higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATES (VOCATIONAL)

ASSESSMENT GUIDELINES

MATHEMATICAL LITERACY

Level 4

IMPLEMENTATION: JANUARY 2015

MATHEMATICAL LITERACY LEVEL 4

CONTENTS

SECTION A: PURPOSE OF THE SUBJECT ASSESSMENT GUIDELINES

This document provides the lecturer with guidelines to develop and implement a coherent, integrated assessment system for Mathematical Literacy in the National Certificates (Vocational). It must be read with the *National Policy Regarding Further Education and Training Programmes: Approval of the Documents, Policy for the National Certificates (Vocational) Qualifications at Levels 2 to 4 on the National Qualifications Framework (NQF)*. This assessment guideline will be used for National Qualifications Framework Levels 2-4.

This document explains the requirements for the internal and external subject assessment. The lecturer must use this document with the *Subject Guidelines: Mathematical Literacy Level 4* to prepare for and deliver Mathematical Literacy. Lecturers should use a variety of resources and apply a range of assessment skills in the setting, marking and recording of assessment tasks.

SECTION B: ASSESSMENT IN THE NATIONAL CERTIFICATES (VOCATIONAL)

1 ASSESSMENT IN THE NATIONAL CERTIFICATES (VOCATIONAL)

Assessment in the National Certificates (Vocational) is underpinned by the objectives of the National Qualifications Framework (NQF). These objectives are to:

- Create an integrated national framework for learning achievements.
- Facilitate access to and progression within education, training and career paths.
- Enhance the quality of education and training.
- Redress unfair discrimination and past imbalances and thereby accelerate employment opportunities.
- Contribute to the holistic development of the student by addressing:
  - social adjustment and responsibility;
  - moral accountability and ethical work orientation;
  - economic participation; and
  - nation building.

The principles that drive these objectives are:

- ***Integration***

To adopt a unified approach to education and training that will strengthen the human resources development capacity of the nation.

- ***Relevance***

To be dynamic and responsive to national development needs.

- ***Credibility***

To demonstrate national and international value and recognition of qualification and acquired competencies and skills.

- ***Coherence***

To work within a consistent framework of principles and certification.

- ***Flexibility***

To allow for creativity and resourcefulness when achieving Learning Outcomes, to cater for different learning styles and use a range of assessment methods, instruments and techniques.

- ***Participation***

To enable stakeholders to participate in setting standards and co-ordinating the achievement of the qualification.

- ***Access***

To address barriers to learning at each level to facilitate students' progress.

- ***Progression***

To ensure that the qualification framework permits individuals to move through the levels of the national qualification via different, appropriate combinations of the components of the delivery system.

- ***Portability***

To enable students to transfer credits of qualifications from one learning institution and/or employer to another institution or employer.

- ***Articulation***

To allow for vertical and horizontal mobility in the education system when accredited pre-requisites have been successfully completed.

- ***Recognition of Prior Learning***

To grant credits for a unit of learning following an assessment or if a student possesses the capabilities specified in the outcomes statement.

- ***Validity of assessments***

To ensure assessment covers a broad range of knowledge, skills, values and attitudes (SKVAs) needed to demonstrate applied competency. This is achieved through:

- clearly stating the outcome to be assessed;
- selecting the appropriate or suitable evidence;
- matching the evidence with a compatible or appropriate method of assessment; and
- selecting and constructing an instrument(s) of assessment.

- ***Reliability***

To assure assessment practices are consistent so that the same result or judgment is arrived at if the assessment is replicated in the same context. This demands consistency in the interpretation of evidence; therefore, careful monitoring of assessment is vital.

- ***Fairness and transparency***

To verify that assessment processes and/or method(s) used neither hinders nor unfairly advantage any student. The following could constitute unfairness in assessment:

- Inequality of opportunities, resources or teaching and learning approaches
- Bias based on ethnicity, race, gender, age, disability or social class
- Lack of clarity regarding Learning Outcome being assessed
- Comparison of students' work with other students, based on learning styles and language

- ***Practicability and cost-effectiveness***

To integrate assessment practices within an outcomes-based education and training system and strive for cost and time-effective assessment.

2 ASSESSMENT FRAMEWORK FOR VOCATIONAL QUALIFICATIONS

The assessment structure for the National Certificates (Vocational) qualification is as follows:

2.1 Internal continuous assessment (ICASS)

Knowledge, skills values, and attitudes (SKVAs) are assessed throughout the year using assessment instruments such as projects, tests, assignments, investigations, role-play and case studies. All internal continuous assessment (ICASS) evidence is kept in a Portfolio of Evidence (PoE) and must be readily available for monitoring, moderation and verification purposes. This component is moderated and quality assured both internally and externally.

2.2 External summative assessment (ESASS)

The external summative assessment comprises TWO papers set to meet the requirements of the Subject and Learning Outcomes. It is administered according to relevant assessment policies and requirements.

External summative assessments will be conducted annually between October and December, with provision made for supplementary sittings.

3 MODERATION OF ASSESSMENT

3.1 Internal moderation

Assessment must be moderated according to the internal moderation policy of the Further Education and Training (FET) College. Internal college moderation is a continuous process. The moderator's involvement starts with the planning of assessment methods and instruments and follows with continuous collaboration with and support to the assessors. Internal moderation creates common understanding of Assessment Standards and maintains these across vocational programmes.

3.2 External moderation

External moderation is conducted according to relevant quality assurance bodies' standards, policies, and requirements (currently the South African Qualifications Authority (SAQA) and Umalusi.)

The external moderator:

- monitors and evaluates the standard of all summative assessments;
- maintains standards by exercising appropriate influence and control over assessors;
- ensures proper procedures are followed;
- ensures summative integrated assessments are correctly administered;
- observes a minimum sample of ten (10) to twenty-five (25) percent of summative assessments;
- gives written feedback to the relevant quality assurer; and
- moderates in case of a dispute between an assessor and a student.

Policy on inclusive education requires that assessment procedures for students who experience barriers to learning be customised and supported to enable these students to achieve their maximum potential.

4 PERIOD OF VALIDITY OF INTERNAL CONTINUOUS ASSESSMENT (ICASS)

The period of validity of the internal continuous assessment mark is determined by the *National Policy on the Conduct, Administration and Management of the Assessment of the National Certificates (Vocational).*

The internal continuous assessment (ICASS) must be re-submitted with each examination enrolment for which it constitutes a component.

5 ASSESSOR REQUIREMENTS

Assessors must be subject specialists and a competent assessor.

6 TYPES OF ASSESSMENT

Assessment benefits the student and the lecturer. It informs students about their progress and helps lecturers make informed decisions at different stages of the learning process. Depending on the intended purpose, different types of assessment can be used.

6.1 Baseline assessment

At the beginning of a level or learning experience, baseline assessment establishes the knowledge, skills, values and attitudes (SKVAs) that students bring to the classroom. This knowledge assists lecturers to plan learning programmes and learning activities.

6.2 Diagnostic assessment

This assessment diagnoses the nature and causes of learning barriers experienced by specific students. It is followed by guidance, appropriate support and intervention strategies. This type of assessment is useful to make referrals for students requiring specialist help.

6.3 Formative assessment

This assessment monitors and supports teaching and learning. It determines student strengths and weaknesses and provides feedback on progress. It determines if a student is ready for summative assessment.

6.4 Summative assessment

This type of assessment gives an overall picture of student progress at a given time. It determines whether the student is sufficiently competent to progress to the next level.

7 PLANNING ASSESSMENT

An assessment plan should cover three main processes:

7.1 Collecting evidence

The assessment plan indicates which Subject Outcomes and Assessment Standards will be assessed, what assessment method or activity will be used and when this assessment will be conducted.

7.2 Recording

Recording refers to the assessment instruments or tools with which the assessment will be captured or recorded. Therefore, appropriate assessment instruments must be developed or adapted.

7.3 Reporting

All the evidence is put together in a report to deliver a decision for the subject.

8 METHODS OF ASSESSMENT

Methods of assessment refer to who carries out the assessment and includes lecturer assessment, self-assessment, peer assessment and group assessment.

LECTURER ASSESSMENT	The lecturer assesses students' performance against given criteria in different contexts, such as individual work, group work, etc.
SELF-ASSESSMENT	Students assess their own performance against given criteria in different contexts, such as individual work, group work, etc.
PEER ASSESSMENT	Students assess another student or group of students' performance against given criteria in different contexts, such as individual work, group work, etc.
GROUP ASSESSMENT	Students assess the individual performance of other students within a group or the overall performance of a group of students against given criteria.

9 INSTRUMENTS AND TOOLS FOR COLLECTING EVIDENCE

All evidence collected for summative assessment purposes (ICASS) is kept or recorded in the student's Portfolio of Evidence (PoE).

The following table summarises a variety of methods and instruments for collecting evidence. A method and instrument is chosen to give students ample opportunity to demonstrate the Subject Outcome has been attained. This will only be possible if the chosen methods and instruments are appropriate for the target group and the Specific Outcome being assessed.

	METHODS FOR COLLECTING EVIDENCE		
	Observation-based (Less structured)	**Task-based** (Structured)	**Test-based** (More structured)
Assessment instruments	• Observation • Class questions • Lecturer, student, parent discussions	• Assignments or tasks • Projects • Investigations or research • Case studies • Practical exercises • Demonstrations • Role-play • Interviews	• Examinations • Class tests • Practical examinations • Oral tests • Open-book tests
Assessment tools	• Observation sheets • Lecturer's notes • Comments	• Checklists • Rating scales • Rubrics	• Marks (e.g. %) • Rating scales (1-7)
Evidence	• Focus on individual students • Subjective evidence based on lecturer observations and impressions	**Open middle**: Students produce the same evidence but in different ways. **Open end**: Students use same process to achieve different results.	Students answer the same questions in the same way, within the same time.

10 TOOLS FOR ASSESSING STUDENT PERFORMANCE

Rating scales are marking systems where a symbol (such as 1 to 7) or a mark (such as 5/10 or 50%) is defined in detail. The detail is as important as the coded score. Traditional marking, assessment and evaluation mostly used rating scales without details such as what was right or wrong, weak or strong, etc.

Task lists and **checklists** show the student what needs to be done. They consist of short statements describing the expected performance in a particular task. The statements on the checklist can be ticked off when the student has adequately achieved the criterion. Checklists and task lists are useful in peer or group assessment activities.

Rubrics are a hierarchy (graded levels) of criteria with benchmarks that describe the minimum level of acceptable performance or achievement for each criterion. It is a different way of assessment and cannot be compared to tests. Each criterion described in the rubric must be assessed separately. Mainly, two types of rubrics, namely holistic and analytical, are used.

11 SELECTING AND/OR DESIGNING RECORDING AND REPORTING SYSTEMS

The selection or design of recording and reporting systems depends on the purpose of recording and reporting student achievement. **Why** particular information is recorded and **how** it is recorded determine which instrument will be used.

Computer-based systems, for example spreadsheets, are cost and time effective. The recording system should be user-friendly and information should be easily accessed and retrieved.

12 COMPETENCE DESCRIPTIONS

All assessment should award marks to evaluate specific assessment tasks. However, marks should be awarded against the marking guidelines (memoranda/rubrics/checklists) and not simply be a total of ticks for right answers. Rubrics should explain the competence level descriptors for the skills, knowledge, values and attitudes (SKVAs) a student must demonstrate to achieve each level of the rating scale.

When lecturers or assessors prepare an assessment task or question, they must ensure that the task or question addresses an aspect of a Subject Outcome. The relevant Assessment Standard must be used to create the rubric to assess the task or question. The descriptions must clearly indicate the minimum level of attainment for each category on the rating scale.

13 STRATEGIES FOR COLLECTING EVIDENCE

A number of different assessment instruments may be used to collect and record evidence. Examples of instruments that can be (adapted and) used in the classroom include:

13.1 Record sheets

The lecturer observes students working in a group. These observations are recorded in a summary table at the end of each project. The lecturer can design a record sheet to observe students' interactive and problem-solving skills, attitudes towards group work and involvement in a group activity.

13.2 Checklists

Checklists should have clear categories to ensure that the objectives are effectively met. The categories should describe how the activities are evaluated and against what criteria they are evaluated. Space for comments is essential.

ASSESSMENT IN MATHEMATICAL LITERACY

LEVEL 4

SECTION C: ASSESSMENT IN MATHEMATICAL LITERACY

1 ASSESSMENT SCHEDULE AND REQUIREMENTS

Internal and external assessments are conducted and the results of both are contributing to the final mark of a student in the subject.

The internal continuous assessment (ICASS) mark accounts for 25 percent and the external examination mark for 75 percent of the final mark. A student needs a minimum final mark of 30 percent to enable a pass in the subject.

1.1 Internal assessment

Lecturers must compile a detailed assessment plan/schedule of internal assessments to be undertaken during the year in the subject. (e.g. date, assessment task/or activity, rating code/marks allocated, assessor, moderator.)

Internal assessments are then conducted according to the plan/schedule using appropriate assessment instruments and tools for each assessment task (e.g. tests, assignments, practical tasks/projects and memorandum, rubric, checklist)

The marks allocated to both the practical and written assessment tasks conducted during the internal continuous assessment (ICASS) are kept and recorded in the Portfolio of Evidence (PoE) which is subjected to internal and external moderation.

A year mark out of 100 is calculated from the ICASS marks contained in the PoE and submitted to the Department on the due date towards the end of the year.

The following internal assessments **GUIDE** the assessment of Mathematical Literacy Level 4

TASKS	Time-frame	Type of assessment activity	Scope of assessment	% contribution to the year mark
			Do not confuse the weightings of topics in the Subject Guidelines with the % contribution to the year mark	
1	Term 1	Formal test	Topics completed in term 1	10%
2	Term 1	**Assignment	Assignment on one or more topics completed to date	10%
3	Term 2	Formal test	Topics completed in term 2	10%
4	Term 2	Formal test:	Topics completed in term 1 and 2	20%
5	Term 2	**Assignment	Topics completed in term 2	10%

6	Term 3	Practical Assessment /**Assignment	Topics completed in term 3 •	10%
7	Term 2 OR Term 3	*Internal Examination Paper 1 Paper 2	All topics completed to date Paper 1=15 Paper 2=15	30%
			TOTAL	100%

**The duration and mark allocation of the internal examination papers are aligned according to the external examination papers*

**The internal examination can be written either in the second or the third term. If written in the second term at least 60% of the curriculum must have been covered. If written in the third term at least 80 – 90% of the curriculum must have been covered*

2 RECORDING AND REPORTING

Mathematical Literacy is assessed according to seven levels of competence. The level descriptions are explained in the following table.

Scale of achievement for the Fundamental component

RATING CODE	RATING	MARKS (%)
7	Outstanding	80 – 100
6	Meritorious	70 – 79
5	Substantial	60 – 69
4	Adequate	50 – 59
3	Moderate	40 – 49
2	Elementary	30 – 39
1	Not achieved	0 – 29

The assessment plan/schedule/programme of assessment should be recorded in the Lecturer's Portfolio of Assessment (PoA) for each level. The minimum requirements for the Lecturer's Portfolio of Assessment should be as follows:

- Lecturer information
- A contents page
- Subject and Assessment Guidelines
- Year plans /Work schemes/Pace Setters
- A formal schedule of assessment
- Instrument(s) (tests, assignments, practical) and tools(memorandum, rubric, checklist) for each assessment task
- A mark/result sheet for assessment tasks

The college could standardise these documents.

The minimum requirements for the student's Portfolio of Evidence (PoE) should be as follows:

- Student information/identification
- A contents page/list of content (for accessibility)
- A record/summary/ of results showing all the marks achieved per assessment for the subject
- The evidence of marked assessment tasks and feedback according to the assessment schedule
- Where tasks cannot be contained as evidence in the Portfolio of Evidence (PoE), its exact location must be recorded and it must be readily available for moderation purposes.

3 INTERNAL ASSESSMENT OF SUBJECT OUTCOMES IN MATHEMATICAL LITERACY – LEVEL 4

Topic 1: Numbers

(Minimum of 20 hours face to face teaching which excludes time for revision, test series and internal and external examination)

SUBJECT OUTCOME	
1.1 Use numbers correctly when working with problems in the workplace and other areas of responsibility including national/global issues.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Numbers are revised with the focus on activities to recognise and practically illustrate the use of different numbers. *Range: natural numbers, whole numbers, positive and negative numbers, fractions, decimals, percentages.*	• Revise numbers with the focus on activities to recognise and practically illustrate the use of different numbers. - Natural numbers - Whole numbers - Positive and negative numbers - Fractions - Decimals - Percentages
• Numbers are rounded off (round up, down and off) according to the requirements of the context. • The possible effect of rounding values within a calculation on the final calculated answer is investigated.	• Round off numbers (round up, down and off) according to the requirements of the context. • Investigate the possible effect of rounding values within a calculation on the final calculated answer. *Example:* *When working with a scale of 1:20 000 000 on a map one mm error in measurement will result in an inaccuracy of 20 km.*

• Where possible and useful calculations are simplified by applying addition and multiplication facts (distributive, associative properties, priority of operations)	• Apply addition and multiplication facts (distributive, associative properties, priority of operations) to simplify calculations where possible and useful. *NOTE: BODMAS may be used*
SUBJECT OUTCOME	
SO 1.2: Use an appropriate calculator to perform calculations and solve problems in a workplace and other areas of responsibility including national/global issues.	
• The following functions and characters are recognised and practised on an appropriate calculator: - Addition - Subtraction - Multiplication and division - Percentages - Squares - Cubes - Square root - Cube root - Memory - "Clear" and "clear all" keys - Decimal signs - Separators	• Recognise and practise the use of the following functions and characters on an appropriate calculator: - Addition - Subtraction - Multiplication and division - Percentages - Squares - Cubes - Square root - Cube root - Memory - "Clear" and "clear all" keys - Decimal signs - Separators
• Calculations are performed with calculators using positive and negative numbers. *Range: Addition, subtraction, multiplication and division*	• Perform calculations with a calculator using positive and negative numbers. *Range: Addition, subtraction, multiplication and division*
• A calculator is used to perform the following calculations on fractions: - Addition, subtraction, multiplication, division. - Conversion from fractions to decimals. - Conversion from fractions to percentages - Conversion between equivalent forms of fractions *Note: Fractions include proper, improper fractions and mixed numbers.*	• Use a calculator to perform the following calculations on fractions: - Addition, subtraction, multiplication, division. - Conversion from fractions to decimals. - Conversion from fractions to percentages. - Conversion between equivalent forms of fractions *Note: Fractions include proper, improper fractions and mixed numbers.*

Examples used in problems include but are not limited to the following: $\frac{1}{2};\frac{1}{4};\frac{3}{4};\frac{1}{3};\frac{2}{3};\frac{1}{10};\frac{1}{100};1\frac{1}{2};\frac{7}{5}$;4%; (0,04)	*Examples used in problems include but are not limited to the following:* $\frac{1}{2};\frac{1}{4};\frac{3}{4};\frac{1}{3};\frac{2}{3};\frac{1}{10};\frac{1}{100};1\frac{1}{2};\frac{7}{5}$;4%;(0,04)
• A calculator is used to perform the following calculations on decimals: - Addition, subtraction, multiplication, division, squares, square roots, cube and cube roots. - Conversion from decimals to fractions. - Conversion from decimals to percentages.	• Use a calculator to perform the following calculations on decimals: - Addition, subtraction, multiplication, division, squares, square roots, cube and cube roots. - Conversion from decimals to fractions. - Conversion from decimals to percentages.
• A calculator is used to perform the following calculations on percentages: - Addition, subtraction, multiplication, division. - Conversion from percentages to decimals. - Conversion from percentages to fractions.	• Use a calculator to perform the following calculations on percentages: - Addition, subtraction, multiplication, division. - Conversion from percentages to decimals. - Conversion from percentages to fractions.
• Calculations and conversions are performed for the following:: - time values expressed and/or recorded on watches, clocks and stopwatches related to a workplace; - time values expressed in the different formats: ➢ time of day formats (*e.g. 8 o'clock, 8:00 am, 8:00 pm, 20:00*) ➢ time recording formats (*e.g. 1 h 12 min 20 sec*) - elapsed time *Example: amount of time passed from Monday 8:35 pm to Wednesday 9:27am, the difference in time between 1 h 23 min 12 seconds and 1 h 39 min 4 seconds.* - calendars showing days, weeks and months; - transport timetables	• Perform calculations and conversions involving the following: - time values expressed and/or recorded on watches, clocks and stopwatches related to a workplace; - time values expressed in the different formats: ➢ time of day formats (*e.g. 8 o'clock, 8:00 am, 8:00 pm, 20:00*) ➢ time recording formats (*e.g. 1 h 12 min 20 sec*) - elapsed time *Example: amount of time passed from Monday 8:35 pm to Wednesday 9:27 am, the difference in time between 1 h 23 min 12 seconds and 1 h 39 min 4 seconds.* - calendars showing days, weeks and months;

Example bus, train, taxi; - production timetables *Example constructing a house, manufacturing a product* - tide tables	- transport timetables *Example bus, train, taxi*; - production timetables *Example constructing a house, manufacturing a product* - tide tables
• Conversions are performed using known relationships for the following: - Distance: mm - cm - m - km; - Volume/Capacity: ml - l - kl; - Mass: mg - g - kg - t; - Time: seconds – minutes – hours – day.	• Perform conversions using known relationships for the following: - Distance: mm - cm - m - km; - Volume/Capacity: ml - l - kl; - Mass: mg - g - kg - t; - Time: seconds – minutes – hours – day.
• Units of measurement are converted using **given** conversion factors and/or tables for the following: - Cooking conversions: *Example: Convert from spoons and cups to millilitres (ml).* - Metric and imperial system conversions: *Example: Convert from inches and feet to centimetres and metres and vice versa* - Solid and liquid conversions: *Example: → g and/or kg to ml and/or litre* *→ between mm^3, cm^3 and m^3 to ml, litres and kilolitres* - Area and volume conversions: *Example :* *→ between mm^2 , cm^2 and m^2* *→ between mm^3, cm^3 and m^3* - Temperature conversions: *Example: Convert between °Celsius and °Fahrenheit using the following given formulae:* °F = (°C ×1,8) + 32° °C = (°F – 32°) ÷ 1,8	• Convert units of measurement using **given** conversion factors and/or tables for the following: - Cooking conversions: *Example: Convert from spoons and cups to millilitres (ml).* - Metric and imperial system conversions: *Example: Convert from inches and feet to centimetres and metres and vice versa* - Solid and liquid conversions: *Example:→ g and/or kg to ml and/or litre* *→ between mm^3, cm^3 and m^3 to ml, litres and kilolitres;* - Area and volume conversions: *Example :* *→ between mm^2 , cm^2 and m^2* *→ between mm^3, cm^3 and m^3* - Temperature conversions: *Example: Convert between °Celsius and °Fahrenheit using the following given formulae:* °F = (°C ×1,8) + 32° °C = (°F – 32°) ÷ 1,8
SUBJECT OUTCOME	

SO 1.3 Solve problems in a workplace and other areas of responsibility including national/global issues.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Problems are solved different time notations. *Range: Elapsed time, total hours worked per day, per week and per month.* • Problems involving different time zones across continents are solved.	• Solve problems in different time notations. *Range: Elapsed time, total hours worked per day, per week and per month.* • Solve problems involving different time zones across continents.
• Calculations involving ratios are performed: - Equivalent ratios/simplifying ratios *Example 1:50 = 2:100* - Convert between different forms of a ratio *Example: If the scale of a plan is 1:100 then 1cm measured on the plan equals 1metre(100cm) in actual length* - Divide or share an amount in a given ratio *Example: How many ml of tint and peroxide will a hairdresser need to make a 100ml mixture if the tint and peroxide is mixed in a ratio 2:3?* - Determine missing numbers in a ratio *Example: If cement, sand and stone must be mixed in the ratio 1:2:2, how many wheel barrows of sand and stone must be mixed to make 40 wheel barrows of cement?*	• Perform calculations involving ratios: - Equivalent ratios/simplifying ratios *Example 1:50 = 2:100* - Convert between different forms of a ratio *Example: If the scale of a plan is 1:100 then 1 cm measured on the plan equals 1 metre(100cm) in actual length* - Divide or share an amount in a given ratio *Example: How many ml of tint and peroxide will a hairdresser need to make a 100ml mixture if the tint and peroxide is mixed in a ratio 2:3?* - Determine missing numbers in a ratio *Example: If cement, sand and stone must be mixed in the ratio 1:2:2, how many wheel barrows of sand and stone must be mixed to make 40 wheel barrows of cement?*
• Calculations are performed involving the following proportions: - Direct/linear proportion *Example1: If the cost of a trip is R5,00 per km, a 85 km trip will cost R5,00/km x 85 km = R425,00* *Example 2: If 50m^2 of carpeting costs R1 750,00 then 1m^2 of carpeting will cost R1 750,00 ÷ 50 = R35,00.*	• Perform calculations involving the following proportions: - Direct/linear proportion *Example1: If the cost of a trip is R5,00 per km, a 85 km trip will cost R5,00/km x 85 km = R425,00* *Example 2: If 50m^2 of carpeting costs R1 750,00, then 1m^2 of carpeting will cost R1 750,00 ÷ 50 = R35,00.*

- Indirect/inverse proportion *Example: A soccer season ticket costs R800, 00. If you watch only one game during the season, the cost per game is R800,00; for two games the effective cost per game is R400,00 and further reduces as the number of games watched increases.* *Note: Interpretation of graphs representing situations involving direct and inverse proportion and the illustration of the differences between the two types of proportion will be covered in the Topic 4 "Patterns, relationships and representations".*	- Indirect/inverse proportion *Example: A soccer season ticket costs R800,00. If you watch only one game during the season, the cost per game is R800,00; for two games the effective cost per game is R400,00 and further reduces as the number of games watched increases.* *Note: Interpretation of graphs representing situations involving direct and inverse proportion and the illustration of the differences between the two types of proportion will be covered in the Topic 4 "Patterns, relationships and representations".*
• Calculations are performed involving the following rates: - consumption rates, e.g. kilometres per litre; - distance, time, speed rates e.g.: kilometres per hour; - cost rates e.g. rand per kilogram. - More complex rates *(e.g. the petrol consumption of a car expressed in litres/100 km; the running speed of a marathon runner measured in min/km* with an awareness of: ➢ the meaning of "/" as "per" and the relevance of this term in relation to the values in the rate (e.g. km/h means the distance in km travelled in 1 hour); ➢ the difference between constant and average rates (e.g. the price of meat in R/kg is a constant rate while the speed of a car in km/h is an average rate; ➢ how to write rates in unit form; ➢ how to simplify and compare rates (e.g is it more cost effective to buy a 1 kg tin	• Perform calculations involving the following rates: - consumption rates, e.g. kilometres per litre; - distance, time, speed rates e.g.: kilometres per hour; - cost rates e.g. rand per kilogram. - More complex rates *(e.g. the petrol consumption of a car expressed in litres/100 km; the running speed of a marathon runner measured in min/km* with an awareness of: ➢ the meaning of "/" as "per" and the relevance of this term in relation to the values in the rate (e.g. km/h means the distance in km travelled in 1 hour); ➢ the difference between constant and average rates (e.g. the price of meat in R/kg is a constant rate while the speed of a car in km/h is an average rate; ➢ how to write rates in unit form; ➢ how to simplify and compare rates (e.g is it more cost effective to buy a 1 kg tin

of coffee that costs R67,00 or a 250 g tin that costs R18,00? • Calculations are performed to determine the benefits of buying in bulk and in different sizes and to select the appropriate option *Example: buying in bulk versus buying per unit; 100 cold drinks vs 1 cold drink.* *Example 2: Buying different sizes of a product; 500ml of milk vs 2 litres of milk*	of coffee that costs R67,00 or a 250 g tin that costs R18,00? • Perform calculations to determine the benefits of buying in bulk and buying different sizes to select an appropriate option *Example 1: buying in bulk versus buying per unit; 100 cold drinks vs 1 cold drink.* *Example 2: Buying different sizes of a product; 500ml of milk vs 2 litres of milk*
• Problems are solved using percentages: - Calculate a percentage of a value. Example: *If 15% discount is offered on a computer priced at R5000,00, VAT exclusive, how much discount will you receive on the VAT inclusive price?* - Decrease and increase a value by a percentage. *Example: If a litre of petrol that costs R9,20 increases in price by 7%, what will the new price of the petrol be.* - Express a part of a whole as a percentage. *Example: If 15 staff members of a certain company are absent from work, what percentage of the 135 staff employees were present?* - Determine percentage increase and/or decrease. *Example: If a person's salary is increased from R8500,00 to R8750,00 calculate the percentage increase.* - Determine the original value from a value to which a percentage has been added or subtracted. *Example 1: If the price of a pair of shoes after a discount of 15% is R212,50, what was the original price of the shoes?*	• Solve problems using percentages: - Calculate a percentage of a value Example: *If 15% discount is offered on a computer priced at R5000,00, VAT exclusive, how much discount will you receive on the VAT inclusive price?* - Decrease and increase a value by a percentage. *Example: If a litre of petrol that costs R9,20 increases in price by 7%, what will the new price of the petrol be.* - Express a part of a whole as a percentage. *Example: If 15 staff members of a certain company are absent from work, what percentage of the 135 staff employees were present?* - Determine percentage increase and/or decrease. *Example: If a person's salary is increased from R8500,00 to R8750,00 calculate the percentage increase.* - Determine the original value from a value to which a percentage has been added or subtracted. *Example 1: If the price of a pair of shoes after a discount of 15% is R212,50, what was the original price of the shoes?*

Example 2: VAT inclusive and VAT exclusive percentages	*Example 2: VAT inclusive and VAT exclusive percentages*
ASSESSMENT TASK OR ACTIVITY:	
• Tests • Assignments • Examinations • These Assessment Standards and Learning Outcomes are also integrated in all Mathematical Literacy assessment tasks.	

Topic 2: Space, Shape and Orientation

(Minimum of 25 hours face to face teaching which excludes time for revision, test series and internal and external examination)

SUBJECT OUTCOME	
2.1 Revise and acquire the correct vocabulary for space, shape and orientation.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Concepts regarding space, shape and orientation are recognised and vocabulary correctly used. - Shape: square; rectangle; triangle; circle, semi- circle. - Space: cube; rectangular prism; triangular prism; cone; cylinder; sphere. - Attributes: length; breadth; height; side; base; perimetre; diagonal, area; angle; centre; radius; diametre; circumference; volume; perpendicular; height; parallel lines. *Note: The vocabulary listed should be assessed in the context of problems and not as dictionary definitions.*	• Recognise and identify the following: - Shape: square; rectangle; triangle; circle; semi- circle - Space: cube; rectangular prism; triangular prism; cone; cylinder; sphere. - Attributes: length; breadth; height; side; base; perimetre; diagonal; area; angle; centre; radius; diametre; circumference; volume; perpendicular; height; parallel lines.

ASSESSMENT TASK OR ACTIVITY:	
These Assessment Standards and Learning Outcomes are integrated in all Mathematical Literacy assessment tasks. • Tests • Assignments • Examinations	
SUBJECT OUTCOME	
2.2 Perform space, shape and orientation calculations correctly to solve problems in workplace and other areas of responsibility including national/global issues.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The length of the hypotenuse of a right-angled triangle is determined using the Theorem of Pythagoras. • The Theorem of Pythagoras is manipulated and applied to determine the lengths of the right angled sides of a right angled triangle.	• Use the Theorem of Pythagoras to determine the length of the hypotenuse. • Manipulate and apply the Theorem of Pythagoras to determine the lengths of the right angled sides of a right angled triangle.
• **Given** formulae are used to perform calculations using appropriate conversions and rounding off. *Note: Use π as 3,14.* - Perimeter/Circumference: square; rectangle; triangle; circle. *Example: Determine the quantity of fencing needed to fence the garden.* - Area: square; rectangle; triangle; circle; semi circle and other objects that can be decomposed into squares, rectangles, triangles and circles. *Example: Determine how far apart the vegetables must be planted and how many vegetables the garden can accommodate.* - Surface Area: cube, rectangular prism, triangular prism, cone, sphere and cylinder - Volume: cube; rectangular prism; cylinder; sphere	• Use **given** formulae to calculate the following using appropriate conversions and rounding off. *Note: Use π as 3,14.* - Perimeter/Circumference: square; rectangle; triangle; circle. *Example: Determine the quantity of fencing needed to fence the garden.* - Area: square; rectangle; triangle; circle; semi-circle and other objects that can be decomposed into squares, rectangles, triangles and circles. *Example:* investigating the number and cost of the tiles needed to tile a floor, taking into consideration the space for grouting between the tiles and cut tiles; - Surface Area: cube, rectangular prism, triangular prism, cone, sphere and cylinder. - Volume: cube; rectangular prism; cylinder; sphere

and other objects that can be decomposed into rectangular prisms, spheres and cylinders *Example 1: determining the water that can be harvested using the roof of a house;* *Example 2: Investigating the size of a dam needed to service a village based on the number of people living in the village, each person's water usage and/or requirements, and data on the annual rainfall in the area.*	and other objects that can be decomposed into rectangular prisms, spheres and cylinders. *Example 1: determining the water that can be harvested using the roof of a house;* *Example 2: Investigating the size of a dam needed to service a village based on the number of people living in the village, each person's water usage and/or requirements, and data on the annual rainfall in the area.*
• Given formulae are manipulated to calculate the unknown values when the perimeter/circumference, area and volume of the following shapes are given: - square; - rectangle; - triangle; - circle; - semi-circle - cube; - rectangular prism; - triangular prism; - cylinder; - sphere; - cone *Note: Manipulation of formulae for total surface area not included.*	• Manipulate given formulae to calculate the unknown values when the perimeter/circumference, area and volume of the following shapes are given: - square; - rectangle; - triangle; - circle; - semi-circle; - cube; - rectangular prism; - triangular prism; - cylinder; - sphere; - cone *Note: Manipulation of formulae for total surface area not included.*

ASSESSMENT TASK OR ACTIVITY:

These Assessment Standards and Learning Outcomes are integrated in all Mathematical Literacy assessment tasks.

- Tests
- Assignments
- Examinations

SUBJECT OUTCOME	
2.3 Read, interpret and use representations to make sense of and solve problems in workplace and other areas of responsibility including national/global issues.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• A given scale on a plan and/or map where the measurements are known is used to calculate actual length and distance. • Calculate map and/ or plan measurements when actual lengths and distance are known using a given scale. • The scale in which to draw/construct a map/plan or model is determined.	• Use a given scale on a plan and/or map where the measurements are known to calculate actual length and distance. • Calculate map and/ or plan measurements when actual lengths and distance are known using a given scale. • Determine the scale of a map/plan or model derived from given information. *Example: If 1 cm on a map represents an actual distance of 10 km, determine the scale of the map.*
• The following is determined on road, street and route maps (taking into account the scale of the map): - A specific location - The distance between two positions - Routes to travel from one destination to another - The shortest and/or fastest and /or most appropriate mode of transport for a planned trip. • Trips subjected to constraints (e.g. financial, time and/or availability) are planned by choosing the most appropriate route and modes of transport using maps, route maps, bus /train/taxi/flight timetables, tariff tables, exchange rates (if necessary) and the AA fixed, running and operating cost tables if necessary . *Note: This can be integrated with the Topics Number and/or Finance.*	• Use road, street and route maps (buses and trains) (taking into account the scale of the map) to determine the following: - A specific location - The distance between two positions - Routes to travel from one destination to another - The shortest and/or fastest and /or most appropriate mode of transport for a planned trip. • Plan trips subjected to constraints (e.g. financial, time and/or availability) by choosing the most appropriate route and modes of transport using maps, route maps, bus /train/taxi/flight timetables, tariff tables, exchange rates (if necessary) and the AA fixed, running and operating cost tables if necessary . *Note: This can be integrated with the Topics Number and/or Finance.*

• Different plans are used (e.g. floor/layout and house plans, seating plans) to determine the following: - Actual lengths/dimensions of objects shown on plans using measurement and a given scale (number or bar scale) - Positions - Quantities of material needed in complex projects (e.g. determining quantities of materials needed to build an RDP house)	• Use different plans (e.g. floor/layout and house plans, seating plans) to determine: - Actual lengths/dimensions of objects shown on plans using measurement and a given scale (number or bar scale) - Positions - Quantities of material needed in complex projects (e.g. determining quantities of materials needed to build an RDP house)
• Activities are sequenced to complete a task in the most cost and/or time effective manner (e.g. make a dress; build a building; move contents of a house/office) using plans and/or diagrams	• Sequence activities to complete a task in the most cost and/or time effective manner (e.g. make a dress; build a building; move contents of a house/office) using plans and/or diagrams
ASSESSMENT TASKS OR ACTIVITIES	
• Practical/assignment (e.g. use assembly diagrams such as those found in manuals and brochures to identify parts and objects and follow instructions.) • Tests • Examination	
SUBJECT OUTCOME	
2.4 Use physical and diagrammatic representations to investigate problems and/or illustrate solutions in workplace and other areas of responsibility including national/global issues.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Various packaging arrangements of objects (e.g. blocks, balls, cans and boxes) are used to determine the most appropriate way to package the objects for optimal usage of space. *Examples: Should balls be packaged into a cylindrical or rectangular container?* *What is the best packaging shape to use for fragile and irregular-shaped objects like a television set?*	• Use various packaging arrangements of objects (e.g. blocks, balls, cans and boxes) to determine the most appropriate way to package the objects for optimal usage of space. *Examples: Should balls be packaged into a cylindrical or rectangular container?* *What is the best packaging shape to use for fragile and irregular-shaped objects like a television set?*
• The number and placement of furniture in a venue is determined considering free space for movement.	• Determine the number and placement of furniture in a venue considering free space for movement.
• Aspects of the lay-out and/or design of a	• Critique aspects of the lay-out and/or design of

structure are critiqued and suggestions are made for alterations.	a structure and make suggestions for alterations.
• 3D scale models of objects are built or drawn from 2D plans.	• Build or draw diagrams of 3D scale models of objects from 2D plans (nets) of the object to visualise the object (e.g. build a model of a house from its plan).
ASSESSMENT TASK/ACTIVITY:	
• SO 2.4 will be assessed using a practical/assignment and/or investigation only.	

Topic 3: Finance

(Minimum of 30 hours face to face teaching which excludes time for revision, test series and Internal and external examination)

SUBJECT OUTCOME	
3.1 Manage finances with confidence in workplace and other areas of responsibility including national/global issues.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Financial concepts related to business environments are recognised - Net income/pay/salary - Taxable income - Tax rates and tax brackets - PAYE - SITE - UIF - Gross income/pay/salary - Deductions from income/pay/salary: income tax, pension fund, medical aid membership fees, retirement annuity;	• Recognise financial concepts business environments - Net income/pay/salary - Taxable income - Tax rates and tax brackets - PAYE - SITE - UIF - Gross income/pay/salary - Deductions from income/pay/salary: income tax, pension fund, medical aid membership fees, retirement annuity;

• Financing methods and concepts related to business environments are recognised: - Loans, bonds, overdrafts, credit cards - Interest rates - Repayment amounts and periods - Hire purchase when buying vehicles (car, deliver truck/van)& residual value, real cost or total cost - Buying land/property and buildings; - Trading on the stock market *Note: Contexts are limited to those that deal with workplace, business, national and global finance and more complex financial scenarios.* *Examples of contexts in which national, global and more complex financial scenarios to be explored*	• Recognise financing methods and concepts related to business environments: - Loans, bonds, overdrafts, credit cards - Interest rates - Repayment amounts and periods - Hire purchase when buying vehicles (car, deliver truck/van)& residual value, real cost or total cost - Buying land/property and buildings; - Trading on the stock market *Note: Contexts are limited to those that deal with workplace, business, national and global finance and more complex financial scenarios.* *Examples of contexts in which national, global and more complex financial scenarios to be explored*
• Documents relating to more complex financial environments including national and global situations are identified: - Orders, quotations and invoices - Travel allowance and claim documentation - Cash flow, budgets and financial statements (income & expenditure statements and balance sheets) - Tax forms (e.g. tax deduction and tax rate tables, IRP 5 forms, employee income tax forms); - "Tax Pocket Guide" issued by SARS; - Loan documentation, including: ➢ Agreements stating loan conditions (e.g. term, of the loan, interest rate, repayment periods); ➢ Statements from banks and other loan institutions showing changes in a loan agreement (e.g. interest rate and monthly repayment changes). - Inflation data and graphs	• Identify documents relating to more complex financial environments including national and global situations: - Orders, quotations and invoices - Travel allowance and claim documentation - Cash flow, budgets and financial statements (income & expenditure statements and balance sheets) - Tax forms (e.g. tax deduction and tax rate tables, IRP 5 forms, employee income tax forms); - "Tax Pocket Guide" issued by SARS; - Loan documentation, including: ➢ Agreements stating loan conditions (e.g. term, of the loan, interest rate, repayment periods); ➢ Statements from banks and other loan institutions showing changes in a loan agreement (e.g. interest rate and monthly repayment changes). - Inflation data and graphs;

• Typical receipts, funding and income in a local national or global business are identified and listed: - Services rendered and /or sales of retail and/or manufactured goods - Interest received on savings and investments - Donations and sponsorships received - Rent received/ rent income - Loans received - Income from taxes (only in local and national governments)	• Identify and list typical receipts, funding and income in a local national or global business: - Services rendered and /or sales of retail and/or manufactured goods - Interest received on savings and investments - Donations and sponsorships received - Rent received/ rent income - Loans received - Income from taxes (only in local and national governments)
• Typical payments and expenses in a local, national or global business are identified and listed: - Loan repayments - Running/operations expenses e.g. Monthly rent, electricity & water, telephone& cell phone; internet access. - Fees payable, e.g. bank fees, payments to local and national governments/municipalities - Insurance e.g. vehicles/fleet owned by company, stock carried by company; import/export risks	• Identify and list typical payments and expenses in a local, national or global business: - Loan repayments - Running/operations expenses e.g. monthly rent, electricity & water, telephone& cell phone; internet access. - Fees payable, e.g. bank fees, payments to local and national governments/municipalities - Insurance e.g. vehicles/fleet owned by company, stock carried by company; import/export risks
• Two graphs are drawn on a system of axes indicating the total income and total costs in a business environment to illustrate and read break-even values either in units sold or in total income. *Note: Break-even point can always be expressed in two values, namely the number of items sold and the total income from sales. Determination of break-even values through algebraic calculations are excluded (i.e. solving equations simultaneously)* *Note: Break-even values are used in order to make sense of:* ➢ *investigation of the break-even values for a business with consideration of cost price, selling price, income and expenditure values*	• Draw two graphs on a system of axes indicating the total income and total costs in a business environment to illustrate and read break-even values either in units sold or in total income. *Note: Break-even point can always be expressed in two values, namely the number of items sold and the total income from sales. Determination of break-even values through algebraic calculations are excluded (i.e. solving equations simultaneously)* *Note: Break-even values are used in order to make sense of:* ➢ *investigation of the break-even values for a business with consideration of cost price, selling price, income and*

➢ *situations involving an investigation of the values for which two or more different costing options are equal (e.g. different electricity or cell phone costing options).*	*expenditure values* ➢ *situations involving an investigation of the values for which two or more different costing options are equal (e.g. different electricity or cell phone costing options).*
• A projected plan/budget/cash flow forecast is drawn up for a business based on expected income and expenditure. *Example:* *An annual/quarterly monthly budget/plan to show what is the expected income and turnover for a business*	• Draw up a projected plan/budget/cash flow forecast for a business based on expected income and expenditure. *Example:* *An annual/quarterly monthly budget/plan to show what is the expected income and turnover for a business*
• The projected values in the budget/cash flow forecast are compared to the actual values recorded in the income and expenditure statements to identify and calculate variances for larger businesses *Examples:* *A comparison of income/expenditure/profit values over two years;* *Budgets showing a comparison of projected versus actual income, expenditure and profit/loss values.*	• Compare the projected values in the budget/cash flow forecast with the actual values recorded in the income and expenditure statements to identify and calculate variances for *larger businesses* *Examples:* *A comparison of income/expenditure/profit values over two years;* *Budgets showing a comparison of projected versus actual income, expenditure and profit/loss values.*
• Possible causes for variances between actual and projected figures are identified and explained *Note: Simulated examples can be used.*	• Identify and explain possible causes for variances between actual and projected figures *Note: Simulated examples can be used.*
• Possible corrective methods of financial control are provided and the importance of saving for occasional future expenses considered. *Note: Limited to classroom discussions*	• Provide possible corrective methods of financial control and consider the importance of saving for occasional future expenses. *Note: Limited to classroom discussions*
ASSESSMENT TASKS OR ACTIVITIES	

<table>
<tr><td colspan="2">

- Practical Project
- Assignments
- Tests
- Examination

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<tr><td colspan="2">SUBJECT OUTCOME</td></tr>
<tr><td colspan="2">3.2 Read, interpret and act on information regarding taxation and financial documents in workplace and other areas of responsibility including national/global issues</td></tr>
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- The following aspects of VAT are revised:
  - The concept VAT and the current VAT rate.
  - The difference between a VAT “inclusive” value and a value “excluding” VAT .
- The final price is calculated by adding 14% VAT to a price excluding VAT.
- The amount of VAT added to a VAT “inclusive” price is calculated.

Note: The following methods may be used for calculations of VAT:

- *Dividing the VAT “inclusive” value by 1,14*
- *Identifying the VAT “inclusive” as being 114% and working out the “value excluding VAT” as 100%*

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Students are to revise:

- VAT and the current VAT rate.
- The difference between a VAT “inclusive” value and a value “excluding” VAT.
- Calculate the final price by adding 14% VAT to a price excluding VAT.
- Calculation of the amount of VAT that has been added to a VAT “inclusive” price.

Note: The following methods may be used for calculations of VAT:

- *Dividing the VAT “inclusive” value by 1,14*
- *Identifying the VAT “inclusive” as being 114% and working out the “value excluding VAT” as 100%*

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- A pay slip of an employee in a business is read and interpreted to conclude on the following:
- Calculation and deduction of UIF on the payslip
- Amount of personal income tax deducted according to tax deduction tables and tax brackets on the payslip
- The amount of income tax deducted on the pay slip is verified according to tax deduction tables and tax brackets on the payslip
- The impact of an increase in salary on the amount of tax payable is reflected upon.

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- Read and interpret a pay slip of an employee in a business to conclude on the following:
  - Calculation and deduction of UIF on the payslip
  - Amount of personal income tax deducted according to tax deduction tables and tax brackets on the payslip
  - Verify the amount of income tax deducted on the pay slip according to tax deduction tables and tax brackets on the payslip
- Reflect on the impact of an increase in salary on the amount of tax payable

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<tr><td colspan="2">SUBJECT OUTCOME</td></tr>
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3.3 Perform calculations correctly to solve problems regarding interest in workplace and other areas of responsibility including national/global issues.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Simple and compound interest calculations are performed without the use of formulae (manually) using a basic calculator, pen and paper, and/or spread sheets • Tables showing compounded values are used for interpretation. *Note: students are not expected to work with a formula here. Rather, the focus is on developing an understanding of the concept of a compounding calculation, e.g. where the values used in a calculation draw on answers/values from a previous calculation.*	• Perform simple and compound interest calculations without the use of formulae (manually) using a basic calculator, pen and paper, and/or spread sheets • Interpret and use tables showing compounded values *Note: students are not expected to work with a formula here. Rather, the focus is on developing an understanding of the concept of a compounding calculation, e.g. where the values used in a calculation draw on answers/values from a previous calculation*
• Graphs showing loan/bond and investment scenarios are used to determine the following: - The effect of changes in the interest rate on the cost of a loan/bond is investigated - The effect of changes in the interest rate on the final/projected value of an investment is investigated. - The effect of changes in the monthly repayment amount on the real cost of a loan/bond is investigated. *Note: Cost saving effects of paying off a loan/bond in a shorter period of time.*	• Make sense of graphs showing loan/bond and investment scenarios: - Investigate the effect of changes in the interest rate on the cost of a loan/bond - Investigate the effect of changes in the interest rate on the final/projected value of an investment. - Investigate the effect of changes in the monthly repayment amount on the real cost of a loan/bond *Note: Cost saving effects of paying off a loan/bond in a shorter period of time.*

• The effect of changes in the monthly investment amount on the value of the final investment is investigated. *Note: Use a table or spread sheets to construct a model of a loan scenario; investigate the impact of increasing monthly repayments on the real cost of the loan or investigate the impact of changes in the interest rate on the loan.*	• Investigate the effect of changes in the monthly investment amount on the value of the final investment. *Note: Use a table or spread sheets to construct a model of a loan scenario; investigate the impact of increasing monthly repayments on the real cost of the loan or investigate the impact of changes in the interest rate on the loan.*
SUBJECT OUTCOME	
3.4 Apply tariff systems in a workplace and other areas of responsibility including national/global issues.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Tariff systems are investigated: - Telephone tariffs (e.g. cell phone and land/fixed line) - Transport tariffs (e.g. bus, taxi and train tariffs) - Municipal tariffs (e.g. electricity, water, sewage, refuse removal) - Bank fees for different bank accounts - Rental options, e.g. hiring a photocopier rather than buying one	• Investigate the following tariff systems: - Telephone tariffs (e.g. cell phone and land/fixed line) - Transport tariffs (e.g. bus, taxi and train tariffs) - Municipal tariffs (e.g. electricity, water, sewage, refuse removal) - Bank fees for different bank accounts - Rental options, e.g. hiring a photocopier rather than buying one
• Costs are calculated and two or more different options available for different system from scenarios, time tables and brochures are compared.	• Calculate the cost and compare two or more different options available for different system from scenarios, time tables and brochures.
• Graphs are drawn to represent the different options of costs, indicating the intersections and interpret the graph	• Draw graphs to represent the different options of costs, indicating the intersections and interpret the graphs
SUBJECT OUTCOME	
3.5: Investigate, explain and graphically represent inflation	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**

• The concept *inflation* is revised and explained. • National inflation rates over a period of time (two to three years) are compared. • The impact of fluctuating national inflation rates on a business as an external factor. (CPIX) is explained. *Example:* *Explain the impact of inflation on a business in the following scenario:* - *Purchasing power, e.g. M&M Incorporated spends an average of R195000 on stock purchases in a financial year. If the purchasing price for stock items increases at the rate of inflation, 6%, what effect would this have on the purchasing power of the business?* - *Costing: What effect will it have on the cost price of stock items in the business?* - *Profitability: What can the business to ensure the profit is not negatively influenced?*	• Revise the concept and explanation of *inflation.* • Compare the national inflation rates over a period of time (two to three years) • Explain the impact of fluctuating national inflation rates on a business as an external factor. (CPIX) *Example:* *Explain the impact of inflation on a business in the following scenario:* - *Purchasing power, e.g. M&M Incorporated spends an average of R195000 on stock purchases in a financial year. If the purchasing price for stock items increases at the rate of inflation, 6%, what effect would this have on the purchasing power of the business?* - *Costing: What effect will it have on the cost price of stock items in the business?* - *Profitability: What can the business to ensure the profit is not negatively influenced?*
ASSESSMENT TASK OR ACTIVITY:	
Simulated documents and statements may be used however students should be encouraged to collect original documents from family members, friends and business contacts. • Practical Project • Assignments • Tests • Examination	

Topic 4: Patterns, Relationships and Representations

(Minimum of 15 hours face to face teaching which excludes time for revision, test series and Internal and external examination)

SUBJECT OUTCOME	
4.1 Identify relationships and complete patterns to solve problems in workplace context.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Features of patterns and/or relationships are described including the following: - Dependent and independent variables - Direct/linear and indirect/inverse proportions - Increasing and/or decreasing relationships *Example: Consider a cell phone contract where the cost of talking on the phone is R1,50 per minute. In this scenario, cost is dependent on the amount of time spent talking on the cell phone; also, the relationship between cost and talk time is an increasing relationship, with cost increasing at a fixed rate of R1,50 per minute*	• Describe features of patterns and/or relationships including the following: - Dependent and independent variables - Direct/linear and indirect/inverse proportions - Increasing and/or decreasing relationships *Example: Consider a cell phone contract where the cost of talking on the phone is R1,50 per minute. In this scenario, cost is dependent on the amount of time spent talking on the cell phone; also, the relationship between cost and talk time is an increasing relationship, with cost increasing at a fixed rate of R1,50 per minute*

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- Numerical and geometric patterns are investigated and established.

  Patterns include:

  - Constant difference patterns (arithmetic progressions) e.g. the cost of a number of items;
  - Constant ratio patterns (geometric progressions) e.g. fixed deposit bank account with a fixed interest rate;
  - Patterns associated with inverse and direct proportion relationships.
  - Situations in which there is no mathematical relationship between the independent and dependent variable but in which a trend can be identified.

    Example: Number of products sold at different prices against income received

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- Use given information to establish a specific pattern

  Patterns include:

  - Constant difference patterns (arithmetic progressions) e.g. the cost of a number of items;
  - Constant ratio patterns (geometric progressions) e.g. fixed deposit bank account with a fixed interest rate;
  - Patterns associated with inverse and direct proportion relationships.
  - Situations in which there is no mathematical relationship between the independent and dependent variable but in which a trend can be identified.

    Example: Number of products sold at different prices against income received

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- A range of techniques is used to determine missing and/or additional terms in a pattern, including:
  - the relationship between consecutive terms;
  - the formulae provided for calculations.

Example: The following table shows the cost of fuel. There are two ways to determine the pattern in the values in the following table:

Litres	0	1	2	3	4
Cost	R0,00	R8,00	R16,00	.....	.....

Method 1:

The difference between consecutive cost values is R8,00.To find the cost of buying 3 litres of petrol you can add R8,00 to the cost of buying 2 litres (i.e. R16,00) to get R16,00 + R8,00 = R24,00

Method 2:

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- Use a range of techniques to determine missing and/or additional terms in a pattern, including:
  - the relationship between consecutive terms;
  - the formulae provided for calculations

Example: The following table shows the cost of fuel. There are two ways to determine the pattern in the values in the following table:

Litres	0	1	2	3	4
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Method 1:

The difference between consecutive cost values is R8,00.To find the cost of buying 3 litres of petrol you can add R8,00 to the cost of buying 2 litres (i.e. R16,00) to get R16,00 + R8,00 = R24,00

Method 2:

The relationship between litres of petrol and cost is R8,00 per litre of petrol. The cost of filing a car with

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<td>The relationship between litres of petrol and cost is R8,00 per litre of petrol. The cost of filing a car with 3 litres of petrol is R8,00/ℓ × 3 ℓ = R24,00.</td>
<td>3 litres of petrol is R8,00/ℓ × 3 ℓ = R24,00.</td>
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<td>• Written content(not necessarily containing numbers) is used to derive own formula
Note:
- Application of derived formulae is excluded in assessments.
- Limited to linear equations
Example:
A taxi driver charges a fixed cost of R12,00 plus R10,00 for every kilometre travelled. Write a formula in words and in symbols to represent the cost.</td>
<td>• Derive own formula from written content (not necessarily containing numbers)
Note: Limited to linear equations

Example:
A taxi driver charges a fixed cost of R12,00 plus R10,00 for every kilometre travelled. Write a formula in words and in symbols to represent the cost.</td>
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<td>• Patterns are constructed from given formulae and represent these patterns in a table.
Example:
A quotation states that the cost of hiring a photocopier is R1 500,00 per month and an additional R0,50 per copy.
The following table can be constructed to represent the relationship between number of copies and cost.
<table>
<tr><td>Pages photocopied</td><td>0</td><td>10</td><td>20</td></tr>
<tr><td>Total monthly cost</td><td>R1500</td><td>R1505</td><td>R1510</td></tr>
</table>
</td>
<td>• Construct patterns from given formulae and represent these patterns in a table.
Example:
A quotation states that the cost of hiring a photocopier is R1 500,00 per month and an additional R0,50 per copy.
The following table can be constructed to represent the relationship between number of copies and cost.
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</table>
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<td>• Numerical patterns arising from formula are identified and extended.
Example:
The following formula can be used to determine the cost per day for a person selling hotdogs at a food stall:
Cost per day = [daily rent + (number of products x cost per product)]</td>
<td>• Identify and extend numerical patterns arising from formula.
Example:
The following formula can be used to determine the cost per day for a business selling products:
Cost per day = [daily rent + (number of products x cost per product)]]
Use the formula to construct a table indicating how</td>
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</table>

Use the formula to construct a table indicating how the cost varies as the number of products increases.

Cost per product = R 50,00

Daily rent = R 150 per day

Number of hot dogs	0	1	5	10	....
Total cost per day	R150,00	R 200,00	R 400,00	R 650,00	.....

the cost varies as the number of products increases.

Cost per product = R 50,00

Daily rent = R150 per day

Number of hot dogs	0	1	5	10	....
Total cost per day	R150,00	R 200,00	R 400,00	R 650,00	.....

ASSESSMENT TASKS OR ACTIVITIES

- Investigation
- Practical assignment
- Test
- Examination

SUBJECT OUTCOME

4.2 Move between different representations of relationships in workplace contexts.

ASSESSMENT STANDARDS	LEARNING OUTCOMES
• Representations of relationships are moved from as follows: - complete a table of values by reading values from the graph; - complete a table of values from formulae and/or descriptions of relationships.	• Move between representations of relationships as follows: - complete a table of values by reading values from the graph; - complete a table of values from given formulae and/or descriptions of relationships.

• Graphs are drawn of one or two relationships on a system of axes by: - plotting points from a given table of values - plotting points from values calculated using given equations; - constructing axes with an appropriate scale chosen for both the vertical and horizontal axes - labelling the vertical and horizontal axes and the graph appropriately;	• Draw graphs of one or two relationships on a system of axes by: - plotting points from a given table of values - plotting points from values calculated using given equations; - constructing axes with an appropriate scale chosen for both the vertical and horizontal axes - labelling the vertical and horizontal axes and the graph appropriately;
• Dependent and independent variables are identified and distinguished • The following information is identified and selected when working with relationships represented in tables, equations, graphs and formulae: - dependent variables for given independent variables - independent variables for given dependent variables • Relationships represented in tables and/or graphs are described for: - Direct/Linear relationships. - Indirect/inverse relationships. • Supplied formulae is used to determine: - The value of the dependent variable for given value(s) of the independent variable using substitution - The value of the independent variable for given value(s) of the dependent variable using simple algebraic manipulation to solve only linear equations.	• Identify and distinguish between dependent and independent variables. • Identify and select the following information when working with relationships represented in tables, equations, graphs and formulae: - dependent variables for given independent variables - independent variables for given dependent variables • Describe relationships represented in tables and/or graphs for: - Direct/Linear relationships. - Indirect/inverse relationships. • Use formulae supplied to determine: - The value of the dependent variable for given value(s) of the independent variable using substitution - The value of the independent variable for given value(s) of the dependent variable using simple algebraic manipulation to solve only linear equations.

ASSESSMENT TASK OR ACTIVITY:
• Investigation • Practical assignment • Test • Examination

Topic 5: Data Handling

(A minimum of 20 hours face to face teaching which excludes time for revision, test series and internl and external examination)

The philosophy underlying this topic is to develop the ability in students to critically engage with and communicate data. Some experience in collecting, organising and interpreting data is required. However the focus should be on interpreting information rather than gathering and/or generating it.

To develop a healthy and critical approach towards arguments based on data, students should be aware that data can be represented and interpreted (and misrepresented) in different ways.

SUBJECT OUTCOME	
5.1 Collect and organise data to answer questions in a workplace based context.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Key concepts relating to information/data collection and handling are described: *Range: research question, population, target and sample population, survey, questionnaire, tally, bias/subjectivity, reliability of information, sample size, interview, observation, misrepresentation, outlier.* *Note: Examples of data relating to the workplace may be:* - *sales figures for a business;* - *profile of shoppers at a shopping centre;* - *vehicle statistics (as an indication of income level) of shoppers at a shopping centre;* - *price history data for grocery items;* - *data on toilet, water and electricity facilities for a shopping centre*	• Describe key concepts relating to information/data collection and handling: *Range: research question, population, target and sample population, survey, questionnaire, tally, bias/subjectivity, reliability of information, sample size, interview, observation, misrepresentation, outlier.* *Note: Examples of data relating to the workplace may be:* - *sales figures for a business;* - *profile of shoppers at a shopping centre;* - *vehicle statistics (as an indication of income level) of shoppers at a shopping centre;* - *price history data for grocery items;* - *data on toilet, water and electricity facilities for a shopping centre*

• The way in which data has been collected, organised, summarised and represented is investigated to reveal possible sources of error/bias or misinterpretation. *Students should ask questions about:* - *The size of the sample* - *The representivity of the sample* - *The methods used for collecting data* - *The neutrality of the data collection process* - *Whether the data collected was fact or opinion* - *The way in which the data was sorted and/or grouped* - *The sizes of the groups used in grouping the data* - *The range (spread) of the data and what it says about the data*	• Investigate how data has been collected, organised, summarised and represented to reveal possible sources of error/bias, misrepresentation or misinterpretation. *Students should ask questions about:* - *The size of the sample* - *The representivity of the sample* - *The methods used for collecting data* - *The neutrality of the data collection process* - *Whether the data collected was fact or opinion* - *The way in which the data was sorted and/or grouped* - *The sizes of the groups used in grouping the data* - *The range (spread) of the data and what it says about the data*
• A set of questions is developed to obtain two sets of data. *Note: Keep in mind that the way in which questions are phrased can impact on the data collected and the outcome/findings of the investigation.*	• Develop a set of questions to obtain two sets of data. *Note: Keep in mind that the way in which questions are phrased can impact on the data collected and the outcome/findings of the investigation.*
• An appropriate instrument used for collecting data is justified. Instruments include: - Observation - Interview - Questionnaire/survey *Note: Consider the following when selecting an appropriate instrument:* - *The advantages and disadvantages of each instrument.* - *The selection of a representative sample from a population.* - *The impact of the choice of sample on the reliability of the data collected.*	• Justify the use of an appropriate instrument for collecting data. Instruments include: - Observation - Interview - Questionnaire/survey *Note: Consider the following when selecting an appropriate instrument:* - *The advantages and disadvantages of each instrument.* - *The selection of a representative sample from a population.* - *The impact of the choice of sample on the reliability of the data collected.*

• Data is organised using tally and frequency tables. Data is restricted to two categories (.e.g. sort data of employees according to gender and age) • Data is grouped using intervals (where appropriate) e.g. it is often appropriate to group age groups test scores in the mark intervals "18-28". "29-39", etc.)	• Organise data restricted to two categories using tally and frequency tables (e.g. sort data of employees according to gender and age) • Group data using intervals (e.g. it is often appropriate to group age groups test scores in the mark intervals "18-28", "29-39", etc.)

SUBJECT OUTCOME	
5.2 Represent and interpret given data in various forms in workplace contexts.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Two sets of collected data are arranged to calculate the following measures of central tendency and spread: *(keeping in mind that the choice of summary affects the answer to the question.)* - mean - median - mode - range	• Arrange two sets of collected data to calculate the following measures of central tendency and spread: *(keeping in mind that the choice of summary affects the answer to the question.)* - mean - median - mode - range
• The calculated or given measures of central tendency are interpreted and the preferred answer most suitable/appropriate to the situation selected.	• Interpret the calculated or given measures of central tendency and select the preferred answer most suitable/appropriate to the situation.
• Two sets of collected data are represented using: - vertical and horizontal bar graphs - histograms - compound/double bar graphs - vertical and horizontal stacked bar graphs - line and broken line graphs *Note:* *Realise that each type of representation offers a different picture of the data and certain types of representations are more appropriate for particular types of data e.g. Although it would be possible to use*	• Represent two sets of collected data using: - vertical and horizontal bar graphs - histograms - compound/double bar graphs - vertical and horizontal stacked bar graphs - line and broken line graphs *Note:* *Realise that each type of representation offers a different picture of the data and certain types of representations are more appropriate for*

a pie chart to show the monthly rainfall in a town, it would be difficult to identify trends in the rainfall pattern from this chart. A bar graph and especially a line graph would allow for a much more in-depth analysis of the trends in the rainfall data. Students *are not expected to draw pie charts in an examination. Rather, they must be able to interpret and read values from a pie chart and, if necessary, explain how the sizes of the different segments of a pie chart have been determined.*	*particular types of data e.g. Although it would be possible to use a pie chart to show the monthly rainfall in a town, it would be difficult to identify trends in the rainfall pattern from this chart. A bar graph and especially a line graph would allow for a much more in-depth analysis of the trends in the rainfall data.* Students *are not expected to draw pie charts in an examination. Rather, they must be able to interpret and read values from a pie chart and, if necessary, explain how the sizes of the different segments of a pie chart have been determined.*
• Data is read and critically interpreted from representations (i.e. pie charts, vertical and horizontal bar graphs, histograms, compound/double bar graphs, vertical and horizontal stacked bar graphs, line and broken line graphs) containing data in order to answer questions relating to the data.	• Read and critically interpret data from representations (i.e. pie charts, vertical and horizontal bar graphs, histograms, compound/double bar graphs, vertical and horizontal stacked bar graphs, line and broken line graphs) containing data in order to answer questions relating to the data.
• Data represented in graphs and tables are used to identify trends and draw conclusions.	• Identify trends and draw conclusions from data represented in graphs and tables
• It is recognised how the choice of representation affects the impressions created and conclusion(s) that can be drawn. *Note: Realise the effect that the scale of the axes and the point at which the axes cross have on the impression created.*	• Recognise how the choice of representation affects the impressions created and conclusion(s) that can be drawn. *Note: Realise the effect that the scale of the axes and the point at which the axes cross have on the impression created.*
ASSESSMENT TASKS OR ACTIVITIES	
• Tests • Assignments • Examination	

SUBJECT OUTCOME	
5.3 Interpret the implications of the expressions of likelihood in workplace context. *Note: The expression" likelihood" is also known as " chance" and/or more formally as "probability"*	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The following terms are differentiated: - Event - Outcome/result - Random and non-random events - Probability/likelihood - Probability scale - Independent and dependent events - Predictions - Theoretical probability - Experimental probability *Note: Explore likelihood in scenarios involving the following:* - *Games using coins and a dice;* - *Weather predictions* - *Tests where there is a chance of inaccurate results;* - *Cosmetic and other products making statements regarding likelihood.*	• Recognise the difference between the following terms: - Event - Outcome/result - Random and non-random events - Probability/likelihood - Probability scale - Independent and dependent events - Predictions - Theoretical probability - Experimental probability *Note: Explore likelihood in scenarios involving the following:* - *Games using coins and a dice;* - *Weather predictions* - *Tests where there is a chance of inaccurate results;* - *Cosmetic and other products making statements regarding likelihood.*
• The different expressions of likelihood is recognised as a scale ranging between - 0 (events that cannot take place – impossible events); and - 1 or 100% (events certain to take place) • The likelihood of an event is expressed using fractions, percentages and decimal notations.	• Recognise that likelihood is expressed as a scale that ranges between: - 0 (events that cannot take place – impossible events); and - 1 or 100% (events certain to take place) • Recognise that the likelihood of an event is expressed using fractions, percentages and decimal notations.

• Expressions of likelihood are recognised as predictions about the outcome of an event. *Example: Although there is always a chance that someone may win a lottery, this does not mean that there will always be a winner every time the lottery is played*	• Recognise that expressions of likelihood are only predictions about the outcome of an event. *Example: Although there is always a chance that someone may win a lottery, this does not mean that there will always be a winner every time the lottery is played*
• Expressions of likelihood are recognised as predictions about the future based on events of the past. *Example: Car insurance rates for people between the ages of 18 and 25 years are generally higher than those for people between the ages of 30 and 55 years. This is because historically there have been more motor vehicle accidents involving 18 to 25 year olds than 30 to 55 year olds.*	• Recognise that expressions of likelihood are predictions about the future based on events of the past. *Example: Car insurance rates for people between the ages of 18 and 25 years are generally higher than those for people between the ages of 30 and 55 years. This is because historically there have been more motor vehicle accidents involving 18 to 25 year olds than 30 to 55 year olds.*
• It is recognised that expressions of likelihood can only predict the trend of an outcome over a long period of time (for a very large number of trials) and cannot accurately predict the outcome of single events. *Example: Even though people aged 18 to 25 years are deemed more likely to be involved in a motor vehicle accident than any other age group, this does not necessarily mean that it is not possible that another age group might experience a higher number of crashes during the course of a year. However, based on trends in the past, it is more likely that people aged 18 to 25 years will be involved in an accident.*	• Recognise that expressions of likelihood can only predict the trend of an outcome over a long period of time (for a very large number of trials) and cannot accurately predict the outcome of single events. *Example: Even though people aged 18 to 25 years are deemed more likely to be involved in a motor vehicle accident than any other age group, this does not necessarily mean that it is not possible that another age group might experience a higher number of crashes during the course of a year. However, based on trends in the past, it is more likely that people aged 18 to 25 years will be involved in an accident.*
ASSESSMENT TASKS OR ACTIVITIES	
• Practical assignments and tasks *Examples of activities to illustrate likelihood:* - *Develop a game using coins and/or a dice and make the game unfair (i.e. there is a higher likelihood of losing).*	

- *Give the game to your fellow students and ask them to determine (without doing any calculations) whether the game is fair and if not, why not.*
- *Toss a coin only a few times and then determine the likelihood of the tossed coin landing on heads for this experiment.*
- *Toss the same coin for a very large number of times and then determine the likelihood of the tossed coin landing on heads for this larger experiment.*
- *Compare the likelihood values for the two experiments, discuss why they are different and explain how the notion that "there is a 50% chance that a tossed coin will land on either heads or tails" has been determined.*

3 EXTERNAL ASSESSMENT IN MATHEMATICAL LITERACY – LEVEL 4

Apart from the internal assessment a national examination is also conducted annually in October or November each year by means of two three hour examination paper set externally. The national examination is subjected to external moderation by Umalusi or an appropriate Education and Training Quality Assurance (ETQA) body, appointed by the Umalusi Council in terms of Section 28(2) of the *General and Further Education and Training Quality Assurance Act, 2001 (Act No. 58 of 2001).*

Refer to Annexure A attached to this document for guidelines on the use of Blooms assessment taxonomy and the setting of external examination papers for Mathematical Literacy Level 4

The following structure and mark distribution between paper 1 and paper 2 is proposed for setting national examination papers:

Paper 1:

This paper is a basic knowledge and routine application paper. The paper intends to assess basic mathematical skills and competency and contains primarily questions at the *knowing* (Level 1 of taxonomy) and *routine procedures* (Level 4 of taxonomy) levels.

The table below provides information on percentages allocated to different assessment taxonomy levels as follows:

The four levels of the Mathematical Literacy assessment taxonomy	Allocation
Level 1: Knowing	50%
Level 2: Applying routine procedures in familiar contexts	40%
Level 3: Applying multi-step procedures in a variety of contexts	5%
Level 4: Reasoning and reflecting	5%

Paper 1 (3 hours) and proposed mark allocation:

The examination paper will consist of five questions with sub-questions. Each of the questions will focus on a specific topic.

	TOPICS	**MARKS**
Assessment Of Basic Skills	1. Numbers	30
	2. Space, Shape and Orientation	30
	3. Finance	30
	4. Patterns, Relationships and Representations	30
	5. Data Handling	30
		150

Paper 2:

This paper is intended to be an application of the following:

routine procedures, multi- step procedures, reasoning and reflecting in a workplace context.

The table below provides information on percentages allocated to different assessment taxonomy levels as follows:

The four levels of the Mathematical Literacy assessment taxonomy	Allocation
Level 1: Knowing	10%
Level 2: Applying routine procedures in familiar contexts	20%
Level 3: Applying multi-step procedures in a variety of contexts	40%
Level 4: Reasoning and reflecting	30%

Paper 2 (3 hours) and proposed mark allocation:

The examination paper consists of four questions with sub-questions. Each of the 4 questions will focus on a topic (Topic 2 – 5) with the topic on Numbers integrated across the four questions.

	TOPICS	**MARKS**
Application Skills	1. Numbers	This topic will be assessed in an integrated way throughout the
	2. Space, Shape and Orientation	40
	3. Finance	40
	4. Patterns, Relationships and Representations	35
	5. Data Handling	35
		150

Annexure A:

Complexity in Mathematical Literacy is structured around the following assessment taxonomy framework:

- Level 1: Knowing
- Level 2: Applying routine procedures in familiar contexts
- Level 3: Applying multi-step procedures in a variety of contexts
- Level 4: Reasoning and reflecting

It is important to recognise that this taxonomy must not be seen as being associated exclusively with different levels of *mathematical* calculations and/or complexity. Rather, in determining the level of complexity and cognitive demand of a task, consideration must also be given to the extent to which the task requires the use of integrated content and skills drawn from different topics, the complexity of the context in which the problem is posed, the influence of non-mathematical considerations on the problem, and the extent to which the learner is required to make sense of the problem without guidance or assistance.

Level 1: Knowing

Level 1: Knowing questions serve two functions:

1. To familiarise students with the context in which problems are posed by asking them questions about the context.
2. To test ability to interpret contextualised information, to use familiar techniques to perform basic calculations and to explain common terms.

Examples of the types of tasks at the *knowing* level of the Mathematical Literacy taxonomy include:

- Reading information directly from a table (e.g. the date on a bank statement; the time that a bus leaves the bus terminal).
- Performing basic operations on numbers (e.g. subtracting income and expenditure values to determine the profit/loss for a business; adding values to show how the “Amount due” value on an electricity bill has been determined).
- Measuring accurately (e.g. measuring the dimensions of a room on a given plan accurately using a ruler).
- Rounding answers appropriately as per a given instruction (e.g. rounding off an answer to one decimal place when instructed to do so).
- Identifying the appropriate formula to be used in a given calculation (e.g. identifying the formula for the area of a circle as $area = \pi \times radius^2$ from a given list of area formulae).
- Recognising and explaining vocabulary appropriate to a particular scenario (e.g. “discrete” and “continuous” in the context of data; “event” and “outcome” in the context of likelihood; “dependent” and “independent” variables; “debit” and “credit” in the context of finance).

- Reading values directly from the values provided on a graph or table (e.g. reading off the cost of talking for 60 minutes on a cell phone contract from a graph showing the cost of calls over time).
- Performing conversions within the metric system (e.g. from mm to cm to m to km; from ml to ℓ; from g to kg; from seconds to minutes to hours).

Level 2: Applying routine procedures in familiar contexts

Tasks at the *applying routine procedures in familiar contexts* level of the Mathematical Literacy taxonomy require learners to perform well-known procedures and complete common tasks in familiar contexts. Learners know what procedure/task is required from the way the problem is posed and all the necessary information to solve the problem is immediately available to the learner. Routine procedures questions commonly involve single-step calculations, repeating the same calculation several times, or the completion of a task that learners are familiar with (e.g. constructing an income-and-expenditure statement to reflect an individual's finances).

Examples of *routine procedures* tasks include:

- Substituting values into given equations (e.g. determining the bank charge for depositing money into an account using a given formula).
- Solving equations by means of trial and improvement or algebraic processes.
- Drawing graphs from given tables of values (e.g. drawing a graph to show the cost of a call on a cell phone contract over time from a given table of time and cost values).
- Constructing a budget for a small household project.
- Using tax deduction tables to determine the amount of tax to be deducted from an employee's salary.
- Measuring the dimensions of the floor of a room and using the dimensions to determine how many running metres of carpeting to buy to cover the floor of the room.
- Calculating the mean, median and/or modal averages of a set of data.
- Increasing or decreasing an amount by a percentage (e.g. determining how much a person will pay for a television set if a 5% discount is given).
- Estimating values from the values provided on a graph or in a table (e.g. on a graph showing population statistics in millions for the different provinces in South Africa, estimate the population of KwaZulu-Natal).
- Converting units of measurement between different systems of measurement using given conversion tables and/or factors (e.g. using a baking conversion table to convert from g to ml when baking a cake).
- Using a given scale to determine actual length or distance (e.g. using a scale of 1:100 on a plan to determine the actual length and width of the walls of a room).

Level 3: Applying multi-step procedures in a variety of contexts

Tasks at the a*pplying multi-step procedures in a variety of contexts* level of the Mathematical Literacy taxonomy require learners to solve problems or complete tasks using well-known procedures and methods, but where the procedure or method is not immediately obvious from the way the problem is posed. As such, learners may have to decide on the most appropriate procedure or method to find the solution to the question or to complete a task, and they may have to perform one or more preliminary calculations or complete one or more preliminary tasks before determining a solution. Situations in which a variety of mathematical and non-mathematical content, skills and/or considerations must be utilised from different topics in the curriculum in order to make sense of a problem are also at the *multi-step procedures* level of the taxonomy.
Tasks at the *multi-step procedures* level contain far less direction or guidance than tasks at the *routine procedures level* and require that learners make decisions regarding the appropriate content, methods and non-mathematical considerations needed to solve problems and complete tasks.

Examples of *multi-step procedures* tasks include:

- Deciding on the most appropriate graph and an appropriate means of constructing that graph to represent a particular scenario (e.g. constructing a table of values to represent a tariff structure for a particular electricity system and then using the table of values to draw a graph to represent that tariff structure).
- Determining the most appropriate scale in which to draw a plan, determining dimensions according to that scale, and then drawing the plan according to those scaled dimensions.
- Determining the quantity of paint needed to paint the walls of a building by determining the surface area of the walls of a building, using a conversion ratio to convert the surface area value from m^2 to litres, rounding the litres value up to the nearest whole litre and then making a decision about the most appropriate quantity of paint to be bought based on available tin sizes.
- Using maps, a distance chart, weather report information and other travel resources to plan a trip, giving consideration to where to stop for petrol, estimated travelling distance and time, and estimated travel costs.
- Researching the costs involved in a fund-raising activity and preparing a budget for the activity.
- Using given inflation rates to investigate the estimated value of an item over a multiple time period. (For example, if a car is currently worth R90 000, what would the car be worth in two years' time if the value of the car depreciated by approximately 15% in the first year and 10% in the second year?)

Level 4: Reasoning and reflecting:

Tasks at the *reasoning and reflecting* level of the Mathematical Literacy taxonomy can be divided into two groups of questions:

1. Questions that require a decision, opinion or prediction about a particular scenario based on calculations in a previous question or on given information (e.g. analysing calculations performed in a previous question on two different electricity costing options and making a decision about the most

suitable option for a person with particular needs; or critiquing a statement regarding crime statistics reported in a newspaper article; or making a prediction about the projected income for a business based on current financial data).

Examples of these types of *reasoning and reflecting* questions include:

- Comparing provided data on the performance of two groups of learners in an examination and explaining which group performed better based on the available data.
- Providing an opinion on how a particular government minister might react to a particular set of statistics.
- Analysing a completed income-and-expenditure statement for a household and making suggestions on how the members of the household could change their expenditure to improve their financial position.

2. Questions that require students to pose and answer questions about what mathematics they require to solve a problem, select and use that mathematical content, recognise the limitations of using mathematics to solve the problem, and consider other non-mathematical techniques and factors that may define or determine a solution to the problem. (For example, when presented with adverts for two different cell phone contracts, learners must decide what method will be the most appropriate for comparing the costs involved in the contracts. They may decide to construct tables of values, or draw graphs, or use equations. Having chosen a suitable method, they will need to perform the necessary calculations and then make sense of their calculations in order to make a decision regarding the most affordable contract for an individual with particular needs. They will also need to recognise that irrespective of the mathematical solution to the problem, the individual may choose a cell phone based on personal preference, e.g. colour or cell phone model).

Examples of these types of *reasoning and reflection* questions include:

- Using calculations to compare income and expenditure values for a business in order to determine whether the business is in a healthy financial position.
- Comparing the bank charges on two different types of accounts for various transactions and making a decision about the most suitable account for an individual with particular needs.
- Constructing a table to model a loan scenario, taking into account the interest calculated on the loan, the monthly repayment and the closing balance on the loan every month.
- Using this model of the loan scenario to investigate the effect of changes in the interest rate on the loan and the impact of increasing the monthly repayment on the real cost of the loan.
- Building two different types of boxes for packaging an item, comparing the boxes in terms of wasted space (volume) and materials (surface area), and making a decision about the most cost-effective box for packaging the item