# Akapapaanga Manako — Contents

## Foreword

The *Cook Islands Curriculum Framework* (July 2002) establishes the policy for learning and assessment in all Cook Islands schools. The Curriculum Framework acknowledges the importance of Mathematics by designating it as one of the eight essential learning areas, by designating numeracy as an essential skill, and by identifying literacy and numeracy as being so critical for learning that they be taught across the curriculum and that new initiatives be introduced at the junior primary level and in homes and the community.

The goal of education in the Cook Islands includes the building of relevant knowledge, skills, attitudes and values to enable people to put their capabilities to best use in all areas of their lives. The new Mathematics Curriculum exemplifies this goal of relevant learning and relevant application of learning by emphasising the need for programmes to progress beyond computational skills to increased development of problem solving skills. The new curriculum also emphasises numeracy as the foundation skill of Mathematics and provides strong links to the Numeracy Project currently being introduced into Cook Islands schools.

Pursuant to section 37 of the Education Act 1986/87 which delegates authority over the school curriculum to the Secretary of Education, I approve the Cook Islands Mathematics Curriculum (December 2005) as the official curriculum for use in Cook Island schools.

I am appreciative of the work done to develop the Mathematics Curriculum by a wide range of people including teachers, Curriculum Advisory Unit staff, curriculum panel members and community members. In particular I acknowledge the significant contribution made by the Mathematics Adviser, Alison Fagan, who has led the curriculum development in this essential learning area.

*K. S. Matheson*

Ken Matheson

Secretary of Education

# Tuatua Akamataanga — Introduction

Mathematics is a body of knowledge that has been created by humans and which is constantly being refined and increased by ongoing enquiry. It is also a basis for scientific study and an essential tool for everyday life. It has contributed to and is reflected in all cultures of the world. This document divides Mathematics knowledge and learning into 5 strands but there are areas where these overlap and this should be reflected in the teaching program.

Numeracy is the foundation skill of Mathematics and all students need to be numerate in order to function effectively at school, at home and in the community. This document provides a strong link to the strategy and knowledge frameworks of the Numeracy Project which is being introduced into the Cook Islands.

The ability to compute accurately is no longer sufficient in education or the workplace therefore problem-solving skills must be developed in order for students to become successful. Educators have a responsibility to prepare students to meet the challenges of the future which cannot always be anticipated or specifically prepared for. Developing a wide range of problem solving skills and the ability to determine which to use prepares students for complex situations.

Students should be competent and comfortable with the language of Mathematics. Literacy is the other major focus of education and one aspect of this is Mathematical literacy. They should also learn and use the symbols of Mathematics as these will clarify their thinking and ability to communicate Mathematical ideas.

Students should develop the ability to effectively use appropriate technology. This technology can be used as a tool in computation as well as for data display and presentation. There is an expectation by employers that employees will be competent and confident in the use of technology and Mathematics education has a role to play in preparing students for the workforce. The use of technology does not necessarily mean a lack of skills such as computation or graph drawing, but rather ensures accuracy and speed which is highly motivating for students.

Mathematics is one of the essential learning areas as defined in the Cook Islands Curriculum Framework. This document stresses the importance of Mathematics in everyday life and for community involvement. Students should develop an awareness of the relevance of Mathematics to their lives and to value Mathematics.

Tu-tu-a

Tu-tu-a o te rau-anga
ki-a kumi a-nga-rere
Ki-a o mai nga ariki e tini
ki roto i te kau-kura
No te i-na-nga-ro
No te i-na-nga-ro
No te i-na-nga-ro


Pound, Pound, Pound the bark
Expand, lengthen, widen and strengthen
That all may be girded with honour
With love
With love
With love

Pee akamarokuraanga o Aitutaki

# Te Peu Maori i Roto i te Akapapaanga Kura Apii — Culture in the *Cook Islands Curriculum Framework*

The Cook Islands Curriculum reflects the unique nature of the Cook Islands including cultural and spiritual beliefs and values.

*The school curriculum will acknowledge and value the special place that is the Cook Islands, and will give students the opportunity to learn about Cook Islands culture and language. It will ensure that Cook Islands cultural traditions, spiritual beliefs, histories and events are recognised and respected.*

*Cook Islands Curriculum Framework*, p. 5.

Traditional methods of measurement were used by fishermen to find out at what depth the fish were and to communicate this to others. Measurement was and still is important for determining land boundaries.

Geometry has many uses in tivaevae making and other art forms. Rotational and reflectional symmetry are used in the design of tivaevae and for cutting out the patterns.

Symmetry also plays an important role in carving and other artworks.

Children use Mathematics in games such as teki miti where counting the score was important, and for ipanapana where measurement was used to determine the winner.

# Aims of the Curriculum

Mathematics education aims to prepare all students in the Cook Islands to become numerate members of society. They will be able to interpret information from the world around them and also be better able to contribute to the socio-economic future of their society.

The aim of Mathematics Education in the Cook Islands is to assist students to learn Mathematics by:

◆ acquiring the relevant Mathematical skills and attitudes necessary to function as a member of society;

◆ developing their number sense;

◆ developing a range of strategies to solve problems;

◆ understanding the vocabulary of Mathematics;

◆ developing an understanding of the concepts of Number, Measurement, Geometry, Algebra, Statistics and Probability and the inter-relationship between them;

◆ learning processing skills;

◆ using technology appropriately;

◆ communicating their understanding of Mathematics.

# Te Au Enu — The Strands

The *Cook Islands Mathematics Curriculum* has five (5) content Strands and one (1) Process Strand.

The 5 content strands are:

- *Numero*        Number
- *Vaitoanga*        Measurement
- *Tiomitiri*        Geometry
- *Aratipara*        Algebra
- *Tatakitika*        Statistics and Probability

These will often be taught separately, although it is possible and even desirable to develop units of work that use more than one strand. The learning of Number should have the highest priority especially in the junior classes. The other strands should provide opportunities to develop contexts to reinforce Number concepts.

The Processes Strand incorporates 3 aspects:

- Problem Solving,
- Logic and Reasoning
- Communicating Mathematical Ideas

This strand is interwoven through the other 5 strands as shown below.
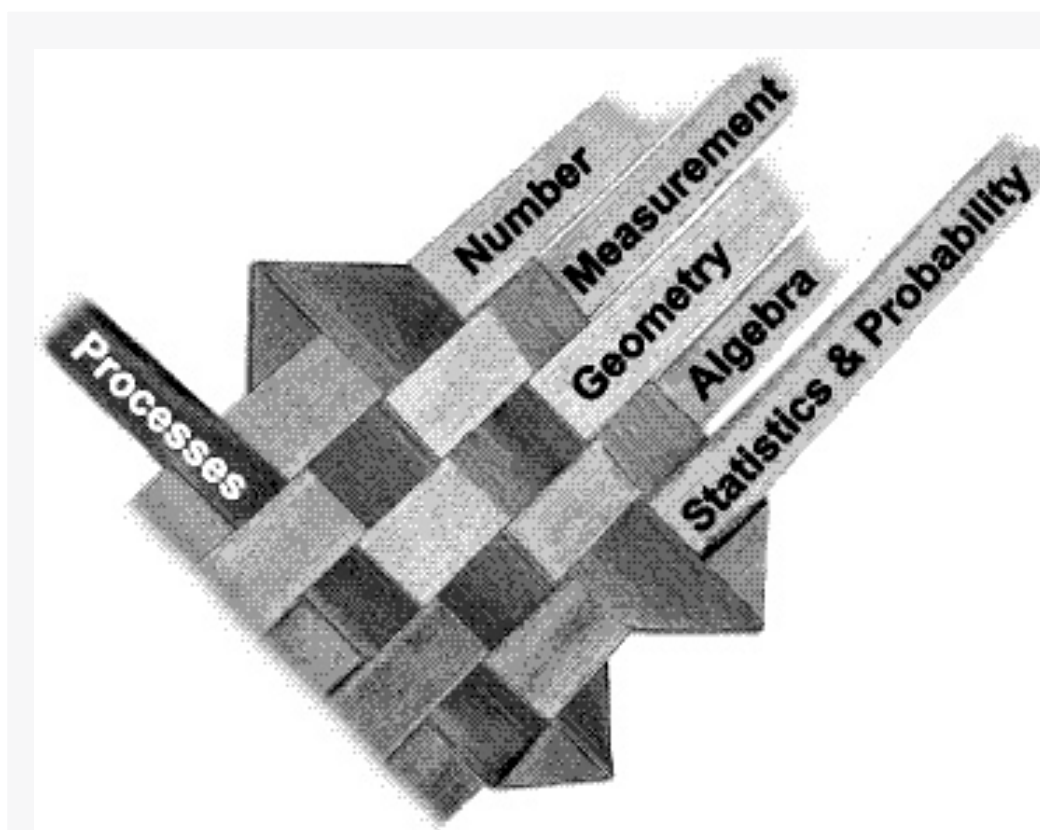
# Matematika i te au ra roarai

# Revera o te Au Koronga Aruaruia — Levels of Achievement Objectives

There are eight (8) levels of achievement identified in the *Cook Islands Curriculum Framework*. These levels are intended to help teachers identify and track a student's progress throughout their schooling. By knowing at which levels the students in their class are working a teacher will be better informed on planning to meet the needs for all the students in their class.

This document only covers achievement objectives to level 5 because from year 11 onwards students in the Cook Islands will be assessed for the New Zealand National Certificate of Educational Achievement (NCEA). Teachers of these students will use the current New Zealand Mathematics Curriculum as the basis for their planning.

Students may operate at different levels for different strands or at different levels between the achievement objectives within a strand. In any particular class there will therefore be students working at different levels and teachers will need to plan accordingly.

The following diagram shows the approximate comparison between the eight levels of achievement and the class or year bands. These are intended as an indication only and students will progress at different rates.
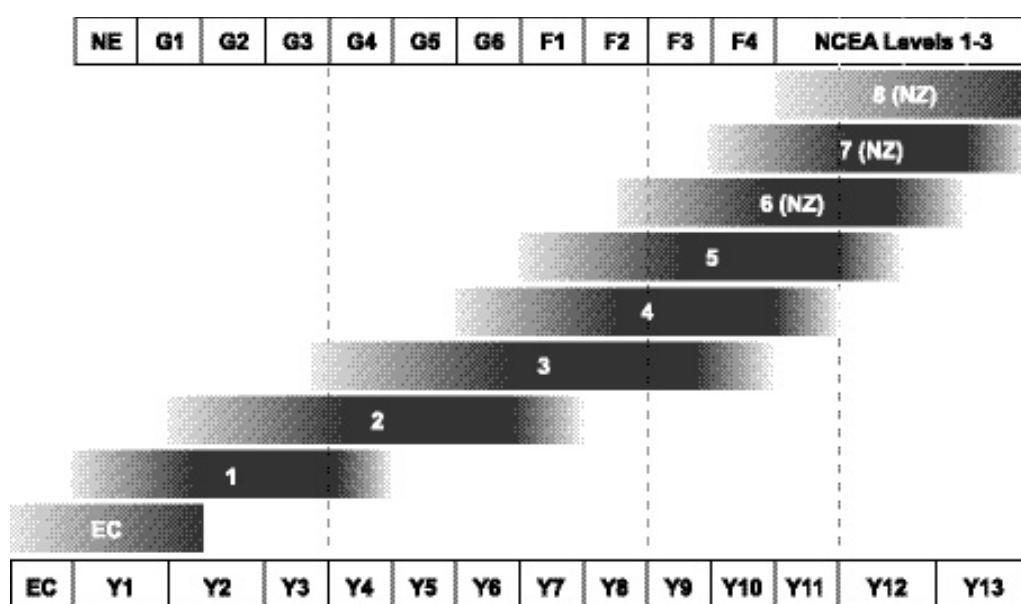


The following pages provide information on each Strand. The General Aims for each Strand are introduced followed by the specific Achievement Objectives for that Strand. Learning Outcomes are provided and these are separated into lower and upper levels to give a sequential flow of learning. These will be coded in the Teachers Guide to make their use in planning and assessment easier.

# Numero — Number

## Puapinga — Achievement Aims

The student will:

◆ Understand numbers, what they represent and the relationships between them.
◆ Use appropriate strategies for calculations and by using estimation have an awareness of the reasonableness of their results.

Students should develop the ability to take numbers apart and put them together again in appropriate ways. They also need to be able to represent numbers in different ways and to know important benchmark numbers such as 10s, 100s. For example:

*skip-counting by 10s gives 10, 20, 30, 40…*

Students cannot appreciate numbers unless they also understand the operations to be used on those numbers. They need to know what effect the various operations will have on different types of numbers. For example:

*dividing by a fraction less than one gives a larger number, 3 divided by a half is six.*

The amount of time that students spend on the Number strand will decrease as they progress through the grades. In their early years Number should be the dominant strand with decreasing importance as students move up the levels of the curriculum.

# Numero — Number

| Aims | Achievement Objectives | | | | |
|---|---|---|---|---|---|
| | **Level 1** | **Level 2** | **Level 3** | **Level 4** | **Level 5** |
| **Understand numbers, what they represent and the relationships between them** | 1. Identify, write, order, and connect number words and numerals up to 50, count with understanding and know the numbers before and after them.<br><br>2. Form a set of objects using an appropriate counting strategy.<br><br>3. Read the symbols for a half and a quarter and demonstrate their understanding of this using a shape or set of objects. | 1. Identify, write, order and connect number words and numerals up to 4 digit numerals, count with understanding and know the numbers before and after them.<br><br>2. Use appropriate skip counting techniques to count and compare sets.<br><br>3. Identify, read and order simple unit fractions and be able to use them to find the fraction of a shape or set of objects. | 1. Understand the place value structure of our number system and be able to represent and compare whole numbers, fractions, decimals and percentages.<br><br>2. Round numbers sensibly. | 1. Compare and order fractions, decimals and percents, and convert between them.<br><br>2. Round numbers appropriately.<br><br>3. Develop an understanding of integers. | 1. Use ratios and proportions to represent quantitative relationships.<br><br>2. Use the properties of place value to express numbers appropriately. |
| **Use appropriate strategies for calculations and have an awareness of the reasonableness of their results** | 4. Use appropriate counting strategies to solve simple addition/ subtraction problems.<br><br>5. Understand the effects of adding and subtracting. | 4. Use advanced counting or early additive strate-gies to solve addition/ subtraction, and multiplication/division problems.<br><br>5. Understand the effects of multiplying and dividing whole numbers. | 3. Use appropriate strategies to solve whole number problems.<br><br>4. Use appropriate strategies to solve simple problems involving fractions, decimals and percentages in familiar situations.<br><br>5. Understand the effect of operations on numbers. | 4. Use integers, BEDMAS and the properties of indices to evaluate expressions.<br><br>5. Find the fraction, decimal and percentage of a quantity. | 3. Solve problems involving ratios and proportions.<br><br>4. Increase or decrease a quantity by a percentage, decimal or fraction.<br><br>5. Estimate the results of computations. |

# Level 1  Numero — Number

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

**1. Identify, write, order, and connect number words and numerals up to 50, count with understanding and know the numbers before and after them**

| LOWER | UPPER |
|---|---|
| 1. Identify all of the numerals in the range 0 - 20. | 1. Identify the numerals in the range 0 - 50. |
| 2. Write the numerals in the range 0 - 20. | 2. Write the numerals in the range 0 - 50. |
| 3. Order numbers in the range 0 - 20. | 3. Order numbers in the range 0 - 50. |
| 4. Say the number before or after a given number in the range 0 - 20. | 4. Name the number before or after a given number in the range 0 - 50. |
| 5. Say the forwards and backwards number word sequences in the range 0 - 20 with understanding. | 5. Say the forwards and backwards number word sequences in the range 0 - 50 with understanding. |

**2. Form a set of objects using an appropriate counting strategy**

| LOWER | UPPER |
|---|---|
| 1. Use one to one counting to form a set of up to 20 objects. | 1. Use any counting strategy to form a set of up to 50 objects. |
| 2. Count a set of up to 20 objects. | 2. Count a set of up to 50 objects. |
| 3. Know groupings within 5. | 3. Know groupings with 5. |

**3. Read the symbols for a half and a quarter and demonstrate their understanding of this using a shape or set of objects**

| LOWER | UPPER |
|---|---|
| 1. Recognise the symbols for half and quarter. | 1. Recognise and write the symbols for half and quarter. |
| 2. Find halves and quarters of a set of objects of up to 20 objects by equal sharing. | 2. Find halves and quarters of a set of objects to 50 using materials. |
| 3. Find halves and quarters of a shape by folding or drawing. | 3. Find halves or quarters of a shape. |

**4. Use appropriate counting strategies to solve simple addition/ subtraction problems**

| LOWER | UPPER |
|---|---|
| 1. Solve simple addition problems to 20 by counting all the objects. | 1. Solve simple addition problems to 50 by counting all the objects in their head (by imaging). |
| 2. Solve simple subtraction problems from 20 by counting all the objects. | 2. Solve simple subtraction problems from 50 by counting all the objects in their head (by imaging) |
|  | 3. Use skip counting to solve simple multiplication problem (2,5,10} |

**5. Understand the effects of adding and subtracting**

| LOWER | UPPER |
|---|---|
| 1. Know that adding whole numbers increases a value. | 1. Understand that subtraction is the opposite process to addition. |
| 2. Know that subtracting whole numbers decreases a value. | 2. Show that subtraction can be done by "counting on". |
| 3. Use materials or pictures to illustrate simple addition or subtraction problems. | 3. Use a word problem to illustrate simple addition and subtraction problems. |
|  | 4. Understand that skip counting is the same as multiplication (2,5,10}. |

## Level 2  Numero — Number

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

**1. Identify, write, order and connect number words and numerals up to 4 digit numerals, count with understanding and know the numbers before and after them**

| LOWER | UPPER |
|---|---|
| 1. Identify all of the numerals in the range 0 - 100. | 1. Identify the numerals in the range 0 - 1000. |
| 2. Write the numerals in the range 0 - 100. | 2. Write the numerals in the range 0 - 1000. |
| 3. Order numbers in the range 0 - 100. | 3. Order numbers in the range 0 -1000. |
| 4. Name the number before or after a given number in the range 0 - 100. | 4. Write a numeral up to 1000 in words. |
| 5. Say the forwards and backwards number word sequence in the range 0 - 100 with understanding. | 5. Say the number 1, or 10 more or less than a given number up to 1000. |
| 6. Write a numeral up to 100 in words. | |

**2. Use appropriate skip counting techniques to count and compare sets**

| LOWER | UPPER |
|---|---|
| 1. Count a set of objects by skip counting in 2s or 5s. | 1. Count a set of objects by any appropriate skip counting strategy. |
| 2. Compare the size of sets of even objects. | 2. Compare the size of sets of objects that they have counted. |
| 3. Know groupings within 10. | 3. Know groupings with 10. |

**3. Identify, read and order simple unit fractions and be able to use them to find the fraction of a shape or set of objects**

| LOWER | UPPER |
|---|---|
| 1. Identify the symbols for $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$ . | 1. Identify any unit fraction with denominator <10. |
| 2. Find $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$ of a set of objects using materials. | 2. Find the $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$ of a set of objects with or without materials using additive strategies. |
| 3. Order the unit fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$. | 3. Order any unit fraction. |
| 4. Find the fraction of a shape by folding or cutting. | 4. Identify the fraction that a shape has been divided into. |
| | 5. Find the fraction (>1) of a shape. |
| | 6. Identify fractions 0 - 1 on a number line. |

**4. Use advanced counting or early additive strategies to solve addition/ subtraction, and multiplication/division problems**

| LOWER | UPPER |
|---|---|
| 1. Solve addition problems by counting on from the larger number. | 1. Solve addition or subtraction problems using part-whole strategies such as<br>- Doubling<br>- Using tidy numbers. |
| 2. Solve subtraction problems by counting on. | 2. Solve multiplication/division problems using part-whole strategies such as<br>- Doubling<br>- Using tidy numbers. |
| 3. Solve simple multiplication/division problems by skip counting. | |

**5. Understand the effects of multiplying and dividing whole numbers**

| LOWER | UPPER |
|---|---|
| 1. Develop an understanding of the patterns in multiplication. | 1. Understand that division is the opposite process to multiplication. |
| 2. Use word problems to illustrate the concept of multiplying numbers. | 2. Use word problems to illustrate the effect of multiplying and dividing numbers. |

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## Level 3  Numero — Number

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

**1. Understand the place value structure of our number system and be able to represent & compare whole numbers, fractions, decimals and percentages**

| | |
|---|---|
| 1. Say the number 1, 10, or 100 more or less than a given number up to 1000. | 1. Say the number 1, 10, 100 or 1000 more or less than a given number up to 1,000,000. |
| 2. State how many 10s or 100s there are in a number up to 1000. | 2. State how many 10s, 100s or 1000s there are in a number up to 1 000 000. |
| 3. Order numbers with 1 decimal place. | 3. Order numbers with two decimal places. |
| 4. Explain the effect of the denominator on the value of a fraction. | 4. State how many tenths or hundredths there are in a number. |
| 5. Simplify fractions. | 5. Order non-unit fractions. |
| 6. Identify decimals 0-1 on a number line. | 6. Find equivalent fractions. |
| 7. Identify any fraction (including > 1) on a number line. | 7. Identify decimals on a number line. |

**2. Round numbers sensibly**

| | |
|---|---|
| 1. Round a number to the nearest 10 or 100. | 1. Round numbers to one significant figures. |

**3. Use appropriate strategies to solve whole number problems**

| | |
|---|---|
| 1. Solve addition and subtraction problems using<br>- Compensation<br>- Place value<br>- Compatible numbers<br>- Reversibility<br>- Equal additions<br>- Decomposition.<br>2. Solve multiplication and division problems using<br>- Doubling and halving<br>- Reversing<br>- Using tidy numbers. | 1. Use empty number lines to solve addition or subtraction problems.<br>2. Choose from a range of strategies to solve whole number problems.<br>3. Use pen and paper and an appropriate algorithm to solve problems involving larger or untidy numbers. |

**4. Use appropriate strategies to solve simple problems involving fractions, decimals and percentages in familiar situations**

| | |
|---|---|
| 1. Find the fraction (0 - 1) of a quantity using a fraction line. | 1. Find any fraction of a quantity using a fraction line. |
| 2. Find the decimal (0 - 1) of a quantity using a decimal line. | 2. Find any decimal of a quantity using a decimal line. |
| 3. Find the percentage (0 - 100) of a quantity using a percentage line. | 3. Find any percentage of a quantity using percentage line. |
| | 4, Add and subtract fractions with the same denominator |

**5. Understand the effect of operations on numbers**

| | |
|---|---|
| 1. Use an integer number line to evaluate adding or subtracting positive integers. | 1. Use an integer number line to evaluate adding or subtracting positive and negative integers. |

## Level 4  Numero — Number

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

**1.  Compare and order fractions, decimals, and percents, and convert between them**

| | |
|---|---|
| 1. Order decimals to 3 decimal places<br><br>2. Convert from<br>   - Fractions to decimals<br>   - Fractions to percentages<br>   - Percentages to decimals. | 1. Convert from<br>   - Decimals to fractions<br>   - Decimals to percentages<br>   - Percentages to fractions. |

**2.  Round numbers appropriately**

| | |
|---|---|
| 1. Round numbers using a given number of significant figures.<br><br>2. Know the groupings of 10s, 100s and 1000s in numbers up to 10,000. | 1. Round numbers using a given number of decimal places.<br><br>2. Know the groupings of 10s, 100s and 1000s in numbers up to 1,000,000. |

**3.  Develop an understanding of integers**

| | |
|---|---|
| 1. Interpret word problems as integer problems.<br><br>2. Determine factors and multiples of numbers. | 1. Use real world situations to model integer problems.<br><br>2. Determine if a number is prime or non-prime. |

**4.  Use integers, BEDMAS and the properties of indices to evaluate expressions**

| | |
|---|---|
| 1. Use positive integers in addition, subtraction, multiplication and division problems.<br><br>2. Use addition, subtraction, multiplication in the appropriate order to solve problems.<br><br>3. Solve simple indices problems.<br><br>4. Solve integer problems involving multiplication of integers.<br><br>5. Evaluiate fractions, decimals and percentages. | 1. Use positive and negative integers in addition, subtraction, multiplication and division problems.<br><br>2. Use addition, subtraction, division, multiplication, exponents and brackets in the appropriate order to solve problems.<br><br>3. Use the properties of indices to simplify expressions.<br><br>4. Solve indices problems.<br><br>5. Solve integer problems involving division of integers.<br><br>6. Know square numbers to 100 and their roots. |

**5.  Evaluate fractions, decimals and percentages**

| | |
|---|---|
| 1. Calculate the fraction (0 - 1) of a given quantity.<br><br>2. Calculate the percentage (0 - 100%) of a given quantity.<br><br>3. Calculate the decimal (0 - 1) of a given quantity.<br><br>4. Perform operations on fractions, decimals and percentages. | 1. Calculate any fraction of a quantity.<br><br>2. Calculate any percentage of a quantity.<br><br>3. Calculate any decimal of a quantity. |

## Level 5  Numero — Number

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

**1.  Use ratios and proportions to represent quantitative relationships**

| LOWER | UPPER |
|---|---|
| 1. Express ratios in their simplest form.<br>2. Solve problems using ratios. | 1. Rewrite a word problem as a ratio. |

**2.  Use the properties of place value to express numbers appropriately**

| LOWER | UPPER |
|---|---|
| 1. Convert from decimal form to standard form. | 1. Convert to and from standard form.<br>2. Develop an understanding of limits of accuracy.<br>3. Round a number to an appropriate degree of accuracy. |

**3.  Solve problems involving ratios and proportions**

| LOWER | UPPER |
|---|---|
| 1. Share quantities in a given ratio.<br>2. Calculate a quantity in a ratio problem. | 1. Compare ratios to determine relativity. |

**4.  Increase or decrease a quantity by a percentage, decimal or fraction**

| LOWER | UPPER |
|---|---|
| 1. Increase or decrease a value by a percentage.<br>2. Increase or decrease a value by a decimal.<br>3. Increase or decrease a value by a fraction. | 1. Find the original value before a percentage increase, eg VAT or decrease.<br>2. Find the original value before a decimal increase or decrease.<br>3. Find the original value before a fractional increase or decrease. |

**5.  Estimate the results of computations**

| LOWER | UPPER |
|---|---|
| 1. Estimate the results of calculations by using "number sense" etc. | |

# Vaitoanga — Measurement

## Puapinga — Achievement Aims

The student will:

◆ Use appropriate equipment to take measurements and perform calculations when required.

◆ Have an understanding of different systems of measurement.

Measurement is the process whereby a numerical value is given to the physical attribute of an object for example its length or weight. This can commence with non-formal instruments such as parts of the body and progress to choosing and using the most appropriate equipment. For example:

*students can use hand spans to measure table widths.*

Students should experience a wide range of practical activities in their study of measurement. They should also use a range of equipment, scales etc. to take measurements. This strand provides many opportunities for extended investigations of interest to students. For example:

*students could plan a playground or calculate the cost of reflooring their classroom.*
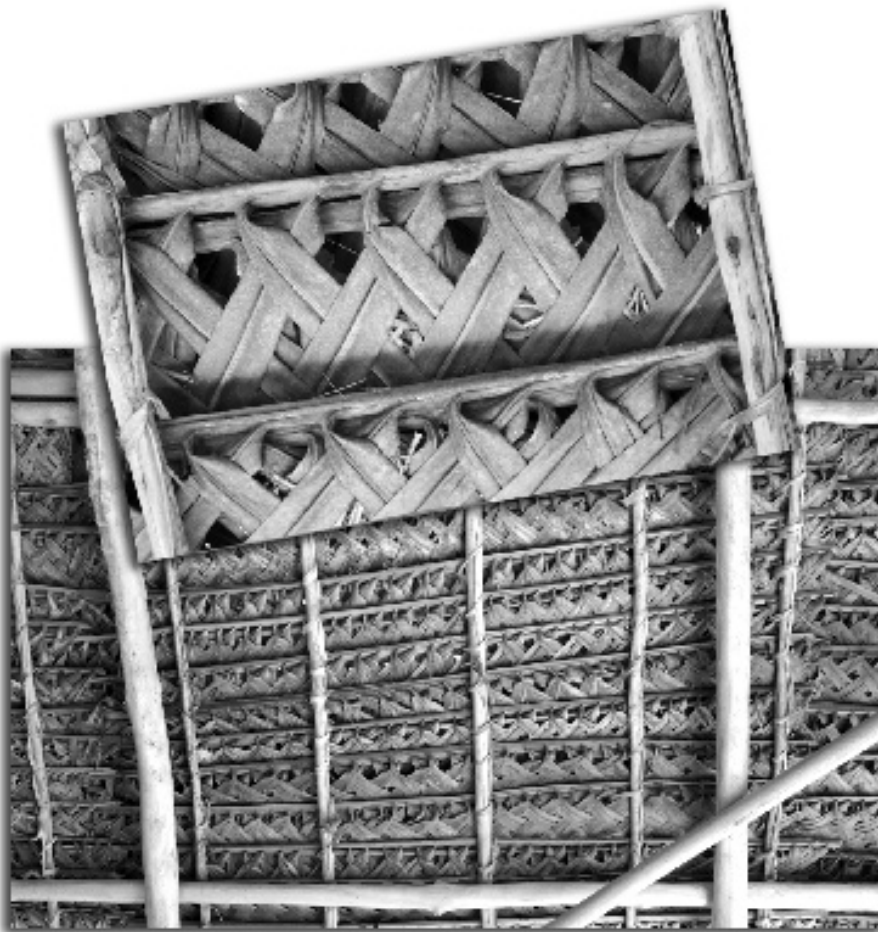
| Vaitoanga — Measurement | | | | | |
|---|---|---|---|---|---|
| **Aims** | **Achievement Objectives** | | | | |
| | **Level 1** | **Level 2** | **Level 3** | **Level 4** | **Level 5** |
| **Use appropriate equipment to take measurements and perform calculations when required** | 1. Measure objects using appropriate standard or non standard units.<br><br>2. Compare and order the lengths, masses and volumes of objects. | 1. Use appropriate equipment and metric units to measure length, mass and volume. | 1. Estimate and measure length, mass, volume and time.<br><br>2. Perform simple conversions of units.<br><br>3. Estimate and calculate the area and perimeter of simple shapes. | 1. Use standard and non-standard scales.<br><br>2. Convert between units of measurement.<br><br>3. Calculate the area, perimeter and volume of complex shapes. | 1. Use a suitable model to carry out a practical measuring task.<br><br>2. Convert between units of area and volume.<br><br>3. Develop an understanding of the limits of accuracy of an answer. |
| **Have an understanding of different systems of measurement** | 3. Read prices and know the value of monetary units.<br><br>4. Use and understand simple units of time. | 2. Use money in practical situations.<br><br>3. Read and know the units of time. | 4. Convert between analogue and digital time.<br><br>5. Understand the relationship between time and simple rates. | 4. Perform simple calculations involving time.<br><br>5. Interpret and use a variety of tables.<br><br>6. Understand and use graphs of qualitative data. | 4. Solve problems using decimal time notation.<br><br>5. Interpret and use rate information presented in different ways. |

## Level 1  Vaitoanga — Measurement

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

**1.  Measure objects using appropriate non standard units**

| | |
|---|---|
| 1. Measure lengths by counting non standard units using body measurements, for example hand spans, feet. | 1. Measure length, mass & volume using non body measurements, for example string, books, cups. |

**2.  Compare and order the lengths, masses and volumes of objects**

| | |
|---|---|
| 1. Compare lengths using appropriate units and language, for example wider, narrower, shorter, longer. | 1. Compare mass and volume using appropriate units and language, for example heavier, lighter, bigger, smaller. |

**3.  Read prices and know the value of monetary units**

| | |
|---|---|
| 1. Identify coins used in the Cook Islands. <br> 2. Know the comparative value of coins used. | 1. Know the value of coins & notes up to $20. <br> 2. Read straight forward prices. <br> 3. Know the value of common items, for example packet of chips, can of drink. |

**4.  Use and understand simple units of time**

| | |
|---|---|
| 1. Describe time using everyday language, for example bed time, lunch time, home time, days of the week and before and after. | 1. Read clock times (to hours & half hours). |
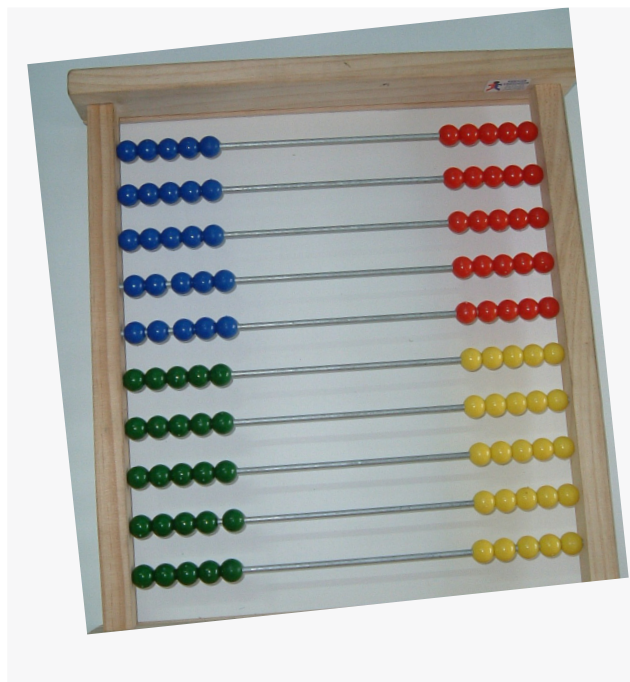
## Level 2  Vaitoanga — Measurement

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|
| **1. Use appropriate equipment and metric units to measure length, mass and volume** | |
| 1. Use rulers to find the length of objects and record in cm or m.<br>2. Use simple scales to find the mass of objects. | 1. Use rulers and other equipment to find the length of objects and record in mm, cm, and m.<br>2. Use measuring equipment and water to find the volume of objects and record in ml and l.<br>3. Use scales to investigate the different masses of similarly sized objects and record using g and kg. |
| **2. Use money in practical situations** | |
| 1. Use notes & coins to "purchase" objects.<br>2. Use different combinations of coins and notes to make an amount. | 1. Use notes and coins to model transactions up to $100 and giving change.<br>2. Find the total cost of up to 3 items. |
| **3. Read and know the units of time** | |
| 1. Be able to read digital time.<br>2. Be able to read the hours, half hours & quarter hours of analogue time.<br>3. Know the hours of the day, seasons and months of the year. | 1. Be able to read analogue time.<br>2. Be able to convert between seconds & minutes and between hours and minutes.<br>3. Be able to convert between days, weeks and months in a year.<br>4. Understand the effect of the earth and moon's movements on time (seasons, time zones, tides, day length). |

## Level 3  Vaitoanga — Measurement

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

### 1.  Estimate and measure length, mass, volume, time and temperature

| LOWER | UPPER |
|---|---|
| 1. Read and record length, mass, temperature, time & capacity.<br>2. Choose & use appropriate equipment to measure length.<br>3. Estimate length using appropriate units. | 1. Choose & use appropriate equipment to measure mass, volume, time & temperature.<br>2. Estimate mass, volume, time & temperature. |

### 2.  Perform simple conversions of units

| LOWER | UPPER |
|---|---|
| 1. Convert cm to mm, m to cm and km to m. | 1. Convert kg to g.<br>2. Convert l to ml. |

### 3.  Estimate and calculate the perimeter and area of simple shapes

| LOWER | UPPER |
|---|---|
| 1. Estimate perimeter and area using non standard units.<br>2. Calculate the perimeter & area of simple shapes (rectangles). | 1. Calculate the perimeter of triangles and quadrilaterals.<br>2. Calculate the area of triangles. |

### 4.  Understand the relationship between time and simple rates

| LOWER | UPPER |
|---|---|
| 1. Investigate the effect of different flows on filling containers.<br>2. Estimate time taken to fill up different shaped containers. | 1. Measure rates of change e.g. Pulse rate.<br>2. Investigate tides, walking & running speeds. |

### 5.  Convert between analogue and digital time

| LOWER | UPPER |
|---|---|
| 1. Show analogue time as digital time and vice versa. | 1. Read 24 hour time. |

## Level 4  Vaitoanga — Measurement

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|
| **1. Use standard and non-standard scales** | |
| 1. Carry out measuring tasks involving reading scales to the nearest graduation, for example 1s, 2s, 0.1s. | 1. Carry out measuring tasks involving reading scales to the nearest graduation, for example 0.5s, 0.25s, 0.2s. |
| **2. Convert between units of measurement** | |
| 1. Convert distance units i.e. mm to m, mm to cm, cm to m, and m to km. | 1. Convert weight units from mg to kg and g to kg. |
| | 2. Convert volume units from ml to l. |
| | 3. Understand the relationship between mls and $cm^3$. |
| **3. Calculate the perimeter, area and volume of complex shapes with appropriate units** | |
| 1. Calculate the perimeter and area of rectangles, triangles, parallelograms and trapeziums. | 1. Find an approximate value for pi. |
| 2. Calculate the volume of cuboids. | 2. Calculate the perimeter and area of circles & composite shapes. |
| 3. Express answers in appropriate units, for example $mm^2$, $cm^2$, $m^2$, ha, $cm^3$, $m^3$. | 3. Calculate the volume of prisms and pyramids. |
| **4. Interpret and use a variety of tables** | |
| 1. Read & interpret a variety of timetables, charts and maps. | 1. Construct a suitable timetable, for example a sports day, the ideal school day, an umukai. |
| **5. Perform simple calculations involving time, rates and change** | |
| 1. Perform calculations using analogue, digital and 24 hour time. | 1. Calculate speed, distance and time. |
| 2. Understand time zones. | 2. Interpret distance/time graphs. |
| | 3. Interpret rates of change using different shaped containers. |
| **6. Understand and use graphs of qualitative data** | |
| 1. Interpret a graph of qualitative data. | 1. Design and use a simple scale to measure qualitative data. |

# Level 5  Vaitoanga — Measurement

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

## 1.  Use a suitable model to carry out a practical measuring task

1. Solve contextual problems which involve irregular and composite shapes by using a suitable model.
2. Explain the limitations and advantages of the model used.

## 2.  Convert between units of area and volume

1. Convert between mm², cm², m², km² & ha for area and between mm³, cm³ & m³ for volume.

## 3.  Develop an understanding of the limits of accuracy of an answer

1. Understand the limits of accuracy for length, area and volume.

## 4.  Solve problems using decimal time notation

1. Convert decimal time to hours and minutes.
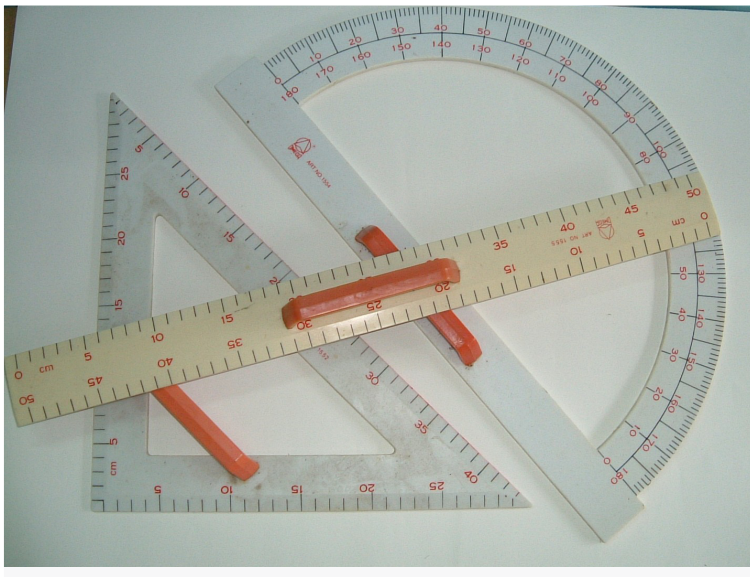
# Tiomitiri — Geometry

## Puapinga — Achievement Aims

The student will:

◆ Understand the two and three-dimensional properties of geometrical objects and appreciate their relevance in the environment.

◆ Recognise the symmetries of geometrical and everyday objects.

◆ Develop a range of spatial abilities.

Geometry allows students to represent, describe, and make sense of the world in which they live. This world is three-dimensional and to appreciate it students need to develop an understanding of space. Success in Mathematics is closely related to the development of spatial abilities.

Spatial abilities include making and interpreting drawings, visualising objects and interpreting changes in their environment. For example,

*students could draw different views of the school playground and interpret them.*

Classification of objects in geometry is a skill that can be applied to other strands of Mathematics and other curricular areas.

The manipulation of equipment required to draw or construct geometrical objects allows for the development of fine motor skills. For example:

*students' use of rulers, compasses etc should be encouraged.*
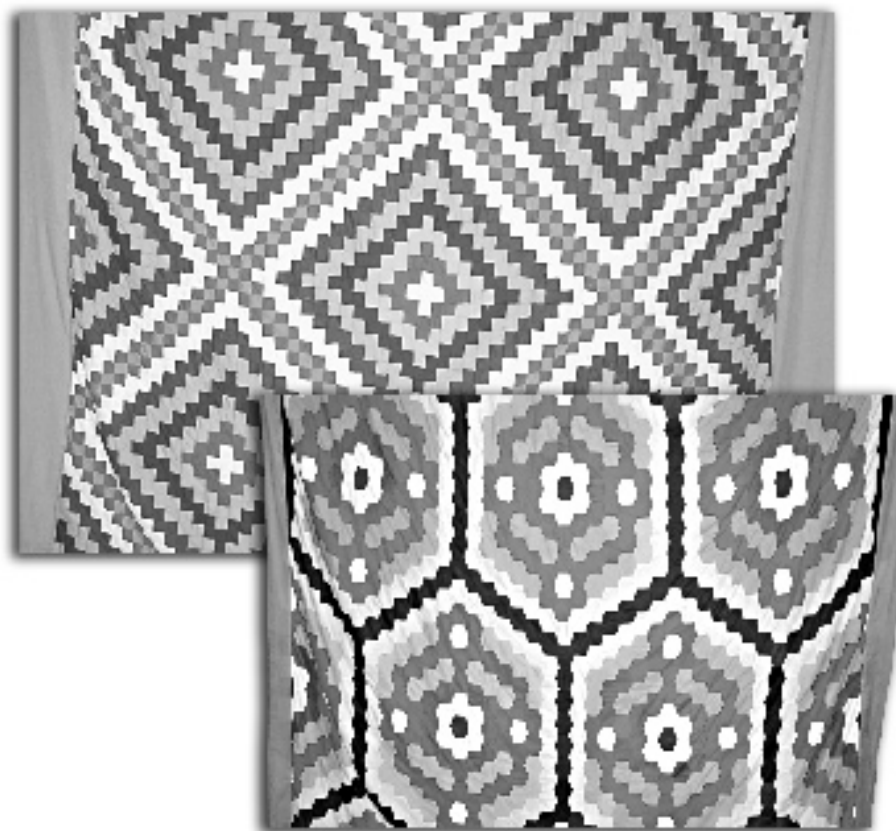
# Tiomitiri — Geometry

| Aims | Achievement Objectives | | | | |
|---|---|---|---|---|---|
| | **Level 1** | **Level 2** | **Level 3** | **Level 4** | **Level 5** |
| **Understand the two and three-dimensional properties of geometrical objects and appreciate their relevance in the environment** | 1. Identify, describe and classify simple shapes. | 1. Use geometrical terms or properties to describe and classify shapes.<br>2. Understand the 3 dimensional nature of objects. | 1. Use geometrical terms or properties to classify or evaluate 2 or 3 dimensional objects.<br>2. Draw/make and interpret simple 3 dimensional objects. | 1. Construct geometrical shapes using appropriate techniques.<br>2. Draw/ make and interpret 3 dimensional objects. | 1. Use the angle and symmetry properties of parallel lines, circles and polygons to find unknown angles and provide their reasoning.<br>2. Use trigonometry and/or Pythagoras' theorem to find unknown sides/angles in right angled triangles. |
| **Recognise the symmetries of geometrical and everyday objects** | 2. Use rotation and translation of shapes to create patterns. | 3. Use rotation, reflection or translation of shapes or designs to create patterns and be able to describe their symmetry(ies). | 3. Use a combination of rotation, reflection, enlargement or translation of shapes or designs and be able to identify the resulting symmetry(ies). | 3. Identify the invariant properties of transformations.<br>4. Enlarge or reduce a shape or object. | |
| **Develop a range of spatial abilities** | 3. Use positional language to locate objects.<br>4. Rotate themselves and objects through half and quarter turns. | 4. Use direction and distance to describe position. | 4. Draw and interpret simple scale maps. | 5. Use grid references or bearings to describe location. | |

## Level 1  Tiomitiri — Geometry

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

### 1. Identify, describe and classify simple shapes

| | |
|---|---|
| 1. Name circles, squares and triangles. | 1. Name circles, squares triangles, pentagons, hexagons, and ovals. |
| 2. Sort shapes into circles, squares and triangles. | 2. Sort shapes into circles, squares, triangles, pentagons and hexagons. |
| 3. Use the words straight and curved to describe shapes. | 3. Use the words straight, curved and pointed to describe shapes. |

### 2. Use rotation and translation of shapes to create patterns

| | |
|---|---|
| 1. Use a simple shape template and translation to make a pattern. | 1. Make a template of a shape and use translation and/or rotation to create a pattern. |
| 2. Describe the pattern they have created. | |

### 3. Use positional language to locate objects

| | |
|---|---|
| 1. Use the words on, above, under and between to describe the relative position of objects. | 1. Use the words behind, in front of, outside and inside to describe the relative position of objects. |
| 2. Place familiar objects on, above, under and between other objects. | 2. Place familiar objects behind, in front of, outside and inside other objects. |
| 3. Follow part of a sequence of instructions relative to their position. | 3. Follow a sequence of instructions relating to position and movement. |

### 4. Rotate themselves or objects through half and quarter turns

| | |
|---|---|
| 1. Rotate themselves through half a turn. | 1. Rotate themselves through a half or quarter turn and describe their change in view. |
| 2. Rotate an object through half a turn. | 2. Rotate a shape or object through a half or quarter turn, and describe the change of view. |

## Level 2  Tiomitiri — Geometry

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

### 1.  Use geometrical terms or properties to describe and classify shapes

| | |
|---|---|
| 1. Describe circles, ovals, squares, rectangles, triangles, pentagons and hexagons. | 1. Use geometrical terms to classify circles, ovals, squares, rectangles, triangles, pentagons, hexagons, cubes, cylinders and spheres. |
| 2. Use the terms curved, straight and the number of sides to classify shapes. | |

### 2.  Understand the 3 dimensional nature of objects

| | |
|---|---|
| 1. Create a 3 dimensional object using familiar objects. | 1. Create a 3 dimensional object using geometrical objects. |
| 2. Use words such as higher, wider. | 2. Use words such as side, corner and edge to describe 3 dimensional objects. |
| 3. Explain how the view from the opposite side of an object is different. | 3. Explain how the view of an object changes as you move around it. |

### 3.  Use rotation, reflection or translation of shapes or designs to create patterns and be able to describe their symmetry(ies)

| | |
|---|---|
| 1. Use reflection and/or translation of a shape to create a pattern. | 1. Use reflection, translation and/ or rotation to create a pattern. |
| 2. Be able to identify the symmetry of a pattern. | 2. Be able to describe the symmetry(ies) of their pattern. |

### 4.  Use direction and distance to describe position

| | |
|---|---|
| 1. Use the words further, closer, and beside to describe the relative positions of objects. | 1. Use N, S, E, W and NE, SE, SW and NW to describe direction. |
| 2. Make clockwise and anticlockwise turns. | 2. Use distance to describe position. |
| 3. Draw and discuss simple picture maps. | 3. Draw and read simple maps using the four compass points. |
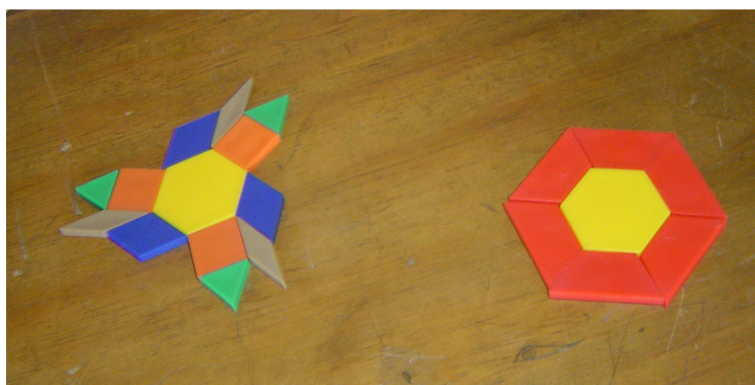
## Level 3  Tiomitiri — Geometry

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

### 1.  Use geometrical terms or properties to classify or evaluate shapes

| | |
|---|---|
| 1. Classify triangles and quadrilaterals according to their attributes.<br><br>2. Evaluate angles in scalene triangles.<br><br>3. Identify parallel lines and understand their properties.<br><br>4. Measure angles using a protractor.<br><br>5. Investigate angles<br> - in a triangle<br> - in a quadrilateral<br> - on a straight line<br> - around a point. | 1. Investigate and use pi in circle calculations.<br><br>2. Identify the radius, diameter and circumference of circles.<br><br>3. Evaluate the radius, diameter and circumference of circles.<br><br>4. Evaluate angles<br> - in a triangle<br> - in a quadrilateral<br> - on a straight line<br> - around a point<br> - using parallel lines. |

### 2.  Draw/make and interpret simple 3 dimensional objects

| | |
|---|---|
| 1. Use square or isometric paper to draw simple 3 dimensional objects.<br><br>2. Model a simple 3 dimensional object from a drawing.<br><br>3. Design containers to specified requirements. | 1. Use cubes or similar objects to make a 3 dimensional object from a drawing.<br><br>2. Interpret different views of a 3 dimensional object in order to build it.<br><br>3. Design and make containers to specific requirements. |

### 3.  Use a combination of rotation, reflection or translation of shapes or designs and be able to identify the resulting symmetry(ies)

| | |
|---|---|
| 1. Use simple shapes such as triangles or rectangles to create a tessellation.<br><br>2. Identify the symmetry in patterns such as tivaevae. | 1. Use composite shapes to create a tessellation.<br><br>2. Design a complex shape to create a tessellation. |

### 4.  Draw and interpret simple scale maps

| | |
|---|---|
| 1. Draw a scale map of a familiar environment such as their classroom.<br><br>2. Interpret scale maps by being able to identify objects from their position shown on the map. | 1. Draw a scale map of a larger environment such as their school grounds.<br><br>2. Interpret scale maps by being able to determine distance and direction. |

# Level 4  Tiomitiri — Geometry

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

## 1.  Construct geometrical shapes using appropriate techniques

| | |
|---|---|
| 1. Construct circles, triangles, hexagons, and rectangles.<br><br>2. Use appropriate language to describe the properties of circles, triangles, hexagons and rectangles. | 1. Construct parallel and perpendicular lines.<br><br>2. Construct angle bisectors and mediators. |

## 2.  Draw/make and interpret 3 dimensional objects

| | |
|---|---|
| 1. Use isometric paper to draw 3 dimensional objects made of cubes.<br><br>2. Construct objects from a 3 dimensional drawing. | 1. Use isometric paper to draw complex 3 dimensional objects.<br><br>2. Interpret and make an object from representations of different views.<br><br>3. Interpret different views of their environment. |

## 3.  Identify the invariant properties of transformations

| | |
|---|---|
| 1. Use a vertical or horizontal mirror line to reflect a shape.<br><br>2. Identify a mirror line.<br><br>3. Use a given center to rotate a shape by half or quarter turn. | 1. Use any mirror line to reflect a shape.<br><br>2. Use the center and angle of rotation to rotate a shape.<br><br>3. Determine the center and angle of rotation that rotated a shape.<br><br>4. Use vectors to translate a shape.<br><br>5. Determine what vector translated a shape. |

## 4.  Enlarge or reduce a shape or object

| | |
|---|---|
| 1. Enlarge a shape using a whole number scale factor.<br><br>2. Enlarge a shape with the center of enlargement at one of the vertices or at the center of the circle. | 1. Enlarge a shape using any scale factor.<br><br>2. Enlarge a shape using any center of enlargement.<br><br>3. Determine the scale factor of enlargement from two similar shapes.<br><br>4. Use scale factor to find the length of any side of a similar shape. |

## 5.  Use grid references or bearings to describe location

| | |
|---|---|
| 1. Locate a position on a map using a grid reference.<br><br>2. Use bearings to describe the location of an object in a familiar environment. | 1. Locate a position on a map using latitude and longitude.<br><br>2. Use bearings to describe a journey around a familiar environment like a sports field.<br><br>3. Use bearings to describe a journey on a map. |

## Level 5  Tiomitiri — Geometry

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

**1.  Use trigonometry and/or Pythagoras' theorem to find unknown sides/ angles in right angled triangles**

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|
| 1. Use Pythagoras' theorem to find the length of the hypotenuse of a right-angled triangle.<br><br>2. Use trigonometry to find the angle in a right-angled triangle.<br><br>3. Use trigonometry to find the adjacent or opposite side in a right-angled triangle. | 1. Use Pythagoras' theorem to find the length of any side of a right-angled triangle.<br><br>2. Know and use the 3, 4, 5 and 5, 12, 13 properties of right-angled triangles.<br><br>3. Use trigonometry to find any angle or side in a right-angled triangle.<br><br>4. Use Pythagoras' theorem and/or trigonometry to solve problems in the environment. |

**2.  Use the angle and symmetry properties of parallel lines, circles and polygons to find unknown angles and provide their reasoning**

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|
| 1. Use the alternate, corresponding, and co-interior properties of parallel lines to evaluate angles.<br><br>2. Use the tangent/radius, angle at centre and angles on the same arc properties of circles to solve problems. | 1. Use the alternate, corresponding, and co-interior properties of parallel lines to evaluate angles in multi step problems.<br><br>2. Use the tangent/radius, angle at centre and angles on the same arc properties of circles to solve multi-step problems.<br><br>3. Be able to provide geometrical reasons in solving angle problems. |

# Aratipara — Algebra

## Puapinga — Achievement Aims

The student will:

◆ Recognise and explore patterns and relationships and be able to generalise from them.

◆ Use Mathematical and other symbols to explore, represent and solve Mathematical relationships in a variety of forms.

Algebra is the language that Mathematicians and others use to communicate. Students will start with informal representations and develop more abstract representations as they progress through the levels.

A study of patterns leads to an understanding of relations and functions. Early experiences should include the use of materials and this will lead to a generalisation of patterns and other relationships. Such experiences may involve students in creating or continuing patterns using a range of materials.

There is a strong link between the strategic thinking developed in the Numeracy Project and the acquisition of early Algebraic thinking.
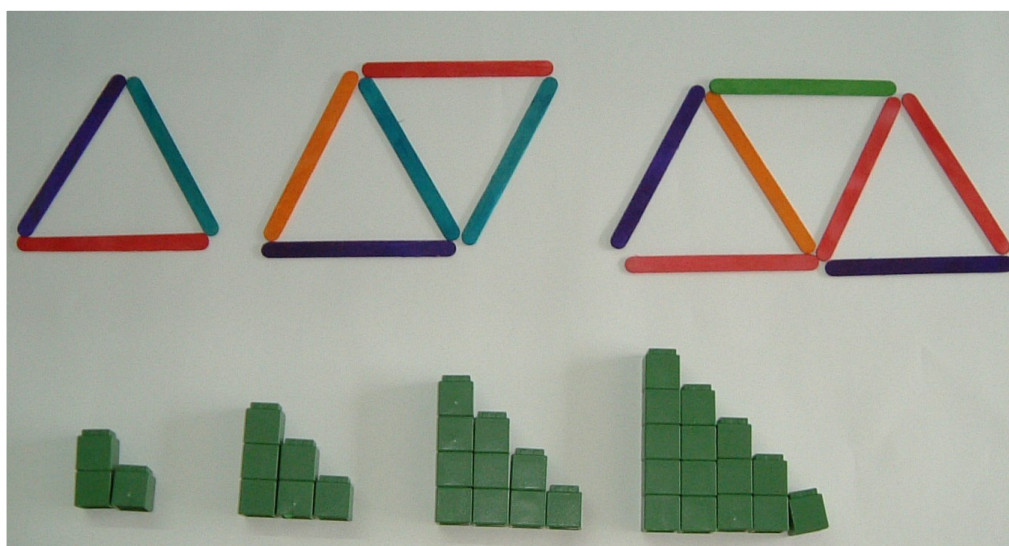
## Aratipara — Algebra

| Aims | Achievement Objectives | | | | |
|---|---|---|---|---|---|
| | **Level 1** | **Level 2** | **Level 3** | **Level 4** | **Level 5** |
| **Recognise and explore patterns and relationships and be able to generalise from them** | 1. Make and describe patterns using materials. | 1. Continue a sequential pattern and use a rule to describe it.<br><br>2. Use graphs to illustrate relationships.<br><br>3. Understand graphs of familiar situations. | 1. Find and use the rule to describe a numerical or practical pattern.<br><br>2. Use a graph to represent a numerical or real world situation. | 1. Use a rule to generate a pattern or to make predictions.<br><br>2. Graph linear relationships, and be able to interpret linear graphs. | 1. Find the general term and rule for a pattern and plot and interpret graphs which represent everyday situations.<br><br>2. Graph and interpret linear and quadratic functions. |
| **Use Mathematical and other symbols to explore, represent and solve Mathematical relationships in a variety of forms** | 2. Write simple number sentences from materials or stories. | 4. Use the Mathematical symbols (>,< and =) in number sentences. | 3. Solve simple linear equations. | 3. Find and use equations to model practical equations.<br><br>4. Rearrange, simplify, evaluate and solve linear equations. | 3. Manipulate and solve linear and quadratic equations. |
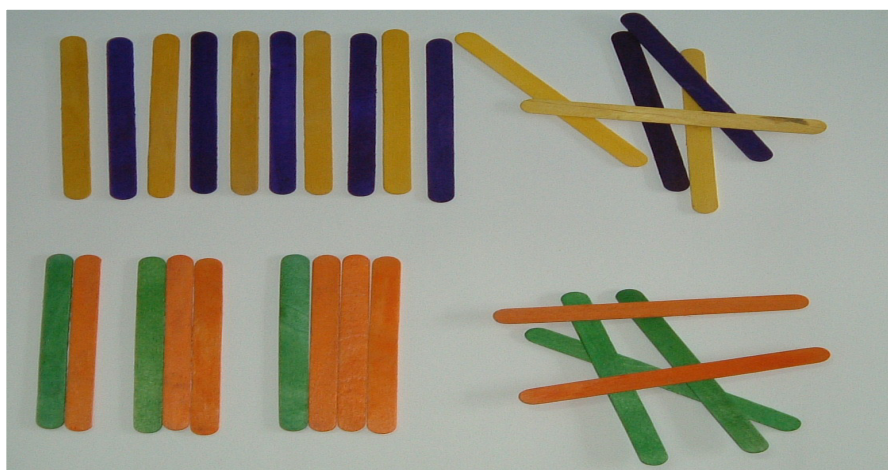
## Level 1  Aratipara — Algebra

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

### 1.  Make and describe patterns using materials

| | |
|---|---|
| 1. Use sticks or other materials to make simple patterns. | 1. Describe and continue simple repeating and sequential patterns. |
| 2. Describe their pattern using words such as "more than" or "less than". | 2. Illustrate and discuss relationships using pictures and arrows. |
| 3. Demonstrate relationships such as "more than" or "less than" using materials. | |

### 2.  Write simple number sentences from materials or stories

| | |
|---|---|
| 1. Demonstrate simple operations involving =, "is the same as", using concrete materials, for example 3 + 2 = 4 + 1. | 1. Using materials or stories write and explain number sentences using = . |

# Level 2  Aratipara — Algebra

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

## 1.  Continue a sequential pattern and use a rule to describe it

| LOWER | UPPER |
|---|---|
| 1. Continue a simple linear relationship. | 1. Continue a simple nonlinear relationship such 2, 4, 8 or 1, 1, 2, 3, 5, 8…. etc. |
| 2. Use a rule in words to describe a linear relationship, for example<br>2, 4, 6, 8….<br>10, 9, 8, 7…. | 2. Use a rule in words to describe a simple non-linear relationship. |
| 3. Explore patterns such as<br>3 ──▶ 1<br>4 ──▶ 2<br>5 ──▶ 3 | 3. Use calculators to create and investigate patterns in numbers.<br>4. Investigate patterns in everyday use such as calendars etc. |

## 2.  Use graphs to illustrate relationships

| LOWER | UPPER |
|---|---|
| 1. Use a pictograph to model a simple linear relationship. | 1. Use a graph to model a simple relationship. |

## 3.  Understand graphs of familiar situations

| LOWER | UPPER |
|---|---|
| 1. Interpret a graph of a familiar relationship such as hunger during the day. | 1. Draw a graph of a familiar situation.<br>2. Interpret graphs of familiar situations. |

## 4.  Use the Mathematical symbols ( >,< and =) in number sentences

| LOWER | UPPER |
|---|---|
| 1. Demonstrate different ways of using number sentences using <,>, and =, for example 7 > 6 | 1. Write number sentences using +,  -,  <,  >, and =, for example<br>3 + 4 > 6<br>3 + 4 = 5 + 2 |

## Level 3  Aratipara — Algebra

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

### 1.  Find and use the rule to describe a numerical or practical pattern

| | |
|---|---|
| 1. Use Mathematical language to describe a simple pattern.<br>2. Use a rule to create a simple pattern. | 1. Use Mathematical language to describe a pattern.<br>2. Use a given rule to create a pattern.<br>3. Use a rule to predict a value. |

### 2.  Use a graph to represent a numerical or real world situation

| | |
|---|---|
| 1. Recognise that graphs show relationships.<br>2. Plot whole number co-ordinate pairs on a graph.<br>3. Read whole number co-ordinate pairs from a graph. | 1. Plot numerical relationships on a graph using a table of integer values.<br>2. Describe a simple relationship from a graph. |

### 3.  Solve simple linear equations

| | |
|---|---|
| 1. Solve linear equations of the form<br>$3 + \boxed{\phantom{x}} = 7$, or $2 \times \boxed{\phantom{x}} = 8$ | 1. Solve linear equations of the form<br>$\boxed{\phantom{x}} + 5 = 9$, and $2 \times \boxed{\phantom{x}} + 1 = 9$<br>2. Manipulate equations of the form<br>$3 + \boxed{\phantom{x}} = 7 + \triangle$<br>3. Evaluate simple substitution examples, for example<br>if $a = 2$, what is $2a$, or $a + 3$ |

## Level 4  Aratipara — Algebra

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

### 1.  Find and use a rule to generate a pattern or to make predictions

| | |
|---|---|
| 1. Given any rule complete a table of values.<br>2. Find the rule from a table of linear values. | 1. Use a rule to find the value of any required term.<br>2. Find the rule from a table of simple quadratic values. |

### 2.  Graph linear relationships, and be able to interpret linear graphs

| | |
|---|---|
| 1. Plot linear relationships using a table or equation in the form y = mx + c<br>2. Find x or y intercepts from a graph. | 1. Plot linear relationships using an equation in any form.<br>2. Find intercepts or any other required point.<br>3. Find the equation of a linear graph. |

### 3.  Find and use equations to model practical equations

| | |
|---|---|
| 1. Use equations to solve problems such as "Tere is 10 years older than Kura. The total of their ages is 25, how old is Tere? | 1. Use equations to solve practical situations, such as "the length of the garden is twice as long as it is wide. The garden area is 50 sqm, what is its length?" |

### 4.  Rearrange, simplify, evaluate and solve linear equations

| | |
|---|---|
| 1. Simplify expressions such as 2x + 3x<br>2. Solve equations of the form 2x + 3 = 11<br>3. Expand expressions such as 5 (a + 4)<br>4. Factorise expressions such as 2a – 6 | 1. Simplify expressions such as 3a + 2b – 2a + 4b<br>2. Solve equations of the form 3x + 3 = 2x + 7<br>3. Expand 2 brackets such as (a + 2) (a + 3)<br>4. Factorise quadratics such as $a^2 + 4a$, $a^2 + 3a + 2$<br>5. Re-arrange simple equations to make a given variable the subject. |

## Level 5  Aratipara — Algebra

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

**1. Find the general term and rule for a pattern and plot and interpret graphs which represent everyday situations**

1. Interpret graphs showing correlation between two quantities.
2. Draw the graph representing a pattern.
3. Find the general term for a linear pattern.

**2. Graph and interpret linear and quadratic functions**

1. Draw and interpret graphs of simultaneous equations.
2. Draw graphs of quadratics in the form $y = ax^2 + bx + c$

**3. Manipulate and solve linear and quadratic equations**

| LOWER | UPPER |
|---|---|
| 1. Expand expressions involving one or two brackets. | 1. Write word problems involving equations. |
| 2. Factorise and solve quadratic equations. | 2. Solve word problems involving equations. |
| 3. Solve word problems involving equations. | 3. Re-arrange equations to make a given variable the subject. |
| 4. Solve equations by substituting values. | 4. Solve problems with algebraic fractions. |

# Tatakitika — Statistics and Probability

## Puapinga — Achievement Aims

The student will:

- ◆ Collect, display and analyse data in appropriate ways.
- ◆ Interpret data presented in a variety of ways.
- ◆ Estimate and use probabilities.

Collecting, organising and displaying data as well as interpreting and analysing information to make decisions are important skills for society. Investigation and exploration should be used as a basis for developing these skills.

Students need to develop an understanding of probability concepts such as fairness and chances of winning.

The use of appropriate technology should be encouraged as this can be used for the collection, analysis and presentation of data and simulating probability experiments.

| Aims | Tatakitika — Statistics and Probability | | | | |
|---|---|---|---|---|---|
| | **Achievement Objectives** | | | | |
| | **Level 1** | **Level 2** | **Level 3** | **Level 4** | **Level 5** |
| **Collect, display and analyse data in appropriate ways** | 1. Collect, sort and display objects in a suitable form and comment on the distribution. | 1. Collect and display discrete objects/ data in an appropriate graph. | 1. Plan a statistical investigation, collect and display the data. <br> 2. Understand the relevance of samples and populations. | 1. Collect and display time series data. | 1. Pose a question for and plan a statistical investigation, collect and display the data. <br> 2. Collect and display time series data and make predictions. |
| **Interpret data presented in a variety of ways** | | 2. Explain the features of an investigation. | 3. Interpret their own statistical reports. <br> 4. Find measures of central tendency and range. | 2. Interpret their own and others' statistical reports. <br> 3. Find and interpret measures of central tendency and range. <br> 4. Develop an understanding of normal distributions. | 3. Interpret their own and others' statistical reports. <br> 4. Further develop the concept of normal distribution. |
| **Estimate and use probabilities** | 2. Understand simple probability terms and concepts. | 3. Rank and explain out-comes of simple experiments and be able to find by practical means all possible outcomes. | 5. Find or evaluate probabilities. | 5. Use tree diagrams to find all possible out-comes of an experiment. <br> 6. Calculate relative frequencies from tables or practical means. <br> 7. Devise and use simple simulation exercises. | 5. Use tree diagrams or other means to find the probabilities of outcomes. |

## Level 1  Tatakitika — Statistics and Probability

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

**1.  Collect, sort and display objects in a suitable form and comment on the distribution**

| | |
|---|---|
| 1. Choose a set of objects eg leaves and sort according to a characteristic. | 1. Choose a set of objects eg leaves and sort according to a specified characteristic. |
| 2. Display their sorted objects in an organised way. | 2. Display their sorted objects in a graphical form. |
| 3. Describe aspects of their collection. | 3. Describe comparative aspects of their collection. |

**2.  Understand simple probability concepts**

| | |
|---|---|
| 1. Use words such as never, always or might in an appropriate context. | 1. Use words such as impossible, possible, very likely or certain to describe familiar events. |
| | 2. Rank familiar events in order of their probability of occurring. |

## Level 2  Tatakitika — Statistics and Probability

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

**1.  Collect and display discrete objects/data in an appropriate graph**

| | |
|---|---|
| 1. Use tally charts to record information. <br><br> 2. Use pictographs or bar charts to illustrate their findings. | 1. Use tally charts and frequency tables to record information. <br><br> 2. Use bar charts to illustrate their findings. |

**2.  Explain the features of an investigation**

| | |
|---|---|
| 1. Discuss aspects of their graphs. <br><br> 2. Understand that their collection represents a sample of the population. <br><br> 3. Compare in simple terms the ranges of different distributions | 1. Discuss important features of graphs. <br><br> 2. Compare their sample with others' and comment on any similarities/differences. <br><br> 3. Identify the most common/popular value. |

**3.  Rank and explain outcomes of simple experiments and be able to find by practical means all possible outcomes**

| | |
|---|---|
| 1. Rank events in order of the probability of their occurring. | 1. Use materials, eg dice, to find the outcomes of an experiment. |

## Level 3  Tatakitika — Statistics and Probability

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

### 1.  Plan a statistical investigation, collect and display the data

| | |
|---|---|
| 1. Carry out a designed investigation.<br><br>2. Use stem and leaf or other appropriate chart to organise data.<br><br>3. Display discrete data in the most appropriate form, for example pie graph, bar chart, line graph. | 1. Design and carry out a statistical investigation.<br><br>2. Use back to back stem and leaf graphs to collect and sort data.<br><br>3. Choose and justify the use of a particular form of graph to display data. |

### 2.  Understand the relevance of samples and populations

| | |
|---|---|
| 1. Use a simple method to generate an appropriate sample. | 1. Use an appropriate method eg simple random and/or stratified sampling to generate a sample.<br><br>2. Comment on the appropriateness of their sample. |

### 3.  Interpret their own statistical reports

| | |
|---|---|
| 1. Use appropriate language to draw conclusions from their report. | 1. Use their own report to support or disprove an hypothesis. |

### 4.  Find measures of central tendency and range in a set of data

| | |
|---|---|
| 1. Find the mean, median and mode of a distribution.<br><br>2. Find the range of a distribution. | 1. Find the mean, median and mode of a distribution.<br><br>2. Find the range of a distribution. |

### 5.  Find or evaluate probabilities

| | |
|---|---|
| 1. Find all possible outcomes of an experiment. | 1. Use a systematic approach to find all possible outcomes of an experiment.<br><br>2. Evaluate the probability of different outcomes, for example complements or combinations of events. |

## Level 4  Tatakitika — Statistics and Probability

| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|

**1.  Collect and display time series data**

| | |
|---|---|
| 1. Collect time series data from a familiar situation. <br><br> 2. Graph time series data from a familiar situation. | 1. Collect and graph time series data. <br><br> 2. Make comments on cyclical aspects of the data. |

**2.  Interpret their own and others' statistical reports**

| | |
|---|---|
| 1. Comment on possible sources of error in an investigation. | 1. Comment on possible improvements to an investigation. |

**3.  Find and interpret measures of central tendency and range**

| | |
|---|---|
| 1. Find the mean, median and mode of a distribution from a table of values. <br><br> 2. Find the range and inter-quartile range of a distribution. | 1. Find the mean, median and mode of a distribution and interpret their values. <br><br> 2. Find the range and inter-quartile range and interpret their values. <br><br> 3. Compare distributions with different values. |

**4.  Develop an understanding of normal distributions**

| | |
|---|---|
| 1. Use simple graphical means to demonstrate the characteristics of a normal distribution. | 1. Use graphs to determine whether a distribution is normal or not. |

**5.  Use tree diagrams to find all possible outcomes of an experiment**

| | |
|---|---|
| 1. Use a tree diagram to find all outcomes of an experiment. | 1. Use a tree diagram to find all outcomes of an experiment. <br><br> 2. Determine the probability of an outcome using a tree diagram. |

**6.  Calculate relative frequencies from tables or practical means**

| | |
|---|---|
| 1. Collect information into relative frequency tables. <br><br> 2. Find the relative frequency of an event from a table. | 1. Compare the relative frequency of different experiments. <br><br> 2. Use long-run experiments to evaluate relative frequency. |

**7.  Devise and use simple simulation exercises**

| | |
|---|---|
| 1. Use a simple simulation exercise to determine the probability of an outcome. | 1. Devise a suitable simulation exercise. <br><br> 2. Use their or others simulations to determine the probability of an outcome. |

## Level 5  Tatakitika — Statistics and Probability

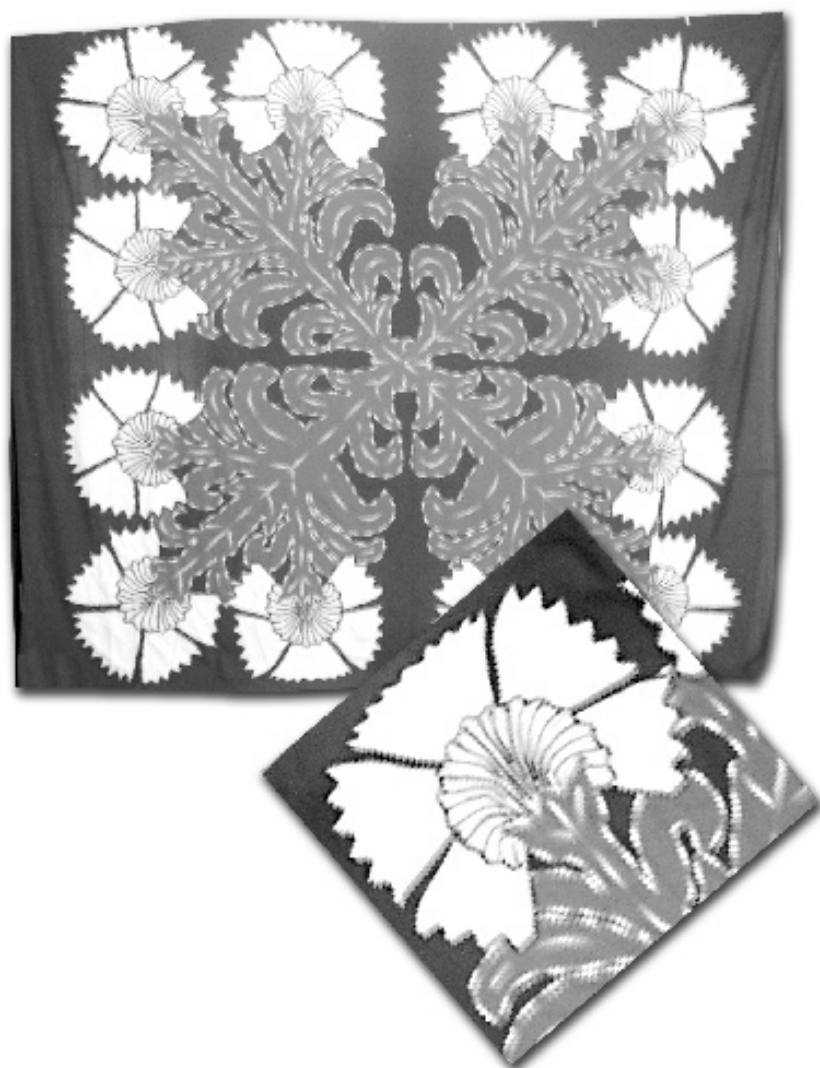| LOWER Learning Outcome | UPPER Learning Outcome |
|---|---|
| **1. Pose a question for, and plan a statistical investigation, collect and display the data** | |
| 1. Pose an appropriate question from a set of data.<br><br>2. Display their discrete or continuous data in an appropriate graph including histogram or box and whisker. | |
| **2. Collect and display time series data and make predictions** | |
| 1. Collect and display time series data that has a daily, weekly, monthly, or quarterly cycle. | 1. Predict a future value from a time series graph with seasonal variations and a long term trend. |
| **3. Interpret their own and other's statistical reports** | |
| 1. Interpret features of a statistical report presented in a graphical form.<br><br>2. Interpret aspects of a statistical report presented in a written form. | 1. Critically evaluate statistical reports. |
| **4. Evaluate the different measures of central tendency and range, and perform more complex calculations** | |
| 1. Calculate the mean, median and mode from a set of data.<br><br>2. Determine which form of average is the most appropriate to use. | 1. Perform calculations on/for means. |
| **5. Further develop the concept of normal distributions** | |
| 1. Recognise the attributes of a normal distribution.<br><br>2. Compare the similarities and differences between 2 or more normal distributions. | 1. Discuss the characteristics of skewed or bi-modal distributions. |
| **6. Use tree diagrams or other means to find the probabilities of outcomes** | |
| 1. Use tree diagrams with relevant probabilities to find the probability of various outcomes. | |

# Ravenga — Processes

## Puapinga — Achievement Aims

The student will:

- ◆ Solve problems individually and co-operatively by selecting and using appropriate strategies.
- ◆ Interpret and evaluate information presented in a variety of ways.
- ◆ Communicate using their own and Mathematical language.

The Mathematical processes of Problem Solving, Logic and Reasoning and Communicating Mathematical ideas are acknowledged to be of great importance in the learning of Mathematics. In order to assist teachers with their planning and implementation of these processes they are included within the most appropriate strand and level.

Individual Achievement Objectives from the Process strand have been identified and listed according to strand and level. This is not to limit teachers to this Achievement Objective but to ensure that it is included in planning and assessment.

| Ravenga — Processes | | | | | |
|---|---|---|---|---|---|
| | **Level 1** | **Level 2** | **Level 3** | **Level 4** | **Level 5** |
| Numero<br><br>Number | Use equipment appropriately when exploring Mathematical ideas. | Build new Mathematical knowledge through problem solving. | Solve problems that arise in Mathematical contexts. | Devise and use problem-solving strategies to solve problems. | Apply and adapt appropriate strategies to solve problems. |
| Vaitoanga<br><br>Measurement | Solve problems that arise in Mathematics. | Use equipment appropriately when exploring Mathematical ideas. | Recognise and use connections among Mathematical ideas. | Effectively plan a Mathematical exploration. | Find and use with justification, a Mathematical model as a problem solving strategy. |
| Tiomitiri<br><br>Geometry | Classify objects. | Use their own language to explain Mathematical ideas. | Use Mathematical language and diagrams to explain Mathematical ideas. | Communicate their Mathematical thinking coherently and clearly. | Recognise and use Mathematics in contexts outside of Mathematics. |
| Aratipara<br><br>Algebra | Use representations to communicate Mathematical ideas. | Use words and symbols to describe and continue patterns. | Use words and symbols to describe and generalise patterns. | Record information in ways that are helpful for drawing conclusions. | Make conjectures in a Mathematical context. |
| Tatakitika<br><br>Statistics and Probability | Classify objects, numbers and ideas. | Record and talk about the results of Mathematical exploration. | Record, in an organised way and talk about the results of Mathematical exploration. | Interpret information and results in context. | Pose questions for Mathematical exploration. |

# Kimi Kite Marama e te Apiianga — Learning and Teaching

## Tivaevae as a Metaphor for Learning and Teaching Mathematics

Tivaevae can be used as a metaphor for this Curriculum and for teaching and learning Mathematics in the Cook Islands.

Mathematics knowledge and the structure of the Curriculum have been imported from overseas but integrated with and transformed by the indigenous culture of the Cook Islands. Through this Curriculum the knowledge and learning of Mathematics will continue to evolve with time.

A similar process has happened with tivaevae, which have evolved from the use of tapa cloth through the use of different materials, threads and equipment such as needles to the complex tivaevae of today.

These tivaevae are still evolving as new techniques and skills are developed.

A taunga or teacher works with a group to share and demonstrate skills. The ability to communicate and share ideas, essential for the group to be successful.

The taungas knowledge is considered a gift and is to be shared amongst the group.

The teacher must be able to adapt to the different learning styles of the group in order for them to achieve to their potential.

Mathematics teaching should follow the same process so that students can become independent learners

The skills of piercing material and embroidering were originally brought to the Cook Islnd by missionaries and nums.

The resultant quilts have a practical use but also have artistic value.

As an art form they have undergone major changes to become unique to, and representative of, the Cook Islands.

The tivaevae tataura which uses a combination of embroidery and applique is unique to the Cook Islands.

Mathematics teaching should reflect the uniqueness of the Cook Islands by using and developing indigenous resources.

The sewing of tivaevae is done by a group of women who work together under the guidance of a teacher towards a collective goal.

As the members of this group become more skilled they can become teachers and share their knowledge and skills with others.

There are different types of knowledge and sewing skills required in order to complete a tivaevae.

Thse knowledge and skills can be adapted when necessary and are continually evolving.

This is reflected in Mathematics teaching where different students in a group will have different skills and abilities and these should be acknowledged and developed.

Tivaevae designs have a strong link with Mathematics as shown in their use of reflectional and rotational symmetry.

The skills of measuring and estimating are also important for a successful outcome.

The patterns and symbols used are carefully selected and reflect stories of ancestors, self and family.

# Kite Karape Puapinga — The Essential Skills

The *Cook Islands Mathematics Curriculum* makes an important contribution to the development of the essential skills as described in the *Cook Islands National Curriculum Framework*. These essential skills are those that are deemed to enable students in the Cook Islands to achieve their potential and to participate within their society.

The following are a selection of ways that teachers may develop the Essential Skills within a Mathematics context, it is not intended to be definitive. Teachers may come up with a number of other activities.

## Communication Skills

Students can develop the skills to communicate when they have opportunities to

- ◆ discuss alternative solving strategies;
- ◆ present their results of an investigation in a graphical form;
- ◆ use different forms of information and communication technology.

## Numeracy Skills

Students can develop numeracy skills when they have opportunities to

- ◆ use manipulatives to represent and solve problems;
- ◆ develop different strategies to perform computations;
- ◆ discuss the strategies they are using;
- ◆ have multiple approaches to a problem.

## Artistic and Creative Skills

Students can develop artistic and creative skills when they have opportunities to

- ◆ create patterns and designs using tessellations or other geometric techniques;
- ◆ explore the symmetries of designs such as tivaevae.

## Self-management, Work and Study Skills

Students can develop work and study skills when they have opportunities to

- ◆ manage time and other resources appropriately;
- ◆ set goals for research activities;
- ◆ use resources in an appropriate manner.

# Physical Skills

Students can develop physical skills when they have opportunities to

- ◆ manipulate equipment required to draw geometric shapes;
- ◆ build three-dimensional objects;
- ◆ use objects for counting and computation;
- ◆ measure objects using standard or non-standard measures.

# Social and Co-operative Skills

Students can develop social and co-operative skills when they have opportunities to

- ◆ solve problems in co-operative groups;
- ◆ participate effectively as a member of a group;
- ◆ interact with people when collecting data or interviewing.

# Information Skills

Students can develop information skills when they have opportunities to

- ◆ gather data from a wide range of sources for statistics investigations;
- ◆ use technology to access, process and present data.

# Problem-solving Skills

Students can develop problem-solving skills when they have opportunities to

- ◆ explore different strategies to solve problems;
- ◆ evaluate the different strategies possible to solve problems.

# Te Au Irinakianga e te Au Tu Tangata — Attitudes and Values

Values and belief systems determine behaviour in society including how members communicate and interact with one another, what knowledge is learnt and how such knowledge is imparted.

Cook Islands Curriculum Framework, p. 24

The *Cook Islands Curriculum Framework* uses the tree of learning as its basis.

This tree has a close connection with the land and also spiritual beliefs. The environment around this tree reflects the values that influence students' learning.

The values amongst the leaves are those that relate to particular learning areas.
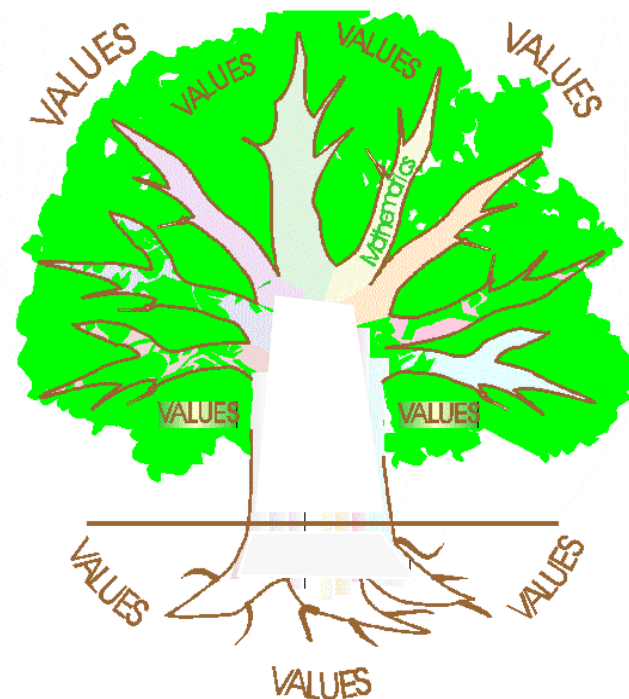
The air around the tree represents the values from outside the Cook Islands but which are important for their effect on students' behaviour and practice.



**The soil around the roots of the tree represents the values of all Cook Islanders, their society, their homes and their village. It allows students to develop positive attitudes of their identity and involvement in an environment that is closely linked to the home**

In Mathematics it is important to acknowledge the values associated with problem solving and investigations. In problem solving students use their prior learning and experiences and modify their strategies accordingly. During investigations students are interacting with others and possibly reporting back to them on their findings. This requires **tukuanga tika tau,** fairness and **tuatua tika,** honesty.

In these activities students need to develop the following attitudes.

- **Timataanga i te au ravenga tukeke/flexibility**, to try different approaches to a problem.
- **Ngakau akakoromaki/tolerance**, for others' methods.
- **Tauta uatu rai/perseverance**, when not initially successful.
- **Angaanga taokotai/co-operation**, to work in a group.

# Te Au Ravenga no te Taokotai Anga Atu ki te au Tuanga Apii Puapinga —Integration with other Essential Learning Areas

The *Cook Islands Curriculum Framework* uses the tree of learning as its basis.

The leaves on the tree have grown from the branches representing the various learning areas of the Cook Islands Curriculum Framework. These leaves may become intermingled when a learning activity draws on more than one learning area.

Mathematics should be integrated with the other essential learning areas and the following are some suggestions.

**Taieni/Science**
- interpreting motion and rates of change
- understanding time and seasonal variations
- measuring and recording data.

**Oraanga o te Tupuanga Meitaki/Health and Physical Well-being**
- investigating body ratios,
- studying rates of physical activity
- studying metabolic activity rates.

**Peu Oraanga/ The Arts**
- using posters to present work
- creating designs
- using ratios to mix paints
- using enlargement and perspective.

**Kimianga Puapinga/ Enterprise**
- surveying requirements
- cost projections
- profit/loss analysis
- knowing and understanding monetary system.

*Integrating other Essential Learning Areas*

**Oraanga Iti-tanga ta/ Social Sciences**
- investigating social issues /trends
- understanding traditional uses of mathematics.

**Tekinoroti/Technology**
- surveying and analysing requirements
- building and analysing three dimensional models.

**Te Reo/ Language**
- writing questions for investigations
- writing reports of investigations
- oral presentation of findings
- following and writing instructions
- communicating with others.

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# Apii Taokotai — Inclusiveness

*The school curriculum will provide for the educational needs of all students regardless of gender, religion, ethnicity, social and economic backgrounds, location, abilities and disabilities. It will recognise and provide for the different learning paces and styles, and previous experiences of students.*

*Cook islands Curriculum Framework,* p. 6.

The school should provide learning environments that are safe and supportive for all students. The school's Mathematics scheme should ensure that it meets the need of all the students in the school. In order for this to occur students should feel positive about learning Mathematics and have an expectation of success.

## Special needs

Within every school there will be students with special needs. These students may have physical and/or cognitive disabilities. Teachers should be aware of the disabilities of their students and ensure that their teaching programmes cater for the needs of all their students.

A number of these students will have Individual Education Programmes which will include numeracy goals and suggested ways of achieving these. Teachers should work with advisors, teacher aides and parents to develop and implement activities and monitor progress.

## Special abilities

There will be a wide range of Mathematical ability in every class. Teachers should be aware of the special abilities of their students in order to meet their needs. Students can be extended in one or more areas and specifically designed resources should be accessed.

Some students will master skills and concepts quicker than others and it is inappropriate that they repeat work that they have mastered. It is not the intention of this document that these students be accelerated up through the levels but rather that resources and activities should be made available for these students in order for their Mathematical experiences to be broadened. This does not mean that all students in a class will be working on the same Learning Outcome but that extension can involve broadening within a level as well as promoting to another level.

## Gender

Resources and assessments used should be equitable for both genders. There is a risk when writing resources and/ or assessments in context that some students may be disadvantaged.

There is a body of research that states that girls have poorer spatial ability than boys and this is a concern as spatial ability is often linked to success in Mathematics. Teachers should try to ensure that all students have the opportunity to manipulate equipment, including building and interpreting models as suggested in the Geometry strand of this document.

## Religion

Religion should not be a barrier to a student's learning, there should be respect and consideration for all. Students participating in group or other activities should not be identified or penalised by religious affiliation or lack of.

# Paranianga — Planning

The *Cook Islands Mathematics Curriculum* promotes approaches to learning that are learner-centred and contribute to life-long learning.

Students should be actively involved in the doing of Mathematics. This requires access to suitable materials for learning and consolidating new concepts. It is not appropriate to use whole class teaching as the sole method of instruction. Teachers should play an important role in establishing a learning environment where discussion and collaboration are encouraged. Students, including juniors, are expected to justify their thinking by developing Mathematical arguments.

This curriculum has 5 levels with each Achievement Objective divided into sub-levels each with separate Learning Outcomes. These sub-levels are **not** designed to correspond to years or grades. This curriculum has only 5 levels because from year 11 the students will be being assessed for NCEA and will follow the learning outcomes of the appropriate New Zealand Unit or Achievement Standards.

It is expected that the planning teachers do will take into account the achievement levels of **all** the students within their class. The Numeracy project provides an exemplar of a diagnostic assessment leading to grouping of students for teaching according to their strategy level. This process should take place for all strands. It is likely that there will be 2 or more ability levels within a class for a unit.

There should be a continuous link between the learning outcomes/planning and assessment. Appropriate exemplars and resources to assist with this will be provided in the Teachers' Guides. However this Curriculum has been developed to assist teachers to implement a programme of learning and not as tool for assessment.

Greater emphasis on the Number Strand in the junior classes is reflected in this curriculum where the non-Number strands have fewer Achievement Objectives at the lower levels.

When developing their long term plans teachers need to take into account the recommended allocation for the Number strand.

| | | |
|---|---|---|
| Grade | 1-3 | 80% |
| | 4-6 | 60% |
| Year | 7-8 | 40% |
| | 9-10 | 20% |

However, it is important to remember that the other strands can provide a contextual basis for Number by, for example, reinforcing adding strategies when calculating perimeter.

For more details of planning refer to the "Guide'to Planning using the new Cook Islands Mathematics Curriculum" and the accompanying Resource books.

# Vaitoanga Kite — Assessment

Assessment should be an integral part of instruction and planning. As professionals, teachers should be continually assessing each student's progress and adapting their instruction to suit.

Diagnostic assessment provides information on a student's level of ability prior to a unit of teaching. This information can be provided from the records of a previous teacher or determined immediately prior to teaching the unit. This allows the teacher to group the students within their class, according to which learning outcome is the most appropriate for them.

Formative assessment provides on-going information about the progress of students. This non-formal assessment is dependent on the teacher having clearly defined expectations and understanding of an appropriate sequence of learning. It is as valid as more formal means and should be included in planning and documented and recorded.

Summative assessment is carried out at the end of a specific time or unit(s) and provides information on a student's skill and knowledge acquisition.

Historically a large proportion of Mathematics assessment has been carried out by pen and paper tests. This is no longer suitable. Other forms of assessment such as group work, discussions, projects, investigations, posters or presentations could be used. Some examples will be provided in the *Teachers' Guide*.

# Resources

Teachers should make use of as wide a range of resources as possible. These include texts and other books as well as equipment.

Schools will already have a range of books, the ones listed below are a selection of new books that are particularly suited to the intent of this curriculum.

There will be greater information on the use of these resources and appropriate levels provided in the *Teachers' Guide*.

*Mathematics: Pacific Experiences. Activities drawn from contexts in the Pacific*. R. Averill, K. Phillips. S. French.

**The specifications of the books below are the American grade levels**
> *Nimble with Numbers 1-2*, Childs, Choate, Jenkins
> *Nimble with Numbers 2-3*, Childs, Choate, Wickett
> *Nimble with Numbers 3-4*, Childs, Choate,
> *Nimble with Numbers 4-5*, Childs, Choate, Jenkins
> *Nimble with Numbers 5-6*, Childs, Choate,
> *Nimble with Numbers 6-7*, Childs, Choate, Hill
> *Number Sense Grade 1-2*, McIntosh, Reys, Reys
> *Number Sense Grade 3-4*, McIntosh, Reys, Reys
> *Number Sense Grade 4-6*, McIntosh, Reys, Reys, Hope
> *Number Sense Grade 6-8*, McIntosh, Reys, Reys

**The specifications for the resources below are the New Zealand curriculum levels**
> *Figure it Out* in each of Number, Measurement, Geometry, Algebra, Statistics, Basic Facts and Theme, for levels 2 - 3, 3 and 3 - 4. Published by Learning Media, Wellington New Zealand.

Non-text resources should be available in all classes. The implementation of the Numeracy project will introduce and demonstrate the use of hands on equipment. Much of this equipment is also suitable for use in the other strands and should be used as widely as possible.

Other resources supporting the intent of the curriculum, particularly at the junior levels, have been provided. These include Cook Islands context photos and vocabulary concepts suitable for matching and co-operative activities.  These resources are available online at the Ministry of Education website; www.education.gov.ck.

# Mathematics Progress Indicators

| | **Level One** *Students can:* |
|---|---|
| ## Numero — Number | |
| **Understand numbers, what they represent and the relationships between them** | 1. Identify, write, order, and connect number words and numerals up to 50, count with understanding and know the numbers before and after them. 2. Form a set of objects using an appropriate counting strategy. 3. Read the symbols for a half and a quarter and demonstrate their under-standing of this using a shape or set of objects. |
| **Use appropriate strategies for calculations and have an awareness of the reasonableness of their results** | 4. Use appropriate counting strategies to solve simple addition/ subtraction problems. 5. Understand the effects of adding and subtracting. |
| ## Vaitoanga — Measurement | |
| **Use appropriate equipment to take measurements and perform calculations when required** | 1. Measure objects using appropriate standard or non standard units. 2. Compare and order the lengths, masses and volumes of objects. |
| **Have an understanding of different systems of measurement** | 3. Read prices and know the value of monetary units. 4. Use and understand simple units of time. |
| ## Timoitiri — Geometry | |
| **Understand the two and three-dimensional properties of geometrical objects and appreciate their relevance in the environment** | 1. Identify, describe and classify simple shapes. |
| **Recognise the symmetries of geometrical and everyday objects** | 2. Use rotation and translation of shapes to create patterns. |
| **Develop a range of spatial abilities** | 3. Use positional language to locate objects. 4. Rotate themselves and objects through half and quarter turns. |
| ## Aratipara — Algebra | |
| **Recognise and explore patterns and relationships and be able to generalise from them** | 1. Make and describe patterns using materials. |
| **Use Mathematical and other symbols to explore, represent and solve Mathematical relationships in a variety of forms** | 2. Write simple number sentences from materials or stories. |
| ## Tatakitika — Statistics & Probability | |
| **Collect, display and analyse data in appropriate ways** | 1. Collect, sort and display objects in a suitable form and comment on the distribution. |
| **Interpret data presented in a variety of ways** | |
| **Estimate and use probabilities** | 2. Understand simple probability terms and concepts. |