APPLY MATHEMATICS FOR SCIENCE

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UNIT DESCRIPTION

This unit describes the competencies required to apply mathematics for science. It involves applying: basic arithmetic operation; algebraic equation and expression; linear and non-linear graphs; indices and logarithm; binomial expansion; matrices; vectors; trigonometry; calculus; sequence and series and statistics.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace functions	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements ***(Bold and italicized terms are elaborated in the range)***
1. Apply basic arithmetic operation	1.1 Addition and subtraction is performed as per arithmetic operation rules 1.2 Multiplication and division is applied as per arithmetic operation rules 1.3 Rational and irrational numbers are evaluated as per algebraic rules 1.4 Ratios, ***proportions*** and percentages is applied as per algebraic rules
2. Apply algebraic equation and expression	2.1 Linear equations are solved as per the concept 2.2 Simultaneous equations are solved as per the ***simultaneous method*** 2.3 Formulation of a formula is applied as per the concept 2.4 quadratic equation is solved as per the ***quadratic methods***

3. Apply linear and non-linear graphs	3.1 Linear and nonlinear graph is plotted as per the graphical methods 3.2 Reduction of non-linear to linear graphs is performed as per the concept 3.3 Graph is interpreted as per the concept formulate Graphical solution
4. Apply indices and logarithms	4.1 Indices are operated as per the concept 4.2 ***Logarithm*** is defined as per the concept 4.3 Change of base of logarithms is performed as per logarithmic concept 4.4 Logarithmic and exponential graph is plotted as per logarithmic concept
5. Apply binomial expansions	5.1. Roots of numbers are determined using binomial theorem 5.2. ***Errors*** of small changes are determined using binomial theorem 5.3. Permutation and combination are applied using binomial theorem
6.Apply matrices	6.1 Determinant and inverse of 2x2 matrix is determined as per the concept. 6.2 Simultaneous equations are solved as per matrix concept 6.3 Eigenvalues and Eigenvectors are determined as per matrix concepts
7. Apply vectors	7.1 Vectors and scalar quantities are obtained in two dimensions 7.2 ***Operations*** on vectors are performed as per vector concept 7.3 Position of vectors are obtained as per vector concept 7.4 Vector is resolved as per vector concept
8. Apply trigonometry	

	8.1 ***Trigonometric ratios*** are applied as per trigonometric rules. 8.2 Angles of elevation and depression are determined as per trigonometric rules. 8.3 Angles are determined as per compound angle formula 8.4 Sine and cosine waves are interpreted as per trigonometri rules.
9.Apply Calculus	9.1 Rate of change is determined as per ***differentiation rules.*** 9.2 ***Stationary points*** of functions are determined as per differentiation rules. 9.3 Integrals of algebraic functions are determined as per ***integration rules*** 9.5 Integrals of logarithmic functions are determined as per integration rules
10. Apply sequences and series	10.1 Arithmetic means and nth term of an arithmetic sequence is determined as per the concept 10.2 Sum of terms of a given ***arithmetic series*** are determined as per the concept 10.3 A geometric sequence is differentiated according to arithmetic sequence 10.4 A finite geometric sequence is differentiated according to finite geometric sequence 10.5 Geometric means and n^{th} terms of a geometric sequence is determined as per geometric sequence concept 10.6 Sum of finite and infinite geometric sequence is determined as per geometric sequence concept
11.Apply statistics methods	11.1 ***Raw data*** is collected as per job requirement 11.2 ***processing of raw data*** is carried out as per job requirement Interpretation of data is performed as per job requirement 11.3 ***Data presentation*** is performed as per job requirement

RANGE

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Variable	Range
1. Proportions include but not limited to:	• Direct proportion • Inverse proportion
2. Simultaneous method includes but not limited to:	• Elimination method • Substitution • Graphical method
3. Quadratic methods include but not limited to:	• Factorization • Completing Square Method • Quadratic formula
4. Logarithms include but not limited to:	• Operation • Conversions • Graph plotting
5. Errors may include but not limited to:	• Absolute • Relative • Percentage
6. Trigonometric rules include but not limited to:	• Sine rule • Cosine rule • Double angle formula
7. Binomial theorem includes but not limited to:	• Pascal triangle

8. Differentiation include but not limited to:	• First principles • High order functions • Differential equations • Inverse differentiation
9. Differentiation rules include but not limited to:	• Product rule • Chain rule • Quotient rule
10. Stationary points include but not limited to:	• Maxima • Minima • Point of inflection
11. Integration include but not limited to:	• Constant of integration • Integral notation • Indefinite and definite integrals
12. Methods of integration include but not limited to:	• Standard form • Substitution • Integration by parts
13. Currency table include but not limited to:	• Selling price • Buying price
14. Series include but not limited to:	• Arithmetic Progression • Geometric Progression
15. Raw data include but not limited to:	• Grouped data • Ungrouped data
16. Processing of raw data include but not limited to:	• Mean • Mode • Median • Range

	• Quartile • Standard deviation • Variance
17. Data presentation include but not limited to:	• Pictograms • Histograms • Pie charts • Bar charts • Frequency polygon
18. Order of matrix include but not limited to:	• Singular • Non-singular • Identity • Echelon
19. Matrix operation include but not limited to:	• Compatibility • Addition/subtraction • Multiplication • Multiplication by scalar

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

Required Skills

The individual needs to demonstrate the following skills:

- Applying fundamental operations (addition, subtraction, division, multiplication)
- Using and applying mathematical formulas
- Logical thinking
- Problem solving
- Applying statistics
- Drawing graphs
- Using different measuring tools

Required knowledge

The individual needs to demonstrate knowledge of:

- Fundamental operations (addition, subtraction, division, multiplication)
- Types and purpose of measuring instruments
- Units of measurement and abbreviations
- Rounding techniques
- Types of fractions
- Types of tables and graphs
- Presentation of data in tables and graphs
- Vector operations
- Matrix operations
- Data presentation

EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills, knowledge and range

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Applied Ratios, proportions and percentages as per algebraic rules 1.2 Interpreted graph as per formulated graphical solution 1.3 Plotted logarithmic and exponential graph as per logarithmic concept 1.4 Solved Simultaneous equations as per matrix concept 1.5 Performed operations on vectors as per vector concept 1.6 Determined angles of elevation and depression as per trigonometric concept 1.7 Determined rate of change as per differentiation concept 1.8 Differentiated finite geometric sequence as per finite geometric sequence 1.9 Determined sum of terms of geometric sequence as per the geometric sequence concept 1.10 Interpreted data as per work requirement 1.11 Presented data as per job requirement

2. Resource Implications	The following resources should be provided: 2.1 Appropriately simulated environment where assessment can take place. 2.2 Access to relevant work environment. 2.3 Resources relevant to the proposed activities or tasks.
3. Methods of Assessment	Competency may be assessed through: 3.1 Practical Assessment 3.2 Project-Based Assessment 3.3 Portfolio of Evidence 3.4 Written Assessment
4. Context of Assessment	Competency may be assessed in a workplace or simulated workplace
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.