Introduction

This curriculum outlines the major focus of the mathematics programme of learning for students of Grades 7, 8, and 9. It provides a set of teaching activites for each learning out come as listed under each strand for each grade. The philosophical assumptions, rational and general aims of the curriculum are identified. Some suggestions relating to teaching, learning and assessment are also included.

Philosophy

The philosophical assumption underpinning this curriculum suggests that school mathematics needs to simultaneously educate all students about mathematics while equipping them with the skills necessary for them to be able to use their mathematical knowledge. The belief is that all students CAN LEARN both to acquire basic mathematics knowledge, skills and strategies; and to use such mathematical awareness as a tool for further learning.

The intent is to give students not only a body of mathematics facts and knowledge, but also a rich repertoire of skills, values and insights into mathematics. The curriculum therefore serves to assist all students in constructing their mathematical journey along which they will regularly use their mathematical experiences to make sense of the physical, cultural, social and environmental issues which impact on their lives.

In this way, this curriculum would achieve the intended goal of assisting all students to readily and consistently use their mathematical awareness to:
• acquire more mathematical knowledge
• enjoy and appreciate their mathematics learning
• better understand real life occurrences
• gain meaningful insights into other subject disciplines

Essentially, the philosophy guiding this curriculum suggests that the stated programme of learning prepares students for adult life while

Rationale

If education is to realize the prescribed goal of producing adults who are capable of becoming problem solvers, then the mathematics education of all students must be emphasized. Indeed "the study of mathematics began because it was useful, continues because it is useful and is valuable to the world because of the usefulness of its results while the mathematicians who determine what the teachers shall do, hold that the subject should be studied for its own sake" (Griffith & Howson, 1974).

Mathematics is a way of thinking. Mathematics stimulates the mind and interests curiosity. It promotes structured learning, logical thinking and sound reasoning. Mathematics is therefore considered as an activity; not a stock of knowledge. It is something the learners do – the vehicle through which knowledge is discovered in a meaningful way.

As an activity, mathematics challenges the learner to go beyond simply accepting information. It influences the mind to ask 'how', 'why' and 'what if', as justifications have to be given to support generalizations. The use of generalizations also allows for classifications of ideas, and the use of precise and concise language in describing patterns and relations. Mathematics therefore invites the learner to experience the world's richness. It empowers the learners to ask his/ her own questions and to seek his/ her own answers; and then motivates him/ her to understand the world's complexities. Mathematics provides for investigative learning, a process which allows the learner to construct his/ her own learning and thereby establish meaningful comprehension of the things which impact on him/her.

Mathematics education therefore promotes the acquisition of useful skills such as questioning, reflecting, hypothesizing, critical thinking and proof. The aesthetic value of mathematics and the fun enjoyed from mathematics related activities add much to the importance of the study of mathematics in any educational programme.

General Aims

This curriculum aims to produce students who are 'at home' with basic mathematics concepts, principles and strategies. To achieve this general aim, several broad goals covering the essential process skills to be developed and the content to be covered are suggested as key targets for all students.

Process
- To communicate ideas in precise but meaningful ways
- To utilize a variety of mental strategies when doing mathematics
- To develop and apply mathematical thinking and reasoning skills
- To adapt an analytical approach to learning of mathematical concepts
- To learn in ways which make for easy transfer of knowledge gained
- To regularly explore concepts in detail and systematic ways

Content
- To deepen understanding of mathematical concepts related to the five named strands
- To identify connections that exist across concepts, strands and topics
- To develop the skills of estimation, computation and calculation
- To gather, organize, present and analyze data in meaningful ways
- To study examples and non examples as related to a concept and use such information to formulate generalizations
- To construct and use formulae
- To develop spatial awareness and the skills of accurately measuring and recording
- To use algebraic thinking as a strategy in problem solving
- To identify properties of shapes

Problem Solving
- To use mathematical knowledge to identify causes and consequences
- To make informed choices based on analysis of data
- To use mathematics knowledge to investigate and solve routine and non-routine; theoretical and real life problems
- To enjoy problem solving as an fun activity

Information Technology
- To use the calculator effectively and efficiently as a tool to aid in computations and investigations
- To utilize technological devices to model data in different forms
- To use the internet as a medium for researching ideas relating to the study of mathematical ideas

Values and Attitude
- To experience the aesthetic value of mathematics
- To have fun while learning
- To develop theme approach to work
- To experience and value the social construction aspect of learning

Structure of the Curriculum

The curriculum outlines the content areas to be covered by students in grades 7, 8 and 9. The stated content areas are summarized into five strands. These include Number and Number Sense; Measurements; Geometry; Data Handling and Patterns and Algebra. An Attainment Target is identified for each named strand. Several Learning Outcomes with related Achievement Indicators are listed under each Attainment Target. The table below lists each strand with matching attainment target.

Strand	Attainment Target
Number & Number Sense	Students develop competency, knowledge, skills and understanding in mental and written computations as well as effective calculator use and numerical reasoning when working with numbers
Measurement	Students develop competency, knowledge, skills and understanding in identifying and communicating the attributes of shapes and objects; and employ measurement strategies to explore, investigate and solve theoretical and real life problems
Geometry	Students develop geometric knowledge, skills and understanding; and readily apply geometric reasoning to solve problems relating to spatial visualization
Data Handling	Students develop competency, knowledge, skills and understanding in collecting, organizing, representing, analyzing and evaluating information in order to make informed decisions, reasonable predictions, draw logical conclusions and solve problems
Patterns and Algebra	Students develop knowledge, skills and understanding in interpreting and constructing patterns, generalizations and graphical representations

Guiding Principles

The goal of this curriculum is to provide opportunities for students to learn about mathematics in ways that will equip them with knowledge and build their confidence in and attitude to the subject. Accordingly, it would be useful to adapt the following guiding principles in developing and implementing this unit.

Learning Activities
• As much and as far as possible learning activities should provide students with plenty of opportunities to construct understanding.
• Concepts should be developed in context using sufficient examples that embodied the concepts as well as non examples
• Students should be guided to deduce generalizations and formulae through structured exercises rather than giving formulae to students as rules
• Time should be allotted and learning activities organized for students to use their mathematical knowledge to investigate real life situations on a regular basis
• As much as possible students should be encouraged to develop the skill of estimating answers as a first step in their working towards solutions
• Small group activities should be used to encourage the development of interpersonal skills

Teachers will find it helpful to:
• develop an extensive knowledge of concepts, skills, processes and principles connected to the subject matters that they are expected to teach
• adopt classroom instructional practices that allow every child regardless of ability level to achieve some measure of success in every class
• plan every lesson on the basis of what students already know; what students need to know; and what students are able to do

Students will need to be given opportunities to:
• work mathematically by asking and using questions; constructing and solving problems; and reflecting and assessing their own learning
• participate in activities that help them to develop knowledge pertaining to the 'how' and 'why' of the concepts that they are exploring
• engage in activities that will challenge them to use their mathematics knowledge to explore new situations
• communicate their mathematics ideas in their own way and to be able to defend such thinking along mathematics lines
• connect their prior knowledge and experiences to new ideas and in the process develop a network of concepts, skills and processes related to the concepts under study
• share ideas and experiences by working in small groups
• reflect on their approach to learning and their progress in learning

Notes for the Teacher

Mathematics as a relevant tool is rendered meaningless when educators limit students to merely reproduce mathematical content. Additionally, mathematics as powerful as it is loses its effectiveness when educators rob students of opportunities to investigate phenomena and explore their environment. It is out of these two principled positions that the conviction has been reached that the mathematics teacher needs to adopt approaches that support the learner.

In using this curriculum, the emphasis should be on helping students to see their mathematics knowledge as a tool that they can use inside as well as outside the mathematics classroom. The focus of the curriculum is on teaching for understanding and learning for application. To realize these goals, students need to be regularly engaged in activities that guide them to discover mathematics relations for themselves in meaningful contexts. In essence, the teacher's responsibility is to create the learning climate that challenges students to learn how to learn. The teacher does this by encouraging self initiated inquiry, providing suitable materials and activities for learning tasks, and sensitively mediating teacher/ students; and student/ student interactions. This curriculum must therefore be guided by every teacher wanting to find time in every lesson to help students to:
• enjoy mathematics;
• understand its power;
• want to know more about it;
• feel confident about their ability to do mathematics

To achieve this goal, systematic planning is necessary at all times.

Planning for Teaching

Purposeful planning leads to insightful teaching approaches which provide clear learning pathways for students of all abilities. Much effort, time and resources need to be put into planning for teaching. One useful approach to meaningful planning is for the teacher to conduct an analysis of each topic prior to teaching. This kind of planning brings clarity to the teacher about the major factors which might impede or support the learning process. The format given below provides a guide on how an analysis of a topic may be done.

Pre-requisites

As a first step in approaching the teaching of any concept/ topic, the teacher will find it useful to ensure that students have the necessary pre-requisite skills and knowledge rather than beginning to teach on the assumption that such are in place. It will be necessary in some instances for the teacher to devote some time prior to teaching a concept to assess the needs (readiness) of students. Where students are identified to be lacking in the necessary pre-requisites, it is advised that adequate activities be provided to facilitate students in acquiring the skills and knowledge that are needed to begin meaningful work in the particular area of study.

Development of concepts

Concepts need to be introduced and developed with students in practical ways. It is always important to facilitate for the emergence of mathematical ideas through students' engagement in a rich series of structured activities. Construction of understanding by students is therefore critical. This should never be replaced by the giving of definitions of concepts, formulae and a string of rules. This approach involves students' interactions with several examples that embodied the concept being introduced. Students' development of understanding of concepts also benefits when students' experiences are valued in the learning process.

It is important that the teacher remember, too, that it is not only the things that children can do that measures progress, but how they do them and whether their methods are of a kind that can be built on in subsequent development (Tall & Faster 1996)

Establishing Connections

The hierarchal structure of mathematics itself necessitates that concepts be taught in a logical and sequential order. In teaching this curriculum, it is considered useful that focused effort be taken to identify and emphasize connections:
• between concepts and topics within mathematics itself
• with other subject disciplines
• across grade levels

In this regard, an approach to learning mathematics that helps students to see mathematical concepts not as isolated bits of information, but as ideas that are interrelated needs to be emphasizes. This makes learning more meaningful, as it allows for students to be actively involve in constructing a network of concepts and skills. In this way, students are able to make sense of the knowledge so gained as they would have proven it to be true and can also explain why it is so. According to Selinger (1994) if mathematics is to have any meaning then inter-weaved with the learning of skills there must be recognition about how such skills are connected.

Application of Knowledge

This curriculum lends itself to much investigative work. Students can therefore be given several open ended tasks in which they are encouraged to explore mathematical ideas as they relate to issues within students' experiences. Such investigative tasks may form part of regular class activities or home work tasks and may be done as whole class, small groups and individual assignments. Ideally, the choice of activities will be based on the environmental and social issues prevailing in the immediate environments of students.

Vocabulary

Language plays a significant role in any programme of learning. Mathematics is no exception. Some words carry a different meaning within a mathematical context than their usual meaning. Other words used in mathematics are peculiar to mathematics. This situation adds to the challenges encountered by the student of mathematics

Many students find mathematics difficult because they do not understand the words being used. Some words are peculiar to mathematics and are used only in the context of mathematics (ROSE1 Curriculum 1998).

Based on this understanding, it seems necessary that the teaching of any mathematics curriculum will require some focus on the mathematics vocabulary that is related to the aspect of mathematics that is being studied. The provision of opportunities for students to build and extend their mathematics vocabulary is therefore central to this programme of learning. In this regard, students' mathematics learning seems likely to benefit where mathematics language emerge out of appropriate contexts; and students are encouraged to keep tract of the development of their own mathematical vocabulary.

Assessment

The philosophical underpinning and the proposed approach to teaching governing this curriculum necessitates a type of assessment procedure that emphasizes a shift from the usual paper and pencil tests to a more encompassing assessment structure. Assessment should aim primarily at enhancing students' learning by providing useful information to the teacher and students. Research suggests that students learning benefits when assessment is intricately linked to instruction. Teachers may achieve this goal by integrating assessment with their teaching instruction rather than approach assessment as an entity that is seen as interrupting instructions and or tagged on at the end of each unit of work.

One useful strategy is for the teacher to encourage students to frequently ask questions and to respond to students' questions with questions, as a means of challenging students to make their own interpretation of ideas. This approach to assessment provides the additional advantage of allowing the teacher a window into the minds of the learner. This has a further benefit of enabling the teacher to readily detect students' mistakes thereby providing for the teacher to work along with students to determine corrective measures on an ongoing basis.

Assessment may be further broadened to include oral presentations, project work, reflective writing, port folio and performance on authentic tasks. The idea of using a wide range of assessment tasks is to allow students to demonstrate their learning in different ways. Additionally, engaging students in investigative work provides useful opportunities for direct assessment of students' ability to apply their knowledge to novel situations.

Writing as a tool for assessment may be incorporated as a systematic way of assessing students' understanding, while encouraging students to communicate mathematical ideas. This can be done to encourage self-assessment of mathematical learning by students while allowing the teacher to get a sense of how students see themselves in learning a particular concept.

Essentially, assessment of students' learning associated with this curriculum should as much as possible provide useful information on students':
• development of mathematical insights
• mental attitude to mathematics and the particular strand, topic and concept being studied
• creativity and problem solving abilities
• reflective approach to learning
• perceptions of their teacher's approach and attitude to teaching

When assessment encompasses these different aspects, assessment would determine students' progress rather than just provide the teacher with a grade to be assigned to students.

Questioning

Accepting the commonly held view that the effective teacher stimulates learning demands the adoption of a rich repertoire of effective strategies capable of provoking and cultivating productive thoughts by students. A deliberate move to create a shift in teaching to reflect the inclusion of provisions for increasingly more mental challenges is considered most relevant. In this regard, the use of good questioning skills seems an immediate priority as the teacher will of necessity need to tell students less while asking students to tell him/ her more.

This means that the teacher has to consciously find ways of providing students with plenty of opportunities for them to communicate using the mathematical ideas they are learning. It is for this reason that questioning is considered an important teaching strategy. A questioning strategy supports the learning process by serving as a necessary tool for guiding students to classify misunderstandings. The preference for suggesting questioning over teacher talk is embedded in the fact that the questioning style lesson tends to promote:
• students' thinking over regurgitation of knowledge
• the building of understanding over knowing
• stimulation of curiosity over memorization
• divergent thinking over convergent thinking

The motive therefore for asking questions is to stimulate and challenge the intellectual ability of students. In the words of Petty (1992), questioning teaches students to think for themselves.

SUGGESTED TEACHING, LEARNING AND ASSESSMENT ACTIVITIES

Learning Outcomes		
	Suggested Learning Activities (NUMBER & NUMBER SENSE)	**Assessment**

LO:1
 	
Demonstrate an understanding of place value by reading, writing and ordering, whole numbers of any size; and using related vocabulary
	• Use unmarked number lines to indicate the position of one number in relation to another. For example:
	- Which number falls half/ quarter way between 400 000 and 400 500; between 1 000 000 and 1 500 000
	• Discuss the use of large numbers as used to make reference to large quantities in National budgets, population size of countries, distances.
	Bases
	• Convert numbers in base ten to other bases and vice versa.
	 For example:
	- $123 = 1 \times 64 + 3 \times 16 + 2 \times 4 + 3 \times 1$
	      $= 1323_4$
	- $60 = 1 \times 36 + 4 \times 6 + 0 \times 1$
	       $= 140_6$
	• Write numbers in different bases in expanded notations.
	 For example:
	- $1323_4 = 1 \times 4^3 + 3 \times 4^2 + 2 \times 4^1 + 3 \times 4^0$
	- $140_6 = 1 \times 6^2 + 4 \times 6^1 + 0 \times 6^0$
		• Students work in small groups to develop a scrap book to include examples of numbers as used in newspapers, magazines, brochures, national budgets
		
		• Students perform computations involving the conversion of numbers from base ten to other bases and vice versa
		
		• Students round off whole numbers to nearest ten, hundred, thousands, million
		
		• Students write short notes to explain the strategies used in rounding off numbers to a given number

LO:2 **Use the vocabulary of estimation and approximation; make and justify estimates and approximations of numbers**	**Rounding** • Use rounding off to establish a reasonable range within which actual calculation will fall. For Example: - 2 593 + 6 278 is more than 2 500 + 6 200, but smaller than 2 600 + 6 300 - 245 × 19 is slightly smaller than 245 × 20, but larger than 250 × 20 - 886 ÷ 38 is larger than 890 ÷ 40, but smaller than 890 ÷ 35 • Use rounding as a skill to aid in use of estimation • Link estimation to other strands in mathematics and subject disciplines. For example: - link to measurements relating to money, distance, angle, area, volume - link computations • Round whole numbers to the nearest multiple of 10, 100, 1 000. For example: - round population of a country to the nearest 1 000; - round measurement to the nearest unit such as; cm, m, km, g, kg - round to the nearest 10, 100, 1 000 units measurements such as the height of a person; the distance between two points and the weight of an object in grams	• Students estimate results of computations and write short notes to explain strategies used in arriving at estimations

Learning Outcomes		
	Suggested Learning Activities (NUMBER & NUMBER SENSE)	**Assessment**

LO:3
 	
Understand, select and apply appropriate strategies for the four basic operations; and develop ways to check accuracy of computations
	• Use appropriately the principles of commutative, associative and distributive laws as applied to multiplications. For example:
	
	    120 × 35 = 35 × 120 – commutative
	    120 × 35 = 120 × 7 × 5 – associative
	    120 × 35 = 120 × (30 + 5) – distributive
	• Discuss/explore situations that lead to a discovery of different rules related to the order of operation (BODMAS). For example:
	- speak the different ways of calculating the total cost of three books at \$5 each plus three books at \$4 each
	• Work out items consisting of mixed operations. For example:
	- 16 + 4 × 3 − 2 (multiply first)
	16 + 12 − 2 = 26
	- (7 + 8) ÷ 3 × 4 (bracket first)
	15 ÷ 3 × 4 (work left to right – divide first in this case)
	5 × 4 = 20
	• Estimate then use standard written methods in performing multiplication and division. For example:
	- 36.8 ÷ 1.5 is approximately 37 ÷1.5
	- 368 ÷ 15 (make equivalent computation by multiplying both numbers by 10)
		• Students give worked examples to illustrate communicative, associated and distributed principles involved in computations
		
		• Students work computations involving the order of operations
		
		• Students work in small groups to develop a chart that includes examples that reflect different aspects of the order of operations

Learning Outcomes		
	Suggested Learning Activities (NUMBER & NUMBER SENSE)	**Assessment**
LO:4 **Distinguish between; order; and calculate with different types of numbers**	• Use geometric strategy to explore the common multiple of sets of two numbers as follows. LCM of 3 & 4 = 12 (The Number of small square through which the line passes) LCM of 3 & 5 = 15 LCM of 4 & 6 = 12	• Students generate sets of multiples and factors of given numbers • Students identify Common Multiples and Highest Common Multiples (HCM) of a set of numbers • Students identify Common Factors and Highest Common Factors of a set of numbers • Students interpret Venn diagrams to determine multiples, common multiples and Lowest Common Multiples of a set of numbers • Students interpret Venn diagrams to determine factors, common factors and Highest Common Factors of a set of numbers • Students compute the square root of square numbers • Students use the calculator to compute the square root of 'non square' numbers • Students write an item/ a story problem that match a given result. For example:
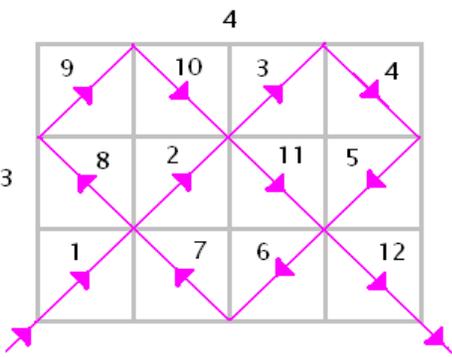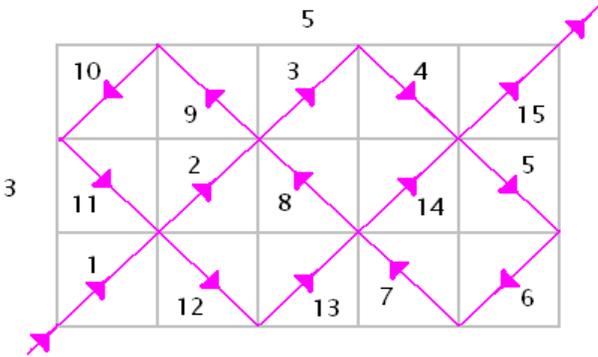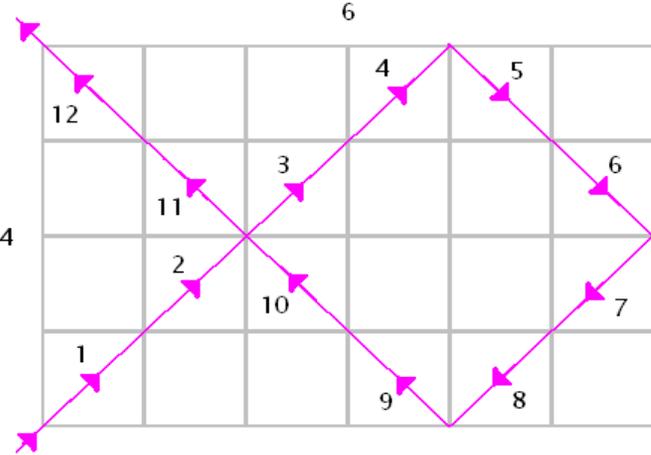
Learning Outcomes	

	Suggested Learning Activities (NUMBER & NUMBER SENSE)	Assessment
	• Link properties of numbers to set theory. For example: - use Venn Diagrams to show the relationship between the multiples/ factors of two numbers. **LCM of 3 & 4** 6, 3, 9, 21, (12), 24, 4, 8, 16, 15, 18, 20 Common Multiples of 3 & 4 **Factors of 18** Factors of 6 1, 2, 3, (6), 9, 18 Common Factors of 6 & 18 — HCF of 6 & 18 • Simplify computations involving indices and verbalize the meaning of the simplified format. For example: - 4 × 4 × 4 × 4 × 4 = 45 - 32 × 34 = $3^{(2+4)}$ = 3^6 because $3^2 × 3^4$ equals 3 × 3 × 3 × 3 × 3 × 3 - $6^4 ÷ 6^3$ = $6^{(4-3)}$ because $6^4 ÷ 6^3$ equals $$\frac{6 \times 6 \times 6 \times 6}{6 \times 6 \times 6}$$	A result of 1.25 may be obtained from Multiplying 0.25 by 5; dividing 5 by 4; adding 0.7 to 0.55
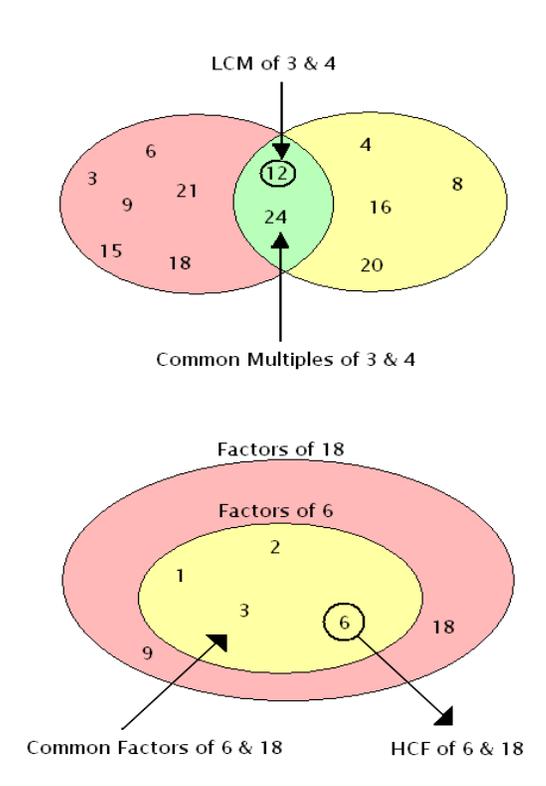
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Learning Outcomes		
	Suggested Learning Activities (NUMBER & NUMBER SENSE)	**Assessment**
	For example find the square root of a number by looking at a number of counters arranged in a square formation and note that the number of counters in a row and a column is the square root of the total number of counters used in the formation.	
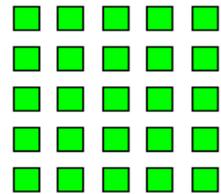
$$25 = 5 \times 5$$

$$\Rightarrow \sqrt{25} = 5$$
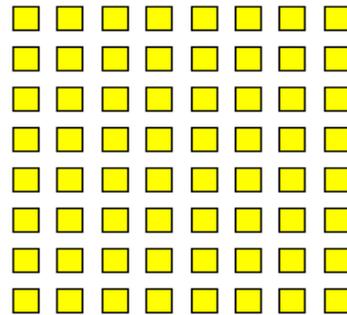
$$64 = 8 \times 8$$

$$\Rightarrow \sqrt{64} = 8$$
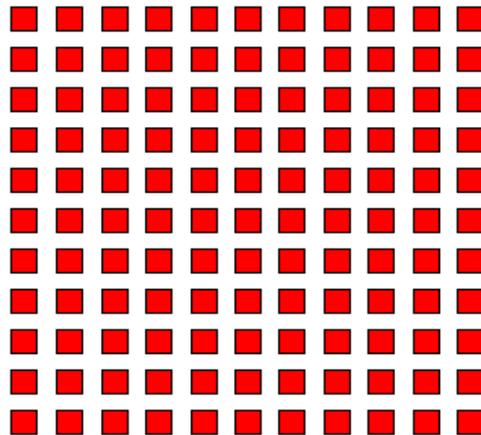
$$121 = 11 \times 11$$

$$\Rightarrow \sqrt{121} = 11$$

Learning Outcomes	Suggested Learning Activities (NUMBER & NUMBER SENSE)	Assessment
	• Find the square root of a number by using; - the area of a square and determining the side of the length of one side of the square $A = 3cm \times 3cm = 9cm^2$ Length of one side = $3 \equiv \sqrt{9}$ $A = 6cm \times 6cm = 36cm^2$ Length of one side = $6 \equiv \sqrt{36}$ $A = 9cm \times 9cm = 81cm^2$ Length of one side = $9 \equiv \sqrt{81}$ • Use the calculator to explore number written in different forms. For example: - Use the key $\boxed{\sqrt{}}$ on the calculator to evaluate the square of numbers - Use the key $\boxed{X^Y}$ on he calculator to evaluate numbers written in index form.	
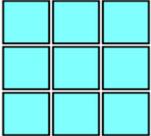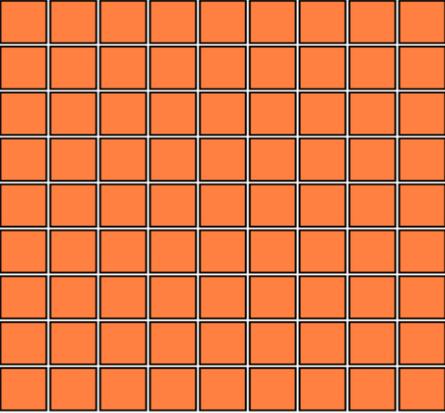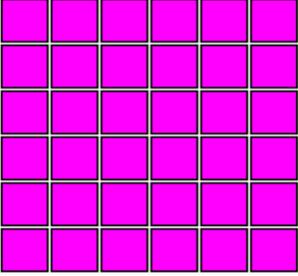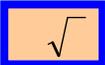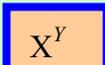
Learning Outcomes		
	Suggested Learning Activities (NUMBER & NUMBER SENSE)	**Assessment**

Integers

• Read and record thermometer displays of temperatures below and above zero degrees Celsius
• Investigate the behaviour of integers under addition and subtraction, by studying, completing and extending number patterns. For example:

2 + 1 = 3	−3 + 4 = 1	4 − 4 = 0	−5 − 3 = −8
2 + 0 = 2	−3 + 3 = 0	4 − 3 = 1	− 5 − 2 = −7
2 + −1 = 1	−3 + 2 = −1	4 − 2 = 2	−5 − 1 = −6
2 + −2 = 0	−3 + 1 = −2	4 − 1 = 3	−5 − 0 = −5
2 + −3 = −1	−3 + 0 = −3	4 − 0 = 4	−5 − −1 = −4
2 + −4 = −2	−3 + −1 = −4	4 − −1 = 5	−5 − −2 = −3

• Add and subtract integers by constructing, completing and extending tables of the form:

+	−3	−2	−1	0	1	2	3
−3	−6	−5	−4	−3	−2		
−2	−5	−4	−3	−2	−1	0	1
−1							
0							
1							
2							
3	0						

• Use the calculator to perform addition and subtraction of negative and positive numbers
• Verbalize generalizations relating to addition and subtraction of negative and positive numbers
• Solve problems involving addition and subtraction of negative numbers

Learning Outcomes		
	Suggested Learning Activities (NUMBER & NUMBER SENSE)	**Assessment**
LO:5 **Distinguish between; order; and calculate with different types of numbers**	• Relate fractions to division. For example: - interpret $\frac{7}{8}$ as 7 ÷ 8 • Express one quantity as a fraction (in its smallest term) of another. For example: - 215 of 300 is equivalent to $\frac{43}{60}$ - 55 minutes as a fraction of one hour is equivalent to $\frac{11}{12}$ - 600 cm as a fraction of 1 metre is equivalent to $\frac{3}{5}$ • Generate sets of equivalent fractions by multiplying both numerator and denominator by the same constant. For example: $$-\frac{3}{5}, \frac{6}{10}, \frac{9}{15}, \frac{12}{18}$$ $$-\frac{4}{7}, \frac{8}{14}, \frac{12}{21}, \frac{16}{28}$$ $$-\frac{2}{11}, \frac{4}{22}, \frac{6}{33}, \frac{8}{44}$$ • Convert improper fractions to mixed numbers and vice versa. For example: - change $\frac{62}{13}$ to mixed numbers - change $21\frac{7}{11}$ to improper fraction • Recognize from practical work that some fractions can be reduced to an equivalent fraction by dividing both numerator and denominator by the same number. For example: - $\frac{20}{100}$ = $\frac{4}{20}$ dividing by 5 - $\frac{52}{13}$ = $\frac{4}{1}$ or 4 diving by 13 • Compare and order up to four fractions, by converting them to fractions with common denominators. For example:	• Students work as a whole class to make a bulletin board to display sets of equivalence fractions/ decimals • Students perform computations in which they: - express one number as a fraction of another - convert fractions to decimals and vice versa - convert improper fractions to mixed numbers and vice versa - compare and order fractions and decimals • Students make sets of card that are equivalent fractions. For example: $\frac{1}{2}$　$\frac{2}{4}$　$\frac{3}{6}$　$\frac{4}{8}$ $\frac{1}{3}$　$\frac{2}{6}$　$\frac{3}{9}$　$\frac{4}{12}$

Learning Outcomes		
	Suggested Learning Activities (NUMBER & NUMBER SENSE)	**Assessment**
	- arrange in order of size beginning with the smallest/ largest $\frac{3}{7}, \frac{1}{4'}, \frac{7}{14}$ $\frac{4}{10}, \frac{5}{15}, \frac{2}{5}$ $\frac{2}{9}, \frac{1}{4}, \frac{5}{12}$ - arrange on a number line between 0 and 1 $\frac{1}{2}, \frac{1}{5}, \frac{2}{3}, \frac{1}{4}$	
LO:6 **Compare, order and calculate with decimals, fractions and percentages**	• Add and subtract fractions by expressing the equivalence of each fraction with a common denominator. For example: $$\frac{2}{3}+\frac{1}{4} \equiv \frac{8}{12}+\frac{3}{12}=\frac{11}{12}$$ $$\frac{5}{8}-\frac{1}{3} \equiv \frac{15}{24}-\frac{8}{24}=\frac{7}{24}$$ • Compute fractions of numbers, quantities and measurements such as: $$\frac{2}{8} \, of \, \$28.00$$ $$\frac{4}{7} \, of \, 3 \, weeks$$ $$\frac{2}{5} \, of \, 2 \, hours$$ $$\frac{3}{4} \, of \, 1 \, litre$$ • Generate the inverse of number sentences involving fractions and use the same to formulate strategy for dividing by a fraction. For example: $$\frac{1}{2} \times 2 = 1 \Rightarrow 1 \div \frac{1}{2} = 2$$ $$\frac{1}{4} \times 4 = 1 \Rightarrow 1 \div \frac{1}{4} = 4$$ $$\frac{2}{3} \times 2 = \frac{4}{3} \Rightarrow \frac{4}{3} \div \frac{2}{3} = 2$$	• Students perform computations involving addition, subtraction, multiplication and division with fractions and decimals • Students arrange fractions and decimals in ascending and descending order ; on a number line • Students make up story problems to match a worked computation • Students calculate a fraction/ percentage of a whole number or quantity

Learning Outcomes		
	Suggested Learning Activities (NUMBER & NUMBER SENSE)	**Assessment**
	• Add, subtract, divide, & multiply decimal numbers • Use mental strategies in calculating a percentage of a quantity. For example: - 23% of 500 (finding 20% then 3% and adding the two results) - 6.5% of 84 (finding 5%, then 1%, then halving the result of 1% and adding all three results) • Use written methods to calculate a percentage of a quantity such as: - converting the given percentage as an equivalent fraction. For example 40% of 35 $$\equiv \ \frac{40}{100} \times 35$$ - expressing a percentage as an equivalent decimal. For example 35% of 27 0.35 × 27 • Calculate the result of a given percentage increase or decrease and note the relationship between the result and the original number. For example: - A 100% increase results in the original quantity being doubled. - A 200% increase results in the original quantity being tripled - A 50% decrease results in the original quantity being halved - 100 % decrease results in the original quantity being reduced to zero - An increase of 25% results in 125% $\equiv 1.25 \quad \equiv 1\frac{25}{100}$ - A decrease of 15% results in 85% $\equiv 0.85 \quad \equiv \frac{85}{100}$ • Use the equivalence of fractions, decimals and percentages to solve problems. • Link to consumer arithmetic	

Learning Outcomes		
	Suggested Learning Activities (NUMBER & NUMBER SENSE)	**Assessment**
LO:7 **Solve consumer arithmetic problems involving earning and spending money; taxes, interest, appreciation and depreciation.**	• Collect advertisements from newspapers magazines, flyers, brochures; and perform calculations based on the conditions set out in those advertisements. For example calculate: - percentage discounts; - the price paid for an article after discount - the savings received/ unit price per article paid, if an offered of 'buy two get one free' is preferred over buying three singles • Perform calculations to convert from one currency to another based on a given exchange rate. • Construct simple bankbooks. Use the same in role play to reflect: - deposits; - withdrawals; - interests; - new balance after each transaction; • Construct tables to show growth of an amount of money invested at simple interest over a period not exceeding five years **Money** • Perform four basic operations involving money • Comput the bill for purchase of a number of articles • Work out the unit price per article, per gallon, per litre, etc • Work out simple currency conversions	• Students construct advertisements which make appropriate use of percentages • Given sufficient information, students calculate profit, loss, percentage profit, percentage loss; discount, sale tax, percentages increase and decrease in price, hire purchase price, deposit, cash price • Students write short notes to explain the meaning of terms used in consumer arithmetic to include percentages • Given sufficient information, students calculate profit, loss, percentage profit, percentage loss; discount, sale tax, percentages increase and decrease in price, hire purchase price, deposit, cash price • Students perform calculations involving money to determine the unit cost of an item, the "Best Buy" for money • Students solve problems involving computations with money • Students construct and answer questions related to aspects of consumer arithmetic as depicted in advertisements collected from flyers and newspapers

Learning Outcomes		
	Suggested Learning Activities (MEASUREMENT)	**Assessment**
LO:1 **Estimate, measure, compare and record measurements of lengths, distances and perimeters using appropriate units and devices**	• Estimate linear measurements (lengths, distances and perimeter, length of coiled string and to explain how such estimates were arrived at. • Manipulate different measuring instruments (ruler, tape measure, metre stick) to perform actual measurement of length, distance and perimeter • Measure different lengths using different units of measurement and discuss the advantages and disadvantages of using a particular unit to measure certain lengths • Describe one mm as one-tenth of a cm; one cm as one-hundredth of a metre; one metre as one-thousandth of a km • Convert from one unit of measurement to another – first giving an estimate then performing the actual calculation • Communicate ideas about linear measurements, using common fractions and decimal (¼, ½, ¾; 0.25; 0.5; 0.75). For eg. (500 m is ½ of a km; 75 cm is ¾ the length of a metre. • Record the same measurement in different ways. For example the length of the pole is 1m 50cm or 1.5 m or 1½ m • Create and solve problems relating to measurement of length, distance and perimeter. For example. - How many different integer rectangles having a perimeter of 24cm can you form?	• Students perform the actual task of measuring a set of objects in different units within a given time period or to a given degree of accuracy • Students complete exercises involving conversion from one unit of measurement to another • Students complete a table to show equivalence between different units of measurements. For example | MM	CM	M	KM
---	---	---	---
5000	500	5	.005
		1000	1
100		0.1		

Learning Outcomes		
	Suggested Learning Activities (MEASUREMENT)	**Assessment**
LO:2 **Estimate, measure, compare and record the areas of surfaces in square centimetres and square metres**	• Use the base and height of a right angled triangle, to sketch the corresponding rectangle and speak of the area of the right angled triangle in relation to the area of the corresponding rectangle that so formed. Area of B C E = ½ area of rectangle A B C D • Cut an isosceles triangle into 2 identical right angled triangles and re-arrange the two right angled triangles to form a rectangle. Guide students to speak of the area of the rectangle formed in relation to the area of the isosceles triangle that was started with. Area of ▲ R S T = Area of Rectangle R S X T	• Students estimate the area of regular and irregular shapes draw on grid paper • Students draw/ sketch shapes on dotted/ grid paper that enclosed a given area. For example: Draw as many shapes as possible that enclosed an area of 2 square centimeters • Students use formula to calculate the area of triangles and quadrilaterals

| Learning Outcomes		
	Suggested Learning Activities (MEASUREMENT)	**Assessment**
	• Use the results obtained for the area of rectangles and triangles to investigate ways that can be applied to find the area of other shapes (parallelograms, compound shapes) • Divide a parallelogram into two identical triangles and speak of the sum of the area of the two triangles so obtained as the area of the parallelogram. Use result to guide students to formulate a generalization for area of parallelograms Area of Parallelogram A B C D = Area A B C + Area of B C D $$= \tfrac{1}{2}(b \times h) + \tfrac{1}{2}(b \times h)$$ $$= b \times h$$ • Apply formulae to calculate the area of 2-D shapes (triangles and quadrilaterals) as well as composite shapes and explain orally or in written form the strategies employed • Select (giving reasons for choice) appropriate units to estimate, measure and record area of different size surfaces • Create and solve problems relating to measurement of surface area. For eg Investigating/exploring rectangles with same perimeter but different area; same area different perimeter	

Learning Outcomes	

	Suggested Learning Activities (MEASUREMENT)	**Assessment**
LO:3 **Estimate, measure, compare and record the areas of surfaces in square centimeters and square metres Volume, Capacity and Mass**	• Estimate, measure, record and compare measurements of volume capacity and mass; giving reasons for estimations and strategies used to obtain measurement. • Construct rectangular prisms using cubic centimetre blocks. Tabulate results and use such data to guide students to speak of volume determine the relationship between length, breadth, height and volume of rectangular prisms. Use results to verbalise a generalization that can be used to find volume of cubes and cuboids • Use formulae to determine the volume of rectangular containers. • Estimate and measure quantities to the nearest 100 ml and 10 ml; 100 grams and 10 grams • Recognise and refer to 1 000 cubic centimetres as 1 litre;	• Students compute the volume of cubes, cuboids and cylinders • Students complete tables of the form

Second part of assessment table:

MM	CM	M	KM
5000	500	5	.005
		1000	1
100		0.1	

1 L
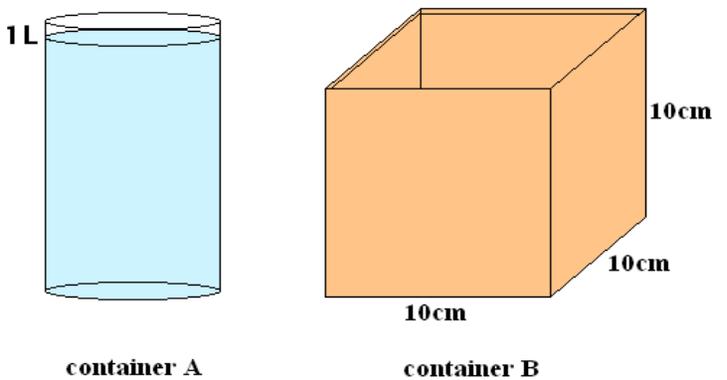
container A   container B

Empty the liquid in container A into container B and speak of the equivalence between 1litre and 1000cm^3

• Communicate ideas about volume/capacity and mass, using common fractions and decimal (¼, ½, ¾; 0.25; 0.5; 0.75). For eg. (500 ml is ½ of a litre; 750 grams is ¾ the mass of a kilogram
• Convert between millitres and litres and write measurement of volume using both litres and millitres For example;
- 3.5 litres is equivalent to 3 litres 500 millitres;

Assessment continued:

• Students give the dimension of cubes and cuboids with the same volume/ capacity
• Students use the fact 1000 cubic centimeters = 1 litre to convert between cubic centimetres and litres
• Given sufficient information, students compute the weight of objects
• Students perform computations involving conversion from grams to kilograms and vice versa
• Students give the dimension of cubes and cuboids with the same volume/ capacity
• Students use the relationship 2.2 pounds equal 1 kilogram to convert between pounds and kilograms
• Students solve problems related to measurement of weight and volume

Learning Outcomes		
	Suggested Learning Activities (MEASUREMENT)	**Assessment**
	• Estimate, then measure the volume of an irregular shaped object by observing the change in water levels when the object is submerged into a container of water. The water level rises by 200ml ∴ the volume of the stone = 200ml • Read & interpret information about the volume of commercial packages • Solve problems involving measurement of volume and capacity	
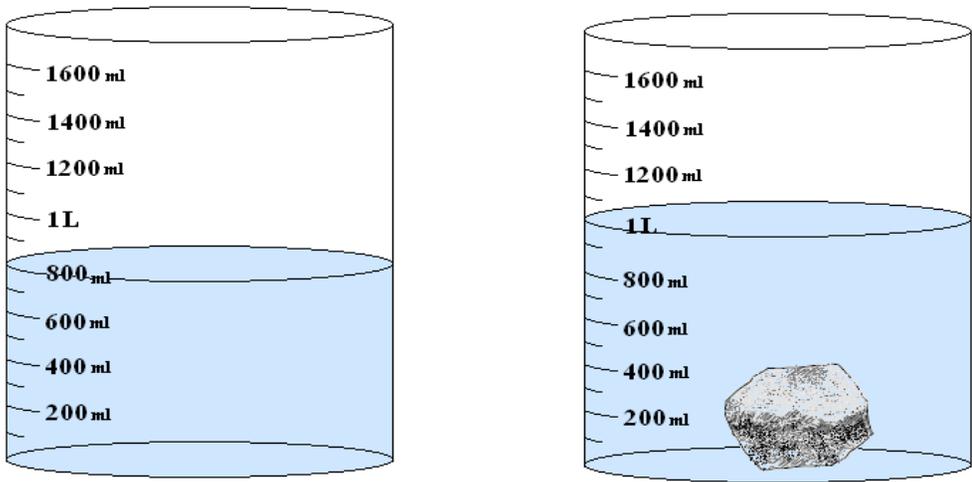
Learning Outcomes		
	Suggested Learning Activities (MEASUREMENT)	**Assessment**
	Weight • Estimate, measure, record and compare measurements of mass; giving reasons for estimations and strategies used to obtain measurements • Recognize and refer to 1 000 grams as one kilograms and one gram as one-thousandth of one kilogram; and use the same to aid in conversion from one unit to another • Communicate ideas about mass, using common fractions and decimal (¼, ½, ¾; 0.25; 0.5; 0.75). For example: - 500 g is ½ or 0.5 of a kg; - 2.2 lbs. is equivalent to 1 kg; - 5 750 g 5 ¾ the mass of a kg • Measure ones body weight at different intervals and speak of the difference in weight. For example: - measure one's weight before and after a physical Education session; or before and after lunch - measure one's weight each day for a period of five days • Differentiate between gross weight and net weight by measuring the content of a package and the package separately • Solve problems involving measurement of weight • Interpret calculator display for computations involving time • Solve problems involving calculations of time	

Learning Outcomes		
	Suggested Learning Activities (MEASUREMENT)	**Assessment**
LO:4 **Read and record time; perform calculations involving mixed units of time**	• Interpret calculator display for computations involving time • Convert between time given on the 24 hour clock and time given on the analog clock • Read a stop watch before and after an event and use such readings to determine the duration of an event to the nearest second or minute • Create and solve problems involving calculations of time	• Perform calculation involving measurments of time • Convert from one unit of measurment to another • Construct and solve problems involving time.
LO:5 **Temperature Read, Record, Interpret and Calculate temperature**	• Measure and record the change in temperature of an object. - measure at five minute intervals, the change in temperature of a glass of water placed in a freezer - measure and record at five one minute intervals the temperature of a pot of water placed on a burner to boil • Calculate the decrease or increase in temperature including situations involving the use of negative numbers • Link to the study of directed numbers to record temperature below zero degrees • Solve problems involving measurement of temperature • Link to related topics in Geography and Science	• Students perform the task of measuring and record the temperature of different objects in degrees Celsius and degrees F • Students complete a table to show the equivalence between degrees Celsius and degrees F • Students solve problems involving addition and subtraction of temperature

Learning Outcomes		
	Suggested Learning Activities (GEOMETRY)	**Assessment**
LO:1 **Estimate, measure, compare and record the areas of surfaces in square centimeters and square metres Volume, Capacity and Mass**	• Continue to label line segments using letters • Continue to use symbols to show that two lines are parallel/ equal • Draw/sketch line segments with given direction described in terms of the cardinal points (North East, South, West, North- East, South East, South West, North West). For example: - Draw the line PM 5 units long moving in a North East direction - Draw/sketch a line segment to show a distance of 6 units in an Easterly direction • Draw sets of lines in different orientations that are intersecting, parallel, perpendicular 	• Students sketch/ draw lines that meet given specification. For example: Draw lines that are parallel, perpendicular • Students identify from a given set, those lines that are parallel or perpendicular • Students use a pair of compasses and a ruler to construct a line to a given measurement • Students use a ruler and a set-square or a ruler and a pair of compasses to construct a line that is parallel or perpendicular to a given line • Students sketch parallel and perpendicular lines in different orientations

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Learning Outcomes		
	Suggested Learning Activities (GEOMETRY)	**Assessment**
	• Manipulate the ruler and set squares to form sets of parallel lines in different orientations • Make use of the basic Cardinal points to produce lines that are parallel or perpendicular. For example both line segments AB & CD are moving in an Easterly direction, hence they are both parallel Each pair of lines are parallel since they are moving in the same direction. Line segments RS & RT meet at 90° angle because RS is moving directly West and RT is moving directly South. Each pair of lines meet at 90°	
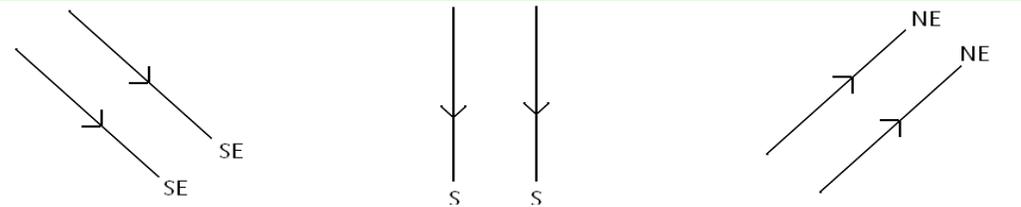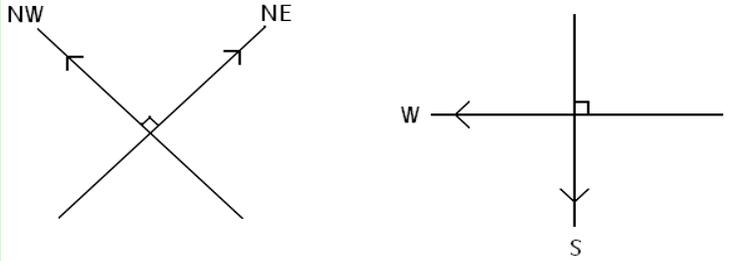
Learning Outcomes		
	Suggested Learning Activities (GEOMETRY)	**Assessment**
LO:2 **Identify properties of angles and use such knowledge to solve problems**	• Use the protractor to draw and measure angles in different orientations of a given size up to 180° 	• Students sketch different types of angles in different orientations • Students measure and record the size of a given angle • Given sufficient information, students calculate the size of angles formed by: - two intersecting lines - two parallel lines cut by a transversal • Students construct angles of 60, and 90 using a pair of compasses and a ruler
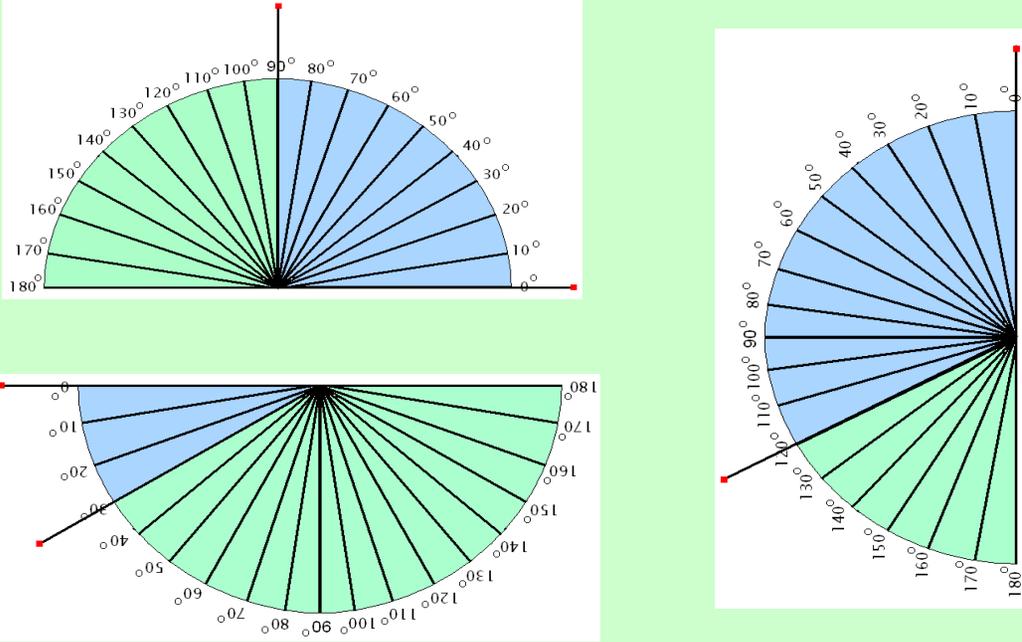
Learning Outcomes		
	Suggested Learning Activities (GEOMETRY)	**Assessment**
	• Estimate, measure and record the size of angles up to 180° to the nearest 5° • Sketch/ draw examples of the different types of angles (acute, right, obtuse, straight, reflex) • Investigate: - when/ why two acute angles could/ could not form another acute angle; a right angle; an obtuse angle, a straight angle, a reflex angle - when/ why two obtuse angles could/ could not form another obtuse angle; a right angle; a straight angle; a reflex angle • From practical work deduce the relationship between angles formed by two intersecting lines. - Draw four 90° angles by intersecting a straight edge with a line. Rotate the straight edge about a fixed point on the line and speak of the effects on the size of the four angles involved Rotate the Blue line 30° to the right about the point of intersection	
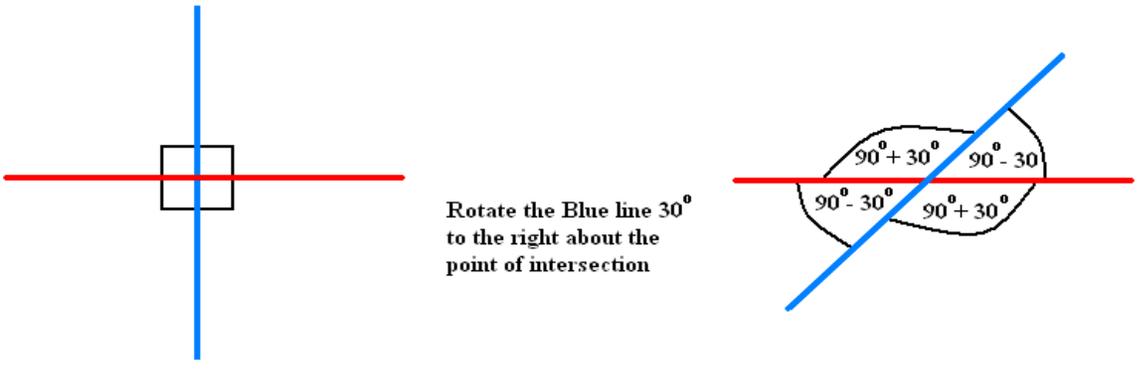
Learning Outcomes	Suggested Learning Activities (GEOMETRY)	Assessment
	- Form eight right angles by placing a straight edge across two parallel lines. Rotate the straight edge about a fixed point on each of two parallel lines and speak about the resulting effects on the size of the eight angles involved Rotate the Green line (AB) about the point O and speak of the resulting effect on the size of each angle.	
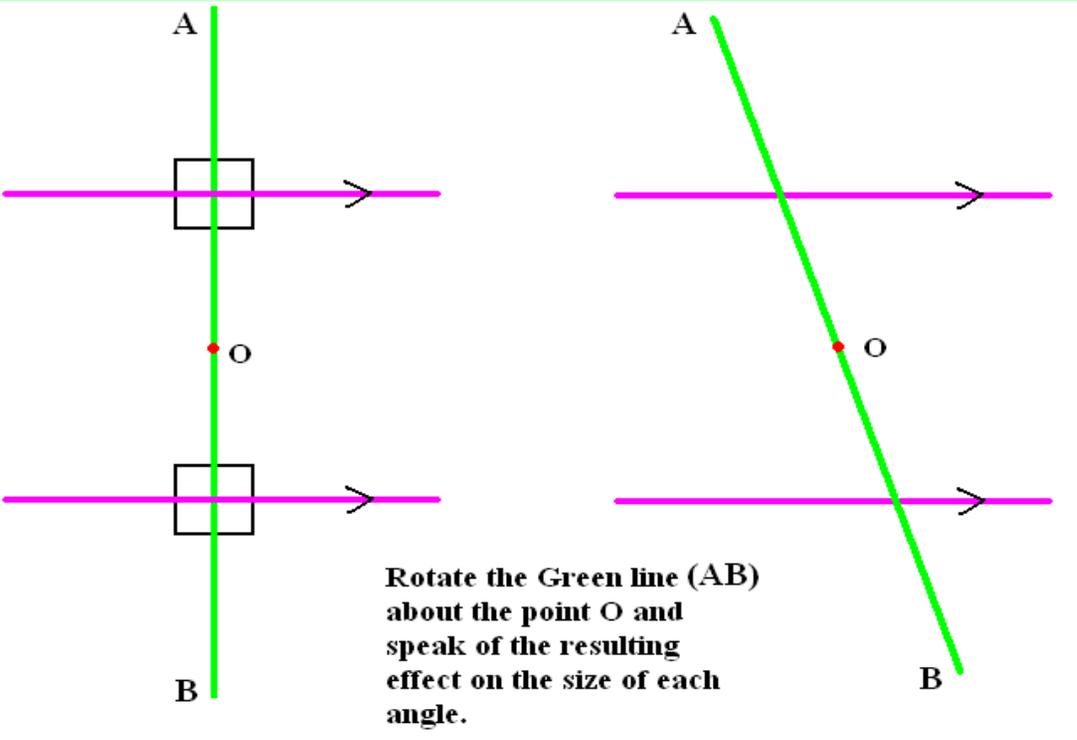
Learning Outcomes		
	Suggested Learning Activities (GEOMETRY)	**Assessment**
	- Draw sets of two parallel lines cut by a transversal in different orientations; label and measure the angles and discuss the relationship between the measurement of the different angles • Solve problems relating to angles • Use pair of compasses and ruler to construct angles of size 60° and 90°	
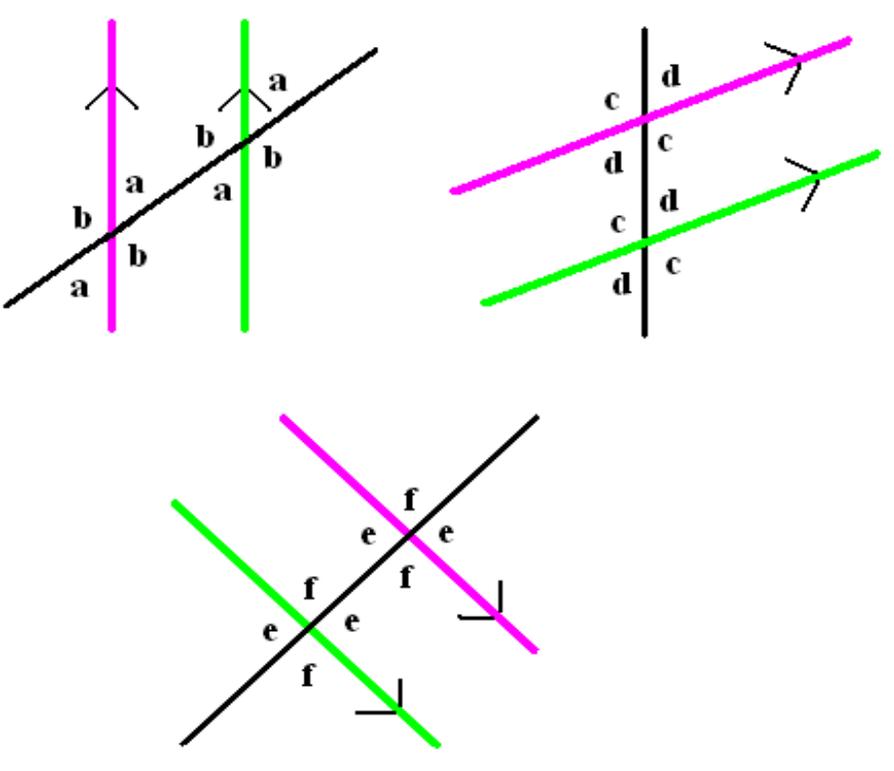
| Learning Outcomes		
	Suggested Learning Activities (GEOMETRY)	**Assessment**
LO:3 **Polygons (triangle) Identify and use the geometrical properties of triangles in problem solving**	• Classify and name polygons based on the number of sides of the polygon up to ten sides • Differentiate between regular and irregular polygons • Sketch/draw different types of triangles in different orientations • Extend lines (sides) of a triangle to produce exterior angles of that triangle. **Exterior Angles** • Investigate the relationship between sides and angles of a triangle. Increase/decrease one angle or side of a triangle and talk about resulting impact on the size of other angles and sides of the triangle. Use three rods to form a triangle. Remove one of the rods and replace with a longer or shorter rod and speak of the resulting effect on the angles/ sides of the triangle • Rotate different types of triangles and speak of the order of rotational symetery of the different types of triangles.	• Given sufficient information, students calculate: - missing angles in triangles - exterior angles of a triangle • Students identify sets of three lengths that can form a triangle • Students state the properties of different types of triangles • Students sketch triangles to match stated properties • Students make a chart using triangles of different sizes, shapes and colours that they have cut from Bristol board showing different types of triangles

Learning Outcomes		
	Suggested Learning Activities (GEOMETRY)	**Assessment**
	• Compare the sum of two lengths of a triangle with the length of the third side and talk about the relationship between any two sides and the third side of a triangle. Sum of any two lengths is greater than the length of the third side. • Cut rectangles/squares/isosceles triangles into two identical triangles and re-arrange the two triangles to form other types of triangles • Cut out three strips of cardboard, one 6cm long , one 2cm long, and one 3cm long. then try to make a triangle using the strips and discuss why a triangle cannot be made. • Apply geometrical facts, properties and relationships to solve numerical problems such as finding unknown sides and angles of triangles, and justifying solutions to problems by giving	
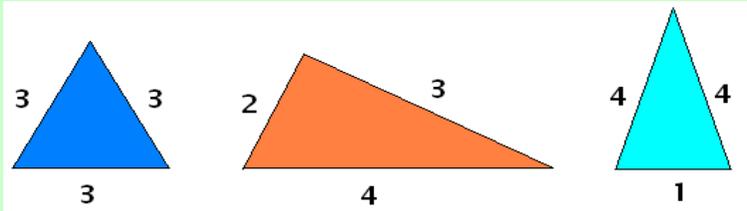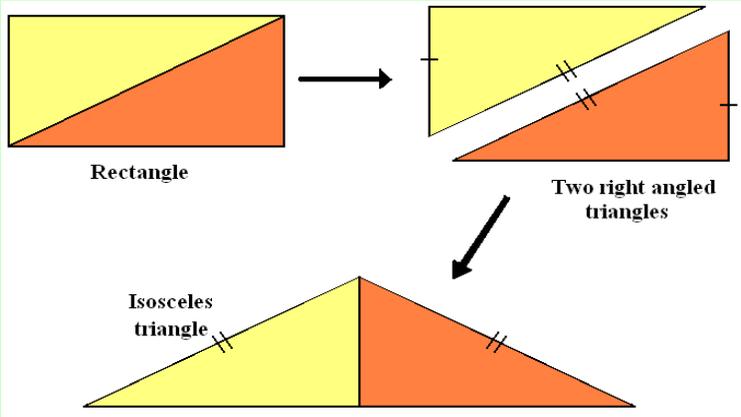
Learning Outcomes		
	Suggested Learning Activities (GEOMETRY)	**Assessment**
LO:4 **Polygons (Quadrilaterals) Identify and use the geometric properties of quadrilaterals in solving problems**	• Determine the properties of quadrilateralsby measuring and comparing lengths of sides and angles • Sketch/draw quadrilaterals by following given cardinal directions and speak of the type of quadrilateral so formed. • For example. Start at a point A, move 4 cm to East, label that point B, move 3 cm to the South East, label that point C; move 4cm to West, label that point D; move from D straight to at A. • Use 'cut outs' of different types of triangles to form four sided figures and speak of the types of quadrilaterals so formed. For example: - form quadrilaterals using two right angle triangles; two equilateral triangles; two isosceles triangles - form a trapezium by cutting a right angled triangle; an isosceles or equilateral triangle • Apply knowledge of quadrilaterals to solve problems. 	• Students draw tables to summarize the properties of different quadrilaterals • Students sketch examples of different quadrilaterals in different orientations • Given sufficient information, students calculate the size of missing angles and length of sides of quadrilaterals • Students design a chart consisting of examples of different types of quadrilaterals • Students classify quadrilaterals and state the rule governing their classifications • Students make a booklet consisting of polygons of different shapes and sizes. This booklet may include pictures from magazines and newspapers that illustrate the types of polygons labeling each
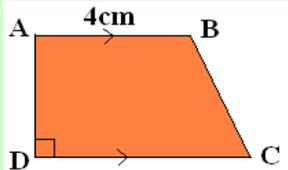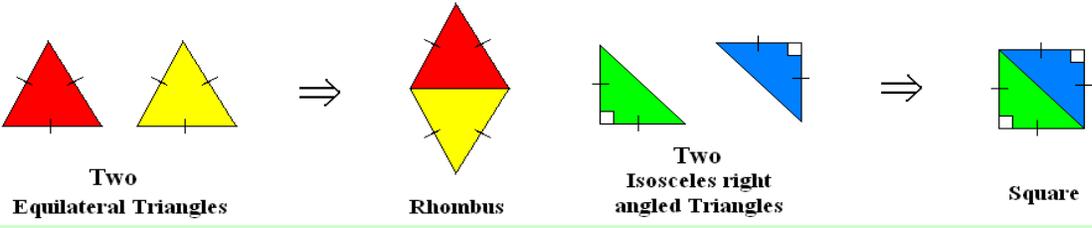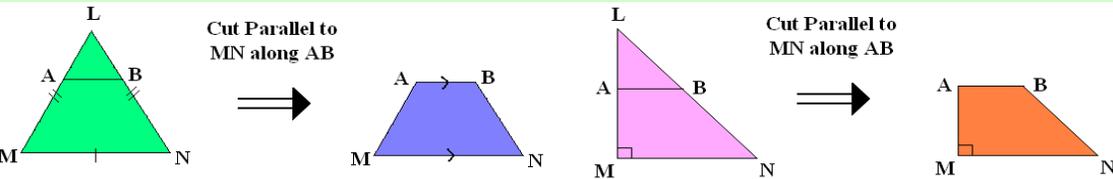
Learning Outcomes		
	Suggested Learning Activities (GEOMETRY)	**Assessment**
LO:5 **Circle** **Identify abd use properties of circle to solve problems**	• Identify, name and sketch the different parts of the circle (radius, diameter, arc, circumference, chord, sector, segment) • Draw several lines from the center of a circle to the circumference of the circle, estimate, measure and record the measurement of these lines and speak about the results obtained. Repeat same activity with different circle of a different radius • Draw several lines that run from one point on the circumference of a circle to another point on the circumference and passing through the centre of the circle. Measure each line and discuss the results obtain. Repeat activities with circles of larger or smaller radii • Cut a piece of string the length of the radius of a circle. Use that length of string to measure the diameter of the same circle then talk of the length of the diameter of the circle in relation to the length of its radius • Cut a piece of string the length of the diameter of a circle. Use that length of string to measure the circumference of the same circle then talk of the circumference of the circle in relation to the length of its diameter • Construct circles, using a pair of compases	• Students estimate the diameter/ radius of a circle given the circumference and vice versa • Given sufficient information, students calculate the circumference, radius, diameter of a circle • Students construct circles to a given radius, using a pair of compasses and a ruler

Learning Outcomes		
	Suggested Learning Activities (GEOMETRY)	**Assessment**
LO:6 **Solid Shapes** **Identify the** **properties of solids** **and apply such** **knowledge in** **solving problems**	• Draw nets of 3-D shapes in as many ways as possible. For Example; **Examples of** **Nets of a Cube** • Draw solids shapes on isometric paper For example 	• Students classify solids and solid shapes and explain the rule governing such classification • Students draw the corresponding nets for various solid shapes and vice versa

Learning Outcomes		
	Suggested Learning Activities (GEOMETRY)	**Assessment**
LO:7 **Transformation Geometry Identify properties of transformation and use such knowledge to solve problems relating to geometry**	• Manipulate objects and speak of/sketch its positions before and after it has been manipulated • Rotate linear objects about a fixed position and discuss/sketch the object in its original and new positions. • Pin 'cut outs' of triangles and rectangles at one vertex, rotate the shape about that point and discuss/sketch the object in its original and new positions. • Translate objects by moving such objects to the left, right, up or down and sketch the object in its original position and position after the translation. • By folding papers and tracing produce an original diagram and its image. • Place an object on a clean sheet of paper. Trace the object in that position. Slide the object up, down, right, left and trace the object in its new position for example; 	• Students sketch on grid paper, the object and its image after a stated transformation • Given sufficient information, students state the type of transformation that was performed on the object

Learning Outcomes	Suggested Learning Activities (GEOMETRY)	Assessment
	• Draw on dotted paper objects and their images after reflection. For example;	

Learning Outcomes		
	Suggested Learning Activities (PATTERN & ALGEBRA)	**Assessment**
LO:1 **Generate, describe and complete number and geometrical patterns using a variety of strategies and completing simple number sentences by calculating missing values**	• Make generalizations using words and symbols about numbers and number relationship and explain how these generalizations were arrived at giving examples to illustrate the correctness of the generalization • Generate geometric patterns to reflect different types of numbers and discuss the observed patterns. For example: 4 4 + 3 4 + 3 + 3 2 2 + 2 2 + 2 + 2 1 2 3 1 1 + 3 1 + 3 + 5	• Students complete number sequence and geometric patterns • Students describe in words, the rule depicted by a given number sequence or geometric pattern • Students extend number sequences and geometric patterns • Students generate number sequences and geometric patterns
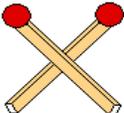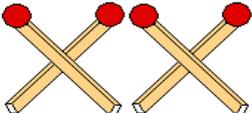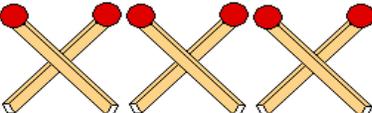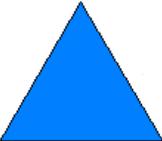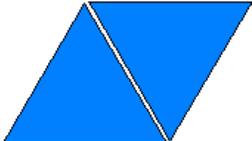
Learning Outcomes		
	Suggested Learning Activities (PATTERN & ALGEBRA)	**Assessment**
	• Use data from numbers patterns to construct and complete tables of values. • Make up and play "guess my rule' games. For example: - 29, 26, 30, 27, 31, 28, 32 • Identify, make and complete patterns involving algebra without using symbols. (Students should not be introduced to algebraic expressions until they have had considerable experience describing patterns in their own words).	
LO:2 **Construct, simplify and transform algebraic expressions**	• Use concrete materials such as rods to model algebraic expressions of the form: - 2a; 3p; 5t (variable times a constant) - 2a + 1 (variable times a constant plus another constant). 	• Students construct algebraic expressions from verbal statements and pictorial representations. For example write an expression for the perimeter of this rectangle: • Students simplify algebraic expressions by grouping liked terms • Students develop geometrical models to illustrate algebraic expressions. For example the expression 8**m** + 4**n** may be model geometrical as the perimeter of athis rectangle
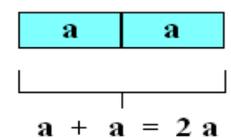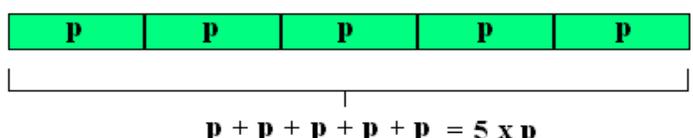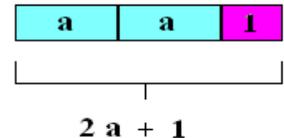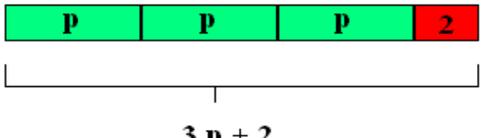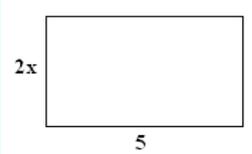
Learning Outcomes		
	Suggested Learning Activities (PATTERN & ALGEBRA)	**Assessment**
	• Link verbal expressions to physical model. For example build algebraic expressions from discussions about the perimeter of plane shapes. Start with a shape where the lengths of all sides are given then gradually move to shapes with one unknown side, two unknown sides, three unknown sides. For example students generate expressions for the perimeter of each plane shape. 	• Students rewrite a given algebraic expression in as many ways as possible. For example: $10t + 12$ may be rewritten as: $5t + 5t + 12$; $9t + t + 12$; $10t + 6 + 6$; $2(5t + 6)$
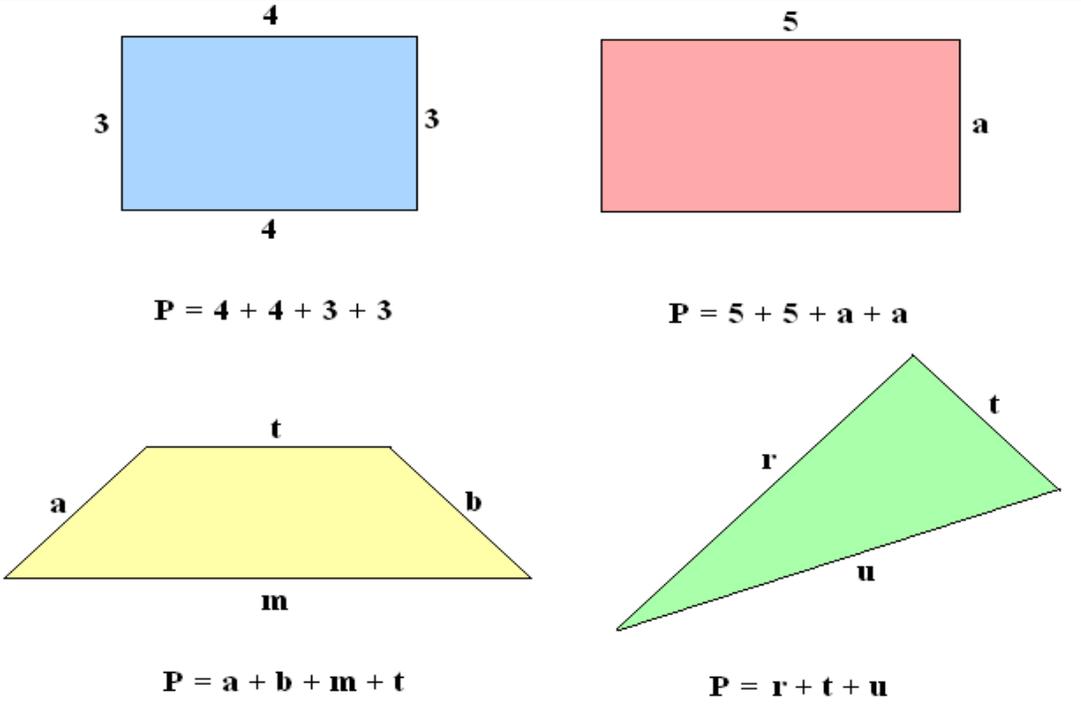
Learning Outcomes		
	Suggested Learning Activities (PATTERN & ALGEBRA)	**Assessment**
	• Generate a variety of equivalent expressions that represent a particular situation or problem. For example generate as many equivalent expressions for the total length of a line, perimeter of a single plane shape by starting at different points, moving along the entire object and forming the expression as you move. Start here · t a b m $P = t + b + m + a$ t a b m Start here $P = m + b + t + a$ • Use colour code models to aid in the identification and grouping of liked terms. For example in the diagram below, guide students to speak of similar length as having the same term/expression; and to rearrange the diagram to have similar lengths side by side. b b b t t $3b + 2t$ m r m m r $m + r + 2m + r$ ↓ **Put all the r's side by side** r r m m m $2r + 3m$ q t q 5 5 t q ↓ **Put similar letters & numbers side by side** q q q t t 5 5 $3q + 2t + 10$	
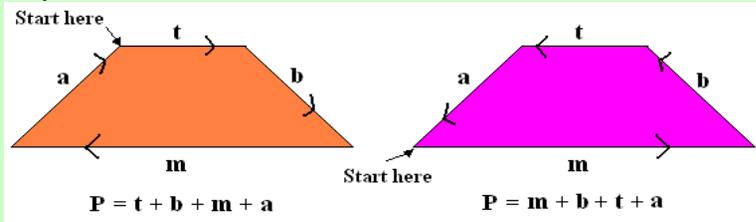
Learning Outcomes		
	Suggested Learning Activities (PATTERN & ALGEBRA)	**Assessment**

	• Develop and use geometrical model for expressions of the form t (c + d). For example the total area of these rectangles can be computed as follows:
	
	A = 4 x 7 x + 4 x 3
	  = 4 (7+3)
	
	A = 3a + 3b
	  = 3 (a + b)
	
	A = 6 x m + 2 x m
	  = m (6 + 2)	

Learning Outcomes	Suggested Learning Activities (PATTERN & ALGEBRA)	Assessment
LO:3 **Construct and solve algebraic equations and inequalities**	• Discuss/ produce situations which give rise to the use of the equal sign (=) to express relationship between two expressions. For example these two lines are equal in length. $3t + 4 = 2t + 9$ or $t + 4 = 9$ $6 + 4r = 14$ or $4r + 6 = 14$ The same length of wire was used to form both rectangles. $5t + 5t + 3 + 3 = 2t + 4 + 2t + 4 + 5 + 5$ • Generate the inverse operation of given equations to assist with approaches in the solving of equation. For example students may work in pairs where one student give an equation and the other produce the inverse operations. Begin with arithmetic equation then move to algebraic equations. For example: $9 + 4 = 13$ $13 - 4 = 9$ & $13 - 9 = 4$ $m + 5 = 12$ $12 - 5 = m$ & $12 - m = 5$ $7 + c = 19$ $19 - 7 = c$ & $19 - c = 7$ $15 - a = 16$ $15 + 16 = a$ $13 - a = 5$ $5 + a = 13$	• Students translate verbal statements and geometrical representations into algebraic equations • Students write the inverse of given algebraic equations • Students solve simple algebraic equations in one unknown • Students write short notes to explain the steps followed in solving an algebraic equation

Learning Outcomes		
	Suggested Learning Activities (PATTERN & ALGEBRA)	**Assessment**
	• Generate equivalent equations by adding the same quantity to or subtracting the same quantity from each side of the equation. $p + 10 = 15$ $p + 10 + 3 = 15 + 3$ • Verify the equivalence of algebraic expressions and equations by substituting a given number for letters • Apply knowledge of algebraic expression and equations in solving problems	
LO:4 **Identify, transpose and apply familiar mathematics formulae**	• Make use of drawings and examples to illustrate/ explain the meaning of familiar formulae used in mathematics such as - P = 2L + 2W or 2(L + W) - A = L × W - A = ½ B × H • Work out solutions to simple binary operations. For example: - if t m = t + m, then 2 3 = 2 + 3 - if r q = 2r – q, then 5 7 = 2 × 5 − 7 • Solve equations arising from substitution into known mathematics formulae. For example: A = L x W. Find the value of L where A = 24 and W = 3	• Substitute numbers into given formulae • Give examples to illustrate formulae • Compute solutions to simple binary operations

Learning Outcomes	Suggested Learning Activities (PATTERN & ALGEBRA)	Assessment
LO:5 **Express functions; and represent mappings diagrams graphically. Graph and interpret linear relationships on the number plane Express and represent functions in mapping diagrams on linear graphs**	• Students make apparatus that can be used to illustrate mappings. For example, fasten two long pieces of wood so that they are about half a metre apart. Put a number line on each stick and hammer in a nail on each number. Label one stick X and the other $f(X)$ • Students use apparatus like that shown below to construct and describe mapping diagrams. For example the diagram below shows a mapping that may be described in the following ways: - "you add one to the first number" - The second number is one more than the first number" **Add 1 to the first number to get the second number** • Students use mapping diagrams to formulate tables of values. For example the diagram above may be represented in a tabula form as shown below. | x	f(x)
---	---
-1	0
0	1
1	2
2	3
3	4 | • Replace written (verbal) description of mapping diagram with algebraic symbols	• Students complete and extend mapping diagrams. For example: $$f(x) = 2x + 1$$ • Students complete tables of values to match a given rule/ generalization • Students states the rules governing a mapping diagram • Students plot pairs of points on the Cartesian Plane from a mapping diagram or table • Students generate tables of values from a linear graph • Students describe, using words/ symbols, linear graphs as shown on grid papers
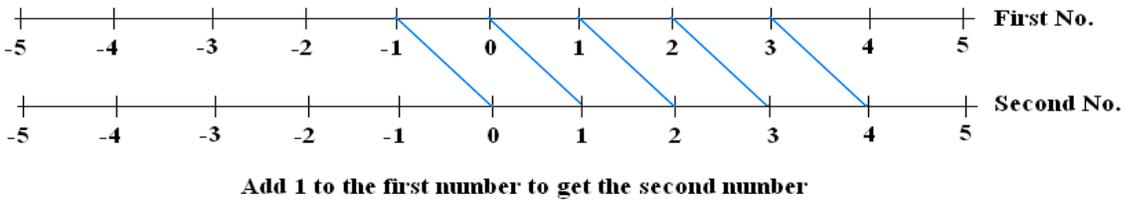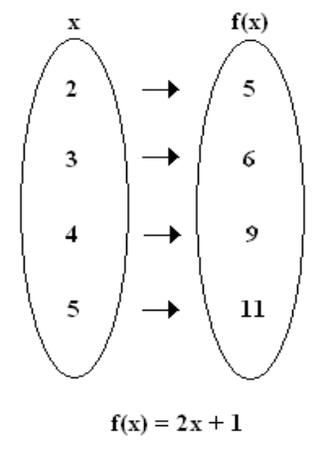
Learning Outcomes	Suggested Learning Activities (PATTERN & ALGEBRA)	Assessment
	• Make large grids on cardboards that show a pair of axes labeled χ and f (χ). Pin pieces of string on the grid to represent different sets of linear functions. For example;	

$f(x)$

$f(x) = x$

4
3
2
1
0   1   2   3   4   5   6   x

$f(x)$

5
$fx = x - 2$
4
3
2
1
-3 -2 -1 0   1   2   3   4   5   6   x
         -1
         -2
         -3
         -4

Learning Outcomes		
	Suggested Learning Activities (DATA HANDLING)	**Assessment**

LO:1
 	
Use set notations to organize information and; solve problems
	• List members of sets by interpreting Venn diagrams and explaining the relationship between the set listed and the other sets. For example if:
	
	$Y = \{\text{whole numbers 1 to 20}\}$
	
	$A = \{\text{multiples of four}\}$
	
	$B = \{\text{odd numbers}\}$
	
	- $A' = \{1, 2, 3, 5, 6, 7, 9, 10, 11, 12, 13, 15, 17, 18, 19\}$
	  (All members of Y not belonging to B)
	
	- $B' = \{2, 4, 6, 8, 10, 12, 14, 16, 18, 20\}$
	  (All members of Y not belonging to A)
	
	- $(A \cup B)' = \{2, 6, 10, 14, 18\}$
	  (All members outside of the union between A and B)
	
	• Use knowledge of the properties of shapes to construct statements using set notations. For example:
	- $\{\text{rectangle}\} \subset \{\text{quadrilaterals}\}$
	
	- $\{\text{cubes}\} \subset \{\text{cuboids}\}$
	• Apply the expression 2^n in determining the number of subsets where n is the number of elements in the given set. For example given that:
	- set A = $\{2, 4, 6\}$ the number of subsets = 2^3 = 2 × 2 × 2 = 8 (there being 3 members in set A)
	
	- set Q = $\{r, s, t, u, v\}$,the number of subsets = 2^5 = 2 × 2 × 2 × 2 × 2 = 32
	
	(there being 5 members in set Q)
		• Students list members of a set given a description of the set and vice versa
		• Students give examples of different types of sets (null, infinite, finite, equal, equivalent)
		• Students use set language notations to describe set relationships
		• Students answer questions based on information presented in Venn diagrams
		• Students draw simple Venn diagrams to show relationships between given sets

Learning Outcomes		
	Suggested Learning Activities (DATA HANDLING)	**Assessment**
	•Link set theory to geometry • Make Venn diagrams to illustrate relationships between different types of polygons. For example: Polygon regular — irregular isosceles triangles — right angled triangles both isosceles & right angled equalaterial acute angle equalaterial triangles all equalaterial trinagles are acute angle • Use knowledge of set theory in solving problems. • Link to number theory, geometry and other related area of the mathematics curriculum.	

Learning Outcomes		
	Suggested Learning Activities (DATA HANDLING)	**Assessment**
LO:2 **Design and use simple instrument for relevant data collection**	• Discuss questions that can be investigated in mathematics and identify means of collecting data to answer such questions. For example: - What is the household size of students in our class/ school? - What are the ten fastest times recorded at our school across the 100 metre distance? (record from the school athletic meet) - Which types of fish are the most frequently caught in St Vincent and the Grenadines? (statistical data from the Fisheries Department) **Link to other subject disciplines** • Carry out simple tasks in which data are collected. For example gather and record data: - through observation such as the time of the setting of the sun over a one week period or in different location of the country - from simple experiment such as boiling a pot of water and reading temperature of the water at one minute interval - by asking questions of a sample of a larger population in your community such as; how many persons are in your household. • Link to the strand on measurement by as using devices to carry out direct measures of students': - heights of students in centimetres and metres - weight in pounds, and kilograms	• Students select the most appropriate data collection method to collect information for a stated purpose • Students design suitable questions, tally chart, tables that can be used to collect data for a stated purpose • Students perform the actual task of collecting data through observation, and administration of questions and direct measure

Learning Outcomes		
	Suggested Learning Activities (DATA HANDLING)	**Assessment**
LO:3 **Organize and display data using different forms of presentations**	• Make and use tally charts to record the outcomes of simple experiments associated with chance. For example the tossing of a coin or rolling of a die 100 times may be recorded in the tally chart. • Construct ungrouped frequency tables. For example: - this list of scores (15, 5, 25, 15, 20, 10, 15, 10, 5, 25, 15, 10, 5, 15, 15, 20, 20, 15, 5, 20) may be presented in an ungrouped frequency table as follows: - Ungrouped frequency table | Score	Frequency
---	---
5	4
10	3
15	8
20	4
25	1 | • Construct grouped frequency tables for a set of data given class intervals. For example: - a grouped frequency table using class intervals of 1 – 5; 6 – 10; 11 – 15; 16 – 20; may be used to record the following list of scores: 4, 6, 7, 9, 11, 11, 14, 15, 19, 19 | Score	Frequency
---	---
1-5	1
6-10	3
11-15	4
16-20	2		• Student organize data in grouped and ungrouped frequency tables • Students construct frequency tables, graphs, bar charts, pie charts from a given set of data • Students construct tables from bar chart and vice versa

Learning Outcomes		
	Suggested Learning Activities (DATA HANDLING)	**Assessment**
	• Organize and present data in the form of bar charts. For example: - (Draw bar chart) **A bar chart showing the attendance record of a group of students** Number of Students in class Day • Organize and present data in the form of line graphs using a suitable scale on any one of the axes: For example: (Draw samples of line graphs) **This line graph shows the time taken on each part of the journey to school by a student** Distance in Km Waiting Walking Travelling in a Bus Waiting Waiting Walking 10 20 30 40 50 1hr 10 20 30 40 Time	
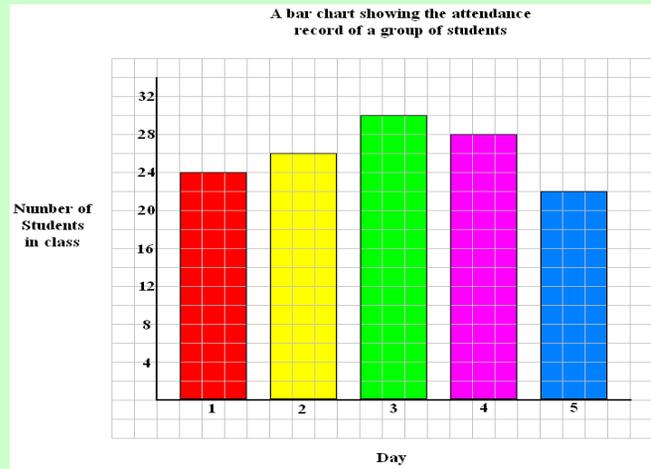
Learning Outcomes		
	Suggested Learning Activities (DATA HANDLING)	**Assessment**
	• Organize and present data in the form of pie charts. For example: **This pie chart shows a favourite activities of a group of 72 students** Hiking (9) TV (18) 45° Picnic (9) 45° 60° Seeing Friends (12) Sports (18) 30° (6) reading • Construct tables and graphs from the same data and discuss which is the most appropriate means of display • Use simple graphing software to enter data and create graphs such as spreadsheets programme	
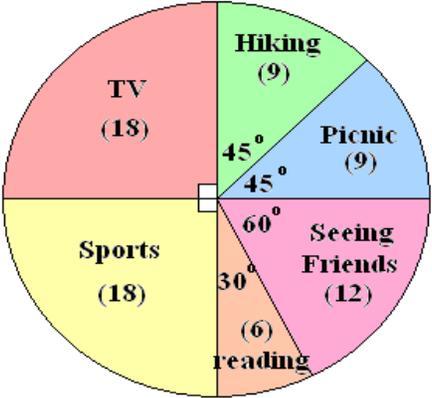
Learning Outcomes		
	Suggested Learning Activities (DATA HANDLING)	**Assessment**
LO:4 **Determine and use typical statistical measures from data**	• Discuss situations in which the one measure is considered more appropriate than the others. For example: - the modal brand of corned beef sold is more likely to be used by a sales person in determining the quantity of each brand to be purchase when replacing stocks; - the median height of persons is likely to be preferred by a sales person putting up a sign board advertising his/her goods - the mean is the measure likely to be used by a meteorologist in reporting the average rain fall for a given period: • Determine the mode from a bar chart as the score represented by the bar having the greatest height • Calculate the mean of a set of scores by using the scores and frequencies as presented in an ungrouped frequency table. | Score	Frequency
---	---
5	2
10	3
15	2
20	3 | $$\text{Average Score} = \frac{\text{Total score}}{\text{Frequency}}$$ $$\frac{5+5+10+10+10+15+15+20+20+20}{10} = \frac{130}{10} = 13$$	• Students calculate the mean from a given set of ungrouped data • Students determine the mode, range, median, maximum, minimum scores from a given set of data • Students construct a frequency tables from a given bar chart, line graph or pie chart • Students make predictions and conclusion based on information presented in tables, bar charts, line graphs or pie charts • Students answer questions based on information presented in tables, bar charts, line graphs or pie charts
LO:5 **Interpret data and draw conclusions**	• Generate sets of questions that can be answered using the information in a table or graph • Answer questions based on information presented in tables, charts, graphs. For example: • Represent data represented one way in another form. For example: - construct a frequency table from a given bar chart and vice versa • Interpret line graphs, given scales on the axes • Compare two sets of data by using the mean and the mode or the median or the range • Make predictions on information presented.	• Respond orally and in writing to questions based on information presented in the form of tables, charts, graphs and pie charts • Make predictions based on information presented in the form of tables, charts, graphs and pie charts

Learning Outcomes		
	Suggested Learning Activities (DATA HANDLING)	**Assessment**
LO:6 **Probability Describe and compare the chance of an event occuring**	• Indicate on a number line between impossible and certain the likelihood of something occurring. For example: - (A) it will rain on an over cast day - (B) • Use knowledge of equivalent fractions, decimals and percentages to assign numerical values to and speak of the likelihood of simple events occurring. For example: - there is a three in ten $\dfrac{3}{10}$, 30%, 0.3 of it raining today - there is an eighty percent (0.8, $\dfrac{8}{10}$ that our school football team will win the schools' championship this year • Solve simple probability problems	• Order events from least likely to most likely. • Determine the probability(likelyhood) of an outcome