

Introduction

This syllabus makes explicit the knowledge, skills, attitudes and values that students should achieve for Grades 3, 4 and 5 in Mathematics. These are expressed as learning outcomes and indicators. The learning outcomes are student-centred and written in terms that enable them to be demonstrated, assessed and measured. The outcomes are written to show the progression of learning from one grade to the next.

The syllabus flows from Cultural Mathematics at Elementary level. It focuses on developing numerical, analytical and investigative skills to solve real life problems likely to be encountered in the students' cultures and communities. Furthermore, it provides a sound foundation for future mathematical studies and provides the numeracy knowledge and skills necessary for Upper Primary Mathematics.

The main languages of instruction at Lower Primary are vernacular and English. By using the students' vernacular languages and using relevant contexts, teachers will enhance students' understanding of mathematical concepts. Research has shown that students learn best in their first language. Teachers teaching this course must be competent in the language the children speak, so that they explain mathematical concepts clearly to the students.

Teachers will use the syllabus and teacher guide together, along with other support materials to present this course.

Mathematics is to be timetabled for 210 minutes per week in all Lower Primary Schools.

Key links between the Elementary, Lower Primary and Upper Primary learning areas, subjects and strands are shown in the table below.

Key links between Elementary, Lower Primary and Upper Primary

	Elementary	Lower Primary	Upper Primary
Learning Area	Mathematics	Mathematics	Mathematics
Subject	Cultural Mathematics	Mathematics	Mathematics
Strands	Number Measurement Space Chance Patterns	Number and Application Measurement Space and Shape Chance and Data Patterns	Number and Application Measurement Space and Shape Chance and Data Patterns and Algebra

Rationale

All citizens in Papua New Guinea have the right to participate fully in all aspects of development and self-determination. To do this, students need to develop sound mathematical knowledge, skills and understanding. Students need to have a thorough understanding of Mathematics in order to find solutions to real life problems. By linking new mathematical concepts to existing cultural knowledge, students integrate their knowledge, skills and understanding so that they can use Mathematics in familiar and interesting contexts in their own lives.

In everyday situations sound mathematical reasoning skills are required, such as buying, selling, earning an income, building a house, making a meri blouse or even interpreting political statements. Therefore it is important that our Mathematics curriculum caters for these changing needs, by making Mathematics more relevant and accessible to students.

There are pressing issues in Papua New Guinea regarding population growth, inequitable distribution of resources, corruption and compensation demands which can be better addressed with a good understanding of Mathematics. This course teaches the Mathematics needed to understand these issues and thus allows the next generation to take steps to correct these problems.

For these reasons it is important that we use Mathematics in schools to produce a mathematically literate population.

Curriculum Principles

Curriculum principles identify, describe and focus attention on the important concerns that must be addressed when developing the curriculum at all levels of schooling. They are based on significant cultural, social and educational values and beliefs. The three curriculum principles that provide the focus for Lower Primary syllabuses are:

- Our Way of Life
- Integral Human Development
- Teaching and Learning.

These principles should guide teachers in what they teach, how they teach and how students learn and apply their learning.

Our Way of Life

Bilingual education

There are over 800 different spoken languages across Papua New Guinea. Most Papua New Guinean students do not speak English as their first language.

Bilingual education is the regular use of two languages for instruction. Papua New Guinea's *Language Policy in All Schools* (NDOE, 1999) requires a bilingual approach to education that incorporates bridging to English in Grades 3, 4 and 5. This policy states:

At the Lower Primary level (Grades 3–5) the learning and teaching will be conducted in a bilingual situation, in which there is planned, gradual bridging from vernacular (or the lingua franca) to English. Oral and written vernacular language development will continue throughout Lower Primary. Oral and written English development will gradually be introduced and established as the major language of instruction by the end of Grade 5...

At the Lower Primary level, while English is being learned, the language mostly used for teaching and learning should be the same language that the children used in Elementary school.

Where a number of active languages exist in one community, the main language of interaction between the language groups and of commerce in the community should be the language selected, that is the local lingua franca.

(Ministerial Policy Statement no. 38/99, NDOE, 1999)

Lower Primary uses a bilingual education approach because current international educational research indicates that there are academic benefits for students from being bilingual. Students continue to learn in their first language because learning only in English as a second language can limit their learning and social development. As students become confident in

Bilingual education:
the regular use of two languages for instruction.

thinking, reasoning, problem solving and decision making in their vernacular, they are more able to learn another language such as English. It is important to continue to develop, expand and enhance vernacular language to the language used by adults in and out of the classroom.

Bridging to English

Bridging to English:
the gradual change from vernacular to English instruction during Grades 3 to 5.

Students complete Elementary education in their vernacular. Bridging to English is the gradual change from vernacular to English instruction during Grades 3 to 5. Bridging, while maintaining vernacular language, helps students retain their identity, culture, self-confidence and self-esteem.

The table below shows the gradual progression from vernacular to English. It is anticipated that, as students become more confident in their English skills, the time allocation for vernacular instruction will be reduced. The percentages presented in this table are suggestions only to help teachers see the expected progression.

Suggested Percentage of Teaching, Learning and Assessment in Lower Primary in Vernacular and English					
Grade 3		Grade 4		Grade 5	
vernacular	English	vernacular	English	vernacular	English
60%	40%	50%	50%	30%	70%

Using vernacular language for continued learning and development while English is being learned is an effective way for Papua New Guinean students to develop their full potential.

Bridging to English strategies will be explained with examples in the Teacher Guide.

Multiculturalism

As a multicultural society, we must protect, promote and respect our many cultures and languages. The diversity of our cultures is the source of our knowledge, skills, attitudes and Melanesian values. These values will be promoted and language and literacy knowledge will enable students to share understanding of these with the rest of the world. In the same way, students will learn to exchange understanding from stories and knowledge from the past relating to their communities and environments. In this way, multiculturalism will be maintained and enjoyed whilst learning experiences will be enriched.

Integral Human Development

Catering for diversity

Gender

All Lower Primary syllabuses are designed to cater for the educational needs and interests of both girls and boys. The Department of Education's *Gender Equity in Education Policy* (NDOE, 2003) recommends that no student in the education system of Papua New Guinea will be disadvantaged on the basis of gender.

To implement the policy, teachers have the responsibility to use and promote gender equity practices in their classrooms and within the wider community. This means they will provide:

- a curriculum that caters for the educational needs of girls and boys
- a safe, challenging learning environment which is socially and culturally supportive
- programs that recognise the contributions to society of women and men.

In Papua New Guinea, there is a need for sensitivity to local cultural practices and values with respect to traditional roles for males and females. In Mathematics, students will be given equal opportunities to participate in all class and assessment activities regardless of their gender. Mathematics will enable students to develop positive attitudes towards sensitive cultural issues about gender.

In gender-sensitive classrooms, students:

- take turns in being the leader, reporter and taking other roles in group work
- share and participate in activities involving different students
- show respect for other students and their contributions.

Students with special needs

Many students have special needs. This includes students who are gifted and those who are disadvantaged. Gifted students should be given opportunities to extend their learning. Students with physical or intellectual impairments and emotional or learning difficulties need special support in the classroom. Teachers have a responsibility to ensure that the learning needs of these students are met. All students are individuals and all have the right to quality education in order to reach their full potential.

Teaching and Learning

This Mathematics Syllabus is based on three learning principles.

- We learn best when we build new learning on what is already known.
- We learn well when we recognise an immediate use or need for what is to be learned.
- We use ideas and skills in a coordinated way to solve real problems.

This syllabus continually refers to previous knowledge and skills and teachers need to see Mathematics in contexts that are familiar and of interest to students. This contextual approach requires students to participate in both problem-setting and problem-solving processes.

Students need to use concepts and skills from many areas of Mathematics to find solutions to problems in real life situations. This approach facilitates a student-based mode of learning.

Whilst using meaningful contexts for the students, teachers in Primary schools often prefer to use an integrated approach to teaching and learning. The teacher creates programs that are meaningful, appropriate, engaging and motivating to students. The use of learning outcomes provides opportunities to integrate the curriculum.

Teachers should map out the learning outcomes for those parts of the syllabus that they intend to teach in the coming term or year. Where there is more than one teacher across the grade, this should be done as a small team. Teachers in the school with leadership responsibilities should be invited to attend and support this planning process. While carrying out this process, links between learning outcomes for different subjects should be noted, as there is scope for combining and using these outcomes in an integrated approach to teaching.

For example Mathematics Outcome 3.5.1 'Make and describe patterns and number patterns' refers to making and describing patterns from within the students' community and Arts at Grade 3 also has outcomes related to patterns. Teachers can link these related outcomes from different subjects and develop integrated programs to address them. In this way evidence of the achievement of these outcomes can be provided in more than one subject.

Inclusive curriculum

All students are individuals and all have the right to quality education in order to reach their full potential. An inclusive curriculum uses content, language and teaching methods that take account of all students. All Lower Primary syllabuses value the experiences and knowledge of all students, regardless of gender, ability, geographic location, religious and cultural background or socioeconomic status.

Teachers must ensure that the teaching, learning and assessment activities include all students fairly when interpreting and implementing syllabus learning outcomes. The following statements identify important requirements of an inclusive curriculum:

- All students have fair access to resources, such as time spent with the teacher, space in the classroom, books, equipment and playground space.
- All students have equal opportunity to participate fully in teaching, learning and assessment activities.

- The curriculum includes and addresses the needs and interests of all students: girls as well as boys, gifted students, students with disabilities and students from different cultural and religious backgrounds.
- The experiences and knowledge of all students are valued by teachers and are reflected in classroom practice.
- Teaching and learning methods cater for different learning styles by allowing students opportunities to learn in different ways.
- Teachers use a variety of assessment methods that give students opportunities to demonstrate achievement of learning outcomes.

Teachers have a responsibility to ensure that the curriculum they teach and the classroom practices they use give all students the opportunity to reach their full potential.

Relevance

It is important to establish daily routines for students, however teachers are encouraged to be flexible with the times allocated, to allow for spontaneous learning experiences.

Special projects, field trips and events such as cultural shows, sports, births and deaths often provide opportunities for integrated holistic learning, which should be encouraged. Teachers should allow students to take part in such local activities to make learning more interesting and relevant.

Student-centred learning

The teaching and learning approaches required for this syllabus are student-centred. They should promote the philosophy of 'how to think', not 'what to think'. The student-centred learning activities include investigating, problem solving and class excursions.

These provide opportunities for students to work cooperatively to discuss, make decisions, plan, organise, carry out activities, record results and report findings. Activities should also allow the students to listen to each other's opinions, demonstrate their strategies and critically analyse results.

Teaching and learning promotes the philosophy of 'known to unknown', building on what the students know and teaching concepts using relevant contexts for better understanding. The teaching and learning approaches must be student-centred and where possible, student-directed.

Language development across the curriculum

Language development across the curriculum should be encouraged because all subject areas provide meaningful contexts for real purpose learning. Specific subjects have different language requirements such as vocabulary and language features. The conventions and differences must be explicitly taught in relevant contexts across the curriculum.

Multigrade teaching

The contextual approach used for this course lends itself to multigrade teaching. The same context can be used for all students in a multigrade classroom with the more advanced students tackling difficult work and those less advanced students doing similar activities at a lower level.

Teachers of multigrade classes will need to plan their programs of work carefully so that students do not repeat the same content and contexts. In this way students will progress through the skills stages presented in the outcomes. It is best if the same teacher remains with the multigrade class over the number of years represented in that class. If this is not possible, then the replacement teacher will need to use the programs of the previous teacher for writing new programs.

Thematic teaching and integration

A thematic, activity-based approach is also recommended in Lower Primary classes. Teaching and learning activities should be based on themes derived from the learning outcomes and the community calendar and be sensitive to local culture, traditions and seasons. The development of skills should be emphasised.

Some content or skills in the Lower Primary Mathematics Syllabus are also dealt with in other subject areas. These include measuring, drawing, classifying, collecting and presenting data, graphing, time, money, decimals and percentages.

The skills and knowledge taught in Mathematics are used widely in other subject areas. Content from other subjects provides suitable contexts in which to teach Mathematics. For example, if students are studying traditional skills to produce arts from different provinces in Arts, this would tie in with Patterns in Mathematics.

The Lower Primary Mathematics Curriculum is designed to be taught using a flexible approach to programming. While it is necessary for some of the content to be taught in sequence, the majority of the course can be taught in any order that suits the needs of the students and other subjects. Teachers are advised to take advantage of this to maximise the links between other subjects.

Aims

The aims of the Lower Primary Mathematics curriculum are for students to:

- develop and demonstrate the concepts, skills and attitudes flowing from Elementary *Cultural Mathematics*
- develop a sound foundation for further mathematical learning
- develop confidence in applying mathematical skills
- develop curiosity leading to the understanding of mathematical concepts
- develop critical judgement in selecting approaches to solving problems
- develop an appreciation of the cultural diversity in Mathematics in Papua New Guinea
- understand information in graphical, statistical and written forms
- master manipulative skills in presenting information by drawing, illustrating, identifying, comparing, measuring, calculating and graphing
- develop numerical, analytical and investigative skills to solve real life problems likely to be encountered in their culture and community.

Content Overview

The content for this syllabus is organised into five Strands. A Strand such as Number and Application is a useful way of organising the learning outcomes for a subject. Each Strand identifies a particular aspect of a subject or a particular theme or a set of processes and shows a typical progression of learning from one grade to the next. Each Strand is further organised into a number of Substrands to allow the content to be specific and described as learning outcomes.

Strands and Substrands

Lower Primary Mathematics has five Strands: Number and Application, Measurement, Space and Shape, Chance and Data, Patterns.

Number and Application has three Substrands: Number and Place Value, Fractions and Decimals, Operations: add, subtract, multiply, divide.

Measurement has five Substrands: Length, Area, Volume and Capacity, Weight, Time.

Space and Shape has two Substrands: Shapes, Angles and Directions.

Chance and Data has two Substrands: Probability and Sets, Graphs and Tables.

Patterns has a single Substrand: Patterns.

Number and Application

Students use local counting systems in the students' own language in the early part of Grade 3 as well as learning the formal language used in mathematics. The concept of the four operations: addition, subtraction, multiplication and division are dealt with in a practical way. The other common forms of number such as fractions, decimals and percentages are used in everyday situations.

Measurement

This Strand concentrates on the units used to describe length, area, volume and capacity, weight and time and how they are applied in everyday living. The concepts in this Strand focus on ways of estimating and measuring using local measurements as well as common formal measurements. Students estimate, measure, record, calculate and present their measurements in meaningful ways.

Space and Shape

Students learn concepts and the language required to discuss shapes, angles and direction. They learn about the features of two-dimensional and three-dimensional shapes, the properties of angles and how to give and follow directions to move from one location to another. They are presented with practical applications of what they are learning.

Chance and Data

Students use information to predict or make guesses about events that will happen, may happen or can never happen. Students also learn to use sets, statistical information, graphs and tables in practical situations.

Patterns

This Strand deals with number patterns and local art patterns, such as those used in bilums and pottery. Students are introduced to simple number patterns and their representations and meanings as they use numbers to write and form patterns.

Strands and Substrands for Mathematics

Strands	Substrands		
	Grade 3	Grade 4	Grade 5
Number and Application	Number and place value Operations: add, subtract, multiply, divide Fractions and decimals	Number and place value Operations: add, subtract, multiply, divide Fractions and decimals	Number and place value Operations: add, subtract, multiply, divide Fractions and decimals
Measurement	Length Area Volume and capacity Weight Time	Length Area Volume and capacity Weight Time	Length Area Volume and capacity Weight Time
Space and Shape	Shapes Angles and directions	Shapes Angles and directions	Shapes Angles and directions
Chance and Data	Probability and sets Graphs and tables	Probability and sets Graphs and tables	Probability and sets Graphs and tables
Patterns	Patterns	Patterns	Patterns

Learning Outcomes and Indicators

The Strands and Substrands are expressed as learning outcomes and indicators.

Learning outcome:
specific statement that identifies the knowledge, skills, attitudes and values all students should achieve or demonstrate.

A learning outcome is a specific statement that identifies the knowledge, skills, attitudes and values all students should achieve or demonstrate.

These statements are student-centred and written in terms that enable them to be demonstrated, assessed or measured. For example, 4.1.2 Explain relationships between individuals and groups in the wider community.

Lower primary syllabus

Indicators:
examples of the kinds of things students should be able to do, know and understand if they have achieved an outcome.

Indicators are examples of the kinds of things students should be able to do, know and understand if they have achieved an outcome.

Each learning outcome is accompanied by a set of indicators. Indicators are what students do, know and understand if they have achieved the learning outcomes. Learning outcomes help teachers to determine the standard expected of students at particular grades in particular subjects. Indicators are examples only and should not be used as checklists.

The learning outcomes and indicators will:

- give teachers, individually or collaboratively, the flexibility to write programs and units of work. These can be developed to suit local conditions and individual student needs
- help teachers assess and report students' achievements in relation to the learning outcomes
- allow students' achievement of the outcomes to be described in consistent ways
- help teachers to monitor student learning
- help teachers plan their future teaching programs.

Learning Outcomes

Numbering Learning Outcomes

Each learning outcome is numbered with three-digits, such as 3.1.2.

The first number refers to the Grade level. The second number refers to the Strand. The third number refers to the outcome in the Strand. Thus, 3.1.2 refers to an outcome at Grade 3, Strand number 1 and outcome number 2.

Strand	Grade 3	Grade 4	Grade 5
Number and Application	<p>3.1.1 Count, order, read and represent two and three digit numbers</p> <p>3.1.2 Apply and use the four operations to do calculations with two and three digit numbers</p> <p>3.1.3 Identify, and recognise common fractions</p> <p>3.1.4 Identify decimal notation in real life situations</p>	<p>4.1.1 Count, order, read and record three and four digit numbers</p> <p>4.1.2 Apply and use the four operations to do calculations with three and four digit numbers</p> <p>4.1.3 Compare and represent common fractions</p> <p>4.1.4 Compare and represent simple decimals up to two decimal places</p>	<p>5.1.1 Order, read and write four and five digit numbers</p> <p>5.1.2 Apply and use the four operations to do calculations with four and five digit numbers</p> <p>5.1.3 Use the four operations to solve problems related to common proper fractions</p> <p>5.1.4 Use the four operations to solve problems related to decimals</p>
Measurement	<p>3.2.1 Estimate and measure lengths, distances and perimeters using formal and informal units</p> <p>3.2.2 Estimate and measure areas using informal regular units</p> <p>3.2.3 Estimate and measure volume and capacity using informal units</p> <p>3.2.4 Estimate weights of objects using informal units</p> <p>3.2.5 Recognise formal and informal units of time</p>	<p>4.2.1 Estimate and measure lengths, distances and perimeters using standard units of length</p> <p>4.2.2 Estimate and measure areas of surfaces using standard units of area</p> <p>4.2.3 Estimate and measure volume and capacity using standard units of volume and capacity</p> <p>4.2.4 Estimate and measure weights of objects using standard units of weight</p> <p>4.2.5 Tell and read time accurately to the quarter hour</p>	<p>5.2.1 Estimate, measure and solve problems using standard units of length</p> <p>5.2.2 Use appropriate metric units to measure and calculate area</p> <p>5.2.3 Estimate, measure and solve problems using standard units of volume and capacity</p> <p>5.2.4 Estimate, measure and solve problems using standard units of weight</p> <p>5.2.5 Compare and discuss the relationship between parts of time and tell time correctly</p>
Space and Shapes	<p>3.3.1 Identify two and three dimensional shapes</p> <p>3.3.2 Recognise, compare and order angles</p>	<p>4.3.1 Investigate and describe features of two and three dimensional shapes</p> <p>4.3.2 Recognise, name and describe angles</p>	<p>5.3.1 Describe properties of two and three dimensional shapes</p> <p>5.3.2 Construct and name angles</p>
Chance and Data	<p>3.4.1 Use the language of chance to describe everyday events</p> <p>3.4.2 Draw and interpret simple graphs</p>	<p>4.4.1 Compare events according to their likelihood</p> <p>4.4.2 Construct and interpret information using graphs and simple timetables</p>	<p>5.4.1 Perform and record results of trials</p> <p>5.4.2 Represent and interpret information using graphs, tables and charts</p>
Patterns	<p>3.5.1 Make and describe patterns and number patterns</p>	<p>4.5.1 Develop arithmetical rules to describe number patterns</p>	<p>5.5.1 Use patterns and arithmetical rules to solve problems</p>

Learning Outcomes and Indicators

Strand: NUMBER AND APPLICATION

Substrand	Grade 3	Grade 4	Grade 5
<p>Number and Place Value</p> <p><i>All indicators are listed as bullet points after each outcomes. The list of indicators always begins with the statement: students will be achieving the above learning outcomes in vernacular and/or English, when they for example:</i></p>	<p>3.1.1 Count, order, read and represent two and three digit numbers</p> <p>Indicators Students will be achieving the above learning outcomes in vernacular and/or English, when they, for example:</p> <ul style="list-style-type: none"> • recognise, compare and group objects into 5s, 10s, 20s • estimate and count groups of 5 and 10 using real objects such as sticks, stones and shells • count and recall backwards and forwards 1–9, 10–100, 11– 999 • say, read and write numbers to 999 • match words with numbers and vice versa • represent numbers using base 10 materials such as a bundle of sticks, groups of stones and compare to their groupings • compare traditional number systems with Arabic number systems • show place values on an abacus to show units, tens and hundreds • recognise and count using odd and even numbers. 	<p>4.1.1 Count, order, read and record three and four digit numbers</p> <ul style="list-style-type: none"> • show numbers to 1000 by bundling concrete materials such as sticks • show numbers to 1000 using an abacus • represent thousands, hundreds, tens and units in words and numerals • compare numbers using 'more' or 'less' such as 10 more, 10 less • estimate and count the number of objects by forming groups • use terms such as approximately, equal to, less than, more than • recognise numbers in groups by arranging objects in patterns such as 2 x 3 to help identify numbers of objects. 	<p>5.1.1 Order, read and write four and five digit numbers</p> <ul style="list-style-type: none"> • read and write numbers including tens of thousands in words and numerals • represent tens of thousands using base 10 materials • round numbers off to the nearest ten, hundred, thousand and tens of thousand • arrange five digit numbers in ascending and descending order • recognise and order square and cubed numbers.

Strand: NUMBER AND APPLICATION

Substrand	Grade 3	Grade 4	Grade 5			
<p>Operations: add, subtract, multiply, divide</p>	<p>3.1.2 Apply and use the four operations to do calculations with two and three digit numbers</p>	<p>4.1.2 Apply and use the four operations to do calculations with three and four digit numbers</p>	<p>5.1.2 Apply and use the four operations to do calculations with four and five digit numbers</p>			
<p>Indicators Students will be achieving the above learning outcomes in vernacular and/or English, when they, for example:</p> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • add two or three digit numbers with trading using concrete materials, pictures and symbols • add and subtract numbers mentally using real life situations • recall multiplication tables for 2, 3, 4, 5, 10 • solve division problems using concrete materials, pictures and symbols dividing only by 1, 2, 3, 4, 5 and 10 • use concrete materials to make equal groups and describe the groups using 'lots of' or 'groups of' • multiply one and two digit numbers using concrete materials, pictures and symbols • share concrete materials equally between groups, such as divide 20 bananas between 5 people and record the operation with the division symbol: ÷ • recognise that multiplication tables such as '3 x 6' can be reversed to '6 x 3'. </td> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • add and subtract three and four digit numbers with and without trading using concrete materials and pictures • use addition and subtraction processes in problem solving • multiply two digit numbers by one and two digit numbers • use short and long multiplication, multiplying by up to two digit numbers • recall multiplication table facts of 6, 7, 8 and 9 • divide two and three digit numbers by a one digit divisor using appropriate division symbols • solve division problems using concrete materials, pictures and symbols, including dividing by 6, 7, 8 and 9 without remainders • multiply and divide using short and long multiplication and short division • recognise that division is the inverse of multiplication. </td> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • add and subtract four and five digit numbers with and without trading, using concrete materials if required • use addition and subtraction processes in problem solving • multiply two and three digit numbers by one, two and three digit numbers • divide three and four digit numbers by one and two digit divisors including those with remainders • solve multiplication and division word problems • multiply and divide using short and long multiplication and division. </td> </tr> </table>				<ul style="list-style-type: none"> • add two or three digit numbers with trading using concrete materials, pictures and symbols • add and subtract numbers mentally using real life situations • recall multiplication tables for 2, 3, 4, 5, 10 • solve division problems using concrete materials, pictures and symbols dividing only by 1, 2, 3, 4, 5 and 10 • use concrete materials to make equal groups and describe the groups using 'lots of' or 'groups of' • multiply one and two digit numbers using concrete materials, pictures and symbols • share concrete materials equally between groups, such as divide 20 bananas between 5 people and record the operation with the division symbol: ÷ • recognise that multiplication tables such as '3 x 6' can be reversed to '6 x 3'. 	<ul style="list-style-type: none"> • add and subtract three and four digit numbers with and without trading using concrete materials and pictures • use addition and subtraction processes in problem solving • multiply two digit numbers by one and two digit numbers • use short and long multiplication, multiplying by up to two digit numbers • recall multiplication table facts of 6, 7, 8 and 9 • divide two and three digit numbers by a one digit divisor using appropriate division symbols • solve division problems using concrete materials, pictures and symbols, including dividing by 6, 7, 8 and 9 without remainders • multiply and divide using short and long multiplication and short division • recognise that division is the inverse of multiplication. 	<ul style="list-style-type: none"> • add and subtract four and five digit numbers with and without trading, using concrete materials if required • use addition and subtraction processes in problem solving • multiply two and three digit numbers by one, two and three digit numbers • divide three and four digit numbers by one and two digit divisors including those with remainders • solve multiplication and division word problems • multiply and divide using short and long multiplication and division.
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Strand: NUMBER AND APPLICATION

Substrand	Grade 3	Grade 4	Grade 5			
<p>Fractions and Decimals</p>	<p>3.1.3 Identify, and recognise common fractions</p>	<p>4.1.3 Compare and represent common fractions</p>	<p>5.1.3 Use the four operations to solve problems related to common proper fractions</p>			
<p>Indicators Students will be achieving the above learning outcomes in vernacular and/or English, when they, for example:</p> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • identify and count parts of a whole such as halves, quarters, thirds • make and name common fractions such as halves, quarters, thirds and match them with concrete materials • represent common fractions using concrete materials starting with the same size whole • combine fractions to make a whole such as $\frac{1}{2} + \frac{1}{2} = 1$ using concrete materials. </td> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • identify simple fractions and recognise parts of a fraction such as numerator, denominator • make, compare and represent common fractions such as halves, thirds, quarters, fifths, tenths using concrete materials • model the addition of simple fractions with same denominators such as $\frac{1}{4} + \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$ and match to the symbols • model the subtraction of simple fractions with same denominators such as $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$ and match with the symbols • make, compare and recognise simple equivalent fractions such as $\frac{4}{8}$ to $\frac{2}{4}$ to $\frac{1}{2}$. </td> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • add and subtract common fractions in real life situations • multiply simple fractions with different denominators such as $\frac{2}{3} \times \frac{1}{2} = \frac{2}{6} = \frac{1}{3}$ • divide simple fractions with same denominators such as $\frac{2}{3} \div \frac{1}{3} = \frac{6}{3} = 2$ • use the four operations to solve real life problems related to fractions. </td> </tr> </table>				<ul style="list-style-type: none"> • identify and count parts of a whole such as halves, quarters, thirds • make and name common fractions such as halves, quarters, thirds and match them with concrete materials • represent common fractions using concrete materials starting with the same size whole • combine fractions to make a whole such as $\frac{1}{2} + \frac{1}{2} = 1$ using concrete materials. 	<ul style="list-style-type: none"> • identify simple fractions and recognise parts of a fraction such as numerator, denominator • make, compare and represent common fractions such as halves, thirds, quarters, fifths, tenths using concrete materials • model the addition of simple fractions with same denominators such as $\frac{1}{4} + \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$ and match to the symbols • model the subtraction of simple fractions with same denominators such as $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$ and match with the symbols • make, compare and recognise simple equivalent fractions such as $\frac{4}{8}$ to $\frac{2}{4}$ to $\frac{1}{2}$. 	<ul style="list-style-type: none"> • add and subtract common fractions in real life situations • multiply simple fractions with different denominators such as $\frac{2}{3} \times \frac{1}{2} = \frac{2}{6} = \frac{1}{3}$ • divide simple fractions with same denominators such as $\frac{2}{3} \div \frac{1}{3} = \frac{6}{3} = 2$ • use the four operations to solve real life problems related to fractions.
<ul style="list-style-type: none"> • identify and count parts of a whole such as halves, quarters, thirds • make and name common fractions such as halves, quarters, thirds and match them with concrete materials • represent common fractions using concrete materials starting with the same size whole • combine fractions to make a whole such as $\frac{1}{2} + \frac{1}{2} = 1$ using concrete materials. 	<ul style="list-style-type: none"> • identify simple fractions and recognise parts of a fraction such as numerator, denominator • make, compare and represent common fractions such as halves, thirds, quarters, fifths, tenths using concrete materials • model the addition of simple fractions with same denominators such as $\frac{1}{4} + \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$ and match to the symbols • model the subtraction of simple fractions with same denominators such as $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$ and match with the symbols • make, compare and recognise simple equivalent fractions such as $\frac{4}{8}$ to $\frac{2}{4}$ to $\frac{1}{2}$. 	<ul style="list-style-type: none"> • add and subtract common fractions in real life situations • multiply simple fractions with different denominators such as $\frac{2}{3} \times \frac{1}{2} = \frac{2}{6} = \frac{1}{3}$ • divide simple fractions with same denominators such as $\frac{2}{3} \div \frac{1}{3} = \frac{6}{3} = 2$ • use the four operations to solve real life problems related to fractions. 				

Strand: NUMBER AND APPLICATION

Substrand	Grade 3	Grade 4	Grade 5			
<p>Fractions and Decimals</p>	<p>3.1.4 Identify decimal notation in real life situations</p>	<p>4.1.4 Compare and represent simple decimals up to two decimal places</p>	<p>5.1.4 Use the four operations to solve problems related to decimals</p>			
<p>Indicators Students will be achieving the above learning outcomes in vernacular and/or English, when they, for example:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • identify how kina and toea are separated using decimal notation such as K0.30, K1.50, K4.20 • add and subtract simple money problems involving K10.00 or less • discuss and use Papua New Guinean money to solve simple decimal problems • write decimal numbers to show prices of goods such as K2.50 for a packet of rice. </td> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • represent decimal numbers involving hundreds, tens, units and tenths • represent decimals with concrete objects • add decimals with trading using concrete materials • subtract decimals with trading using concrete materials • identify and match simple fractions with decimals such as $\frac{1}{2} = 0.5$, $\frac{1}{10} = 0.1$, $\frac{1}{4} = 0.25$. </td> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • compare and order decimals • use decimals to convert measurement units such as millimetres to centimetres, centimetres to metres, kina to toea • round decimal numbers with two or three decimal places to the nearest tenth or hundredth • convert decimals to percentages such as $0.20 = 20\%$. </td> </tr> </table>				<ul style="list-style-type: none"> • identify how kina and toea are separated using decimal notation such as K0.30, K1.50, K4.20 • add and subtract simple money problems involving K10.00 or less • discuss and use Papua New Guinean money to solve simple decimal problems • write decimal numbers to show prices of goods such as K2.50 for a packet of rice. 	<ul style="list-style-type: none"> • represent decimal numbers involving hundreds, tens, units and tenths • represent decimals with concrete objects • add decimals with trading using concrete materials • subtract decimals with trading using concrete materials • identify and match simple fractions with decimals such as $\frac{1}{2} = 0.5$, $\frac{1}{10} = 0.1$, $\frac{1}{4} = 0.25$. 	<ul style="list-style-type: none"> • compare and order decimals • use decimals to convert measurement units such as millimetres to centimetres, centimetres to metres, kina to toea • round decimal numbers with two or three decimal places to the nearest tenth or hundredth • convert decimals to percentages such as $0.20 = 20\%$.
<ul style="list-style-type: none"> • identify how kina and toea are separated using decimal notation such as K0.30, K1.50, K4.20 • add and subtract simple money problems involving K10.00 or less • discuss and use Papua New Guinean money to solve simple decimal problems • write decimal numbers to show prices of goods such as K2.50 for a packet of rice. 	<ul style="list-style-type: none"> • represent decimal numbers involving hundreds, tens, units and tenths • represent decimals with concrete objects • add decimals with trading using concrete materials • subtract decimals with trading using concrete materials • identify and match simple fractions with decimals such as $\frac{1}{2} = 0.5$, $\frac{1}{10} = 0.1$, $\frac{1}{4} = 0.25$. 	<ul style="list-style-type: none"> • compare and order decimals • use decimals to convert measurement units such as millimetres to centimetres, centimetres to metres, kina to toea • round decimal numbers with two or three decimal places to the nearest tenth or hundredth • convert decimals to percentages such as $0.20 = 20\%$. 				

Strand: MEASUREMENT

Substrand	Grade 3	Grade 4	Grade 5			
<p>Length</p>	<p>3.2.1 Estimate and measure lengths, distances and perimeters using formal and informal units</p>	<p>4.2.1 Estimate and measure and lengths, distances and perimeters using standard units of length</p>	<p>5.2.1 Estimate, measure and solve problems using standard units of length</p>			
<p>Indicators Students will be achieving the above learning outcomes in vernacular and/or English, when they, for example:</p> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • discuss informal ways of measuring length such as using paces, hand span, strings • use appropriate informal units to estimate and measure lengths and distances • measure and compare lengths, distances and perimeters using formal units such as centimetres, metres • estimate perimeters of common regular shapes such as squares, triangles • estimate and arrange lengths of objects from shortest to longest or vice versa. </td> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • use appropriate standard units to estimate and measure lengths, distances and perimeters in metres, centimetres and millimetres • apply the idea of measuring length in real life practical situations such as <i>gardening</i> • establish and use the relationships of 10 mm = 1 cm and 100 cm = 1 m. </td> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • select and use appropriate units to calculate perimeters of squares, rectangles and triangles • explain and demonstrate basic relationships such as 10 mm = 1 cm, 100 cm = 1 m • measure and convert distances in metres and kilometres using given scales • use appropriate units to measure distances and perimeters. </td> </tr> </table>				<ul style="list-style-type: none"> • discuss informal ways of measuring length such as using paces, hand span, strings • use appropriate informal units to estimate and measure lengths and distances • measure and compare lengths, distances and perimeters using formal units such as centimetres, metres • estimate perimeters of common regular shapes such as squares, triangles • estimate and arrange lengths of objects from shortest to longest or vice versa. 	<ul style="list-style-type: none"> • use appropriate standard units to estimate and measure lengths, distances and perimeters in metres, centimetres and millimetres • apply the idea of measuring length in real life practical situations such as <i>gardening</i> • establish and use the relationships of 10 mm = 1 cm and 100 cm = 1 m. 	<ul style="list-style-type: none"> • select and use appropriate units to calculate perimeters of squares, rectangles and triangles • explain and demonstrate basic relationships such as 10 mm = 1 cm, 100 cm = 1 m • measure and convert distances in metres and kilometres using given scales • use appropriate units to measure distances and perimeters.
<ul style="list-style-type: none"> • discuss informal ways of measuring length such as using paces, hand span, strings • use appropriate informal units to estimate and measure lengths and distances • measure and compare lengths, distances and perimeters using formal units such as centimetres, metres • estimate perimeters of common regular shapes such as squares, triangles • estimate and arrange lengths of objects from shortest to longest or vice versa. 	<ul style="list-style-type: none"> • use appropriate standard units to estimate and measure lengths, distances and perimeters in metres, centimetres and millimetres • apply the idea of measuring length in real life practical situations such as <i>gardening</i> • establish and use the relationships of 10 mm = 1 cm and 100 cm = 1 m. 	<ul style="list-style-type: none"> • select and use appropriate units to calculate perimeters of squares, rectangles and triangles • explain and demonstrate basic relationships such as 10 mm = 1 cm, 100 cm = 1 m • measure and convert distances in metres and kilometres using given scales • use appropriate units to measure distances and perimeters. 				

Strand: MEASUREMENT

Substrand	Grade 3	Grade 4	Grade 5			
<p>Area</p>	<p>3.2.2 Estimate and measure areas using informal regular units</p>	<p>4.2.2 Estimate and measure areas of surfaces using standard units of area</p>	<p>5.2.2 Use appropriate metric units to measure and calculate area</p>			
<p>Indicators Students will be achieving the above learning outcomes in vernacular and/or English, when they, for example:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • use appropriate informal units to estimate areas within the environment such as garden beds • compare and order two or more areas within the environment • make and use a square to measure small areas such as a classroom floor • identify common areas such as a basket ball court, flower gardens • use informal regular units to measure area without gaps and overlaps. </td> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • use appropriate standard units to estimate and measure areas • estimate and measure surface areas using appropriate units such as square centimetres, square metres • find areas of objects such as desk tops and class flower gardens by drawing area grids • solve simple word problems from real life situations such as the area of a school playground. </td> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • use appropriate formal units to estimate and measure areas in square metres • select and use appropriate units to calculate area of squares, and rectangles using grids • calculate areas of simple compound shapes using grids • calculate area of triangles formed by cutting a rectangle diagonally • solve simple word problems from real life situations such as the area of a small coffee garden or copra plantation. </td> </tr> </table>				<ul style="list-style-type: none"> • use appropriate informal units to estimate areas within the environment such as garden beds • compare and order two or more areas within the environment • make and use a square to measure small areas such as a classroom floor • identify common areas such as a basket ball court, flower gardens • use informal regular units to measure area without gaps and overlaps. 	<ul style="list-style-type: none"> • use appropriate standard units to estimate and measure areas • estimate and measure surface areas using appropriate units such as square centimetres, square metres • find areas of objects such as desk tops and class flower gardens by drawing area grids • solve simple word problems from real life situations such as the area of a school playground. 	<ul style="list-style-type: none"> • use appropriate formal units to estimate and measure areas in square metres • select and use appropriate units to calculate area of squares, and rectangles using grids • calculate areas of simple compound shapes using grids • calculate area of triangles formed by cutting a rectangle diagonally • solve simple word problems from real life situations such as the area of a small coffee garden or copra plantation.
<ul style="list-style-type: none"> • use appropriate informal units to estimate areas within the environment such as garden beds • compare and order two or more areas within the environment • make and use a square to measure small areas such as a classroom floor • identify common areas such as a basket ball court, flower gardens • use informal regular units to measure area without gaps and overlaps. 	<ul style="list-style-type: none"> • use appropriate standard units to estimate and measure areas • estimate and measure surface areas using appropriate units such as square centimetres, square metres • find areas of objects such as desk tops and class flower gardens by drawing area grids • solve simple word problems from real life situations such as the area of a school playground. 	<ul style="list-style-type: none"> • use appropriate formal units to estimate and measure areas in square metres • select and use appropriate units to calculate area of squares, and rectangles using grids • calculate areas of simple compound shapes using grids • calculate area of triangles formed by cutting a rectangle diagonally • solve simple word problems from real life situations such as the area of a small coffee garden or copra plantation. 				

Strand: MEASUREMENT

Substrand	Grade 3	Grade 4	Grade 5			
<p>Volume and Capacity</p>	<p>3.2.3 Estimate and measure volume and capacity using informal units</p>	<p>4.2.3 Estimate and measure volume and capacity using standard units of volume and capacity</p>	<p>5.2.3 Estimate, measure and solve problems using standard units of volume and capacity</p>			
<p>Indicators Students will be achieving the above learning outcomes in vernacular and/or English, when they, for example:</p> <table border="1" data-bbox="416 622 1441 1164"> <tbody> <tr> <td data-bbox="416 622 759 1164"> <ul style="list-style-type: none"> • estimate and measure volumes using informal units • compare volumes using informal units • measure and compare capacity using different containers • compare local ways of measuring volume and capacity • identify recorded volumes of common items such as a carton, box • identify capacity of common items such as a can of soft drink. </td> <td data-bbox="759 622 1099 1164"> <ul style="list-style-type: none"> • demonstrate the volume of one cubic metre • describe objects with a capacity of about one litre such as a soft drink bottle • order plastic containers according to their capacity • find the capacity of objects such as cups, buckets and bottles by determining how many can be filled from one litre • measure and label volume and capacity of different containers using standard units • discuss standard units for measuring volume and capacity. </td> <td data-bbox="1099 622 1441 1164"> <ul style="list-style-type: none"> • investigate and identify appropriate units to measure capacity and volume • measure volumes of three-dimensional shapes using appropriate units such as cubic metres, cubic centimetres • convert one unit of capacity to another such as 1000 mL = 1 L. </td> </tr> </tbody> </table>				<ul style="list-style-type: none"> • estimate and measure volumes using informal units • compare volumes using informal units • measure and compare capacity using different containers • compare local ways of measuring volume and capacity • identify recorded volumes of common items such as a carton, box • identify capacity of common items such as a can of soft drink. 	<ul style="list-style-type: none"> • demonstrate the volume of one cubic metre • describe objects with a capacity of about one litre such as a soft drink bottle • order plastic containers according to their capacity • find the capacity of objects such as cups, buckets and bottles by determining how many can be filled from one litre • measure and label volume and capacity of different containers using standard units • discuss standard units for measuring volume and capacity. 	<ul style="list-style-type: none"> • investigate and identify appropriate units to measure capacity and volume • measure volumes of three-dimensional shapes using appropriate units such as cubic metres, cubic centimetres • convert one unit of capacity to another such as 1000 mL = 1 L.
<ul style="list-style-type: none"> • estimate and measure volumes using informal units • compare volumes using informal units • measure and compare capacity using different containers • compare local ways of measuring volume and capacity • identify recorded volumes of common items such as a carton, box • identify capacity of common items such as a can of soft drink. 	<ul style="list-style-type: none"> • demonstrate the volume of one cubic metre • describe objects with a capacity of about one litre such as a soft drink bottle • order plastic containers according to their capacity • find the capacity of objects such as cups, buckets and bottles by determining how many can be filled from one litre • measure and label volume and capacity of different containers using standard units • discuss standard units for measuring volume and capacity. 	<ul style="list-style-type: none"> • investigate and identify appropriate units to measure capacity and volume • measure volumes of three-dimensional shapes using appropriate units such as cubic metres, cubic centimetres • convert one unit of capacity to another such as 1000 mL = 1 L. 				

Strand: MEASUREMENT

Substrand	Grade 3	Grade 4	Grade 5			
<p>Weight</p>	<p>3.2.4 Estimate weights of objects using informal units</p>	<p>4.2.4 Estimate and measure weights of objects using standard units of weight</p>	<p>5.2.4 Estimate, measure and solve problems using standard units of weight</p>			
<p>Indicators Students will be achieving the above learning outcomes in vernacular and/or English, when they, for example:</p> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • estimate and describe weights using everyday language • compare and order the weight of objects using everyday language • demonstrate the weighing of objects using informal units • compare local ways of measuring weights • use mathematical language to describe and compare weights • identify recorded weights of familiar objects that have standard units such as a packet of rice • describe weights of two or more objects using comparison words such as heavier, heaviest, lighter, lightest. </td> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • compare weights of objects using standard units such as kilograms • measure weights to the nearest half kilogram • order and record weights of different objects in kilograms to the nearest half kilogram • weigh, order and arrange weights of children using a bathroom scale • collect various common objects, such as stones and exercise books to a total weight of one kilogram • use balance scales to classify weights by size and recognise equal weights, such as 1 kg packet of rice is equal to a certain number of exercise books. </td> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • estimate and compare different weights involving standard units such as grams, kilograms • classify and express weights of objects using grams, kilograms and tonnes • measure weights of objects using the balance scales, such as finding the number of pens to balance 100 g • add and subtract different weights using grams, kilograms and tonnes • separate a 500 g packet of rice into 5 equal parts to measure 100 g each. </td> </tr> </table>				<ul style="list-style-type: none"> • estimate and describe weights using everyday language • compare and order the weight of objects using everyday language • demonstrate the weighing of objects using informal units • compare local ways of measuring weights • use mathematical language to describe and compare weights • identify recorded weights of familiar objects that have standard units such as a packet of rice • describe weights of two or more objects using comparison words such as heavier, heaviest, lighter, lightest. 	<ul style="list-style-type: none"> • compare weights of objects using standard units such as kilograms • measure weights to the nearest half kilogram • order and record weights of different objects in kilograms to the nearest half kilogram • weigh, order and arrange weights of children using a bathroom scale • collect various common objects, such as stones and exercise books to a total weight of one kilogram • use balance scales to classify weights by size and recognise equal weights, such as 1 kg packet of rice is equal to a certain number of exercise books. 	<ul style="list-style-type: none"> • estimate and compare different weights involving standard units such as grams, kilograms • classify and express weights of objects using grams, kilograms and tonnes • measure weights of objects using the balance scales, such as finding the number of pens to balance 100 g • add and subtract different weights using grams, kilograms and tonnes • separate a 500 g packet of rice into 5 equal parts to measure 100 g each.
<ul style="list-style-type: none"> • estimate and describe weights using everyday language • compare and order the weight of objects using everyday language • demonstrate the weighing of objects using informal units • compare local ways of measuring weights • use mathematical language to describe and compare weights • identify recorded weights of familiar objects that have standard units such as a packet of rice • describe weights of two or more objects using comparison words such as heavier, heaviest, lighter, lightest. 	<ul style="list-style-type: none"> • compare weights of objects using standard units such as kilograms • measure weights to the nearest half kilogram • order and record weights of different objects in kilograms to the nearest half kilogram • weigh, order and arrange weights of children using a bathroom scale • collect various common objects, such as stones and exercise books to a total weight of one kilogram • use balance scales to classify weights by size and recognise equal weights, such as 1 kg packet of rice is equal to a certain number of exercise books. 	<ul style="list-style-type: none"> • estimate and compare different weights involving standard units such as grams, kilograms • classify and express weights of objects using grams, kilograms and tonnes • measure weights of objects using the balance scales, such as finding the number of pens to balance 100 g • add and subtract different weights using grams, kilograms and tonnes • separate a 500 g packet of rice into 5 equal parts to measure 100 g each. 				

Strand: MEASUREMENT

Substrand	Grade 3	Grade 4	Grade 5			
<p>Time</p>	<p>3.2.5 Recognise formal and informal units of time</p>	<p>4.2.5 Tell and read time accurately to the quarter hour</p>	<p>5.2.5 Compare and discuss the relationship between parts of time and tell time correctly</p>			
<p>Indicators Students will be achieving the above learning outcomes in vernacular and/or English, when they, for example:</p> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • introduce words for different parts of the day and relate to approximate clock time in hours • name the days of the week and discuss local activities done weekly such as Sunday worship days • discuss and use the words year, season, month, week, day, night, morning, afternoon, midday • use 7 days as 1 week and 12 months as a year to measure time • estimate how long a minute is and things that take more or less than 1 minute to complete • talk about a sequence of events and draw traditional calendars based on events from the local community • use simple calendars to work out when activities will take place, such as how many more weeks before Christmas holidays. </td> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • draw clock faces to show and tell the time using time on the hour, half hour and quarter hour • make and use clock faces to show the timing of activities in stories • tell and demonstrate time stories using calendars and timelines • solve problems on time such as how many hours before or after an event • relate school activity times to hour and half-hour times • use quarter hour intervals to tell the time in 'past' and 'to' form, such as quarter past 3 or quarter to 4. </td> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • describe and use five-minute intervals to tell the time in past and to form, such as 10 minutes to 3, 25 past 8 • tell the time accurately using clock faces to within five minutes • tell and convert time on both digital and analogue (clock face) clocks, using one-minute intervals • convert digital time to analogue (clock face) time and vice versa such as 23 minutes to 11 as 10:37 • differentiate between 'am' and 'pm' and convert time from a 12 hour clock to a 24 hour clock • read and interpret airline time tables that give departure and arrival times in 24-hour time • discuss and identify units of time and the relationship between each unit such as 60 secs = 1 min, 60 min = 1 hour, 24 hours = 1 day, 365 days = 1 year • describe how many years in a decade and a century. </td> </tr> </table>				<ul style="list-style-type: none"> • introduce words for different parts of the day and relate to approximate clock time in hours • name the days of the week and discuss local activities done weekly such as Sunday worship days • discuss and use the words year, season, month, week, day, night, morning, afternoon, midday • use 7 days as 1 week and 12 months as a year to measure time • estimate how long a minute is and things that take more or less than 1 minute to complete • talk about a sequence of events and draw traditional calendars based on events from the local community • use simple calendars to work out when activities will take place, such as how many more weeks before Christmas holidays. 	<ul style="list-style-type: none"> • draw clock faces to show and tell the time using time on the hour, half hour and quarter hour • make and use clock faces to show the timing of activities in stories • tell and demonstrate time stories using calendars and timelines • solve problems on time such as how many hours before or after an event • relate school activity times to hour and half-hour times • use quarter hour intervals to tell the time in 'past' and 'to' form, such as quarter past 3 or quarter to 4. 	<ul style="list-style-type: none"> • describe and use five-minute intervals to tell the time in past and to form, such as 10 minutes to 3, 25 past 8 • tell the time accurately using clock faces to within five minutes • tell and convert time on both digital and analogue (clock face) clocks, using one-minute intervals • convert digital time to analogue (clock face) time and vice versa such as 23 minutes to 11 as 10:37 • differentiate between 'am' and 'pm' and convert time from a 12 hour clock to a 24 hour clock • read and interpret airline time tables that give departure and arrival times in 24-hour time • discuss and identify units of time and the relationship between each unit such as 60 secs = 1 min, 60 min = 1 hour, 24 hours = 1 day, 365 days = 1 year • describe how many years in a decade and a century.
<ul style="list-style-type: none"> • introduce words for different parts of the day and relate to approximate clock time in hours • name the days of the week and discuss local activities done weekly such as Sunday worship days • discuss and use the words year, season, month, week, day, night, morning, afternoon, midday • use 7 days as 1 week and 12 months as a year to measure time • estimate how long a minute is and things that take more or less than 1 minute to complete • talk about a sequence of events and draw traditional calendars based on events from the local community • use simple calendars to work out when activities will take place, such as how many more weeks before Christmas holidays. 	<ul style="list-style-type: none"> • draw clock faces to show and tell the time using time on the hour, half hour and quarter hour • make and use clock faces to show the timing of activities in stories • tell and demonstrate time stories using calendars and timelines • solve problems on time such as how many hours before or after an event • relate school activity times to hour and half-hour times • use quarter hour intervals to tell the time in 'past' and 'to' form, such as quarter past 3 or quarter to 4. 	<ul style="list-style-type: none"> • describe and use five-minute intervals to tell the time in past and to form, such as 10 minutes to 3, 25 past 8 • tell the time accurately using clock faces to within five minutes • tell and convert time on both digital and analogue (clock face) clocks, using one-minute intervals • convert digital time to analogue (clock face) time and vice versa such as 23 minutes to 11 as 10:37 • differentiate between 'am' and 'pm' and convert time from a 12 hour clock to a 24 hour clock • read and interpret airline time tables that give departure and arrival times in 24-hour time • discuss and identify units of time and the relationship between each unit such as 60 secs = 1 min, 60 min = 1 hour, 24 hours = 1 day, 365 days = 1 year • describe how many years in a decade and a century. 				

Strand: SPACE AND SHAPE

Substrand	Grade 3	Grade 4	Grade 5			
<p>Shapes</p>	<p>3.3.1 Identify two and three dimensional shapes</p>	<p>4.3.1 Investigate and describe features of two and three dimensional shapes</p>	<p>5.3.1 Describe properties of two and three dimensional shapes</p>			
<p>Indicators Students will be achieving the above learning outcomes in vernacular and/or English, when they, for example:</p> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • make and name squares, triangles and rectangles using a variety of materials such as sticks, cardboard boxes, blocks • count corners and edges of two dimensional (2D) shapes such as triangles • group two dimensional (2D) shapes according to size and shapes • recognise and describe three dimensional (3D) objects found in the environment such as cubes, cones, spheres • recognise that three dimensional objects look different from different viewpoints or perspectives. </td> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • make three dimensional (3D) solid shapes out of local materials • talk about features of shapes such as faces, edges, curved surfaces, vertices • draw and label two dimensional (2D) shapes • draw a birds-eye-view plan of a classroom or a school garden • collect two dimensional (2D) shapes and identify lines of symmetry. </td> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • draw three dimensional (3D) shapes using line drawings from a particular viewpoint or perspective • name shapes representing the cross section of objects • identify the lines of symmetry of squares, equilateral triangles, regular pentagons and regular hexagons • construct a straight angle by tearing off corners of triangles and fitting them together • make, draw, compare and sort triangles into groups such as scalene, isosceles, equilateral, right-angled • describe properties of equilateral triangles. </td> </tr> </table>				<ul style="list-style-type: none"> • make and name squares, triangles and rectangles using a variety of materials such as sticks, cardboard boxes, blocks • count corners and edges of two dimensional (2D) shapes such as triangles • group two dimensional (2D) shapes according to size and shapes • recognise and describe three dimensional (3D) objects found in the environment such as cubes, cones, spheres • recognise that three dimensional objects look different from different viewpoints or perspectives. 	<ul style="list-style-type: none"> • make three dimensional (3D) solid shapes out of local materials • talk about features of shapes such as faces, edges, curved surfaces, vertices • draw and label two dimensional (2D) shapes • draw a birds-eye-view plan of a classroom or a school garden • collect two dimensional (2D) shapes and identify lines of symmetry. 	<ul style="list-style-type: none"> • draw three dimensional (3D) shapes using line drawings from a particular viewpoint or perspective • name shapes representing the cross section of objects • identify the lines of symmetry of squares, equilateral triangles, regular pentagons and regular hexagons • construct a straight angle by tearing off corners of triangles and fitting them together • make, draw, compare and sort triangles into groups such as scalene, isosceles, equilateral, right-angled • describe properties of equilateral triangles.
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Strand: SPACE AND SHAPE

Substrand	Grade 3	Grade 4	Grade 5			
<p>Angles and Directions</p>	<p>3.3.2 Recognise, compare and order angles</p>	<p>4.3.2 Recognise, name and describe angles</p>	<p>5.3.2 Construct and name angles</p>			
<p>Indicators Students will be achieving the above learning outcomes in vernacular and/or English, when they, for example:</p> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • identify, compare and discuss different angles within the environment • draw simple angles such as right angles • demonstrate and make turns to describe simple directions such as half, quarter, full turns • identify angles as corners. </td> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • identify, compare and name angles within the environment • order, compare and name different angles • use angle testers to compare corners with right angles and half right angles (45°) • form angles using local materials such as sticks, stones and shells • draw grids and coordinates to describe positions. </td> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • construct and name angles using local materials such as sticks, stones, shells • construct, describe and name straight, acute, right, obtuse and reflex angles • create sums of angles in triangles, squares and rectangles by cutting them to form different angles • recognise and name properties of triangles • locate positions on grids by using directions such as moving to the East, West, North and South • use equilateral triangles to make angle testers for 60°, 30° and 15° angles • name a right angle as 90 degrees. </td> </tr> </table>				<ul style="list-style-type: none"> • identify, compare and discuss different angles within the environment • draw simple angles such as right angles • demonstrate and make turns to describe simple directions such as half, quarter, full turns • identify angles as corners. 	<ul style="list-style-type: none"> • identify, compare and name angles within the environment • order, compare and name different angles • use angle testers to compare corners with right angles and half right angles (45°) • form angles using local materials such as sticks, stones and shells • draw grids and coordinates to describe positions. 	<ul style="list-style-type: none"> • construct and name angles using local materials such as sticks, stones, shells • construct, describe and name straight, acute, right, obtuse and reflex angles • create sums of angles in triangles, squares and rectangles by cutting them to form different angles • recognise and name properties of triangles • locate positions on grids by using directions such as moving to the East, West, North and South • use equilateral triangles to make angle testers for 60°, 30° and 15° angles • name a right angle as 90 degrees.
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Strand: CHANCE AND DATA

Substrand	Grade 3	Grade 4	Grade 5			
<p>Probability and Sets</p>	<p>3.4.1 Use the language of chance to describe everyday events</p>	<p>4.4.1 Compare events according to their likelihood</p>	<p>5.4.1 Perform and record results of trials</p>			
<p>Indicators Students will be achieving the above learning outcomes in vernacular and/or English, when they, for example:</p> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • describe the chances of everyday events happening such as the likelihood of rain falling or someone winning a running race • identify which things are certain and which things are impossible • use disjoint sets to classify and record certain and impossible events. </td> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • play simple mathematical games of chance such as tossing coins, card and dice games • order the possible outcomes of simple trials, such as determining which is most likely: rolling 6 or an even number on a dice • record the possible results of events using Venn diagrams. </td> <td style="vertical-align: top; width: 33%;"> <ul style="list-style-type: none"> • perform activities such as tossing coins, lucky dip or identifying particular cards in a pack of cards and record results • solve simple chance problems related to real life situations, such as someone winning from a raffle or lucky dip draw • perform simple games using dice and coins and record results using tallies • practise recording results of chance games using tallies • identify the complement of an event, such as rolling an even number on a dice. </td> </tr> </table>				<ul style="list-style-type: none"> • describe the chances of everyday events happening such as the likelihood of rain falling or someone winning a running race • identify which things are certain and which things are impossible • use disjoint sets to classify and record certain and impossible events. 	<ul style="list-style-type: none"> • play simple mathematical games of chance such as tossing coins, card and dice games • order the possible outcomes of simple trials, such as determining which is most likely: rolling 6 or an even number on a dice • record the possible results of events using Venn diagrams. 	<ul style="list-style-type: none"> • perform activities such as tossing coins, lucky dip or identifying particular cards in a pack of cards and record results • solve simple chance problems related to real life situations, such as someone winning from a raffle or lucky dip draw • perform simple games using dice and coins and record results using tallies • practise recording results of chance games using tallies • identify the complement of an event, such as rolling an even number on a dice.
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Strand: CHANCE AND DATA

Substrand	Grade 3	Grade 4	Grade 5			
<p>Graphs and Tables</p>	<p>3.4.2 Draw and interpret simple graphs</p>	<p>4.4.2 Construct and interpret information using graphs and simple timetables</p>	<p>5.4.2 Represent and interpret information using graphs, tables and charts</p>			
<p>Indicators Students will be achieving the above learning outcomes in vernacular and/or English, when they, for example:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • make and interpret picture graphs where one picture represents one object • collect and show information on simple graphs using concrete materials • collect and show information using tallies • draw and read information from simple graphs. </td> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • read and interpret information from schedules and simple timetables • draw and interpret bar and picture graphs • solve real life problems using graphs. </td> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • construct bar graphs to scale such as 1 cm equals 5 people • survey members of a class to find out their favourite fruits, weights and ages and record the information in table form • answer questions to gather information from tables, graphs and charts • find average rainfalls from information provided in graphs or tables. </td> </tr> </table>				<ul style="list-style-type: none"> • make and interpret picture graphs where one picture represents one object • collect and show information on simple graphs using concrete materials • collect and show information using tallies • draw and read information from simple graphs. 	<ul style="list-style-type: none"> • read and interpret information from schedules and simple timetables • draw and interpret bar and picture graphs • solve real life problems using graphs. 	<ul style="list-style-type: none"> • construct bar graphs to scale such as 1 cm equals 5 people • survey members of a class to find out their favourite fruits, weights and ages and record the information in table form • answer questions to gather information from tables, graphs and charts • find average rainfalls from information provided in graphs or tables.
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Strand: PATTERNS

Substrand	Grade 3	Grade 4	Grade 5			
<p>Patterns</p>	<p>3.5.1 Make and describe patterns and number patterns</p>	<p>4.5.1 Develop arithmetical rules to describe number patterns</p>	<p>5.5.1 Use patterns and arithmetical rules to solve problems</p>			
<p>Indicators Students will be achieving the above learning outcomes in vernacular and/or English, when they, for example:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • identify, describe and model common patterns used in the community • design and draw common geometric shapes and create patterns without empty spaces • identify and discuss patterns from different parts of Papua New Guinea • build steps using blocks and identify the number of blocks used • build a sequence of triangular shapes using concrete materials such as seeds or stones and record the numbers used, such as 1, 3, 6, 10. </td> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • make, write and describe patterns and number patterns using materials, diagrams, numbers and arithmetical rules • make number patterns and use them to write number sentences • make number patterns describing the number of sides in a line of separate shapes such as triangles, quadrilaterals • solve number patterns using arithmetic rules • describe in words the rule needed to continue simple number patterns, such as 3, 6, 9, 12, 15. </td> <td style="width: 33%; vertical-align: top;"> <ul style="list-style-type: none"> • make and identify number patterns, based on square and triangular numbers • follow a rule to form number patterns, such as 4 multiplied by the last number plus 2 • solve problems on patterns and functions, such as how many triangles in a hexagon. </td> </tr> </table>				<ul style="list-style-type: none"> • identify, describe and model common patterns used in the community • design and draw common geometric shapes and create patterns without empty spaces • identify and discuss patterns from different parts of Papua New Guinea • build steps using blocks and identify the number of blocks used • build a sequence of triangular shapes using concrete materials such as seeds or stones and record the numbers used, such as 1, 3, 6, 10. 	<ul style="list-style-type: none"> • make, write and describe patterns and number patterns using materials, diagrams, numbers and arithmetical rules • make number patterns and use them to write number sentences • make number patterns describing the number of sides in a line of separate shapes such as triangles, quadrilaterals • solve number patterns using arithmetic rules • describe in words the rule needed to continue simple number patterns, such as 3, 6, 9, 12, 15. 	<ul style="list-style-type: none"> • make and identify number patterns, based on square and triangular numbers • follow a rule to form number patterns, such as 4 multiplied by the last number plus 2 • solve problems on patterns and functions, such as how many triangles in a hexagon.
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Assessment and Reporting

Assessment and reporting practices described here are detailed further in the *National Assessment and Reporting Policy 2003* (NDOE, 2003) and in other support materials produced by the Department of Education.

Assessment

Assessment:
the ongoing process of identifying, gathering and interpreting information about students' achievement of the learning outcomes.

Assessment is the continuous process of identifying, gathering and interpreting information about students' achievement of the learning outcomes described in the subject syllabuses.

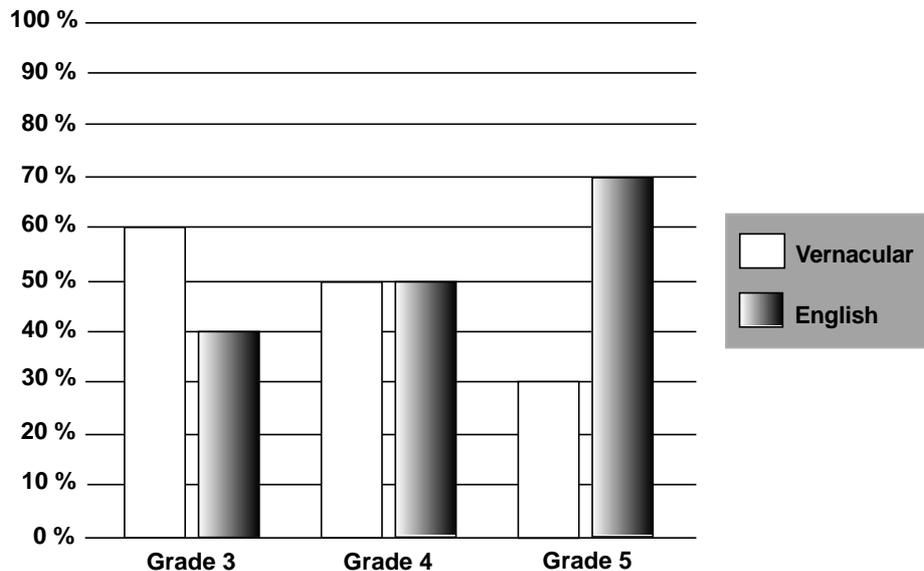
Teachers record evidence of students' learning and use this to make judgements about their achievements of the learning outcomes. To ensure that assessment is fair and balanced, teachers must use a range of assessment methods including:

- observing and recording details of students' performance on particular tasks
- conferencing or talking and questioning the students about their work and how they are thinking and feeling: their attitudes towards work
- analysing students' products
- setting written assignments, projects and practical work
- setting and marking written tests.

Teachers should provide opportunities for students to assess their own learning (self-assessment) and the learning of others (peer assessment) according to set negotiated criteria. The overall purpose of assessment is to improve student learning.

Assessment in vernacular and English

The suggested percentage of assessment, teaching and learning in vernacular and English is shown below:



Teachers will need to apply the principles described in the *National Assessment and Reporting Policy* (NDOE, 2003) to ensure that students are treated fairly and given many opportunities to demonstrate their achievement of the learning outcomes in each subject. When assessing students' achievements, teachers should be clear about:

- which language best enables students to demonstrate their learning
- whether they are assessing subject content or language skills and knowledge, or both
- whether the percentages of assessment in vernacular and English are similar to those suggested in the graph on the opposite page.

Assessment in Lower Primary

Assessment in Lower Primary schooling is the continuous process of finding out if students have achieved the learning outcomes. Assessment at Lower Primary should:

- be predominantly integrated into teaching and learning activities as students bridge from vernacular to English
- use a range of assessment methods
- use local cultural approaches to assess and report students' achievements where appropriate
- be used for diagnostic purposes only.

Assessment in Mathematics

Assessment should first and foremost be used to evaluate students' performance so that teaching can be adjusted to improve students' achievements of the outcomes. To do this well assessment must be continuous throughout the year.

The emphasis should be on teaching Mathematics for understanding. Written tests should be only one of the methods used to find out what students have learnt. Other assessment methods must also be used.

Assessment Methods

These are some methods that teachers can use to assess students' performance in Mathematics lessons.

Observing students during the lesson

To do this in a manageable way, teachers make informal observations and make notes of these on a class list. They choose just one or two students in any one lesson and note down both positive and negative things students do during that lesson. Teachers continue with different students until they have some comments on all students, then they repeat the process.

Talking with students

Teachers should use good questioning techniques in class as well as informal discussions with individual students to get a picture of each student's progress. Relevant points from such discussions must be noted down such as whether or not correct mathematical terms were used to answer a question or whether or not the student showed understanding of a concept. Formal interviews may also provide further information.

Profiles

Teachers may set a series of mini-projects or exercises and keep samples of work from each student on a file, maintaining a folder of work for each student. Students' exercise books fulfil this function to some extent. Another form of maintaining such profiles is to only retain the best and latest version of students' work.

Tests

There are many types of tests suitable for Mathematics, some of which include short answer tests, longer exercises and multiple choice questions. The important thing to remember is that teachers use a range of assessment methods and not just tests to decide if students have achieved the learning outcomes.

Recording

Teachers must keep accurate records of students' achievement of the learning outcomes. They must report these achievements in fair and accurate ways to parents, guardians, teachers and students. Examples of recording methods include:

- anecdotal notes in a journal or diary
- checklists
- portfolios of students' work
- progressive records
- work samples with comments written by the teacher.

Reporting

Reporting is communicating clearly to students, parents, guardians, teachers and others, the information gained from assessing students' learning.

Students' reports should be based on assessment information collected from ongoing assessments. Schools will decide on how reports will be presented

Reporting:
communicating clearly to students, parents, guardians, teachers and others, the information gained from assessing students' learning.

to best suit the needs of their communities. Methods will include interviews and written reports. Written reports should include:

- a written record of learning outcomes achieved by students since the previous report
- a written record of the learning outcomes the student is now working towards
- information about students' attitudes, values and other additional information that is specific to individual students.

(National Assessment and Reporting Policy, 2003, p.6)

Evaluation

Teachers will use assessment information to make judgements about the effectiveness of their teaching, learning and assessment programs and to make improvements to their teaching practice in order to improve student learning.

Schools may use whole school assessment data to evaluate the effectiveness of teaching and learning in a particular subject or at particular grade levels and make decisions on how to improve student learning.

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Appendix

MINISTERIAL POLICY STATEMENT

Language Policy In All Schools

The authority of this Ministerial Policy Statement is Section 27 (1) (h) of the Education Act (Chapter No. 163) as amended.

The purpose of this circular is to advise authorities of all institutions within the National Education System regarding the use of languages in schools. This statement should be read in conjunction with the Ministerial Policy Statement No. 1/91 and Secretary's Instruction No. 1/91.

The future direction for language use in the formal school system as stated in Secretary's circular No. 1/91 is that the language of the community, together with its cultures, spiritual and work practices will form the basis for the activities of the school.

In practice, using the language of the community as the basis for the school activities means the use of vernacular or a language spoken by both the students and the teacher in the school system for teaching and learning. The use of vernacular languages establishes strong culture bonding between children and their community. This is one of the aims of the education reform in Papua New Guinea. Research findings also support the use of vernacular languages in schools.

The findings indicate that:

- there are academic achievement benefits for the student from being bilingual
- to stop students learning in their first language and forcing them to learn only in a new language can be harmful and obstructive to their development
- it usually takes an English language learner five or more years to develop the ability to use English for learning complex concepts
- beginning schooling in the children's first language and using this language for continued learning and development while the English language is being learned, is the best way for children to develop their full potential in schooling.

On the basis of this information, the reform curriculum calls for a program of bilingual education in Primary Schools. Children who graduate from Elementary Schools will enter this new bilingual program in Grade 3.

1. At the Elementary School level (Prep to Elementary 2), this means that the language of instruction is completely in the children's vernacular language, or the community lingua franca, with an introduction to oral English at the end of Elementary 2. Children will leave Elementary School literate in their first language.

The community through their Parents and Citizens Association (P&C) and the Board of Management (BOM) will decide the language to be used at the Elementary level of education.

In practice, the community must be informed in order to make the decision on what language should be used at Elementary level. The language chosen should be the language that is shared in the community and used for most communication in that community.

2. At the Lower Primary level (Grades 3-5) the learning and teaching will be conducted in a bilingual situation, in which there is planned, gradual bridging from vernacular (or the lingua franca) to English. Oral and written vernacular language development will continue throughout Lower Primary. Oral and written English development will gradually be introduced and established as the major language of instruction by the end of Grade 5, using "Teaching English to Speakers of Other Languages" (TESOL) methodology.

At the Lower Primary level, while English is being learned, the language mostly used for teaching and learning should be the same language that the children used in Elementary school.

Where a number of active languages exist in one community, the main language of interaction between the language groups and of commerce in the community should be the language selected, that is the local lingua franca.

Every effort must be made to appoint vernacular speaking teachers to the Lower Primary grades, particularly those who have received inservice in bilingual education strategies.

3. At the Upper Primary level (Grades 6-8), class activities will be conducted with English as the main language of instruction, but students should still be provided with opportunities to further develop their oral and written vernacular (or lingua franca) skills.
4. At the Secondary level and Provincial High School level including Vocational School, lessons will be conducted in English. But advantage should be taken where opportunities arise for students to further develop their oral and written vernacular (or lingua franca) skills or if a concept can be better explained using the vernacular or lingua franca.

Whereas children must be encouraged to learn and use English, all schools at all levels should not discourage free communication in vernacular languages that the children speak in and out of school grounds. This will establish confidence in students to use vernacular in academic learning.

Honourable Prof. JOHN WAIKO, Ph.D, MP.

Minister for Education