SOUTH AFRICAN QUALIFICATIONS AUTHORITY

NSB 10: MATHEMATICAL, PHYSICAL, COMPUTER AND LIFE SCIENCES

Unit Standards for Mathematical Literacy

Level 2, 3 & 4

NQF Level 2

- Demonstrate understanding of rational and irrational numbers, and number systems, within the context of relevant calculations
- Use mathematics to investigate and monitor the financial aspects of personal and community life
- Apply basic knowledge of statistics in order to investigate life and work related problems
- Measure, estimate and calculate physical quantities and explore, describe and represent geometrical relationships in 2-dimensions in different life or workplace contexts
- Work with a range of patterns and functions to solve problems

NQF Level 3

- Demonstrate understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations
- Use mathematics to investigate and monitor the financial aspects of personal and business issues
- Investigate life and work related problems using data and probabilities
- Measure, estimate and calculate physical quantities and explore, describe and represent, interpret and justify geometrical relationships in two and three-dimensional space relevant to the life or workplace of the community

NQF Level 4

- Use mathematics to investigate and monitor the financial aspects of personal, business, and national issues
- Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings on life-related problems
- Measure, estimate and calculate physical quantities and explore, critique and prove geometrical relationships in two and three-dimensional space in the life and workplace of the adult with increasing responsibilities

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SAQA ID. No. 8982

Title: Demonstrate understanding of rational and irrational numbers, and number systems, within the context of relevant calculations

Level: 2

Credit: 3

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date: 10 October 2001

Review Date: 10 October 2004

Learning Assumptions: The credit value is based on the assumption that people starting to learn towards this unit standard are competent in Mathematics and Communications at NQF level 1.

Purpose: This unit standard is designed to provide credits towards the mathematical literacy requirements of the NQF at level 2. The essential purposes of the mathematical literacy requirements are that, as the learner progresses with confidence through the levels, the learner will grow in:

- An insightful use of mathematics in the management of the needs of everyday living to become a self-managing person
- An understanding of mathematical applications that provides insight into the learner's present and future occupational experiences and so develop into a contributing worker
- The ability to voice a critical sensitivity to the role of mathematics in a democratic society and so become a participating citizen.

People credited with this unit standard are able to:

- Demonstrate understanding of and carry out calculations with rational and irrational numbers.
- Demonstrate knowledge and understanding of different representations of rational numbers.
- Demonstrate understanding of and use scientific notation.

Range statement: This unit standard includes the use of technology such as calculators.

Specific Outcomes and Assessment Criteria

specific outcome 1: **Demonstrate understanding of and carry out calculations with rational numbers and irrational numbers**

Range: this outcome includes the need to:

- *Use technology such as calculators;*
- *Demonstrate understanding of mathematical relationships and principles involved in computations;*
- *Approximate irrational numbers to rational numbers in calculations.*

assessment criteria

1.1 Decisions about the use of a calculation tool to solve problems are reasonable.

1.2 Computational tools are used effectively and correctly.

1.3 Results of calculations are predicted and verified by estimation.

1.4 Solutions obtained are verified in terms of the context or problems.

1.5 Computational procedures (algorithms) are executed correctly on different calculation tools.

1.6 Calculation procedures (algorithms) used are explained and justified.

specific outcome 2: **Demonstrate knowledge and understanding of the different representations of rational numbers**

Range: this outcome includes the need to:

- *Work with percentages, common fractions, decimal fractions, exponential notation (e.g., $3^2/4^2$).*

assessment criteria:

2.1 Common fractions are correctly written as decimal fractions and vice versa.

2.2 Rational numbers are written in exponential notation.

2.3 The appropriate equivalent representation of rational numbers is used in calculations.

2.4 Calculations procedures (algorithms) are explained and justified.

specific outcome 3: **Demonstrate understanding of and use scientific notation**

Range: this outcome includes the need to:

- *Use of computational tools with different conventions for representing exponential and scientific notation.*
- *Demonstrate understanding of mathematical relationships and principles involved in computations.*
- *Find rational approximations to irrational numbers.*

assessment criteria

3.1 Very large and small numbers are converted to scientific notation correctly.

3.2 Scientific notation is interpreted and used appropriately in real life contexts.

3.3 Numbers are rounded off appropriate to context.

Accreditation Option: Providers of learning towards this unit standard will need to meet the accreditation requirements of the GENFETQA.

Moderation Option: The moderation requirements of the GENFETQA must be met in order to award credit to learners for this unit standard.

Notes:

Critical Cross-Field Outcomes:

This unit standard promotes, in particular, the following critical cross-field outcomes:

- Collect, analyse, organise and critically evaluate information:
  Gather, organise, and describe numerical information.
- Communicate effectively:
  Use everyday language and mathematical language to describe relationships, processes and problem solving methods.
- Use mathematics:
  Use mathematics to, describe and represent realistic situations and to life and work related problems solve problems.

Embedded knowledge

The following essential embedded knowledge will be assessed through assessment of the specific outcomes in terms of the stipulated assessment criteria. Candidates are unlikely to achieve all the specific outcomes, to the standards described in the assessment criteria, without knowledge of the listed embedded knowledge. This means that the possession or lack of the knowledge can be inferred directly from the quality of the candidate's performance against the standards.

- Number systems
- Rational and irrational numbers
- Estimation and approximation

Notes to assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments against this unit standard:

- Focus the assessment activities on gathering evidence in terms of the main outcome expressed in the title to ensure assessment is integrated rather than fragmented. Remember we want to declare the person competent in terms of the title. Where

assessment at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes.

- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- Do not focus the assessment activities on each assessment criterion. Rather make sure the assessment activities focus on outcomes and are sufficient to enable evidence to be gathered around all the assessment criteria.
- The assessment criteria provide the specifications against which assessment judgments should be made. In most cases, knowledge can be inferred from the quality of the performances, but in other cases, knowledge and understanding will have to be tested through questioning techniques. Where this is required, there will be assessment criteria to specify the standard required.
- The task of the assessor is to gather sufficient evidence, of the prescribed type and quality, as specified in this unit standard, that the candidate can achieve the outcomes again and again and again. This means assessors will have to judge how many repeat performances are required before they believe the performance is reproducible.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent.

SAQA ID. No. 8983

Title: Use mathematics to investigate and monitor the financial aspects of personal and community life

Level:	2
Credit:	2
Field:	Mathematical, Physical, Computer and Life Sciences
Sub-Field:	Mathematical Sciences
Issue Date:	10 October 2001
Review Date:	10 October 2004
Learning Assumptions:	The credit value is based on the assumption that people starting to learn towards this unit standard are competent in Mathematics and Communications at NQF level 1.

Purpose: This Unit Standard is designed to provide credits towards the mathematical literacy requirement of the NQF at Level 2. The essential purposes of the mathematical literacy requirement are that, as the learner progresses with confidence through the levels, the learner will grow in:

- a confident, insightful use of mathematics in the management of the needs of everyday living to become a self-managing person
- an understanding of mathematical applications that provides insight into the learner's present and future occupational experiences and so develop into a contributing worker
- the ability to voice a critical sensitivity to the role of mathematics in a democratic society and so become a participating citizen.

People credited with this unit standard are able to:

- Use mathematics to plan and control personal and other small budgets and income and expenditure.
- Use simple and compound interest to make sense of and define a variety of situations.
- Investigate various aspects of financial transactions.

Range statement: Range statements are provided for specific outcomes and assessment criteria as needed.

Specific Outcomes and Assessment Criteria

specific outcome 1: **Use mathematics to plan and control personal and other small budgets and income and expenditure**

Range: The mathematics associated with relevant financial situations which includes the use of:

- *ratio and proportion; percentages; various representations of functions; behaviour of functions; data-analysis;*
- *small budgets such as household, school or workplace club or project.*

assessment criteria

1.1 Plans describe projected income and expenditure realistically.

1.2 Calculations are carried out using computational tools efficiently and correctly and solutions obtained are verified in terms of the context.

1.3 Ratio, proportion and percentage calculations are used effectively to plan budgets.

1.4 Actual income and expenditure is recorded accurately and in relation to planned income and expenditure. Variances are identified and explained and methods are provided for control.

specific outcome 2: **Use simple and compound interest to make sense of and define a variety of situations**

Range: the mathematics associated with situations that include:

- *investments, stokvels, inflation, appreciation and depreciation;*
- *situations relevant to the learner.*

assessment criteria

2.1 Methods of calculation are appropriate to the problem types.

2.2 The differences between simple and compound interest are described in terms of their rates of change, different functional representations, common applications and effects.

2.3 Computational tools are used efficiently and correctly and solutions obtained are verified in terms of the context or problem.

2.4 Solutions to calculations are used effectively to define the changes over a period of time.

2.5 Appropriate formulae are used, with understanding, to calculate solutions to problems.

specific outcome 3: **Investigate various aspects of financial transactions**

Range: the mathematics of transactions including:
- *costs, prices, cost price, selling price, loss and profit;*
- *those related to experiences appropriate to the learner such as making and marketing a product in school or workplace contexts*

assessment criteria

3.1 Values are calculated correctly from various functional representations.
Range: Representations include tables, graphs, formulae and verbal descriptions.

3.2 Mathematical tools and systems are used effectively to determine and describe the relationships between the various transactions.

3.3 Mathematical justifications are provided for the control of costs and the maximising of profits in relation to given data.

Accreditation Option: Providers of learning towards this unit standard will need to meet the accreditation requirements of the GENFETQA.

Moderation Option: The moderation requirements of the GENFETQA must be met in order to award credit to learners for this unit standard.

Notes:

Critical Cross Field Outcomes:
This unit standard promotes, in particular, the following critical cross-field outcomes:
- Identify and solve problems using critical and creative thinking:
  Solve a variety of numerical and financial problems related to the experiences of the learner.
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, and interpret financial information to plan and make provision for monitoring personal and small budgets and other financial situations.
- Communicate effectively:
  Use everyday language and mathematical language to describe relationships, processes and problem solving methods in relation to financial transactions relevant to the learner.
- Use mathematics:
  Use mathematics to analyse, describe, represent and solve problems related to financial situations and to solve problems. relevant for the learner.

Embedded knowledge

The following essential embedded knowledge will be assessed through assessment of the specific outcomes in terms of the stipulated assessment criteria. Candidates are unlikely to achieve all the specific outcomes, to the standards described in the assessment criteria, without knowledge of the listed embedded knowledge. This means that the possession or lack of the knowledge can be inferred directly from the quality of the candidate's performance against the standards.

- Income and expenditure
- Budgetary control
- Percentage, rates, ratio and proportion
- Terminology and definitions associated with financial situations
- Compound growth
- Estimation and approximation

Notes to assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments against this unit standard:

- Focus the assessment activities on gathering evidence in terms of the main outcome expressed in the title to ensure assessment is integrated rather than fragmented. Remember we want to declare the person competent in terms of the title. Where assessment at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- Do not focus the assessment activities on each assessment criterion. Rather make sure the assessment activities focus on outcomes and are sufficient to enable evidence to be gathered around all the assessment criteria.
- The assessment criteria provide the specifications against which assessment judgements should be made. In most cases, knowledge can be inferred from the quality of the performances, but in other cases, knowledge and understanding will have to be tested through questioning techniques. Where this is required, there will be assessment criteria to specify the standard required.
- The task of the assessor is to gather sufficient evidence, of the prescribed type and quality, as specified in this unit standard, that the candidate can achieve the outcomes again and again and again. This means assessors will have to judge how many repeat performances are required before they believe the performance is reproducible.

All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent.

SAQA ID No. 9009

Title 2003:	**Apply basic knowledge of statistics in order to investigate life and work related problems**

Level:	2
Credit:	3
Field:	Mathematical, Physical, Computer and Life Sciences
Sub-Field:	Mathematical Sciences
Issue Date:	10 October 2001
Review Date:	10 October 2004

Learning Assumptions: The credit value is based on the assumption that people starting to learn towards this unit standard are competent in Mathematics and Communications at NQF level 1.

Purpose: This Unit Standard is designed to provide credits towards the mathematical literacy requirement of the NQF at Level 2. The essential purposes of the mathematical literacy requirement are that, as the learner progresses with confidence through the levels, the learner will grow in:

- a confident, insightful use of mathematics in the management of the needs of everyday living to become a self-managing person
- an understanding of mathematical applications that provides insight into the learner's present and future occupational experiences and so develop into a contributing worker
- the ability to voice a critical sensitivity to the role of mathematics in a democratic society and so become a participating citizen

People credited with this Unit Standard are able to:

- Apply various techniques to organise and represent data in order to model situations for specific purposes.
- Give opinions on the implications of the modeled data for the required purpose.

Range statement:

This unit standard includes the requirement to:

- Identify issues suited to resolution by basic statistical methods.
- Work with existing data.
- Generate statistics through the use calculators and other available technology.
- Represent data in the form of tables, charts and graphs.
- Use statistics and representations of data to summarise real-life and or work related issues within the experience of the learner.
- Give opinions on statistics and representations of data.

More detailed range statements are provided for specific outcomes and assessment criteria as needed.

Specific Outcomes and Assessment Criteria

specific outcome 1: **Apply various techniques to organise and represent data in order to model situations for specific purposes**

Range:
Techniques include:

- *using a variety of methods to represent statistics including pie charts, bar graphs, stem and leaf plots;*
- *reading tables (e.g., the meaning of row and column headings and the relationship between them) inclusive of those with three variables (e.g., age by gender by province);*
- *extracting a suitable set of data from tables and databases (e.g., census data, tables in newspapers, HIV data ; weather data);*
- *recording and organising data into tables ;*
- *calculating measures of centre and spread such as mean, median, mode, and range; the use of quartiles in classifying data items ("Measures of centre and spread" should be handled via examples which are directly related to the life or work experiences of each learner. For example workers' wages and learners' test scores.).*

assessment criteria

1.1 Questions about sets of data that can be dealt with through statistical methods are identified correctly.

1.2 Existing tables are understood correctly through a proper applicationn of row and column headings

1.3 Raw data or statistics in the body of tables are used correctly

1.4 Effective methods to record and organise data are used to solve problems.

1.5 Calculations of statistics are correct.

1.6 Appropriate statistics are used to answer questions.

1.7 Scales used in graphical representations and tables are consistent with the data, are correct, clear and appropriate to the situation and target audience.

specific outcome 2: **Give opinions on the implications of the modeled data for the required purpose**

Range: Purposes include:

- *determining trends in societal issues such as crime and health;*
- *identifying relevant characteristics of target groups such as age range, gender, socio-economic group, cultural belief, and performance;*
- *considering the attitudes or opinions of people on current issues relevant to the life experience of the learners;*
- *determining weather patterns for a given region.*

assessment criteria

2.1 Verbal (written or oral) explanation of findings is based on the representation of the data.
2.2 Trends, group profiles and attitudes are justified.
2.3 Appropriate information is extracted from representations in order to answer questions.

Accreditation Option: Providers of learning towards this unit standard will need to meet the accreditation requirements of the GENFETQA.

Moderation Option: The moderation requirements of the GENFETQA must be met in order to award credit to learners for this unit standard.

Notes:

Critical Cross Field Outcomes:
This unit standard promotes, in particular, the following critical cross-field outcomes:

- Identify and solve problems using critical and creative thinking:
  Give opinions, based on data and statistics, on a variety of problems and issues.
- Collect, analyse, organise and critically evaluate information:
  Select organise, and give opinions on statistics to make sense of situations related to the life or work of the learner.
- Communicate effectively:
  Use everyday language and mathematical language to represent data, statistics and probabilities and to communicate conclusions.
- Use mathematics:
  Use mathematics to describe and represent situations and to solve life related problems.

Embedded knowledge

The following essential embedded knowledge will be assessed through assessment of the specific outcomes in terms of the stipulated assessment criteria. Candidates are unlikely to achieve all the specific outcomes, to the standards described in the assessment criteria, without knowledge of the listed embedded knowledge. This means that the possession or lack of the knowledge can be inferred directly from the quality of the candidate's performance against the standards.

- Methods for selecting, organising data and calculating statistics
- The meaning of concepts such as centre and spread
- Techniques for representing and drawing conclusions from statistics

Notes to assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments against this unit standard:

- Focus the assessment activities on gathering evidence in terms of the main outcome expressed in the title to ensure assessment is integrated rather than fragmented. Remember we want to declare the person competent in terms of the title. Where assessment at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- Do not focus the assessment activities on each assessment criterion. Rather make sure the assessment activities focus on outcomes and are sufficient to enable evidence to be gathered around all the assessment criteria.
- The assessment criteria provide the specifications against which assessment judgements should be made. In most cases, knowledge can be inferred from the quality of the performances, but in other cases, knowledge and understanding will have to be tested through questioning techniques. Where this is required, there will be assessment criteria to specify the standard required.
- The task of the assessor is to gather sufficient evidence, of the prescribed type and quality, as specified in this unit standard, that the candidate can achieve the outcomes again and again and again. This means assessors will have to judge how many repeat performances are required before they believe the performance is reproducible.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent.

SAQA ID No. 9008

Title: Measure, estimate and calculate physical quantities and explore, describe and represent geometrical relationships in 2-dimensions in different life or workplace contexts.

Level: 2

Credit: 3

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date: 10 October 2001

Review Date: 10 October 2004

Learning Assumptions: The credit value is based on the assumption that people starting to learn towards this unit standard are competent in Mathematics and Communications at NQF level 1.

Purpose: This unit standard is designed to provide credits towards the mathematical literacy requirements of the NQF at level 2. The essential purposes of the mathematical literacy requirements are that, as the learner progresses with confidence through the levels, the learner will grow in:

- An insightful use of mathematics in the management of the needs of everyday living to become a self-managing person.
- An understanding of mathematical applications that provides insight into the learner's present and future occupational experiences and so develop into a contributing worker.
- The ability to voice a critical sensitivity to the role of mathematics in a democratic society and so become a participating citizen.

People credited with this unit standard are able to:

- Estimate, measure and calculate physical quantities in practical situations.
- Explore transformations of two dimensional geometric figures.

Range statement: The scope of this unit standard includes symmetry, transformations; making conjectures; measurement in practical situations and calculations involving plane figures. Situations should preferably be related to the teenager, peer groups and the school or work community.

More detailed range statements are provided for specific outcomes and assessment criteria as needed.

Specific Outcomes and Assessment Criteria

specific outcome 1: **Estimate, measure and calculate physical quantities to solve problems in practical situations**

Range:

- *Basic instruments to include those readily available such as rulers, measuring tapes, measuring cylinders or jugs, thermometers, spring or kitchen balances, watches and clocks.*
- *Quantities to estimate or measure to include length, mass, time and temperature*
- *The quantities should range from the low or small to the high or large*
- *Mass, volume and temperature values are used in practical situations relevant to learners or the workplace*
- *Calculate lengths using Pythagoras' theorem*
- *Calculate perimeters and areas of rectangles, parallelograms, circles, trapesia, from measurements in practical situations*
- *Use rough sketches to interpret represent and describe situations.*
- *Use and interpret scale drawings of plans (e.g., teenager rooms, factory floors; in painting walls, designing gardens).*
- *SI units to be used but conversions from imperial to SI included.*

assessment criteria

1.1 Scales on the measuring instruments are read correctly.

1.2 Quantities are estimated to a tolerance acceptable in the context of the estimation.

1.3 The appropriate instrument is chosen to measure a particular quantity.

1.4 Calculations are carried out correctly.

1.5 Appropriate units are used in measurement and calculation.

1.6 Rough sketches are interpreted or used correctly to represent and describe situations.

1.7 Scales are used correctly in interpreting and describing situations through scale diagrams.

specific outcome 2: **Explore transformations of two dimensional geometric figures .**

Range:

- *Use parallelism, symmetry, translation, reflection and rotation in describing artifacts.*
- *Make conjectures about mathematical relationships found in artifacts .*
- *Use transformations and symmetry in describing objects*
- *Use transformations and symmetry in designing patterns in 2 dimensions (e.g., tessellations, dress material, logos) of interest to teenagers.*

assessment criteria

2.1 Properties of symmetrical shapes are recognised and described.

2.2 The concept of lines of symmetry in 2-dimensional figures is explored using paper folding and reflections in the lines of symmetry.

2.3 The concept of transformation in terms of reflections, translations and rotations is identified and explained using concrete materials.

2.4 The descriptions are based on correct application of transformations and other geometrical properties.

2.5 Designs, based on transformations and other geometrical properties are innovative, and correct geometrically.

Accreditation Option: Providers of learning towards this unit standard will need to meet the accreditation requirements of the GENFETQA.

Moderation Option: The moderation requirements of the GENFETQA must be met in order to award credit to learners for this unit standard.

Notes:

Critical Cross Field Outcomes:

This unit standard promotes, in particular, the following critical cross-field outcomes:

- Identify and solve problems using critical and creative thinking:
  Solve a variety of problems relevant to the learner involving physical quantities and time using geometrical techniques
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, and interpret information about objects and processes.
- Communicate effectively:
  Use everyday language and mathematical language and drawing or geometrical diagrams to describe geometric and other physical properties, and processes relevant to the learner and the workplace.
- Use mathematics:
  Use mathematics to describe and represent realistic situations and to solve practical problems.

Embedded knowledge

The following essential embedded knowledge will be assessed through assessment of the specific outcomes in terms of the stipulated assessment criteria. Candidates are unlikely to achieve all the specific outcomes, to the standards described in the assessment criteria, without knowledge of the listed embedded knowledge. This means that the possession or lack of the knowledge can be inferred directly from the quality of the candidate's performance against the standards.

- Properties of geometric shapes
- Length, area, mass, temperature, time
- Scale drawing

Notes to assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments against this unit standard:

- Focus the assessment activities on gathering evidence in terms of the main outcome expressed in the title to ensure assessment is integrated rather than fragmented. Remember we want to declare the person competent in terms of the title. Where assessment at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- Do not focus the assessment activities on each assessment criterion. Rather make sure the assessment activities focus on outcomes and are sufficient to enable evidence to be gathered around all the assessment criteria.
- The assessment criteria provide the specifications against which assessment judgements should be made. In most cases, knowledge can be inferred from the quality of the performances, but in other cases, knowledge and understanding will have to be tested through questioning techniques. Where this is required, there will be assessment criteria to specify the standard required.
- The task of the assessor is to gather sufficient evidence, of the prescribed type and quality, as specified in this unit standard, that the candidate can achieve the outcomes again and again and again. This means assessors will have to judge how many repeat performances are required before they believe the performance is reproducible.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent.

SAQA ID No. 9007

Title:	**Work with a range of patterns and functions to solve problems**

Level:	2
Credit:	5
Field:	Mathematical, Physical, Computer and Life Sciences
Sub-Field:	Mathematical Sciences
Issue Date:	10 October 2001
Review Date:	10 October 2004
Learning Assumptions:	The credit value is based on the assumption that people starting to learn towards this unit standard are competent in Mathematics and Communications at NQF level 1.

Purpose: This unit standard is designed to provide credits towards the mathematical literacy requirements of the NQF at level 2. The essential purposes of the mathematical literacy requirements are that, as the learner progresses with confidence through the levels, the learner will grow in:

- An insightful use of mathematics in the management of the needs of everyday living to become a self-managing person
- An understanding of mathematical applications that provides insight into the learner's present and future occupational experiences and so develop into a contributing worker
- The ability to voice a critical sensitivity to the role of mathematics in a democratic society and so become a participating citizen.

People credited with this unit standard are able to:

- Convert flexibly between and within various representations of functions.
- Compare, analyse and describe the behaviour of patterns and functions.
- Represent situations mathematically in order to interpret and solve problems.

Range statement: This unit standard includes the requirement to:

- Use algebraic notiation to express generality.
- Make conjectures, demonstrate and explain their validity.
- Recognise equivalence among expressions and situations resulting from manipulation and rearrangement to forms appropriate for solving problems.
- Work with:
  - functions for which there are rules and for which there are no rules;
  - functions that are discrete (rules and no rules);
  - functions that are continuous (rules and no rules).
- Investigate, and interpret graphs of situations with regard to the following:
  - increasing / decreasing,
  - maxima / minima,
  - continuous / discrete,
  - rate of change,
  - intercepts,
  - interpolation / extrapolation.

  (The above must be done in relation to the contexts in which the functions are acting as models.)
- Work with the following basic functions: $y = ax + b$; $y = ax^2 + b$; $y = a^x$; $xy = k$,

  in terms of their:
  - shape and symmetry,
  - finding function values,
  - finding input values,
  - analysing the behaviour of function values (the rate of change).
- Represent, interpret and solve problems that relate to these functions by using point by point plotting and numerical analysis.
- Convert flexibly among various representations of the above functions (i.e., words, tables, formulae, graphs).

Learners are not expected to master each concept and procedure when they first encounter it, but rather to continually develop their mathematical understandings through encounters with mathematical models of realistic situations.
The contexts and situations should be used to develop a critical awareness of human rights, social, economic, political, cultural and environmental issues.
Examples of the power of modeling as a descriptive tool to describe situations between two variables and as an analytic tool to gain additional information about the situation must be developed.

Specific Outcomes and Assessment Criteria

specific outcome 1: **Convert flexibly between and within various representations of functions**

Range: *This outcome includes the requirement to:*

- *Translate from one representation to another (i.e. verbal, tables, formulae, graphs).*
- *Deal with situations involving the range of functions specified in the main range statement as well as functions for which there is no rule.*

assessment criteria

1.1 Appropriate information is selected to convert flexibly between and within various representations of functions.

1.2 Appropriate representations are selected for specific applications.

1.3 Conversions represent the functions accurately and appropriately.

specific outcome 2: **Compare, analyse and describe the behaviour of patterns and functions**

Range:This outcome includes the requirement to work with functions.

- *Identify, contrast and compare the features of the functions listed in the main range statement as well as functions for which there are no rules.*
- *Recognise equivalent forms of an expression, equation or function.*

assessment criteria

2.1 Patterns and functions are compared in terms of:
- shape and symmetry,
- finding function values,
- finding input values,
- the average rate of change of function values.

2.2 The key features of the graphs of functions are described and interpreted correctly.

2.3 The behaviour of functions is described as being increasing or decreasing or constant as determined visually from graphical representations.

specific outcome 3: **Represent situations mathematically in order to interpret and solve problems**

Range: *This outcome includes the requirement to:*

- *Use expressions, functions and equations to represent situations.*
- *Develop strategies for deciding whether symbolic representations are reasonable and interpret such results.*

assessment criteria

3.1 Accurate point by point plotting is used to model contextual problems.

3.2 Appropriate symbolic representations are used to model contextual problems.

3.3 Representations are analysed and manipulated efficiently in arriving at results.

3.4 Representations are verified in terms of available data.

3.5 Results are interpreted correctly in terms of the situation.

3.6 Interpretations and predictions are based on the properties of the mathematical model.

Accreditation Option: Providers of learning towards this unit standard will need to meet the accreditation requirements of the GENFETQA.

Moderation Option: The moderation requirements of the GENFETQA must be met in order to award credit to learners for this unit standard.

Notes:

Critical Cross Field Outcomes:
This unit standard promotes, in particular, the following critical cross-field outcomes:

- Identify and solve problems using critical and creative thinking:
  Solve a variety of problems based on patterns and functions.
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, evaluate and interpret information to compare and represent relationships and functions.
- Communicate effectively:
  Use everyday language and mathematical language to describe relationships, processes and problem solving methods.
- Use mathematics:
  Use mathematics to, describe and represent realistic and abstract situations and to solve problems.

Embedded knowledge
The following essential embedded knowledge will be assessed through assessment of the specific outcomes in terms of the stipulated assessment criteria. Candidates are unlikely to achieve all the specific outcomes, to the standards described in the assessment criteria, without knowledge of the listed embedded knowledge. This means that the possession or

lack of the knowledge can be inferred directly from the quality of the candidate's performance against the standards.

- Relationships between variables
- Mathematical functions
- Representations of functions and relations.

Notes to assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments against this unit standard:

- Focus the assessment activities on gathering evidence in terms of the main outcome expressed in the title to ensure assessment is integrated rather than fragmented. Remember we want to declare the person competent in terms of the title. Where assessment at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- Do not focus the assessment activities on each assessment criterion. Rather make sure the assessment activities focus on outcomes and are sufficient to enable evidence to be gathered around all the assessment criteria.
- The assessment criteria provide the specifications against which assessment judgements should be made. In most cases, knowledge can be inferred from the quality of the performances, but in other cases, knowledge and understanding will have to be tested through questioning techniques. Where this is required, there will be assessment criteria to specify the standard required.
- The task of the assessor is to gather sufficient evidence, of the prescribed type and quality, as specified in this unit standard, that the candidate can achieve the outcomes again and again and again. This means assessors will have to judge how many repeat performances are required before they believe the performance is reproducible.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent.

SAQA ID No. 9010

Title: Demonstrate understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations

Level:	3
Credit:	2
Field:	Mathematical, Physical, Computer and Life Sciences
Sub-Field:	Mathematical Sciences
Issue Date:	10 October 2001
Review Date:	10 October 2004
Learning Assumptions:	The credit value is based on the assumption that people starting to learn towards this unit standard are competent in Mathematical Literacy and Communications at NQF level 2.

Purpose: This unit standard is designed to provide credits towards the mathematical literacy requirements of the NQF at level 2. The essential purposes of the mathematical literacy requirements are that, as the learner progresses with confidence through the levels, the learner will grow in:

- An insightful use of mathematics in the management of the needs of everyday living to become a self-managing person
- An understanding of mathematical applications that provides insight into the learner's present and future occupational experiences and so develop into a contributing worker
- The ability to voice a critical sensitivity to the role of mathematics in a democratic society and so become a participating citizen.

People credited with this unit standard are able to:

- Convert numbers between the decimal number system and binary number system
- Work with numbers in different ways to express size/ magnitude.
- Demonstrate the effect of error in calculations.

Range statement: This unit standard covers:

Approximation in relation to the use of computing technologies, the distinction between exact and approximate answers in a variety of problem settings.

More detailed range statements are provided for specific outcomes and assessment criteria as needed.

Specific Outcomes and Assessment Criteria

specific outcome 1: **Convert numbers between the decimal number system and the binary number system**

Range: this outcome includes the need to:

- *Perform addition and subtraction of positive whole numbers in binary up to 10000_2 (16 in decimal).*
- *Demonstrate understanding of the mathematical relationships and principles involved in the computations.*

assessment criteria:

1.1 Conversion between binary and decimal numbers is done correctly.

1.2 Basic addition and subtraction calculations in the binary number system are done correctly.
Range: Using positive whole numbers up to the16 in decimal.

1.3 Practical applications of the decimal and binary system are explained correctly.

specific outcome 2: **Work with numbers in different ways to express size and magnitude**

Range: this outcome includes the need to:

- *Use scientific notation for small and large numbers*

assessment criteria:

2.1 The prefixes indicating magnitude in measurements are correctly related to the decimal system.
Range: From Giga to Pico (10^{12} to 10^{-12})

2.2 Conversions between related units in different measurement systems are correctly applied in real-life contexts.
Range: SI to Imperial; Degrees F to degrees C.

specific outcome 3: **Demonstrate the effect of error in calculations**

Range: this outcome includes the need to:
- *Work with rational and irrational numbers.*
- *Explore repeating decimals and convert them to common fraction form*
- *Use scientific notation for small and large numbers*

assessment criteria:

3.1 Symbols for irrational numbers such as π and $\sqrt{2}$ are left in formulae or steps to calculations except where approximations are required.

3.2 Descriptions are provided of the effect of rounding prematurely in calculations.

3.3 The desired degree of accuracy is determined in relation to the practical context.

3.4 The final value of a calculation is expressed in terms of the required unit.

Accreditation Option: Providers of learning towards this unit standard will need to meet the accreditation requirements of the GENFETQA.

Moderation Option: The moderation requirements of the GENFETQA must be met in order to award credit to learners for this unit standard.

Notes:

Critical Cross-Field Outcomes:
This unit standard promotes, in particular, the following critical cross-field outcomes:
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, and interpret numerical information.
- Communicate effectively:
  Use everyday language and mathematical language to describe relationships, processes and problem solving methods.
- Use mathematics:
  Use mathematics to, describe and represent realistic situations and to solve problems relevant to the learner.

Embedded knowledge
The following essential embedded knowledge will be assessed through assessment of the specific outcomes in terms of the stipulated assessment criteria. Candidates are unlikely to achieve all the specific outcomes, to the standards described in the assessment criteria, without knowledge of the listed embedded knowledge. This means that the possession or lack of the knowledge can be inferred directly from the quality of the candidate's performance against the standards.

- Number systems and rational and irrational numbers
- Estimation and approximation
- Scientific notation

Notes to assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments against this unit standard:

- Focus the assessment activities on gathering evidence in terms of the main outcome expressed in the title to ensure assessment is integrated rather than fragmented. Remember we want to declare the person competent in terms of the title. Where assessment at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- Do not focus the assessment activities on each assessment criterion. Rather make sure the assessment activities focus on outcomes and are sufficient to enable evidence to be gathered around all the assessment criteria.
- The assessment criteria provide the specifications against which assessment judgments should be made. In most cases, knowledge can be inferred from the quality of the performances, but in other cases, knowledge and understanding will have to be tested through questioning techniques. Where this is required, there will be assessment criteria to specify the standard required.
- The task of the assessor is to gather sufficient evidence, of the prescribed type and quality, as specified in this unit standard, that the candidate can achieve the outcomes again and again and again. This means assessors will have to judge how many repeat performances are required before they believe the performance is reproducible.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent.

SAQA ID. No. 9011

Title:	**Use mathematics to investigate and monitor the financial aspects of personal and business issues**

Level:	3
Credit:	5
Field:	Mathematical, Physical, Computer and Life Sciences
Sub-Field:	Mathematical Sciences
Issue Date:	10 October 2001
Review Date:	10 October 2004

Learning Assumptions: The credit value is based on the assumption that people starting to learn towards this unit standard are competent in Mathematical Literacy and Communications at NQF level 2.

Purpose: This Unit Standard is designed to provide credits towards the mathematical literacy requirement of the NQF at Level 3. The essential purposes of the mathematical literacy requirement are that, as the learner progresses with confidence through the levels, the learner will grow in:

- a confident, insightful use of mathematics in the management of the needs of everyday living to become a self-managing person
- an understanding of mathematical applications that provides insight into the learner's present and future occupational experiences and so develop into a contributing worker
- the ability to voice a critical sensitivity to the role of mathematics in a democratic society and so become a participating citizen.

People credited with this unit standard are able to:

- Use mathematics to investigate and interpret business budgets with respect to income and expenditure.
- Use simple and compound interest to make sense of and define a variety of situations.
- Use mathematics to debate aspects of remuneration in the workplace.

Range statement: Range statements are provided for specific outcomes and assessment criteria as needed.

Specific Outcomes and Assessment Criteria

specific outcome 1: **Use mathematics to investigate and interpret business budgets with respect to income and expenditure**

Range:

- *The mathematics associated with budgets related to small business plans, bank accounts, annual financial statements, salaries and benefits as cost to company, different aspects of tax.*

assessment criteria

1.1 Financial statements are interpreted in order to describe profits and losses realistically.

1.2 Calculations are carried out using computational tools efficiently and correctly and solutions obtained are verified in terms of the context.

1.3 Percentages and ratio are used effectively to compare planned budgets to end of year financial statements.

1.4 Analyses of budgets and financial statements are presented in different ways that makes for easy monitoring and control.
Range: *Presentations include pie-charts, graphs, tables, formulae and verbal descriptions.*

specific outcome 2: **Use simple and compound interest to make sense of and define a variety of situations**

Range

- *The mathematics associated with situations which include effective and nominal rates, appreciation and depreciation.*

assessment criteria

2.1 Methods of calculation are appropriate to the problem types.

2.2 The effect of compound interest quoted as effective or nominal is described in terms of rates of change, different functional representations and common applications.

2.3 Computational tools are used efficiently and correctly and solutions obtained are verified in terms of the context or problem.

2.4 Solutions to calculations are used effectively to define the changes over a period of time.

2.5 Formulae used to calculate solutions to problems are appropriate and used with understanding.

specific outcome 3: **Use mathematics to debate aspects of remuneration in the workplace**

Range:

- *The mathematics associated with wage negotiations, tax, productivity and the equitable distribution of resources.*

assessment criteria

3.1 Values are calculated correctly.

3.2 Mathematical calculations are used to compare, interpret and describe aspects of remuneration.

3.3 Debating points are based on well-reasoned arguments and are supported by mathematical information.

Accreditation Option: Providers of learning towards this unit standard will need to meet the accreditation requirements of the GENFETQA.

Moderation Option: The moderation requirements of the GENFETQA must be met in order to award credit to learners for this unit standard.

Notes:

Critical Cross Field Outcomes:

This unit standard promotes, in particular, the following critical cross-field outcomes:

- Identify and solve problems using critical and creative thinking:
  Solve a variety of numerical and financial problems related to small business.
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, summarise and interpret financial information to plan and make provision for monitoring small business and local community budgets and other financial situations.
- Communicate effectively:
  Use everyday language and mathematical language to describe relationships, processes and problem solving methods in relation to the financial concerns of the adult.
- Use mathematics:
  Use mathematics to interpret, describe and represent financial situations and to solve problems relevant to small business and the adult.

Embedded knowledge

The following essential embedded knowledge will be assessed through assessment of the specific outcomes in terms of the stipulated assessment criteria. Candidates are unlikely to achieve all the specific outcomes, to the standards described in the assessment criteria, without knowledge of the listed embedded knowledge. This means that the possession or lack of the knowledge can be inferred directly from the quality of the candidate's performance against the standards.

- Income and expenditure
- Budgetary control
- Taxation
- Percentage, rates, ratio and proportion
- Terminology and definitions associated with financial situations
- Compound increase and decrease
- Estimation and approximation

Notes to assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments against this unit standard:

- Focus the assessment activities on gathering evidence in terms of the main outcome expressed in the title to ensure assessment is integrated rather than fragmented. Remember we want to declare the person competent in terms of the title. Where assessment at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- Do not focus the assessment activities on each assessment criterion. Rather make sure the assessment activities focus on outcomes and are sufficient to enable evidence to be gathered around all the assessment criteria.
- The assessment criteria provide the specifications against which assessment judgements should be made. In most cases, knowledge can be inferred from the quality of the performances, but in other cases, knowledge and understanding will have to be tested through questioning techniques. Where this is required, there will be assessment criteria to specify the standard required.
- The task of the assessor is to gather sufficient evidence, of the prescribed type and quality, as specified in this unit standard, that the candidate can achieve the outcomes again and again and again. This means assessors will have to judge how many repeat performances are required before they believe the performance is reproducible.

All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent.

SAQAID. No. 9012

Title 3003:	**Investigate life and work related problems using data and probabilities**

Level:	3
Credit:	5
Field:	Mathematical, Physical, Computer and Life Sciences
Sub-Field:	Mathematical Sciences
Issue Date:	10 October 2001
Review Date:	10 October 2004

Learning Assumptions: The credit value is based on the assumption that people starting to learn towards this unit standard are competent in Mathematics and Communications at NQF level 2.

Purpose: This Unit Standard is designed to provide credits towards the mathematical literacy requirement of the NQF at Level 3. The essential purposes of the mathematical literacy requirement are that, as the learner progresses with confidence through the levels, the learner will grow in:

- a confident, insightful use of mathematics in the management of the needs of everyday living to become a self-managing person
- an understanding of mathematical applications that provides insight into the learner's present and future occupational experiences and so develop into a contributing worker
- the ability to voice a critical sensitivity to the role of mathematics in a democratic society and so become a participating citizen

People credited with this Unit Standard are able to:

- Pose questions, collect and organise data.
- Represent and interpret data using various techniques to investigate real-life and work problems.
- Use random events to explore and apply probability concepts in simple life and work related situations.

Range statement: This unit standard includes the requirement to:

- Identify issues suited to resolution by statistical methods
- Select a suitable sample
- Collect and generate data through the use of questionnaires and suitable experiments
- Calculate statistics and probability values through the use of calculators
- Represent data in the form of tables, charts and graphs
- Use statistics and representations of data to argue a resolution of an issue
- Interpret statistics, the use of probabilities, and representations of data
- Determine probability values
- Work with probability in practical situations
- Use available technology (i.e. whatever is available for working with data e.g. pencil and ruler, including spreadsheets, graphical calculators) to fit appropriate curves (e.g., linear, quadratic,) to data

More detailed range statements are provided for specific outcomes and assessment criteria as needed.

Specific Outcomes and Assessment Criteria

specific outcome 1: **Pose questions, collect and organise data**

Range: Techniques include:

- *The selection of a sample from a population with due sensitivity to issues relating to bias.*
- *The formulation and use of questionnaires and interviews to obtain data for specific purposes related to surveys and censuses.*
- *Use of databases to obtain information (e.g., StatsSA for national census data) and data suited to the resolution of particular issues.*
- *Work with different types of measuring instruments and scales such as yes/no (dichotomous) 5 point (Likert), discrete, and continuous variables (e.g., temperature).*
- *Evaluation of data gathering techniques and of data collected so that faults and inconsistencies are identified.(e.g., in cases where a person may be counted more than once such as when collecting STD data).*

Specific purposes include:

- *determining trends in societal issues such as crime and health.*
- *identifying relevant characteristics of target groups such as age, range, gender, socio-economic group, cultural belief, and performance.*
- *predicting the likelihood of the occurrence of events.*
- *considering the attitudes or opinions of people on issues.*

assessment criteria

1.1 Situations or issues that can be dealt with through statistical methods are identified correctly.

1.2 Variables contributing to a problem situation are identified and addressed in data gathering, e.g., crime is related to time of day and location.

1.3 Appropriate and efficient methods are used to collect, record and organise data.

1.4 Data samples are of adequate size and are representative of the population.

specific outcome 2: **Represent, analyse and interpret data using various techniques to investigate real-life and work problems**

Range

- *Calculation of measures of centre and spread such as mean, median, mode, range and inter-quartile range.*

- *Use of scatter plots and intuitively placed lines of best fit to represent the association between two variables.(Regression analysis not included).*
- *Fit curves (e.g., linear and quadratic cases) to predict trends.*
- *Use of a variety of representations applicable to the issue being investigated.*

Specific purposes include:

- *determining trends in societal issues such as crime and health;*
- *identifying relevant characteristics of target groups such as age, range, gender, socio-economic group, cultural belief, and performance;*
- *considering the attitudes or opinions of people on issues.*

assessment Criteria

2.1 Graphical representations and numerical summaries are consistent with the data, are clear and appropriate to the situation and target audience.

2.2 Different representations of aspects of the data are compared to take a position on the issue.

2.3 Calculations and the use of statistics are correct and appropriate to the problem.

2.4 Interpretations of statistics are justified and applied to answer questions about the problem.

2.5 New questions that arise from the modelling of the data are discussed.

specific outcome 3: **Use random events to explore and apply probability concepts in simple life and work related situations**

Range

- *Distinguish outcomes which are equally likely (e.g., spinning a coin, rolling a die) from those that are not (e.g., dropping a drawing pin , spinning a biased coin).*
- *Distinguish between a trial (e.g., a turn at rolling a die), outcome (getting a 6 when the die is rolled) and event (getting any even number when rolling a die – a collection of outcomes).*
- *Interpret probability values expressed as fractions between 0 and 1 or as percentages.*
- *Use the term "odds on" in relation to a probability value (e.g., the odds on getting a 4 when rolling a die are 1 to 5 while the probability of getting a 4 is one sixth).*
- *Distinguish between theoretical (e.g., for a fair coin on the basis of equal liklihood) and experimental probabilities (e.g., for getting a pin to land with its point up or its point down when dropped on the*

basis of relative frequency after a large number of trials).
- *Use tree diagrams in representing and working with events.*
- *Use basic counting techniques to determine the number of ways an event can occur. (The formal use of permutations and combinations not expected.)*
- *Distinguish between situations in which probabilities need to be multiplied from those in which probabilities need to be added (e.g., drawing the ace of hearts and the ace of spades as opposed to drawing one or the other).*
- *Make and test predictions about probability in the context of games ,real-life situations and the work-place*

[Note: straightforward applications relevant to the life or work related experiences of the learners should be chosen]

assessment criteria

3.1 Data are gathered, organised, sorted and classified in a suitable manner for further processing and analysis.
3.2 Experiments and simulations are chosen appropriately in terms of the situation to be investigated.
3.3 Probabilities are determined correctly.
3.4 Distinctions are correctly made between theoretical and experimental probabilities.
3.5 Predictions are based on validated experimental or theoretical probabilities.
3.6 The outcomes of experiments and simulations are communicated clearly.

Accreditation Option: Providers of learning towards this unit standard will need to meet the accreditation requirements of the GENFETQA.

Moderation Option: The moderation requirements of the GENFETQA must be met in order to award credit to learners for this unit standard.

Notes:

Critical Cross Field Outcomes:
This unit standard promotes, in particular, the following critical cross-field outcomes:
- Identify and solve problems using critical and creative thinking:
  Solve a variety of problems or take a position on issues related to the learner based on data, statistics and probability.

- Collect, analyse, organise and critically evaluate information:
  Collect, organise, and interpret data and statistics to make sense of adult situations.
- Communicate effectively:
  Use everyday language and mathematical language to represent data, statistics and probability and to communicate conclusions.
- Use mathematics:
  Use mathematics to , describe and represent and interpret life or work related situations and to solve problems relevant to the learner.

Embedded knowledge

The following essential embedded knowledge will be assessed through assessment of the specific outcomes in terms of the stipulated assessment criteria. Candidates are unlikely to achieve all the specific outcomes, to the standards described in the assessment criteria, without knowledge of the listed embedded knowledge. This means that the possession or lack of the knowledge can be inferred directly from the quality of the candidate's performance against the standards.

- Methods for collecting, organising data and calculating statistics
- The meaning of concepts such as centre and spread
- Techniques for statistically modeling a situation
- Random events, equal likelihood, probability

Notes to assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments against this unit standard:

- Focus the assessment activities on gathering evidence in terms of the main outcome expressed in the title to ensure assessment is integrated rather than fragmented. Remember we want to declare the person competent in terms of the title. Where assessment at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- Do not focus the assessment activities on each assessment criterion. Rather make sure the assessment activities focus on outcomes and are sufficient to enable evidence to be gathered around all the assessment criteria.
- The assessment criteria provide the specifications against which assessment judgements should be made. In most cases, knowledge can be inferred from the quality of the performances, but in other cases, knowledge and understanding will have to be tested through questioning techniques. Where this is required, there will be assessment criteria to specify the standard required.
- The task of the assessor is to gather sufficient evidence, of the prescribed type and quality, as specified in this unit standard, that the candidate can achieve the outcomes again and again and again. This means assessors will have to judge how many repeat performances are required before they believe the performance is reproducible.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent.

SAQA ID. No. 9013

Title:	**Measure, estimate and calculate physical quantities and explore, describe and represent, interpret and justify geometrical relationships in two and three-dimensional space relevant to the life or workplace of the community**
Level:	3
Credit:	4
Field:	Mathematical, Physical, Computer and Life Sciences
Sub-Field:	Mathematical Sciences
Issue Date:	10 October 2001
Review Date:	10 October 2004

Learning Assumptions: The credit value is based on the assumption that people starting to learn towards this unit standard are competent in Mathematical Literacy and Communications at NQF level 2.

Purpose: This unit standard is designed to provide credits towards the mathematical literacy requirements of the NQF at level 3. The essential purposes of the mathematical literacy requirements are that, as the learner progresses with confidence through the levels, the learner will grow in:

- An insightful use of mathematics in the management of the needs of everyday living to become a self-managing person
- An understanding of mathematical applications that provides insight into the learner's present and future occupational experiences and so develop into a contributing worker
- The ability to voice a critical sensitivity to the role of mathematics in a democratic society and so become a participating citizen.

People credited with this unit standard are able to:

- Measure, estimate, and calculate physical quantities in practical situations relevant to the adult in life or the workplace
- Explore describe and represent, interpret and justify geometrical relationships and conjectures to solve problems in two and three dimensional geometrical situations

Range statement: The scope of this unit standard includes length, surface area, volume, mass, speed ; ratio and proportion; making and justifying conjectures. Contexts relevant to the adult, the workplace and the local community.

More detailed range statements are provided for specific outcomes and assessment criteria as needed.

Specific Outcomes and Assessment Criteria

specific outcome 1: **Measure, estimate, and calculate physical quantities in practical situations relevant to the adult in life or the workplace**

Range:

- *Basic instruments to include those readily available such as rulers, measuring tapes, measuring cylinders or jugs, thermometers, spring or kitchen balances, watches and clocks.*
- *In situations which necessitate it such as in the workplace, the use of more accurate instruments such as vernier callipers, micrometer screws, stop watches and chemical balances.*
- *Quantities to estimate or measure to include length/distance, area, mass, time, speed and temperature.*
- *Estimate the area and volume of simple irregular shapes and objects.*
- *The quantities should range from the low or small to the high or large.*
- *Mass, volume temperature, distance, and speed values are used in practical situations relevant to the learner or the workplace.*
- *Calculations involving the effects on area and volume when altering linear dimensions.*
- *Calculate heights and distances using Pythagoras' theorem.*
- *Calculate surface areas and volumes of right prisms (i.e., end faces are polygons and the remaining faces are rectangles) and cylinders from measurements in practical situations relevant to the life of the learner or in the workplace.*

assessment criteria

1.1 Scales on the measuring instruments are read correctly.

1.2 Quantities are estimated to a tolerance justified in the context of the need.

1.3 The appropriate instrument is chosen to measure a particular quantity.

1.4 Quantities are measured correctly to within the least step of the instrument.

1.5 Calculations are carried out correctly.

1.6 Symbols and units are used in accordance with SI conventions and as appropriate to the situation.

specific outcome 2: **Explore, describe and represent, interpret and justify geometrical relationships and conjectures to solve problems in two and three dimensional geometrical situations**

Range:

- *Applications taken from different contexts such as packaging, arts, building construction, dressmaking.*

- *The use of tessellations and symmetry in artifacts and in architecture.*
- *Use rough sketches to interpret, represent and describe situations.*
- *Use and interpret scale drawings of plans (e.g., plans of houses or factories; technical diagrams of simple mechanical household or work related devices such as jacks,*
- *Nets of prisms and cylinders.*
- *Road maps relevant to the local community.*
- *The use of the Cartesian co-ordinate system in determining location and describing relationships in at least two dimensions.*

assessment criteria

2.1 Descriptions are based on a systematic analysis of the shapes and reflect the properties of the shapes accurately, clearly and completely.

2.2 Descriptions include quantitative information appropriate to the situation and need.

2.3 Conjectures as appropriate to the situation, are based on well-planned investigations of geometrical properties.

2.4 Representations of the problems are consistent with and appropriate to the problem context. The problems are represented comprehensively and in mathematical terms.

2.5 Results are achieved through efficient and correct analysis and manipulation of representations.

2.6 Problem-solving methods are presented clearly, logically and in mathematical terms.

2.7 Solutions are correct and are interpreted and validated in terms of the context of the problem.

Accreditation Option: Providers of learning towards this unit standard will need to meet the accreditation requirements of the GENFETQA.

Moderation Option: The moderation requirements of the GENFETQA must be met in order to award credit to learners for this unit standard.

Notes:

Critical Cross Field Outcomes:
This unit standard promotes, in particular, the following critical cross-field outcomes:

- Identify and solve problems using critical and creative thinking:
  Solve a variety of problems involving space, shape and time using geometrical techniques related to the life or workplace of the learner
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, and interpret information about objects and processes.
- Communicate effectively:
  Use everyday language and mathematical language to describe properties, processes and problem solving methods.

- Use mathematics:
  Use mathematics to analyse, describe and represent realistic and abstract situations and to solve problems relevant to the adult, the workplace and the local community.

Embedded knowledge
The following essential embedded knowledge will be assessed through assessment of the specific outcomes in terms of the stipulated assessment criteria. Candidates are unlikely to achieve all the specific outcomes, to the standards described in the assessment criteria, without knowledge of the listed embedded knowledge. This means that the possession or lack of the knowledge can be inferred directly from the quality of the candidate's performance against the standards.

- Properties of geometric shapes
- Length, area, volume, mass, time, temperature, speed
- The Cartesian system
- Scale drawing

Notes to assessors:
Assessors should keep the following general principles in mind when designing and conducting assessments against this unit standard:

- Focus the assessment activities on gathering evidence in terms of the main outcome expressed in the title to ensure assessment is integrated rather than fragmented. Remember we want to declare the person competent in terms of the title. Where assessment at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- Do not focus the assessment activities on each assessment criterion. Rather make sure the assessment activities focus on outcomes and are sufficient to enable evidence to be gathered around all the assessment criteria.
- The assessment criteria provide the specifications against which assessment judgements should be made. In most cases, knowledge can be inferred from the quality of the performances, but in other cases, knowledge and understanding will have to be tested through questioning techniques. Where this is required, there will be assessment criteria to specify the standard required.
- The task of the assessor is to gather sufficient evidence, of the prescribed type and quality, as specified in this unit standard, that the candidate can achieve the outcomes again and again and again. This means assessors will have to judge how many repeat performances are required before they believe the performance is reproducible.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent.

SAQA ID. No. 9014

Title:	**Use mathematics to investigate and monitor the financial aspects of personal, business, and national issues**

Level:	4
Credit:	6
Field:	Mathematical, Physical, Computer and Life Sciences
Sub-Field:	Mathematical Sciences
Issue Date:	10 October 2001
Review Date:	10 October 2001

Learning Assumptions: The credit value is based on the assumption that people starting to learn towards this unit standard are competent in Mathematical Literacy and Communications at NQF level 3.

Purpose: This Unit Standard is designed to provide credits towards the mathematical literacy requirement of the NQF at Level 4. The essential purposes of the mathematical literacy requirement are that, as the learner progresses with confidence through the levels, the learner will grow in:

- a confident, insightful use of mathematics in the management of the needs of everyday living to become a self-managing person
- an understanding of mathematical applications that provides insight into the learner's present and future occupational experiences and so develop into a contributing worker
- the ability to voice a critical sensitivity to the role of mathematics in a democratic society and so become a participating citizen.

People accredited with this standard are able to:

- Use mathematics to investigate and analyse, regional and/or national budgets and income and expenditure
- Use compound growth to make sense of inflationary effects on the national economy
- Use mathematics to critique and debate aspects of the national economy

Range statement: Range statements are provided for specific outcomes and assessment criteria as needed.

Specific Outcomes and Assessment Criteria

specific outcome 1: **Use mathematics to investigate and analyse regional and/or national budgets and income and expenditure**

Range: The mathematical aspects related to the following situations:

- *Key elements of provincial and national budgets such as gross domestic product, balance of payments, money supply, indices, and tax*

assessment criteria

1.1 Regional and/or national budgets from the media and other sources are accessed, and income and expenditure are described realistically.

1.2 Calculations are carried out efficiently and correctly using computational tools.

1.3 Solutions obtained are verified in terms of the context.

1.4 Different ways of representing budgets are critically analysed and related.
Range: Representations refer to pie-charts, graphs, tables, and formulae

1.5 Actual income and expenditure is analysed and compared to planned income and expenditure. Variances are identified.

specific outcome 2: **Use compound growth to make sense of inflationary effects on the national economy**

Range: the mathematics related to::

- *indices (e.g., consumer price index);*
- *base rates,* rates of inflation;
- interest rates, (e.g. the repo rate, bank rate) ;
- inflation targeting.

assessment criteria

2.1 Methods of calculation are appropriate to the problem types.

2.2 Computational tools are used efficiently and correctly and solutions obtained are verified in terms of the context or problem.

2.3 Solutions to calculations are interpreted in terms of base rates or indices.

2.4 Appropriate formulae are understood and used to calculate solutions to problems.

specific outcome 3: **Use mathematics to critique and debate aspects of the national economy**

Range: the mathematics to include aspects such as:

- *exchange rates;*
- *imports, exports;*
- *monetary policy;*
- *the control of inflation.*

assessment criteria

3.1 Values are calculated correctly.

3.2 Mathematical tools are used to compare the effects of changes in different sectors of the national economy

3.3 Critique and debating points are based on well-reasoned arguments and are supported by mathematical information.

Accreditation Option: Providers of learning towards this unit standard will need to meet the accreditation requirements of the GENFETQA.

Moderation Option: The moderation requirements of the GENFETQA must be met in order to award credit to learners for this unit standard.

Notes:

Critical Cross Field Outcomes:

This unit standard promotes, in particular, the following critical cross-field outcomes:

- Identify and solve problems using critical and creative thinking:
  Solve a variety of numerical and financial problems related to business and national budgets.
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, evaluate and interpret financial information to plan, critique and make provision for monitoring budgets and other financial issues.
- Communicate effectively:
  Use everyday language and mathematical language to critique relationships, processes and problem solving methods in relation to the financial concerns of the adult with increasing responsibilities.
- Use mathematics:
  Use mathematics to analyse, describe, represent and critique financial issues of a national nature and to solve problems of a financial nature relevant to the adult with increasing responsibilities.

Embedded knowledge

The following essential embedded knowledge will be assessed through assessment of the specific outcomes in terms of the stipulated assessment criteria. Candidates are unlikely to achieve all the specific outcomes, to the standards described in the assessment criteria, without knowledge of the listed embedded knowledge. This means that the possession or lack of the knowledge can be inferred directly from the quality of the candidate's performance against the standards.

- Income and expenditure
- Budgetary control

- Taxation
- Percentage, rates, ratio and proportion
- Terminology and definitions associated with financial situations
- Compound increase and decrease
- Estimation and approximation
- Inflation targeting, money supply, liquidity
- Index

Notes to assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments against this unit standard:

- Focus the assessment activities on gathering evidence in terms of the main outcome expressed in the title to ensure assessment is integrated rather than fragmented. Remember we want to declare the person competent in terms of the title. Where assessment at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- Do not focus the assessment activities on each assessment criterion. Rather make sure the assessment activities focus on outcomes and are sufficient to enable evidence to be gathered around all the assessment criteria.
- The assessment criteria provide the specifications against which assessment judgements should be made. In most cases, knowledge can be inferred from the quality of the performances, but in other cases, knowledge and understanding will have to be tested through questioning techniques. Where this is required, there will be assessment criteria to specify the standard required.
- The task of the assessor is to gather sufficient evidence, of the prescribed type and quality, as specified in this unit standard, that the candidate can achieve the outcomes again and again and again. This means assessors will have to judge how many repeat performances are required before they believe the performance is reproducible.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent.

SAQA ID. No. 9015

Title 4:	**Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings on life-related problems**

Level:	4
Credit:	6
Field:	Mathematical, Physical, Computer and Life Sciences
Sub-Field:	Mathematical Sciences
Issue Date:	10 October 2001
Review Date:	10 October 2004

Learning Assumptions: The credit value is based on the assumption that people starting to learn towards this unit standard are competent in Mathematical Literacy and Communications at NQF level 3.

Purpose: This Unit Standard is designed to provide credits towards the mathematical literacy requirement of the NQF at Level 4. The essential purposes of the mathematical literacy requirement are that, as the learner progresses with confidence through the levels, the learner will grow in:

- a confident, insightful use of mathematics in the management of the needs of everyday living to become a self-managing person
- an understanding of mathematical applications that provides insight into the learner's present and future occupational experiences and so develop into a contributing worker
- the ability to voice a critical sensitivity to the role of mathematics in a democratic society and so become a participating citizen

People credited with this unit standard are able to:

- Critique and use techniques for collecting, organising and representing data.
- Use theoretical and experimental probability to develop models, make predictions and study problems.
- Critically interrogate and use probability and statistical models in problem solving and decision making in real-world situations.

Range statement: This unit standard includes the requirement to:

- Critique the selection of samples in terms of size and representativeness.
- Identify features of distributions: symmetry and skewness, clusters and gaps, and possible outliers in data and consider their effects on the interpretation of the data.
- Critique the use of data from samples to estimate population statistics.
- Apply an understanding of random phenomena to critique and interpret real life and work related situations.
- Critique arguments based on probability in terms of an understanding of random behaviour and the law of large numbers (e.g., lottery 'hot' numbers).
- Demonstrate understanding of and determine probabilities for independent, disjoint and complementary events.
- Judge or critique probability values.

Further range statements are provided for specific outcomes and assessment criteria as needed.

Specific Outcomes and Assessment Criteria

specific outcome 1: **Critique and use techniques for collecting, organising and representing data.**

Range:
Techniques include:

- *the formulation of questions in surveys to obtain data;*
- *the methods and devices (e.g., tables of random numbers, calculators or computers) used to select random samples;*
- *different instruments and scales such as yes/no (dichotomous) and 5 point (Likert scales) and discrete and continuous variables*;
- *evaluation of data gathering techniques and of data collected so that faults and inconsistencies are identified;*
- *calculating measures of centre and spread such as mean, median, mode, range; and variance;*
- *using scatter plots and lines of best fit to represent the association between two variables;*
- *correlation.*

Specific purposes include:

- *determining trends in societal issues such as crime and health;*
- *identifying relevant characteristics of target groups such as age range, gender, socio-economic group, cultural belief, and performance;*
- *considering the attitudes or opinions of people on issues.*

assessment criteria

1.1 Situations or issues that can be dealt with through statistical methods are identified correctly.

1.2 Appropriate methods for collecting, recording and organising data are used so as to maximise efficiency and ensure the resolution of a problem or issue.

1.3 Data sources and databases are selected in a manner that ensures the representativeness of the sample and the validity of resolutions.

1.4 Activities that could result in contamination of data are identified and explanations are provided of the effects of contaminated data.

1.5 Data is gathered using methods appropriate to the data type and purpose for gathering the data.

1.6 Data collection methods are used correctly.

1.7 Calculations and the use of statistics are correct.

1.8 Graphical representations and numerical summaries are consistent with the data, are clear and appropriate to the situation and target audience.

1.9 Resolutions for the situation or issue are supported by the data and are validated in terms of the context.

specific outcome 2: **Use theoretical and experimental probability to develop models, make predictions and study problems**

Range: Performance in this specific outcome includes the requirement to:

- *Use the laws governing independent, complementary and mutually exclusive events.*
- *Determine theoretical and experimental probabilities.*
- *Use simulations (e.g., six sided spinners, random number generators in calculators or computers) for comparing experimental results (e.g., the rolling of a die) with mathematical expectations.*
- *Compare experimental results with mathematical expectations using probability models.*

assessment criteria

2.1 Experiments and simulations are chosen and/or designed appropriately in terms of the situation to be modelled.

2.2 Predictions are based on validated experimental or theoretical probabilities.

2.3 The results of experiments and simulations are interpreted correctly in terms of the real context.

2.4 The outcomes of experiments and simulations are communicated clearly.

specific outcome 3: **Critically interrogate and use probability and statistical models in problem solving and decision making in real-world situations**

Range: Performance in this specific outcome includes the requirement to:

- *Source and interpret information from a variety of sources including databases.*
- *Manipulate data in different ways to support opposing conclusions.*
- *Evaluate statistically based arguments and make recommendations and describe the use and misuse of statistics in society.*
- *Make inferences about a population on the basis of a sample selected from it.*
- *Make comparisons between predictions and actual occurrences.*

assessment criteria

3.1 Statistics generated from the data are interpreted meaningfully and interpretations are justified or critiqued.

3.2 Assumptions made in the collection or generation of data and statistics are defined or critiqued appropriately.

3.3 Tables, diagrams, charts and graphs are used or critiqued appropriately in the analysis and representation of data, statistics. and probability values.

3.4 Predictions, conclusions and judgements are made on the basis of valid arguments and supporting data, statistics and probability models.

3.5 Evaluations of the statistics identify potential sources of bias, errors in measurement, potential uses and misuses and their effects.
Range: *Effects on arguments, judgements, conclusions and ultimately the audience.*

Accreditation Option: Providers of learning towards this unit standard will need to meet the accreditation requirements of the GENFETQA.

Moderation Option: The moderation requirements of the GENFETQA must be met in order to award credit to learners for this unit standard.

Notes:

Critical Cross Field Outcomes:
This unit standard promotes, in particular, the following critical cross-field outcomes:

- Identify and solve problems using critical and creative thinking:
  Solve a variety of problems based on data, statistics and probability.
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, evaluate and critically interpret data and statistics to make sense of situations.
- Communicate effectively:
  Use everyday language and mathematical language to represent data, statistics and probability and effectively communicate or critique conclusions.
- Use mathematics:
  Use mathematics to critically analyse, describe and represent situations and to solve problems related to the life or work situations of the adult with increasing responsibilities.

Embedded knowledge

The following essential embedded knowledge will be assessed through assessment of the specific outcomes in terms of the stipulated assessment criteria. Candidates are unlikely to achieve all the specific outcomes, to the standards described in the assessment criteria, without knowledge of the listed embedded knowledge. This means that the possession or lack of the knowledge can be inferred directly from the quality of the candidate's performance against the standards.

- Methods for collecting, organising and analysing data
- Measures of centre and spread
- Techniques for representing and evaluating statistics
- Randomness, probability and association

Notes to assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments against this unit standard:

- Focus the assessment activities on gathering evidence in terms of the main outcome expressed in the title to ensure assessment is integrated rather than fragmented. Remember we want to declare the person competent in terms of the title. Where assessment at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- Do not focus the assessment activities on each assessment criterion. Rather make sure the assessment activities focus on outcomes and are sufficient to enable evidence to be gathered around all the assessment criteria.
- The assessment criteria provide the specifications against which assessment judgements should be made. In most cases, knowledge can be inferred from the quality of the performances, but in other cases, knowledge and understanding will have to be tested through questioning techniques. Where this is required, there will be assessment criteria to specify the standard required.
- The task of the assessor is to gather sufficient evidence, of the prescribed type and quality, as specified in this unit standard, that the candidate can achieve the outcomes again and again and again. This means assessors will have to judge how many repeat performances are required before they believe the performance is reproducible.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent.

SAQA ID. No. 9016

Title:	**Measure, estimate and calculate physical quantities and explore, critique and prove geometrical relationships in two and three-dimensional space in the life and workplace of the adult with increasing responsibilities**

Level: 4

Credit: 4

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date: 10 October 2001

Review Date: 10 October 2004

Learning Assumptions: The credit value is based on the assumption that people starting to learn towards this unit standard are competent in Mathematical Literacy and Communications at NQF level 3

Purpose: This unit standard is designed to provide credits towards the mathematical literacy requirements of the NQF at level 4. The essential purposes of the mathematical literacy requirements are that, as the learner progresses with confidence through the levels, the learner will grow in:

- An insightful use of mathematics in the management of the needs of everyday living to become a self-managing person.
- An understanding of mathematical applications that provides insight into the learner's present and future occupational experiences and so develop into a contributing worker.
- The ability to voice a critical sensitivity to the role of mathematics in a democratic society and so become a participating citizen.

People credited with this unit standard are able to:

- Measure, estimate, and calculate physical quantities in practical situations relevant to the adult with increasing responsibilities in life or the workplace
- Explore analyse and critique, describe and represent, interpret and justify geometrical relationships and conjectures to solve problems in two and three dimensional geometrical situations

Range statement: The scope of this unit standard includes length, surface area, volume, mass, speed ; ratio, proportion; making and justifying conjectures. Contexts relevant to the adult, the workplace and the country.

More detailed range statements are provided for specific outcomes and assessment criteria as needed

Specific Outcomes and Assessment Criteria

specific outcome 1: **Measure, estimate, and calculate physical quantities in practical situations relevant to the adult with increasing responsibilities in life or the workplace**

Range:

- *Basic instruments to include those readily available such as rulers, measuring tapes, measuring cylinders or jugs, thermometers, spring or kitchen balances, watches and clocks.*
- *In situations which necessitate it such as in the workplace, the use of more accurate instruments such as vernier callipers, micrometer screws, stop watches and chemical balances.*
- *Quantities to estimate or measure to include length/distance, area, mass, time, speed acceleration and temperature.*
- *Distinctions between mass and weight, speed and acceleration.*
- *The quantities should range from the low or small to the high or large.*
- *Mass, volume temperature, distance, and speed values are used in practical situations relevant to the young adult or the workplace.*
- *Calculate heights and distances using Pythagoras' theorem.*
- *Calculate surface areas and volumes of right prisms (i.e., end faces are polygons and the remaining faces are rectangles) cylinders, cones and spheres from measurements in practical situations relevant to the adult or in the workplace.*

assessment criteria

1.1 Scales on the measuring instruments are read correctly.

1.2 Quantities are estimated to a tolerance justified in the context of the need.

1.3 The appropriate instrument is chosen to measure a particular quantity

1.4 Quantities are measured correctly to within the least step of the instrument

1.5 Appropriate formulae are selected and used.

1.6 Calculations are carried out correctly and the least steps of instruments used are taken into account when reporting final values

1.7 Symbols and units are used in accordance with SI conventions and as appropriate to the situation.

specific outcome 2: **Explore, analyse and critique, describe and represent, interpret and justify geometrical relationships and conjectures to solve problems in two and three dimensional geometrical situations**

Range:

- *Applications taken from different contexts such as packaging, arts, building construction, dressmaking.*
- *The operation of simple linkages and mechanisms such as car jacks.*
- *Top, front and side views of objects are represented.*
- *Use rough sketches to interpret, represent and describe situations.*
- *The use of available technology (e.g., isometric paper,* drawing instruments, software) *to represent object.s*
- *Use and interpret scale drawings of plans (e.g., plans of houses or factories; technical diagrams of simple mechanical household or work related devices,*
- *Road maps relevant to the country.*
- *World maps.*
- *International time zones.*
- *The use of the Cartesian co-ordinate system in determining location and describing relationships in at least two dimensions.*

assessment criteria

2.1 Descriptions are based on a systematic analysis of the shapes and reflect the properties of the shapes accurately, clearly and completely.

2.2 Descriptions include quantitative information appropriate to the situation and need.

2.3 3-dimensional objects are represented by top, front and side views

2.4 Different views are correctly assimilated to describe 3-dimensional objects.

2.5 Available and appropriate technology is used in producing and analysing representations.

2.6 Relations of distance and positions between objects are analysed from different views.

2.7 Conjectures as appropriate to the situation, are based on well-planned investigations of geometrical properties.

2.8 Representations of the problems are consistent with and appropriate to the problem context. The problems are represented comprehensively and in mathematical terms.

2.9 Results are achieved through efficient and correct analysis and manipulation of representations.

2.10 Problem-solving methods are presented clearly, logically and in mathematical terms

2.11 Reflections on the chosen problem solving strategy reveal strengths and weaknesses of the strategy.

2.12 Alternative strategies to obtain the solution are identified and compared in terms of appropriateness and effectiveness.

Accreditation Option: Providers of learning towards this unit standard will need to meet the accreditation requirements of the GENFETQA.

Moderation Option: The moderation requirements of the GENFETQA must be met in order to award credit to learners for this unit standard.

Notes:

Critical Cross Field Outcomes:
This unit standard promotes, in particular, the following critical cross-field outcomes:

- Identify and solve problems using critical and creative thinking:
  Solve a variety of problems relevant to the adult with increasing responsibilities involving space, shape and time using geometrical techniques.
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, evaluate and critique information about objects and processes.
- Communicate effectively:
  Use everyday language and mathematical language to describe properties, processes and problem solving methods.
- Use mathematics:
  Use mathematics to analyse, describe and represent realistic and abstract situations and to solve problems relevant to the adult with increasing responsibilities

Embedded knowledge
The following essential embedded knowledge will be assessed through assessment of the specific outcomes in terms of the stipulated assessment criteria. Candidates are unlikely to achieve all the specific outcomes, to the standards described in the assessment criteria, without knowledge of the listed embedded knowledge. This means that the possession or lack of the knowledge can be inferred directly from the quality of the candidate's performance against the standards.

- Properties of geometric shapes
- Surface area and volume
- Mathematical argument and evaluation based on logical deduction
- Spatial interrelationships

Notes to assessors:

Assessors should keep the following general principles in mind when designing and conducting assessments against this unit standard:

- Focus the assessment activities on gathering evidence in terms of the main outcome expressed in the title to ensure assessment is integrated rather than fragmented. Remember we want to declare the person competent in terms of the title. Where assessment at title level is unmanageable, then focus assessment around each specific outcome, or groups of specific outcomes.
- Make sure evidence is gathered across the entire range, wherever it applies. Assessment activities should be as close to the real performance as possible, and where simulations or role-plays are used, there should be supporting evidence to show the candidate is able to perform in the real situation.
- Do not focus the assessment activities on each assessment criterion. Rather make sure the assessment activities focus on outcomes and are sufficient to enable evidence to be gathered around all the assessment criteria.
- The assessment criteria provide the specifications against which assessment judgements should be made. In most cases, knowledge can be inferred from the quality of the performances, but in other cases, knowledge and understanding will have to be tested

through questioning techniques. Where this is required, there will be assessment criteria to specify the standard required.

- The task of the assessor is to gather sufficient evidence, of the prescribed type and quality, as specified in this unit standard, that the candidate can achieve the outcomes again and again and again. This means assessors will have to judge how many repeat performances are required before they believe the performance is reproducible.
- All assessments should be conducted in line with the following well documented principles of assessment: appropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent.