

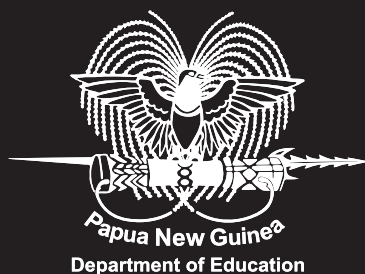
# **Mathematics**

## **Syllabus**

### **2015**



**Standard Based**



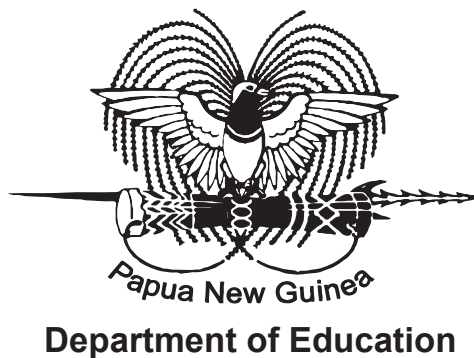
**Elementary**

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# **Mathematics**

## **Elementary Syllabus**

2015



**Issued free to schools by the Department of Education**

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## Secretary's Message

The Department of Education is responsible for the development and implementation of a relevant and quality national curriculum for its schools. The Government of Papua New Guinea has introduced a standards-based curriculum for its schools from Elementary Prep to Grade 8.

This Mathematics Syllabus is the new standards-based curriculum for elementary schools in Papua New Guinea. It covers the content to be taught in the first three years of school. It is an important part of raising standards in mathematics at the foundation level.

The syllabus is based on everyday mathematics used in the community. Teachers are encouraged to use resources in the community to help in their teaching.

The standards in the syllabus are the benchmarks for all children to achieve before they begin primary school. They are compulsory for all children.

The Department of Education has planned the daily lessons for every term in elementary. I instruct all teachers to use the lesson plans in the teacher guides to teach mathematics to a high standard.

I commend and approve this syllabus as the official curriculum for Language to be used in Elementary schools throughout Papua New Guinea.

.....  
**Dr Michael F Tapo, EdD**  
**Secretary for Education**

## Introduction

This syllabus explains the mathematics concepts and skills must be taught to all elementary children.

The syllabus must be used with the Teacher Guides. The Guides contain daily lesson plans for each grade. They are compulsory.

The Strand of study are:

**Strand 1: Number and Operation**

**Strand 2 Measurement**

**Strand 3 Geometry**

**Strand 4 Algebra**

**Strand 5 Data and Statistics**

The content is written as standards that the children need to achieve by the end of each year.

### **Time Allocation**

The minimum time for teaching mathematics will be 300 minutes per week for all three years of elementary school.

The timetable can be flexible to allow for spontaneous learning experiences.

## **Rationale**

All citizens have the right to participate in the future development of Papua New Guinea. Children need to develop sound mathematical knowledge and skills. The Elementary Mathematics syllabus provides the foundation for future learning.

Children should enjoy learning and using mathematics in their everyday lives. Understanding mathematics will give them confidence to do things by themselves and for themselves. They will learn through play and exploring mathematics in their home environment.

The Task Force Report (2013) recommended a move to a Standards Based Curriculum. The Report also recommended the use of scripted lessons to improve mathematics teaching and learning. Teachers will use this syllabus and the teachers' guides to help them to teach.

Benchmarking of skills and concepts will show teachers what children are expected to achieve in mathematics by the end of elementary 2.

## Aims

The aims of this syllabus are to;

- raise the standard of mathematics in every elementary school
- encourage enjoyment and interest in learning mathematics
- teach the child how to solve problems and to apply mathematics to everyday life
- prepare children for learning mathematics in primary school

## Curriculum principles

The syllabus is based on three learning principles;

- children learn best when we build new learning on what they already know in their culture and home
- when children play, use real objects and solve real life problems
- when mathematics is fun, challenging and structured.

### Catering for Diversity

All children have the right to good teaching. Boys and girls must be treated the same during lessons. Teachers must help all children to reach the standards in the syllabus. All children must be given the opportunity to achieve success.

### Teaching and Learning

The teaching of mathematics in elementary school will follow the daily lesson plans in the teacher guides. Teachers should use and adapt the lesson plans.

The lesson plans are progressive and cover all the content and skills needed in elementary.

Teachers must use child-centred teaching strategies to make the lessons enjoyable and challenging. Lessons should be practical and playful and use real objects. Children should be asked open and closed questions and set real-life problems. Children should be given opportunities to talk about mathematics confidently.



It is important to use the correct mathematical words. The lesson plans have a list of the words which must be taught. Children should learn these words in English and in their home language.

Children need to learn about their traditional mathematics and will build on this to learn standard mathematics. They will value their traditional culture.

The standards are easier to teach and assess. National benchmarks are also set in this syllabus for the end of elementary 2.

### **Technology**

Mental arithmetic is important so calculators are banned in elementary school.

The syllabus and teacher guides can be downloaded from [www.education.gov.pg](http://www.education.gov.pg)

### Materials and Resources

Children learn best when they use real objects to count and measure. Elementary schools must buy or make mathematical materials so there are enough for good quality teaching.

Every elementary classroom must have:

- clock
- clock faces
- scale balance
- beam balances
- counting sticks
- number flash cards
- linking cubes
- 100 square
- sets of coins and paper money
- 2D and 3D shapes
- metre rulers
- measuring jugs
- 1kg,  $\frac{1}{2}$  kg and  $\frac{1}{4}$  kg weights

## Content Overview

The syllabus is organised into five units of study;

### **Strand 1 Number and Operation**

This unit is about the decimal counting system and builds on the children's traditional mathematics to classify, match, compare and order numbers and objects in sets up to 100.

The unit also covers place value, addition, subtraction and simple fractions such as halves and quarters. It includes the 2, 5 and 10 times tables.

### **Strand 2 Measurement**

This unit introduces standard length, weight, capacity and time and how they are measured. It builds from traditional ways of measuring. The children will learn metre, litre and kilogram. They will learn to read a clock.

The unit also covers money.

### **Strand 3 Geometry**

This unit will deal with the concepts of shape and space and the language used to name, describe, sort and make common 2D and 3D shapes. Children will learn about angles and lines of symmetry in practical ways in their environment.

### **Strand 4 Algebra**

This unit will deal with number patterns and patterns in local art and craft. Children will solve and make simple problems such as  $A + B = 7$

### **Strand 5 Data and Statistics**

This unit will deal with collection of simple data and children will be taught to interpret simple picture graphs.

**Table of Strands and Sub strands**

Numbering has grade, strand and sub strand e.g. P.1.1

Strands	Sub strands for Elementary Prep	Sub strands for Elementary 1	Sub strands for Elementary 2
<b>1. Number and Operation</b>	<b>P.1.1</b> Counting  <b>P.1.2</b> Comparing and ordering  <b>P.1.4</b> Addition & Subtraction	<b>1.1.1</b> Counting  <b>1.1.2</b> Comparing and ordering  <b>1.1.3</b> Place value  <b>1.1.4</b> Addition  <b>1.1.5</b> Subtraction  <b>1.1.6</b> Fractions	<b>2.1.1</b> Counting  <b>2.1.2</b> Comparing and ordering  <b>2.1.3</b> Place value  <b>2.1.4</b> Addition  <b>2.1.5</b> Subtraction  <b>2.1.6</b> Fractions
<b>2. Measurement</b>	<b>P.2.1</b> Length  <b>P.2.2</b> Weight  <b>P.2.3</b> Capacity  <b>P.2.4</b> Time  <b>P.2.5</b> Money	<b>1.2.1</b> Length  <b>1.2.2</b> Weight  <b>1.2.3</b> Capacity  <b>1.2.4</b> Time  <b>1.2.5</b> Money	<b>2.2.1</b> Length  <b>2.2.2</b> Weight  <b>2.2.3</b> Capacity  <b>2.2.4</b> Time  <b>2.2.5</b> Money
<b>3. Geometry</b>	<b>P.3.1.</b> Plane shapes (2D shapes)  <b>P.3.3</b> Angles & directions  <b>P.3.5</b> Solids (3D shapes)	<b>1.3.1 2</b> Plane shapes (2D shapes)  <b>1.3.2.</b> Symmetry  <b>1.3.3</b> Angles & Directions  <b>1.3.5</b> Solids (3D) shape	<b>2.3.1.</b> Plane shapes (2D shapes)  <b>2.3.2</b> Symmetry  <b>2.3.3</b> Angles & Directions  <b>2.3.4</b> Area  <b>2.3.5</b> Solids (3D shapes)
<b>4. Algebra</b>	<b>P.4.1</b> Extending Patterns	<b>1.4.1</b> Extending and Using Patterns	<b>2.4.1</b> Extending and Using Patterns
<b>5. Data and Statistics</b>	<b>P.5.1</b> Representing and interpreting data	<b>1.5.1</b> Representing and interpreting data	<b>2.5.1</b> Representing and interpreting data

## Subject Standard Statements

Strands	Sub strands for Elementary Prep	Sub strands for Elementary 1	Sub strands for Elementary 2
<b>1 Number and Operation</b>	count sets to 20, compare, order partition and combine numbers using concrete objects in playful ways	count sets; 0-50, compare, order and combine numbers using concrete objects, read and write numbers, do addition and subtraction and calculate halves in fraction	count sets; 0 to 100, compare, order and combine numbers using concrete objects, read and write numbers, do addition and subtraction and calculate halves and quarters in fraction
<b>2 Measurement</b>	Describe length, weight, capacity, time and money and be able to measure using local and standard units.	Describe and measure length, weight, capacity, time and money using standard units.	Measure length, weight, capacity, time and money using standard units. Describe area in a space and shape
<b>3 Geometry</b>	Describe and identify features of 2-D and 3-D shapes	Describe and identify features of 2-D and 3-D shapes and drew one line of symmetry	Describe and identify features of 2-D and 3-D shapes, symmetrical shapes and angles in an environment.
<b>4 Algebra</b>	Make patterns of various shapes, colours and numbers	Make patterns of various shapes, colours and numbers and use them	Make and build patterns of various shapes, colours and numbers and use them in practical ways
<b>5 Data and Statistics</b>	Represent and interpret data in two rows of columns using real objects, model and pictures	Represent and interpret data in two, three or four rows of columns using real objects, model and pictures	Represent, read and interpret simple pictorial graphs

## Strand 1: Number and Operation

By the end of Elementary Prep. the child can	By the end of Elementary 1 the child can	By the end of Elementary 2 the child can
<b>P.1.1 Counting</b> <ul style="list-style-type: none"> <li>Count and estimate the number of objects in a set, 0-20 or more</li> <li>Read, write and order numbers 0 -20 or more</li> </ul>	<b>1.1.1 Counting</b> <ul style="list-style-type: none"> <li>Count, read, write and order numbers 0 -50 or more</li> <li>Recognise even and odd numbers</li> <li>Estimate the number of objects in a set 0 -50 or more</li> </ul>	<b>2.1.1 Counting</b> <ul style="list-style-type: none"> <li>Count, read, write and order numbers 0-100 or more</li> <li>Double and halve 2-50</li> </ul>
<b>P.1.2 Comparing and ordering</b> <ul style="list-style-type: none"> <li>Compare and order sets of objects and numbers 0 -20 or more</li> <li>Use vocabulary: first, second, third, last</li> </ul>	<b>1.1.2 Comparing and ordering</b> <ul style="list-style-type: none"> <li>Compare and order sets of objects and numbers 0 -50 or more</li> <li>Use vocabulary: first to twentieth</li> </ul>	<b>2.1.2 Comparing and ordering</b> <ul style="list-style-type: none"> <li>Compare and order sets of objects and numbers 0 -100</li> <li>Count from 1st to 31st using a</li> </ul>
	<b>1.1.3 Place value</b> <ul style="list-style-type: none"> <li>Write numbers in tens and units 1-50 or more</li> <li>Break a number into tens and units e.g. <math>24 = 20 + 4</math></li> </ul>	<b>2.1.3 Place value</b> <ul style="list-style-type: none"> <li>Write numbers in hundreds, tens and units 0 -100 or more</li> <li>Break and combine a number into hundreds, tens and units e.g. <math>75 = 70 + 5</math> &amp; <math>70 + 5 = 75</math></li> </ul>
<b>P.1.4 Addition &amp; Subtraction</b> <ul style="list-style-type: none"> <li>Combine and separate sets of objects, 0 -20 or more</li> <li>Solve simple oral and pictorial problems 0 -20 or more</li> </ul>	<b>1.1.4 Addition &amp; Subtraction</b> <ul style="list-style-type: none"> <li>Add sets of objects and numbers 0 -50 or more</li> <li>Make number sentences and stories and solve addition problems 0 -50 or more</li> <li>Do repeated addition for numbers 2 and 5</li> </ul>	<b>2.1.4 Addition &amp; Subtraction</b> <ul style="list-style-type: none"> <li>Add sets of objects and numbers 0 -100 or more</li> <li>Make number sentences and stories and solve addition problems 0 -100 or more</li> <li>Do repeated addition for number 10</li> <li>Read and use +, - and =</li> </ul>

By the end of Elementary Prep. the child can	By the end of Elementary 1 the child can	By the end of Elementary 2 the child can
	<b>1.1.5 Subtraction</b> <ul style="list-style-type: none"> <li>• Make number sentences and stories to estimate and solve subtraction problems 1-50 or more</li> <li>• Use mental arithmetic to solve simple addition and subtraction sums 1-50 or more</li> </ul>	<b>2.1.5 Subtraction</b> <ul style="list-style-type: none"> <li>• Make number sentences and stories to estimate and solve subtraction problems 1-100 or more</li> <li>• Use mental arithmetic to solve simple addition and subtraction sums 1-100 or more</li> </ul>
	<b>1.1.6 Fractions</b> <ul style="list-style-type: none"> <li>• Divide into halves whole objects and sets of objects</li> </ul>	<b>2.1.6 Fractions</b> <ul style="list-style-type: none"> <li>• Divide into halves and quarters whole objects and sets of objects</li> </ul>

## Strand 2 Measurement

By the end of Elementary Prep. the child can	By the end of Elementary 1 the child can	By the end of Elementary 2 the child can
<b>P.2.1 Length</b> <ul style="list-style-type: none"> <li>Measure height and length in non-standard ways</li> <li>Compare height and length using 'longer than', 'shorter than' taller than</li> </ul>	<b>1.2.1 Length</b> <ul style="list-style-type: none"> <li>Estimate and measure height, width and length using a metre ruler or a 1 metre rope</li> <li>Compare height and length using 'more than 1m' or 'less than 1m'</li> </ul>	<b>2.2.1 Length</b> <ul style="list-style-type: none"> <li>Estimate, measure and record height, width and length using a metre ruler or rope</li> <li>Solve simple problems about length and height using 1m, <math>\frac{1}{2}</math>m and <math>\frac{1}{4}</math> m</li> </ul>
<b>P.2.2 Weight</b> <ul style="list-style-type: none"> <li>Measure light and heavy objects using non-standard units</li> <li>Compare light and heavy objects using 'lighter than' and 'heavier than'</li> </ul>	<b>1.2.2 Weight</b> <ul style="list-style-type: none"> <li>Estimate and measure light and heavy objects using improvised balances</li> <li>Compare light and heavy objects using improvised balances</li> </ul>	<b>2.2.2 Weight</b> <ul style="list-style-type: none"> <li>Estimate, measure and record weight using a scale balance</li> <li>Solve simple weight problems using 1kg, <math>\frac{1}{2}</math>kg and <math>\frac{1}{4}</math> kg</li> </ul>
<b>P.2.3 Capacity</b> <ul style="list-style-type: none"> <li>Compare and order different sizes of containers</li> <li>Estimate and compare how much each container can hold in</li> </ul>	<b>1.2.3 Capacity</b> <ul style="list-style-type: none"> <li>Compare, estimate and measure the capacity of containers using standard units litre (L)</li> </ul>	<b>2.2.3 Capacity</b> <ul style="list-style-type: none"> <li>Estimate, measure and record capacity of containers using standard units, e.g. 1L; <math>\frac{1}{2}</math> L</li> <li>Solve simple capacity problems</li> </ul>
<b>P.2.4 Time</b> <ul style="list-style-type: none"> <li>Order daily and weekly events</li> <li>Tell time using morning, lunch, afternoon, before, after</li> <li>Read time in one hour intervals</li> </ul>	<b>1.2.4 Time</b> <ul style="list-style-type: none"> <li>Read day, date and month using a calendar</li> <li>Read time in hours and half hour on clock face</li> </ul>	<b>2.2.4 Time</b> <ul style="list-style-type: none"> <li>Read day, date, month and year</li> <li>Record how long daily events last e.g. hours of darkness; morning lessons</li> <li>Understand quarter past and quarter to</li> </ul>
<b>P.2.5 Money</b> <ul style="list-style-type: none"> <li>Recognise notes up to K20 and coins up to K1</li> <li>Do play activities to solve simple money problems</li> </ul>	<b>1.2.5 Money</b> <ul style="list-style-type: none"> <li>Recognise notes up to K50 and exchange and use coins up to K1 or more</li> <li>Calculate how many items may be bought with a sum</li> </ul>	<b>2.2.5 Money</b> <ul style="list-style-type: none"> <li>Recognise notes to K100 and exchange and use coins up to K2 or more</li> <li>Solve simple money problems</li> </ul>



### Strand 3: Geometry

By the end of Elementary Prep. the child can	By the end of Elementary 1 the child can	By the end of Elementary 2 the child can
<b>P.3.1. Plane shapes (2D shapes)</b> <ul style="list-style-type: none"> <li>Identify and name circles, triangle, squares in their environment</li> </ul>	<b>1.3.1 2 Plane shapes (2D shapes)</b> <ul style="list-style-type: none"> <li>Identify and sort four sided shapes in their environment</li> <li>Draw plain shapes and make patterns</li> </ul>	<b>2.3.1. Plane shapes (2D shapes)</b> <ul style="list-style-type: none"> <li>Identify, describe and name the most common shapes in their environment</li> </ul>
	<b>1.3.2. Symmetry</b> <ul style="list-style-type: none"> <li>Identify one line of symmetry in shapes and in the environment and art</li> </ul>	<b>2.3.2 Symmetry</b> <ul style="list-style-type: none"> <li>Identify two lines of symmetry in shapes and in the environment and art</li> </ul>
<b>P.3.3 Angles &amp; directions</b> <ul style="list-style-type: none"> <li>Give and follow simple moving and turning directions using forwards, backwards, sideways, up, down, left, right</li> </ul>	<b>1.3.3 Angles &amp; directions</b> <ul style="list-style-type: none"> <li>Identify right angles in the environment</li> <li>Give, follow and draw simple moving and turning directions using half turns, clockwise and anticlockwise</li> </ul>	<b>2.3.3 Angles &amp; directions</b> <ul style="list-style-type: none"> <li>Give, follow and draw simple directions and maps within classroom and school settings including turning directions, using half and quarter turns</li> <li>Describe angles as more than or less than a right angle</li> </ul>
		<b>2.3.4 Area</b> <ul style="list-style-type: none"> <li>Compare, estimate and measure areas using non-standard units</li> </ul>
<b>P.3.5 Solids (3D shapes)</b> <ul style="list-style-type: none"> <li>Select and sort solid shapes found in their environment</li> </ul>	<b>1.3.5 Solids (3D) shape Group,</b> <ul style="list-style-type: none"> <li>Group, describe and name common solid shapes using non-standard words like ball, box, tins, cans</li> </ul>	<b>2.3.5 Solids (3D shapes)</b> <ul style="list-style-type: none"> <li>Name, describe and compare solid shapes using maths names: cube, cuboid, sphere, cone and cylinder</li> <li>Identify 2D shapes in 3D shapes</li> </ul>

## Strand 4 : Algebra

By the end of Elementary Prep the child can	By the end of Elementary 1 the child can	By the end of Elementary 2 the child can
<b>P.4.1 Extending Patterns</b> <ul style="list-style-type: none"> <li>Recognize and complete simple patterns in colour, shapes and sizes</li> <li>Know that the same number of objects can be arranged in different ways</li> </ul>	<b>1.4.1 Extending and Using Patterns</b> <ul style="list-style-type: none"> <li>Recognize odd and even number patterns</li> <li>Recognize and use number patterns in addition and subtraction from 1-50</li> <li>Work out missing numbers e.g. 4, 5, 6 or <math>A + 4 = 8</math></li> </ul>	<b>2.4.1 Extending and Using Patterns</b> <ul style="list-style-type: none"> <li>Recognize odd and even numbers patterns</li> <li>Recognize and use number patterns in addition and subtraction from 1-100</li> <li>Work out missing numbers from longer patterns e.g. 3, 8, 13, ... or <math>B - X = 10</math></li> </ul>

## Unit 5 Data and Statistics

By the end of Elementary Prep. the child can	By the end of Elementary 1 the child can	By the end of Elementary 2 the child can
<b>P.5.1 Representing and interpreting data</b> <ul style="list-style-type: none"> <li>Collect objects and sort them into groups</li> </ul>	<b>1.5.1 Representing and interpreting data</b> <ul style="list-style-type: none"> <li>Select and sort real objects by two features e.g. shape, colour or size</li> </ul>	<b>2.5.1 Representing and interpreting data</b> <ul style="list-style-type: none"> <li>Select and sort real objects by three features e.g. shape, color and size</li> <li>Make, read and interpret simple pictorial graph</li> </ul>

## Assessment

The standards are written so they are easy to assess. There are three types of assessment tasks built into the lesson plans or units of work:

### 1. Assessment for learning

Assessment for learning is on-going assessment (also known as “formative assessment”). It is the assessment that teachers do every day during their teaching and at the end of the lesson.

Formative assessment helps a teacher to plan their next lesson.

### 2. Assessment as learning

Assessment as learning means that children are involved in assessing their own progress and the work of other peers in the class.

### 3. Assessment of learning

Assessment of learning is also called “summative assessment”. This form of assessment is done at the end of a topic or term.

National benchmarking or end of term tests are examples of assessment of learning.

### Recording

It is important for teachers to keep a record of children’s progress and any problems they are having.

The teachers must use the progress chart in the teacher guides to record children’s learning at the end of each year.

### Reporting

It is compulsory for teachers to;

- report the child’s progress to parents at the end of each term;
- pass the child’s records to the next teacher before the next school year begins;
- pass the child’s records to the primary school when they graduate from elementary.

### Evaluation

Evaluation is when the teacher reflects on their own teaching to improve the children’s learning. For example,

- Was the lesson effective?
- Did the children reach the expected standard?
- How can I improve my teaching?

### **National benchmarks**

Benchmarking takes place at the end of Elementary 2, Grade 5 and Grade 8.

Benchmarks are the national standards that all children should reach at the end of each level of their schooling.

The standards statements are the benchmarks for the end of that level.

The school must record and report the children's achievement. The School Learning Improvement Plan must set a target for improving the standards the children achieve. The Standards Officer will inspect the children's progress towards the standards.

### **National benchmarks for Mathematics**

By the end of Elementary Two the child should achieve the standards as set in the syllabus for:

#### **Strand 1: Number and Operations**

- Read, write and order numbers 0-100
- Know odd and even numbers
- Separate any two digit number into tens and units  
e.g.  $75 = 70 + 5$
- Add and subtract any two digit number within 100
- Know their 2, 5 and 10 times table
- Solve simple real-life addition and subtraction problems
- Divide sets of objects into halves and quarters

#### **Strand 2: Measurement**

- Estimate and measure using:
- Length (meters and half metres)
- Weight (kilogram and half kilograms)
- Capacity (litres and half litres)
- Read time in hours and half hours using a clock face
- Use money up to K2 to solve every day problems

#### **Strand 3: Geometry**

- Use half turn and quarter turn in directions and right angles in the environment
- Name and sort common 2D and 3-D shapes
- Identify lines of symmetry in flat shapes

**Strand 4: Algebra**

- Complete missing number patterns
- Predict numbers in simple problems e.g.  $4 + B = 17$

**Strand 5: Data and Statistics**

- Read and interpret simple pictorial graphs

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NSW Mathematics Syllabus

