MATHEMATICS FOR SCIENCE

ISCED UNIT CODE: 0541 551 03A

TVET CDACC UNIT CODE: APB/CU/AB/CC/03/6/MA

Relationship to Occupational Standards

This unit addresses the unit of competency: Apply Mathematics for Science.

Duration: 150 hours

Unit Description

This unit describes the competencies required by an Applied Biology technologist in order to apply mathematics for science. It involves applying: basic arithmetic operation; algebraic equation and expression; linear and non-linear graphs; indices and logarithm and sequences and series, apply trigonometry, apply binomial expansions apply matrices, apply statistics methods apply vectors and apply Calculus

Summary of Learning Outcomes

By the end of this unit, the learner should be able to:

S/No	Learning Outcomes	Duration (Hours)
1.	Apply basic arithmetic operation	10
2.	Apply algebraic equation and expression	10
3.	Apply linear and non-linear graphs	10
4.	Apply indices and logarithms	10
5.	Apply sequences and series	10
6.	Apply trigonometry	20
7.	Apply binomial expansions	20

8.	Apply matrices	20
9.	Apply statistics methods	10
10.	Apply vectors	10
11.	Apply Calculus	20
	TOTAL	**150**

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	**Content**	**Suggested Assessment Methods**
1. Apply basic arithmetic operation	1.1 Addition and subtraction on; 1.1.1 Natural numbers 1.1.2 Integers 1.1.3 Fractions 1.1.4 Decimals 1.2 Multiplication and division on; 1.2.1 Natural numbers 1.2.2 Integers 1.2.3 Fractions 1.2.4 Decimals 1.3 Rational and irrational numbers 1.4 Ratios, proportions and percentages 1.4.1 Direct proportion 1.4.2 Inverse proportion	• Observation • Third party report • Written tests • Oral questioning • Portfolio of evidence • Interviews
2. Apply algebraic equation and expression	2.1 Solution of linear equations 2.2 Solution of simultaneous 2.2.1 Elimination method	• Observation • Third party report • Written tests

	2.2.2 Substitution method 2.2.3 Graphical method 2.3 Transposition of formula 2.4 Solution of quadratic equations 2.4.1 Factorization 2.4.2 Completing square method 2.4.3 Quadratic formula	• Oral questioning • Portfolio of evidence • Interviews
3. Apply linear and non-linear graphs	3.1 Linear and nonlinear graphs 3.2 Reduction of non-linear to linear graphs 3.3 Interpretation of graphs	• Observation • Third party report • Written tests • Oral questioning • Portfolio of evidence • Interviews
4. Apply indices and logarithms	4.1 Indices 4.1.1 Bases 4.1.2 Laws of indices 4.1.3 Indicial equations 4.2 Logarithms 4.2.1 Laws of logarithms 4.2.2 Logarithmic operations 4.3 Conversion of base of logarithms 4.4 Graphs of Logarithmic and exponential functions	• Observation • Third party report • Written tests • Oral questioning • Portfolio of evidence • Interviews
5. Apply sequences and series	5.1 Arithmetic sequence 5.1.1 arithmetic mean 5.1.2 nth term of arithmetic sequence	• Observation • Third party report • Written tests • Oral questioning

	5.2 Sum of terms of arithmetic series (Arithmetic progression) 5.3 Geometric sequence 5.3.1 Finite geometric sequence 5.3.2 Geometric means and n^{th} terms of a geometric sequence 5.3.3 Sum of finite and infinite geometric sequence	• Portfolio of evidence • Interviews
6. Apply trigonometry	6.1 Pythagoras theorem 6.2 Trigonometric ratios 6.2.1 Trigonometry identities 6.2.2 Trigonometric equations	• Observation • Third party report • Written tests • Oral questioning • Portfolio of evidence • Interviews
7. Apply binomial expansions	7.1 Roots of numbers using binomial theorem 7.1.1 Pascals triangle 7.2 *Errors* of small changes using binomial theorem 7.2.1 Absolute Error 7.2.2 Relative Error 7.2.3 Percentage Error 7.3 Permutation and combination	• Observation • Third party report • Written tests • Oral questioning • Portfolio of evidence
8. Apply matrices	8.1 Introduction to matrices 8.2 Types of matrices 8.2.1 Singular 8.2.2 non-singular	• Observation • Third party report • Written tests • Oral questioning

	8.2.3 identity 8.2.4 echelon 8.3 Order of matrices 8.4 Matrix operation 8.4.1 addition and subtraction 8.4.2 multiplication by scaler 8.4.3 compatibility 8.4.4 matrix multiplication 8.5 Determinant and inverse of 2x2 matrix	• Portfolio of evidence
9. Apply statistics methods	9.1 Collection of raw data 9.1.1 Ungrouped data 9.1.2 Grouped data 9.2 Data presentation 9.2.1 Pictograms 9.2.2 Histograms 9.2.3 Pie charts 9.2.4 Bar charts 9.2.5 Frequency polygon 9.3 Processing of raw data 9.3.1 Measures of central tendency 9.3.1.1 Mean 9.3.1.2 Mode 9.3.1.3 Median 9.4 Measures of dispersion 9.4.1 Range 9.4.2 Quartile 9.4.3 Variance 9.4.4 Standard deviation	• Observation • Third party report • Written tests • Oral questioning • Portfolio of evidence

	9.5 Interpretation of processed data	
10. Apply vectors	10.1 Vectors and scalar quantities in two dimensions 10.2 Definitions of vector and scalar quantities\ 10.3 Drawing a vector 10.4Vectors operations 10.4.1 Addition 10.4.2 Subtraction 10.4.3 Scalar multiplication 10.5Position of vectors 10.6Modulus of a vector 10.7Resolution of a vector	• Observation • Third party report • Written tests • Oral questioning • Portfolio of evidence • Interviews
11. Apply Calculus	11.1 Differential Calculus 11.1.1 Functional notation 11.1.2 Differentiation by first principle 11.1.3 Standard differentiation 11.1Methods of differentiation 11.1.1 Product rule 11.1.2 Quotient rule 11.1.3 Chain rule **11.2** Rates of change **11.2.1** Small changes **11.3**Differential equations **11.4**Integral Calculus 11.4.1 Integral notation 11.4.2 Standard integration 11.4.3 Constant of integration	• Observation • Third party report • Written tests • Oral questioning • Portfolio of evidence • Interviews

	11.4.4 Definite and indefinite integration 11.4.5 Methods of integration 11.4.6 Algebraic substitution	

Suggested Delivery Methods

- Group discussions
- Demonstration by trainer
- Practical exercises by trainees

Recommended Resources for 25 trainees

S/No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Trainee)
A	**Learning Materials**			
	Power point presentations	For trainer's use	1	1:25
B	**Learning Facilities & infrastructure**			
2.	Lecture/theory room	For training	1	1:25
3.				
C	**Tools and Equipment**			
4.	Computer	For trainer's use	1	1:25
5.	Scientific calculator	For trainee's use	25	1:1
6.	Projector	For trainer's use	1	1:25
7	SMP Mathematical table	For trainee's use	25	1:1
8	White board ruler	For trainer's use	1	1:25
9	White board compass	For trainer's use	1	1:25
10.	White board protractor	For trainer's use	1	1:25
11.	Geometrical set	For trainee's use	25	1:1
12.	Graph book	For trainee's use	25	1:1