasing pattern)
- can you count backwards down the staircase? (this is a decreasing pattern)

Variation: Students count aloud every second number as they touch each stair (eg 2, 4, 6) and are asked questions similar to those above.

Calendars

Students count from 1 to 30 (31) on a calendar display for one month. They are then asked to discuss the pattern of days – Monday, Tuesday, Wednesday, etc.

Possible questions include:

- is there a pattern to the days?
- what dates will be Tuesdays?
- how many Mondays will there be in this month?

WM What's Wrong With this Pattern?

Students are presented with patterns where one of the elements (eg shapes, pictures, letters, numbers) has been misplaced.

eg 

Possible questions include:

- do you think this is a pattern?
- can you find what is wrong and can you correct the mistake?

Students should experience a variety of patterns with errors so that they can readily identify patterns that repeat and those that don't.

'Is the Same as'

Students are given collections of objects to sort and count in order to find groups that have the same number of objects.

Students describe and label the group using the term 'is the same as'.

eg 

Students could use drawings or simple computer graphics, and the term 'is the same as' to record their findings.

Connecting Repeating Patterns with Counting

This activity has been included as a bridge to Stage 1 content.

WM Part A

Students are shown a large strip of paper with the numbers from 1 to 30 written on it. The paper is placed on the floor.

Using materials, the teacher starts a repeating pattern with each new element of the pattern positioned above a number on the strip of paper.

eg

Δ	O	Δ	O	Δ	O	Δ		
1	2	3	4	5	6	7	8	9

Possible questions include:

- can you describe the pattern I have made?
- what part of the pattern repeats?
- what will the next shape be? How do you know?

Students are asked to imagine that the pattern continues and to consider the following questions:

- what shape will be above the number 10? How do you know?
- what shape will be above the number 15? How do you know?

Extension: Students could be asked:

- if we read out all of the numbers that have a circle above them, what do we know about these numbers?
- if we continue the pattern up to the number 20, how many triangles will there be?

Part B

In pairs, students are given a numeral strip and a collection of objects to create a repeating pattern and pose questions to be answered by their partner.

Resources

pattern blocks, unifix cubes, multilink cubes, coloured counters, lego or duplo bricks, a paper strip with numbers marked, calculators, calendar

Links

Whole Numbers

Addition and Subtraction

Multiplication and Division

Time

Language

pattern, repeat, copy, is the same as, group, increase, decrease, before, after, next, wrong, 'two' pattern, 'three' pattern, number, count forwards, count backwards

3.5 Area

Strand – Measurement

Syllabus Content p 96

MES1.2

Describes area using everyday language and compares areas using direct comparison

Key Ideas

Identify and describe the attribute of area

Estimate the larger of two areas and compare using direct comparison

Record comparisons informally

WM Working Mathematically Outcomes

Questioning	Applying Strategies	Communicating	Reasoning	Reflecting
Asks questions that could be explored using mathematics in relation to Early Stage 1 content	Uses objects, actions, imagery, technology and/or trial and error to explore mathematical problems	Describes mathematical situations using everyday language, actions, materials and informal recordings	Uses concrete materials and/or pictorial representations to support conclusions	Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Early Stage 1 content

Knowledge and Skills

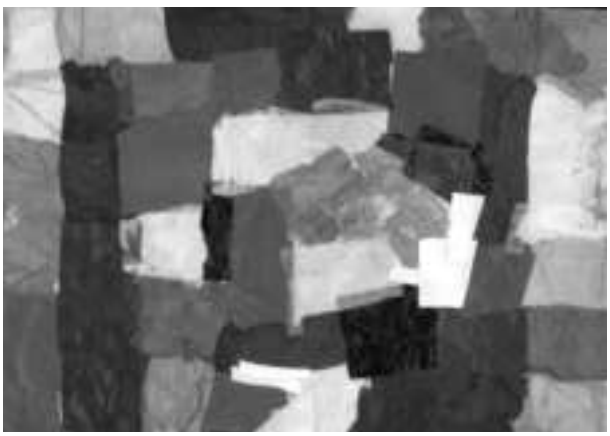
Students learn to

- identifying the attribute of area as the measure of the amount of surface
- covering surfaces completely with smaller shapes
- making closed shapes and describing the area of the shape
- using everyday language to describe area eg surface, inside, outside
- using comparative language to describe area eg bigger than, smaller than, the same as
- estimating the larger of two areas and comparing by direct comparison eg superimposing
- recording area comparisons informally by drawing, tracing or cutting and pasting

Working Mathematically

Students learn to

- ask questions about area in everyday situations eg 'Which book cover is bigger?'(*Questioning*)
- solve simple everyday problems using problem-solving strategies that include 'acting it out' (*Applying Strategies*)
- demonstrate how he/she determined which object has the biggest area (*Communicating, Reasoning*)
- explain why they think the area of one surface is bigger or smaller than another (*Communicating, Reasoning*)
- use computer software to draw a closed shape, colouring in the area (*Applying Strategies*)



Learning Experiences and Assessment Opportunities

Surfaces

Students gain an understanding of 'surface' by:

- touching and describing various surfaces in the classroom or school environment eg desk tops, tree trunks, skin, bricks, grass, fences and carpet and making rubbings.
- discussing floor, wall and roof coverings in different parts of the school and at home. Students could collect photos and pictures from magazines showing coverings and make statements about these.

The teacher supplies materials such as sandpaper or corrugated cardboard of different sizes. Students are blindfolded and feel the surfaces. They state which surface covers the most area. Students then superimpose the surfaces to test their predictions.

Covering a Paper Giant

The teacher draws a 'giant' on a large sheet of butchers' paper. In small groups, students are asked to cover a part of the giant (eg the pants) with small pieces of paper without leaving gaps.

Students discuss whether the entire giant is covered.

WM Match the Shape

Students are given four small pieces of paper, card or fabric. Two pieces are the same size and shape, and two are the same shape but different sizes.

Possible questions include:

- can you find two shapes that are the same?
- how do you know they are the same?
- can you describe how they are the same?

Extension: The activity could be repeated for a wider range of shapes in smaller gradations of size.

Cover Up

Students cover a shape with various tessellating and non-tessellating objects such as thin books, pieces of paper, sheets of newspaper, leaves or chip packets.

Possible questions include:

- is the entire shape covered?
- what other objects could you use so that the entire shape is covered?

Handprint Detective

The teacher presents the following story:

'This morning I found a handprint in the classroom. I have made copies of the handprint so that we can find who it belongs to.'

Possible questions include:

- can you work out if your hand is bigger, smaller or about the same area as the handprint?

Students superimpose their hand onto the handprint.

Students explain how they checked if their hand was a match, and if not, whether their hand is bigger or smaller than the handprint. (Adapted from CMIM)

WM Ordering Leaves

Students collect or are given a collection of leaves.

Possible questions include:

- which leaf is the biggest/smallest?
- how can you tell which leaf has the biggest/smallest area?
- can you show me a leaf that is smaller/bigger than this one?
- can you sort the leaves according to their size?

Students are shown an outline of a tree shape and are asked to identify the group of leaves they would use:

- if they had to cover the tree shape completely and explain why
- if they had to use as many leaves as possible
- if they weren't allowed to use many leaves.

Students are then given an outline of a tree shape and are asked to glue leaves onto the shape so it is completely covered.

Bag of Shapes

The teacher prepares several bags containing a variety of shapes.

The students are organised into small groups. Each group is given a bag of shapes.

In turns, each student randomly selects two of the shapes from the bag, estimates which one is bigger, and superimposes the shapes to test their prediction. They share their observations with the group.

Students are asked to describe how they worked out which shape was bigger and to record their comparisons.

Possible questions include:

- can you describe what you have done?
- how did you compare these two shapes?

WM Find a Bigger Area

In pairs, students draw a shape on paper and are asked to find three areas that are bigger, smaller or about the same size.

Students discuss how they compared the areas.

The teacher models comparing by superimposing one shape over another.

Students' responses are listed in a table.

Bigger	Smaller	About the same

(Adapted from CMIM)

Doll's Quilt

Students are given a piece of art paper and are asked to design a patchwork quilt by covering it with small coloured paper shapes. The small shapes can be made by tearing or cutting regular or irregular shapes.

Possible questions include:

- did you cover the whole quilt?
- which shape worked best?
- were there any overlaps or gaps? Why?

Let's Compare Shapes

In pairs, each student is given a piece of paper and asked to draw a large shape. They paint or colour the area of the shape and cut it out.

Students compare the size of their shape with their partner's shape by superimposing. Students glue their shape onto paper and write a statement comparing their shape with their partner's shape eg 'Hugo's shape is bigger than Alexandra's.'

Possible questions include:

- what is area?
- can you show me the area of this shape?
- how do I know which area is bigger? Can you show me? (Adapted from CMIM)

WM Closed and Open

Students are given a piece of ribbon. They make lines and then shapes with the ribbon. They then draw these. The whole class join several ribbons to make a large area. They measure the area by covering it with their bodies.

Variation: Students use computer software to draw closed and open shapes, and colour them in using the paint tool. (Adapted from CMIM)

Cat and Mouse

Students play a variation of the game Cat and Mouse. One student is outside the circle and one student is inside the circle.

When the teacher/student calls 'open' the cat and mouse can move inside or outside to chase each other. When the teacher/student calls 'closed' the students hold hands to 'close' the circle and stop the cat chasing the mouse. The teacher/student chooses when to say 'open' or 'closed' by whether the cat and mouse are inside or outside the circle.

Resources

paper, scissors, pencils, copied handprint, paint, crayons, different enlargements of shapes, leaves, pieces of cloth, glue, wall paper, string, ribbon

Links

Two-dimensional Space

Length

Visual Arts

Human Society and its Environment

Language

the same as, nearly the same as, almost, about the same as, bigger, much bigger than, larger, smaller, much smaller than, surface, area, overlap, on top of, gaps, covers, fits, on top, space

'I covered all my shape without leaving any gaps.'

'The tea towel fits on the beach towel and doesn't hang over.'

'When I put it on top I know the square is bigger than the triangle because there is some space around it.'

3.6 Volume and Capacity

Strand – Measurement

Syllabus Content p 102

MES1.3

Compares the capacities of containers and the volumes of objects or substances using direct comparison

Key Ideas

Identify and describe the attributes of volume and capacity

Compare the capacities of two containers using direct comparison

Compare the volumes of two objects by direct observation

Record comparisons informally

WM Working Mathematically Outcomes

Questioning	Applying Strategies	Communicating	Reasoning	Reflecting
Asks questions that could be explored using mathematics in relation to Early Stage 1 content	Uses objects, actions, imagery, technology and/or trial and error to explore mathematical problems	Describes mathematical situations using everyday language, actions, materials and informal recordings	Uses concrete materials and/or pictorial representations to support conclusions	Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Early Stage 1 content

Knowledge and Skills

Students learn about

- identifying the attribute of the volume of an object or substance as the amount of space it occupies
- identifying the attribute of the capacity of a container as the amount it can hold
- filling and emptying containers using materials such as water, sand, marbles and blocks
- using the terms 'full', 'empty' and 'about half-full'
- using comparative language to describe volume and capacity eg has more, has less, will hold more, will hold less
- stacking and packing blocks into defined spaces eg boxes, cylindrical cans
- comparing the capacities of two containers directly by
  - filling one and pouring into the other
  - packing materials from one container into the other
- comparing the volumes of two piles of material by filling two identical containers
- comparing the volumes of two objects by directly observing the amount of space each occupies eg a garbage truck takes up more space than a car
- using drawings, numerals and words to record volume and capacity comparisons informally

Working Mathematically

Students learn to

- recognise when a container is nearly full, half-full or empty (*Applying Strategies*)
- recognise and explain which three-dimensional objects pack and stack easily (*Communicating, Reflecting*)
- question and predict whether an object or collection of objects will fit inside a defined space such as a box or cupboard (*Questioning, Applying Strategies, Reflecting*)
- solve simple everyday problems using problem-solving strategies that include 'acting it out' (*Applying Strategies*)
- predict which container has the greater capacity (*Applying Strategies*)

Learning Experiences and Assessment Opportunities

Volume and Capacity Through Play

Students develop an understanding of volume and capacity during free and directed play. Experiences could include:

- packing away materials
- filling a variety of containers using handfuls, cups, sieves, spoons and scoops
- filling containers with materials such as sand, water, gravel or pasta
- filling containers to the brim
- filling one container and pouring the contents into another
- filling boxes with smaller objects such as unifix cubes
- packing and unpacking toys.

WM Stacking

Students are asked to select a number of the same objects (eg cans, boxes, balls or blocks) to build a wall. Students explain why they selected a particular object. They then build another wall using a different object.

Possible questions include:

- how did you create your wall?
- are there other ways of stacking the objects you used?
- which object was the easiest to stack?
- which wall is the biggest? How do you know?
- what were you measuring?

Variations: Students could be asked to build vehicles, buildings or animals by stacking various junk materials and gluing them together.

Sand Moulds

Students make sand models using suitable containers as moulds eg buckets or yoghurt cups. Students make sand castles using damp, wet or dry sand.

Students then compare their sand castles to the original mould and with the sand castles made from the same mould by other students.

Full or Empty

The teacher provides a set of labels with the terms 'full', 'empty' and 'about half-full'.

In pairs, students use a variety of containers and substances (eg water, sand, beans, marbles, small blocks) to represent each of the labels.

Students record the activity using drawings and words.

Pouring and Packing

In small groups, students are given a collection of different-sized containers.

Student A selects one of the containers and fills it with material such as pasta or blocks. The group is then asked to find containers in the collection that hold more or less than the chosen container.

Each student checks their prediction by pouring the pasta or packing the blocks from the first container into the selected container.

Students record their results. Students discuss:

- how could you tell if the second container holds more or less than the first container?
- how did you predict whether the second container would hold more or less than the first container?
- would you get different results if a different material was used?

WM Holds More Holds Less

Students find containers that have larger or smaller capacity than a given container eg students check by filling containers with blocks or by pouring sand from one container to another. Students record their results in a table.

Holds more	Holds less	Holds about the same

Who Can Hold The Most?

In pairs, students are given a bucket of beans and two identical clear containers.

Students investigate who can hold the most beans in their two hands (cupped together). Each student places the beans into one of the clear containers and compares the containers to determine who can hold the most beans in their hands.

Students use drawings or numerals to record the results.

Variation: The activity could be repeated using different materials eg blocks. (Adapted from CMIM)

Towers

Students work in a group to build a tower. They choose from a range of materials, such as building blocks, cans, interlocking cubes, cuisenaire rods, cylinders or wood off-cuts. Students discuss their towers.

Possible questions include:

- who made the tallest tower?
- who made the widest tower?
- which tower takes up the most space?
- how can we check this?
- is there an easier way to check?
- why are the towers different?

Variation: The activity could be repeated with each group using equal-sized blocks.

WM Containers with the Same Capacity

Students select a pair of containers that they think will have the same capacity from a large collection of containers. Students test their prediction by filling one container with water, sand, grain, beads, marbles or other appropriate material, and transferring the contents to the other container.

Students demonstrate and explain to others how they compared their two containers. They describe one container as 'holding more' and the other as 'holding less'.

Possible questions include:

- how do you know when a container is full?
- what does it mean when all of the water from one container does not fit into another container?
- are marbles good for measuring? Why or why not?

WM Packing

Students are presented with a variety of objects such as cubes, cuisenaire rods, marbles or buttons.

Students predict whether or not a collection of particular objects will fill a box. They discuss the result obtained in packing different objects.

Students select a group of objects, predict if they will pack into the box, and pack the objects to check.

Possible questions include:

- if I use blocks to measure capacity, what is the best way to pack them?
- how will you know how many blocks you used? Can you draw how you work this out?
- is there a quick way to work it out?

Resources

sand, water, containers, beans, pasta, blocks, felt pens, marbles, peas, sieves, cups, spoons, funnels, colanders, sugar, buckets, teapots, tubes, plastic boxes, scoops

Links

Three-dimensional Space

Science and Technology

Language

pile, stack, contain, hold, takes up more room, space, takes up the least/most space, size, big, bigger, small, smaller, fit, same, the same as, different, difference, wide, narrow, thick, thin, tall, short, deep, shallow, round, fill, loose, flowing over, even level, level with, enough, not enough, too much, full, half full, nearly full, full to the brim, full to the top, overflow, empty, nearly empty, spill, more, less, pack, pour, will hold more/less, has more, has less

'This container is half full.'

'This container has nothing in it.'

'If it's full to the brim, it spills easily.'

'A grain of rice is so small it hardly takes up any room.'

3.7 Mass

Strand – Measurement

Syllabus Content p 108

MES1.4

Compares the masses of two objects and describes mass using everyday language

Key Ideas

Identify and describe the attribute of mass

Compare the masses of two objects by pushing, pulling or hefting or using an equal arm balance

Record comparisons informally

WM Working Mathematically Outcomes

Questioning	Applying Strategies	Communicating	Reasoning	Reflecting
Asks questions that could be explored using mathematics in relation to Early Stage 1 content	Uses objects, actions, imagery, technology and/or trial and error to explore mathematical problems.	Describes mathematical situations using everyday language, actions, materials and informal recordings	Uses concrete materials and/or pictorial representations to support their conclusions	Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Early Stage 1 content

Knowledge and Skills

Students learn about

- identifying the attribute of mass as the amount of matter in an object
- describing objects in terms of their mass
  eg heavy, light, hard to push, hard to pull
- using comparative language to describe mass
  eg heavier, lighter, heaviest, lightest
- comparing and describing two masses by pushing or pulling
- comparing two masses directly by hefting
  eg 'This toy feels heavier than that one.'
- sorting objects on the basis of their mass
- using an equal arm balance to compare the masses of two objects
- identifying materials that are light or heavy
- using drawings and words to record mass comparisons informally

Working Mathematically

Students learn to

- ask questions about why they can or cannot lift an object (*Questioning*)
- predict which object would be heavier than, lighter than or have about the same mass as another object (*Applying Strategies*)
- give reasons why they think one object will be heavier than another (*Reasoning*)
- check a prediction about the masses of two objects by using an equal arm balance (*Applying Strategies*)
- discuss the action of an equal arm balance when a heavy object is placed in one pan and a lighter object in the other pan (*Communicating*)

Learning Experiences and Assessment Opportunities

Pushing, Pulling and Lifting

Students are encouraged to hold, push, pull, and lift objects, especially those that are of clearly different mass.

Students throw balls of different mass and compare how far they are able to throw them.

Students discuss the idea of splitting a heavy load into several lighter loads, or using a trolley or wheelbarrow to transfer materials.

Free Play with an Equal Arm Balance

In small groups, students are given the opportunity to experiment with an equal arm balance and a variety of materials. Students work with a minimum of direction and record their findings. Students discuss and compare their results and note any findings about balance.

Possible questions include:

- what are the words we use to talk about mass?
- by looking at these two objects, which one do you think is heavier?
- show me how you know which mass is heavier?

WM Mystery Boxes

Students are shown two identical boxes, but one is empty and the other contains objects. Students are asked to describe how the two boxes are the same and how they are different.

Students may attempt to lift the boxes but are told that the boxes are too large to lift safely. Students investigate another way of finding out how heavy the boxes are.

Students are encouraged to pull or push the boxes and asked whether they can tell which box is lighter.

Collectively, students create a list of items that are too heavy to lift and so should be pushed or pulled.

Mystery Bags

Students are each given two opaque shopping bags and are asked to place objects in them so that one bag is heavier than the other. These bags are shared with others to lift and describe.

Possible questions include:

- what words did you use to describe how the bags felt?
- could you work out which bag was heavier by just looking at them?
- what could you use to help you to work out which bag is heavier?

WM Guessing Game

In pairs, students are given an ice-cream container and a collection of objects, each of different mass eg ping-pong ball, lump of plasticine and chalkboard duster.

Student A selects one of the objects and places it in the ice-cream container, and puts the lid on without the other students seeing which object has been chosen.

By handling the container, and without referring to the original group of objects, Student B is asked to determine which object has been placed in the container.

Students should be encouraged to ask each other why they think a particular object is in the container.

WM Hefting

Students use hefting to compare and order two masses.

Students are asked to describe which is heavier and which is lighter. The teacher should include objects that are light or heavy for their size eg feather, beach ball, sinker. Students draw their objects and attach them to a class chart.

Heavier	Lighter

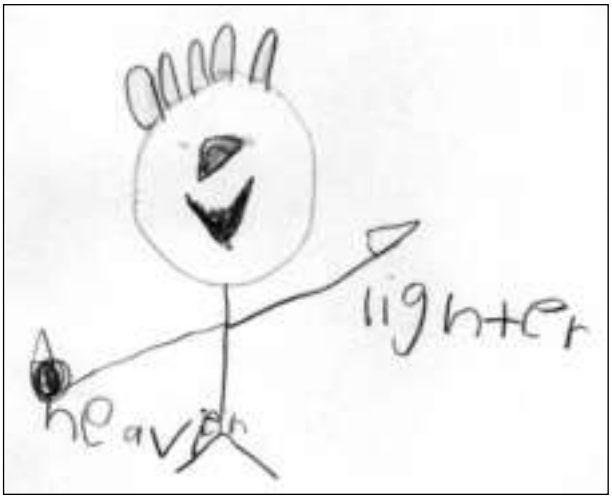
Everyone Can Balance

Students stand with their arms outstretched to simulate an equal arm balance.

The teacher holds an object in each hand and asks students to predict and demonstrate what would happen to their arms if the objects were placed in their hands.

Students are then given the objects to explain their actions and check their predictions.

Students record their results by drawing and labelling a picture. (Adapted from CMIM)



WM Sorting

Students are given a selection of obviously light and obviously heavy objects to sort into groups. A variety of everyday objects can be used eg paper clip, rock, tile, drink bottle. The teacher then discusses with students the reasons for putting objects into different groups.

Variation: As students get better at determining mass they could be given objects which have less obvious variations in weight.

Blindfold

Students take turns to be blindfolded. The teacher or another student places an object or container in each hand of the blindfolded student. The student is asked to state which hand is holding the heavier object or container. Students who are observing are asked to make an estimate of which one is the heavier object, giving reasons for their choice. (Adapted from CMIM)

Twin

Students are each given a bag, and work in small groups to find a partner who has a bag with about the same mass. The teacher prepares bags or invites students to fill the bags, providing them with a choice of objects or materials. Students discuss how they determined their twin and give reasons for their findings. Students record their results. (Adapted from CMIM)

WM Equal Arm Balance and Hefting

Students heft to decide which is the heavier of two objects.

They then predict which pan will drop (and which will rise) when the objects are placed in the balance pans of an equal arm balance.

The objects are then placed in the pans and the students confirm which object is heavier.

Possible questions include:

- why do we measure mass?
- can you draw a picture that shows which object is heavier?

WM Is your Bag Heavier?

Students work in pairs and are seated back to back. The teacher provides each student with a variety of everyday objects of varying weights and sizes, a plastic or paper bag, and a die. Students roll the die and place the corresponding number of objects into their bag. When both students have placed the correct number of objects in their bag they face each other and determine whose bag is heavier by hefting. The student with the heavier bag wins a counter. The activity is repeated until one student wins five counters.

Possible questions include:

- how did you choose which objects to put into your bag?
- how could you change the weight of your bag?
- does the size of the object chosen change the weight of the bag?
- how did you test to see whose bag was heavier?

Variation: Students win a counter for the lighter bag.

Resources

string, telephone book, large cereal boxes, match boxes, bean bags, balls, shot puts, toys, hoops, polystyrene, bricks, rocks, stones, foam, ping-pong balls, washers, macaroni, corks, sand, buckets, students' school bags, equal arm balance, balls of various sizes, boxes of similar sizes, bags

Links

Volume and Capacity

Language

light, heavy, small, large, hard to lift, easy to lift, easy to push, not heavy, not light, equal arm balance, lopsided, as heavy as, lighter than, heavier than, weight, smaller than, larger than, mass, less mass, more mass, greater mass, not as heavy, not as light, harder to push, harder to lift

3.8 Two-dimensional and Three-dimensional Space

Strand – Space and Geometry

Syllabus Content pp 124 & 118

Outcomes

SGES1.1

Manipulates, sorts and represents three-dimensional objects and describes them using everyday language

SGES1.2

Manipulates, sorts and describes representations of two-dimensional shapes using everyday language

Key Ideas

Manipulate and sort three-dimensional objects found in the environment

Describe features of three-dimensional objects using everyday language

Use informal names for three-dimensional objects

Manipulate, sort and describe two-dimensional shapes

Identify and name circles, squares, triangles and rectangles in pictures and the environment, and presented in different orientations

Represent two-dimensional shapes using a variety of materials

Identify and draw straight and curved lines

WM Working Mathematically Outcomes

Questioning	Applying Strategies	Communicating	Reasoning	Reflecting
Asks questions that could be explored using mathematics in relation to Early Stage 1 content	Uses objects, actions, imagery, technology and/or trial and error to explore mathematical problems	Describes mathematical situations using everyday language, actions, materials and informal recordings	Uses concrete materials and/or pictorial representations to support conclusions	Links mathematical ideas and makes connections with, and generalisations about, existing knowledge and understanding in relation to Early Stage 1 content

Knowledge and Skills

Students learn about

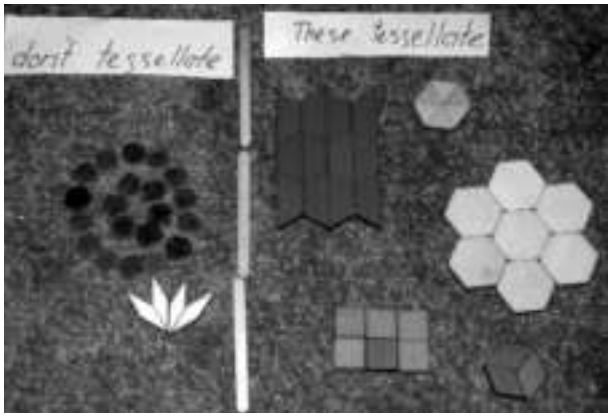
Three-dimensional Space

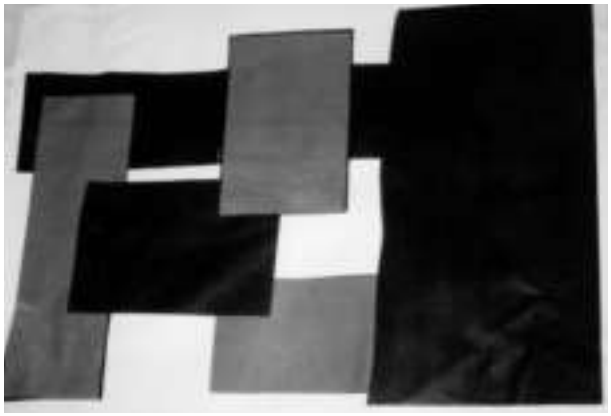
- manipulating and describing a variety of objects found in the environment
- describing the features of common three-dimensional objects using everyday language eg flat, round, curved
- sorting three-dimensional objects and explaining the attribute used eg colour, size, shape, function
- predicting and describing the movement of objects eg 'This will roll because it is round.'
- making models using a variety of three-dimensional objects and describing the models
- recognising and using informal names for three-dimensional objects eg box, ball

Working Mathematically

Students learn to

- manipulate and describe a hidden object using everyday language eg describe an object hidden in a 'mystery bag' (*Applying Strategies, Communicating*)
- use everyday language to describe the sorting of objects (*Communicating*)
- recognise and explain how a group of objects has been sorted eg 'These objects are all pointy.' (*Applying Strategies, Reasoning, Communicating*)
- predict the building and stacking capabilities of three-dimensional objects (*Applying Strategies*)
- use a plank or board to find out which objects roll and which objects slide (*Applying Strategies*)
- describe the difference between three-dimensional objects and two-dimensional shapes using everyday language (*Communicating, Reflecting*)



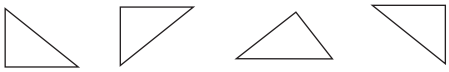


Knowledge and Skills

Students learn about

Two-dimensional Space

- identifying and drawing straight and curved lines
- comparing and describing closed shapes and open lines
- manipulating circles, squares, triangles and rectangles, and describing features using everyday language
- sorting two-dimensional shapes according to features, including size and shape
- identifying, representing and naming circles, squares, triangles and rectangles presented in different orientations eg



- identifying circles, squares, triangles and rectangles in pictures and the environment
- making representations of two-dimensional shapes using a variety of materials, including paints, paper, body movements and computer drawing tools
- drawing a two-dimensional shape by tracing around one face of a three-dimensional object

Working Mathematically

Students learn to

- ask and respond to questions that help identify a particular shape (*Questioning, Communicating*)
- recognise and explain how a group of two-dimensional shapes has been sorted (*Communicating, Reasoning, Applying Strategies*)
- ask and respond to questions that help identify a given shape (*Questioning, Communicating*)
- make pictures and designs using a selection of shapes eg a house from a square and a triangle (*Applying Strategies*)
- create a shape using computer paint, draw and graphics tools (*Applying Strategies*)
- turn two-dimensional shapes to fit into or match a given space (*Applying Strategies*)
- predict the results of putting together or separating two-dimensional shapes (*Applying Strategies*)

Learning Experiences and Assessment Opportunities

WM Free Play (Three-dimensional Space)

In groups, students participate in free play using a wide variety of collectable and commercial materials on a regular basis eg Lego, Duplo, boxes, everyday three-dimensional objects.

Free play sessions may also be used to practise teacher-directed activities.

Possible questions include:

- can you sort the three-dimensional objects?
- can you describe your sorting?
- can you describe the features of each three-dimensional object?

Shape Walk (Two- and Three-dimensional Space)

Students walk around the school and describe the various shapes they see eg 'These leaves look round.'

Students are asked to use drawings to show what they found. These are collated and placed in a class book for others to share.

Tracing Objects (Two- and Three-dimensional Space)

In pairs, students make a design or picture by tracing around the faces of various objects eg make a picture of a robot by tracing a variety of objects.

Students share and describe their pictures and are asked to:

- explain the position of particular shapes
- discuss the ways different students used a particular shape, and
- identify any shape used in different orientations.

Print It (Two- and Three-dimensional Space)

Students select an object from a collection of environmental and commercial materials such as fruit, stones, boxes and pattern blocks.

They are asked to investigate the different parts of the object that can be painted and printed onto paper. Students share and discuss the printed shapes and the ways they were able to create particular shapes.

Variation: The teacher could cut some of the objects and ask the students to predict the shape/s that could be made if the cut surface was printed. Students test their predictions by painting and printing.

Lines (Two-dimensional Space)

Students are given a piece of string and are asked to make a straight line, a curved line or a closed shape. They are asked to describe their line or shape, and draw what they create.

Variation: Students could use computer software to draw a variety of closed shapes and open lines.

WM Making Shape Pictures (Two-dimensional Space)

Students make a picture using different-sized paper shapes, including circles, squares, triangles and rectangles. As students are working, the teacher asks the students to name the shapes they are using.

Students glue their picture onto paper, add additional features, and describe their picture in sentences to be scribed.

Variation: Students could use a computer drawing program to create a shape picture.

Pipe Cleaner Shapes
(Two- and Three-dimensional Space)

Students investigate the shapes or figures that can be made by bending and joining pipe cleaners. Students describe their shape and use drawings to record what they have made. Alternatively, the teacher may take photos.

Variation: Students could use connecting straws or other appropriate material.

Sorting Attribute Blocks (Two-dimensional Space)

Part A

Students are shown a set of attribute blocks and, in turn, are asked to select two of the blocks and state how they are alike and how they are different eg 'These two shapes are both triangles but one is thick and one is thin.'

Part B

The teacher then sorts the attribute blocks into two groups and the students determine how the shapes were sorted.

Part C

In small groups, a student randomly selects one of three cards and displays the card for the others to see.

The group then sorts the attribute blocks according to the feature indicated on the card.

Sorting and Classifying
(Two- and Three- dimensional Space)

The teacher prepares a variety of regular and irregular paper shapes and collects a variety of objects (some with similar features).

Part A

Students are asked to sort the shapes and objects into groups eg rough or smooth, colour, size, shape. Students are asked to explain their grouping.

Students then sort the shapes and objects in a different way. For example, if the students sort them according to their colour the teacher could ask 'If these shapes and objects were all red, how would you sort them?'

Part B

In small groups, students take turns to sort the shapes and objects for others to determine and explain how they have been sorted.

Possible questions include:

- how many different ways can you sort the shapes?
- is this shape a square, a rectangle or a triangle? How do we know?
- how are these shapes (two rectangles) the same or different?
- can you name each shape?

Cutting Up Triangles
(Two-dimensional Space)

The teacher provides copies of several different drawings of large triangles. Each student selects a triangle and cuts it out. They begin cutting off triangles. As students work, they describe the kind of cuts that have been made eg 'I snipped off a corner.'

Possible questions include:

- do you know the name of this shape?
- can you find two triangles that are the same or similar and one very different triangle?
- are all of these shapes triangles? How do you know?

Predicting Movement
(Three-dimensional Space)

Students are asked to sort a collection of objects into those they predict will roll and those that will slide.

Using a variety of materials, students make a device that will help them to test their predictions.

Students explain why some objects roll and some objects slide and reflect on their predictions.

Students use drawings and labels to show how the objects were sorted.

Extension: Students investigate and describe the effect of varying the steepness of a ramp.

WM Drawing and Describing Shapes
(Two-dimensional Space)

Students are asked to draw a particular shape eg a circle.

They are then asked to draw a different shape eg a rectangle.

Possible questions include:

- how did you draw the circle?
- what was different about the way you drew the rectangle?
- can you draw another rectangle that looks different? How is it different?
- are there other shapes that can be drawn using curved/straight lines? Can you draw some?

WM Geoboards (Two-dimensional Space)

Students construct a large triangle on a geoboard, using an elastic band.

Possible questions include:

- how many smaller triangles could you make inside your triangle?
- how many different triangles can you make on your geoboard?
- can you make two triangles that are the same?
- can they fit better if we put them another way?

Students share their responses and describe how each triangle is different.

Variation: This activity could be varied using a square or rectangle.

Shape and Line Hunt (Two-dimensional Space)

The teacher prepares a chart on butchers' paper with columns labelled 'circles', 'squares', 'triangles' and 'rectangles'.

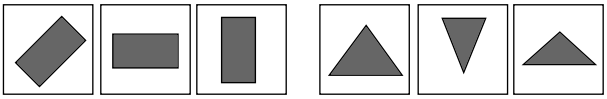
The students are asked to find pictures in magazines that are similar to the shapes, cut them out, and paste them in the correct column.

Students then view the class chart and discuss the pictures and shapes that were found and comment on which shapes were more difficult to find.

Variation: Students are asked to find examples of curved or straight lines in magazines.

WM Shapes in Different Orientations (Two-dimensional Space)

In small groups, students are given a bag, two hoops and two sets of cards (each set representing a particular shape in different orientations).
eg



All cards are shuffled and placed in the bag, and the two hoops are labelled 'Triangles' and 'Rectangles'. Students take turns to randomly select a card from their bag and place it in the appropriate hoop.

Variation: The activity could be varied using different shapes or more than two sets of cards (and hoops).

WM Barrier Shapes (Two-dimensional Space)

In pairs, each student is given an identical set of two-dimensional shapes eg 1 circle, 1 square, 3 triangles, and 2 rectangles.

Student A creates a flat design using the shapes and conceals it. They describe it to Student B who attempts to produce the same design. Students compare designs, swap roles and repeat the activity.

Possible questions include:

- could your partner follow your instructions?
- what shapes did you make and how did you do it?

Resources

geoboards, sponge shapes, elastic bands, pattern blocks, paint, crayons, pencils, chalk, textas, fruit and vegetables, cardboard shapes, plastic shapes, envelopes, leaves, sticks, buttons, fabric, wool, string, ribbon, felt, shells, wrapping paper, newspapers, magazines

Links

Creative and Practical Arts

HSIE

Language

large, larger, small, smaller, curved, straight, round, square, circle, triangle, rectangle, compare, same as, almost the same as, not the same as, sort, match, order, straight, trace, outline, edge, different, pointy

'I tore a big circle out and tore a little circle out for his head.'

'It's a triangle because it goes up to a kind of point.'