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SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

NSB 10: PHYSICAL, MATHEMATICAL, COMPUTER AND LIFE SCIENCES

Mathematical Literacy

FUNDAMENTAL UNIT STANDARDS AT NQF LEVELS 2, 3 AND 4

Field: Physical, Mathematical, Computer and Life Sciences

Sub-field: Mathematical Literacy

Unit standards at NQF levels 2

Title	Credits
1. Demonstrate understanding of rational and irrational numbers and number systems	3
2. Use mathematics to investigate and monitor the financial aspects of personal and community life	2
3. Work with a wide range of patterns and basic functions and solve related problems	2
4. Use mathematical models to represent and deal with problems that arise in real life contexts	2
5. Identify, describe, compare, classify, calculate shape and motion in 2-and 3-dimensional shapes in different contexts	3
6. Apply basic knowledge of statistics and probability to influence the use of data and procedures in order to investigate life related problems	4
Total credits	16

Unit standards at NQF level 3

Title	Credits
1. Demonstrate understanding of numbers and relationships among numbers and number systems, and represent numbers in different ways	2
2. Use mathematics to investigate and monitor the financial aspects of personal, business and national issues	2
3. Work with a wide range of patterns and basic functions and solve related problems	3
4. Describe, apply, analyse and calculate shape and motion in 2- and 3-dimensional space in different contexts	4
5. Apply the knowledge of statistics and probability to inform the collection and use of data and procedures in order to investigate life related problems and interpret the findings	5
Total credits	16

Unit standards at NQF level 4

Title	Credits
1. Apply knowledge of sequences and series to interpret and solve problems in real and simulated situations	2
2. Use mathematics to investigate and monitor the financial aspects of personal, business, national and international issues	2
3. Work with a wide range of patterns and transformations of functions and solve related problems	3
4. Construct, analyse and calculate shape and motion in 2- and 3-dimensional space in different contexts	4
5. Apply knowledge of statistics and probability to evaluate and communicate findings on life-related problems	5
Total credits	16

UNIT STANDARD TITLES AND SPECIFIC OUTCOMES AT NQF LEVEL 2

1. **Title**: **Demonstrate understanding of rational and irrational numbers and number systems**

Specific Outcome 1.1: Demonstrate understanding of rational and irrational numbers

Specific Outcome 1.2: Know and understand the relationships among numbers and number systems, and represent numbers in different ways

Specific Outcome 1.3: Apply base 10 number systems on technology to demonstrate understanding of scientific notation and rounding off numbers

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

Specific Outcome 2.1: Use mathematics to plan and control personal and/or household budgets and income and expenditure

Specific Outcome 2.2: Use simple and compound interest to make sense of and define a variety of situations

Specific Outcome 2.3: Investigate various aspects of financial transactions

3. **Title: Work with a wide range of patterns and basic functions and solve related problems**

Specific Outcome 3.1: Express and justify mathematical generalisations of situations

Specific Outcome 3.2: Express mathematical functions and relationships between variables in terms of numerical, graphical, verbal and symbolic approaches

Specific Outcome 3.3: Analyse and represent mathematical situations and structures using symbolic forms

4. **Title: Use mathematical models to represent and deal with problems that arise in real life contexts**

Specific Outcome 4.1: Translate contextual problems using mathematical language

Specific Outcome 4.2: Analyse and manipulate representations to arrive at results

Specific Outcome 4.3: Interpret solutions in terms of the problem context

5. **Title: Identify, describe, compare, classify, calculate shape and motion in 2- and 3-dimensional shapes in different contexts**

Specific Outcome 5.1: Identify, describe, compare and classify geometric figures

Specific Outcome 5.2: Explore transformations of geometric shapes

Specific Outcome 5.3: Calculate the area and perimeter of geometric figures in different contexts by means of measurement and estimation

6. **Title: Apply basic knowledge of statistics and probability to influence the use of data and procedures in order to investigate life related problems**

Specific Outcome 6.1: Apply various techniques to data in order to establish statistical models for specific purposes

Specific Outcome 6.2: Use equally likely events to explore probability models, make predictions and study problems

Specific Outcome 6.3: Use probability and statistical concepts in solving routine problems from real-world situations and draw conclusions

UNIT STANDARD TITLES AND SPECIFIC OUTCOMES AT NQF LEVEL 3

1. **Title: Demonstrate understanding of numbers and relationships among numbers and number systems, and represent numbers in different ways**

Specific Outcome 1.1: Express rational numbers in decimal notations

Specific Outcome 1.2: Measure and perform error calculations

Specific Outcome 1.3: Convert from decimal number system to binary number system

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

Specific Outcome 2.1: Use mathematics to investigate and analyse, regional and/or national budgets and income and expenditure

Specific Outcome 2.2: Use compound interests to make sense of and define a variety of situations

Specific Outcome 2.3: Use mathematics to debate aspects of national economy

3. Title: Work with a wide range of patterns and basic functions and solve related problems

Specific Outcome 3.1: Express and justify mathematical generalisations of situations

Specific Outcome 3.2: Express mathematical functions and relationships between variables in terms of numerical, graphical, verbal and symbolic approaches

Specific Outcome 3.3: Analyse and represent mathematical situations and structures using symbolic forms

4. Title: Describe, apply, analyse and calculate shape and motion in 2- and 3-dimensional space in different contexts

Specific Outcome 4.1: Describe the conditions that make two geometric shapes congruent and similar

Specific Outcome 4.2: Apply and analyse different transformations of geometric shapes

Specific Outcome 4.3: Calculate areas and perimeter of geometric shapes in different contexts

5. Title: Apply the knowledge of statistics and probability to inform the collection and use of data and procedures in order to investigate life related problems and interpret the findings

Specific Outcome 5.1: Collect and work with data using various techniques to investigate life-related problems

Specific Outcome 5.2: Use experiments, simulations and equally likely events to explore probability models, make predictions and study problems

Specific Outcome 5.3: Use probability and statistical concepts in problem solving and decision making in real-world situations

UNIT STANDARD TITLES AND SPECIFIC OUTCOMES AT NQF LEVEL 4

1. Title: Apply knowledge of sequences and series to interpret and solve problems in real and simulated situations

Specific Outcome 1.1: Demonstrate understanding of infinite and finite sequences and series

Specific Outcome 1.2: Identify and interpret patterns of divergent and convergent sequences and series

Specific Outcome 1.3: Apply knowledge of sequences and series to perform calculations on saving and interest rates

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

Specific Outcome 2.1: Use mathematics to plan and manage financial instruments

Specific Outcome 2.2: Use simple and compound interest to make sense of and define a variety of situations

Specific Outcome 2.3: Use mathematics to debate aspects of the national and global economy

3. Title: Work with a wide range of patterns and transformations of functions and solve related problems

Specific Outcome 3.1: Express and justify mathematical generalisations of situations

Specific Outcome 3.2: Express mathematical functions and relationships between variables in terms of numerical, graphical, verbal and symbolic approaches

Specific Outcome 3.3: Analyse and represent mathematical situations and structures using symbolic forms

Specific Outcome 3.4: Use mathematical models to represent and deal with problems that arise in real and abstract contexts

4. Title: Construct, analyse and calculate shape and motion in 2- and 3-dimensional space in different contexts

Specific Outcome 4.1: Construct 2- and 3-dimentional shapes in terms of given criteria

Specific Outcome 4.2: Create and analyse designs that include translated, rotational and reflected two dimensional images

Specific Outcome 4.3: Calculate surface areas and volumes of geometric shapes in different contexts

5. Title: Apply knowledge of statistics and probability to evaluate and communicate findings on life-related problems

Specific Outcome 5.1: Investigate statistical reports and critique their findings

Specific Outcome 5.2: Investigate probability distributions and critique and explore models and predictions

Specific Outcome 5.3: Critically interrogate probability and statistical models using distributions in problem solving and decision making in real-world situations

NQF LEVEL 2
Unit No: Math 2001

Title: **Demonstrate understanding of rational and irrational numbers, and number systems**

Level: 2

Credit: 3

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date:

Review Date:

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 will be useful to people who aim to achieve recognition at some level in Further Education and Training or to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

People credited with this unit standard are able to:

- Use and analyse computational tools and strategies, and make estimates and approximations.
- Demonstrate understanding of numbers and relationships among numbers and number systems, and represent numbers in different ways.

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.

Specific outcome 1: **Demonstrate understanding of rational 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*
- *find rational approximations to irrational numbers*

assessment criteria

1.1 Rational numbers are used to develop different set of odd, even and prime numbers.

1.2 Computational tools are used effectively and correctly and solutions obtained are verified in terms of the context or problems.

1.3 Solutions involving irrational numbers are recorded to degrees of accuracy appropriate to the problem.

1.4 Algorithms are executed appropriately in calculation.

1.5 The viability of selected algorithms is verified and justified.

specific outcome 2: **Know and understand the relationships among numbers and number systems, and represent numbers in different ways**

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:

2.1 Methods of calculations and approximations are appropriate to the problem types.

2.2 Numbers and quantities are represented using rational and irrational numbers as appropriate to the context.

specific outcome 3: **Apply base 10 number system on technology to demonstrate understanding of scientific notation and rounding off numbers**

Range: this outcome includes the need to:

- *use technology such as calculators*
- *demonstrate understanding of mathematical relationships and principles involved in computations*
- *find rational approximations to irrational numbers*

assessment criteria

3.1 Numbers are written in correct scientific notation.

3.2 Numbers are rounded off correctly to the nearest unit, ten, hundred and thousand.

3.3 Estimates and approximations are used appropriately.

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:

- *Gather, organise, evaluate and interpret numerical information*
- *Use everyday language and mathematical language to describe relationships, processes and problem solving methods.*
- *Use mathematics to analyse, 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.

- Number systems and 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: a*ppropriateness, fairness, manageability, integration into work or learning, validity, direct,* au*thentic, sufficient, systematic, open and consistent.*

Unit No: Math 2002

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 (Fundamental)

Issue Date:

Review Date:

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 will be useful to people who aim to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

People credited with this unit standard are able to:

- Use mathematics to plan and control personal and/or household budgets and income and expenditure.
- Use simple and compound interest to make sense of and define a variety of situations including investments, stokvels, inflation, appreciation and depreciation.
- Investigate various aspects of financial transactions including costs, prices, revenue, cost price, selling price, loss and profit.

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/or household budgets and income and expenditure**

Range: Mathematics used include:

- *Ratio and Proportion ; percentages ; various representations of functions ; behaviour of functions ; data-analysis.*

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 Budgets are presented in a manner that makes for easy monitoring and control.

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: situations include:

- *investments, stokvels, inflation, appreciation and depreciation*

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 Understand and use appropriate formulae to calculate solutions to problems.

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

Range: transactions include:

- *costs, prices, revenue, cost price, selling price, loss and profit*

assessment criteria

3.1 Values are calculated correctly from various functional representations, namely, tables, graphs, formulae, 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 the control of costs and 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:
  Solving a variety of numerical and financial problems
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, evaluate and interpret financial information to plan and make provision for monitoring budgets and other financial situations.
- Communicate effectively:
  Use everyday language and mathematical language to describe relationships, processes and problem solving methods.
- Use mathematics:
  Use mathematics to analyse, describe and represent financial 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.

- Budgets
- Terminology and definitions associated with financial situations
- Estimation and approximation
- Compound increase and decrease

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: a*ppropriateness, fairness, manageability, integration into work or learning, validity, direct,* au*thentic, sufficient, systematic, open and consistent.*

Unit No: Math 2003

Title: **Work with a wide range of patterns and basic functions and solve related problems**

Level: 2

Credit: 2

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date:

Review Date:

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 will be useful to people who aim to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

People credited with this unit standard are able to:

- Express and justify mathematical generalisations of situations.
- Express mathematical functions and relationships between variables in terms of numerical, graphical, verbal and symbolic approaches.
- Analyse and represent mathematical situations and structures using symbolic forms.
- Use mathematical models to represent and deal with problems that arise in real and abstract contexts.

Range statement: This unit standard includes the requirement to:

- Use algebraic notions to express generality
- Make conjectures, demonstrate and explain their validity
- Recognise equivalence among expressions and situations in which we need to manipulate and rearrange for a specific purpose.
- Work with the following basic functions in terms of their shape and symmetry:

$$y = ax + b; \quad y = ax^2 + bx + c;$$

- Convert flexibly among various representations of the above functions.
- Represent, interpret and solve problems that relate to these functions by using point by point plotting and numerical analysis

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

Specific Outcomes and Assessment Criteria

Specific outcome 1: **Express and justify mathematical generalisations of situations**

Range: *This outcome includes the requirement to:*

- *deal with situations involving the range of functions specified in the main range statement*
- *distinguish between patterns which apply to limited sets of data and generalisations which can apply to extended sets of data*
- *develop generalisations from sets of data which relate to a wide range of contexts, both concrete, such as performing experiments, and investigating open ended mathematical situations*

assessment criteria

1.1 Generalisations are based on systematic investigations and adequate evidence.

1.2 Generalisations are expressed in symbolic form using functions appropriate to the situation.

1.3 Conjectures are supported by acceptable arguments and claims that generalisations are not possible are supported by coherent reasons.

specific outcome 2: **Express mathematical functions and relationships between variables in terms of numerical, graphical, verbal and symbolic approaches**

Range: *This outcome includes the requirement to:*

- *Translate from one representation to another*
- *Explore and express the behaviour of functions using a variety of approaches such as finding function values and solving equations*
- *Identify, contrast and compare the features of the functions listed in the main range statement*

assessment criteria

2.1 The interchange of functions from one representation to another is fluent.

2.2 Computations in dealing with functions are accurate.

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

2.4 Representations are expressed in an appropriate and integrated way and assist in the formulation and explanation of relationships as functions and relations embedded in contexts.

specific outcome 3: **Analyse and represent mathematical situations and structures using symbolic forms**

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*
- *Recognise equivalent forms of an expression, equation, function or relation*

assessment criteria

3.1 Situations are represented correctly and comprehensively.

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

3.3 Results are interpreted correctly in terms of the situation.

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:
  Solving 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 analyse, 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.

- Mathematical relations and 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: a*ppropriateness, fairness, manageability, integration into work or learning, validity, direct,* au*thentic, sufficient, systematic, open and consistent*

Unit No: Math 2004

Title: Use mathematical models to represent and deal with problems that arise in real life contexts

Level: 2

Credit: 2

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date:

Review Date:

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 will be useful to people who aim to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

People credited with this unit standard are able to:

- Use mathematical models to represent and deal with problem that arise in real contexts.

Range statement: This unit standard includes the requirement to:

- Represent the problem mathematically using functions, systems of equations and/or inequalities. (This could include using the constant speed equation to solve distance, time and speed problems.)
- Solve systems of linear equations involving 2 equations in 2 variables.
- Use simple matrices to represent and solve problems

Specific Outcomes and Assessment Criteria

Specific outcome 1: **Contextual problems are translated correctly comprehensively and mathematically.**

Range: *This outcome includes the requirement to:*

- *translate between words, situations, tables, graphs, matrices and equations*
- *interpretation of different representations*
- *generalisation*

assessment criteria

1.1 Generalisations are based on systematic investigations and adequate evidence.

1.2 Generalisations are expressed in different representations appropriate to the situation.

Specific outcome 2: **Representations are analysed and manipulated efficiently in arriving at results.**

Range: *This outcome includes the requirement to:*

- *use general laws*
- *interpolate ; extrapolate*
- *deal with situations involving the domain and range of*
- synthesis

assessment criteria

2.1 Representations are manipulated and expressed in appropriate equivalent forms.

2.2 Solution of equalities/inequalities are accurately expressed.

Specific outcome 3: **Solutions are reinterpreted correctly in terms of the problem context.**

assessment criteria

3.1 Solutions are reinterpreted

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:
  Solving a variety of problems using mathematical models.
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, evaluate and interpret information to represent the problem mathematically.
- *C*ommunicate effectively:
  Use everyday language and mathematical language to describe relationships, processes and problem solving methods.
- Use mathematics:
  Use mathematics to analyse, 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.

- Mathematical models
- Use of functions, systems of equations and/or inequalities
- Linear equations involving 2 equations in 2 variables
- Use of simple matrices

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: a*ppropriateness, fairness, manageability, integration into work or learning, validity, direct,* au*thentic, sufficient, systematic, open and consistent*

Unit No: Math 2005

Title: **Identify, describe, compare, classify, calculate shape and motion in 2- and 3-dimensional space in different contexts**

Level: 2

Credit: 3

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date:

Review Date:

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 will be useful to people who aim to achieve recognition at NQF level 2 in Further Education and Training or to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

People credited with this unit standard are able to:

- Identify, describe, compare and classify geometric figures
- Explore transformations of geometric figures
- Calculate areas and perimeters of geometric figures in different environments by means of measurements and estimation.

Range statement: The scope of this unit standard includes perimeter, surface area, volume, ratio, proportion, symmetry, transformations, co-ordinate geometry, trigonometry and making and justifying conjectures.

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

Specific Outcomes and Assessment Criteria

specific outcome 1: Identify, describe, compare and classify geometric figures

Range:

- *Introduction to the understanding of geometric properties of 2 and 3 dimentional shapes*

assessment criteria

1.1 Two dimensional shapes are identified and described accurately, clearly and completely using concrete materials and drawings.

1.2 Two dimensional shapes are compared and sorted according to their observable attributes.

1.3 Three dimensional shapes are identified and described accurately, clearly and completely using concrete materials and drawing.

1.4 Three dimensional shapes are compared and sorted according to their observable attributes.

specific outcome 2: Explore transformations of geometric shapes.

Range:

- *Use symmetry, translation, reflection and rotation in analysing and describing artefacts.*
- *Make and justify conjectures about mathematical relationships found in artefacts and objects.*
- *Use transformations and symmetry in analysing and describing objects.*
- *Make and justify conjectures about relationships among objects.*

assessment criteria

2.1 The symmetry in the environment is recognized

2.2 The concept of lines of symmetry in 2- 3-dimentional shapes is explored using paper folding and reflections in the mirror

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

2.4 Symmetrical figures are constructed using concrete materials and drawing

2.5 The analysis and description are based on correct application of transformations and other geometrical properties.

2.6 Patterns and shapes are replicated through the innovative use of transformations and geometrical properties.

2.7 Conjectures made relative to transformations and geometric properties are valid and appropriate to the situation.

specific outcome 3: Calculate areas and perimeters of geometric figures in different contexts by means of measurements and estimations

assessment criteria

3.1 The dimensions of geometric figures to be measured are identified

3.2 An appropriate strategy is devised

3.3 Measurements and estimates are done accurately

3.4 The chosen strategy to solve the problem is reflected upon

3.5 Alternative strategies to obtain the solution are explored

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

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

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

3.9 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:
  Solving a variety of problems involving space, shape and time using geometrical and trigonometric techniques
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, evaluate 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.

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
- Formulae for calculating surface area and volume
- Geometric and trigonometric techniques for analysing and describing situations and solving problems
- The Cartesian system

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.

Unit No: Math 2006

Title: **Apply basic knowledge of statistics and probability to influence the use of data and procedures in order to investigate life-related problems**

Level: 2

Credit: 4

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date:

Review Date:

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 will be useful to people who aim to achieve recognition at some level in Further Education and Training or to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

People credited with this unit standard are able to:

- collect and work with data using various techniques to establish statistical models for the purpose of summarising and giving an opinion on information
- Use experiments and consider equally likely events to explore probability models, make conjectures and give opinions, and
- Use probability and statistical concepts in problem solving and decision making in real-world situations.

Range statement: This unit standard includes the requirement to:

- Identify issues suited to resolution by basic statistical methods
- Collect and generate data through the use of questionnaires and suitable experiments
- Generate appropriate statistics and probability values through the use of calculators
- Represent data in the form of tables and appropriate charts and graphs
- Use statistics and representations of data to summarise real-life issues within the experience of the learner
- Critically analyse and interpret statistics and representations of data
- Work with experimental and theoretical definitions of probability that do not require abstract decuctions
- Work with probability values in practical situations

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 data in order to establish statistical models for specific purposes**

Range: Techniques include:

- *working with dichotomous, discrete, and continuous data*
- *using a variety of methods to represent statistics including pie charts, bar graphs, histograms, stem and leaf plots*
- *calculating and interpeting measures of centre and spread such as mean, median, mode, and range. ["Measures of centre and spread" should be handled via examples which are directly related to the life experience of each learner. For example workers' wages and students' test scores. Learners should be able to argue from statistics about fairness], the use of quartiles in classifying data items*

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 current issues relevant to the life experience of the learners*

assessment criteria

1.1 Real-life situations or issues that can be dealt with through statistical methods are identified correctly.

1.2 Methods for collecting, recording and organising data are identified and selections are made so as to maximise efficiency and ensure resolution of the problem or issue.

1.3 Data sources and databases are selected to ensure representativeness of the data sample and validity of **resolutions / findings**

1.4 *Collected data is evaluated and faults and inconsistencies are identified. [only for level 3?]*

1.5 Calculations and the use of statistics are correct.

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

1.7 Express verbally the findings depicted in the data summaries (these representations may be in tables or graphs) and give an opinion on the findings

specific outcome 2: **Use equally likely events to explore probability models, make predictions and study problems**

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

- *organise, sort and classify data for processing and analysis*
- *distinguish between theoretical and experimental probabilities*
- *use probability models for comparing experimental results with mathematical expectations*
- *use tree diagrams in representing and working with events*
- *distinguish between independent, mutually exclusive and complementary events*
- *use basic counting techniques to determine the number of ways an event can occur.*
- *make and test predictions about probability in the context of games and real-life situations*

[Note: straightforward applications relevant to the life experience of the learners should be chosen]

assessment criteria

2.1 Experiments and simulations are chosen appropriately in terms of the situation to be investigated

2.2 Data is gathered, organised, sorted and classified in a suitable manner for further processing and analysis.

2.3 Theory is used correctly to determine probabilities.

2.4 Distinctions are correctly made between theoretical and experimental probabilities and between independent, mutually exclusive and complementary events.

2.5 Predictions are based on validated experimental or theoretical probabilities.

2.6 The outcomes of experiments and simulations are communicated clearly.

specific outcome 3: **Use probability and statistical concepts in solving routine problems from real-world situations and draw conclusions**

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

- *Source and interpret information from a variety of sources including nested or layered tables*
- *Decide whether an argument based on statistics and probability is fair*
- *Describe the use and misuse of statistics and probability in society*
- *Use probabilities to make predictions and judgements*

[Note: straightforward applications relevant to the life experience of the learners should be chosen]

assessment criteria

3.1 Statistics generated from the data are interpreted meaningfully and interpretations can be justified.

3.2 Tables, diagrams, charts and graphs are used appropriately to represent and analyse data and statistics.

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

3.4 Conclusions drawn from the statistics mention:
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:
  Solving a variety of problems based on data statistics and probabilities
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, evaluate and interpret data and statistics to make sense of situations.
- Communicate effectively:
  Use everyday language and mathematical language to represent data, statistics and probabilities and to communicate conclusions.
- Use mathematics:
  Use mathematics to analyse, describe and represent 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.

- Methods for collecting, organising and analysing data
- Techniques for representing and evaluating statistics
- Probability concepts

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: a*ppropriateness, fairness, manageability, integration into work or learning, validity, direct,* au*thentic, sufficient, systematic, open and consistent.*

NQF LEVEL 3
Unit No: Math 3001

Title: Demonstrate understanding of numbers and relationships among number systems, and represent numbers in different ways

Level: 3

Credit: 2

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date:

Review Date:

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 will be useful to people who aim to achieve recognition at some level in Further Education and Training or to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

People credited with this unit standard are able to:

- Use and analyse computational tools and strategies, and make estimates and approximations
- Demonstrate understanding of numbers and relationships among numbers and number systems, and represent numbers in different ways.

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 and measurement error in relation to the accuracy of instruments

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

Specific Outcomes

specific outcome 1: **Expression of rational numbers in decimal notation**

Range: this outcome includes the need to:

- *use technology such as calculators*
- *demonstrate understanding of mathematical relationships and principles involved in computations*
- *find rational approximations to irrational numbers*

assessment criteria:

1.1 Scientific notations are used appropriately and consistently with mathematical conventions.

1.2 Situations for the use of scientific notation are provided and described in terms of advantages.

1.3 Substitution calculation is performed.

specific outcome 2: **Taking measurements and performing error 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:

2.1 Measurements are recorded accurately.

2.2 The effect of error measurements on the final values calculated is reflected through the use of the simple method.

2.3 A simple method with specification involving tolerance is constructed to show the effect of error measurement on the final product.

specific outcome 3: **Conversion from one number system to another number system i.e. conversion from decimal number system to binary number system**

Range: this outcome includes the need to:

- *Demonstrate understanding of mathematical relationships of number systems and principles involved in computations*

assessment criteria:

3.1 Conversions between numbers expressed in different number systems are accurate.

3.2 Additions and subtraction calculation of different number systems are performed accurately.

3.3 Practical application of the different number systems are performed accurately.

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, evaluate 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 analyse, 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.

- Number systems and 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: a*ppropriateness, fairness, manageability, integration into work or learning, validity, direct,* au*thentic, sufficient, systematic, open and consistent.*

Unit No: Math 3002

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

Level: 3

Credit: 2

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date:

Review Date:

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 will be useful to people who aim to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

People credited with this unit standard are able to:

- Use mathematics to plan and control personal and/or household budgets and income and expenditure
- Use simple and compound interest to make sense of and define a variety of situations including investments, stokvels, inflation, appreciation and depreciation
- Investigate various aspects of financial transactions including costs, prices, revenue, cost price, selling price, loss and profit.

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:

- *bank accounts, provincial and key elements of national budgets 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 using computational tools efficiently and correctly and solutions obtained are verified in terms of the context.

1.3 Analysis of budgets are presented in different ways that makes for easy monitoring and control. E.g. pie-charts, graphs, tables, formulae, verbal descriptions.

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: situations include:

- *effective and nominal rates, commission, appreciation and depreciation*

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 to calculate solutions to problems are understood and used.

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

Range: aspects include:

- *tax, productivity and the equitable distribution of resources*

assessment criteria

3.1 Values are calculated correctly.

3.2 Mathematical tools and systems are used effectively to determine, compare and describe aspects of the national economy.

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:
  Solving a variety of numerical and financial problems
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, evaluate and interpret financial information to plan and make provision for monitoring budgets and other financial situations.
- Communicate effectively:
  Use everyday language and mathematical language to describe relationships, processes and problem solving methods.
- Use mathematics:
  Use mathematics to analyse, describe and represent financial 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.

- Budgets
- Terminology and definitions associated with financial situations
- Estimation and approximation
- Compound increase and decrease

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: a*ppropriateness, fairness, manageability, integration into work or learning, validity, direct,* au*thentic, sufficient, systematic, open and consistent.*

Unit No: Math 3003

Title: **Work with a wide range of patterns and basic functions and solve related problems**

Level: 3

Credit: 3

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date:

Review Date:

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 will be useful to people who aim to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

People credited with this unit standard are able to:

- Express and justify mathematical generalisations of situations
- Express mathematical functions and relationships between variables in terms of numerical, graphical, verbal and symbolic approaches
- Analyse and represent mathematical situations and structures using symbolic forms
- Use mathematical models to represent and deal with problems that arise in real and abstract contexts.

Range statement: This unit standard includes the requirement to:

- Use algebraic notions to express generality
- Make conjectures, demonstrate and explain their validity
- Recognise equivalence among expressions and situations in which we need to manipulate and rearrange for a specific purpose.
- Work with the following basic functions in terms of their *shape and symmetry*:

  $y = ax + b$; $y = ax^2 + bx + c$; $y = \frac{a}{x}$; $y = ax^3$; $y = a^x$

  $y = a\sin x$; $y = a\cos x$; $y = a\tan x$;

- Trigonometric functions are limited to:

  $y = \sin\theta$; $y = \cos\theta$; $y = \tan\theta$ for $\theta \in [-360°;360°]$ using the co-ordinate definitions.

- Convert flexibly among various representations of the above functions.
- Represent, interpret and solve problems that relate to these functions by using point by point plotting and numerical analysis

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

Specific Outcomes and Assessment Criteria

Specific outcome 1: **Express and justify mathematical generalisations of situations**

Range: *This outcome includes the requirement to:*

- *deal with situations involving the range of functions specified in the main range statement*
- *distinguish between patterns which apply to limited sets of data and generalisations which can apply to extended sets of data*
- *develop generalisations from sets of data which relate to a wide range of contexts, both concrete, such as performing experiments, and investigating open ended mathematical situations*

assessment criteria

1.1 Generalisations are based on systematic investigations and adequate evidence.

1.2 Generalisations are expressed in symbolic form using functions appropriate to the situation.

1.3 Conjectures are supported by acceptable arguments and claims that generalisations are not possible are supported by coherent reasons.

specific outcome 2: **Express mathematical functions and relationships between variables in terms of numerical, graphical, verbal and symbolic approaches**

Range: *This outcome includes the requirement to:*

- *Translate from one representation to another*
- *Explore and express the behaviour of functions using a variety of approaches such as finding function values and solving equations*
- *Identify, contrast and compare the features of the functions listed in the main range statement*

assessment criteria

2.1 The interchange of functions from one representation to another is fluent.

2.2 Computations in dealing with functions are accurate.

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

2.4 Representations are expressed in an appropriate and integrated way and assist in the formulation and explanation of relationships as functions and relations embedded in contexts.

specific outcome 3: **Analyse and represent mathematical situations and structures using symbolic forms**

Range: *This outcome includes the requirement to:*

- *Use expressions, functions, equations and inequalities to represent situations*
- *Develop strategies for deciding whether symbolic representations are reasonable and interpret such results*
- *Recognise equivalent forms of an expression, equation, function or relation*

assessment criteria

3.1 Situations are represented correctly and comprehensively.

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

3.3 Results are interpreted correctly in terms of the situation.

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:
  Solving 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 analyse, 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.

- Mathematical relations and 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: a*ppropriateness, fairness, manageability, integration into work or learning, validity, direct,* au*thentic, sufficient, systematic, open and consistent*

Unit No: Math 3004

Title: **Describe, apply, analyse and calculate shape and motion in 2- and 3-dimensional space in different contexts**

Level: 3

Credit: 4

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date:

Review Date:

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 will be useful to people who aim to achieve recognition at some level in Further Education and Training or to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

People credited with this unit standard are able to:

- describe and represent the properties of geometric shapes

  Range: properties of 2-dimensional geometric figures, congruence and similarity of polygons

- apply and analyse translations, reflections, and rotations on a variety of geometric contexts
- calculate areas and perimeters of geometric figures in different contexts

Range statement: The scope of this unit standard includes perimeter, surface area, volume, ratio, proportion, symmetry, transformations, co-ordinate geometry, trigonometry and making and justifying conjectures. More detailed range statements are provided for specific outcomes and assessment criteria as needed.

Specific Outcomes and Assessment Criteria

specific outcome 1: **Describe and represent the properties of geometric shapes**
Range: properties of 2-dimensional geometric figures, congruence and similarity of polygons

assessment criteria

1.1 Angles and sides are accurately measured and corresponding parts of the angle are matched to show congruence and similarity of polygons.

1.2 The conditions that make two figures congruent and similar are described.

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

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

1.5 Estimates are appropriate and their accuracy can be justified in terms of the need.

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

1.7 Conjectures as appropriate to the situation, are based on well-planned investigations of geometrical properties and can be justified through logical arguments.

specific outcome 2: A**pply and analyse translations, reflections, and rotations on a variety of geometric contexts**

Range:

- *Problems in 2- dimensions.*
- *Models and representations to include combinations of different transformations..*

assessment criteria

2.1 The effect of translations, reflections and rotations are described.

2.2 Translations, reflections, and rotations are applied on a variety of geometric contexts.

2.3 Translations, reflections, and rotations on a variety of geometric contexts are analysed.

specific outcome 3: **Calculate areas and perimeters of geometric figures in different contexts**

assessment criteria:

3.1 The dimensions of geometric figures to be measured are identified

3.2 An appropriate formulate is selected to solve the problem.

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

3.4 The required quantities are calculated accurately.

3.5 The chosen strategy to solve the problem is reflected upon.

3.6 Alternative strategies to obtain the solution are explored

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:
  Solving a variety of problems involving space, shape and time using geometrical and trigonometric techniques
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, evaluate 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.

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
- Formulae for calculating surface area and perimeter
- Geometric and trigonometric techniques for analysing and describing situations and solving problems

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: a*ppropriateness, fairness, manageability, integration into work or learning, validity, direct,* au*thentic, sufficient, systematic, open and consiste*nt.

Unit No: Math 3005

Title: **Apply knowledge of statistics and probability to inform the collection and use of data and procedures in order to investigate life-related problems and interpret the findings**

Level: 3

Credit: 5

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date:

Review Date:

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 3.

Purpose: This unit standard will be useful to people who aim to achieve recognition at some level in Further Education and Training or to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

People credited with this unit standard are able to:

- collect and work with data using various techniques to establish statistical models for specific purposes,
- use experiments and simulations to explore probability models, make predictions and study problems, and
- construct and critically interpret probability and statistical concepts in problem solving and decision making in real-world situations.

Range statement: This unit standard includes the requirement to:

- Identify issues suited to resolution by statistical methods
- Select a sample that is representative of the population
- Collect and generate data through the use of questionnaires and suitable experiments
- Use experiments and simulations to explore situations, make predictions and study problem
- Generate appropriate statistics and probability values through the use of calculators
- Represent data in the form of tables and appropriate charts and graphs
- Use statistics and representations of data to argue a resolution of an issue
- Critically analyse and interpret statistics, the use of probabilities, and representations of data
- Work with experimental and theoretical definitions of probability and sample spaces
- Work with probability values in practical situations
- Use technology to determine how well different models such as linear, quadratic fit data

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

Specific Outcomes and Assessment Criteria

specific outcome 1: **Collect and work with data using various techniques to investigate life-related problems**

Range: Techniques include:

- *selecting 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*
- *generating experimental data appropriate to the situation under investigation*
- *using databases to obtain information and data suited to the resolution of particular issues*
- *using random number devices such as spinners, tables or calculators to select a sample*
- *adapting simple models to simulate situations involving chance processes*
- *working with different types of measuring instruments and scales such as dichotomous scale, 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 inter-quartile range*
- *using scatter plots and intuitively placed lines of best fit to represent the association between two variables*

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 probabilistic or statistical methods are identified correctly.

1.2 Methods for collecting, recording and organising data are identified and selections are made so as to maximise efficiency and ensure resolution of the problem or issue.

1.3 Data sources are selected to ensure representativeness of the data sample and validity of resolutions. Activities that could result in contamination of data are identified and explanations are provided for the effects of contaminated data.

1.4 Data is gathered using methods appropriate to the data type and purpose for gathering the data. Data collection methods are used correctly.

1.5 Calculations and the use of statistics are correct.

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

specific outome 2: **Use experiments, simulations and equally likely events to explore probability models, make predictions and study problems**

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

- *organise, sort and classify data for processing and analysis*
- *examine random events through simulation*
- *distinguish between theoretical and experimental probabilities*
- *use sets to develop theoretical probability in terms of sample spaces*
- *make and test predictions about probability in the context of games and real-life situations*
- *use probability models for comparing experimental results with mathematical expectations*
- *design a probability experiment to study a problem*
- *use counting techniques inclusive of permutations and combinations to determine the number of ways an event can occur.*

assessment criteria

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

2.2 Data is gathered, organised, sorted and classified in a suitable manner for further processing and analysis. Available technology is used in a way that improves the efficiency of the process.

2.3 Samples selected model or represent the whole situation.

2.4 Theory is used correctly to determine probabilities

2.5 Predictions are based on validated experimental or theoretical probabilities.

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

2.7 The outcomes of experiments and simulations are communicated clearly.

specific outcome 3: **Use probability and statistical concepts in problem solving and decision making in real-world situations**

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

- *Use a variety of methods to represent statistics including pie charts, bar graphs, histograms, stem and leaf plots, box plots, scatter graphs, time series graphs,*
- *Source and interpret information from a variety of sources including nested or layered tables,*
- *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,*
- *Use probabilities to make predictions and judgements*
- *Make comparisons between predictions and actual occurrences*
- *Use curve fitting in linear and quadratic cases to predict trends*

assessment criteria

3.1 Statistics generated from the data are interpreted meaningfully and interpretations can be justified.

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

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

3.4 Everyday situations are classified in terms of dependent and independent events.

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

3.6 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.

3.7 Resolutions for the situation or issue are supported by the data and are validated in terms of the 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:

- Identify and solve problems using critical and creative thinking:
  Solving 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 to communicate conclusions.
- Use mathematics:
  Use mathematics to critically analyse, describe and represent 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.

- Methods for collecting, organising and analysing data
- Techniques for representing and evaluating statistics
- Probability concepts and set theoretic development

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: a*ppropriateness, fairness, manageability, integration into work or learning, validity, direct, authentic, sufficient, systematic, open and consistent.*

NQF LEVEL 4
Unit No: Math 4001

Title: **Apply knowledge of sequences and series to interpret and solve problems in real and simulated situations**

Level: 4

Credit: 2

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date:

Review Date:

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 3.

Purpose: This unit standard will be useful to people who aim to achieve recognition at some level in Further Education and Training or to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

- Demonstrate understanding of numbers and relationships among numbers and number systems, and represent numbers in different ways.

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 and measurement error in relation to the accuracy of instruments

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

Specific Outcomes

specific outcome 1: **Demonstrate understanding of infinite and finite sequences and series**

assessment criteria:

1.1 Covergent and divergent sequences are correctly identified.

1.2 Real life situations are expressed in the form of sequences and series.

1.3 Unknown terms in a sequence are correctly determined.

specific outcome 2: **Identify and interpret patterns of divergent and convergent sequences and series**

assessment criteria:

2.1 Patterns are correctly identified and interpreted.

2.2 Sequences and series of numbers are correctly interpreted and expressed.

2.3 Real life situations of convergence and divergence sequences are given.

specific outcome 3: **Represent and interpret sequences and series in sigma notation**

Range: this outcome includes the need to:

- *use technology such as calculators*
- *demonstrate understanding of mathematical relationships and principles involved in computations*

assessment criteria:

3.1 Sequences are expressed in sigma notation correctly.

3.2 Sequences in sigma notation are interpreted and expressed in expansion form.

3.3 Calculations involving the sum to n terms of arithmetic and geometric series are performed correctly.

specific outcome 4: **Apply knowledge of sequences and series to perform calculations on savings and interest rates**

Range: this outcome includes the need to:

- *use technology such as calculators*
- *demonstrate understanding of mathematical relationships and principles involved in computations*

assessment criteria:

4.1 Calculations on savings and interest rates are performed accurately.

4.2 The effect of change of interest rates to the mortgage bond is explained.

4.3 The differences between simple and compound interest are described.

4.4 Practical examples of savings over a period of time are performed accurately.

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, evaluate 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 analyse, 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.

- Number systems and 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 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: a*ppropriateness, fairness, manageability, integration into work or learning, validity, direct,* au*thentic, sufficient, systematic, open and consistent.*

Unit No: Math 4002

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

Level: 4

Credit: 2

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date:

Review Date:

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 3.

Purpose: This unit standard will be useful to people who aim to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

People credited with this unit standard are able to:

- Use mathematics to plan and control financial instruments including insurance and assurance, unit trusts, stock exchange dealings, options, futures and bonds
- Use simple and compound interest to make sense of and define a variety of situations including mortgage loans, hire-purchase, present values, annuities and sinking funds
- Investigate various aspects of costs and revenue including marginal costs, marginal revenue and optimisation of profit
- Use mathematics to debate aspects of the national and global economy, including tax, productivity and the equitable distribution of resources.

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 manage financial instruments**

Range: instruments include:

- *insurance and assurance, unit trusts, stock exchange dealings, options, futures and bonds*

assessment criteria

1.1 Relevant formulae is selected and manipulated to solve problems related to management of financial instruments. E.g. calculate premiums, rates of insurance, manipulation of formulae, percentages, calculator skills.

1.2 Different financial instruments are compared in terms of yield and cost.

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

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

Range: situations include:

- *mortgage loans, hire-purchase, present values, annuities and sinking funds*

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 understood and used to calculate solutions to problems.

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

Range: aspects include:

- *exchange rates, imports, exports, comparative effectiveness of currency in relation to remuneration, monetary policy and the control of inflation.*

assessment criteria

3.1 Values are calculated correctly.

3.2 Mathematical tools and systems are used effectively to determine, compare and describe aspects of the national and global economy.

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:
  Solving a variety of numerical and financial problems
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, evaluate and interpret financial information to plan and make provision for monitoring budgets and other financial situations.
- Communicate effectively:
  Use everyday language and mathematical language to describe relationships, processes and problem solving methods.
- Use mathematics:
  Use mathematics to analyse, describe and represent financial 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.

- Budgets
- Terminology and definitions associated with financial situations
- Estimation and approximation
- Compound increase and decrease

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: a*ppropriateness, fairness, manageability, integration into work or learning, validity, direct,* au*thentic, sufficient, systematic, open and consistent.*

Unit No: Math 4003

Title: **Work with a wide range of patterns and transformations of functions and solve related problems**

Level: 4

Credit: 2

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date:

Review Date:

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 will be useful to people who aim to achieve recognition at some level in Further Education and Training or to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

People credited with this unit standard are able to:

- Express and justify mathematical generalisations of situations
- Express mathematical functions and relationships between variables in terms of numerical, graphical, verbal and symbolic approaches
- Analyse and represent mathematical situations and structures using symbolic forms
- Use mathematical models to represent and deal with problems that arise in real and abstract contexts.

Range statement: This unit standard includes the requirement to:

- Use algebraic notions to express generality
- Make conjectures, demonstrate and explain their validity
- Recognise equivalence among expressions and situations in which we need to manipulate and rearrange for a specific purpose
- Understand and use transformations (vertical and horizontal shifts, reflections) of the basic functions to derive information to solve problems. These would include transformations implicit in, for example, the following formulations

$$y = a(x+p)^2 + q$$
$$y = a(x+p)^3 + q$$
$$y = a^x + q$$
$$y = \sin\theta + q$$
$$y = \cos\theta + q$$
$$y = \tan\theta + q$$

- Convert flexibly among various representations of these functions
- Represent, interpret and solve problems mathematically using the above functions

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

Specific Outcomes and Assessment Criteria

specific outcome 1: **Express and justify mathematical generalisations of situations**

Range: *This outcome includes the requirement to:*

- *deal with situations involving the functions listed in the main range statement*
- *distinguish between patterns which apply to limited sets of data and generalisations which can apply to extended sets of data*
- *develop generalisations from sets of data which relate to a wide range of contexts, both concrete, such as performing experiments, and abstract, such as investigating open ended mathematical situations*

assessment criteria

1.1 Generalisations are based on systematic investigations and adequate evidence.

1.2 Generalisations are expressed in symbolic form using functions appropriate to the situation.

1.3 Conjectures are supported by acceptable arguments and claims that generalisations are not possible, are supported by coherent reasons.

specific outcome 2: **Express mathematical functions and relationships between variables in terms of numerical, graphical, verbal and symbolic approaches**

Range: *This outcome includes the requirement to:*

- *Translate from one representation to another*
- *Identify, contrast and compare the features of the functions listed in the main range statement*

assessment criteria

2.1 The interchange of functions from one representation to another is fluent.

2.2 Symbolic computations in dealing with functions are accurate.

2.3 The key features of the graphs of functions and the effects of transformations on them are described and interpreted correctly.

2.4 Representations are expressed in an appropriate and integrated way and assist in the formulation and explanation of relationships as functions and relations embedded in contexts.

specific outcome 3: **Analyse and represent mathematical situations and structures using symbolic forms**

Range: *This outcome includes the requirement to:*

- *Use expressions, functions, equations, inequalities and systems of equations to represent situations that involve variable quantities*
- *Develop strategies for deciding whether symbolic representations are reasonable and interpret such representations*
- *Analyse the effect of transformations on symbolic representations (explain ito rotation, horizontal flips, etc.)*
- *Develop and recognise equivalent forms of an expression, equation, function or relation*

assessment criteria

3.1 Situations are represented correctly and comprehensively.

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

3.3 Results are interpreted correctly in terms of the situation.

specific outcome 4: **Use mathematical models to represent and deal with problems that arise in real and abstract contexts**

Range: *This outcome includes the requirement to:*

- *Represent the problem mathematically using functions, systems of equations and/or inequalities. This could include dealing with motion of objects in a straight line by regarding velocity and acceleration as rates of change.*
- *Investigate a variety of repetitive processes which can be modelled in terms of periodic functions*
- *Solve systems involving 3 linear equations and 3 variables and other systems involving linear and quadratic equations*

assessment criteria

4.1 Contextual problems are represented correctly and comprehensively.

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

4.3 Solutions are obtained through careful analysis and interpretation of the mathematical representation and solutions are reinterpreted correctly in terms of the problem context.

4.4 A variety of different situations that can be modelled by a particular type of function are identified

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:
  Solving 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 analyse, 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.

- Mathematical relations and 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: a*ppropriateness, fairness, manageability, integration into work or learning, validity, direct,* au*thentic, sufficient, systematic*

Unit No: Math 4004

Title: Construct, analyse and calculate shape and motion in 2- and 3-dimensional space in different contexts

Level: 4

Credit: 4

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date:

Review Date:

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 3.

Purpose: This unit standard will be useful to people who aim to achieve recognition at some level in Further Education and Training or to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

People credited with this unit standard are able to:

- Analyse, describe and represent the properties of geometric shapes
- Construct and analyse geometrical and trigonometric models to solve real and abstract problems
- Calculate surface areas and volume of geometric shapes in different contexts

Range statement: The scope of this unit standard includes perimeter, surface area, volume, ratio, proportion, symmetry, transformations, co-ordinate geometry, trigonometry and making and justifying conjectures. More detailed range statements are provided for specific outcomes and assessment criteria as needed.

Specific Outcomes and Assessment Criteria

specific outcome 1: **Analyse, describe and represent the properties of geometric shapes**

assessment criteria

1.1 3-dimensional figures are sketched from models and drawings.

Range: The sketch could be done with or without the use of computer application

1.2 2- 3-dimensional shapes are constructed to meet certain criteria.

1.3 The conditions that make two shapes congruent are investigated.

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

1.5 Conjectures are appropriate to the situation, are based on well-planned investigations of geometrical properties and can be justified through logical arguments.

specific outcome 2: **Construct and analyse geometrical and trigonometric models to solve real and abstract problems**

assessment criteria

2.1 The image of a 2-dimensional shape under a translation, a reflection and rotation is recognised in a variety of situations.

2.2 The designs that include translated, rotated and reflected 2-dimensional images are constructed and analysed using concrete materials and drawings and/or using appropriate computer applications.

2.3 Patterns are constructed and analysed.

specific outcome 3: Calculate surface areas and volume of geometric shapes in different contexts

assessment criteria:

3.1 The dimensions of geometric figures to be measured are identified.

3.2 An appropriate formulate is selected to solve the problem.

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

3.4 The required quantities are calculated accurately.

3.5 The chosen strategy to solve the problem is reflected upon.

3.6 Alternative strategies to obtain the solution are explored.

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:
  Solving a variety of problems involving space, shape and time using geometrical and trigonometric techniques
- Collect, analyse, organise and critically evaluate information:
  Gather, organise, evaluate 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.

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
- Formulae for calculating surface area and volume
- Geometric and trigonometric techniques for analysing and describing situations and solving problems
- The Cartesian system

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: a*ppropriateness, fairness, manageability, integration into work or learning, validity, direct,* au*thentic, sufficient, systematic, open and consistent.*

Unit No: Math 4005

Title: Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings on a life-related problem

Level: 4

Credit: 5

Field: Mathematical, Physical, Computer and Life Sciences

Sub-Field: Mathematical Sciences

Issue Date:

Review Date:

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 3.

Purpose: This unit standard will be useful to people who aim to achieve recognition at some level in Further Education and Training or to meet the Fundamental requirement of a wide range of qualifications registered on the National Qualifications Framework.

People credited with this unit standard are able to:

- collect and work with data using various techniques to establish statistical models for specific purposes,
- use experiments and simulations to explore probability models, make predictions and study problems, and
- construct and interpret probability and statistical concepts in problem solving and decision making in real-world situations.

Range statement: This unit standard includes the requirement to:

- Use experimental design
- Select the sample that can be representative of the population
- Decide on factors that influence the range of reasonableness of estimates of the population statistics from sample
- Make comparisons of distribution of variables in one population and compare with the distribution of the same variable in two different populations
- Use electronic and other devices as available to assist data collection, organisation and representation
- Recognise how sample size and transformation of data affects shape, centre and spread
- Use technology to determine how well different models such as linear, quadratic exponential and logarithmetic fit data
- Look for symmetry and skewness, clusters and gaps, and possible outliers in data and consider their effects on the interpretation of the data
- Use data from samples to estimate population statistics
- Demonstrate understanding that some phenomena are random and apply the law of large numbers to predict long term behaviour
- Demonstrate understanding of and compute probabilities of independent, disjoint and conditional events
- Demonstrate an understanding of probability distributions

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

Specific Outcomes and Assessment Criteria

specific outcome 1: **Investigate statistical reports and critique their findings**

Range: Techniques include:

- *the formulation and use of questionnaires, surveys and interviews to obtain data*
- *using random number devices such as spinners, tables or calculators and computers to select a sample of data*
- *adapting simple models to simulate situations involving chance processes*
- *working with different instruments and scales such as dichotomous and 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; variance, standard deviation and inter-quartile range*
- *using scatter plots and lines of best fit to represent the association between two variables*
- *calculating correlation coefficients.*

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*
- *examining random events through simulation*

assessment criteria

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

1.2 Methods for collecting, recording and organising data are identified and selections are made so as to maximise efficiency and ensure resolution of the problem or issue.

1.3 Data sources and databases are selected to ensure representativeness of the data and validity of resolutions. Activities that could result in contamination of data are identified and explanations are provided of the effects of contaminated data.

1.4 Data is gathered using methods appropriate to the data type and purpose for gathering the data. Data collection methods are used correctly.

1.5 Calculations and the use of statistics are correct.

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

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

specific outcome 2: **Investigate probability distributions and critique and explore probability models and predictions**

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

- *examine random events through simulation*
- *use the laws governing events*
- *Estimate and calculate theoretical and experimental probabilities in a variety of ways including the use of probability distributions,*
- *Demonstrate an understanding of basic discrete (e.g., uniform, binomial, hypergeometric) and continuous distributions*
- *Probability models for comparing experimental results with mathematical expectations*
- *Use the normal distribution to describe various sets of continuous data*
- *Assign conditional probabilities in two way tables*
- *Use continuous distributions, in particular the normal distribution, and areas under the distribution curve, to calculate the probability of an occurrence within an interval*
- *Use the normal distributions to calculate confidence intervals for population statistics estimated from random samples*

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 **probability and statistical models [which use] using distributions 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*
- *Design a probability experiment to study a problem*
- *Compare predictions made through simulation with those arrived at through the use of a distribution such as the binomial distribution.*
- *Apply basic discrete probability distributions to model and solve real life problems*
- *Use areas under the normal curve to calculate probabilities for events*

assessment criteria

3.1 Statistics generated from the data are interpreted meaningfully and interpretations can be justified.

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

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

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:
  Solving 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 conclusions.
- Use mathematics:
  Use mathematics to critically analyse, describe and represent 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.

- Methods for collecting, organising and analysing data
- Techniques for representing and evaluating statistics
- Basic discrete and continuous probability distributions

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.
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