REPUBLIC OF TRINIDAD AND TOBAGO

MINISTRY OF EDUCATION

Secondary School Curriculum

MATHEMATICS

Curriculum Development Division

Contents

A Message from the Director

The Curriculum Guides and Teachers' Guides have been developed by educators and teachers. They are intended to facilitate the preparation of students to meet the rapidly changing demands of life in the 21st century, while ensuring that they acquire the core of general knowledge and experience essential for higher education. The revised curriculum represented is designed to guide the adoption of a more student-centred approach to instruction, and the provision of learning opportunities that are relevant and inclusive of varied learning needs and interests.

We have seen profound changes in the use of technology in education, the need for a greater focus on morals and values education and increased acquisition of life skills. There is no doubt that further shifts will take place in the coming years. The challenge for us as educators is to find ways to make our approach to teaching flexible, progressive, and responsive, so that we embrace change where it benefits learners. This entails becoming lifelong learners ourselves and creating environments that provide necessary community and stakeholder support and foster professional development.

The design of the revised curriculum documents was based on sound, contemporary educational theory, best practice, and system data. These documents will serve as foundational guides for the development of instructional programmes to be implemented at the Forms 1-3 levels.

The Curriculum Development Division is confident that the revised National Curriculum Guides and the Teachers Guides for Forms 1–3 will contribute significantly to enhanced teaching and learning experiences in our secondary schools. Accordingly, the curriculum is the main channel to educate and develop children towards being academically balanced, healthy and growing normally, well-adjusted socially and culturally, emotionally mature and happy and enabling them to achieve their full potential.

John Roopchan

Director of Curriculum Development

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PART 1

The National Curriculum for

Forms 1 – 3

National Curriculum Framework

Introduction

This curriculum framework is intended to outline the nature and purpose of the curriculum as well as the parameters for consistent curriculum implementation throughout secondary education in Trinidad and Tobago. The document sets out the principles that govern and guide teaching and learning. The term 'curriculum' is used in this document to describe the sum total of the planned experiences which occur within that environment and was designed to foster children's learning and development. These include activities and events, with either direct or indirect impact upon the child.

A clear understanding of the nature, role and function of the national curriculum for Trinidad and Tobago is a critical part of the whole positive transformation of education to provide a seamless pathway for all students through the system of teaching and learning. For Trinidad and Tobago, the National Curriculum Framework becomes the basis for all education and curriculum decision-making, including the design, development and implementation strategies for a new system of teaching and learning covering those foundation years of education. The statement of outcomes for students are a key part of this education framework and forms the basis for all subsequent decisions about teaching and learning, content, pedagogy and assessment. These must work towards fulfilling the vision for successful students and future citizens of our nation.

In order to establish common ground and ensure that the curriculum can be implemented as designed, a set of foundational principles needs to be established. This National Curriculum Framework establishes a consistent foundation for learning that is undergirded by the Ministry of Education's vision, mission and the five value outcomes for all children.

The National Curriculum must ensure that all curriculum activity, including implementation at the classroom level, functions within the guiding principles of education established by the Ministry of Education. The guiding principles of the Ministry of Education *(Education Sector Strategic Plan 2011-2015 p.g. XI)* were developed after extensive stakeholder dialogue and sound analysis of the current societal and national requirements.

For an effective and relevant twenty-first century process of teaching and learning, these guiding principles are an indicator that the Ministry of Education seeks to place education in Trinidad and Tobago alongside, if not ahead of international best practices. The Ministry of Education has established an *Education Sector Strategic Plan: 2011-2015* to achieve the goals of quality, innovative, challenging, flexible education for all, and has begun an investment in human and material resources to achieve this outcome in a purposeful and timely fashion.

Foundation of the National Curriculum

Curriculum development is informed by the vision and mission of the Ministry of Education. The design of revised curriculum documents for implementation at the classroom level is therefore guided by the principles and policies of the Ministry of Education.

A forward-looking perspective on what all schools should be facilitating in terms of student achievement is guided by the national curriculum. There is equal clarity regarding a twenty-first century education system functioning to provide the highest standard of education. The regulatory and guiding principles for education provide the overarching national framework for education.

The Ministry of Education, *Education Sector Strategic Plan: 2011-2015,* and other policy documents, establish the design framework for all components of the new curriculum. Principal among these are the vision, mission and the five (5) value outcomes established at the national level for all students, which further guides the formulation of the desired and intended learning experiences for the classroom in the curriculum guide.

Vision of the Ministry of Education

The Ministry is leading a quality education system that responds to the diverse needs and requirements of 21st century learners, promotes inclusivity, seamlessness, equity and equality and contributes to human capital and sustainable development.

*GORTT, Ministry of Education, Education Sector Strategic Plan: 2011-*2015

The Mission statement is derived from the Vision of the Ministry of Education. The Mission statement will guide the revision of the curriculum to meet the needs of the learners.

Mission of the Ministry of Education

To educate and develop children who are able to fulfil their full potential; healthy and growing normally; academically balanced; well-adjusted socially and culturally; and emotionally mature and happy.

*GORTT, Ministry of Education, Education Sector Strategic Plan: 2011-*2015

Value Outcomes

An internal analysis of the education system, together with research conducted in international forums, has shown that the curriculum is core to the development of innovative people. This curriculum is aimed at attaining the five value outcomes of the Ministry of Education that help to define standards of attainment for all secondary school students.

The Ministry of Education's overarching goal is to educate and develop children who are:

- Able to fulfil their full potential
- Academically balanced
- Healthy and growing normally
- Well-adjusted socially and culturally
- Emotionally mature and happy

Every core curriculum subject must facilitate the achievement of these value outcomes by all students. The core curriculum subjects, their content and the suggested teaching, learning, and assessment strategies are the means to fulfil the holistic development of the student.

It is expected that by the end of secondary school education, students will achieve all five value outcomes in order to make informed choices and contribute to the needs of society.

The five value outcomes are described more fully below.

A. Children who will achieve their full potential

1. Function with a purpose based on love, value, family life, service and aesthetic expression.

2. Understand and participate constructively in their career and vocational pathway.

3. Able to cope with daily challenges, set healthy boundaries and make wise social choices.

4. Productive achievers, role models with good work ethics.

5. Will function at their best with a strong sense of commitment to their interests and activities.

6. Optimize their God-given talents to their advantage.

7. Enterprising and responsible in risk taking.

8. Recover quickly from setbacks and disappointments.

9. Achieve economic well-being and make a positive contribution to society.

B. Children who are adequately prepared educationally to fulfil their potential

1. Prepared to participate in society as appropriate to their age.

2. Academically balanced to be productive (combination of appropriate skills and competencies).

3. Skilled in critical and creative thinking, problem-solving, visioning, thinking outside the box and receptive to new ideas.

4. Skilled in the use of current technology and the Internet (cyber wellness).

5. Proficient in a second language.

C. Children who are adequately developed socially and culturally

1. Productive and have good self-image.

2. Enquiring, confident and strong among their peers, and emotionally secure, open, honest and empathetic in relationships.

3. Competent to interact and communicate with others, within different social settings and environments.

4. Patriotic and courageous in civic affairs and proud to be identified as members of the national and Caribbean Community.

5. Historically aware, including knowledge of our people.

6. Capable of informed participation in the democratic and political process.

7. Capable of functioning with good character and values in their culture.

8. Respectful of the law, authority, the rights of others, creative imagination in its different forms and of the right to divergent views.

9. Developed with interpersonal and language skills.

10. Environmentally aware, protective of the physical environment and demonstrates an understanding of sustainable development.

11. Able to lead, have good governance skills, are competent to respond to the challenges of new roles in multiple contexts and are able to manage conflict.

12. Humanely aware of the less fortunate and the disadvantaged and committed to contributing to the welfare of our community and country.

13. Functioning with an honest sense of family and community.

14. Proficient in dealing with daily conditions.

15. Skilled in finding a safe place to think and grow.

16. Confident in themselves, self-motivated, enterprising and pursuing self-education and lifelong self-development and able to work independently and with others.

17. Capable of finding assistance if they are abused or neglected.

18. Spiritually aware with the emotional and intellectual resources to pursue their spiritual growth.

19. Appreciative of the contribution of the arts to daily life, cultural identity and diversity, locally, regionally and internationally.

20. Able to express themselves through the arts.

D. Children who are healthy and growing normally

1. Secure and safe in their home, school, and community.

2. Physically fit, mentally alert, well nourished, and psychologically sound.

3. Active in exercise, sports, games and recreation.

4. Capable of wholesome interaction with peers.

5. Morally prepared for a productive life.

6. Adequately developed neurologically to overcome learning, speaking, hearing, focusing, and memory or mobility challenges.

E. Children who are emotionally developed, mature and happy

1. Able to enjoy daily life, have fun and express happiness and positive emotions.

2. Participants in entertainment and celebration.

3. Established in their peer group, satisfied with their lives and able to achieve meaning in their lives.

4. Mature and able to become full-fledged, productive and enterprising citizens.

Further readings - GORTT, Ministry of Education, Education Sector Strategic Plan: 2011-2015

Education Policies That Impact on the Curriculum

Several policies from the Ministry of Education were taken into account for the revision of the Lower Secondary School Curriculum. These include the Education Sector Strategic Plan 2011-2015, the ICT in Education Policy and National Schools Code of Conduct. Three policies that have direct impact on the development and implementation of the curriculum are discussed.

Education Sector Strategic Plan: 2011-2015

The Education Sector Strategic Plan purports a vision for education premised on guiding principles which informed the curriculum design and development process. They will provide reference points to ensure that the desired attributes of education are achieved. The guiding principles, listed below, are important components in the revised curriculum.

Principle	*Elaboration*
Student Centered	The student is at the centre of everything we do.
Engaged Communities	We engage parents and families as the heart of students' lives and we support and acknowledge them as the primary guides and decision-makers for students. We engage members of local, regional and global communities as active contributors to student learning.
Inclusive	We expect all students will learn in a welcoming environment regardless of place, culture, or learning needs.
Proactive	We plan for a desired future, preventing problems instead of reacting to them.
Shared Responsibility	We acknowledge that education is everybody's business and therefore expect teachers, the school and education leaders to collaborate with other government and community organizations to foster student learning
Innovative	We explore new learning opportunities through research, innovation and professional development to ensure continuous improvement of student learning.
Flexible	We enable meaningful and relevant learning through a range of opportunities appropriate to each student's development stage.
Equitable	We ensure that every student will have the benefit of high-quality learning opportunities.
Accountable	We explain to the citizens of Trinidad and Tobago the outcomes for our students and our use of funding.
Transformative Leadership	We believe that people with vision and passion can achieve great things. We therefore empower and inspire our staff and stakeholders to create positive and lasting changes in the education system.
Quality	We are committed to meeting our own quality standards that are driven by the requirements of our customers. Each of us takes charge to ensure that these standards are implemented in our individual areas of authority.

Teacher Empowerment	We create the environment for excellence in teaching practice that improves the learning of all students, deepens educators' content knowledge, provides them with research-based instructional strategies to assist students in meeting rigorous academic standards, and prepares them to use various types of classroom assessments appropriately.

ICT in the Curriculum

The ICT in Education Policy goals and objectives of the Ministry of Education are to:

   i.   Ensure all stakeholders possess the critical requisite skills and competencies to use ICTs in the education system as a tool to enhance learning and teaching, communication and research, and to generate innovative processes;

   ii.   Encourage innovative models of ICT use such as:
- teacher education;
- teaching;
- learning; and
- curriculum materials development;

   iii.   Harmonize activities, approaches and standards in the use of ICTs within the Education System;

   iv.   Encourage critical and creative thinking, lifelong learning and social responsibility.

ICTs in education in Trinidad and Tobago would create an educational system in which students leave schools as confident, creative and productive users of new technologies, including information and communication technologies, and understand the impact of those technologies on society.

The Ministry of Education's ICT in Education Policy (pp. 28–29) refers to Curriculum Content and Learning Resources as,

- Curriculum and content must increasingly maximize the use of ICT.

- ICT must be integrated into the development and delivery of the curriculum.

- The ICT curriculum needs to be reviewed frequently in order to maintain its relevance.

- ICT integration and ICT competency measures across the curriculum shall be driven through the development and delivery of an ICT-infused curriculum.

ICT in education would create an environment that encourages creativity, innovation, critical thinking and decision making.

Inclusive Education Policy

The Ministry of Education is committed to "support the delivery of inclusive education in all schools by providing support and services to all learners, and by taking appropriate steps to make education available, accessible, acceptable and adaptable to all learners." An inclusive curriculum is acknowledged to be the most important factor in achieving inclusive education. In planning and teaching the school curriculum, teachers are therefore required to give due regard to the following principles:

i.   The National Curriculum Guides set out what most students should be taught at lower secondary school but teachers should teach the required knowledge and skills in ways that suit students' interests and abilities. This means exercising flexibility and drawing from curricula for earlier or later class levels to provide learning opportunities that allow students to make progress and experience success. The degrees of differentiation exercised will depend on the levels of student attainment.

ii.   Varied approaches to teaching, learning, and assessment should be planned to allow all students to participate fully and effectively. Account should be taken of diverse cultures, beliefs, strengths, and interests that exist in any classroom and so influence the way students learn.

Copies of these documents may be obtained from the Ministry of Education's offices or its website at http://moe.edu.tt/.

The Curriculum Development Process

The term 'curriculum' has several meanings, depending on the context and the perspective of curriculum theory that is applied to the definition. Most theories concur that there are four fundamental components within definitions of curriculum:

- Curriculum as the transmission of a body of knowledge.
- Curriculum as product - defined by the ends or achievements expected.
- Curriculum as process.
- Curriculum as praxis

This revised curriculum subscribes to an eclectic approach which is an amalgamation of the above definitions.

The foundation of the National Curriculum is also informed by a wealth of available curriculum theories and processes. The major forces that influence and shape the organization and content of the curriculum include:

1. Educational philosophy and understandings about the nature of knowledge

2. Society and culture

3. The learner and learning process

4. Learning theories

5. The nature and structure of subject matter to be learned

Thus, these areas represent the foundation on which the national curriculum is revised. These areas will inform educational goals with the aim of developing a coherent, culturally focused, and dynamically evolving curriculum.

This revised curriculum displays a learner-centred design with philosophical assumptions that are mainly constructivist. It seeks to educate and develop children who are able to fulfil their full potential; healthy and growing normally; academically balanced; well-adjusted socially and culturally; and emotionally mature and happy.

The curriculum process was developed through four stages:

Stage 1 of the curriculum development process consisted of consultations with stakeholders from a cross-section of the national community.

The Ministry of Education conducted one national consultation on the secondary education curriculum, along with 3 joint-district consultations and one in Tobago. Consultations were held with representatives from the various divisions of the Ministry of Education: students; denominational and local school boards; members from the primary and secondary principals association; members of the business community; Unions; representatives from tertiary institutions; representatives from Non-Governmental Organizations (NGOs); parents; and special interest groups. These key stakeholders provided valuable information which helped to inform curriculum change to better prepare students to meet the needs of society.

Stage 2 of the process involved the analysis of findings from opinions, experts, relevant documents and best practices which informed the design of the revised curriculum to enable a set of desirable outcomes and essential competencies to be possessed by all students.

Data from different sources together with other policy documents were examined and a unanimous decision was taken for the following to be core:

English Language Arts, Mathematics, Science, Visual and Performing Arts (VAPA), Physical Education, Spanish and Health and Family Life Education (HFLE), Technology Education, Information and Communication Technology (ICT) and Social Sciences which comprise History, Geography, Social Studies, Religious Education.

In order to develop the student holistically, emphasis was also placed on ICT integration, Sexuality and Sexual Health Education, Eating and Fitness, Literacy and Numeracy.

At **Stage 3**, subject experts produced the revised curriculum documents. For each subject, a Curriculum Guide and Teachers' Guide was developed. Teachers with specific subject or curriculum development skills from schools were also included in the creation of these curriculum documents. The outputs of this phase included learning outcomes specific to each subject that contribute to the fulfilment of the national outcomes; subject content; teaching, learning and assessment strategies to support the outcomes. As part of the development process, the curriculum was validated by feedback solicited from Universities and other key stakeholders. Continued consultations with key stakeholders will provide feedback to inform curriculum evaluation and further validation.

These curriculum documents will provide learning opportunities, teaching and learning strategies, assessment strategies and instructional plans which will contribute to the full potential of the students.

Stage 4 involved the implementation of the revised curriculum. Implementation of the curriculum is a dynamic process, requiring collaboration of the curriculum coordinators / officers and teachers. In implementing, teachers are expected to use the formal curriculum, as described in the curriculum guides, to plan work and teach in a manner that accomplishes the outcomes described. Teachers are expected to translate those outcomes into units of study, determining the appropriate sequence and time allocation according to the learning needs of their students. Although the curriculum documents provide sample teaching and assessment strategies, it is also the role of the teacher to select and use sound teaching practices, continually assessing student learning and systematically providing feedback to curriculum teams for use in revising and improving the guides.

The revised curriculum documents will be implemented initially for Forms 1 then at the Form 2 level and finally at the Form 3 level. Curriculum officers responsible for specific subject areas will monitor and support teachers in the implementation of this curriculum through school visits.

A curriculum development system provides support for the tasks of curriculum implementation. The system advocated by the Ministry of Education involves stakeholders, specialist curriculum officers, principals, heads of departments, and teachers, each with specific roles and responsibilities. Some of these are outlined in the table below.

System Component	Members	Role
Strategic Executive Team (SET) of the Ministry of Education	Consultants, Advisors	• Advise on curriculum policy, goals, and standards.
Curriculum Development Division (Head Office and District-based)	Curriculum Officers	• Plan and develop curriculum. • Provide leadership in identifying curriculum goals and determining the process for development of curriculum materials. • Lead writing teams (which include teachers). • Monitor implementation. • Provide teacher support.

		•Facilitate teacher professional development for curriculum implementation. • Advise on processes and materials for effective implementation and student assessment. • Evaluate curriculum.
School Curriculum Management Team	Principal/ Vice Principal and Heads of Departments	• Make major decisions concerning the school curriculum, such as assigning resources. • Provide guidelines for Instructional Planning Teams.
Instructional Planning Teams/School Instructional Committees	Teachers	• Cooperate on tasks necessary for effective implementation, such as: yearly work plans, units of study, development of materials to individualize the curriculum, identification and development of learning materials, student assessment and evaluation.

At the school level, the curriculum refers to all the learning and other experiences that the school plans for its students. It includes the formal or written curriculum, as well as the informal curriculum, which is comprised of other developmental opportunities provided by the school, such as those offered by student clubs, societies and committees, and sporting organizations (e.g. mathematics club, debating society, cricket team, Girl Guides, Boy Scouts, Cadets).

The School Curriculum Management team develops a School Curriculum that must be in alignment with the National Curriculum. The School Curriculum Management team usually consists of the Principal and/or Vice Principal and Heads of Department. The duties of the School Curriculum Management team include the development of school culture, goals, vision, and curriculum in alignment with the national curriculum and culture. It also provides support for curriculum work and performs evaluation functions.

In providing support for curriculum work, the School Curriculum Management team may, for instance:

- Encourage teachers to identify challenges and try new ideas;
- Develop timetables to allow time for the development of curriculum materials, for example, year plans, units, instructional materials;
- Ensure availability of learning materials;
- Provide instructional leadership;
- Ensure that appropriate strategies are formulated to promote student success.
- Monitor the curriculum (using, for example, observation, test scores, student books, formal and informal discussions with different stakeholders);
- Assess the hidden curriculum (including discipline policies, fund allocation, physical environment);
- Evaluate the school's programme of studies.

The roles of instructional teams are described below:

- Develop/Revise/Evaluate work programmes
- Determine resource needs
- Identify/Develop instructional materials
- Conduct classroom action research
- Integrate and align curriculum
- Identify and develop appropriate assessment practices
- Develop reporting instruments and procedures (student and teacher performance)
- Keep records

The roles of teachers are described below:

- Develop/Revise instructional programme
- Individualize curriculum to suit students' needs and interests
- Develop/Evaluate/Revise unit plans
- Develop/Select appropriate learning materials
- Select appropriate teaching strategies to facilitate student success
- Integrate the curriculum as far as possible, and where appropriate
- Select appropriate assessment strategies
- Monitor/Assess student learning and keep records

- Evaluate student performance
- Evaluate classroom programmes
- Conduct action research
- Collaborate with colleagues

The revised lower secondary curriculum for Trinidad and Tobago provides every opportunity for the child to learn, master new important skills and develop attributes and values that are critical to their role as emerging productive, caring and responsible citizens.

The Core Curriculum Subjects

The core curriculum subjects are those for which every student is required to demonstrate achievement of the stated outcomes in Forms 1–3.

A minimum time allocation is recommended for each core subject. The principal, as instructional leader of the school, will make the final decision as to time allocation, according to the needs of the students and the resources available at any given time.

The subjects and the recommended time allocations are as follows:

The number of recommended periods per subject is based on:

- A 5 day cycle
- 7 periods per day
- Approximately 40 minutes per period

SUBJECT	NUMBER OF PERIODS PER WEEK
English Language Arts (ELA)	7
Mathematics	7
Spanish	2
Science – Physics, Chemistry and Biology	4
Sports	2
Technology Education	3
Visual and Performing Arts (VAPA)	4
Information and Communication Technology (ICT)	2
Social Sciences – Social Studies, History, Geography, Religious Education/Health and Family Life Education (HFLE)	4

FRAMEWORK FOR AREAS OF STUDY IN SOCIAL SCIENCES

- Social Sciences comprise of the following subjects: Social Studies, History, Geography and Religious Education/HFLE.
- Four periods are dedicated to Social Sciences.
- One period will be dedicated for Social Studies from Forms 1-3 all terms.
- Two periods each will be dedicated to History and Geography
- One period per week is dedicated to Religious Education or HFLE

Form	Term 1		Term 2		Term 3	
	Subject	# of periods per week	Subject	# of periods per week	Subject	# of periods per week
Form 1	Social Studies Geography History RE/HFLE	1 1 1 1	Social Studies History RE/HFLE	1 2 1	Social Studies Geography RE/HFLE	1 2 1
Form 2	Social Studies Geography RE/HFLE	1 2 1	Social Studies Geography History RE/HFLE	1 1 1 1	Social Studies History RE/HFLE	1 2 1
Form 3	Social Studies Geography RE/HFLE	1 2 1	Social Studies History RE/HFLE	1 2 1	Social Studies Geography History RE/HFLE	1 1 1 1

At the end of Form 3, students will be assessed for the National Certificate of Secondary Education (NCSE), Level I.

Information and Communication Technology (ICT) Infusion into the Curriculum

Information and Communication Technology (ICT) Infusion into the curriculum is intended to ultimately transform teaching and learning to meet the needs of twenty-first century learners and better prepare them to be global citizens. The use of ICT integration initiatives should support the development of critical skills such as knowledge construction, problem-solving, critical thinking, collaboration, communication, innovation, inquiry, digital literacy and entrepreneurship.

ICT covers all the technologies used for the handling and communication of information. These technologies include:

- Computers/laptops
- Storage devices (e.g. flash drives, CDs)
- Mobile devices/handheld devices
- Satellite communication
- Audio & Audio visual systems
- Cloud computing
- Email/messaging

In addition to the above named technologies, there is a generation of Web 2.0 tools that facilitate a more engaging and interactive learning experience in the classroom. The following is a small sample that may be useful to teachers and students:

- Social networking sites (including educational social networking platforms like Edmodo)
- Blogs, wikis, forums
- Photo and Video sharing tools (e.g. Flickr, Instagram, Youtube)
- Cloud storage (e.g. Skydrive, Dropbox, Deego)
- Digital Story telling tools (e.g. Story Maker)
- Social bookmarking and annotation tools (e.g. Diigo)
- Inspirational tools and lessons (e.g. TED Talks/Ed)
- Screen casting/screen capture tools (e.g. Jing)
- Word cloud generators (e.g. Wordle)

The process of integrating ICT into the curriculum requires that administrators and teachers find ways to incorporate ICTs into teaching and learning to maximize educational outcomes, making learning relevant and meaningful. This integration can only be successful if it is carefully planned, managed, monitored, evaluated. Additionally, appropriate measures should be devised to provide support wherever needed according to the context of the school environment.

It is hoped that educators continue to be creative and resourceful, making full use of the resources that are available to them as they plan instruction.

Literacy across the Curriculum

Literacy is about more than reading and writing – it is about how we communicate in society. It is about social practices and relationships, about knowledge, language and culture. Literacy … finds its place in our lives alongside other ways of communicating. Indeed, literacy itself takes many forms: on paper, on the computer screen, on TV, on posters and signs. Those who use literacy take it for granted – but those who cannot use it are excluded from much communication in today's world. Indeed, it is the excluded who can best appreciate the notion of "literacy as freedom". (UNESCO, Statement for the United Nations Literacy Decade, 2003–2012)

The revised lower secondary curriculum addresses the literacy needs of all learners as they interact with a variety of texts across the different subject disciplines. Research indicates that students who struggle have significant difficulty navigating mathematics, science and social sciences texts in which the language is expository, dense and full of difficult vocabulary (Allen 2000). This underscores the need for all teachers to support students' literacy development since literacy skills are needed if students are to access the entire curriculum.

Teachers of English address students' literacy by teaching the skills of listening, speaking, reading and writing in an explicit and systematic manner. The goal of literacy instruction is to improve learning by building students' comprehension and communication skills. Teachers of other content areas have the responsibility of extending students' literacy instruction by teaching the subject-specific literacy of their respective subject areas. Literacy is embedded in every subject so teachers must create literacy-rich activities for students that will strengthen and support subject-specific learning.

The table below illustrates generic literacy activities that content area teachers and students can engage in to build the core skills of listening, speaking, reading, writing and representing as the curriculum is enacted in all subjects.

Table 1: BUILDING LITERACY SKILLS ACROSS ALL SUBJECT AREAS

LITERACY SKILLS	STUDENT ACTIVITY IN ALL SUBJECTS	TEACHER SUPPORT
Listening and Speaking	Engage in collaborative discussions	Set ground rules for discussions
Aesthetic Listening	Make oral presentations that include use of ICTs	Listen attentively
Efferent Listening	Express ideas, perceptions and feelings about what is being learnt	Facilitate discussions and explanations
Critical Listening	Listen to videos, film clips, audio tapes, DVDs, CDs	Source audio texts of related content for discussion

	Engage in discussions related to their learning and to their multicultural environment	Help students interpret and analyse what they listen to
	Engage in critical listening to process information and solve problems	Develop students' presentation skills
	Engage in critical reflection on ethical issues related to subject	
Reading • Textbooks • E-books • Reports • Interviews • Surveys • Newspapers • Magazines • Multi-media texts	Engage in individual, peer and group reading	Model reading of subject content to students
	Extract details relevant to learning	Model the Think Aloud strategy
	Make inter-textual references	Engage students in reading as a process
	Access and read e-books and online information	Explain technical terminology and subject-specific vocabulary
	Critically reflect on and interpret ideas presented in multi-media texts	Indicate features of text and internal organization in subject-specific materials
	Identify problems and discuss solutions	Provide graphic organisers/ concept map templates for student use
	Read for information and enjoyment	Help students interpret, analyse and evaluate subject-specific content
		Help students connect subject content to the world beyond the classroom
Writing Expository Persuasive Technical Reflective	Use graphic organisers to plan and record ideas	Infuse technology when modelling writing of subject content
	Engage in individual and shared writing	Explore subject-specific vocabulary and language use
	Create descriptions, songs, raps, narrations, explanations	Explain internal organization of subject-specific texts

	Create comics and story boards	Provide graphic organizers/ concept map templates
	Engage in reflective thinking when writing	Create blogs for collaboration
	Use ICTs to produce and publish pieces	Encourage emailing of student responses
		Help students interpret, analyse and evaluate what they write
Representing	Present work learnt through role play, movement, monologues, tables, graphs, maps, songs, posters, diagrams, letters, brochures, written paragraphs, essays, reports, cartoons, comics, models, digital presentations	Encourage a range of presentation types/modes
		Infuse ICTs when teaching subject content
		Encourage use of ICTs in students' presentations

Failure to acquire literacy skills for learning across subject disciplines is a major risk which the revised curriculum seeks to address. Literacy lies at the heart of student understanding and achievement. For the curriculum to be enacted in a meaningful manner that benefits all students, effective subject-specific literacy teaching is critical. Each content area requires skills for effective reading and studying of text materials.To support literacy development, content area teachers must know how to teach the skills so that students can bridge existing gaps. Literacy skills are essential for good communication, critical thinking and problem-solving at school and for success in life beyond school.

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PART 2

The Mathematics Curriculum

Introduction

The mathematics curriculum has traditionally been one of the central elements of the core curriculum at all levels of our national education system. In order to remain relevant, a revision of the mathematics curriculum at the lower secondary level became essential. The revision was based on the *Value Outcomes* for the development of the ideal child as articulated in the Ministry of Education's Mission Statement, a coordinated response to the Primary Curriculum Rewrite (PCR) in 2013, and feedback from stakeholders garnered during national consultations. In responding to this collective mandate, the revised mathematics curriculum endeavours to promote teaching and learning practices which develop conceptual understanding, adaptive reasoning, strategic competence, procedural fluency, and productive disposition, towards the development of numerate citizens and in support of sustainable national development.

In essence, the revised curriculum guide retains the integrity of its antecessors. It is intended to take learners through a spiraling learning process that integrates concepts. A *framework* is presented in matrix form as a summary of the *curriculum content*. The content is presented using a *tabular format*, with each table indicating *strand; topic; specific learning outcomes; suggested teaching/learning strategies and assessment strategies,* along with a *referencing system* for the specific learning outcomes. Both new and experienced teachers will find this document user-friendly as it presents flexible guidelines for appropriately sequencing curriculum content so that it can be effectively delivered in the given time frame. For the benefit of new teachers the curriculum guide recommends pedagogical approaches that emphasise teaching, learning and assessment strategies; and which are fundamentally authentic. Such strategies include

- linking concepts using concrete models for conceptual understanding;
- ICT infusion for the development of technological competence;
- cooperative strategies for the promotion of inclusive classroom environments;
- a STREAM approach for student engagement in problem-solving in real world contexts

It is expected that the implementation of the revised curriculum would give students a solid mathematical foundation and allow for smooth transition and continuation into the CXC CSEC Mathematics curriculum. It is hoped that this revision would aptly guide the development of numerate citizens who can contribute to national as well as global developments and who can successfully meet the rapidly changing demands of life in the 21st century and beyond.

Recognising that pure mathematics is abstract and context-free, the approach of the curriculum guide towards the teaching and learning of mathematics is through numeracy across the curriculum. The curriculum guide addresses the utilitarian function of mathematics through strategies which engage students in problem solving within real world situations; and through a focus on context, purpose and use. Consequently, the content addressed by the mathematics curriculum is divided into six strands; *Algebra; Geometry; Measurement; Number Operations and Number Theory; Probability and Statistics; and Set, Relations and Functions* which translate into a numeracy continuum.
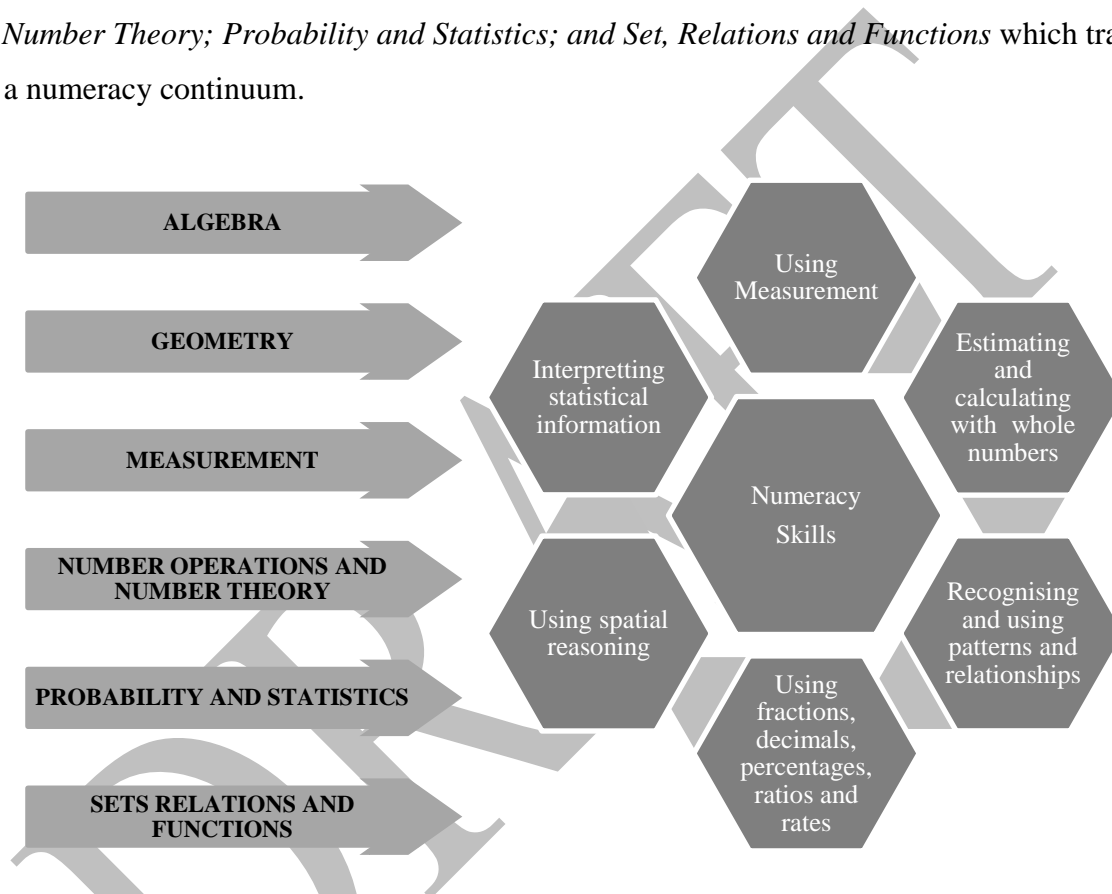
The revised mathematics curriculum guide is a national policy document that prescribes core content for the teaching and learning processes as well as pedagogical strategies to support its successful implementation. Its conceptualization remains focused on the ubiquitous nature of mathematics, and encourages all stakeholders in the education system to stimulate students' interest in the development of numeracy skills, with purely authentic experiences in the field of mathematics, and beyond.

Subject Philosophy

The mathematics curriculum is underpinned by our national educational philosophy. The mathematics curriculum must endeavour to facilitate accommodations, modifications and adaptations to suit the needs of learners while retaining the integrity of its originally stated goals and outcomes. As such, it seeks to provide opportunity for all students to develop the mathematical literacy and competencies necessary for them to successfully achieve their diverse personal and social goals and to fulfil their responsibilities as citizens, as they contribute to sustainable national development within a continuously changing global environment.

The mathematics curriculum is informed by current research on the nature and purpose of mathematics as well as how children learn generally and how they learn mathematics in particular. Curriculum developers are also aware of the increasing impact of science on everyday life and of information and digital technologies on teaching and learning. They also recognize the influence of context on learning and the importance of communication and collaboration to success within an increasingly networked global village. Our students live in a complex world that is facing diverse challenges. They are expected to compete in a global market place and help to sustain ongoing national development. Within an interconnected world, effective teaching and learning of mathematics should then give students the skills to problem-solve by developing an ability to create solutions from information sourced from various disciplines using a variety of media. Therefore, the curriculum utilises an interdisciplinary approach that forms bridges to other subject areas. It supports the attempts made across all subject areas to facilitate the development of core skills, such as literacy, not usually considered to be under the gambit of mathematics instruction. As such, the curriculum infuses technology, permits collaborative and co-operative learning strategies and integrates curricula using strategies such as the STREAM (science, technology, reading, the arts, mathematics) approach.

Since mathematics pervades our daily lives, the mathematics curriculum needs to reflect the various ways in which students encounter mathematics in their environment and in real-life situations. Knowledge and meaning are generated from an interaction between experiences and ideas and the curriculum thus emphasises the understanding of mathematics concepts and how

they are taught, learnt, and applied. Therefore the curriculum focuses on doing mathematics, as far as possible, in real-life contexts and in meaningful and useful ways. Learning is also a cumulative process so that every stage in the educational proceedings in comparison with what has gone before it, as well as what is to come, is an important and critical one in the learner's development. As such, within the mathematics curriculum, a spiral approach to teaching and learning is applied throughout the various levels, so that the curriculum builds and provides the necessary structures to support the learning of new concepts as well as the development of concepts previously learnt. Therefore, the mathematics curriculum, apart from its own internal consistency, also provides a bridge to facilitate a smooth transition from a dynamic primary curriculum to an evolving CXC CSEC Mathematics curriculum, at the upper secondary level.

For the most part, mathematics education is conceptualized as a process that can be carried out in different ways, using multiple approaches to achieve similar aims whilst addressing the diverse needs, talents, and learning rates of students. To this end, the mathematics curriculum advocates ample use of a variety of not only teaching and learning strategies but assessment strategies as well, to indicate whether learners have successfully achieved learning objectives. Methods of assessment can be alternative, authentic or performance based to support the learning process with the quality feedback needed to launch remediation and intervention if necessary. Such assessments should cater to learners along the continuum to make classrooms more inclusive and experiences more authentic and enjoyable for all learners including the struggling learner, the gifted learner and learners who are located at the middle of the continuum. The curriculum therefore prescribes assessment practices which are in alignment with meaningful tasks.

Vision

The development of numerate citizens who are able to achieve their full potential; who challenge themselves, to become more mature, healthy and happy; and who engage skillfully in problem-solving to develop their creativity and innovation in order to compete successfully on the international stage

Mission

To foster the growth and development of mathematically empowered students in Trinidad and Tobago so that they can effectively address their personal needs and the needs of our society in order to sustain our national development and serve as innovators to world development

Rationale for Teaching and Learning Mathematics

Reports on mathematical achievement from external examination bodies, the Ministry of Education, employers, and public and private agencies have all concluded that the majority of students at both primary and secondary levels lack basic skills in numeracy. The high percentage of students who are not presently certified as being proficient in mathematics is one indicator of the problem. Many factors must be considered in addressing this situation, but the most important must be the design of a mathematics curriculum that is relevant to the needs of such learners and of a developing society, in the rapidly changing 21st century.

Mathematics is an activity that is critical for the development of individuals and societies. It is the study of the properties of number, and its relationship to measurement, space, shape, statistics, and probability. Mathematics also deals with abstractions, with algebra being the strand of mathematics that presents abstraction in its purest form. The study of mathematics enables individuals to become creative and critical thinkers through the development of logical thinking, problem-solving, investigative, organizational, and argumentative skills.

Students acquire mathematical power by constructing mathematical knowledge and understanding. Mathematically empowered students can adapt to the quickening pace of change in today's society. They will have acquired basic skills, self-confidence, and self-reliance, which will prepare them to make effective contributions to their society. Through experiencing and practising the processes of communication; reasoning; making connections; representations; and recognizing patterns and relationships, students will have achieved the value outcomes and, inevitably, the goals of education.

Mathematics is also essential to the study of all other subjects on both the primary and secondary schools' curricula, and this in itself underscores the value and the role it plays in the daily lives of our nation's students.

Goals of the Mathematics Curriculum

The goals of the Mathematics Curriculum are:-

(1) To provide students with a range of knowledge, skills and techniques relating to number, geometry (space and shape), algebra, measurement, relations, functions, statistics and probability in a manner relevant to the technological advancements of the 21st century;

(2) To enable students to become numerate citizens capable of making informed decisions in their best interest, and the society at large;

(3) To make mathematics relevant to the interests and experiences of the students and to prepare students for the use of mathematics in further studies;

(4) To cultivate creativity and critical thinking in applying mathematical knowledge and concepts to solve routine and non-routine problems;

(5) To develop skills in inquiry by the use of mathematics to explain phenomena, and by recognition of the influence of mathematics in the advancement of civilization;

(6) To develop self-reliance, honesty, open-mindedness, confidence and perseverance by cultivating a method of studying mathematics that results in success;

(7) To promote appreciation of the role of mathematics in aesthetics and to make mathematics fun;

(8) To enable students to communicate effectively, accurately and with clarity using mathematical language and representations: orally, in writing and graphically;

(9) To encourage collaboration among students and to promote positive attitudes and values in students through the completion of tasks;

(10) To provide opportunities for students to experience the structure of mathematics and to appreciate the elegance and power of mathematics;

(11) To develop life-long learners, capable of adapting to the changing needs of society.

General Learning Outcomes

Students, by the end of Form Three, will:

(1) understand the relevance of mathematics to meet their needs in preparation for the world of work, citizenship and further study;

(2) solve routine and non-routine mathematical problems using a variety of strategies, and demonstrate creative and critical thinking skills;

(3) demonstrate skills in inquiry to investigate or examine the environment, other disciplines and the progress of mankind;

(4) work independently to demonstrate competence in a variety of mathematical tasks;

(5) enjoy doing mathematics and demonstrate an appreciation of the connection between mathematics, and all other subject areas;

(6) become effective communicators using appropriate mathematical language orally, in writing and graphically, with the required degree of accuracy, logical sequencing and clarity;

(7) display positive attitudes such as caring, confidence, determination, thoroughness, respect for self and others, cooperation and teamwork;

(8) cultivate an awareness of the nature and purpose of mathematics by applying the mathematical knowledge and skills relating to all strands and using technology to enhance learning;

(9) develop numeracy skills for making informed decisions in the varied contexts of everyday life.

The general learning outcomes for each *strand* in mathematics are:

Algebra

- Students will provide evidence of their powers of reasoning with abstract entities and use equations and inequalities to model situations from the real world.

Geometry

- Students will demonstrate spatial sense and apply geometric concepts, properties and relationships to routine and non-routine problems in the world around them.

Measurement

- Students will demonstrate an understanding of and apply concepts and skills associated with linear measurement, two dimensions, three dimensions, and consumer arithmetic, in relation to other strands, disciplines and in real life situations.

Number Operations and Number Theory

- Students will demonstrate number sense, master computation, understand the structure of number and apply the laws and principles of number.

Sets, Relations and Functions

- Students will explore, recognize, represent and apply set notation, set language, patterns and relationships to relevant situations in the real world.

Statistics and Probability

- Students will solve problems involving the collection, display, analysis and interpretation of data; design, represent and solve problems involving uncertainty; and use statistics and probability in decision making.

PART 3

Curriculum Content

Framework for Mathematics Curriculum

The framework for the mathematics curriculum spans the three levels of Forms One, Two and Three. There are six (6) strands, *Number Operations and Number Theory; Sets, Relations and Functions; Statistics and Probability; Geometry; Measurement and Algebra*, that are addressed at each form level. Each strand has been divided into topics, and a suggested sequence is provided across the three terms in each level, according to the strands and their corresponding topics.

Referencing System for Curriculum Content

The key used for referencing the content in the curriculum document follows the following format: *Form Level • Strand • Topic • Learning Outcome*.

Learning Outcomes are defined for the *Topics* which are associated with each of the six (6) *Strands* that are addressed at all three (3) *Form Levels*, as follows:

Form Level	*Strand*	*Topic*	*Learning Outcome*
1 – Form One	1 – Number Operations and	1 – 1st subtopic	1 – 1st learning outcome
2 – Form Two	Number Theory	2 – 2nd subtopic	2 – 2nd learning outcome
3 – Form Three	2 – Sets, Relations and Functions	3 – 3rd Subtopic	3 – 3rd learning outcome
	3 – Statistics and Probability	⋮	⋮
	4 – Geometry		
	5 – Measurement		
	6 – Algebra		

The following are examples for referencing *Strands*, *Topics and Learning Outcomes* at the Form One Level:

Strand	1.5	Form One•*Measurement*
Topic	1.5.4	Form One•Measurement•*Area*
Learning Outcome	1.5.4.2	Form One•Measurement•Area•*Students will be able to measure surface area*

Form One

TERM ONE	TERM TWO	TERM THREE
NUMBER OPERATIONS AND NUMBER THEORY: Whole Numbers historical development; sequence the number names and numerals; place value; rounding; estimation of quantities; rectangular, triangular and square numbers, factors and multiples, odd and even , prime and composite, square roots; LCM and HCF; problem solving **STATISTICS AND PROBABILITY: Statistics** formulation of problems; discrete data; tally and frequency table; pictographs and block graphs; drawing conclusions; mode from a frequency table **GEOMETRY: Solids and Plane Shapes** properties; nets; create solids from nets; polygons; tessellations **ALGEBRA: Introducing Algebra** varying quantities; constants and variables; symbols; algebraic terms; word statements to expressions; identification of expressions; substitution; simplification of expressions; distributive law	**NUMBER OPERATIONS AND NUMBER THEORY: Fractions** representation; naming fractions; classification; conversion; equivalent; comparing and ordering; rational and whole numbers; problem solving **GEOMETRY: Points and Lines** explanation; parallel and perpendicular lines **GEOMETRY: Angles** description; comparison; conversion of turns to degrees; classification ; measuring; drawing; problem solving **GEOMETRY: Triangles** sum of interior angles; relation between side and opposite angle; classification; drawing; problem solving **GEOMETRY: Quadrilaterals** sum of interior angles; classification, drawing; solve problems **STATISTICS AND PROBABILITY: Statistics** bar graphs; interpretation of bar graphs; problem solving (mode, median, mean)	**NUMBER OPERATIONS AND NUMBER THEORY: Decimals** representation; matching number names; place value; ascending and descending order; round; rational form; convert fractions to decimals; terminating, non-terminating and recurring decimals; problem solving **NUMBER OPERATIONS AND NUMBER THEORY: Percentages** converting fractions, decimals and percentages; comparing and ordering; problem solving **GEOMETRY: Transformations** lines of symmetry; reflection; symmetrical shapes; problem solving **ALGEBRA: Algebraic Equations** translation of word problems to algebraic equations; solution of linear equations **NUMBER OPERATIONS AND NUMBER THEORY: Consumer Arithmetic** equivalence of bills; best buy; solve problems - profit, loss, percent profit and percent loss, sales tax and discount; solve problems - percentages, simple interest

TERM ONE	TERM TWO	TERM THREE
SETS, RELATIONS AND FUNCTIONS: Sets description; definition; subsets; types; concepts; Venn diagrams **MEASUREMENT: Introducing Measurement** standard units; non-standard units; equivalent measures; metric to imperial measures; comparison of the metric with the denary system **MEASUREMENT: Linear Measure** lengths; conversion of units; problem solving **MEASUREMENT: Perimeter** concept of perimeter; calculation of perimeter for plane figures; calculation of perimeter for compound shapes; problem solving **MEASUREMENT: Area** concept of area; unit of measure; measuring space; calculation of area for triangles, squares and rectangles	**NUMBER OPERATIONS AND NUMBER THEORY: Directed Numbers** concepts; number line; addition; subtraction; multiplication; division **MEASUREMENT: Mass and Weight** mass and weight; conversion of units; problem solving **MEASUREMENT: Time** measuring; conversion of units; problem solving **ALGEBRA: Expressions** substitution; creation of expressions to represent the nth term of a sequence; calculating n^{th} term of a sequence **SETS, RELATIONS AND FUNCTIONS: Sets** problem solving	

Form Two

TERM ONE	TERM TWO	TERM THREE
NUMBER OPERATIONS AND NUMBER THEORY: Integers order; relationships; operations; real world situations; problem solving **NUMBER OPERATIONS AND NUMBER THEORY: Laws and Properties of Numbers** commutative, associative and distributive laws; properties of closure, identity and inverse; applications; scientific figures, standard from and scientific notation; estimation; operations; problem solving **NUMBER OPERATIONS AND NUMBER THEORY: Number Bases** place value; base conversion; role of the binary system; expanded notation; computation in different bases; problem solving **ALGEBRA: Substitution** concept of a variable; translation of verbal statements; concrete and symbolic; substitution **ALGEBRA: Simplification of Algebraic Expressions** concept of algebraic expression; concrete, pictorial and symbolic representation; like and unlike terms; coefficient and operational sign; order of operations; simplify expressions	**GEOMETRY: Coordinate Geometry** concept of a plane; concept of coordinates; Cartesian coordinate system; locate points; state coordinates; plot points **SETS, RELATIONS AND FUNCTIONS: Graphical Representation of Linear Equations and Linear Inequalities** interpret graphs; draw graphs; define linear relations; modes of representation; simple linear inequalities **GEOMETRY: Transformations - Translations and Reflections** similarity and congruency; properties; representation in the Cartesian Plane; vector; object; image; reflection; mirror line; state coordinates **MEASUREMENT: Units of Measurement and Conversion of Units** measuring instruments; units; read and interpret scales; measure quantities, convert linear units; conversion between metric and imperial; convert square units	**GEOMETRY: Angles, Triangles and Parallel lines** exterior angle; interior angle; opposite interior angles; parallel lines; transversal; classification of angles; problem solving **GEOMETRY: Geometric Drawings and Constructions** construction of line segment; bisection of line segment; drawing angles; bisection of angles; construction of angles **STATISTICS AND PROBABILITY: Statistical Analysis** frequency distribution; mean, median, mode; appropriateness of a statistic; nominal, ordinal, interval and ratio data; data analysis **STATISTICS AND PROBABILITY: Data Displays** ungrouped frequency distribution; pie chart; histogram; line graph; appropriateness of a data display; interpret data displays; make inferences from line graphs

Framework for Mathematics Curriculum   **Form Two**

TERM ONE	TERM TWO	TERM THREE
ALGEBRA: Solution of Linear Equations expressions and equations; solution for an equation with variables on both sides; use of distributive law; translate verbal statements; problem solving **ALGEBRA: Solution of Linear Inequalities** real world context; notation; solution sets; solving inequalities; number line representation; problem solving **SETS, RELATIONS AND FUNCTIONS: Sets** subsets; disjoint sets; intersection of sets; union of sets; Venn diagram; counting; problem solving **SETS, RELATIONS AND FUNCTIONS: Relations, Mappings and Functions** relation; concept of arrow diagram; concept of domain and range; concept of relation mapping and function; differentiate among relation mapping and function; mapping rules **SETS, RELATIONS AND FUNCTIONS: Ordered pairs** Concept or an ordered pair; representation; domain and range; relations; satisfying a relation; representation on the Cartesian plane; verify a relation	**MEASUREMENT: Circles** parts of a circle; concept of pi; formula for circumference; estimate circumference; formula for area; estimate area; problem solving **MEASUREMENT: Area and perimeter of compound shapes** calculate perimeter; conservation of area; calculate area; problem solving (including the circle and the semicircle) **MEASUREMENT: Volume and Capacity of Prisms** properties of solids; classification; concept of volume, concept of capacity; calculation of volume; estimate volume; problem solving **MEASUREMENT: Problem Solving involving Rate, Ratio and Proportion** concepts of rate, ratio and proportion; distance, speed and time relationship; speed formula; transposition of speed formula; proportion techniques; problem solving **MEASUREMENT: Consumer Arithmetic** hire purchase; salary and wage; proportion; percentage; percent increase or decrease; currency conversion; problem solving	

Framework for Mathematics Curriculum

Form Three

TERM ONE	TERM TWO	TERM THREE
NUMBER OPERATIONS AND NUMBER THEORY: Real Numbers and Number Bases problem solving using the four operations; irrational numbers; approximation of irrational numbers; subsets of the set of real numbers and representation of their relationships; sums and differences in base 2 and base 3 **MEASUREMENT: Area and Perimeter of Compound Shapes Involving Parts of the Circle** interpret formulae for length of arc and area of sector; apply formulae for length of arc and area of sector; apply formulae to determine perimeter and area of compound shapes involving parts of a circle **MEASUREMENT: Surface Area and Volume of Prisms and Pyramids** calculate surface area; calculate volume; problem solving **MEASUREMENT: Scales and Scalar Measurement** determine distances using scales; create 2-D drawings given a scale; create 3-D models of prisms from nets; calculate length, area, and volume given a scale factor; use of appropriate units and tools for problem solving	**MEASUREMENT: Consumer Arithmetic** problem solving with rates: salaries, wages, overtime, utility bills; concept of compound interest; calculation of compound interest; problem solving involving compound interest **ALGEBRA : Solution of Linear Equations Involving Algebraic Fractions** solution of linear equations involving algebraic fractions; problem solving **ALGEBRA: Solution of Linear Inequalities Involving Algebraic Fractions** solution of linear inequalities involving algebraic fractions; representation on the number line and the Cartesian plane; problem solving **ALGEBRA: Solution of Simultaneous Equations** terminology: simultaneous equations; modelling problems using mathematical concepts; solution of simultaneous equations by the methods of calculation; problem solving **SETS, RELATIONS AND FUNCTIONS: Venn Diagrams** representation of the real number system; problem solving; simultaneous equations	**ALGEBRA: Laws of Indices** bases and exponents; evaluation of exponential forms; interpretation of laws of indices; problem solving **ALGEBRA: Simplifying Algebraic Expressions** binary expressions; product of two binomial expressions; simplification of algebraic products; HCF of two algebraic expressions; simplification of algebraic quotients **ALGEBRA: Factorisation of Algebraic Expressions** binomial factorisation; factorisation of expressions involving sums and differences up to four terms **ALGEBRA: Quadratics** quadratic expression; factorisation; differentiation between expressions and equations; solution of the quadratic equation by the method of factorisation **GEOMETRY: Polygons** concept of a polygon in concrete, representational and abstract modes; problem solving

Framework for Mathematics Curriculum   **Form Three**

TERM ONE	TERM TWO	TERM THREE
GEOMETRY: Congruency concept of congruency of triangles; proof of congruency of triangles; apply properties to problem solving **GEOMETRY: Similarity** concept of similarity; conditions for similarity; deductions given information; application of the properties of similar triangles; concept of a scale factor; concept of an enlargement; application of the properties of enlargement to problem solving **GEOMETRY: Right-Angled Triangles and Pythagoras Theorem** demonstration of Pythagoras theorem; application of Pythagoras theorem; modelling for problem solving **GEOMETRY: Trigonometric Ratios** concept; definition; calculation; application; concept of angles of elevation and depression; application of trigonometric ratios to solve for angles of elevation and depression **GEOMETRY: Construction** logic and reasoning for supporting conjectures; construction of triangles; construction of parallel and perpendicular lines; lines, angles axes and direction; compound shapes; circles; quadrilaterals; regular polygons; 2-D and 3-D geometric objects	**SETS, RELATIONS AND FUNCTIONS: Graphs of Linear Equations** concept of gradient; calculation of gradient; positive and negative slopes; concept of parallel lines; concept of y-intercept; equation of a straight line; linear relations on the Cartesian plane; modelling for problem solving **SETS, RELATIONS AND FUNCTIONS: Graphical Solutions to Simultaneous Equations** representation on the Cartesian plane; application of graphical methods to determine an ordered pair; application of the concept of the point of intersection to problem solving	**STATISTICS AND PROBABILITY: Introduction to Probability** outcome of an experiment; concept of probability; terminology: event, certainty, change, fairness, possibility, risk; application of the probability formula; calculation of probability; range of values for probability; notation; probability in decision making; problem solving

CURRICULUM CONTENT

CURRICULUM CONTENT

Form One Term One

Strand: 1.1 Number Operations and Number Theory		
Topic: 1.1.1 Whole Numbers		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.1.1.1 explain the historical development of the denary system	• use technology tools to conduct research • provide information (in a variety of forms) about the origin of numbers	• performance task - compile a portfolio comprising information on the historical development of the denary system • performance task - group presentations
1.1.1.2 sequence the number names and numerals up to 999 999 999	• use technology tools to represent the position of numbers • explore activities involving reading and writing number names and numerals; matching number names and numerals; and comparing and ordering numerals in ascending and descending order	• oral quiz • self-assess using technology tools - CAI • peer assessment using an online activity • paper and pencil test
1.1.1.3 state the place value of each digit in a numeral up to 999 999 999	• review/check for prior knowledge about the denary system (using base 10 materials) • re-teach as necessary	• performance task - group presentations : explaining the place value of digits in numerals (including money) using base ten materials including place value mats

Strand: 1.1 Number Operations and Number Theory		
Topic: 1.1.1 Whole Numbers		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	• independent practice	• peer-assessment/self-assessment • paper and pencil test
1.1.1.4 round numbers to the nearest tens, hundreds, thousands and up to millions	• review/ check for prior knowledge of the rounding rule • re-teach as necessary • independent practice (e.g. complete worksheets)	• performance task - journal writing to explain the 'rounding rule' • paper and pencil test
1.1.1.5 estimate a given quantity of items using 100 as a benchmark (using 'mental grouping') and verify by counting	• review/check for prior knowledge using practical activities • discussion about real life application of estimations (e.g. the number of bricks for building a house, number of people in a large crowd)	• performance task - use objects to display a known quantity and allow their peers to estimate and verify the amount • journal writing - importance of estimation in real life
1.1.1.6 differentiate between or among 　(a) rectangular, triangular and square numbers 　(b) factors and multiples of	• explore activities using manipulatives (e.g. counters to illustrate the geometric shape of different numbers) • use technology tools to conduct research	• performance task - group presentations on patterns observed • teacher observation of journal entries

Strand: 1.1 Number Operations and Number Theory		
Topic: 1.1.1 Whole Numbers		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
numbers (c) odd and even numbers (d) prime and composite numbers (e) square numbers and their square roots	• cooperative learning to describe patterns observed and explain rules	
1.1.1.7 calculate the Lowest Common Multiple (LCM) and Highest Common Factor (HCF) of a set of numbers	• problem solving (use various strategies to solve real-life problems involving LCM and HCF) • independent practice (develop algorithms for calculating LCM and HCF)	• teacher observation using checklist • paper and pencil test • mental quiz • self-assessment using CAI • peer assessment using games
1.1.1.8 solve problems involving whole numbers (write answers to a specified degree of accuracy)	• use Polya's problem solving strategy/approach to solve problems • cooperative learning • model by 'thinking aloud' the process	• performance task - group presentations: to justify responses/solutions and choice of strategies • performance task - compile a portfolio of different problems and their solutions • paper and pencil test

Strand: 1.3 Statistics and Probability		
Topic: 1.3.1 Statistics		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.3.1.1 formulate a problem to be investigated or formulate questions that can be addressed via statistical data	• cooperative learning to formulate problems • use of technology tools to conduct research, and hence assist in formulating problems	• performance task - projects which are expected to span learning outcomes [1.3.1.1] to [1.3.1.7] e.g. What healthy snacks should the café sell and why? • teacher observation (checklist) • peer-assessment/self-assessment
1.3.1.2 collect discrete data to address the problem	• discussion to cite examples of discrete data and their sources (e.g. newspaper, internet, magazines, books) • guided practice to collect data using techniques such as counting, direct observation, interviews, surveys, research, questionnaires, experiments and databases	• teacher observation of data collected using checklist
1.3.1.3 tally ungrouped discrete data into a frequency table	• review/check for prior knowledge • re-teach as necessary • independent practice to construct frequency tables	• teacher observation of notebook entries using checklist • peer-assessment/self-assessment

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Strand: 1.3 Statistics and Probability		
Topic: 1.3.1 Statistics		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.3.1.4 construct pictographs and block graphs, to represent data collected (using appropriate scale factors)	• review/check for prior knowledge • re-teach as necessary • use technology tools to create data displays	• teacher observation (checklist) • performance task- multimedia presentations of data displays
1.3.1.5 interpret pictographs and block graphs	• use questioning strategies to determine students understanding • cooperative learning (students formulate and answer questions given pictographs and block graphs)	• oral questioning • peer-assessment/self-assessment • paper and pencil test
1.3.1.6 draw conclusions from pictographs and block graphs	• cooperative learning • independent practice • use questioning strategies to determine students' understanding	• oral questioning • peer-assessment/self-assessment • paper and pencil test
1.3.1.7 find the mode for data taken from frequency table	• guided instruction • independent practice	• mental quiz • teacher observation of notebook entries using a checklist

Strand: 1.4 Geometry		
Topic: 1.4.1 Solids and Plane Shapes		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.4.1.1 classify the different solids according to their properties	• explore/investigate the properties of solids using manipulatives/models • cooperative learning to classify solids • discussion about faces, edges and vertices	• performance task - compile a portfolio of solids, their drawings, and a description of their properties • performance task - group presentations: on the classification of solids
1.4.1.2 draw the net of a solid	• explore/investigate the nets of solids by engaging in practical activities involving the use of manipulatives/ models • cooperative learning to draw and display the nets of solids • use technology tools to draw the nets of solids	• performance task - compile a portfolio comprising nets of solids • performance task - group presentations displaying nets of solids (e.g. using multimedia)
1.4.1.3 create a solid using its net	• cooperative learning to construct solids • discussion about the solids constructed	• students construct solids given a variety of nets • teacher observation of solids constructed using a checklist • teacher interviews

Strand: 1.4 Geometry

Topic: 1.4.1 Solids and Plane Shapes

Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.4.1.4 classify polygons according to their properties	• explore/investigate the properties of polygons using manipulatives • cooperative learning to classify, draw and name polygons	• performance task - compile a portfolio of polygons, their drawings, and a description of their properties • performance task - group presentations: on the classification of polygons
1.4.1.5 create patterns involving the tessellation of plane shapes	• observe patterns in the environment (e.g. tiling patterns, patterns in vinyl and gift paper) that can tessellate • use of technology tools to create patterns that tessellate	• performance task - compile a portfolio comprising patterns created • teacher observation of display of patterns created using a checklist • performance task - group presentations displaying patterns created
1.4.1.6 solve problems involving solids and plane shapes	• use Polya's problem solving strategy/approach to solve problems • problem solving activities using Virtual Learning Environments/Learning Management Systems • independent practice using worksheets	• performance task - compile a portfolio of different problems and their solutions • paper and pencil test

Strand: 1.6 Algebra		
Topic: 1.6.1 Introducing Algebra		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.6.1.1 investigate varying quantities	• provide examples to help transfer learning • use of technology tools	• performance task - journal writing about contexts with varying quantities
1.6.1.2 distinguish between constants and variables	• questioning to develop the concept of a constant and a variable	• performance task - journal writing
1.6.1.3 use symbols to represent unknown quantities (variables)	• cooperative learning to identify situations from everyday life and other subjects where variables can be used	• performance task - group presentations • performance task - journal writing
1.6.1.4 translate word statements into mathematical expressions	• model by 'thinking aloud' the process • independent practice (worksheets)	• pop quiz • paper and pencil test
1.6.1.5 identify an expression	• use compare and contrast activities (difference between term and expression) • investigate the structure of expressions	• performance task - journal writing to describe the structure of an expression • pop quiz
1.6.1.6 substitute whole numbers for variables in expressions	• model by 'thinking aloud' the process • independent practice using worksheet	• paper and pencil test • mental mathematics quiz

Strand: 1.6 Algebra		
Topic: 1.6.1 Introducing Algebra		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	• use technology tools	
1.6.1.7 identify like and unlike terms	• guided practice • use compare and contrast activities	• self assessment using technology tools paper and pencil test (matching items)
1.6.1.8 simplify algebraic expressions involving the four operations	• guided practice • cooperative learning (worksheet)	• teacher observation of notebook entries • paper and pencil test
1.6.1.9 simplify algebraic expressions using the distributive law	• review/check for prior knowledge of distributive law • re-teach as necessary • guided practice • cooperative learning	• teacher observation of notebook entries • paper and pencil test

Strand: 1.2 Sets, Relations and Functions		
Topic: 1.2.1 Sets		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.2.1.1 classify a set by describing and naming the set	• discussion to explain the meaning of the word 'set' • co-operative learning to distinguish among groups of objects based on attributes or functions (objects should also be drawn from various local contexts, e.g. local birds, flowers, sportsmen, etc.) • direct instruction to name sets	• teacher observation using checklist • performance task - write a journal entry to explain the meaning of 'set', and to name sets
1.2.1.2 define sets by listing the elements or describing them in words	• provide examples to help transfer learning • check for understanding	• oral questioning • paper and pencil test
1.2.1.3 apply the knowledge of classification to divide a set into a given number of subsets	• guided practice to divide a set into a number of subsets • discuss the concept of 'subset' (including symbol for subset)	• performance task - use illustrations to describe and list subsets from a given set • oral questioning

Strand: 1.2 Sets, Relations and Functions

Topic: 1.2.1 Sets

Learning Outcomes *Students will be able to:*	Suggested Teaching and Learning Strategies	Suggested Assessment Strategies
1.2.1.4 distinguish among empty, equal, equivalent, finite, and infinite sets	• cooperative learning to investigate the different types of sets, using objects in the environment • check for understanding	• performance task - illustrate the different types of sets using objects in the real world • oral questioning
1.2.1.5 describe the concepts of universal sets, complement of a set, union of sets, intersecting sets, subsets, and disjoint sets	• provide information about concepts in a variety of ways • check for understanding (worksheet) • use of real-world situations to illustrate sets	• oral report to describe the type of sets • paper and pencil test
1.2.1.6 use Venn diagrams to represent the relationships between two sets	• simulations (use role-play to develop concepts and translate information to drawings) • demonstrate the relationships in a variety of ways	• performance task - create posters to illustrate relationships among sets • teacher observation of notebook entries • paper and pencil test

Strand: 1.5 Measurement

Topic: 1.5.1 Introducing Measurement

Learning Outcomes *Students will be able to:*	Suggested Teaching and Learning Strategies	Suggested Assessment Strategies
1.5.1.1 explain the need for standard units of measures	• use of technology tools to conduct research related to the use of measures in the community and the need for standard units of measures • cooperative learning to engage in practical activities using standard and non-standard units • discuss the attributes being measured as it relates to the instrument used	• performance task - group presentations on research conducted • performance task - journal writing about the need for standard units of measures
1.5.1.2 distinguish between standard and non-standard units of measures	• cooperative learning to engage in practical activities involving the use of standard and non-standard units of measure	• teacher observation using a checklist • teacher interviews
1.5.1.3 compare equivalent measures qualitatively, between metric and imperial systems	• use of technology to conduct research about the relationship between metric and imperial systems of measure • cooperative learning to engage in	• performance task - group presentations: explain the use of both the metric and the imperial systems of measure in the local context

Strand: 1.5 Measurement		
Topic: 1.5.1 Introducing Measurement		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
(e.g. 1 km is just over $\frac{1}{2}$ mile; 1 m is about 1 yard; 1 kg is a little more than 2 lbs; 1 ton (imperial) is a little more than a tonne (metric))	practical measurement activities involving the metric and imperial systems • direct instruction to convert measures from metric units to imperial units and vice versa	• pop quiz
1.5.1.4 compare the metric system with the denary system to determine the relationships between the sub-units of the metric system	• discussion about the relationships between the metric and denary systems • cooperative learning to explain the relationships between the sub-units of the metric system	• oral report to justify the use of a particular unit of measure for quoting a given quantity (e.g. kilometres rather than metres in real-life situations)

Strand: 1.5 Measurement		
Topic: 1.5.2 Linear Measure		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.5.2.1 measure length using appropriate units and using different instruments (e.g. rulers, measuring tape, trundle wheel)	• cooperative learning to estimate length and measure length in real world situations • discussion about the different units used to measure length and the different instruments • direct instruction about the various units used for measuring length • independent practice to draw lines of varying lengths	• performance task - students demonstrate how to estimate length and verify by measuring e.g. measure height using a metre rule • teacher observation (checklist) • oral report on recording measurements using a combination of linear units and using whole numbers (e.g. 3m and 10cm), fractions (e.g. $3\frac{1}{10}$ m) or decimals (e.g. 3.1 m)
1.5.2.2 convert linear measure from one unit to the other (using the different units of measure - millimetres, centimetres, metres, kilometres)	• discussion about the relationships between different units of measure • demonstrate and explain how linear measures are converted from one unit to another • cooperative learning using worksheets	• teacher observation of notebook entries using a checklist • paper and pencil test

Strand: 1.5 Measurement		
Topic: 1.5.2 Linear Measure		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.5.2.3 solve problems involving length	• problem solving activities involving length	• performance task - journal writing about problem solving activities • paper and pencil test • performance task - group presentations of solutions and strategies used

Strand: 1.5 Measurement		
Topic: 1.5.3 Perimeter		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.5.3.1 identify perimeter of plane shapes	• explore/investigate the concept of 'distance around' using manipulative • independent practice to identify distance around shapes in the environment	• performance task - journal writing: explain the meaning of the term 'perimeter'
1.5.3.2 calculate the perimeter of plane shapes	• direct instruction using manipulative • independent practice to calculate perimeter (worksheets) • use technology tools • problem solving to estimate and verify the perimeter of shapes and determine reasonableness of answer	• teacher observation of notebook entries • performance task - draw various shapes with the same perimeter • paper and pencil test
1.5.3.3 solve problems involving perimeter (write answers to a specified degree of accuracy)	• problem solving activities using Virtual Learning Environments/Learning Management Systems	• paper and pencil test

Strand: 1.5 Measurement		
Topic: 1.5.4 Area		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.5.4.1 explain the concept of area	• explore/investigate the concept of 'area' using manipulatives • independent practice to identify area of shapes in the environment	• performance task - journal writing: explain the meaning of the term 'area'
1.5.4.2 identify the unit for area	• discussion about the different units used to measure area • provide examples to help transfer learning • use compare and contrast activities with other units	• oral quiz • paper and pencil test - matching
1.5.4.3 measure surface area	• demonstrate using manipulatives • cooperative learning using tangrams to develop spatial concepts • independent practice to estimate and verify the area of regular shapes • independent practice to approximate area to the nearest whole number, fraction or decimal	• performance task - measure area of objects in the environment • peer-assessment/self-assessment • performance task - journal writing on the measurement activity

Strand: 1.5 Measurement		
Topic: 1.5.4 Area		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.5.4.4 calculate the area of triangles, squares and rectangles	• direct instruction using manipulatives to develop formulae • independent practice to calculate area • problem solving to estimate and verify the area of shapes and determine reasonableness of answer	• teacher observation of notebook entries • performance task - draw various shapes with the same area • paper and pencil test

CURRICULUM CONTENT

Form One Term Two

Strand: 1.1 Number Operations and Number Theory		
Topic: 1.1.2 Fractions		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.1.2.1 represent fractions using area, linear and set models	• direct instruction using manipulatives • model by 'thinking aloud' the process • cooperative learning to create models to represent fractions	• performance task - group presentations of fractions represented by different models
1.1.2.2 name fractions using words and symbols	• review/check for prior knowledge • re-teach as necessary	• oral questioning
1.1.2.3 classify fractions as proper fractions, improper fractions and mixed numbers	• review/check for prior knowledge • re-teach as necessary • cooperative learning	• performance task - use manipulatives to classify fractions • oral questioning
1.1.2.4 convert from improper fraction to mixed number and vice versa	• review/check for prior knowledge • re-teach as necessary • cooperative learning	• oral questioning • pop quiz
1.1.2.5 create equivalent fractions	• review/check for prior knowledge • re-teach as necessary • cooperative learning to develop and practice the algorithm	• oral questioning • pop quiz • self-assessment using CAI • paper and pencil test

Strand: 1.1 Number Operations and Number Theory

Topic: 1.1.2 Fractions

Learning Outcomes *Students will be able to:*	Suggested Teaching and Learning Strategies	Suggested Assessment Strategies
1.1.2.6 compare and order fractions in ascending and descending order using equivalent relationships	• guided practice to develop a method to compare and order fractions • cooperative learning to practice the procedure (worksheets)	• paper and pencil test • self-assessment using CAI • peer-assessment using online activities
1.1.2.7 state the relationship between rational numbers and whole numbers	• guided practice to express a whole number in rational form ($\frac{a}{b}$, where a and b are whole numbers and $b \neq 0$) and vice versa • explore activities involving the relationship between fractions and the division of two whole numbers with answer less than one e.g. $3 \div 4 = \frac{3}{4}$	• oral report to explain the relationship between rational numbers and whole numbers • teacher observation of notebook entries
1.1.2.8 solve problem involving fractions	• guided practice to develop algorithms (if necessary) • problem solving activities including Polya's problem solving approach • model by 'thinking aloud' the process	• paper and pencil test • teacher observation of notebook entries

Strand: 1.4 Geometry		
Topic: 1.4.2 Points and Lines		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.4.2.1 explain what is meant by the terms, (a) point, (b) straight line (c) line segment (d) ray	• direct instruction using manipulatives • provide examples to help transfer learning • use technology tools to conduct research	• performance task - group presentations of research conducted • teacher observation of notebook entries
1.4.2.2 differentiate between parallel and perpendicular lines	• review/check for prior knowledge • re-teach as necessary • independent practice to identify parallel and perpendicular lines in shapes	• teacher observation of worksheet assignment • performance task- journal entry about parallel and perpendicular lines • peer-assessment/self-assessment

Strand: 1.4 Geometry		
Topic: 1.4.3 Angles		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.4.3.1 describe an angle as a measure of turn	• explore/investigate turns in the environment, such as opening and closing of doors and the movement of hands in clocks • discussion (using manipulatives) to develop an understanding about angles (e.g. angles are dynamic/moveable or static/fixed)	• performance task - demonstrate different turns using geo-strips whole turn, half turn, quarter turn • performance task - journal writing of class activities • teacher observation of notebook entries
1.4.3.2 compare and order angles using direct comparison (no unit)	• explore activities involving the use of geo-strips to form angles which are superimposed on each other to allow for direct comparison so that angles can be compared and ordered easily • cooperative learning • demonstrate procedures followed and explain solutions derived	• performance task - group presentations on procedures used for comparing and ordering angles • peer-assessment/self-assessment
1.4.3.3 express whole turns, half turns and quarter turns in degrees	• discussion about the standard unit of measure • link new information (degrees) to state the number of degrees represented by a whole turn, a half turn and a quarter turn	• oral report to summarize discussions • teacher observation of notebook entries

Strand: 1.4 Geometry		
Topic: 1.4.3 Angles		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.4.3.4 classify angles according to type (acute, right, obtuse, straight and reflex)	• discussion about the different types of angles and represent them using drawings • cooperative learning to classify angles	• performance task- group presentation to explain the difference among the types of angles • pop quiz
1.4.3.5 measure angles in the range 0° to 360° using protractors	• demonstrate and discuss the procedure for measuring angles • cooperative learning to engage in practical activities involving the measuring of angles using protractors • independent practice (worksheets)	• performance task- demonstrate and explain how to measure angles using a protractor • performance task - journal writing • peer-assessment/self-assessment • paper and pencil test - measure angles to compare and order
1.4.3.6 draw angles of various sizes	• guided practice to manipulate drawing tools • cooperative learning for practice	• performance task- demonstrate how angles are drawn using a protractor • teacher observation (checklist)
1.4.3.7 solve problems involving angles	• explore problems involving angles in a real world context	• paper and pencil test

Strand: 1.4 Geometry		
Topic: 1.4.4 Triangles		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.4.4.1 deduce that the sum of the interior angles in a triangle is equal to 180°	• investigate the sum of the interior angles in triangles using manipulatives • discussion about the relationship discovered (sum of angles) • provide examples to help transfer learning	• performance task - presentations on findings • performance task - journal writing
1.4.4.2 deduce the relationship between the size of the angle and the length of the side opposite the angle	• investigate the relationship between the size of the angle and the length of the side opposite the angle using manipulatives • discussion on relationship discovered	• performance task - group presentations on findings from investigation • performance task - journal writing about relationship
1.4.4.3 classify triangles based on their properties as acute angled, right angled, obtuse angled, isosceles, equilateral, and scalene	• review/check for prior knowledge • re-teach as necessary • guided practice to measure angles, and hence classify the triangles • independent practice to identify various types of triangles	• performance task - use illustrations of triangles and classify them • paper and pencil test - matching

Strand: 1.4 Geometry		
Topic: 1.4.4 Triangles		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**

1.4.4.4 draw triangles given
 	
   (a) given the lengths of two sides and included angle
 	
   (b) given the length of one side and two angles
	• explore activities involving the drawing of triangles
	
	• demonstrate and discuss procedures used to draw triangles
	
	• cooperative learning for practice
		• performance task - group presentations of the triangles drawn and explanations of procedures for drawing triangles
		
		• peer-assessment/self-assessment

1.4.4.5 solve problems involving triangles	• explore problems involving triangles in a real world context • collaborate in groups for scaffolding and sharing of ideas	• paper and pencil test • teacher observation of notebook entries

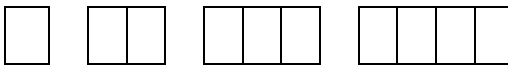| Strand: 1.4 Geometry		
Topic: 1.4.5 Quadrilaterals		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.4.5.1 deduce that the sum of the interior angles in a quadrilateral is equal to 360°	• investigate the sum of the interior angles in quadrilaterals using manipulatives • discussion about the relationship discovered (sum of angles)	• performance task - presentations on findings • performance task - journal writing
1.4.5.2 classify quadrilaterals according to their attributes	• review/check for prior knowledge • guided practice to measure angles and lengths of sides, and hence classify the quadrilaterals • independent practice to identify various types of quadrilaterals	• performance task - compile a portfolio of quadrilaterals, their drawings, and a description of their properties • paper and pencil test - matching diagram
1.4.5.3 draw quadrilaterals given measurements of sides and angles given lengths of sides and sizes of angles	• check for understanding by creating models of quadrilaterals, to be drawn, using manipulatives e.g. straws • demonstrate and discuss procedures used to draw quadrilaterals • independent practice	• performance task - group presentations of the quadrilaterals drawn and explanations of procedures for drawing quadrilaterals • peer-assessment/self-assessment
1.4.5.4 solve problems involving quadrilaterals	• problem solving activities • cooperative learning	• performance task - group presentations; journal writing; portfolio; project • paper and pencil test

Strand: 1.3 Statistics and Probability		
Topic: 1.3.2 Statistics		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.3.2.1 construct bar graphs using appropriate scale factors	• review/check for prior knowledge • re-teach as necessary • use technology tools to create data displays	• teacher observation using a checklist • performance task - multimedia presentations of data displays
1.3.2.2 interpret data from bar graphs	• use questioning strategies to determine students understanding • cooperative learning (students formulate and answer questions given bar graphs)	• pop quiz • peer-assessment/self-assessment • paper and pencil test
1.3.2.3 solve problems involving mode, median and mean	• review/check for prior knowledge (mode, mean) • re-teach as necessary • use questioning strategies that require students to go deeper into understanding mode, median and mean as measures of central tendency • cooperative learning using worksheets	• teacher observation using a checklist • short written responses

Strand: 1.1 Number Operations and Number Theory		
Topic: 1.1.3 Directed Numbers		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.1.3.1 demonstrate an understanding of the concept of directed numbers	• discuss the use of negative numbers in real-world contexts	• oral quiz
1.1.3.2 represent positive and negative numbers on the number line	• guided practice to represent numbers (positive and negative) on the number line	• teacher observation of notebook entries • performance task - using negative numbers to measure quantities in real-world scenarios
1.1.3.3 perform the four basic operations on directed numbers	• simulation of games involving the number line (e.g. stepping backwards and forwards), two-coloured counters, puzzles and number charts • use of technology tools to work with different types of numbers and solve problems • discussion of videos related to directed numbers on YouTube and other Virtual Learning Environments	• performance task - group presentations involving solutions to problems • performance task - journal writing of class activities • short written responses to solve computational and word problems involving the four operations

Strand: 1.5 Measurement		
Topic: 1.5.5 Mass and Weight		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.5.5.1 measure the mass and weight of objects in kilograms and grams	• guided practice to engage in practical real-life situations involving estimation and measuring of mass and weight • discussion about the different units used to measure mass/weight and the different instruments • demonstrate how measurements can be recorded using a combination of units (e.g. 3kg and 100g), fractions (e.g. $3\frac{1}{10}$ kg) or decimals (e.g. 3.1 kg)	• performance task - estimate the mass and weight of objects, verify their mass and weight by measuring, and determine reasonableness of answer • performance task - journal writing about the students' personal estimation skills • oral report to justify the appropriateness of the use of the various units and instruments
1.5.5.2 convert units of measure (grams to kilograms and vice versa)	• discussion about the relationships between different units of measure • explore using measuring instruments • demonstrate and explain how measures are converted from one unit to another • independent practice using worksheets	• paper and pencil test • mental math test

Strand: 1.5 Measurement		
Topic: 1.5.5 Mass and Weight		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.5.5.3 solve problems involving mass and weight	• problem solving activities to measure mass and weight • independent practice involving calculations and conversion	• paper and pencil test • performance task - group presentations of solutions to problems and strategies used • peer assessment using games

Strand: 1.5 Measurement

Topic: 1.5.6 Time

Learning Outcomes *Students will be able to:*	Suggested Teaching and Learning Strategies	Suggested Assessment Strategies
1.5.6.1 measure the duration of events using appropriate units	• discussion about the different instruments that can be used to tell and measure time • discussion about the different units used to measure time • independent practice to record measurements using parts and the whole (e.g. 3hrs and 30 mins), fractions (e.g. $3\frac{1}{2}$ hr) or decimals (e.g. 3.5 hr)	• paper and pencil test - match times shown on standard digital clocks, 24 hour digital clocks and analog clocks to the minute and record the time • performance task - estimate and verify the duration of events justifying the appropriate units used • performance task - explain reasonableness of answers obtained from estimation and actual measuring
1.5.6.2 convert measures of time from one form to the other (using the different units of measure - seconds, minutes, hours, days, weeks, years)	• discussion about the relationships between different units of measure • demonstrate and explain how units of measure are converted from one unit to another • independent practice using worksheets	• self-assessment using CAI • peer-assessment using games • mental math test • paper and pencil
1.5.6.3 solve problems involving time	• problem solving activities involving measurement of time	• performance task - group presentations of solutions and strategies used • paper and pencil test

Strand: 1.6 Algebra		
Topic: 1.6.2 Expressions		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.6.2.1 substitute directed numbers for variables in expressions	• direct instruction to substitute variables in expressions by directed numbers • independent practice using worksheets	• paper and pencil test • pop quiz
1.6.2.2 create an expression to represent the nth term in a sequence	• use technology tools to obtain examples of patterns and sequences (e.g. dance; use geometrical shapes to create patterns) • guided practice to determine rules about patterns and sequences e.g. make squares by joining matchsticks (e.g. 4 matchsticks will make 1 square, 7 matchsticks will make 2 squares etc.) • independent practice using worksheets	• performance task - compile a portfolio comprising examples of patterns and sequences • performance task - group presentation to explain the expression derived for the total number of matchsticks to form the shapes in the pattern below • oral report to summarize the lesson (e.g. no. of matches to make n squares = $3n + 1$) • paper and pencil test
1.6.2.3 calculate the nth term of a sequence	• review substituting a value into an expression • cooperative learning using worksheets	• short written responses • peer-assessment/self-assessment • mental mathematics

Strand: 1.2 Sets, Relations and Functions		
Topic: 1.2.2 Sets		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.2.2.1 solve problems involving sets	• collaborate in groups to derive possible solutions to the problem • focus attention on the strategy used • use Polya's problem solving strategy/approach to solve problems	• group presentations • self-assessment using graphic organisers • peer-assessment using model solutions • short written responses

CURRICULUM CONTENT

Form One Term Three

Strand: 1.1 Number Operations and Number Theory		
Topic: 1.1.4 Decimals		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.1.4.1 represent decimals (up to thousandths) concretely on a place value mat, pictorially and symbolically	• use manipulatives to represent base ten fractions • model by 'thinking aloud' the process of reading number names and numerals • guided practice on the use of the number line to represent the position of numbers	• performance task - use illustrations such as base ten materials and place value mats to represent fractions • oral report to communicate ideas use decimal notation as another form of writing base ten fractions e.g. 0.1 is the same as $\frac{1}{10}$ • teacher observation - observe how students write decimal notation and base 10 fractions in their notebooks
1.1.4.2 match number names to decimal fractions and quantities	• check for understanding by matching the number names (e.g. two and five tenths) and decimal fractions (e.g. 2.5), to the quantities they represent • independent practice (worksheet)	• pencil and paper test to match number names to decimal fractions; match number names to quantities • teacher observation- observes how students write number names and decimal fractions in their notebooks

Strand: 1.1 Number Operations and Number Theory

Topic: 1.1.4 Decimals

Learning Outcomes *Students will be able to:*	Suggested Teaching and Learning Strategies	Suggested Assessment Strategies
1.1.4.3 state the place value and value of digits in decimal fractions	• guided practice to determine the place value and value of digits in numerals using base ten materials including place value mats • independent practice (worksheets) • use of technology to conduct research to describe the pattern of adjacent place positions moving from left to right and right to left of the decimal point(e.g. money)	• paper and pencil test to write decimal fractions using the expanded notation form and vice versa • oral report to explain the place value and value of digits in numerals using base ten materials including place value mats • performance task - project to conduct research, followed by group presentations
1.1.4.4 compare and order decimal fractions in ascending and descending order	• guided practice to use number lines to represent the position of numbers • independent practice using worksheets	• performance task - use illustrations such as number lines to represent positions of numbers • oral reports to communicate reasoning so as to justify responses/solutions
1.1.4.5 apply the 'rounding rule' to round decimal fractions to the nearest whole number, tenth or hundredth position of numbers	• direct instruction about the 'rounding rule' • use technology to 'round' decimal fractions (e.g. spreadsheet)	• performance task - use illustrations such as number lines to represent positions of numbers • oral report to explain rounding rule

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Strand: 1.1 Number Operations and Number Theory		
Topic: 1.1.4 Decimals		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.1.4.6 express a decimal fraction in rational form ($\frac{a}{b}$, where *a* and *b* are whole numbers and $b \neq 0$)	• direct instruction to write decimals as fractions and reduce the fractions to the lowest term • provide examples to help transfer learning • independent practice using worksheets	• peer-assessment/self-assessment with checklist • paper and pencil test
1.1.4.7 convert fractions to decimals	• direct instruction to convert fractions to decimals • investigate the relationship between decimals and the division of two whole numbers with answer less than one e.g. $3 \div 4 = 3.00 \div 4 = 0.75 \left(= \frac{3}{4}\right)$	• paper and pencil test to write decimals as fractions • performance task - write a journal entry about the main idea of the lesson • performance task- use Microsoft excel or calculator to verify answers
1.1.4.8 identify (a) terminating (b) non-terminating (c) recurring decimals	• use technology tools (e.g. calculators, spreadsheets) to convert fractions to decimals • discuss patterns observed and name the different types of decimals	• performance task - use spreadsheet or calculator to illustrate conversion of fractions to decimals • oral reports - to explain the difference among the types of decimals
1.1.4.9 solve problems involving decimals (add, subtract, multiply, divide)	• problem solving activities involving decimals in real world contexts	• worksheet with graded exercises • paper and pencil test

Strand: 1.1 Number Operations and Number Theory		
Topic: 1.1.5 Percentages		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.1.5.1 convert among fractions, decimals and percent	• direct instruction for converting among fractions, decimals and percent • explore real-life situations involving percent • use technology tools to verify solutions	• pencil and paper test - match fractions to percent; represent fractions involving hundredths as percent • teacher observation - observe how students convert among fractions, decimals and percent in their notebooks • performance task - use spreadsheet or calculator to verify answers
1.1.5.2 compare and order fractions, decimals and percent	• guided practice to convert fractions, decimals and percent to a common form so as to be able to compare easily • guided practice to use number lines to represent the position of numbers • independent practice using worksheets	• teacher observation - observes how students compare and order fractions, decimals and percent • performance task - use illustrations such as number lines to represent positions of numbers • paper and pencil test
1.1.5.3 solve problems involving percent	• problem solving activities involving percentages	• teacher observation using checklist • paper and pencil test • performance task

Strand: 1.4 Geometry		
Topic: 1.4.6 Transformations		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.4.6.1 describe the properties of a translation	• discuss observations made by analysing patterns created via translation • discuss the meanings of the terms 'translation' • cooperative learning to engage in practical activities involving the translation of objects (using manipulatives)	• performance task - use illustrations such as patterns or pictures to show translations • oral report to describe the translation of an object to its image • teacher observation- observes how students show translations and reflections in their notebooks
1.4.6.2 identify lines of symmetry in shapes and letters	• discussion about observations made by analysing patterns created using symmetry • cooperative learning to engage in practical activities involving folding and superimposing and using a Mira • discussion about the lines of symmetry in shapes and letters	• performance task - use illustrations such as a Mira to display lines of symmetry; use of technology to display lines of symmetry • performance task - journal writing of reactions to class activities • peer-assessment/self-assessment

Strand: 1.4 Geometry		
Topic: 1.4.6 Transformations		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.4.6.3 describe the reflection of an object in a line	• discuss observations made by analysing patterns created via reflection and symmetrical and asymmetrical shapes • cooperative learning to engage in practical activities involving the reflection of objects in a line and using manipulatives such as cut-out shapes, Miras and the geoboard	• performance task - use illustrations such cut-outs, Miras and geoboards to show the reflection of objects • performance task-journal writing of reactions to class activities • teacher observation - observes how students display reflections in their notebooks

1.4.6.4 create
   (a) symmetrical shapes
   (b) patterns using reflection
	• cooperative learning to engage in practical activities involving the creation of shapes and patterns using reflection
	• discussion about the shapes and patterns created
		• performance task - use illustrations to show the creation of shapes and patterns; display shapes with lines of symmetry
		• paper and pencil test to draw shapes with line symmetry; draw a symmetrical shape given half of the shape and a line of symmetry

1.4.6.5 solve problems involving translation and reflection	• problem solving activities involving translation and reflection	• performance task • observation checklist/rubric • paper and pencil test

Strand: 1.6 Algebra		
Topic: 1.6.6 Algebraic Equations		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
1.6.6.1 translate word problems into algebraic equations	• guided practice to demonstrate balancing of equation e.g. use of coloured cut-outs for concrete representation • independent practice using worksheets	• performance task - illustration of how strips of coloured cut-outs are used to represent equations • oral report to summarize ideas
1.6.6.2 solve linear equations with one variable	• cooperative learning to create linear equations related to real-life situations • independent practice to solve simple linear equations	• performance task - students formulate equations and produce model solutions • peer-assessment/self-assessment using a checklist

Strand: 1.1 Number Operations and Number Theory

Topic: 1.1.6 Consumer Arithmetic

Learning Outcomes *Students will be able to:*	Suggested Teaching and Learning Strategies	Suggested Assessment Strategies
1.1.6.1 state the combinations of $5, $10, $20, $50 and $100 bills equivalent to $1000	• guided practice to determine equivalence • cooperative learning to determine equivalence	• performance task - tabulate the number of $5, $10, $20, $50, $100 bills equivalent to $1000 • performance task - illustrate the equivalence of money by using 'play money'
1.1.6.2 determine the best buy from a choice of similar items with respect to price	• cooperative learning to compare the mass of two similar products to determine which is the better buy • simulation of a shop to role play a Unit Price Game - ***Are you getting value for money*** • discussion about unit prices - finding the unit prices does not give information about the quality of what is bought, but it can help us to make a decision	• performance task - create a shop/store and determine 'best buys', using role play • oral report explaining why a certain item was purchased instead of other similar ones, with respect to price • performance task - journal writing of reactions to class activities
1.1.6.3 solve problems involving percentage (calculate profit and loss, percentage profit and loss, sales tax and discount)	• cooperative learning to create and solve real-life problems: opening a business (e.g. transporting, gardening, shop keeping, store); calculate percentage	• performance task - create a shop/store and transact business using role play • peer-assessment/self-assessment using a checklist

Strand: 1.1 Number Operations and Number Theory		
Topic: 1.1.6 Consumer Arithmetic		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	increase/decrease on the cost price/original value, profit and loss, percentage profit and loss, hire purchase, bills and sales tax (VAT) and discount • independent practice to calculate selling price and cost price given percentage profit, loss or discount	• performance task - compile a portfolio comprising items collected by students • oral report to explain/justify bargains • performance task - journal writing of reactions to class activities

1.1.6.4 solve problems involving simple interest	• observe pattern (use tables of values) and derive the simple interest formula
	• simulation of a bank scenario, to carry out transactions involving loans and savings
	• discussion to define the terms - principal, rate, time, interest, amount
	• investigations and discussions of real-life situations from banking, investments, borrowing of money etc.
		• performance task - students explore investments as advertised and present reports on their analyses
		• performance task - project e.g. go to the bank or credit union and find out:
		  - What does a bank do with the extra money it receives as an interest or loan?
		  - Who can get loans from a bank?
		• performance task- explain to a friend in a letter how the simple interest formula was used in a spreadsheet

CURRICULUM CONTENT

Form Two Term One

Strand: 2.1 Number Operations and Number Theory		
Topic: 2.1.1 Integers		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.1.1.1 differentiate between natural numbers, whole numbers and integers	• explore integers in the real world context • compare and contrast activities using a graphic organiser • use computer drawing tools to create concept maps • create number lines, number trees, and Venn diagrams to display numbers	• oral report - describe how numbers are classified and explain the relationships among them • group presentation - role play • teacher observation - informal observation of notebook entries
2.1.1.2 order integers	• compare and order integers using the number line • use spreadsheets to order integers • develop meaning for integers to represent and compare quantities using a STREAM approach	• performance task - use virtual manipulatives to order integers on the number line • oral quiz • worksheet formulated by teachers/students

Strand: 2.1 Number Operations and Number Theory		
Topic: 2.1.1 Integers		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.1.1.3 perform the four basic operations on integers	• use patterns to develop operations • represent addition, subtraction, multiplication and division concretely and symbolically • use spreadsheet to add, subtract, multiply and divide integers • independent practice to demonstrate proficiency	• performance task - journal entry or letter writing to explain how perfume calculations with more that • self-assess using technology tools - CAI • paper and pencil test
2.1.1.4 recognize situations in everyday life where integers are used	• provide samples from print media demonstrating the use of integers • use word processor, drawing tools and images to create a collage of real world situations involving integers e.g. golf, accounting, temperature, sea level etc. • investigate situations involving integers located in real world contexts	• performance task - create PowerPoint presentation demonstrating the use of integers in our daily lives • short written responses - explain the use of directed numbers in a real world context

Strand: 2.1 Number Operations and Number Theory		
Topic: 2.1.1 Integers		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.1.1.5 solve simple problems involving integers	• solve simple computational problems from real world situations involving integers • evaluate and integrate multiple sources of information • develop an evidence-based opinion or argument	• graded exercises from textbook or teacher designed worksheet • self-assess using technology tools - CAI • paper and pencil test

Strand: 2.1 Number Operations and Number Theory		
Topic: 2.1.2 Laws and Properties of Numbers		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.1.2.1 apply the commutative, associative and distributive laws	• discuss operations on numbers • use situations where the laws of arithmetic apply • develop acrostics to summarise strategies • independent practice to demonstrate proficiency	• apply a practical understanding of laws to aid mental computation • mental quiz • group presentation using situations from real life contexts
2.1.2.2 explain the concept of (a) closure (b) the identity element (c) and inverse operator	• apply appropriate domain-specific vocabulary to communicate concepts • investigate and discuss the properties of the identity element, inverse operator and closure using closed and open number systems • identify situations where the laws and properties of numbers may be used	• students make entries in their journals to describe the concept using illustrations • draw a concept map using a graphic organiser
2.1.2.3 express a value (a) to a given number of significant figures (b) using standard form	• provide examples to help transfer learning • use spreadsheet or calculator for practice	• mental quiz • self-asses using technology tools - CAI • paper and pencil test

Strand: 2.1 Number Operations and Number Theory		
Topic: 2.1.2 Laws and Properties of Numbers		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
(c) in scientific notation	and reinforcement • develop automaticity with drill and practice	
2.1.2.4 compute estimates in relevant problem situations using appropriate approximation techniques	• provide examples of problem solving in real world contexts using estimation techniques • investigate estimation techniques using manipulative • apply approximation skills in performing mental computations • collaborate in groups to derive possible solutions to problems	• groups present solutions to problem situations • mental quiz • self-asses using technology tools - CAI • peer assessment using student designed worksheet
2.1.2.5 perform the four basic operations on numbers expressed in index form, having positive indices only	• guide practice using modelling and coaching • provide examples to scaffold students in the application of strategies during guided practice • independent practice to demonstrate proficiency	• graded exercise from textbook or teacher designed worksheet using real life contexts • paper and pencil test

Strand: 2.1 Number Operations and Number Theory		
Topic: 2.1.2 Laws and Properties of Numbers		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.1.2.6 solve simple problems using mental computation	• apply Polya's problem solving strategies to simple computational problems situated in real world contexts • apply estimation techniques to problem solving • paired problem-solving: one student talks through the problem, describing his thinking processes while his partner listens and asks questions to help clarify thinking and vice versa • develop automaticity with drill and practice	• mental quiz • self-asses using technology tools - CAI • peer assessment using an online activity/games

Strand: 2.1 Number Operations and Number Theory		
Topic: 2.1.3 Number Bases		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.1.3.1 state the place value of a digit in relation to its number base	- activate prior knowledge of the denary system - introduce the concept of number bases using time - provide examples to help transfer learning - oral questioning to determine understanding - explore different number base systems re: digits and place value - develop a glossary of terms for number bases: base, binary, denary, digit, index	- performance task - design a model for counting in different bases - worksheet with items that allow for translation from one base to another
2.1.3.2 covert a numeral given in any base to a base 10 numeral	- perform counting activities to develop the place value system for a given base - practice following an algorithm - use acrostics to recall the steps in the conversion - independent practice for reinforcement	- mental quiz - count in different bases - performance task - devise a strategy for counting in different bases

Strand: 2.1 Number Operations and Number Theory		
Topic: 2.1.3 Number Bases		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.1.3.3 demonstrate appreciation of the role of the binary number system in the development of computer technology	• guide students to use research skills to investigate the origin and development and use of the binary system • investigate the role binary system in computing technology • evaluate and integrate multiple sources of information	• performance task - conduct research and present group report to discuss the role of the binary system in the development of computers
2.1.3.4 write the value of numerals in expanded notation for any number base system	• guide practice in the use of language to provide the bridge between the concrete representations of math and the more abstract and symbolic form • engage in critical reading and writing of technical information	• performance task - journal entry explaining the procedure • self-assess using technology tools - CAI • paper and pencil test
2.1.3.5 convert the value of numerals in any base to their equivalent in base 10	• practice skill following an algorithm • use acrostics to recall the steps in the conversion • students work in pairs to complete a conversion exercise and then evaluate their partner's work	• graded exercises from textbook or teacher designed worksheet • self-assess using technology tools - CAI • paper and pencil test

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Strand: 2.1 Number Operations and Number Theory		
Topic: 2.1.3 Number Bases		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.1.3.6 convert numbers to a single base in order to perform operations	• engage in critical thinking to derive an efficient solution • students collaborate to devise a strategy • focus attention on the strategy used	• graded exercises from textbook or teacher designed worksheet • paper and pencil test
2.1.3.7 represent large and small numbers in scientific notation $(a \times 10^{-6}$ to $a \times 10^{6})$	• integrate skills and concepts e.g. integers and notation • provide a variety of examples using concrete and symbolic representations • use the vocabulary of mathematics to express mathematical ideas precisely: mantissa, exponent • independent practice to develop proficiency	• performance task - journal entry explaining the procedure • mental quiz • paper and pencil test
2.1.3.8 solve simple computational problems in any base: (a) addition (b) subtraction	• create simple computational problems located in real world situations • solve problems involving four operations • apply estimation techniques to problem solving • students evaluate each other's work	• graded exercises from textbook or teacher designed worksheet • self-assess using technology tools - CAI • paper and pencil test

Strand: 2.6 Algebra		
Topic: 2.6.1 Substitution		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.6.1.1 explain the concept of a variable	• introduce variables in mathematical statements using geometric shapes '$\square$' which students can '*fill*' e.g. $\square + 7 = 15$ • assign different values to a variable $\square$ (i.e. *fill* the variable) in a mathematical statement to see the effect on the result • use ***pan balance*** virtual manipulative to *fill* variables in mathematical statements, using a value to make the statement true • discus the attributes of a variable	• performance task - students review the concept through the tasks and log their description in their journals • teacher reviews description for appropriate domain-specific vocabulary
2.6.1.2 translate between word statements and mathematical statements, involving two basic operations	• guide practice in the use of language to provide the bridge between the concrete representations of math and the more abstract and symbolic form • organise and consolidate mathematical thinking through communication • use the language of mathematics to express mathematical ideas precisely	• journal entries to reflect student activities • teacher observation using checklist

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Strand: 2.6 Algebra		
Topic: 2.6.1 Substitution		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.6.1.3 demonstrate understanding of the relationship between abstract and concrete	• use questioning strategies that require students to manipulate concepts and ideas through language to describe models • apply appropriate domain-specific vocabulary to communicate concepts • analyse and evaluate the mathematical thinking and strategies of others • engage in critical reading and writing of technical information	• graded exercises from textbook or teacher designed worksheet • oral questioning to assess students' understanding of the concept
2.6.1.4 substitute integers for unknown quantities in mathematical statements	• present examples to transfer learning • model by 'thinking aloud' to focus attention on the strategy used • use concrete, pictorial and verbal representation to develop an understanding on invented and conventional symbolic notations • independent practice to develop proficiency	• graded exercises from textbook or teacher designed worksheet • paper and pencil test

Strand: 2.6 Algebra		
Topic: 2.6.2 Simplification of Algebraic Expressions		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.6.2.1 explain the concept of an algebraic expression	• activate prior knowledge of variables, constants and operations • integrate skills and concepts e.g. operations on constants and variables • collaborate to investigate the structure of the monomial, binomial and trinomial • apply appropriate domain-specific vocabulary to communicate concepts	• performance task - students review the concept and log their description in their journals • teacher reviews description for appropriate domain-specific vocabulary
2.6.2.2 represent terms concretely, pictorially and symbolically	• use questioning strategies that require learners to activate mental manipulation • use technology tools to manipulate and investigate objects in concrete, pictorial and symbolic from • present models for students to analyse and evaluate	• oral questioning to assess students understanding • teacher observation using checklist
2.6.2.3 identify like and unlike terms	• present examples to transfer learning • compare and contrast activities using: manipulative, pictographs, symbols	• oral questioning to assess students understanding • teacher observation using checklist

Strand: 2.6 Algebra		
Topic: 2.6.2 Simplification of Algebraic Expressions		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	• use the language of mathematics to express mathematical ideas precisely	
2.6.2.4 differentiate between the coefficient and operational sign	• present models for students to analyse and evaluate • compare and contrast activities • small group discussion to verify concepts using supporting information from alternative sources for corroboration • apply differentiation skills to perform computations in graded exercises	• oral questioning to assess students understanding • graded exercises from textbook or teacher designed worksheet • worksheet with graded exercises • oral quiz
2.6.2.5 perform operations on terms represented concretely, pictorially and symbolically	• collaborate in groups for scaffolding and sharing of ideas • guide practice to represent knowledge using a network of interrelated mathematical ideas • perform activities to model operations using algebra tiles, pictographs and symbols	• performance task - students complete exercises using manipulative • teacher observation using checklist • self-assess using technology tools - CAI

Strand: 2.6 Algebra		
Topic: 2.6.2 Simplification of Algebraic Expressions		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.6.2.6 simplify algebraic expressions	- present examples to transfer learning - develop and analyse algorithms to perform simple computations using: - the four basic operations - the order of operations - commutativity, associativity and distributivity - students 'think aloud' to verbalize their thinking - by talking, writing, or drawing the steps used in a strategy	- teacher observation using checklist - graded exercises from textbook or teacher designed worksheet - oral quiz - paper and pencil test

Strand: 2.6 Algebra		
Topic: 2.6.3 Solution of Linear Equations		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.6.3.1 differentiate between expressions and equations	• use questioning strategies that require critical analysis of concepts • compare and contrast activities to differentiate structures	• graded exercises from textbook or teacher designed worksheet • oral quiz
2.6.3.2 solve linear equations of increasing level of difficulty having variables on both sides	• check for prior knowledge to verify mastery of concepts and skills before advancing • model by 'thinking aloud' activities so that students can follow demonstrated thinking processes • use flow charts to explain the processes used to solve the equation • develop acrostics to summarise strategies and aid memory in the retrieval of algorithms • independent practice to develop proficiency	• oral questioning • students develop flow charts to solutions of simple linear equations using computer software

Strand: 2.6 Algebra		
Topic: 2.6.3 Solution of Linear Equations		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	• focus on the strategy used: 　- cover-up method 　- balance method	
2.6.3.3　solve linear equations involving use of the distributive law using a variety of representations	• apply the strategies used in [2.6.3.2] • explore problems in a real world context to include fractions with denominators having natural numbers but no variable	• graded exercises from textbook or teacher designed worksheet • oral questioning
2.6.3.4　rewrite verbal statements in terms of algebraic equations	• check for prior knowledge to verify mastery of concepts and skills before advancing • guide practice in the use of language to provide the bridge between the concrete representations of math and the more abstract and symbolic form • organise and consolidate mathematical thinking through communication • use the language of mathematics to express mathematical ideas precisely	• peer-assessment using worksheet with model solutions • teacher observation

Strand: 2.6 Algebra		
Topic: 2.6.3 Solution of Linear Equations		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.6.3.5 solve word problems using algebraic equations	• check for mastery of required skills before advancing • use Polya's problem solving strategy • practice skills repeatedly • apply customised rubrics for steps in the strategy	• performance task - students complete worksheet with graded exercises • peer-assessment using model solutions • paper and pencil test

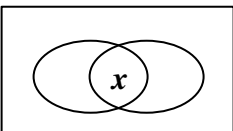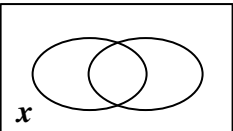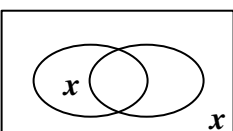| Strand: 2.6 Algebra		
Topic: 2.6.4 Solution of Linear Inequalities		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.6.4.1 define inequalities in the contexts of society, politics and economics	• guided discussion to identify mathematical inequalities in the context of society, politics and economics, in terms of constraints and comparisons • introduce the concept using various representations: real-life examples, manipulatives, models, technology, and symbolic representations • incorporate writing activities and group work to observe student thinking and identify misconceptions and gaps in understanding	• use questioning to assess students' understanding of the concept • students make entries in their journals to describe the concept
2.6.4.2 use mathematical language to represent inequalities	• guide practice in the use of language to provide the bridge between the concrete representations of math and the more abstract symbolic forms • model real world situations involving inequalities using mathematical language	• performance task - students complete graded exercises from their textbook or worksheet

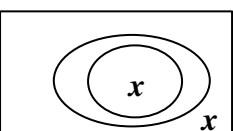| Strand: 2.6 Algebra		
Topic: 2.6.4 Solution of Linear Inequalities		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	• develop a ready reckoner chart for conversion from verbal to symbolic and vice versa	
2.6.4.3 use mathematical language to rewrite word problems involving inequalities	• present models for students to analyse and evaluate • use questioning strategies that require critical analysis of concepts • discuss coding and syntax • provide examples to scaffold students in the application of strategies during guided practice • present opportunities to build on students' inherent sense of curiosity and discovery	• performance task - students complete graded exercises from their textbook or worksheet • paper and pencil test
2.6.4.4 identify the set of numbers to which the solution of an inequality belongs	• review the subsets of the real number system (excluding irrational numbers) • discuss how solutions to inequalities incorporate a range of values • integrate concepts: use the number line to represent the range for a solution	• teacher observation using checklist • mental quiz • self-asses using technology tools - CAI • peer assessment using an online activity

Strand: 2.6 Algebra		
Topic: 2.6.4 Solution of Linear Inequalities		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.6.4.5 solve simple inequalities	- use Polya's problem solving strategy to understand the problem - understand the meaning of equivalent forms of an inequality - use the ***balance method*** to solve simple inequalities - develop acrostics to summarise strategies and aid memory in the retrieval of algorithms	- performance task - students are given simple real world situations to create linear models - teacher observation with checklist
2.6.4.6 represent linear inequalities on the number line	- check prior knowledge to verify mastery of concepts and skills before advancing - model by 'thinking aloud' activities so that students can follow demonstrated thinking processes - develop acrostics to summarise strategies and aid memory in the retrieval of algorithms - independent practice to develop proficiency	- performance task - represent inequalities on the number line of the form: $x > a$ $a < x < b$ $b > x > a$ $x \geq a$ $a \leq x \leq b$ $b \geq x \geq a$ $x < a$ $a < x \leq b$ $b > x \geq a$ $x \leq a$ $a \leq x < b$ $b \geq x > a$ where $a, b \in \mathbf{Z}$ - oral questioning to assess students' understanding - graded exercises from textbook or worksheet

Strand: 2.6 Algebra		
Topic: 2.6.4 Solution of Linear Inequalities		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.6.4.7 represent solutions to linear inequalities on the number line	• model the process before they begin to work independently • review the concept of integers and model their placement on the large-scale number line • integrate and apply strategies used in [2.6.4.5] and [2.6.4.6]	• graded exercises from textbook or teacher designed worksheet • paper and pencil test
2.6.4.8 write solutions to inequalities using set builder notation	• present models for students to analyse and evaluate • use questioning strategies that require critical analysis of concepts • discuss coding and syntax • provide examples to scaffold students in the application of strategies during guided practice	• graded exercises from textbook or teacher designed worksheet • paper and pencil test

Strand: 2.2 Sets, Relations and Functions		
Topic: 2.2.1 Sets		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.2.1.1 interpret information relating to subsets, disjoint and intersecting sets	• investigate and discuss the attributes of a subset, a disjoint set and the intersection of sets • use manipulative to demonstrate conceptual understanding of key concepts	• oral questioning • students complete exercises in their textbook or worksheet

2.2.1.2 count the number of elements in the union and intersection of two sets	• discuss counting, double counting, union and intersection
	
	• use manipulative to demonstrate:
	  - union of sets
	  - intersection of sets without double counting
	
	• practice counting objects from a finite universal set that have been assigned to sets on the Venn diagrams
		• teacher observation
		
		• students complete exercises in their textbook or worksheet
		
		• students summarise concepts explored and make entries in their journals

2.2.1.3 represent information for sets on the appropriate Venn diagram	• investigate attributes of the Venn diagram which characterise its structure	• students draw Venn diagrams to show the relationship among different types of

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Strand: 2.2 Sets, Relations and Functions		
Topic: 2.2.1 Sets		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	• use a checklist to accurately complete a Venn diagram • provide real world situations for students to complete Venn diagrams	numbers • worksheet using graphic organisers
2.2.1.4 count the elements in the union of two sets, intersecting and disjoint	• practice using real world situations with union and intersection of sets/subsets • independent practice in writing the notation for counting and using the notation to communicate information about sets • discuss double counting in relation to the universal set, a set and any subset in the Venn diagram • derive the rule for counting the elements in a union of two sets: - $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ - $n(U) = n(A \cup B) + n(A \cup B)'$	• performance task - students research and conduct polls to complete graded worksheet • students complete exercises from textbook

Strand: 2.2 Sets, Relations and Functions		
Topic: 2.2.1 Sets		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.2.1.5 solve problems involving two set - Venn diagrams, given the number of elements in the sets	• practice problem solving using algebraic equations and substitutions into the rules they have derived: - $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ - $n(U) = n(A \cup B) + n(A \cup B)'$ • practice solving a Venn diagram for all subsets based on information given from a real world context • attempt graded exercises in text book or worksheet	• students complete graded exercises to solve a Venn diagram for the unknown number of elements in one or more subsets e.g. - for one subset - for two subsets
2.2.1.6 use a Venn diagram to solve word problems involving two sets	• solve word problems from real world contexts involving sets of objects/subjects • use Polya's problem solving strategy	• worksheet using graphic organisers • paper and pencil test

Strand: 2.2 Sets, Relations and Functions		
Topic: 2.2.2 Relations, Mappings and Functions		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.2.2.1 generate relations between two sets	• engage in an activity to classify and relate two sets of objects/subjects based on specific rules/factors • create as many connections as possible using words to explain simple relationships between sets of objects/subjects	• oral questioning • students complete exercises in the textbook or worksheet
2.2.2.2 explain the concept of an arrow diagram	• introduce the concept embedded in a context • use concrete representation to introduce the concept then reinforce with verbal, pictorial and symbolic representations • discuss rooted misconceptions, coding issues, unfamiliar terms/phrases • apply appropriate domain-specific vocabulary to communicate concepts	• performance task - students review the concept and log their description in their journals • teacher reviews description for appropriate domain-specific vocabulary

Strand: 2.2 Sets, Relations and Functions		
Topic: 2.2.2 Relations, Mappings and Functions		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.2.2.3 use arrow diagrams to illustrate relationships between sets	• discuss and state relationships that exist in real world situations which represent groups as sets • use arrow diagrams to show relationships that exist in everyday situations involving sets of people, places, and objects	• students complete graded exercises using an interactive computer program
2.2.2.4 draw arrow diagrams to show simple mathematical relations	• provide a variety of contexts where students can use arrow diagrams to demonstrate relations and types of mappings with integers • employ technology tools to represent mathematical relations using arrow diagrams	• students make entries in their journals • self-asses using technology tools - CAI • peer assessment using an online activity
2.2.2.5 explain the concepts of a domain and a range	• activate prior knowledge of sets • introduce the concepts embedded in a context	• performance task - students review the concept and log their description in their journals

Strand: 2.2 Sets, Relations and Functions		
Topic: 2.2.2 Relations, Mappings and Functions		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	• use concrete representation to introduce the concept then reinforce with verbal, pictorial and symbolic representations • apply appropriate domain-specific vocabulary to communicate concepts	• teacher reviews description for appropriate domain-specific vocabulary
2.2.2.6 explain the concept of a relation, a mapping and a function	• provide examples of arrow diagrams to explore/investigate attributes of the different types of relations • small group discussion to classify relations according to their attributes • discuss rooted misconceptions, coding issues, unfamiliar terms/phrases • apply appropriate domain-specific vocabulary to communicate concepts	• performance task - students review the concept and log their description in their journals • teacher reviews description for appropriate domain-specific vocabulary • students complete a matching exercise using an interactive computer program
2.2.2.7 differentiate among a relation, a mapping and a function	• compare and contrast activities using a graphic organiser to distinguish between relations, mapping and functions	• mental quiz • short responses using graphic organisers • paper and pencil test

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Strand: 2.2 Sets, Relations and Functions		
Topic: 2.2.2 Relations, Mappings and Functions		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.2.2.8 solve for missing terms in an arrow diagram, given a relation involving two sets	• focus attention on the thinking processes to develop awareness of strategies that can be applied to other learning situations • paired problem-solving: one student talks through the problem, describing his thinking processes while his partner listens and asks questions to help clarify thinking and vice versa	• students complete graded exercises using an interactive computer program • paper and pencil test

Strand: 2.2 Sets, Relations & Functions		
Topic: 2.2.3 Ordered Pairs		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.2.3.1 explain the concept of an ordered pair	• introduce the concept embedded in a context • use concrete representation to introduce the concept then reinforce with verbal, pictorial and symbolic representations • discuss rooted misconceptions, coding issues, unfamiliar terms/phrases • apply appropriate domain-specific vocabulary to communicate concepts	• performance task - students review the concept and log their description in their journals • teacher reviews description for appropriate domain-specific vocabulary
2.2.3.2 represent relations as sets of ordered pairs	• guided practice to generate ordered pairs from arrow diagrams • link new information to prior skills by substituting values from ordered pairs to validate rules defined by the relation • check for understanding by working backward to describe the relation given a set of ordered pairs	• oral quiz • self-asses using technology tools - CAI • paper and pencil test

Strand: 2.2 Sets, Relations & Functions		
Topic: 2.2.3 Ordered Pairs		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.2.3.3 write the domain and range, given a set of ordered pairs representing a relation	• provide examples to help transfer learning • use questioning strategies that require learners to go deeper • students self-assess (self-monitor) using a customised math error self-correction checklist	• oral questioning • mental quiz • worksheet using graphic organisers
2.2.3.4 identify the relation that exists between elements in a given domain and its corresponding range	• provide examples to help transfer learning • use questioning strategies that require learners to activate prior knowledge and mental manipulation • independent practice to demonstrate proficiency	• oral questioning • mental quiz • students complete graded exercises using an interactive computer program • paper and pencil test
2.2.3.5 verify whether or not an ordered pair satisfies a given relation	• integrate topics and concepts using substitution in mathematical statements • provide examples to scaffold students in the application of strategies during guided practice	• students complete graded exercises using an interactive computer program • paper and pencil test

Strand: 2.2 Sets, Relations & Functions		
Topic: 2.2.3 Ordered Pairs		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.2.3.6 write ordered pairs to satisfy a given relation	• independent practice to demonstrate proficiency • use technology tools as an instructional support to explain, model, scaffold, and guide practice	• students complete graded exercises using an interactive computer program • paper and pencil test
2.2.3.7 represent relations on the Cartesian plane, given as a set of ordered pairs	• guide practice using modelling and coaching • engage students in activities to relate what they know from past experiences to their current learning, so that they can associate what they learn with the larger concept • use technology tools as a virtual manipulative for reinforcement	• performance task - students complete graded exercises in their graph book
2.2.3.8 verify if a given set of ordered pairs represents a linear relationship	• use technology tools as a virtual manipulative to explain, model, scaffold, and guide practice in identifying a linear relationship	• students complete graded exercises using an interactive computer program • paper and pencil test

Strand: 2.2 Sets, Relations & Functions		
Topic: 2.2.3 Ordered Pairs		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	• model higher thinking skills and provide opportunities for students to summarize and symbolize new learning into new formats • small group discussion to verify concepts using supporting information from alternative sources for corroboration	

CURRICULUM CONTENT

Form Two Term Two

Strand: 2.4 Geometry		
Topic: 2.4.1 Coordinate Geometry		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.4.1.1 explain the concept of a plane	• introduce the concept embedded in a context • explore planes and their properties using virtual manipulatives • develop spatial skills by exploring the orientation of geometrical objects in a plane	• performance task - students review the concept and log their description in their journals • teacher reviews description for appropriate domain-specific vocabulary • oral questioning
2.4.1.2 explain the concept of coordinates of a point	• introduce the concept embedded in a context • activate prior knowledge: ordered pairs • use concrete representation to introduce the concept then reinforce with verbal, pictorial and symbolic representations • discuss rooted misconceptions, coding issues, unfamiliar terms/phrases • apply appropriate domain-specific vocabulary to communicate concepts	• performance task - students review the concept and log their description in their journals • teacher reviews description for appropriate domain-specific vocabulary

Strand: 2.4 Geometry		
Topic: 2.4.1 Coordinate Geometry		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**

2.4.1.3 develop an understanding of the Cartesian Coordinate System	• use an atlas to investigate properties of a positioning system relative to the equator and the Greenwich meridian
	
	• collaborate in groups
	   - to investigate hemispheres and quadrants in a Cartesian system
	   - to navigate a Cartesian system using grid lines
	
	• create a positioning system using perpendicular number lines intersecting at 0
	
	• draw the carefully labelled Cartesian system with scale, axes and origin
		• students practice role-play, starting at the origin moving to another location in a plane using a maximum of two movements:
		   - no horizontal or vertical displacement
		   - horizontal displacement only
		   - vertical displacement only
		   - horizontal displacement followed by vertical displacement

2.4.1.4 locate points on the Cartesian plane using a system of coordinates	• investigate reference system for locating points on a grid/atlas • guide discussion on reference systems and their universal convention(s)	• performance task - students engage in a homework exercise to practice locating points in the Cartesian system: - drawing and labelling the x and y axes

Strand: 2.4 Geometry		
Topic: 2.4.1 Coordinate Geometry		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	• discuss how an ordered pair (x, y) can be interpreted in a Cartesian system • use google map to print a map of the school on a grid and allow students to locate rooms given specific coordinates	- labelling the origin - graduating axes using scales - plotting points on the grid • students complete graded exercises using an interactive computer program
2.4.1.5 state the coordinates of a point on the coordinate plane	• provide a variety of exercises for guided practice using different spaces • engage students using an interactive computer program to practice stating the coordinates of points in a Cartesian system	• performance task – use technology tools produce a map of their own '*Paradise Island'* on a Cartesian coordinate system and state the coordinates of at least ten tourist attractions
2.4.1.6 plot points on the Cartesian plane	• model the process before students begin to work independently • review the concept of positive and negative numbers (integers) and model the placement of integers on the large-scale number line	• students complete graded exercises from textbook or teacher designed worksheet • self-assess using technology tools (interactive computer program) - CAI • pen and pencil test

Strand: 2.4 Geometry		
Topic: 2.4.1 Coordinate Geometry		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	- reinforce associated terminology when discussing position relative to the x and y axes, e.g. - 'right'/'positive' - 'left'/'negative' - 'up'/'positive' - 'down'/'negative' - plot points to form/complete familiar shapes or symmetrical designs so students can easily self-monitor their own progress	

Strand: 2.2 Sets, Relations & Functions		
Topic: 2.2.4 Graphical Representation of Linear Equations and Linear Inequalities		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.2.4.1 interpret linear relations as graphs on the Cartesian plane	• guide practice in the use of language to provide the bridge between the concrete representations of math and the more abstract and symbolic forms • model by 'thinking aloud' to guide students in developing comprehension strategies to summarise, elaborate, and explain • engage students in activities to relate what they know from past experiences to their current learning, so that they can associate what they learn with the larger concept	• students generate examples of linear relationships • performance task - students complete graded exercises in their graph book
2.2.4.2 draw graphs on the Cartesian plane	• students participate in activities and make associations to activate prior knowledge • use technology tools to investigate models	• teacher observation with checklist • performance task - students complete graded exercises in their graph book

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Strand: 2.2 Sets, Relations & Functions		
Topic: 2.2.4 Graphical Representation of Linear Equations and Linear Inequalities		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	• independent practice to demonstrate proficiency	
2.2.4.3 define linear relationships	• provide examples to help transfer learning • investigate real world factors that are associated using a linear relationship • use graphing calculator to create models • use questioning strategies that require students to manipulate concepts and ideas through language to describe models	• oral questions • students make entries in their journals
2.2.4.4 represent relations arising from a real world context in a variety of ways	• represent knowledge using a network of interrelated mathematical ideas: ordered pairs, tables, arrow diagrams, and linear graphs • engage students in discussion for deeper understanding to develop inference skills	• graded exercise from textbook or worksheet • performance task - students are given simple real world situations to create linear models

Strand: 2.2 Sets, Relations & Functions		
Topic: 2.2.4 Graphical Representation of Linear Equations and Linear Inequalities		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.2.4.5 draw graphs of simple linear inequalities	- check for mastery of required skills before advancing - integrate skills and concepts: treat the *x* and *y* axes as number lines, then associate solutions on the number line with a regions on the Cartesian plane - solve simple linear inequalities in one variable only, and represent them on the Cartesian plane - practice skills repeatedly applying customised rubrics for specific sub-tasks	- teacher observation using checklist - performance task - students practice drawing graphs of the form : - $x > a,\quad x \geq a,\quad x < a,\quad x \leq a$ - $y > b,\quad y \geq b,\quad y < b,\quad y \leq b$ where $a, b \in \mathbf{Z}$ - pen and pencil test

Strand: 2.4 Geometry

Topic: 2.4.2 Transformations – Translations and Reflections

Learning Outcomes *Students will be able to:*	Suggested Teaching and Learning Strategies	Suggested Assessment Strategies
2.4.2.1 describe the concept of a transformation	• provide materials with diverse sensory attributes and allow students sufficient time and space to discover properties • perform transformation using virtual manipulatives on the computer • explore transformations using the Van Hiele model of Geometric thought • discuss key terminology and their meaning for translations and reflections, in particular • use graph paper to perform transformations	• teacher observation using checklist • students transform figures using computer graphic software: points, lines, plane shapes • students review key terminology by creating a glossary in their journal: congruency, orientation, vector, translation, mirror line, reflection symmetry
2.4.2.2 recognise the properties of translations	• translate figures using computer graphing software/drawing tools • explore translations using the Van Hiele model	• teacher observation using checklist • students make entries in their journals stating the properties of translations

Strand: 2.4 Geometry		
Topic: 2.4.2 Transformations – Translations and Reflections		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.4.2.3 represent a translation on a coordinate plane	• guide instruction • locate the coordinates of the object or the image given the 'translation directions' and the coordinates of the image or the object respectively	• students make entries in their journals describing an algorithm for performing a translation
2.4.2.4 describe a translation using a vector	• use questioning strategies that require students to activate prior knowledge and mental manipulation • provide examples to help develop relational understanding between the form of a vector $\begin{pmatrix} x \\ y \end{pmatrix}$, and coordinates of a point (x, y) • use technology tools as an instructional support to model concepts and scaffold understanding	• teacher observation for use of mathematics language • performance task - students complete a graded activity sheet to describe a translation in the coordinate plane using a translation vector, given the object and the image

Strand: 2.4 Geometry

Topic: 2.4.2 Transformations – Translations and Reflections

Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.4.2.5 locate the position of an object or an image given the translation vector	• provide examples to help transfer learning • use technology tools to reinforce concept graphically • guide practice in the use of language to provide the bridge between the concrete representations and the more abstract and symbolic forms • model by 'thinking aloud' the process	• students complete a graded activity sheet to translate objects given the translation vector: points, lines, regular polygons
2.4.2.6 recognize the properties of reflections	• reflect figures using computer graphing software/drawing tools • explore translations using the Van Hiele model	• teacher observation using checklist • student make entries in their journals, stating the properties of reflections
2.4.2.7 reflect an object in the coordinate plane using horizontal and vertical mirror lines	• use questioning strategies that require learners to activate prior knowledge and mental manipulation • provide examples to scaffold students in the application of strategies during guided practice	• teacher observation using checklist • students make entries in their journals describing an algorithm • performance task - students complete a graded activity sheet to reflect objects in vertical and horizontal mirror lines

Strand: 2.4 Geometry		
Topic: 2.4.2 Transformations – Translations and Reflections		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	• independent practice to demonstrate proficiency • develop acrostics to aid memory in the retrieval of algorithms	
2.4.2.8 state the coordinates of the object or the image under in reflection in the mirror line	• independent practice labelling and stating the coordinates of the point $P(x, y)$ and its image $P'(x_1, y_1)$ under a reflection • use technology tools as a virtual manipulative for reinforcement	• performance task - students locate and state: - the coordinates of the image given the line of reflection and the coordinates of the object - the coordinates of the object given the line of reflection and the coordinates of the image
2.4.2.9 locate mirror line graphically	• use manipulative to explore properties of reflections • use technology tools as a virtual manipulative for reinforcement • independent practice to demonstrate proficiency	• performance task - students locate, draw and label the mirror line for an object and its image

Strand: 2.5 Measurement		
Topic: 2.5.1 Units of Measurement and Conversion of Units		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.5.1.1 identify the appropriate measuring instrument(s) for a given quantity	- activate prior knowledge of relevant concepts in measurement - present opportunities to build on students' inherent sense of curiosity and discovery - visit the science laboratory and investigate the different types of measuring instruments - use a STREAM approach to explore phenomena in the environment and discuss their measurable attributes - differentiate among instruments used for measuring a unique quantity e.g. length – ruler, tape measure, Vernier calliper, micrometre screw gauge Trundle wheel etc.	- performance task - students create a portfolio using measuring instruments found around the home - quiz - students match measuring instruments with quantities

Strand: 2.5 Measurement		
Topic: 2.5.1 Units of Measurement and Conversion of Units		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.5.1.2 identify the most appropriate unit for measuring a given quantity	• visit the science laboratory and collaborate in groups to measure quantities e.g. time, length, area, capacity, mass and temperature • small group discussion to verify concepts using supporting information from alternative sources for corroboration • select and use appropriate units and tools to measure quantities to a specified degree of accuracy	• performance task - students create a portfolio matching units and quantities using measuring objects found in their home environment
2.5.1.3 read and interpret scales accurately	• present situations in real world contexts where accuracy in measurement is important • investigate how scales are graduated • differentiate instruction to cater for heterogeneous levels of student ability and skill	• performance task - students visit the science laboratory and work in groups reading different measuring instruments • teacher observation using checklist

Strand: 2.5 Measurement		
Topic: 2.5.1 Units of Measurement and Conversion of Units		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	• use questioning strategies to connect the degree of error and the degree of accuracy • read scales on measuring instruments stating their degree of error	
2.5.1.4 measure quantities to a given degree of accuracy	• activate prior knowledge of use of the protractor • model the process before students begin to work independently • use technology tools as an instructional support to explain, model, scaffold, and guide practice • student self-assess (self-monitor) using a customised math error self-correction checklist • independent practice to demonstrate proficiency	• performance task - measure quantities to a specified degree of accuracy using the appropriate SI unit of measure for length, area, capacity, mass, temperature and time on the 24-hour clock

Strand: 2.5 Measurement

Topic: 2.5.1 Units of Measurement and Conversion of Units

Learning Outcomes *Students will be able to:*	Suggested Teaching and Learning Strategies	Suggested Assessment Strategies
2.5.1.5 convert from one set of units to another within the metric system	• develop conversion in the metric system using the denary system • use questioning strategies that require learners to activate prior knowledge and mental manipulation • present opportunities to build on students' inherent sense of curiosity and discovery • collaborate in groups to derive possible solutions to the problem	• performance task - use technology tools to create ready reckoners • teacher observation using a checklist • mental quiz • pen and pencil test
2.5.1.6 convert quantities from one system of measure to another using the unitary method	• review the importance of standardized measure • compare measures using measuring instruments graduated in metric and imperial systems • model by 'thinking aloud' the process in the application of an algorithm	• performance task - use technology tools to create ready reckoners • performance task - rewrite a simple recipe from imperial measure using metric measure • performance task - use graded exercises to compare quantities to include other metric and imperial systems of units

Strand: 2.5 Measurement

Topic: 2.5.1 Units of Measurement and Conversion of Units

Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	• collaborate using instruments to create a conversion chart for measure, e.g. degree $\leftrightarrow$ revolution centimetre $\leftrightarrow$ inch metre $\leftrightarrow$ yard kilometre $\leftrightarrow$ mile gram $\leftrightarrow$ ounce kilogram $\leftrightarrow$ pound litre $\leftrightarrow$ gallon Celsius $\leftrightarrow$ Fahrenheit • to practice estimation in conversion	
2.5.1.7 convert the units for area	• introduce the concept embedded in a context using a STREAM approach • model by 'thinking aloud' the process in the application of an algorithm • collaborate in groups to develop and algorithm for conversion • independent practice	• students make entries in their journals describing an algorithm • performance tasks - use technology tools to create a conversion chart for, $mm^2 \leftrightarrow cm^2$, $mm^2 \leftrightarrow m^2$, $cm^2 \leftrightarrow m^2$, $m^2 \leftrightarrow km^2$ • pen and pencil test

Strand: 2.5 Measurement		
Topic: 2.5.2 Circles		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.5.2.1 identify the parts of a circle and their relations	• complete a chart, defining the parts of the circle • describe the parts of the circle using mathematical terminology	• create a graphic organiser using a word processor and drawing tools
2.5.2.2 derive the numerical value of pi	• measure the circumference and diameter of different circles with string and ruler, then investigate the relationship between circumference and diameter	• performance task - students describe a task for determining the approximate value of π, in their journals
2.5.2.3 derive the formula for the circumference of a circle	• develop the formula for the circumference of a circle: - Measure the circumference - Measure the diameter - Calculate the ratio, $\frac{C}{D} = \pi$ - State the relation between circumference, diameter and π, with circumference as the subject	• performance task - students use investigation with circular objects in their environment

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Strand: 2.5 Measurement		
Topic: 2.5.2 Circles		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.5.2.4 use the formula for the circumference of a circle	• apply substitution skills to the formula $C = D\pi$ or $C = 2\pi r$ to calculate the unknown value of the circumference, diameter, or radius of a circle • practice using calculator for computation	• students complete an online task • students complete graded exercises from textbook or teacher designed worksheet
2.5.2.5 estimate the circumference of a circle	• estimate the length of the diameter, then multiply by the factor 3 • practice estimation skills	• self-assess using technology tools - CAI • mental quiz using diagrams
2.5.2.6 derive the formula for the area of a circle	• evaluate and integrate multiple sources of information • explore transformations of an irregular shape into a familiar shapes e.g. cut a circle into equal sectors and transform into a parallelogram • analyse and evaluate the mathematical thinking and strategies of others	• performance task - students make journal entries with supporting diagrams, showing the derivation of the area of a circle

Strand: 2.5 Measurement		
Topic: 2.5.2 Circles		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.5.2.7 use the formula for the area of a circle	• apply substitution skills to the formula $A = \pi r^2$ to calculate the unknown value of the area, radius or diameter of a circle • practice using calculator for computation	• performance task - graded exercises from textbook and worksheet • paper and pencil test
2.5.2.8 estimate area of a circle	• use a variety of methods to approximate the area of a circle • estimate the area of a circle using a grid to count squares and ½ squares • show that squaring a diameter is an approximation for area	• students make entries in their journals to describe the method of estimation used • mental quiz
2.5.2.9 solve problems involving circles	• use group activities to solve problems which will develop reasoning skills involving area and circumference of a circle	• paper and pencil test

Strand: 2.5 Measurement		
Topic: 2.5.3 Area and Perimeter of Compound Shapes		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.5.3.1 recognise the conservation of area	• design and sketch compound shapes: cut out plain shapes from compound shapes; calculate area of each shape; add up areas	• performance task - students work in groups • teacher observation using checklist
2.5.3.2 represent compound shapes as the union of plane shapes	• guide instructions for individual activity • practice using tangrams to develop spatial skills • apply spatial skills to reconstruct compound shapes using different sets of plane shapes	• students make entries in their journal
2.5.3.3 calculate the area of a compound plane shape	• practice using tangrams to develop spatial skills • reconstruct compound shapes into a set of smaller shapes, then use familiar methods to calculate areas using known lengths	• performance task - students transform a compound shape into two or more standard plane shapes, calculate the areas, then sum the areas • attempt graded exercises from textbook and worksheet

Strand: 2.5 Measurement		
Topic: 2.5.3 Area and Perimeter of Compound Shapes		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.5.3.4 use logic and reasoning to make and support conjectures about regular geometrical shapes	• present situations for investigation • collaborate to investigate and discuss ideas for research (e.g., area of a rectangle is twice the area of a triangle) • conduct research online	• presentations - students collaborate to conduct investigations, document findings in their journals, then make presentations to their peers
2.5.3.5 calculate the area of compound shapes involving triangles, quadrilaterals, circles and circle quadrants	• activate prior knowledge of area of plane shapes • use Polya's problem solving strategies • collaborate in groups to derive possible solutions to problem situations	• students complete graded exercises from textbook or worksheet • self-asses using technology tools - CAI
2.5.3.6 calculate the perimeter of compound shapes involving triangles, quadrilaterals, circles and circle quadrants	• identify the actual edges of the compound shape by tracing the length of each edge of the compound shape • differentiate between the actual edges of the compound shape versus the edges of its combined parts • explore strategies for determining unknown lengths of sides	• performance task - students work in groups to select a set of compound shapes, then present at least two strategies for determining the perimeter • pen and pencil test

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Strand: 2.5 Measurement

Topic: 2.5.3 Area and Perimeter of Compound Shapes

Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.5.3.7 solve problems involving estimates of perimeter and area, including finding the dimensions of a shape, given its perimeter	• attempt graded exercises in the textbook or worksheet	• peer assessment using model solutions • paper and pencil test

Strand: 2.5 Measurement

Topic: 2.5.4 Volume and Capacity of Prisms

Learning Outcomes *Students will be able to:*	Suggested Teaching and Learning Strategies	Suggested Assessment Strategies
2.5.4.1 classify solids	• questioning strategies to elicit critical analysis and evaluation by students • discuss the properties of solids then classify solids according to their properties • compare and contrast prisms and pyramids	• game - students are placed in groups and quizzed
2.5.4.2 describe the properties of solids	• collaborate to create a glossary of terms used to describe the attributes of solids e.g. surface, height, edge, vertex, cross-section	• performance task - students work in groups to develop a table of properties for regular solids • observation - teacher observes students working in groups
2.5.4.3 recognise the relationship between the concepts of volume and capacity	• use standard solids of various sizes to fill empty vessels • use a variety of containers to measure capacity • read a scale to determine capacity • demonstrate the relationships in a variety of ways	• students make entries in their journals to distinguish between the concepts

Strand: 2.5 Measurement		
Topic: 2.5.4 Volume and Capacity of Prisms		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.5.4.4 calculate the volume of solids	• guide students to generate a rule for calculating volume of cubes and cuboids • stack unit cubes to form cubes and cuboids • explore the properties of solids to generate a rule for finding the volume of a cylinder and other prisms	• students complete graded exercises in textbook or worksheet • self-assess using technology tools - CAI • pen and pencil test
2.5.5.5 estimate the volume of solids	• collaborate to work in groups and discuss • estimate the unknown volume of objects by making comparisons with known standards, given the volume of an object	• students complete graded exercises in textbook or worksheet • self-assess using technology tools - CAI • mental quiz
2.5.5.6 solve problems involving volume and capacity	• develop a worksheet with graded activities and model answers	• students complete graded exercises in textbook or worksheet • paper and pencil test

Strand: 2.5 Measurement		
Topic: 2.5.5 Problem Solving involving Rate, Ratio and Proportion		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.5.5.1 explain the concepts of (a) rate (b) ratio (c) proportion	• introduce the concepts embedded in a context • develop concepts as comparisons of like and unlike quantities • use questioning strategies that require critical analysis of concepts • small group discussion to verify concepts using supporting information from alternative sources for corroboration	• performance task - students review the concept and log their description in their journals • teacher reviews description for appropriate domain-specific vocabulary • draw a concept map using a graphic organiser
2.5.5.2 use proportion techniques	• provide examples of problem solving in real world contexts using ratio and proportion techniques • work in pairs to investigate and analyse situations in real world contexts involving ratio and proportion • guide students in activities with the application of proportion	• complete graded exercises in textbook or worksheet

Strand: 2.5 Measurement		
Topic: 2.5.5 Problem Solving involving Rate, Ratio and Proportion		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.5.5.3 develop the relationship between time, speed and distance	• engage in practical activities: - measuring distances, - measuring time using stopwatches to record time in seconds or minutes • develop the concept of speed as a rate • collect real data and discuss situations involving speed, comparing the distance covered with time taken • use questioning strategies to derive a unit for speed	• record keeping – use a stop watch to track personal running rate
2.5.5.4 rearrange the formula for time, speed and distance	• paired problem-solving: one student talks through the problem, describing his thinking processes while his partner listens and asks questions to help clarify thinking and vice versa • model by 'thinking aloud' the process to focus attention on the strategy used • practice changing the subject using the ***balance method***	• teacher observation with checklist • students make entries in their journal - writing distance as speed multiplied by time - writing time as distance divided by speed • quiz to reinforce the relationships between distance, speed and time

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Strand: 2.5 Measurement		
Topic: 2.5.5 Problem Solving involving Rate, Ratio and Proportion		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.5.5.5 apply the formula for calculating time, speed and distance	• compute unknown quantities by substituting values into the formula • practice substituting arbitrary units for a given quantity	• students make entries in their journals, writing speed as distance divided by time

2.5.5.6 apply a variety of direct proportion techniques	• perform group activity
	  - convert arbitrary units for speed
	  - write speed as distance per unit time
	  - use speed and time to calculate
	     distance by direct proportion
		• use information about self to analyse:
		  - status of health
		  - athletic potential

2.5.5.7 solve a variety of problems involving time, distance and speed	• use real world contexts to create problems • attempt exercises from textbook and worksheet	• peer assessment using model solutions • paper and pencil test

Strand: 2.5 Measurement		
Topic: 2.5.6 Consumer Arithmetic		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.5.6.1 calculate the total Hire Purchase price	• guide discussion with megastore advertisements with items on sale for Hire Purchase • discuss how hire purchase is calculated • conduct role play allowing students to virtually sell items on hire purchase • discuss the advantages and disadvantages of purchasing on hire purchase	• students make entries in their journals • worksheet for homework assignment
2.5.6.2 apply the terminology of salary and wage	• discuss different careers and their terms of remuneration • students role play to create a payroll for their virtual employees • engage students in activities which guide them to distinguish among the terms: wages, hourly rate, minimum wage, overtime, basic salary, piece work,	• presentation - students are given situations with different conditions and required to present the situation which provides optimal benefits • students complete worksheet to solve problems involving wages and salaries, overtime and commission

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Strand: 2.5 Measurement		
Topic: 2.5.6 Consumer Arithmetic		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	salary and commission. • allow students to create a glossary of terms daily, monthly, yearly, fortnight, basic wage, double time, triple time, time and a half, commission, duration of work, incentive bonus • discuss the advantages and disadvantages of working for: - wages with tips - salary with commission - fixed salary	
2.5.6.3 explain the concept of percent	• develop percent as a ratio by comparing a quantity to one hundred • distinguish between percent and percentage • investigate percent as a part and a whole - between 0% and 1%	• performance task - students complete table to calculate the percentages of given quantities • paper and pencil test

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Strand: 2.5 Measurement		
Topic: 2.5.6 Consumer Arithmetic		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	- greater than 100% - equivalence with fractions	
2.5.6.4 increase or decrease a number by a given percent	• discuss with students how to increase or decrease a number by a certain percent • construct ready reckoners • use numeracy strategies to develop skills in performing calculations	• students complete textbook exercises or worksheet

2.5.6.5 convert currency using rates	• activate prior knowledge of rates
	
	• collaborate to create a collage using images of different currencies and their notation
	
	• interpret a foreign currency exchange rate table and discuss strategies for converting different currencies
	
	• role-play monetary transactions using foreign currency to practise calculations with exchange rates
		• teacher uses checklist to assess collage
		
		• make a portfolio to include:
		  - history of development of foreign
		    exchange table
		  - current table from newspaper
		  - locate countries on the world map
		  - currency used in countries identified
		  - budget for trips to two different
		    countries
		
		• group presentation

Strand: 2.5 Measurement		
Topic: 2.5.6 Consumer Arithmetic		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**

2.5.6.6 use a table of rates to solve problems involving currency conversion	• calculate equivalent currency:
	  - using simple ratios and proportion
	  - using the unitary method
	• use approximations in converting currency values by rounding to two decimal places
	• attempt exercises from textbook and worksheet
		• performance task - students collaborate in groups to prepare a purchase order for items supplied from different countries with different currencies
		• performance task – students convert the individual costs on a list of items purchased in one country to another currency of another country

2.5.6.7 solve problems involving rates: foreign exchange, salaries, wages and utility bills	• attempt graded activity sheet with real world situations on consumer arithmetic	• paper and pencil test

CURRICULUM CONTENT

Form Two Term Three

Strand: 2.4 Geometry		
Topic: 2.4.3 Angles, Triangles and Parallel lines		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.4.3.1 identify the exterior angle of a polygon	• engage students in activities to relate what they know from past experiences to their current learning, so that they can associate what they learn with the larger concept • engage students in activities to develop their spatial skills • independent practice to develop proficiency	• students complete graded exercises using an interactive computer program • oral quiz • paper and pencil test
2.4.3.2 calculate the size of an exterior angle given the size of the interior angle	• paired problem-solving: one student talks through the problem, describing his thinking processes while his partner listens and asks questions to help clarify thinking and vice versa • engage in problem-solving activities	• students use the formula they have derived to solve for angles in triangles and quadrilaterals

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Strand: 2.4 Geometry		
Topic: 2.4.3 Angles, Triangles and Parallel lines		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	involving angles	
2.4.3.3 use the relationship between the exterior angle of a triangle and the opposite interior angles to solve problems	• guided practice to develop broad-based mathematical abilities, including discerning relationships, logical reasoning, and use of a wide variety of methods for solving new problems • model by 'thinking aloud' to focus attention on the strategy used • engage students in independent practice to demonstrate	• performance task -students complete a project to prove that the exterior angle is equal to the sum of the interior triangles in a triangle • students complete graded exercises using an interactive computer program • mental quiz • paper and pencil test
2.4.3.4 classify the angles formed when parallel lines are cut by a transversal	• provide examples to help transfer learning • engage students in activities to develop their spatial skills • engage students in activities to relate what they know from past experiences to their current learning, so that they can	• students make entries in their journals • oral quiz • paper and pencil test - matching pairs of angles

Strand: 2.4 Geometry		
Topic: 2.4.3 Angles, Triangles and Parallel lines		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	associate what they learn with the larger concept • engage in compare and contrast activities using a graphic organiser to differentiate among types of angles	
2.4.3.5 use the angle relationships involving parallel lines cut by a transversal and angles of triangles to solve problems	• engage in activities to develop their spatial skills • independent practice to demonstrate proficiency • guided practice to develop broad-based mathematical abilities, including discerning relationships, logical reasoning, and use of a wide variety of methods for solving new problems	• students complete graded exercises using an interactive computer program • peer assessment using model solutions • complete graded worksheet • paper and pencil test

Strand: 2.4 Geometry		
Topic: 2.4.4 Geometric Drawings and Constructions		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.4.4.1 construct a line segment using ruler and a pair of compasses	• model by 'thinking aloud' the process in the application of an algorithm • independent practice to demonstrate proficiency • practice using measuring instruments with accuracy	• students perform a demonstration of the task with explanations • teacher observation with checklist • performance task - students complete exercises in textbook or worksheet
2.4.4.2 bisect a line segment	• check for prior knowledge to verify mastery of a skill before advancing • differentiate instruction using CAI to cater for heterogeneous levels of student ability and skill • practice skills repeatedly applying customised rubrics for specific sub-tasks • develop acrostics to aid memory retrieval of algorithms	• students perform a demonstration of the task with explanations • teacher observation with checklist • performance task - students complete exercises in textbook or worksheet
2.4.4.3 use a pair of compasses and a straight edge to bisect an angle	• check for prior knowledge to verify mastery of a skill before advancing	• students perform a demonstration of the task with explanations

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Strand: 2.4 Geometry

Topic: 2.4.4 Geometric Drawings and Constructions

Learning Outcomes *Students will be able to:*	Suggested Teaching and Learning Strategies	Suggested Assessment Strategies
	• differentiate instruction using CAI to cater for heterogeneous levels of student ability and skill • practice skills repeatedly applying customised rubrics for specific sub-tasks • develop acrostics to aid memory retrieval of algorithms	• teacher observation with checklist • performance task - students complete exercises in textbook or worksheet
2.4.4.4 create designs of simple plane shapes and patterns in 2D related to architecture and landscaping, using bisection of line segments and angles	• use manipulative to practice manipulating plane shapes to build spatial skills • use technology tools as an instructional support to explain, model, scaffold, and guide practice • focus attention on strategy used • independent practice to demonstrate proficiency	• students perform a demonstration of the task with explanations • teacher observation with checklist • performance task - students complete graded exercises in textbook or worksheet

Strand: 2.4 Geometry		
Topic: 2.4.4 Geometric Drawings and Constructions		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.4.4.5 draw angles using a protractor	• brainstorm what students already know about the topic • revisit mathematical concepts to reinforce new skills • practice using measuring instruments with accuracy • differentiate instruction to address the variety of learning styles • practice following an algorithm	• students perform a demonstration of the task with explanations • teacher observation with checklist • performance task - students complete graded exercises in textbook or worksheet
2.4.4.6 use ruler and a pair of compasses only to construct standard angles, which are multiples of 30º	• model by 'thinking aloud' the activities so that students can follow demonstrated thinking processes • provide examples to help develop relational understanding • present opportunities to build on students' inherent sense of curiosity and discovery	• students perform a demonstration of the task with explanations • teacher observation with checklist • performance task - students complete graded exercises in textbook or worksheet

Strand: 2.4 Geometry		
Topic: 2.4.4 Geometric Drawings and Constructions		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	• apply mathematical reasoning processes, skills and strategies to new situations and problems	
2.4.4.7 construct an angle of equal size to a given angle using a pair of compasses	• students 'think aloud' to verbalize their thinking - by talking, writing, or drawing the steps they used in solving a problem • independent practice to demonstrate proficiency • focus attention on the strategy used	• students perform a demonstration of the task with explanations • teacher observation with checklist • performance task - students complete graded exercises in textbook or worksheet

Strand: 2.3 Statistics and Probability		
Topic: 2.3.1 Statistical Analysis		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.3.1.1 interpret a frequency distribution	• guide practice in the use of language to provide the bridge between the concrete representations and the more abstract and symbolic forms • use questioning strategies that require students to manipulate concepts and ideas through language to describe models • collaborate in groups for scaffolding and sharing of ideas	• performance task - students work in groups to collect raw data from classroom environment and represent in a frequency table
2.3.1.2 calculate (a) the mean; (b) the median; (c) the mode from a frequency distribution of ungrouped data	• guided instruction using frequency distributions to calculate the mean, median and mode • independent practice with the use of technology tools e.g. spreadsheets for checking	• self-asses using technology tools - CAI • peer-assessment using worksheets with model solutions • mental quiz • paper and pencil test

Strand: 2.3 Statistics and Probability		
Topic: 2.3.1 Statistical Analysis		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.3.1.3 explain the appropriateness of different measures of central tendency in analysing a particular set of data	• check for prior knowledge to verify mastery of concepts and skills before advancing • present opportunities to build on students' inherent sense of curiosity and discovery • compare and contrast activities using a graphic organiser	• students prepare a concept map for the measures of central tendency • students prepare a report on the use of measures of central tendency • performance task - students analyse a data set and compare the measures of central tendency
2.3.1.4 identify data types in terms of nominal, ordinal, interval, ratio	• introduce new mathematical concepts with a guiding question • present situations to analyse the characteristics of different types of data • compare and contrast using a graphic organiser	• performance task - design a questionnaire to investigate different types of data
2.3.1.5 analyse data	• collaborate to investigate and discuss ideas for research • present and justify conclusions, using summary statistics in the form of frequency distributions	• performance task - construct frequency tables using data collected from a questionnaire • presentation - justify conclusions based on data analysis

Strand: 2.3 Statistics and Probability		
Topic: 2.3.2 Data Displays		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.3.2.1 describe ungrouped frequency distribution	• collaborate in groups to collect examples of statistical data representing real world phenomena • discuss methods of representing statistical data in a tabular form	• students make entries in their journal
2.3.2.2 differentiate between discrete and continuous data	• use questioning strategies that require learners to activate prior knowledge and mental manipulation • introduce new mathematical concepts with a guiding question • present situations to analyse the characteristics of different types of data • compare and contrast using a graphic organiser	• performance task - draw a concept map using a graphic organiser • teacher reviews student product for interrelated mathematical ideas

2.3.2.3   construct statistical charts
  (a) pie charts
  (b) bar charts
  (c) histograms
	• practice using measuring instruments with accuracy
	• activate prior knowledge of block graphs and scales
		• students create charts using a variety of data types provided by the teacher
		• portfolio - students prepare a selection of charts based on data collected

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Strand: 2.3 Statistics and Probability		
Topic: 2.3.2 Data Displays		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
(d) line graphs	• student self-assess (self-monitor) using a customised math error self-correction checklist • develop acrostics to aid memory retrieval of algorithms for construction of charts	• observation checklist to assess charts and graphs
2.3.2.4 identify appropriate means of representation for the different types of data	• use questioning strategies that require students to manipulate concepts and ideas through language to describe models • collaborate in groups for scaffolding and sharing of ideas • discuss and list the characteristics of different types of statistical charts • guided practice to represent knowledge using a network of interrelated mathematical ideas for representation	• students make entries in their journals • oral questioning

Strand: 2.3 Statistics and Probability		
Topic: 2.3.2 Data Displays		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
2.3.2.5 interpret information from pie charts, bar charts, histograms and line graphs	• discuss attributes of discrete and continuous data • work in groups to collect samples of statistical charts representing real world phenomena • differentiate among the attributes of statistical charts used to represent discrete versus continuous data • collaborate in groups for scaffolding and sharing of ideas • independent practice to demonstrate recall, comparison and analysis	• students formulate questions related to the data in graphs and draw conclusions about the data • paper and pencil test on the interpretation of data displays
2.3.2.6 use line graphs to define relationships and draw conclusions	• provide examples to help transfer learning • engage students in discussion for deeper understanding to develop inference skills • independent practice to demonstrate proficiency using real world data collected from their environment	• students will be given data on a real world sample to represent in a table, draw a line graph and answer related questions • group presentations • peer evaluations

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CURRICULUM CONTENT

Form Three Term One

Strand: 3.1 Number Operations and Number Theory		
Topic: 3.1.1 Real Numbers and Number Bases		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.1.1.1 solve problems with real numbers involving the four operations	• provide examples using a variety of problem solving strategies • cooperative learning to design and solve problems involving real life scenarios	• presentations of student constructed problems with model solutions • paper and pencil test
3.1.1.2 identify irrational numbers in their decimal forms (as non- terminating decimals)	• investigation - use interactive technology to explore numbers in quotient form and in decimal form • peer coaching - students discuss with a partner, giving examples of irrational numbers	• journal writing (include examples of irrational numbers) • self-assessment/peer-assessment
3.1.1.3 approximate the value of irrational numbers between 1 and 100 to four significant figures	• guided demonstration of approximation technique • independent practice using teacher designed exercise	• self-assess using interactive software • paper and pencil test

Strand: 3.1 Number Operations and Number Theory		
Topic: 3.1.1 Real Numbers and Number Bases		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.1.1.4 identify the subsets of the set of real numbers: rational numbers, integers, whole numbers, natural numbers, and irrational numbers	• model the desired outcome • students use an activity to categorize numbers into subsets according to common properties and name each subset	• students prepare a project report • oral questioning by peers about the types of numbers, and the relationships among them • students create a graphic organiser
3.1.1.5 represent the relationship between subsets of the set of real numbers (a) on the number line (b) using a number tree (c) using Venn Diagrams	• use computer graphing software to construct a visual representation of the relationships among subsets • draw Venn diagrams to represent the relationships between different sets of numbers	• journal entries showing illustrations of the concepts • peer assess using teacher designed worksheet with model solutions • paper and pencil test
3.1.1.6 calculate the sums and differences of numbers in base 2 and base 3	• activate prior knowledge of the denary system (base 10) • demonstrate a variety of techniques for addition and subtraction • students collaborate in small groups to practice adding and subtracting numbers • independent practice to develop proficiency	• peer assess using teacher designed worksheet with model solutions • paper and pencil test

Strand: 3.5 Measurement		
Topic: 3.5.1 Area and Perimeter of Compound Shapes Involving Parts of the Circle		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**

3.5.1.1 interpret formulae related to the circle:
  (a) length of an arc of a circle
  (b) area of a sector of a circle
	• activate prior knowledge: parts of a circle, calculation of circumference and area of a circle, operations with fractions, substitution
	• use instructional materials to review known formulae for circles
	• use questioning techniques accompanied by manipulatives and models to develop the formula
	• engage students in discussion for deeper understanding to develop inference skills
	• provide examples to help transfer learning
		• oral questioning to assess student understanding
		• performance task - students create a poster to display the formulae using appropriate illustrations for support
		• journal entries describing the concepts

3.5.1.2 apply formulae related to the circle:
  (a) calculate the length of an arc of a circle
  (b) calculate the area of a sector of a circle
	• scaffold exercises to include manipulatives, then transition to symbolic representation only
	• use problem situations to apply the skill in real world contexts
	• independent practice in the application of the formula to develop proficiency
		• self-assess using technology tools - CAI
		• complete a graded exercise from textbook or worksheet
		• paper and pencil test

Strand: 3.5 Measurement
Topic: 3.5.1 Area and Perimeter of Compound Shapes Involving Parts of the Circle

Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**

3.5.1.3 apply formulae to determine measures of compound shapes involving parts of the circle:
    (a) perimeter of a compound shape
    (b) area of a compound shape
	• activate prior knowledge: formulae for perimeter and area of plane shapes
	• provide examples to help transfer learning
	• present 2-D drawings of compound shapes from the real world and have the students divide the shapes into the least number of known simple shapes including sectors
	• students collaborate to devise a strategy to solve problems
	• students calculate the area of the plane shapes which contribute towards the compound shape and sum them up to obtain the area of a compound shape
	• students evaluate each other's work
		• students are asked to deduce strategies for finding perimeter and area of compound shapes, then present their solutions to the class
		• performance task - students complete simple projects involving measurements, e.g. determine costs involving compound shapes involving parts of the circle
		    - fencing a space
		    - tiling a space
		• self-assess using technology tools - CAI
		• paper and pencil test

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Strand: 3.5 Measurement		
Topic: 3.5.2 Surface Area and Volume of Prisms and Pyramids		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.5.2.1 calculate surface area of (a) prisms (cube, cuboid, triangular prism) (b) pyramids (cone included)	• use models and nets of solids to develop the formulae • provide a variety of examples for cooperative learning using virtual manipulative • independent practice using manipulative	• self-asses using technology tools - CAI • peer-assessment using model solutions • paper and pencil test to assess knowledge of and use of formulae
3.5.2.2 calculate volume of (a) prisms (b) pyramids	• activate prior knowledge for volume • provide a variety of examples for cooperative learning using virtual manipulative • independent practice using manipulative	• self-assess using online games/activities • peer-assessment using model solutions • paper and pencil test
3.5.2.3 solve problems involving (a) surface area (b) volume	• problem solving activities (including Polya's problem solving strategy) • model by 'thinking aloud' the process • cooperative learning using virtual learning environments	• performance task - compile a portfolio of different problems with model solutions • self-asses using technology tools - CAI • peer-assessment using model solutions • paper and pencil test

Strand: 3.5 Measurement		
Topic: 3.5.3 Scales and Scalar Measurement		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.5.3.1 determine distances on maps and models in accordance with a given scale	• activate prior knowledge: scale factor • use questioning strategies to determine students' understanding • investigate situations involving a scale on a map, located in real world contexts • cooperative learning to engage in practical activities involving scales, using virtual learning environments	• oral questioning to assess student understanding • performance task - e.g. students, in small groups, measure parts of the school environment and produce a map project report
3.5.3.2 create accurate 2-D drawings of simple geometric figures, charts, and graphs, given a specific scale requirement	• activate prior knowledge: congruency, similarity • teacher demonstration using manipulatives • collaborative learning : student work in small groups to produce 2-D drawings from teacher designed activity • guided practice using virtual learning environments • independent practice using grid paper	• performance task - students compile a portfolio of well labelled drawings, indicating lengths and scale factor • teacher observation using checklist and scoring rubric • paper and pencil test

Strand: 3.5 Measurement		
Topic: 3.5.3 Scales and Scalar Measurement		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.5.3.3 create 3-D models of prisms from nets	• activate prior knowledge: polygons, nets, solids • engage students in activities to develop spatial skills • model the outcome using manipulatives and technology tools • independent practice to demonstrate proficiency	• performance task - students compile a portfolio of several prisms and their corresponding nets • teacher observation using checklist and scoring rubric
3.5.3.4 calculate the corresponding change in a quantity for a given scale factor: (a) length (b) area (c) volume	• activate prior knowledge: area, volume, ratio, proportion, squared and cubed values • questioning strategies to elicit critical analysis and evaluation by students • engage students in discussion for deeper understanding to develop inference skills • cooperating learning to compare measurable attributes of *similar* plane shapes and solids	• performance task - students describe in their journals how measures are calculated given a scale factor for, - length - area - volume • paper and pencil test

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Strand: 3.5 Measurement		
Topic: 3.5.3 Scales and Scalar Measurement		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.5.3.5 use appropriate units and tools to measure quantities to a degree of precision, for problem-solving in a particular context	• activate prior knowledge: linear measure, area, volume, units of measurement, conversion of units, approximation • use authentic teacher designed activities for student collaboration • present opportunities to build on students' inherent sense of curiosity and discovery • use the STREAM approach for problem solving tasks • use of technology tools for simulations, calculations, documentation	• teacher designed task with rubric to evaluate knowledge, comprehension and reasoning skills

Strand: 3.4 Geometry		
Topic: 3.4.1 Congruency		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.4.1.1 explain the concept of congruency of triangles	• discussion of properties of real life objects which are equal • use manipulatives/models to identify properties of congruent triangles • guided instruction to lead students to investigate the ratios of the lengths of the corresponding sides of plane figures	• oral presentations • performance task - journal writing: explain the meaning of the term 'congruency' using diagrams

3.4.1.2   prove the congruency of triangles, using the minimum conditions:
   (a)   all corresponding sides are equal in length (SSS);
   (b)   corresponding sides and the included angle are equal (SAS);
   (c)   pair of corresponding angles and the included side are equal (ASA);
   (d)   pair of corresponding angles and a non-included side are equal (AAS);
   (e)   right angle triangle: hypotenuse and one side are equal (HS)
	• model by 'thinking aloud' activities so that students can follow demonstrated thinking processes
	• cooperative learning: provide a variety of examples for students to practice
	• independent practice to develop proficiency
	• develop acrostics to summarise facts and aid memory in the retrieval of such facts
		• oral discussion - students verbalize their thinking
		• self-assessment/peer-assessment using virtual learning environments
		• paper and pencil test

Strand: 3.4 Geometry		
Topic: 3.4.1 Congruency		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**

3.4.1.3 apply the properties of congruency in triangles
    (a) to explain simple shapes and patterns;
    (b) to solve problems
	• problem-solving (including Polya's problem solving approach)
	• demonstrate in a variety of ways with a variety of examples
	• cooperative learning
		• performance task - identify the application of congruent triangles in a real world situation and solve problems using the application of the principle
		• graded exercises from textbook and worksheet
		• oral presentations
		• paper and pencil test

Strand: 3.4 Geometry		
Topic: 3.4.2 Similarity		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.4.2.1 explain the concept of similarity	• activate prior knowledge: congruency, proportion • present examples using concrete, visual and abstract representations • use technology tools to provide examples and non-examples of similar objects in real world scenarios • students are given similar pairs of plane geometrical figures then observe and compare their features to write a definition of similarity • guided instruction to lead students to deduce that the ratio of lengths of corresponding sides are in proportion, in similar figures	• performance task - journal writing to explain the meaning of the term 'similarity' using illustrations • performance task - group presentations using posters to represent the concept
3.4.2.2 determine the conditions required for a set of triangles to be similar: (a) all three pairs of corresponding angles are the same (AAA);	• use manipulatives/models to investigate properties of similar triangles • guided discussion using compare and contrast activities	• teacher observation using checklist • multimedia presentations of sets of similar triangles

Strand: 3.4 Geometry		
Topic: 3.4.2 Similarity		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
(b) pairs of corresponding sides are in the same proportion (SSS in same proportion); (c) two pairs of sides in the same proportion and the included angle equal (SAS);	• provide a variety of examples for students to identify similar triangles, working in small groups (include non-examples as well)	
3.4.2.3 deduce whether triangles are similar, given information about their angles and sides	• use questioning strategies (to lead students to discover that the ratios of the lengths of the corresponding sides are in proportion) • model by 'thinking aloud' the process • provide examples for students to transfer learning	• journal writing (describe condition for triangles to be similar) • complete a teacher designed worksheet which requires students to match similar triangles
3.4.2.4 apply the properties of similar triangles to solve problems	• problem-solving (including Polya's problem solving approach) • model by 'thinking aloud' the process • cooperative learning	• self-asses using technology tools - CAI • peer assessment using model solutions • oral presentations • paper and pencil test

Strand: 3.4 Geometry		
Topic: 3.4.2 Similarity		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.4.2.5 explain the concept of a scale factor	• activate prior knowledge: ratio, conversion of units of measure • explore real world situations where scale factors are used: maps, drawing plans, microscopes, cameras, copiers, etc. • compare and contrast activities with lengths, similar plane figures and solids • working cooperatively students state the definition of a scale factor	• oral questioning to determine levels of understanding of the concept • students describe the concept in their journals, using illustrations
3.4.2.6 explain the concept of an enlargement	• activate prior knowledge: scale factor similarity, transformation • compare and contrast activities with reflections, translations and enlargements • students investigate the concept in real life situations e.g. using magnifying lens, projector, font size in word processing, zoom features on a copier	• oral questioning to determine levels of understanding of the concept • students describe the concept in their journals, using illustrations

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Strand: 3.4 Geometry		
Topic: 3.4.2 Similarity		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	• associate terminology with the concept: - enlargement about a point - centre of enlargement	
3.4.2.7 apply the properties of enlargement of plane geometrical figures to solve problems (positive scale factors only)	• use graph paper for representation of models of plane figures • use simple plane shapes for students to investigate the relationship between the areas of the object and image under an enlargement • use simple examples of enlargements, double and triple, to relate to a scale factor • use graded activity sheet with guided instructions for students to investigate instances where scale factors are whole numbers or fractions • students solve a variety of problems involving enlargements, using similar triangles	• teacher observation of journal entries • performance task - project report and/or oral presentations: students work in groups to draw a plan of their school using computer drawing tools, and present it to their classmates • paper and pencil test

Strand: 3.4 Geometry		
Topic: 3.4.3 Right-Angled Triangles and Pythagoras Theorem		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.4.3.1 demonstrate understanding of Pythagoras theorem	• activate prior knowledge: hypotenuse, congruency, similarity • investigate Pythagoras Theorem using technology tools for simulations, documentation and reporting • explore possible relationships between the lengths of the sides, and deduce that linear relationships are not possible • explore squared relationships by placing square cut-outs on each side of the triangle and deduce the relationship among the sides of a right angled triangle • discuss the meaning of a squared length as a measure of area • use of guided discovery for students to deduce the theorem	• performance task - investigation and written report including description of Pythagoras' Theorem • group presentations on findings of relationships among sides in right angled triangles • teacher observation of performance tasks and journals to assess the level of understanding of concepts, and the representation of ideas

Strand: 3.4 Geometry		
Topic: 3.4.3 Right-Angled Triangles and Pythagoras Theorem		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.4.3.2 apply Pythagoras theorem to determine lengths of sides in the right angled-triangle	• activate prior knowledge: order of operations, inverse operations • graded exercises from textbooks and worksheets • independent practice	• teacher observation of note book entries • worksheet with teacher designed activities
3.4.3.3 model real world situations using Pythagoras theorem, in order to solve problems	• use of practical situations for students to create and solve problems, finding missing lengths of sides of right-angled triangles • cooperative learning to develop problem solving strategies including Polya's problem solving approach • use of calculator to simplify complex calculations, and approximations	• self-asses using technology tools - CAI • peer-assessment using teacher designed worksheet with model answers • pen and paper test

Strand: 3.4 Geometry		
Topic: 3.4.4 Trigonometric Ratios		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.4.4.1 explain the concept of a trigonometric ratio	• activate prior knowledge: right-angled triangle, similar triangles, ratio, equivalent fractions • investigate corresponding angles of similar right-angled triangles to explore the relationship between an angle and the ratio of two sides in a triangle • explore the reasoning underlying trigonometric ratios • provide examples to help transfer learning using virtual manipulatives	• oral questioning to determine students' understanding of the concept • performance task - create posters to illustrate concepts • paper and pencil test - multiple choice
3.4.4.2 state the three trigonometric ratios for the angle θ: (a) sine $\theta = \dfrac{opposite}{hypotenuse}$ (b) cosine $\theta = \dfrac{adjacent}{hypotenuse}$ (a) tangent $\theta = \dfrac{opposite}{adjacent}$	• students explore the words opposite and adjacent as they apply to real life and through discussion relate them to the angles and sides of the triangle • Students create a series of examples of triangles with fixed angles and identify the adjacent and opposite sides • independent practice for reinforcement	• teacher observation of journal entries • paper and pencil test - matching exercise

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Strand: 3.4 Geometry		
Topic: 3.4.4 Trigonometric Ratios		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.4.4.3 calculate a trigonometric ratio for an angle θ, in a right-angle triangle: (a) sine θ (b) cosine θ (c) tangent θ	• activate prior knowledge: substitution • provide examples to transfer learning • practice using calculator for complex calculations and approximations • independent practice to develop proficiency	• performance task - students work in groups using graded exercises from textbook and worksheet • paper and pencil test
3.4.4.4 apply trigonometric ratios to calculate the length of a side in a right-angled triangle	• activate prior knowledge: solving equations, substitution • guided practice to demonstrate application of the ratios • teacher designed activity sheet with graded exercises and model answers • independent practice using 'maths error' checklist for reinforcement	• self-asses using technology tools - CAI • peer-assessment using checklist • graded exercises from textbook and worksheet • paper and pencil test
3.4.4.5 explain the concept of (a) angle of elevation (b) angle of depression	• activate prior knowledge: concept of an angle • discuss terminology related to the concept: elevation, depression, horizontal, incline, decline	• performance task - produce journal entries to describe the concept with the use of illustrations • teacher observation of journal entries and visual representations with checklist

Strand: 3.4 Geometry		
Topic: 3.4.4 Trigonometric Ratios		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	• provide concrete examples to transfer learning • students explore their environment and search the Worldwide Web to identify contexts for the concepts • students collaborate to state a definition of the concept	
3.4.4.6 apply trigonometric ratios to solve for angles of elevation and depression	• provide problems in real world contexts involving angles of elevation and depression to stimulate the students' inherent sense of curiosity • use questioning and discussion to guide students • provide exemplars to guide students • students work collaboratively to complete teacher designed activities and compare solutions with model answers • students focus on the strategy used	• self-assess using technology tools – CAI • peer-assessment using model solutions • paper and pencil test

Strand: 3.4 Geometry		
Topic: 3.4.5 Construction		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.4.5.1 use logic and reasoning to make and support conjectures about geometrical shapes	• use questioning to assess students understanding of concepts • teacher designed activities for the recall of facts and algorithms • teacher designed tasks to allow students to collaborate and investigate properties so as to scaffold the development of their understanding and reasoning • guided discussion to link concepts	• oral questioning • students make journal entries of theorems (along with proofs supported by illustrations, where necessary) • paper and pencil test
3.4.5.2 construct triangles, when given: (a) the lengths of three sides (b) the lengths of two sides and the included angle	• discussion involving the use of manipulatives (e.g. straws) to model triangles to be constructed • cooperative learning using virtual learning environments • independent practice	• performance task - students perform a demonstration of the task • teacher observation using a checklist • paper and pencil test
3.4.5.3 construct, (a) parallel lines (b) perpendicular lines	• use manipulatives to demonstrate parallel and perpendicular lines • guided practice using technology tools • cooperative learning to demonstrate the procedure for their peers	• teacher observation using a check list • self-assessment/peer assessment using technology tools • teacher observation of notebook entries

Strand: 3.4 Geometry		
Topic: 3.4.5 Construction		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.4.5.4 use lines, angles and the axes of reference to describe and represent direction (e.g. in using a navigational compass)	• research/investigate using the World Wide Web • use technology tools to provide information • project-based learning	• presentations of research findings • paper and pencil test
3.4.5.5 apply the properties of equality of angles and parallelism of sides to construct compound shapes	• provide examples to transfer learning • demonstrate in a variety of ways using a variety of examples • project-based learning	• presentations of student constructed models/project report • teacher observation of journal entries • paper and pencil test
3.4.5.6 construct a circle, (b) given the radius; (c) given two chords	• teacher demonstration • students use online tutorial - CAI • students focus on the strategy • teacher observes students with a checklist while the students perform the task	• performance task - teacher designed worksheet with graded exercises • paper and pencil test
3.4.5.7 construct squares, rectangles, and parallelograms, using given information	• teacher demonstration • students use online tutorial - CAI • students peer assess using a prepared template • worksheet	• performance task - teacher designed worksheet with graded exercises • paper and pencil test

Strand: 3.4 Geometry		
Topic: 3.4.5 Construction		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.4.5.8 construct regular polygons with up to 6 sides	• review the construction of triangles and quadrilaterals • use questioning and discussion for developing the students' reasoning • extend known strategies to the construction of regular polygons using ruler, compass and protractor. • teacher designed worksheet with graded problems relating to construction of a variety of regular polygons.	• performance task - students describe the process for constructing a regular polygon, using illustrations, in their journals • graded exercises from textbook or worksheet
3.4.5.9 construct representations of 2-D and 3-D geometric objects using geometrical instruments	• teacher demonstration • students focus on the strategy • teacher observes students with a checklist while the students perform the task	• performance task - teacher designed worksheet with graded exercises • paper and pencil test
3.4.5.10 draw representations of 2-D and 3-D geometric objects using computer software	• students use online tutorial - CAI • teacher observes students with a checklist while the students perform the task	• performance task - students use the computer to prepare a portfolio of teacher designed tasks • teacher observation of the process using a checklist and rubric

CURRICULUM CONTENT

Form Three Term Two

Strand: 3.5 Measurement

Topic: 3.5.4 Consumer Arithmetic

Learning Outcomes *Students will be able to:*	Suggested Teaching and Learning Strategies	Suggested Assessment Strategies
3.5.4.1 solve problems involving rates: (a) salaries (b) wages (c) overtime (d) utility bills (electricity and telephone)	• investigations of calculations in real world scenarios (e.g. how T&TEC determines the amount that is to be paid for electricity used) • guided discussion (use findings from investigations to develop algorithms for calculations) • simulations/role-play - students model real world scenarios	• observation of students using scoring rubric (simulations) • oral presentations of findings from investigations. • paper and pencil test
3.5.4.2 explain the concept of compound interest	• activate prior knowledge: simple interest • introduce the concept embedded in a context • provide examples to help transfer learning • create a glossary of terms related to compound interest	• performance task - students review the concept and make entries in their journals to describe the concept • paper and pencil test

Strand: 3.5 Measurement

Topic: 3.5.4 Consumer Arithmetic

Learning Outcomes *Students will be able to:*	Suggested Teaching and Learning Strategies	Suggested Assessment Strategies
3.5.4.3 calculate compound interest on different types of investments	• research/investigate how returns are calculated in real world scenarios (e.g. interest calculated on credit union loans, bank deposits, stock units, etc.) • cooperative learning to develop and practice the algorithms • problem based learning: students determine the 'best' investment option from a given selection	• group presentations of returns on investments, including 'best' investment option • performance task - compile a portfolio comprising examples of compound interest on investments • paper and pencil test
3.5.4.4 solve problems involving compound interest	• provide a variety of examples for students to practice • guided practice using Polya's problem solving approach • cooperative learning for scaffolding re: problem solving in real world contexts • independent practice for reinforcement	• self-assessment/peer-assessment using a teacher designed activity with model solutions • paper and pencil test

Strand: 3.6 Algebra		
Topic: 3.6.1 Solution of Linear Equations Involving Algebraic Fractions		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**

3.6.1.1 solve linear equations involving algebraic fractions, where
  (a) numerator contains a single variable
  (b) numerator contains a binomial of degree one
with whole numbers only in the denominator
	• activate prior knowledge: order of operations; inverse operations; solution of simple linear equations
	• guided practice for higher order thinking
	• provide 'wait time' for independent practice
	• cooperative learning
		• performance task - complete a teacher designed worksheet
		• paper and pencil test

3.6.1.2 solve problems with linear equations involving algebraic fractions	• problem solving activities (including Polya's problem solving strategy) • model by 'thinking aloud' the process • cooperative learning using virtual learning environments • discussion to develop technique	• self-assess using technology tools - CAI • peer-assessment using a collection of problems and model solutions • paper and pencil test

Strand: 3.6 Algebra		
Topic: 3.6.2 Solution of Linear Inequalities Involving Algebraic Fractions		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.6.2.1 solve linear inequalities involving algebraic fractions	• activate prior knowledge: fractions, inequalities • guided practice • provide wait time for independent practice	• self-assess using technology tools - CAI • peer-assessment using a collection of problems and model solutions • paper and pencil test
3.6.2.2 represent solutions of linear inequalities involving algebraic fractions (a) on the number line; (b) on the Cartesian plane	• activate prior knowledge: number line, coordinate geometry • cooperative learning	• self-assess using technology tools - CAI • peer-assessment using checklist • paper and pencil test
3.6.2.3 solve problems on linear inequalities, from real world scenarios	• problem solving activities (including Polya's problem solving strategy) • model by 'thinking aloud' the process • cooperative learning using virtual learning environments/virtual learning environments	• performance task- compile a portfolio of different problems and their solutions • self-assessment using a checklist • peer-assessment using a collection of problems and model solutions • paper and pencil test

Strand: 3.6 Algebra		
Topic: 3.6.3 Solution of Simultaneous Equations		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.6.3.1 explain the term 'simultaneous equations'	• activate prior knowledge: linear equations, graphs of linear equations • investigate whether a pair of x and y values satisfy two linear equations involving the variables • provide problem situations to explore the concept in a real world context • investigate the concept symbolically, using graphing calculators to investigate the point of intersection for a pair of linear equations	• journal writing: describe concept, using examples • oral presentations - describe with examples simultaneous equations
3.6.3.2 model problems in real world contexts using mathematical notation: (a) expressions; (b) equations; (c) systems of equations	• activate prior knowledge of mathematical notations • guide practice in the use of language to provide the bridge between the concrete representations of math and the more abstract and symbolic form • provide examples of simultaneous equations in real world contexts • independent practice for proficiency	• performance task - students complete graded exercises from their textbook or worksheet • paper and pencil test

Strand: 3.6 Algebra		
Topic: 3.6.3 Solution of Simultaneous Equations		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.6.3.3 solve simultaneous equations by methods of calculation: (a) elimination (b) substitution	• demonstrate the processes using appropriately sequenced examples • provide a variety of examples for guided practice • cooperative learning using algorithms to determine an ordered pair that satisfies two linear functions simultaneously • independent practice using teacher designed activities	• performance task - students complete graded exercises from textbook or worksheet • self-assessment using a checklist • peer assessment using a collection of problems and model solutions • paper and pencil test
3.6.3.4 solve problems using simultaneous equations from real world scenarios	• problem solving activities (including Polya's problem solving strategy) • model by 'thinking aloud' the process • cooperative learning using virtual learning environments/virtual learning environments	• performance task- compile a portfolio of different problems and their solutions • self-assessment/peer -assessment using on line activities • paper and pencil test

Strand: 3.2 Sets, Relations and Functions		
Topic: 3.2.1 Venn Diagrams		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.2.1.1 display, using Venn diagrams, the relationship among the subsets of real numbers	- activate prior knowledge: Venn diagram, number theory - use questioning strategies that require students to manipulate concepts and ideas using mathematics language - provide examples to transfer learning - explore the real number system using the Venn diagram as a concept map	- performance task - students complete graded exercises from textbook or worksheet - paper and pencil test
3.2.1.2 solve problems involving set notation for subsets of the universal set in the Venn diagram	- activate prior knowledge: set notation - guided demonstration to represent information accurately on Venn diagrams - cooperative learning to investigate the relationships among sets, both visually and algebraically - graded worksheet with Venn diagrams involving two sets, with regions to shade, or with shaded regions to identify	- teacher observation of journal entries for visual representations of solutions - paper and pencil test

Strand: 3.2 Sets, Relations and Functions		
Topic: 3.2.1 Venn Diagrams		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.2.1.3 solve problems involving two subsets of the universal set using Venn diagrams, to reflect: (a) intersection of sets (review) (b) subsets of a set (c) disjoint sets	• activate prior knowledge: sets, subsets, intersection of sets, disjoint sets, number of elements in a set, double counting • guided demonstration of the application of the formula: n(A∪B) = n(A) + n(B) – n(A∩B) • problem based learning: students construct and solve problems involving real world scenarios	• performance task - students complete worksheet using graphic organisers • performance task - students complete graded exercises from textbook • paper and pencil test
3.2.1.4 use Venn diagrams to determine, in discrete cases, an ordered pair that satisfies two linear functions simultaneously	• activate prior knowledge: ordered pairs, relationship between linear functions and sets, intersection of sets • use questioning and discussion to help students deduce that an ordered pair may be used to represent the point of intersection of a two linear functions • work cooperatively to complete teacher designed activities • independent practice for reinforcement	• oral questioning to assess students' understanding • performance task - students complete graded exercises from textbook or worksheet • paper and pencil test

Strand: 3.2 Sets, Relations and Functions		
Topic: 3.2.2 Graphs of Linear Equations		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.2.2.1 verify that slope, gradient, and steepness all represent the same concept	• provide opportunities for students to investigate slopes in the environment • discussion about slopes to develop meanings of 'slope' ('gradient' and 'steepness') • cooperative learning (using graphing grid on transparency, students superimpose pictures of slopes from the environment, and identify and discuss slopes of lines)	• portfolio - samples of slopes, descriptions of slopes using various terms • journal writing - description of slopes using illustrations • group presentations on investigations of slopes in the environment
3.2.2.2 calculate the gradient of a line segment, with end points $\mathbf{A}(x_1, y_1)$ and $\mathbf{B}(x_2, y_2)$	• activate prior knowledge: ratio, directed numbers, substitution • guided practice to develop the algorithm: $$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_1 - y_2}{x_1 - x_2}$$ • independent practice for reinforcement	• self-assessment /peer assessment using teacher designed worksheet – students use rubrics to assess self/ each other in pairs or small groups • pen and paper test

3.2.2.3 identify the slope of a straight line:
    (a) positive slope
    (b) negative slope
	• use questioning and discussion to assess students' understanding of the concepts
	• cooperative learning for compare and
		• performance tasks - draw of straight lines with positive and negative slopes
		• teacher observation of notebook entries

Strand: 3.2 Sets, Relations and Functions		
Topic: 3.2.2 Graphs of Linear Equations		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
	contrast activities with straight lines • independent practice using software to generate straight lines with positive and/or negative slopes	
3.2.2.4 explain the concept of parallel lines	• investigate a variety of examples of lines with the same gradient • explore the relationship between lines which have the same slope • use questioning strategies to develop the concept of 'parallel lines' • cooperative learning using technology tools to draw lines of the same slope/gradient and make comparisons	• journal writing describing parallel lines with illustrations • teacher observation of notebook entries • presentation of work using multi-media • oral questioning
3.2.2.5 explain the concept of the y-intercept of a straight line	• guided discussion using graphical representation of straight lines to develop the concept of intercepts • investigate the negative, zero and positive values of the y-intercepts along the y-axis • independent practice	• journal writing to define the y-intercept of a straight line • oral presentation/questioning

Strand: 3.2 Sets, Relations and Functions		
Topic: 3.2.2 Graphs of Linear Equations		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.2.2.6 state the equation of a straight line given the gradient and *y*-intercept of the line in the form $y = mx + c$	• guided practice representing the equation in the form $y = mx + c$ • work cooperatively to complete teacher designed worksheet	• self-assess using technology tools - CAI • peer-assessment using games • mental quiz • teacher designed worksheet
3.2.2.7 represent linear relations as graphs on the Cartesian plane, written in any form	• activate prior knowledge: relations on the Cartesian plane • students practice rewriting equations of the form $ax + by = k$ in the form $y = mx + c$	• performance task - students use real life situations, develop linear relations and represent graphically • teacher designed worksheet
3.2.2.8 model real world situations using straight lines, in order to solve problems	• teacher designed activities for problem solving • use a STREAM approach to model a real world situation • cooperative learning to develop strategies and produce model solutions to problems • independent practice for developing proficiency	• self-assessment/peer-assessment using teacher designed worksheet and rubric to score each other in pairs or small groups • performance task - students complete a project and present a documented report of their findings to the class • paper and pencil test

Strand: 3.2 Sets, Relations and Functions		
Topic: 3.2.3 Graphical Solutions to Simultaneous Equations		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.2.3.1 represent a pair of linear relations on the same Cartesian plane	• activate prior knowledge: relations, ordered pairs, Cartesian plane • cooperative learning: use technology tools to plot graphs of linear relations • independent practice using graph paper for reinforcement	• performance task - students use graphing calculator to plot graphs • graded exercises from textbook and worksheet • paper and pencil test
3.2.3.2 apply graphical methods to determine an ordered pair that satisfies two linear functions simultaneously	• activate prior knowledge: simultaneous equations • discuss the solution to two linear equations whose graphs are given • engage students in activities to relate what they know from past experiences to their current learning, so that they can associate what they learn with the larger concept • use of graphing calculators for scaffolding tasks • independent practice with graph paper	• oral questioning - to interpret students' understanding of meaning of the point of intersection • group presentations on findings of real life situations involving solutions to simultaneous equations • paper and pencil test

Strand: 3.2 Sets, Relations and Functions

Topic: 3.2.3 Graphical Solutions to Simultaneous Equations

Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.2.3.3 apply knowledge of the point of intersection to solve a pair of linear simultaneous equations	• collaborate in groups using exemplars to model real world situations using simultaneous equations and then interpret the solution • students focus on the strategies being used • independent practice using teacher designed activities with model answers, and a customised 'maths error' checklist	• teacher observation of student journals using a checklist • self-assess using technology tools - CAI • paper and pencil test

CURRICULUM CONTENT

Form Three Term Three

Strand: 3.6 Algebra		
Topic: 3.6.4 Laws of Indices		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.6.4.1 identify the base and the exponent of a number written in index form, b^a	• activate prior knowledge of factors and products • provide examples to help transfer learning	• journal writing using illustrations to explaining concept • mental quiz
3.6.4.2 evaluate expressions of the form b^a, where $b \in \mathbf{N}$ and $a \in \mathbf{W}$	• activate prior knowledge of directed numbers using games (e.g. tic-tac-toe, what do you know?) • guided practice to develop algorithms • cooperative learning to practice skill	• self-assess using technology tools - CAI • peer-assessment using an online activity/games • paper and pencil test
3.6.4.3 interpret the laws of indices	• activate prior knowledge: product, factor, quotient, numerator, denominator • present examples for students to analyse and evaluate • discuss coding and syntax	• performance task - create a chart to represent the laws of indices • mental quiz • self-assess using technology tools - CAI • peer-assessment using a checklist

Strand: 3.6 Algebra		
Topic: 3.6.4 Laws of Indices		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**

	• students represent numbers as products of prime factors
	  - recognizing numbers with repeated factors
	  - writing numbers in index form
	• guided discovery using examples to generate rules stated algebraically:
	  - $a^n \times a^m = a^{mn}$
	  - $a^n \div a^m = a^{n-m}$
	  - $(a^n)^m = a^{nm}$
	  - $a^0 = 1$
	  - $a^{-n} = \frac{1}{a^n}$	

3.6.4.4 apply the laws of indices to solve problems	• problem solving activities including Polya's problem solving strategy • develop acrostics to aid memory in the retrieval of algorithms • worksheet with graded activities	• performance task - students complete graded exercises in textbook or worksheet • paper and pencil test

Strand: 3.6 Algebra		
Topic: 3.6.5 Simplifying Algebraic Expressions		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.6.5.1 evaluate binary expressions	• activate prior knowledge: order of operations, substitution technique, directed numbers • collaborate to peer-assess/peer-monitor using a customised checklist for math error corrections • independent practice to develop proficiency	• self-assess using technology tools - CAI • peer-assessment using an online activity/games • self-assessment/peer-assessment, using teacher designed worksheet with solutions • paper and pencil test
3.6.5.2 identify the LCM of two algebraic expressions	• activate prior knowledge: LCM concept • engage students in activities to relate what they know from past experiences to their current learning, so that they can associate what they learn with the larger concept • paired problem-solving: one student talks through the problem, describing his thinking processes while his partner listens and asks questions to help clarify thinking and vice versa	• self-assess using technology tools - CAI • peer-assessment using an online activity/games • paper and pencil test

Strand: 3.6 Algebra		
Topic: 3.6.5 Simplifying Algebraic Expressions		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.6.5.3 multiply two binomial expressions	• activate prior knowledge of the distributive law • discussion to develop the **F.O.I.L** technique • cooperative learning • independent practice to develop proficiency	• self-assess using technology tools - CAI • peer-assessment using worksheets with model solutions • paper and pencil test
3.6.5.4 simplify a product when factors contain algebraic expressions with common bases	• activate prior knowledge using index form in base 10 • provide a variety of examples using concrete and symbolic representations • peer coaching using teacher designed activities	• self-assess using technology tools - CAI • peer-assessment using interactive computer games/activities • mental quiz • paper and pencil test
3.6.5.5 simplify a quotient when numerator and denominator contain algebraic expressions with common factors: (a) denominator is a monomial (b) denominator is a linear binomial	• teacher demonstrates how rational algebraic expressions can be simplified using techniques as applied in arithmetic • provide a variety of examples using concrete and symbolic representations • independent practice for reinforcement	• self-assess using technology tools - CAI • peer-assessment using worksheets with model solutions • paper and pencil test

Strand: 3.6 Algebra

Topic: 3.6.6 Factorisation of Algebraic Expressions

Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.6.6.1 factorise a binomial expression (review lesson)	• activate prior knowledge: HCF, commutative law and distributive law • explore the factorisation of numbers using number trees and extend it to algebraic expressions • apply H.C.F. and the distributive law to determine binomial factors • cooperative learning using algebra tiles • independent practice using graded worksheet	• self-assess using technology tools - CAI • peer-assessment using worksheets with model solutions • mental quiz • paper and pencil test
3.6.6.2 factorise algebraic expressions involving two, three and four terms	• provide examples to transfer learning • teacher demonstrates how the strategies for finding H.C.F. of a set of numbers can be applied to algebra • students use the H.C.F. method to factorise expressions in two and three terms (not quadratic). • guided instruction to group terms and apply the distributive law an appropriate number of times, with four terms	• teacher observation of journal entries with checklist • oral questioning of students while on task • paper and pencil test

Strand: 3.6 Algebra		
Topic: 3.6.7 Quadratics		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.6.7.1 identify the form of the quadratic expression	• activate prior knowledge: constant, variable, coefficient, linear expression • cooperative tasks involving use of cut-out manipulative and algebra tiles for concrete representations • provide examples to transfer learning • explore the difference of two squares as a quadratic expression in each variable	• performance task - students complete activities with manipulatives • teacher observation with checklist
3.6.7.2 factorise quadratic expressions of the form: (a) $x^2 + bx + c$ (b) $a^2 - b^2$	• activate prior knowledge: factor, binomial • engage in hand-on activities with cut-out manipulative and algebra tiles for concrete representation of the concept • guided instruction to extend the distributive law to factorise expressions provide a variety of examples for students to use 'guess and check' technique • independent practice using graded worksheet	• performance task - complete graded worksheet with the aid of the manipulative • oral presentations of solutions • teacher observation with checklist • mental quizzes on difference of two squares and complete squares • paper and pencil test - multiple choice and free response

Strand: 3.6 Algebra		
Topic: 3.6.7 Quadratics		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.6.7.3 differentiate between the quadratic expression and the quadratic equation	• activate prior knowledge re: linear expressions and equations • provide examples to transfer learning • use compare and contrast activities	• journal writing using examples to describe the difference between quadratic expression and quadratic equation • oral presentations
3.6.7.4 solve quadratic equations, using the method of factorisation, in the form: (a) $x^2 + bx + c = 0$; (b) $x^2 - k^2 = 0$, $k \in \mathbf{N}$, k is constant	• activate prior knowledge: solution of equations, factors, zero products • guided practice with model solutions • cooperative learning for peer assessment using a customised checklist for math errors • students collaborate to discover the form of the factorisation for the difference of two squares • use the STREAM approach to model the concept e.g. height, h, at time, t, along the path of a projectile • develop acrostics to summarise strategies and aid memory in the retrieval of algorithms	• self-assess using technology tools - CAI • peer-assessment using worksheets with model solutions • paper and pencil test

Strand: 3.4 Geometry		
Topic: 3.4.6 Polygons		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**

3.4.6.1   develop the concept of a polygon through different modes:
   (a)   concrete
   (b)   representational
   (c)   abstract
	• classify and name polygons by their number of sides and angles
	• discuss the properties of a triangle, and extend the discussion to figures with four, five or six sides and angles
	• teacher identifies the equilateral triangle as a 'regular' figure and students collaborate to extend the concept to figures with four, five, or six sides, using drawings and/or constructions
		• teacher observations with checklist and/or rubric
		• oral questioning

3.4.6.2 solve simple geometric problems involving polygons	• engage students in activities to develop spatial skills to support their reasoning • derive the formula to calculate the sum of the interior angles of a polygon of n sides • solve simple problems involving missing angles in polygons • apply properties of straight lines, regular figures and the sum of all interior angles, to determine the size of each interior/exterior angle in a regular polygon	• teacher observations with checklist and/or rubric • oral questioning • students complete graded exercise from textbook or worksheet

Strand: 3.3 Statistics and Probability		
Topic: 3.3.1 Introduction to Probability		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.3.1.1 investigate the outcome of an experiment	• conduct an experiment to investigate the possible outcomes • discuss and record results • use dice, spinners, coins, random selection to generate experimental data • understand concepts of certainty, fairness	• performance task - small group collaboration to design an experiment and investigate its outcome • student submits a report • group presentation
3.3.1.2 explain the concept of probability	• develop the concept as a ratio • investigate the derivation of the probability formula • students participate in activities and make associations to activate prior knowledge • model by 'thinking aloud' activities so that students can follow demonstrated thinking processes • use questioning strategies that require students to manipulate concepts and ideas through language to describe models	• students will state the definition of probability in their journals • students will justify the range of probabilities for the occurrence of an event

Strand: 3.3 Statistics and Probability		
Topic: 3.3.1 Introduction to Probability		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.3.1.3 explain basic terminology associated with probability (a) event (b) certainty (c) chance (d) fairness (e) possibility (e) risk	• collaborate using technology tools to develop a glossary of terms • guide practice in the use of language to provide the bridge between the concrete representations of math and the more abstract and symbolic forms • investigate the relation between possibility and probability • discuss situations which involve 'risk' and 'chance' and note their distinction • discuss the characteristics of games/activities that determine their fairness	• students make entries in their journals • multiple choice quiz • oral presentations by small groups/pairs
3.3.1.4 apply the probability formula	• explore real world situations which can be measured using a ratio: Probability of an event $$= \frac{\text{No. of favourable outcomes}}{\text{Total number of possible outcomes}}$$ • independent practice using teacher designed activities	• self-assessment/peer-assessment -using teacher designed worksheet and rubric to score self/each other in pairs or small groups • journal entry - explanation of formula for calculating probability of event

Strand: 3.3 Statistics and Probability		
Topic: 3.3.1 Introduction to Probability		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.3.1.5 calculate the probability of an event: (a) that is certain to take place (b) that will not take place	• compare the occurrence of events using a ratio expressed in the form of a rational number • students collaborate to develop a variety of examples • students complete a graded exercise from textbook or worksheet • independent practice demonstrating proficiency	• worksheet comprising of questions formulated by teacher/students • paper and pencil test
3.3.1.6 demonstrate an understanding that the probability of an event occurring lies between 0 and 1	• use questioning strategies that require learners to activate prior knowledge and stimulate logical reasoning • investigate the range of values used to represent the probability of all events • deduce the range of values for the probability of an event occurring using a variety of experiments	• oral questioning to assess student understanding • performance task - students make an entry in their journal to explain the reasoning behind the range of values for probability

Strand: 3.3 Statistics and Probability		
Topic: 3.3.1 Introduction to Probability		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.3.1.7 state the probability of an event using mathematical notation	• guide practice in the use of language to provide the bridge between the concrete representations of mathematics and the more abstract and symbolic forms • represent the probability of an event A occurring: $P(A) = p,\ 0 \le p \le 1$ • represent the probability of an event A not occurring: $P(A') = 1 - p, 0 \le p \le 1$ • independent practice demonstrating proficiency	• students make entries in their journals • students do an interactive online quiz for immediate feedback
3.3.1.8 identify real world situations where probability is used in decision making	• integrate topics and concepts: decision trees, chance, probability • investigate STREAM activities to make connections with other disciplines in real world contexts, e.g. - **S**cience: insurance based on life expectancy (HFLE), - **T**echnology: playing the lottery with a random draw, etc.	• group presentation

Strand: 3.3 Statistics and Probability		
Topic: 3.3.1 Introduction to Probability		
Learning Outcomes *Students will be able to:*	**Suggested Teaching and Learning Strategies**	**Suggested Assessment Strategies**
3.3.1.9 solve simple problems involving theoretical probability, experiments and simulations	• guided practice to represent knowledge using a network of interrelated mathematical ideas • present opportunities to build on students' inherent sense of curiosity and discovery e.g. the design of experiments • work in groups to investigate phenomenon and analyse data • use of technology tools for simulations, documentation and reporting	• performance task - students design and conduct an experiment, then prepare a written report on their findings, using statistical diagrams to support their analyses

Conclusion

This revised Mathematics Curriculum Guide documents the range of outcomes that students must attain on completion of the first level of secondary education, leading to assessment at the National Certificate of Secondary Education (NCSE) Level 1. The Curriculum Guide is intended to be used concurrently with the Teacher's Guide. It is anticipated that all students will benefit from the effective implementation of the revised Mathematics Curriculum Guide as it provides strategies for students to experience mathematics in so many different contexts. The mathematics curriculum guide together with the Teacher's Guide encourage teachers to implement the widest possible range of strategies to help students develop their own innate qualities as well as to achieve of the Value Outcomes of the Ministry of Education's Education Sector Strategic Plan 2011 - 2015.

In the Mathematics Curriculum Guide, instructional activities are designed to focus equally on content as they should on the student's inherent sense of curiosity, ability, social interaction, past experience, disposition, and engagement. As a result, mathematics classrooms can be transformed into veritable learning communities. Within the Content Framework the sequencing of the outcomes has been presented in the most comprehensive manner which facilitates the development of a unit of work as well as the integration of previously addressed content into new content across the six strands (Algebra; Geometry; Measurement; Number Operations and Number Theory; Probability and Statistics; and Set, Relations and Functions).

The Curriculum Guide is complemented by the Teacher's Guide which includes a range of teaching and learning instructional material to support the suggested teaching/learning strategies and suggested assessment strategies. The supporting materials included in the Teacher's Guide are not exhausted so teachers are encouraged to explore other strategies for solidifying the students' understanding as well as to develop their numeracy skills.

Finally, the Mathematics Curriculum Guide addresses the holistic development of the student as it promotes cognitive abilities such as reasoning, creativity, innovation and understanding

through problem-solving to make student learning meaningful. The Mathematics Curriculum Guide also promotes positive dispositions in mathematics teaching and learning such as enjoyment, confidence, self-motivation and perseverance through authentic learning experiences in an inclusive environment, as espoused in Value Outcomes of the Ministry of Education's Education Sector Strategic Plan 2011 – 2015.