REPUBLIC OF KENYA

NATIONAL OCCUPATIONAL STANDARD

FOR

COMPUTER SCIENCE TECHNICIAN

KNQF LEVEL 6

(CYCLE 3)

PROGRAMME ISCED CODE: 0613 554 A.

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APPLY MATHEMATICS FOR COMPUTER SCIENCE

ISCED UNIT CODE: 0613 554 10A

UNIT CODE: ICT/OS/CS/CR/03/6/MA

UNIT DESCRIPTION

This unit covers the competencies required to understand mathematics for computer science. It involves understanding Linear Algebra, understanding Boolean Algebra, understanding Set Theory, understanding Calculus and understanding Probability and Statistics.

ELEMENT These describe the **key outcomes** which make up **workplace function**.	**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 Linear Algebra	1.1 Linear Equations are applied. 1.2 Linear equations are solved. 1.3 Vectors are applied. 1.4 Vector operations are applied. 1.5 Matrices are applied. 1.6 Matrix operations are applied. 1.7 Inverse of a square matrix is applied.
2. Apply Boolean Algebra	2.1 Boolean algebra is applied. 2.2 ***Basic Boolean operations*** are performed. 2.3 ***Basic boolean operations*** are applied. 2.4 Secondary Boolean operations are applied 2.5 Writing of Boolean Expressions is implemented. 2.6 ***Methods of simplifying Boolean expressions*** are applied. 2.7 ***Boolean Laws and Theorems*** are used. 2.8 Simplification rules for Boolean expressions are applied.
3. Apply Set Theory	3.1 Sets Theory is applied. 3.2 ***Methods of Set representation*** are used. 3.3 Cardinality of a set determined. 3.4 ***Types of sets*** are classified. 3.5 Venn Diagrams are constructed. 3.6 ***Set Operations*** are Performed.
4. Apply Calculus	4.1 ***Functions*** and graphs are applied. 4.2 Differential calculus is performed. 4.3 I***n***tegral calculus is computed.
5. Apply Probability and Statistics	Business innovation strategies are **applied** according to organizational standards 5.2 Key terminologies in Probability are applied.

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	3 Probability axioms and simple counting problems are solved. 5.4 Permutations and combinations are computed. 5 Conditional probability and the multiplication rule are applied. 5.6 Key terminologies in Probability are applied. 5.7 Data representation techniques are used. 5.8 Measures of central tendency are calculated. 5.9 Measures of spread are calculated. 5.10 Measures of Location are computed.

RANGE

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

Variable	Range
1. Vector operations may include but not limited to:	● Addition ● Multiplication ● Dot product
2. Matrix operations may include but not limited to:	● Sum of two matrices ● Sum of a matrix and a scalar ● Matrix subtraction ● Product of two matrices ● Product of a matrix and a vector
3. Basic Boolean operations may include but not limited to:	● AND ● OR ● NOT
4. Secondary operations may include but not limited to:	● NAND ● NOR ● EX-OR ● EX-NOR
5. Methods of simplifying Boolean expressions may include but not limited to:	● Using algebraic functions ● Using Truth tables ● Using Karnaugh Maps
6. Boolean Laws and Theorems may include but not limited to:	● AND law ● OR law ● Inversion law

Variable	Range
	● Commutative ● Associative ● Distributive ● De-Morgan's Theorems
7. Methods of Set representation may include but not limited to:	● Statement form ● Tabular form ● Set builder notation
8. Types of sets may include but not limited to:	● Finite Set ● Infinite Set ● Subset ● Proper Subset ● Universal Set ● Empty or Null ● Equal ● Equivalent Set ● Singleton Set or Unit Set ● Overlapping Set ● Disjoint Set
9. Set Operations may include but not limited to:	● Set Union and Set Intersection ● Set Difference/Relative Complement ● Set Complement ● Cartesian Product
10. Measures of central tendency may include but not limited to:	● Mean ● Median ● Mode
11. Measures of spread may include but not limited to:	● Variance ● Standard deviation
12. Measures of location may include but not limited to:	● Percentile ● Quartiles

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:

- Communications (verbal and written);
- Time management;
- Problem solving;
- Planning;
- Decision Making;
- Research;

Required knowledge

The individual needs to demonstrate knowledge of:

- Linear Algebra
- Boolean algebra
- Set Theory
- Calculus Probability and Statistics

EVIDENCE GUIDE

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

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Solved Linear equations 1.2 Performed vector operations 1.3 Performed matrix operations 1.4 Performed Boolean algebra operations 1.5 Performed set operations 1.6 Explained samples spaces, events and sets 1.7 Solved problems using Probability axioms 1.8 Solved permutations and combinations 1.9 Solved problems using conditional probability 1.10 Represented data using statistical technique 1.11 Illustrated measures of central tendency 1.12 Illustrated measures of spread 1.13 Illustrated measures of location
2. Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace where assessment can take place 2.2 Appropriately simulated environment where assessment can take place 2.3 Resources relevant to proposed activity or task
3. Methods of Assessment	Competency may be assessed through: 3.1 Oral questioning 3.2 Practical tests 3.3 Observation 3.4 Written test
4. Context of Assessment	Competency may be assessed 4.1 Off the job 4.2 on the job 4.3 During industrial attachment

5. Guidance information for assessment	5.1 Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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