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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 Mathematics 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: Mathematics to prepare for and deliver Mathematics. 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 and develop the capacity of the nation.

- **Relevance**
  To be dynamic and responsive to national development needs.

- **Credibility**
  To demonstrate recognition of competencies and skills acquired, national and international added value and recognition of the acquired qualification

- **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 the setting of standards and the co-ordination of the achievements required for the qualification.
Access
To address barriers to learning experienced on different levels and to facilitate the students’ progress.

Progression
To ensure 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 obtained within a qualification from one learning institution and/or employer to another institution or employer.

Articulation
To allow for vertical and horizontal mobility in the educational system on condition that accredited pre-requisites have been successfully completed.

Recognition of Prior Learning
To grant credits for a unit of learning following an assessment process or where a student possesses the capabilities as specified in the outcomes.

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.

Topics should be assessed individually and then cumulatively with other topics. There should be a final summative internal assessment prior to the external 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.

- Cumulative and summative assessments must be weighted more than single topic tests for the internal mark.
- There should be at least one standardised or norm test in each trimester.
- All standardised or norm tests must be moderated by a subject specialist.

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

Assessment in Mathematics must take into consideration that the process or method carries more weight than the final answer.

Practicability and cost-effectiveness
To integrate assessment tasks and/practices within an outcomes-based education and training system to 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 is either a single or more 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 should ideally be declared competent against the standards set by the ETDP SETA. If the lecturer conducting the assessments has not been declared a competent assessor, an assessor who has been declared competent may be appointed to oversee the assessment process to ensure the quality and integrity of assessments.

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. |

6 Department of Higher Education and Training
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 assessment purposes 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                         | Assignments or tasks    | Examinations                |
|                                 | Class questions                     | Projects                | Class tests                 |
|                                 | Lecturer, student, parent discussions| Investigations or research | Practical examinations |
|                                 |                                     | Case studies            | Oral tests                   |
|                                 |                                     | Practical exercises     | Open tests                   |
|                                 |                                     | Demonstrations          | Open-book tests              |
|                                 |                                     | Role-play               |                            |
|                                 |                                     | Interviews              |                            |
| **Assessment tools**            | Observation sheets                  | Checklists              | Marks (e.g. %)              |
|                                 | Lecturer’s notes                    | Rating scales           | Rating scales (1-7)         |
|                                 | Comments                             | Rubrics                 |                            |
| **Evidence**                    | Focus on individual students        | Open middle: Students produce the same evidence but in different ways. | Students answer the same questions in the same way, within the same time. |
|                                 | Subjective evidence based on lecturer observations and impressions | Open end: Students use same process to achieve different results. | |

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 rubrics 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.

SECTION C: ASSESSMENT IN MATHEMATICS

1 SCHEDULE OF ASSESSMENT
At NQF levels 2, 3 and 4, lecturers will conduct assessments as well as develop a schedule of formal assessments that will be undertaken in the year. All three levels also have an external examination that accounts for 75 percent of the total mark. The marks allocated to assessment tasks completed during the year, kept or recorded in a Portfolio of Evidence (PoE) account for the other 25 percent.

The Portfolio of Evidence (PoE) and the external assessment include practical and written components. The practical assessment in Mathematics, must, where necessary, be 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).

2 RECORDING AND REPORTING
Mathematics is assessed according to seven levels of competence. The level descriptions are explained in the following table.

Scale of achievement for the Fundamental component
The programme of assessment should be recorded in the Lecturer’s Portfolio of Assessment (PoA) for each subject. The following should at least be included in the Lecturer’s Portfolio of Assessment:

- Lecturer information
- A contents page
- Subject and Assessment Guidelines
- Year plans /Work schemes/Pace Setters
- A formal schedule of assessment
- The requirements and resources for each assessment task
- Instrument(s) and tools for each assessment task
- A mark sheet for assessment tasks

The college must standardise these documents.

The student’s Portfolio of Evidence (PoE) should at least include the following:

- 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.

The following internal assessment units guide the assessment of Mathematics.

<table>
<thead>
<tr>
<th>NUMBER OF UNITS</th>
<th>ASSESSMENT</th>
<th>Time and Mark Allocation</th>
<th>Weight %</th>
<th>COVERAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Formal written tests</td>
<td>1 hour each 30 -35 marks</td>
<td>10%</td>
<td>One or more completed topics</td>
</tr>
<tr>
<td>1</td>
<td>June formal written test</td>
<td>2 hours 70 marks</td>
<td>10%</td>
<td>All completed topics</td>
</tr>
<tr>
<td>1</td>
<td>Internal written examination</td>
<td>1 paper 3 hours 100 marks</td>
<td>50%</td>
<td>All completed topics</td>
</tr>
<tr>
<td>2</td>
<td>Assignments</td>
<td>Approximately 2 hours per assignment</td>
<td>20%</td>
<td>One or more completed topics Open book tests and group work assignments may be used</td>
</tr>
<tr>
<td>1</td>
<td>Practical assessment</td>
<td>Determined by type of practical task</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>----------------------</td>
<td>-------------------------------------</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Any related Subject Outcomes, for example:
1. Work out a personal budget and find out where savings can be best invested.
2. Work with advertisements from money lenders to see viability of taking such a loan.
3. Choose a national flag of a country or a favourite sport flag and discuss all the axis of symmetry, reflection and transformation that can occur in the flag.
4. Use given data for analysis and interpretation in different ways by constructing tally charts, bar graphs, pie charts.
ASSESSMENT OF MATHEMATICS

LEVEL 2
## 1. INTERNAL ASSESSMENT OF SUBJECT OUTCOMES IN MATHEMATICS – LEVEL 2

### Topic 1: Numbers

#### SUBJECT OUTCOME

1.1 Use computational tools and strategies and make estimates and approximations.

<table>
<thead>
<tr>
<th>ASSESSMENT STANDARD</th>
<th>LEARNING OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Scientific calculators are correctly used to solve expressions. <em>Range:</em> addition, subtraction, multiplication, division, squares, cubes, square roots and cube roots.</td>
<td>• Use a scientific calculator correctly to solve expressions involving addition, subtraction, multiplication, division, squares, cubes, square roots and cube roots.</td>
</tr>
<tr>
<td>• Physical quantities are estimated and approximated to solve problems in practical situations. <em>Range:</em> Quantities include length, time, mass and temperature</td>
<td>• Estimate and approximate physical quantities to solve problems in practical situations. Quantities include length, time, mass and temperature</td>
</tr>
</tbody>
</table>

#### ASSESSMENT TASKS OR ACTIVITIES

- Practical assignments with calculator
- Test
- Internal examination

### SUBJECT OUTCOME

1.2 Demonstrate an understanding of numbers and relationships among numbers and number systems and represent numbers in different ways.

<table>
<thead>
<tr>
<th>ASSESSMENT STANDARD</th>
<th>LEARNING OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Rational and irrational numbers are identified.</td>
<td>• Identify rational and irrational numbers.</td>
</tr>
<tr>
<td>• Rational and irrational numbers are rounded off to an appropriate degree of accuracy.</td>
<td>• Round off rational and irrational numbers to an appropriate degree of accuracy</td>
</tr>
<tr>
<td>• Rational numbers are converted between terminating and recurring decimals to the form $\frac{a}{b}$; $a, b \in \mathbb{Z}$; $b \neq 0$.</td>
<td>• Convert rational numbers between terminating and recurring decimals to the form $\frac{a}{b}$; $a, b \in \mathbb{Z}$; $b \neq 0$.</td>
</tr>
<tr>
<td>• The following laws of exponents are applied: $a^m \times a^n = a^{m+n}$, $a^m \div a^n = a^{m-n}$, $(a^n)^m = a^{mn}$, $(ab)^n = a^m b^n$, $(a^m b^n)^p = a^{mp} b^{np}$, $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$, $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$, $a \div a^n = a^{-n} = \frac{1}{a^n}$, $a^0 = 1$, $\sqrt[n]{a^m} = a^{\frac{m}{n}}$</td>
<td>• Apply the following laws of exponents. $a^m \times a^n = a^{m+n}$, $a^m \div a^n = a^{m-n}$, $(a^m)^n = a^{mn}$, $(ab)^m = a^m b^n$, $(a^m b^n)^p = a^{mp} b^{np}$, $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$, $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$, $\frac{a \div a^n}{a^n} = a^{-n} = \frac{1}{a^n}$, $a^0 = 1$, $\sqrt[n]{a^m} = a^{\frac{m}{n}}$</td>
</tr>
<tr>
<td>• Fractions with surd denominators (binomial and monomial denominators) are rationalised</td>
<td>• Rationalise fractions with surd denominators (binomial and monomial denominators) without</td>
</tr>
</tbody>
</table>
without using a calculator.  
• Simple surds are added, subtracted, multiplied and divided.  
• Simple technical and nontechnical formulae are manipulated.  
• An unknown variable is solved in simple technical and non technical formulae.  
• Arithmetic sequences and series are identified and worked with.  

using a calculator.  
• Add, subtract, multiply and divide simple surds.  
• Manipulate simple technical and non technical formulae.  
• Solve an unknown variable in simple technical and non technical formulae.  
• Identify and work with arithmetic sequences and series.  

**ASSESSMENT TASKS OR ACTIVITIES**  
• Test  
• Assignment  
• Internal examination  

**Topic 2: Functions and Algebra.**  

**SUBJECT OUTCOME**  

**2.1 Use a variety of techniques to sketch and interpret information from graphs of algebraic and transcendental functions.**  

<table>
<thead>
<tr>
<th>ASSESSMENT STANDARD</th>
<th>LEARNING OUTCOME</th>
</tr>
</thead>
</table>
| • Graphs are generated by means of point-by-point plotting, supported by available technology.  
• The generated graphs are used to make and test conjectures.  
• The effects of the parameters \( a \) and \( q \) on the generated graphs of functions are generalised including the following:  
  \[ y = ax + q \]  
  \[ y = ax^2 + q \]  
  \[ y = \frac{a}{x} + q \]  
  \[ y = ab^x + q \quad b > 0 \]  
  \[ y = a \cos x + q \]  
  \[ y = a \tan x + q \]  | • Generate graphs by means of point-by-point plotting using/supported by available technology.  
• Use the generated graphs to make and test conjectures.  
• Generalise the effects of the parameters \( a \) and \( q \) on the generated graphs of functions including the following:  
  \[ y = ax + q \]  
  \[ y = ax^2 + q \]  
  \[ y = \frac{a}{x} + q \]  
  \[ y = ab^x + q \quad b > 0 \]  
  \[ y = a \cos x + q \]  
  \[ y = a \tan x + q \]  |
| • Functions are defined.  
• The following characteristics of functions are identified:  
  o Domain and range.  
  o Intercepts with axes.  
  o Turning points, minima and maxima.  
  o Asymptotes  
  o Shape and symmetry.  
  o Periodicity and amplitude  
  o Functions or non functions.  | • Define functions.  
• Identify the following characteristics of functions:  
  o Domain and range.  
  o Intercepts with axes.  
  o Turning points, minima and maxima.  
  o Asymptotes  
  o Shape and symmetry.  
  o Periodicity and amplitude  
  o Functions or non functions.  |
- Continuous or discontinuous.  
  - Graphs are sketched and equations of graphs are found for the following functions:  
    \[ y = ax + q \]
    \[ y = ax^2 + q \]
    \[ y = \frac{a}{x} + q \]
    \[ y = ab^x + q, \quad b > 0 \]
    \[ y = a \sin x + q \]
    \[ y = a \cos x + q \]
    \[ y = a \tan x + q \]

### ASSESSMENT TASKS OR ACTIVITIES
- Practice exercises
- Assignments
- Tests
- Internal examination

### SUBJECT OUTCOME

**2.2 Manipulate and simplify algebraic expressions.**

#### ASSESSMENT STANDARD
- Binomials are multiplied by binomials.  
- Binomials are multiplied by trinomials.  
- Expressions are factorised by identifying/taking out the common factor.  
- Expressions are factorised by grouping in pairs.  
- The difference of two squares is factorised.  
- Trinomials are factorised.  
- Algebraic fractions with monomial denominators are simplified.

#### LEARNING OUTCOME
- Find products of two binomials.  
- Find products of binomials with trinomials.  
- Factorise by identifying/taking out the common factor.  
- Factorise by grouping in pairs.  
- Factorise the difference of two squares.  
- Simplify algebraic fractions with monomial denominators.

#### ASSESSMENT TASKS OR ACTIVITIES
- Assignments
- Tests
- Internal examination

### SUBJECT OUTCOME

**2.3 Solve algebraic equations and inequalities.**

#### ASSESSMENT STANDARD
- Linear equations are solved.  
- Quadratic equations are solved by factorisation.  
- Exponential equations like \( ka^x = m \) (where \( x \) is an integer) are solved by using the laws of exponents.  
- Linear inequalities in one variable are solved and the solution is represented in set builder notation, interval notation and on the number line.  
- Linear equations with two unknowns are solved.

#### LEARNING OUTCOME
- Solve linear equations.  
- Solve quadratic equations by factorisation.  
- Solve exponential equations in the form \( ka^x = m \) (where \( x \) is an integer) by using the laws of exponents.  
- Solve inequalities in one variable and represent the solution in set builder notation, interval notation and on the number line.  
- Solve simultaneous equations with two unknowns algebraically and graphically, where...
simultaneously using numerical, algebraic and graphical methods. both equations are linear.

**ASSESSMENT TASKS OR ACTIVITIES**

- Assignments
- Tests
- Internal examination

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**Subject Outcome**

**3.1 Measure and calculate physical quantities**

<table>
<thead>
<tr>
<th>Assessment Standard</th>
<th>Learning Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scales on measuring instruments are read correctly. Instruments to include are the ruler and protractor.</td>
<td>Read scales on measuring instruments correctly. Instruments to include are the ruler and protractor.</td>
</tr>
<tr>
<td>Systeme Internationale (SI) units are understood and used in the appropriate situation.</td>
<td>Use symbols and Systeme Internationale (SI) units as appropriate to the situation.</td>
</tr>
</tbody>
</table>

*Range: Appropriate situations for SI units include length, height, angles, area, volume, capacity, monetary calculations and time.*

**ASSESSMENT TASKS OR ACTIVITIES**

- Project
- Assignments
- Tests
- Internal examinations

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**Subject Outcome**

**3.2 Calculate perimeter, surface area and volume in two and three dimensional geometrical shapes.**

<table>
<thead>
<tr>
<th>Assessment Standard</th>
<th>Learning Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The perimeter and surface area of the following laminas are calculated:</td>
<td>Calculate the perimeter and surface area of the following laminas:</td>
</tr>
<tr>
<td>- Square</td>
<td>- Square</td>
</tr>
<tr>
<td>- Rectangle</td>
<td>- Rectangle</td>
</tr>
<tr>
<td>- Circle</td>
<td>- Circle</td>
</tr>
<tr>
<td>- Triangle</td>
<td>- Triangle</td>
</tr>
<tr>
<td>- Parallelogram</td>
<td>- Parallelogram</td>
</tr>
<tr>
<td>- Trapezium</td>
<td>- Trapezium</td>
</tr>
<tr>
<td>- Hexagon</td>
<td>- Hexagon</td>
</tr>
<tr>
<td>The volume of the following geometric objects are calculated:</td>
<td>Calculate the volume of the following geometric objects:</td>
</tr>
<tr>
<td>- Cubes</td>
<td>- Cubes</td>
</tr>
<tr>
<td>- Rectangular prisms</td>
<td>- Rectangular prisms</td>
</tr>
<tr>
<td>- Cylinders</td>
<td>- Cylinders</td>
</tr>
<tr>
<td>- Triangular prisms</td>
<td>- Triangular prisms</td>
</tr>
<tr>
<td>- Hexagonal prisms</td>
<td>- Hexagonal prisms</td>
</tr>
</tbody>
</table>
| The effect on area of laminas where one or | Investigate the effect on area of laminas where...
more dimensions are multiplied by a constant factor $k$ is investigated.
- The effect on the volume and surface area of right prisms and cylinders, where one or more dimensions are multiplied by a constant factor $k$ is investigated.

• Investigate the effect on the volume and surface area of right prisms and cylinders, where one or more dimensions are multiplied by a constant factor $k$.

### ASSESSMENT TASKS OR ACTIVITIES
- Draw and cut out exercises/practicals using nets of prisms.
- Tests
- Assignments
- Internal examination

### SUBJECT OUTCOME

#### 3.3 Use the Cartesian co-ordinate system to derive and apply equations.

<table>
<thead>
<tr>
<th>ASSESSMENT STANDARD</th>
<th>LEARNING OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Cartesian co-ordinate system is used to:</td>
<td>• Use the Cartesian co-ordinate system to plot points, lines and polygons.</td>
</tr>
<tr>
<td>• Plot points, lines and polygons.</td>
<td>• Use the Cartesian co-ordinate system to calculate the distance between two points.</td>
</tr>
<tr>
<td>• Calculate the distance between two points.</td>
<td>• Use the Cartesian co-ordinate system to find the gradient of the line joining two points.</td>
</tr>
<tr>
<td>• Calculate the gradient of a line segment joining two points.</td>
<td>• Use the Cartesian co-ordinate system to find the co-ordinates of the midpoint of a line segment joining two points.</td>
</tr>
<tr>
<td>• Calculate co-ordinates of the midpoint of a line segment joining two points.</td>
<td></td>
</tr>
</tbody>
</table>

### ASSESSMENT TASKS OR ACTIVITIES
- Practical exercises
- Assignments
- Tests
- Internal examination

### SUBJECT OUTCOME

#### 3.4 Use and apply transformations to plot co-ordinates.

<table>
<thead>
<tr>
<th>ASSESSMENT STANDARD</th>
<th>LEARNING OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>The coordinates of the point $(x; y)$ is found after translating $p$ units horizontally and $q$ units vertically.</td>
<td>• Find the coordinates of the point $(x; y)$ after it is translated $p$ units horizontally and $q$ units vertically.</td>
</tr>
<tr>
<td>The coordinates of the point $(x; y)$ is found after reflecting about the $x$-axis, the $y$-axis, and the line $y = x$ and the line $y = -x$.</td>
<td>• Find the coordinates of the point $(x; y)$ after it is reflected about the $x$-axis, the $y$-axis, and the line $y = -x$ and the line $y = x$.</td>
</tr>
</tbody>
</table>

### ASSESSMENT TASKS OR ACTIVITIES
- Practical exercises
- Assignments
- Tests
- Internal examination

### SUBJECT OUTCOME

#### 3.5 Solve problems by constructing and interpreting geometrical models.

<table>
<thead>
<tr>
<th>ASSESSMENT STANDARD</th>
<th>LEARNING OUTCOME</th>
</tr>
</thead>
</table>
• The relationship between the sides of a right-angled triangle to develop the Theorem of Pythagoras is investigated.
• The Theorem of Pythagoras is used to calculate a missing length in a right-angled triangle leaving answers in the most appropriate form.

- Investigate the relationship between the sides of a right-angled triangle to develop the Theorem of Pythagoras.
- Use the Theorem of Pythagoras to calculate a missing length in a right-angled triangle leaving answers in the most appropriate form.

ASSESSMENT TASKS OR ACTIVITIES

• Practical exercises
• Assignments
• Tests
• Internal examination

SUBJECT OUTCOME

3.6 Solve problems by constructing and interpreting trigonometric models.

<table>
<thead>
<tr>
<th>ASSESSMENT STANDARD</th>
<th>LEARNING OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following trigonometric functions are defined and used: ( \sin \theta ); ( \cos \theta ); ( \tan \theta );</td>
<td>Define and use the following trigonometric functions: ( \sin \theta ); ( \cos \theta ); ( \tan \theta );</td>
</tr>
<tr>
<td>Trigonometric ratios in each of the quadrants are calculated where one ratio in that quadrant is given</td>
<td>Calculate trigonometric ratios in each of the quadrants where one ratio in that quadrant is given</td>
</tr>
<tr>
<td>e.g. If ( \sin \theta = \frac{3}{5} ) and ( 90^\circ \leq \theta \leq 180^\circ ), determine ( \cos \theta ) and ( \tan \theta )</td>
<td>e.g. If ( \sin \theta = \frac{3}{5} ) and ( 90^\circ \leq \theta \leq 180^\circ ), determine ( \cos \theta ) and ( \tan \theta )</td>
</tr>
<tr>
<td>Problems in two dimensions are solved by using the trigonometric functions ( \sin \theta ); ( \cos \theta ); ( \tan \theta )</td>
<td>Solve problems in two dimensions by using the trigonometric functions ( \sin \theta ); ( \cos \theta ); ( \tan \theta )</td>
</tr>
<tr>
<td>Range: Problem solving to include but not limited to; scale drawings, maps and building plans.</td>
<td>Express an appreciation of the contribution to the history of the development and the use of geometry and trigonometry by various cultures.</td>
</tr>
<tr>
<td>An appreciation of the contribution to the history of the development and the use of geometry and trigonometry by various cultures is expressed</td>
<td></td>
</tr>
<tr>
<td>(Not to be examined, delivered by means of a presentation by the lecturer or completed as a project)</td>
<td></td>
</tr>
</tbody>
</table>

ASSESSMENT TASKS OR ACTIVITIES

• Research project
• Practical exercises
• Assignments
• Tests
• Internal examination

Topic 4: Data Handling

SUBJECT OUTCOME
4.1 Calculate central tendencies and dispersion of data.

**ASSESSMENT STANDARD**

- Central tendency of ungrouped data namely the mean, median and mode are calculated.
- Measures such as range, percentiles, quartiles, inter-quartile range and semi-inter-quartile range are calculated.

**LEARNING OUTCOME**

- Calculate central tendency of ungrouped data namely the mean, median and mode.
- Calculate measures of dispersion including range, percentiles, quartiles, inter-quartile range and semi-inter-quartile range.

**ASSESSMENT TASKS OR ACTIVITIES**

- Practical project
- Test
- Assignment
- Internal examination

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4.2 Represent data effectively.

**ASSESSMENT STANDARD**

- Data is effectively represented using an appropriate form
  - Construction of Frequency Distribution/Tally Chart
  - Bar and compound bar graphs;
  - Construction of the stem and leaf plot;
  - Histograms (grouped data);
  - Frequency polygons;
  - Pie charts;
  - Line and broken line graphs.

**LEARNING OUTCOME**

- Represent data effectively, choosing appropriately from:
  - Construction of Frequency Distribution/Tally Chart
  - Bar and compound bar graphs;
  - Construction of the stem and leaf plot;
  - Histograms (grouped data);
  - Frequency polygons;
  - Pie charts;
  - Line and broken line graphs.

**ASSESSMENT TASKS OR ACTIVITIES**

- Research project
- Test
- Assignment
- Internal examination

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**TOPIC 5: Financial Mathematics**

**SUBJECT OUTCOME**

5.1 Plan and manage personal and household finances.

**ASSESSMENT STANDARD**

- Financial concepts related to personal finances, methods of financing and financial control are described.
- Different financial concepts are described.  
  Range: Budget , expense , fixed expense , variable expense , salary , needs , wants , debit card , credit card , bank fees , variance , short term investment , savings accounts , cheque accounts , cheque book , stokvels , medium term investments , unit trusts , fixed deposits , endowments , long term

**LEARNING OUTCOME**

- Describe financial concepts related to personal finances, methods of financing and financial control.
- Draw up a projected personal and household monthly budget.
- Record actual income and expenditure over a period (one month, six months or twelve months) and compare to the projected budget.
- Identify and explain variances between actual and projected figures
- Provide possible corrective methods of
investments, retirement annuities, pension funds, interest, simple interest, compound interest, principle amount, interest rate, mashonisa, hire purchase agreement

- A projected personal and household monthly budget is drawn up.
- Actual income and expenditure over period (one month, six months or twelve months) are recorded and compared to the projected budget.
- Variances are identified and explained.
- Possible corrective methods of financial control are provided.

### ASSESSMENT TASKS OR ACTIVITIES

- Practical Project
- Assignments
- Tests
- Internal examination

### SUBJECT OUTCOME

#### 5.2 Use simple and compound interest to explain and define a variety of situations.

<table>
<thead>
<tr>
<th>ASSESSMENT STANDARD</th>
<th>LEARNING OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple and compound interest are differentiated.</td>
<td>Differentiate between simple and compound interest.</td>
</tr>
<tr>
<td>The advantages and disadvantages of using simple and compound interest in specific situations are explained.</td>
<td>Explain the advantages and disadvantages of using simple and compound interest in specific situations.</td>
</tr>
<tr>
<td>The simple growth formula ( A = P(1 + i n) ) is used and manipulated to solve problems.</td>
<td>Use and manipulate the simple growth formula ( A = P(1 + i n) ) to solve problems.</td>
</tr>
<tr>
<td>The compound growth formula is used and manipulated to solve problems subject to only annual compounding being made.</td>
<td>Use and manipulate the compound growth formula ( A = P(1 + i)^n ) to solve problems subject to only annual compounding being made.</td>
</tr>
</tbody>
</table>

### ASSESSMENT TASKS OR ACTIVITIES

- Practical projects
- Assignments
- Tests
- Internal examination
2. SPECIFICATIONS FOR THE EXTERNAL ASSESSMENT IN MATHEMATICS – LEVEL 2

A National Examination is conducted in October or November each year by means of a paper(s) set and moderated externally. The examination will be structured as follows:

<table>
<thead>
<tr>
<th>LEVEL 2</th>
<th>KNOWLEDGE 20%</th>
<th>COMPREHENSION AND APPLICATION 60%</th>
<th>ANALYSIS, SYNTHESIS AND EVALUATION 20%</th>
</tr>
</thead>
</table>

Proposed mark distribution between paper 1 and paper 2 for external examination papers

**Paper 1**

<table>
<thead>
<tr>
<th>TOPICS</th>
<th>MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Numbers</td>
<td>30</td>
</tr>
<tr>
<td>2. Functions and Algebra</td>
<td></td>
</tr>
<tr>
<td>2.1 Functions</td>
<td>25</td>
</tr>
<tr>
<td>2.2 Algebra</td>
<td>25</td>
</tr>
<tr>
<td>5. Financial Mathematics</td>
<td>20</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**Paper 2**

<table>
<thead>
<tr>
<th>TOPICS</th>
<th>MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Space, Shape and Measurement</td>
<td></td>
</tr>
<tr>
<td>3.1 Geometry</td>
<td>30</td>
</tr>
<tr>
<td>3.2 Trigonometry</td>
<td>30</td>
</tr>
<tr>
<td>4. Data Handling</td>
<td>40</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>