

**Unit ID: 892**

**Domain**

**FOUNDATION NUMERACY SKILLS**

**Title:**

**Apply knowledge of intermediate  
mathematics in different context**

**Level: 4**

**Credits: 6**

### **Purpose**

This unit standard specifies the competencies required to apply knowledge of intermediate mathematics in different context. It includes skills to perform intermediate factorizations, apply laws and rules to solve expressions involving exponents, surds and logarithms, solve equations and word problems and manipulate technical formulae, co-ordinate geometry, solving algebraic equations using graphs, apply knowledge of calculus and apply intermediate knowledge of trigonometry. This unit standard is intended for people in different contexts, requiring intermediate mathematic skills.

### **Special Notes**

1. This unit standard may be assessed in any context of operation and may be assessed in conjunction with other relevant technical unit standards selected from a particular domain that has a thematic link to this unit standard.
2. Glossary of terms:
  - '*Calculus*' refers to the branch in mathematics focused on limits, functions, derivatives, integrals and infinite series.
- 3.
4. Assessment evidence may be collected at any realistic place where logical collection of such evidence can be achieved.
5. This unit standard gives users exposure to a holistic approach of study and world of work to gain an understanding of the world as a set of related systems, by recognizing that problem solving contexts do not exist in isolation but that they may differ from context to context according to the area of application.
6. The correct use of the suitable technical terminology must be stressed, especially in formulating definitions and principles.
7. Regulations and legislation relevant to this unit standard include the following:
  - Labour Act, No. 11, 2007.
  - Occupational Health and Safety Regulations No. 18, 1997 and all subsequent amendments.

### **Quality Assurance Requirements**

This unit standard and others within this subfield may be awarded by institutions which meet the accreditation requirements set by the Namibia Qualifications Authority and the Namibia Training Authority and which comply with the national assessment and moderation requirements. Details of specific accreditation requirements and the national assessment arrangements are available from the Namibia Qualifications Authority and the Namibia Training Authority on [www.nta.com.na](http://www.nta.com.na).

## **Elements and Performance Criteria**

### **Element 1: Perform advanced factorizations.**

#### **Range**

Quadratic expressions are limited to quadratic trinomial, perfect squares and difference of squares.

#### **Performance Criteria**

- 1.1 Polynomials are factorized by looking for the common factor.
- 1.2 Quadratic expressions are factorized.
- 1.3 The difference and sum of two cubes are factorized.
- 1.4 The remainder and factor theorems are applied to quadratic, cubic equations.
- 1.5 Addition and subtraction of algebraic fractions are performed.
- 1.6 Multiplication and division of algebraic fraction are performed by first factorising the numerators and denominators. Fractions divided by fractions are simplified.

### **Element 2: Apply laws of exponents and logarithms to solve expressions involving exponents, surds and logarithms.**

#### **Range**

Laws of exponents:  $a^m a^n = a^{m+n}$ ,  $\frac{a^m}{a^n} = a^{m-n}$ ,  $(a^m)^n = a^{m \cdot n}$ ,  $(a \cdot b)^m = a^m b^m$ ,  $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ ,  $a^0 = 1$ ,  $a^{-1} = \frac{1}{a}$ ,  $a^{-m} = \frac{1}{a^m}$  and  $a^{\frac{1}{m}} = \sqrt[m]{a}$ .

Laws of logarithm:  $\log_a xy = \log_a x + \log_a y$ ,  $\log_a x/y = \log_a x - \log_a y$ ,  $\log_a x^n = n \cdot \log_a x$ ,  $n$ ,  $\log_a a = 1$  and  $\ln x = \log_e x$ .

#### **Performance Criteria**

- 2.1 The laws of exponents and their properties are applied to solve algebraic expressions and exponential equations.
- 2.2 Expressions with surds are simplified by using the rules of the four basic operations and factorization.
- 2.3 Fractions with irrational numerators are rationalized.
- 2.4 Equations containing surds are solved where only equations in which it is necessary to square once are allowed.
- 2.5 Equations which can be converted to quadratic equations are solved.

- 2.6 Laws of logarithms are reproduced and are applied to simplify expressions.
- 2.7 Logarithmic equations in which the natural logarithm  $\log_e x$  or  $\ln x$  appears, with specific reference to the change in the radix (base) are solved.

**Element 3: Solve equations and word problems and manipulate technical formulae.**

**Range**

Manipulation of technical formulae includes manipulation of exponents, manipulation by factorization, manipulation by using quadratic formula and manipulation of cubes, squares, square roots and cube roots.

**Performance Criteria**

- 3.1 Linear equations containing fractions are solved.
- 3.2 Quadratic equations are solved by completing the square, quadratic formula and/or factorization.
- 3.3 The quadratic formula is derived by completing the square.
- 3.4 Simultaneous equations (combination of linear and non-linear) are solved.
- 3.5 Linear and quadratic equations are set and solved from formulated problems. The equations may not both be quadratic.
- 3.6 Technical formulae are manipulated by changing the subject of a given formula to any other subject.
- 3.7 The value is determined from advanced technical formulae by manipulation and substitution.

**Element 4: Co-ordinate geometry.**

**Performance Criteria**

- 4.1 Given a set of information, the equation of a straight line is found.
- 4.2 Given a set of information, the length of a line segment, the angle of inclination, the gradient and the coordinates of the midpoint of a given segment are determined.
- 4.3 Given a set of information of a circle, the equations of a circle, points of intersection and a tangent to the circle are determined.

### **Element 5: Solve algebraic equations using graphs.**

#### **Performance Criteria**

- 5.1 Given the applicable algebraic equations, respective graphs are drawn.
- 5.2 Given sketched graphs, the applicable equations are determined.
- 5.3 Simultaneous equations are graphically solved.
- 5.4 The graph of  $y = ax^n$  is drawn and the influence on the form of the graph with changes in the values of a and n, where  $0 \leq n \leq 3$  is indicated.

### **Element 6: Apply knowledge of calculus.**

#### **Performance Criteria**

- 6.1 Concept of function including domain and range is explained.
- 6.2 The average gradient of a curve between points is calculated.
- 6.3 The speed of an object is calculated.
- 6.4 Given applicable functions, limits are determined.
- 6.5 Concept of differentiation is explained and the rules are reproduced.
- 6.6 The gradient of a curve at any point on the curve is determined.
- 6.7 Differentiation is applied in solving simple problems.
- 6.8 The turning points of polynomials of third degree functions are calculated and the curve is sketched.

### **Element 7: Apply advanced knowledge of trigonometry.**

#### **Range**

Trigonometric functions:  $y = a \sin x$ ,  $y = a \cos x$ ,  $y = \sin bx$ ,  $y = \cos bx$ ,  $y = a \sin bx$ ,  $y = a \cos bx$ ,  $y = a \sin (bx + c)$  and  $y = a \cos (bx + c)$

#### **Performance Criteria**

- 7.1 Trigonometric expressions are simplified using exact (precise) values and by applying reciprocal, quotient and square identities.
- 7.2 Angle, dimension and area of triangles is calculated using sine rule, cosine rule and area rules.
- 7.3 Trigonometric functions are applied in finding heights and distances involving elevations and depressions.

- 7.4 Trigonometric equations for angles in one revolution ( $0^\circ - 360^\circ$ ) are solved.
- 7.5 Graphs of different trigonometric functions are sketched by making use of the amplitude and period method and approximate values from the graphs are interpreted.
- 7.6 Sinusoidal waveforms are developed from a vector rotating with an angular velocity ( $\omega$ ) of radians per second.
- 7.7 Two trigonometric waves are combined on the same axial system.

### **Registration Data**

<b>Subfield:</b>	Numeracy
<b>Date first registered:</b>	18 November 2010
<b>Date this version registered:</b>	18 November 2010
<b>Anticipated review:</b>	2015
<b>Body responsible for review:</b>	Namibia Training Authority