**Competence**

GENMA301 -

**GENMA301 Applied Mathematics I**

**RCAQF Year: 1 Learning hours**

**Credits: 12**

**Sector:** ICT **120**

**Sub-sector:** Software Engineering

**Issue date:** December, 2018

**Purpose statement**

This module describes the knowledge, skills and attitudes required to carry out operations on sets and sets of numbers, to count and perform operations in different number systems, to carry out operations on polynomials, to graphically and algebraically solve linear equations and inequalities, to extent the knowledge of arithmetic and geometric progression to sequences and series, to apply various methods and techniques related to matrix, determinant and vectors to solve system of linear equations. During the learning of this module, it is advisable to take time and efforts to decipher / decode Mathematical concepts and understand their meaning. Learning Mathematics is a little like programming, it takes time to understand a lot of code and you never understand how to write code without doing it. Mathematics is exactly the same you need to do and practice it. At the end of this module, students will be able to apply basic algebraic concepts that are needed by computer scientists.

**Learning assumed to be in place**

Not applicable

**Elements of competence and performance criteria**

Learning units describe the essential outcomes of a competence.

Performance criteria describe the required performance needed to demonstrate achievement of the learning unit.

By the end of the module, the trainee will be able to:

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| **Elements of competence** | **Performance criteria** |
| 1. **Apply the properties of sets of numbers** | * 1. Proper carrying out mathematical operations on set of numbers basing on their properties   2. Proper application of operation properties on sets of numbers and systematically demonstrating that a set is or is not a group; a ring or a field under a given operation.   3. Extend these properties to learning finite fields |
| 1. **Perform operations on sets basing on their properties** | 1. Proper using Venn diagrams to carry out operations on 2 or 3 sets basing on their properties 2. Correct representation of relations between sets as mappings using Venn diagrams 3. Define different types of relations and functions |
| 1. **Perform operations related to the number system and arithmetic** | * 1. Proper differentiating and working with number base systems basing on their properties   2. Proper make calculations with fractions, ratios and percentages, concept of an interest rate and how it can be calculated and modular arithmetic   3. Understanding the concepts of factor, prime number, GCD and LCM, and how to use Euclid’s Algorithm to calculate the GDC of two integers   4. Proper use of exponentials and logarithms to deal with large numbers and multiplicative functions |
| 1. **Perform operations on polynomials** | * 1. Proper classification of polynomials basing on degree and number of terms   2. Proper carrying out operations on polynomials based on properties   3. Proper factorization and expanding of a given polynomial by finding out the common factor or appropriate methods   4. Simplification of complex fractions |
| 1. **Solve algebraically or graphically linear and quadratic equations or inequalities** | * 1. Correct solving algebraically or graphically a linear equation and inequality in accordance with the required steps   2. Perfect discussion on parametric equations and inequalities in one unknown based on established condition.   3. Proper solving algebraically or graphically two simultaneous linear equations in accordance with the required steps   4. Effective solving algebraically or graphically a quadratic equation in accordance with the required steps   5. Proper solving algebraically or graphically a quadratic inequality in accordance with the required steps |
| 1. **Extend the concept of arithmetic and geometric progression to sequences and series** | * 1. Proper determination of nth term and general term of arithmetic sequence and deduce arithmetic series based on definition and appropriate formulae.   2. Proper determination of nth term and general term of geometric sequence and deduce geometric series based on definition and appropriate formulae.   3. Proper definition of recurrence and recurrence relations of different order |
| 1. **Apply various methods and techniques related to matric and determinant to solve system of linear equations** | * 1. Accurate performing operations on matrices of order 2 or 3 in accordance with properties   2. Accurate calculation of determinant of matrices of order 2 or 3 in accordance with the required techniques   3. Proper solving a system of two or three linear equations in two or three unknown using different techniques |
| 1. **Use Mathematical logic as a tool of reason and argumentation in daily activities** | * 1. Correct using the appropriate logical language in a proposition or composite propositions and converting them into logical formula.   2. Correct drawing the truth table of a given proposition or composite proposition using appropriate connectives.   3. Proper explaining that a given logic statement is tautology ,  a contradiction or consistency basing on definitions and truth tables |
| 1. **Geometry and trigonometry as tools of understanding concepts involving movement, such as games** | * 1. Proper meaning of angle and the different ways that an angle can be measured   2. Correct meaning of the term area and how to measure the areas of arbitrary rectangles, circles, or triangles   3. Correct use the trigonometric functions and the Pythagorean Theorem to solve problems in right-angled and other triangles   4. Proper meanings of rotation, reflection, translation, scale, and shear, and how to calculate the first three of these for a given point or shape on the plane |
| 1. **Introduction to calculus and applications as tools of modeling variations and rates of changes problems** | * 1. Proper use of relations to identify functions and non functions relationships   2. Correct use of limits to understand the tangent and small change problems and continuity of functions   3. Correct use of derivatives to model variations problems and rates of changes problems   4. Applications in other fields such as physics, chemistry and economics |
| 1. **Use of counting principles to probability** | * 1. Counting with sum, product and pigeonhole principle   2. Combinatorics   3. Discrete probability |

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| **Learning unit** | LU1: Apply the properties on sets of numbers | |
| **1** | | **Learning Outcomes:**   1. Carry out mathematical operations on set of numbers 2. Determine the operation properties on sets of numbers and systematically demonstrate that a set is or is not a group; a ring or a field under a given operations |
| **15 Hours** | |

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| **Learning Outcome 1.1: Carry out mathematical operations on set of numbers basing on theirproperties** | | |
| **Content** | **Learning activities** | **Resources** |
| * Classification of Sets of numbers * Natural numbers * Integers * Primes numbers * Modular arithmetic * Rational numbers * Real numbers * Operations on different sets of numbers * Addition * Subtraction * Multiplication * division | * Pair share and pair work * Small or large group discussion * Individual work * Documentary research * Presentation * Brainstorming * Watch a video | * Smart Class room * Computer components * Internet * Projector * Video * Reference books * Didactic materials |

**Formative Assessment 1.2**

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**Performance criterion**

Proper carrying out mathematical operations on set of numbers basing on their properties.

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

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| **Types of evidence** | **Portfolio assessment tools** |
| * **Written evidence** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

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| **Checklist** | **Score** | |
| **Yes** | **No** |
| **Indicator: Elements of sets are identified** | | |
| * Natural numbers set is identified |  |  |
| * Integers set is identified |  |  |
| * Rational numbers set is identified |  |  |
| * Real numbers is identified |  |  |
| **Indicator: Subset properties are well identified** | | |
| * Even numbers’ properties are well identified |  |  |
| * Odd numbers’ properties are well identified |  |  |
| * Square numbers’ properties are well identified |  |  |
| * Prime numbers’ properties are well identified |  |  |
| * Factors and prime numbers’ properties are well identified |  |  |
| **Indicator: Performing Operations on different sets of numbers to get the answer** | | |
| * Addition for natural numbers is accurately done |  |  |
| * Nonexistence of subtraction operation for natural numbers is notified |  |  |
| * Multiplication for natural numbers is accurately done |  |  |
| * Nonexistence of division operation for natural numbers is notified |  |  |
| * Addition for integers is accurately done |  |  |
| * Subtraction for integers is accurately done |  |  |
| * Multiplication for integers is accurately done |  |  |
| * Nonexistence of division operation for integers is notified |  |  |
| * Addition for rational numbers is accurately done |  |  |
| * Subtraction for rational numbers is accurately done |  |  |
| * Multiplication for rational numbers of integers is accurately done |  |  |
| * Division for rational numbers of integers is accurately done |  |  |
| * Addition for real numbers is accurately done |  |  |
| * Subtraction for real numbers is accurately done |  |  |
| * Multiplication for real numbers is accurately done |  |  |
| * Division for real numbers is accurately done |  |  |
| **Observation** | | |
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| **Learning Outcome 1.2:** **Determine the operation properties on sets of numbers and demonstrate that a set is or is not a group; a ring or a field** | | |
| **Content** | **Learning activities** | **Resources** |
| * Operation properties on set of number * Closure property * Commutative property * Associative property * Identity property * Inverse property * Distributive property * Algebraic structure * A set as a group * A set as a ring * A set as a field | * Pair share and pair work * Small or large group discussion * Individual work * Documentary research * Presentation * Brainstorming | * Computer * Internet * Projector * Video * Reference books * Didactic materials such as manila paper, … * Handouts on worked examples |

**Formative Assessment 1.2**

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**Performance criterion**

Proper determining the operation properties on sets of numbers and systematically demonstrating that a set is or is not a group; a ring or a field under

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

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| **Types of evidence** | **Portfolio assessment tools** |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

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| --- | --- | --- |
| **Checklist** | **Score** | |
| **Yes** | **No** |
| **Indicator:** **Operator/ operation related to any given set is well identified** | | |
| * Closure property is satisfied |  |  |
| * Commutative property is identified |  |  |
| * Associative property is identified |  |  |
| * Identity property is identified |  |  |
| * Inverse property is identified |  |  |
| * Distributive property is identified |  |  |
| **Indicator:** **Properties and nature/ name of an algebraic structure are well described** | | |
| * Properties of a group are described |  |  |
| * Properties of a ring are described |  |  |
| * Properties of a field are described |  |  |
| **Observation** | | |
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| **Learning unit** | LU2: Apply Sets and numbers | |
| **2** | | **Learning Outcomes:**   1. Introduce Venn diagrams to carry out operations on 2 or 3 sets 2. Represent relations between sets as mappings using Venn diagrams 3. Define functions using relations and identify different types of functions |
| **40 Hours** | |

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| **Learning Outcome 2.1: Introduce Venn diagrams to carry out operations on 2 or 3 sets** | | |
| **Content** | **Learning activities** | **Resources** |
| * Presentation of 2 or 3 sets by Venn diagram * Operations on sets * Intersection of 2 or 3 sets * Union of 2 or 3 sets * Complement of a set * Difference of 2 sets * Symmetrical difference of 2 sets | * Brainstorming * Group discussion * Exercises * Group activities on set operations | * Computer * Internet * Projector * Video * Reference books * Didactic materials * Pictures |

**Formative Assessment 2.1**

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**Performance criterion**

Proper using Venn diagrams to carry out operations on 2 or 3 sets basing on their properties

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

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| **Types of evidence** | **Portfolio assessment tools** |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

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| --- | --- | --- |
| **Checklist** | **Score** | |
| **Yes** | **No** |
| **Indicator:** **Venn diagrams of 2 or 3 sets are well represented** | | |
| * Venn diagrams for intersection of sets is well represented |  |  |
| * Venn diagrams for union of sets is well represented |  |  |
| * Venn diagrams for complement of sets is well represented |  |  |
| * Venn diagrams for difference of sets is well represented |  |  |
| **Indicator: Elements of subsets are well identified** | | |
| * Elements of intersection of sets are well identified |  |  |
| * Elements of union of sets are well identified |  |  |
| * Elements of complement of sets are well identified |  |  |
| * Elements of difference of sets are well identified |  |  |
| * Elements of symmetrical difference of sets are well identified |  |  |
| **Observation** | | |
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| **Learning Outcome 2.2: Represent relations between sets as mappings using Venn diagrams** | | |
| **Content** | **Learning activities** | **Resources** |
| * Relations among sets * Reflective * Symmetric * transitive relations * Classification of relationship * one-to-one function * many-to-one- function * One-to- many relationship | * Brainstorming * Audio visual presentation * Group discussion * Group presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 2.2**

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**Performance criterion**

Correct representation of relations between sets as mappings and using Venn diagrams

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

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| **Types of evidence** | **Portfolio assessment tools** |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question |

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| **Checklist** | **Score** | |
| **Yes** | **No** |
| **Indicator:** **Types of relations are well described and represented** | | |
| * Reflective relations are identified |  |  |
| * Reflective relations are represented |  |  |
| * Symmetric relations are identified |  |  |
| * Symmetric relations are represented |  |  |
| * Transitive relations are identified |  |  |
| * Transitive relations are represented |  |  |
| **Indicator:** **Types of functions are well described** | | |
| * One –to-one functions are well mapped |  |  |
| * One- to- many functions are well mapped |  |  |
| Observation | | |
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| **Learning Outcome 2.3:** Define functions using relations and identify different types of functions | | |
| **Content** | **Learning activities** | **Resources** |
| * Relations among sets * Reflective * Symmetric * transitive relations * Classification of relationship * one-to-one function * many-to-one- function * One-to- many relationship | * Brainstorming * Audio visual presentation * Group discussion * Group presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 2.3**

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**Performance criterion**

Correct representation of relations between sets as mappings and using Venn diagrams

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved

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| **Types of evidence** | **Portfolio assessment tools** |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question |

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| **Checklist** | **Score** | |
| **Yes** | **No** |
| **Indicator:** **Types of relations are well described and represented** | | |
| * Reflective relations are identified |  |  |
| * Reflective relations are represented |  |  |
| * Symmetric relations are identified |  |  |
| * Symmetric relations are represented |  |  |
| * Transitive relations are identified |  |  |
| * Transitive relations are represented |  |  |

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| **Learning unit** | LU3: Apply Number Theory | |
| **3** | | **Learning Outcomes:**   1. Differentiate number base systems 2. Convert a given number from one base to another in accordance with their properties 3. Carry out arithmetic operations in number base system |
| **40 Hours** | |

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| **Learning Outcome 3.1:**  **Differentiate number base systems** | | |
| **Content** | **Learning activities** | **Resources** |
| * Number Base Systems * Decimal system, * Binary base system * Octal base system , * Hexadecimal base system | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 3.1**

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**Performance criterion**

Proper identification of number base systems basing on their properties

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

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| **Types of evidence** | **Portfolio assessment tools** |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question |

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| **Checklist** | **Score** | |
| **Yes** | **No** |
| **Indicator: Number system are well described** | | |
| * Decimal number system is well described |  |  |
| * Octal system is well described |  |  |
| * Binary system is well described |  |  |
| * Hexadecimal system is well described |  |  |
| **Indicator: Number system are well differentiated** | | |
| * Counting principles in decimal system are well explained |  |  |
| * Counting principles in binary system are well explained |  |  |
| * Counting principles in octal system are well explained |  |  |
| * Counting principles in hexadecimal system are well explained |  |  |
| **Indicator:** **Number system are well converted from one base to another** | | |
| * Toxic substances are identified |  |  |
| * Non-toxic substances are identified |  |  |
| **Observation** | | |
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| **Learning Outcome 3.2: Convert a given positive number from one base to another and vice versa in accordance with their properties** | | |
| **Content** | **Learning activities** | **Resources** |
| * Conversion of positive numbers * Decimal to binary, octal and hexadecimal * Binary to decimal, Octal and hexadecimal * Octal to binary, Decimal and hexadecimal * Hexadecimal to binary, octal and decimal * Conversion of fractional numbers * Decimal fraction to binary * Binary fraction to decimal * Conversion of negative decimal to binary * One’s complements * Two’s complements | * Brainstorming * Audio visual * Group discussion * Presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 3.2**

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**Performance criterion**

Accurate converting a given number from one base to another and vice versa in accordance with their properties

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

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| **Types of evidence** | **Portfolio assessment tools** |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

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| --- | --- | --- |
| **Checklist** | **Score** | |
| **Yes** | **No** |
| **Indicator: Number system are well converted from one base to another** | | |
| * Conversion from Decimal to binary system is well performed |  |  |
| * Conversion from Decimal to octal system is well performed |  |  |
| * Conversion from Decimal to hexadecimal system is performed |  |  |
| * Conversion from Binary to decimal system is accurately done |  |  |
| * Conversion from Binary to Octal system is accurately done |  |  |
| * Conversion from Binary to hexadecimal system is accurately done |  |  |
| * Conversion from Octal to binary system is perfectly done |  |  |
| * Conversion from Octal to decimal system is perfectly done |  |  |
| * Conversion from Octal to hexadecimal system is perfectly done |  |  |
| * Conversion from Hexadecimal to binary system is perfectly done |  |  |
| * Conversion from Hexadecimal to decimal system is perfectly done |  |  |
| * Conversion from Hexadecimal to octal system is perfectly done |  |  |
| * Conversion from Decimal fraction to binary system |  |  |
| * Conversion from Binary fraction to decimal system |  |  |
| * Conversion of negative decimal to binary system |  |  |
| **Observation** | | |
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| **Learning Outcome 3.3:** **Carry out arithmetic operations in binary system** | | |
| **Content** | **Learning activities** | **Resources** |
| * Counting in binary up to 15 * Arithmetic operators on binary numbers * Addition * Subtraction * Multiplication * Division | * Brainstorming * Audio visual presentation * Group discussion * Presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 3.3**

**** Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

**Performance criterion**

Correct carrying out arithmetic operations in binary system based on definition.

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| **Types of evidence** | **Portfolio assessment tools** |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

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| --- | --- | --- |
| **Checklist** | **Score** | |
| **Yes** | **No** |
| **Indicator:**  **Arithmetic operations are accurate in binary system** | | |
| * Counting in binary up to 15 is accurately done |  |  |
| * Addition is properly done |  |  |
| * Subtraction is accurately done |  |  |
| * Multiplication is accurately done |  |  |
| * Division is accurately done |  |  |
| **Observation** | | |
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| **Learning unit** | LU4: Apply Basic algebra on polynomials | |
| **4** | | **Learning Outcomes:**   1. Classify polynomials by degree and number of terms 2. Carry out operations on polynomials 3. Expand and Factorize a given polynomial |
| **40 Hours** | |

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| **Learning Outcome 4.1:**  **Proper classifying polynomials by degree and number of terms** | | |
| **Content** | **Learning activities** | **Resources** |
| * Components of polynomials * Degree * Like terms * Non like terms * Classification * Monomial * Binomial * Trinomial * Polynomial | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 4.1**

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**Performance criterion**

Proper classification of polynomials basing on degree and number of terms

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

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| **Types of evidence** | **Portfolio assessment tools** |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

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| Checklist | **Score** | |
| **Yes** | **No** |
| **Indicator: Components of polynomials are well identified** | | |
| * Likely terms are well identified |  |  |
| * Non likely term are well identified |  |  |
| * Degree of polynomial is well identified |  |  |
| **Indicator: Types of polynomials are indicated basing on degree and terms** | | |
| * Monomials are well described |  |  |
| * Binomials are well described |  |  |
| * Trinomials are well described |  |  |
| * Polynomials are well described |  |  |
| Observation | | |
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| **Learning Outcome 4.2: Carry out operations on polynomials** | | |
| **Content** | **Learning activities** | **Resources** |
| * Operations on polynomials * Addition * Subtraction * Multiplication * Division | * Brainstorming * Audio visual * Group discussion * Presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 4.2**

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**Performance criterion**

Proper carrying out operations on polynomials based on properties

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

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| **Types of evidence** | **Portfolio assessment tools** |
| * Written | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

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| Checklist | Score | |
| **Yes** | **No** |
| **Indicator: Rules of arithmetic operations on polynomials are well described** | | |
| * Rules of addition are well described |  |  |
| * Rules of subtraction are well described |  |  |
| * Rules of multiplication are well described |  |  |
| * Rules of division are well described |  |  |
| **Observation** | | |
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| **Learning Outcome 4.3:** **Expand and Factorize a given polynomial** | | |
| **Content** | **Learning activities** | **Resources** |
| * Expanding polynomials using different techniques/ methods * removing brackets and collecting like terms technique * square of a sum pattern * Square of a difference pattern * Factorizing polynomials using different techniques/ methods * Common factor * difference of two squares pattern * the remarkable product method * grouping method * Synthetic division method | * Brainstorming * Audio visual presentation * Group discussion * Presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 4.3**

**** Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

**Performance criterion**

Proper factorization and expanding of a given polynomial by finding out the common factor or appropriate methods

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| **Types of evidence** | **Portfolio assessment tools** |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

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| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| **Indicator: Techniques of expanding polynomials are well used** | | |
| * Square of a sum pattern is well used |  |  |
| * Square of a difference pattern is well used |  |  |
| * Technique of removing brackets and collecting like terms is well used |  |  |
| **Indicator: Techniques of factorizing polynomials are well used** | | |
| * Common factor technique is well used |  |  |
| * Difference of two squares pattern is well used |  |  |
| * The master product method is well used |  |  |
| * Grouping method is well applied |  |  |
| **Observation** | | |
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| **Learning unit** | LU 5: Solve algebraically and Graphically equations and inequalities | |
| **5** | | **Learning Outcomes:**   1. Solve algebraically or graphically linear equation and inequality 2. Discuss on parametric equations and inequalities 3. Solve algebraically or graphically two simultaneous linear equations in two unknown 4. Solve algebraically or graphically a quadratic equation 5. Solve algebraically or graphically a quadratic inequality |
| **40 Hours** | |

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| **Learning Outcome 5.1: Solve algebraically or graphically a linear equation and inequality** | | |
| **Content** | **Learning activities** | **Resources** |
| * Solving linear equation * Algebraic method * Graphical method * Solving a linear inequality * Algebraic method * Graphical method | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 5.1**

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**Performance criterion**

Correct solving algebraically or graphically a linear equation and inequality in one unknown in accordance with the required steps

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

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| **Types of evidence** | **Portfolio assessment tools** |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

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| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| **Indicator: Techniques of solving linear equations are well used** | | |
| * Algebraic method is well performed |  |  |
| * Graphical method is well applied |  |  |
| **Indicator: Techniques of solving linear inequalities are well used** | | |
| * Algebraic method is well performed |  |  |
| * Graphical method is well applied |  |  |
| * Valid solutions have been determined |  |  |
| **Observation** | | |
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| **Learning Outcome 5.2: Discuss on parametric equations and inequalities** | | |
| **Content** | **Learning activities** | **Resources** |
| * Definitions * Parameter * Parametric equation or inequality * Solving steps * discussion rules * principals * validation of solution | * Brainstorming * Audio visual * Group discussion * Presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 5.2**

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**Performance criterion**

Perfect discussion on parametric equations and inequalities in one unknown based on established condition.

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

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| Types of evidence | Portfolio assessment tools |
| * Written | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| **Indicator: Discussion of parametric equations or inequalities is well performed** | | |
| * Parameter is well identified |  |  |
| * Parameter is differentiated from variable |  |  |
| * Steps are well followed |  |  |
| * Solving techniques are well followed |  |  |
| * Discussion rules or principles are well followed |  |  |
| * Solution is valid |  |  |
| **Observation** | | |
|  | | |

|  |  |  |
| --- | --- | --- |
| **Learning Outcome 5.3:** **Solve algebraically or graphically two simultaneous linear equations** | | |
| **Content** | **Learning activities** | **Resources** |
| * Solving algebraically two simultaneous linear equations * Solving graphically two simultaneous linear equations | * Brainstorming * Audio visual presentation * Group discussion * Presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 5.3**

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**Performance criterion**

Proper solving algebraically or graphically simultaneous linear equations in accordance with the required steps

5.4. Effective solving quadratic equations in accordance with the required steps

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| **Types of evidence** | **Portfolio assessment tools** |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| **Indicator: Techniques of solving two simultaneous linear equations are well used** | | |
| * Algebraic method is well performed |  |  |
| * Graphical method is properly used |  |  |
| **Indicator: Techniques of solving two simultaneous linear inequalities are well used** | | |
| * Algebraic method is well performed |  |  |
| * Graphical method is well applied |  |  |
| * Valid solutions have been determined |  |  |
| **Observation** | | |
|  | | |

|  |  |  |
| --- | --- | --- |
| **Learning Outcome 5.4: Solve algebraically or graphically a quadratic equation** | | |
| **Content** | **Learning activities** | **Resources** |
| * Different method of solving algebraically a quadratic equation * factorizing method * square root property * completing the square * quadratic formula * Graphical resolution of a quadratic equation * Construction of a parabola * Determination of solutions set | * Brainstorming * Audio visual * Group discussion * Presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 5.4**

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**Performance criterion**

Effective solving algebraically or graphically a quadratic equation in accordance with the required steps

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * Written | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| **Indicator: Techniques of solving algebraically quadratic equations are well applied** | | |
| * Factorizing method is well applied |  |  |
| * Square root property is accurately used |  |  |
| * Completing the square is properly performed |  |  |
| * Quadratic formula is correctly used |  |  |
| **Indicator: Techniques of solving graphically quadratic equations are well applied** | | |
| * A parabola is accurately plotted |  |  |
| * Solutions set is validated |  |  |
| **Observation** | | |
|  | | |

|  |  |  |
| --- | --- | --- |
| **Learning Outcome 5.5:** **Solve algebraically or graphically a quadratic inequality** | | |
| **Content** | **Learning activities** | **Resources** |
| * Solving algebraically a quadratic inequality * Factorization of the given inequality * Determination of roots * Study of sign * Determination of interval of solutions * Graphical resolution of a quadratic inequality * Shading the region satisfying the given inequality * Determination of interval of solutions | * Brainstorming * Audio visual presentation * Group discussion * Presentation | * Reference books * Geogebra Software * Mathtype Software * DVD players * Internet connection |

**Formative Assessment 5.5**

**** Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

**Performance criterion**

Proper solving algebraically or graphically a quadratic inequality in accordance with the required steps

|  |  |
| --- | --- |
| **Types of evidence** | **Portfolio assessment tools** |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| **Indicator: Steps of solving algebraically quadratic inequalities are well identified** | | |
| * Factorization of the given inequality is perfect |  |  |
| * Roots are accurately determined |  |  |
| * Study of sign is correctly established |  |  |
| * Solutions interval is validated |  |  |
| **Indicator: Steps of solving graphically quadratic inequalities are well performed** | | |
| * Shaded region is appropriate |  |  |
| * Solutions set is valid |  |  |
| **Observation** | | |
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| --- | --- | --- |
| Learning unit | LU 6: Extend the concept of arithmetic and geometric progression to sequences and serie | |
| **6** | | **Learning Outcomes:**   1. Determine nth term and general term of arithmetic sequence and deduce arithmetic series. 2. Determine nth term and general term of geometric sequence and deduce geometric series 3. Recursive and recurrence relations of order one and two |
| **40 Hours** | |

|  |  |  |
| --- | --- | --- |
| **Learning Outcome 6.1:**  **Determine nth term and general term of arithmetic sequence and deduce arithmetic series** | | |
| **Content** | **Learning activities** | **Resources** |
| * Definition of arithmetic sequence * Term number * Common difference * Pattern rule * Arithmetic means * General term of arithmetic sequence * Arithmetic series | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 6.1**

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**Performance criterion**

Proper determination of nth term and general term of arithmetic sequence and deduce arithmetic series based on definition and appropriate formulae.

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| **Types of evidence** | **Portfolio assessment tools** |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| **Checklist** | **Score** | |
| **Yes** | **No** |
| **Indicator: Terms of arithmetic sequences are well determined** | | |
| * Pattern rule of an arithmetic sequence is well identified |  |  |
| * Common difference is well calculated |  |  |
| * Arithmetic means are accurately determined |  |  |
| * Terms of an arithmetic sequence are well generated |  |  |
| * Addition and subtraction properties are well used |  |  |
| * General term of an arithmetic sequence is well formulated |  |  |
| **Indicator: Sum of arithmetic sequence are well determined** | | |
| * Sum formula of an arithmetic series is generated |  |  |
| * Sum of arithmetic is accurately calculated |  |  |
| **Observation** | | |
|  | | |

|  |  |  |
| --- | --- | --- |
| **Learning Outcome 6.2: Determine nth term and general term of geometric sequence and deduce geometric series** | | |
| **Content** | **Learning activities** | **Resources** |
| * Definition of geometric sequence * Term number * Common ratio * Pattern rule * Geometric means * General term of geometric sequence * Geometric series | * Brainstorming * Audio visual * Group discussion * Presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 6.2**

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**Performance criterion**

Proper determination of nth term and general term of geometric sequence and deduce geometric series based on definition and appropriate formulae.

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| **Checklist** | **Score** | |
| **Yes** | **No** |
| **Indicator: Terms of geometric sequences are well determined** | | |
| * Pattern rule of a geometric sequence is well identified |  |  |
| * Common ratio is accurately calculated |  |  |
| * Geometric means are accurately determined |  |  |
| * Terms of a geometric sequence are well generated |  |  |
| * Multiplication properties are well used |  |  |
| * Division properties are well used |  |  |
| * General term of a geometric sequence is well formulated |  |  |
| **Indicator: Sum of geometric sequence are well determined** | | |
| * Term number of a given finite series is properly determined |  |  |
| * Sum formula of a geometric series is generated |  |  |
| * Sum of geometric is accurately calculated |  |  |
| **Observation** | | |
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| --- | --- | --- |
| **Learning Outcome 6.3: Recursive and recurrence relations of order one and two** | | |
| **Content** | **Learning activities** | **Resources** |
| * Definition of Reccurence relation * Reccurrence relation * Finding recurrence relation * Reccurrence relation of order two * General term of arithmetic sequence * Arithmetic series | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

Formative Assessment 6.3

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**Performance criterion**

Proper determination of nth term and general term of arithmetic sequence and deduce arithmetic series based on definition and appropriate formulae.

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |  |
| --- | --- | --- |
| **Checklist** | **Score** | |
| **Yes** | **No** |
| **Indicator: Reccurence** | | |
| * Define reccurence |  |  |
| * Reccurrrence relation of order one |  |  |
| * Reccurrrence relation of order two |  |  |
| * Reccurrrence relation of arithmetic sequence |  |  |
| * Reccurrrence relation of geometricsequence |  |  |
| **Indicator: Sums and reccurrence relations** |  |  |
| * Term number of a given finite series is properly determined |  |  |
| * Sum formula of a geometric and arithmetic series is generated | | |
| * Sum of geometric is accurately calculated |  |  |
| **Observation** |  |  |

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| **Learning unit** | LU 7: Applying Linear algebra | |
| **7**  **40 Hours** | | **Learning Outcomes:**   1. Perform linear transformation and operations on matrices of order 2 or 3 2. Calculate determinant and inverses of matrices of order 2 or 3 3. Solving a system of two or three simultaneous linear equations using different methods |
|  | |

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| --- | --- | --- |
| **Learning Outcome 7.1:**  **Perform linear transformation and operations on matrices of order 2 or 3** | | |
| **Content** | **Learning activities** | **Resources** |
| * Introduction on a matrix of order 2 or order 3 * Identity matrix * Equality of matrices * Transpose of a matrix * Determinant of a matrix of order 2 or 3 * Operations on matrix of order 2 or order 3 * Addition * Subtraction * Multiplication * Inverse of a matrix of order 2 or 3 | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 7.1**

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**Performance criterion**

Accurate Performance of linear transformations and operations on matrices of order 2 or 3

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| **Indicator: Introduction on matrices are accurately performed** | | |
| * Identity matrix is accurately determined |  |  |
| * Transpose of a matrix is well described |  |  |
| * Determinant of a matrix of order 2 is accurately calculated |  |  |
| * Determinant of a matrix of order 3 is accurately determined |  |  |
| **Indicator: Operations on matrices are accurately performed** | | |
| * Addition of matrices of order 2 is accurately performed |  |  |
| * Addition of matrices of order 3 is accurately performed |  |  |
| * Subtraction of matrices of order 2 is accurately performed |  |  |
| * Subtraction of matrices of order 3 is properly performed |  |  |
| * Scalar multiplication is accurately performed |  |  |
| * Multiplication of 2 matrices is accurately performed |  |  |
| * Determination of matrix inverse is correctly determined |  |  |
| **Observation** | | |
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| --- | --- | --- |
| **Learning Outcome 7.2:** **Solving a system of two or three simultaneous linear equations** | | |
| **Content** | **Learning activities** | **Resources** |
| * Solving a System of two or three simultaneous linear equations * Cramer’ method * Inverse matrix method | * Brainstorming * Audio visual presentation * Group discussion * Presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 7.2**

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**Performance criterion**

Proper solving a system of two or three simultaneous linear equations using different techniques

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * Written | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| **Indicator: Steps to solve a system of linear questions are well followed** | | |
| * Coefficients of a linear system are well written in an  matrix form |  |  |
| * Variables of a linear system are well written in an X matrix form |  |  |
| * Constants of a linear system are well written in a matrix form |  |  |
| * The general form  is well generated |  |  |
| * Coefficients of a linear system are well written in an  matrix form |  |  |
| * Variables of a linear system are well written in an  matrix form |  |  |
| * Constants of a linear system are well written in a matrix form |  |  |
| * The general form  is well generated |  |  |
| **Indicator: A system of two or three simultaneous linear questions is perfectly solved** | | |
| * Different operations on square matrix are well performed |  |  |
| * Cramer’s method is well applied |  |  |
| * Inverse matrix method is properly performed |  |  |
| * The values of X, Y, Z are accurately determined |  |  |
| **Observation** | | |
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| --- | --- | --- |
| **Learning unit** | LU 8: Applying propositional logic | |
| **8** | | **Learning Outcomes:**   1. Use the appropriate logical language in a proposition or composite propositions and convert them into logical formula 2. Draw the truth table of a given proposition or composite proposition 3. Determine whether a given logic statement is tautology, a contradiction or consistency |
| **40 Hours** | |

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| --- | --- | --- |
| **Learning Outcome 8.1:**  **Use the appropriate logical language in a proposition or composite propositions and convert them into logical formula** | | |
| **Content** | **Learning activities** | **Resources** |
| * Introduction and   fundamental definitions: statement or propositions   * Logical connectives * Negation * Conjunction * Disjunction | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 8.1**

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**Performance criterion**

Correct using the appropriate logical language in a proposition or composite propositions and converting them into logical formula.

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| **Checklist** | Score | |
| **Yes** | **No** |
| **Indicator: Proportional statements are well constructed** | | |
| * Negation of a statement is well constructed both in symbolic terms or in words |  |  |
| * Conjunction is well used in a compound statement both in symbolic terms or in words |  |  |
| * Disjunction is well used in a compound statement both in symbolic terms or in words |  |  |
| * Conditional (implies) is well used in a compound statement both in symbolic terms or in words |  |  |
| * Bi-conditional (equivalent) is well used in a compound statement both in symbolic terms or in word |  |  |
| **Observation** | | |
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| --- | --- | --- |
| **Learning Outcome 8.2: Draw the truth table of a given proposition or composite proposition** | | |
| **Content** | **Learning activities** | **Resources** |
| * Composite propositions * Tautology * Contradiction * Bi-conditional * Converse Contrapositive and inverse * Predicate Logic * Propositional functions * Quantifiers (universal, existential). | * Brainstorming * Audio visual * Group discussion * Presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 8.2**

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**Performance criterion**

Correct drawing the truth table of a given proposition or composite proposition using appropriate connectives.

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * Written | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| **Checklist** | Score | |
| **Yes** | **No** |
| **Indicator: Correct drawing the truth table of a given proposition or composite proposition using appropriate connectives.** | | |
| * Logic connectors are well defined |  |  |
| * Compound statements are well explained |  |  |
| **Indicator: Quantifiers are well used in logical statements** |  |  |
| * Domain of a predicate is well determined |  |  |
| * Universal quantification is well used in a logical statement symbolic terms |  |  |
| * Universal quantification is well used in a logical statement in words |  |  |
| * Existential quantification is well used in a compound statement in symbolic terms |  |  |
| * Existential quantification is well used in a compound statement in words | | |
| * Nested quantification are well used in a compound statement in symbolic terms |  |  |
| * Nested quantification are well used in a compound statement in word |  |  |
| * Conditional quantification are well used in a compound |  |  |
| **Observation** |  |  |
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| --- | --- | --- |
| **Learning Outcome 8.3:** **Determine whether a given logic statement is tautology, a contradiction or consistency** | | |
| **Content** | **Learning activities** | **Resources** |
| * Truth tables * Analyzing arguments using truth tables (premises and conclusions) | * Brainstorming * Audio visual presentation * Group discussion * Presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 8.3**

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**Performance criterion**

Proper explaining that a given logic statement is tautology, a contradiction or consistency basing on definitions and truth tables

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * Written | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| **Checklist** | Score | |
| **Yes** | **No** |
| **Indicator: Truth tables for a given statement is well constructed** | | |
| * Truth table for negation is well constructed |  |  |
| * Truth table for conjunction is well constructed |  |  |
| * Truth table for disjunction is well constructed |  |  |
| * Truth table for implication is well constructed |  |  |
| **Observation** | | |
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| --- | --- | --- |
| **Learning unit** | LU 7: Use Geometry and trigonometry as tools of understanding concepts involving movement, such as games | |
| **9**  **40 Hours** | | **Learning Outcomes:**  1. Proper meaning of angle and the different ways that an angle can be measured   1. Correct meaning of the term area and how to measure the areas of arbitrary rectangles, circles, or triangles 2. Correct use the trigonometric functions and the Pythagorean Theorem to solve problems in right-angled and other triangles 3. Proper meanings of rotation, reflection, translation, scale, and shear, and how to calculate the first three of these for a given point or shape on the plane 4. Proper derivation of trigonometric formulas of the sum, the duplications and Simpson’s formulas 5. Trigonometric equations, inequalities and systems of equations |
|  | |

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| --- | --- | --- |
| **Learning Outcome 9.1:**  Proper identification of angle and the different ways that an angle can be measured | | |
| **Content** | **Learning activities** | **Resources** |
| * Introduction to measurement of angles * Degrees measurement * Radiant measurement * Grades measurement * Conversion of measurements and algebraic operation * Degree-radians-grades * Addition and subtraction * Angles reductions | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 9.1**

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**Performance criterion**

Proper identification of angle and the different ways that an angle can be measured

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| * **Indicator: Measurement of angles is well defined** | | |
| * Degree measurement is accurately determined |  |  |
| * Radians measurement is accurately determined |  |  |
| * Grades measurement is accurately determined |  |  |
| * **Indicator: Conversion of measurements and algebraic operation is well presented** |  |  |
| * Addition of angles | | |
| * Subs traction of angels |  |  |
| * Conversion from measurement to an other |  |  |
| * Reduction of measurements is well performed |  |  |
| **Observation** |  |  |
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| --- | --- | --- |
| 1. **Learning Outcome 9.2:**  **Correct meaning of the term area and how to measure the areas of arbitrary rectangles, circles, or triangles** | | |
| **Content** | **Learning activities** | **Resources** |
| * Area of figures * Triangles * Rectangles * Circles * Inscribed figures in circles * Angles and figures * Triangles * Rectangles * Circles * Angles of inscribed figures | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 9.2**

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**Performance criterion**

**Correct meaning of the term area and how to measure the areas of arbitrary rectangles, circles, or triangles**

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| * **Indicator: Area of figures is well defined** | | |
| * Area of triangles is well determined |  |  |
| * Area of rectangles determined |  |  |
| * Area of circles is determined |  |  |
| * Inscribed figure problem is well performed |  |  |
| * **Indicator: Angles and figures are well defined** |  |  |
| * Angles in a triangle are well determined | | |
| * Angles in a rectangle are well determined |  |  |
| * Angles in inscribed figures in a triangle are well determined |  |  |
| **Observation** |  |  |
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| --- | --- | --- |
| 1. **Learning Outcome 9.3:**  **Correct use the trigonometric functions and the Pythagorean Theorem to solve problems in right-angled and other triangles** | | |
| **Content** | **Learning activities** | **Resources** |
| * Trigonometric circle and ratio * Sine and cosine * Tangents and cotangent * Secant and cosecant * Reduction to first quadrant and fundamental formula * Reduction * Fundamental formula * Trigonometric identities * Triangles * Right angled triangles * Non right angles triangles * Inscribed figures and triangles | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 9.3**

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**Performance criterion**

**Correct use the trigonometric functions and the Pythagorean Theorem to solve problems in right-angled and other triangles**

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Types of evidence | Portfolio assessment tools | | | |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay | | | |
|  |  | | | |
| **Checklist** | | Score | **No** |
| * **Indicator: Trigonometric circle and ratio are well defined** | | | |
| * Sine and cosine are well defined | |  |  |
| * Tangent and cotangent are well defined | |  |  |
| * Secant and cosecant are well defined | |  |  |
| * **Indicator: Reduction to first quadrant and fundamental formula are well defined** | |  |  |
| * Reduction to first quadrant is well determined | |  |  |
| * Fundamental formula is well determined | | | |
| * Trigonometric identities are well explained | |  |  |
| * **Indicator: Triangles and related problems are well explained** | |  |  |
| * Right angled triangles are well explained * Non right angled triangles are well explained * Inscribed figures and triangles are determined | |  |  |
| **Observation** | |  |  |
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| 1. **Learning Outcome 9.4:**  **Proper meanings of rotation, reflection, translation, scale, and shear, and how to calculate the first three of these for a given point or shape on the plane** | | |
| **Content** | **Learning activities** | **Resources** |
| * Transformations * Rotation * Translation and reflection * Scale and shear * Trigonometric relations of transformations * Rotation * Translation and reflection * Scale and shear * Triangles * Right angled triangles * Non right angles triangles * Inscribed figures and triangles | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 9.4**

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**Performance criterion**

**Proper meanings of rotation, reflection, translation, scale, and shear, and how to calculate the first three of these for a given point or shape on the plane**

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question |

|  |  |  |
| --- | --- | --- |
| **Checklist** | Score | **No** |
| * **Indicator: Transformations are well explained** | | |
| * Rotation well defined |  |  |
| * Translation and reflection well defined |  |  |
| * Scale and shear are well defined |  |  |
| * **Indicator: Trigonometric relations of transformations are well defined** |  |  |
| * Rotation well defined |  |  |
| * Translation and reflection are well defined | | |
| * Scale and shear are well defined |  |  |
| **Observation** |  |  |
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| 1. **Learning Outcome 9.5:**  **Proper derivation of trigonometric formulas of the sum, the duplications and Simpson’s formulas** | | |
| **Content** | **Learning activities** | **Resources** |
| * Derivation of trigonometric formulas * Sum of two angles * Difference of two angles * Duplication formula * Transformation Simpson’s formulas * Sum into product * Product into sum * Applications | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 9.4**

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**Performance criterion**

**Proper derivation of trigonometric formulas of the sum, the duplications and Simpson’s formulas**

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| * **Indicator: Trigonometric formulas are well derived** | | |
| * Sum of two angles is well derived |  |  |
| * Difference of two angles is well derived |  |  |
| * Duplication formula is well derived |  |  |
| * **Indicator: Transformation Simpson’s formula are well derived** |  |  |
| * Sum into product are well defined | | |
| * Product to sum formulas are well defined |  |  |
| * Some applications are well explained |  |  |
| **Observation** |  |  |
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| --- | --- | --- |
| **Learning Outcome 9.5: Trigonometric equations, inequalities and systems of equations** | | |
| **Content** | **Learning activities** | **Resources** |
| * Trigonometric equations * Simple equations * Solving by factorization * Some types of equations * Trigonometric inequalities * Simple inequalities * Solving by factorization or substitution * Some types of inequalities | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 9.5**

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**Performance criterion**

**Trigonometric equations, inequalities and systems of equations**

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| * **Indicator: Trigonometric equations are** **well defined** | | |
| * Simple equations are well explained |  |  |
| * Solving by factorization is well explained |  |  |
| * Some types of equations are well explained |  |  |
| * **Indicator: Trigonometric inequalities are well defined** |  |  |
| * Simple inequalities are well explained | | |
| * Subs traction of angels |  |  |
| * Solving by factorization is well explained |  |  |
| * Some types of inequalities are well explained |  |  |
| **Observation** |  |  |
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| **Learning unit** | LU 7: Introduction to calculus and applications as tools of modeling variations and rates of changes problems | |
| **10**  **40 Hours** | | **Learning Outcomes:**   * 1. 1. Proper use of relations to identify functions and non functions relationships and classification   2. 2. Correct use of limits to understand the tangent and small change problems and continuity of functions   3. 3. Correct use of derivatives to model variations problems and rates of changes problems   4. 4. Applications in other fields such as physics, chemistry and economics |
|  | |

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| --- | --- | --- |
| **Learning Outcome 10.1:**  **Proper use of relations to identify functions and non functions relationships and classification** | | |
| **Content** | **Learning activities** | **Resources** |
| * **Identification of functions** * Use of arrow diagrams * Use of formulas * Using tests * **Defining functions** * Domain and range * Combining functions * Composition and inverses * Classification of functions * Algebraic functions * Transcendental | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 10.1**

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**Performance criterion**

**Proper use of relations to identify functions and non functions relationships and classification**

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| * **Indicator: Identification of functions is well explained** | | |
| * Use of arrow diagrams is determined |  |  |
| * Use of formulas is determined |  |  |
| * Using tests is determined |  |  |
| * **Indicator: Proper Definition functions** |  |  |
| * Determination of domain and range are well explained | | |
| * Combination of functions is well explained |  |  |
| * Composition and inverses are well explained |  |  |
| * **Indicator: Proper Classification of functions** |  |  |
| * Algebraic functions |  |  |
| * Transcendental |  |  |
| **Observation** |  |  |
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| **Learning Outcome 10.2:**  **Correct use of limits to understand the tangent and small change problems and continuity of functions** | | |
| **Content** | **Learning activities** | **Resources** |
| * Introduction to limits * Use of tables * Use of graphs * Using limits laws * Defining continuity * Continuity at a point * Continuity in a interval * Classification * Asymptotes * Vertical asymptotes * Horizontal asymptotes * Oblique asymptotes * Introduction to differentiation * The tangent problem * Derivative as rate of change * Derivative and continuity * Some applications | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 10.2**

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**Performance criterion**

**Correct use of limits to understand the tangent and small change problems and continuity of functions**

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| * **Indicator: Introduction to limits is well explained** | | |
| * Use of tables is determined |  |  |
| * Use of graphs is determined |  |  |
| * Use of limits laws is determined |  |  |
| * **Indicator: Proper Definition of continuity** |  |  |
| * Continuity at a point is well explained | | |
| * Continuity at an interval is well explained |  |  |
| * Classification of discontinuities is well explained |  |  |
| * **Indicator: Proper definition of Asymptotes** |  |  |
| * Vertical asymptote are well determined |  |  |
| * Horizontal asymptote are well determined |  |  |
| * Oblique asymptote are well determined |  |  |
| * **Indicator: Proper Introduction to differentiation** |  |  |
| * The tangent problem is well explained |  |  |
| * Derivative as rate of change is well explained |  |  |
| * Derivative and continuity concerns are well clarified |  |  |
| * Some applications are tackled and well explained |  |  |
| **Observation** |  |  |
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| **Learning Outcome 10.3: Correct use of derivatives to model variations problems and rates of changes problems** | | |
| **Content** | **Learning activities** | **Resources** |
| * Derivatives using formulas * Sum and difference formulas * Product and quotients formulas * Chain rule * Applications * Rate of change problems and optimization problems * Variations of functions * Tangents, normal and limits using L’Hopital’s rule | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 10.3**

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**Performance criterion**

**Correct use of derivatives to model variations problems and rates of changes problems**

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| * **Indicator: Derivatives using formulas is** **well explained** | | |
| * Sum and difference formulas well defined |  |  |
| * Product and quotients formulas well defined |  |  |
| * Chain rule well defined |  |  |
| * **Indicator: Different Applications are well stated and defined** |  |  |
| * Rate of change problems and optimization problems is well defined | | |
| * Variations of functions is well explained |  |  |
| * Tangents, normal and limits using L’Hopital’s rule are well explained |  |  |
| * Derivative as rate of change is well explained |  |  |
| * Derivative and continuity concerns are well clarified |  |  |
| * Some applications are tackled and well explained |  |  |
| **Observation** |  |  |
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| --- | --- | --- |
| **Learning Outcome 10.4:**  **Applications in other fields such as physics, chemistry and economics** | | |
| **Content** | **Learning activities** | **Resources** |
| * Applications in other fields * Application in Physics * Application in chemistry * Application in economics | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 10.4**

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**Performance criterion**

**Applications in other fields such as physics, chemistry and economics**

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| * **Indicator: Applications are well explained** | | |
| * Application in physics is well defined |  |  |
| * Application in chemistry is well defined |  |  |
| * Application in economics iswell defined |  |  |
| **Observation** |  |  |
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| --- | --- | --- |
| **Learning unit** | LU 7: Use of counting principles and probability | |
| **11**  **40 Hours** | | **Learning Outcomes:**   * 1. 1. Counting with sum, product and pigeonhole principle   2. 2. Combinatorics   3. 3. Discrete probability |
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| **Learning Outcome 11.1:**  **Counting with sum, product and pigeonhole principle** | | |
| **Content** | **Learning activities** | **Resources** |
| * Identifying counting rules * Use of sum rule * Use of product rule * Using pigeonhole principle | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 11.1**

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**Performance criterion**

**Counting with sum, product and pigeonhole principle**

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| * **Indicator: Counting rules are well explained** | | |
| * Use of sum rule is well explained |  |  |
| * Use of product rule is well explained |  |  |
| * Using pigeonhole principle is well explained |  |  |
| **Observation** |  |  |
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| --- | --- | --- |
| **Learning Outcome 11.2:**  **Correct use Combinatorics** | | |
| **Content** | **Learning activities** | **Resources** |
| * Introduction to combinatorics * Use of arrangements * Use permutations * Using combination * Newton binomial * Pascal’s triangles * Coefficients identification * Polynomials expansion | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 10.2**

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**Performance criterion**

**Correct use of Combinatorics**

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| * **Indicator: Introduction to combinatorics** | | |
| * Use of arrangements is well defined |  |  |
| * Use permutations is well defined |  |  |
| * Using combination is well defined |  |  |
| * **Indicator: Proper use of Newton’s binomial** |  |  |
| * Pascal’s triangle is well explained | | |
| * Coefficients identification is well explained |  |  |
| * Polynomials expansion is well explained |  |  |
| **Observation** |  |  |
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| --- | --- | --- |
| **Learning Outcome 11.3: Correct use** Discrete probability | | |
| **Content** | **Learning activities** | **Resources** |
| * Finite probability space * Counting with probability * Probability of events * Conditional probability * Baye’s theorem | * Brainstorming * Audio visual presentation * Group discussion and presentation | * Reference books * DVD players * Internet connection |

**Formative Assessment 11.3**

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**Performance criterion**

**Correct use discrete probability**

Assessor may collect among the following evidences and make judgements on whether the performance criterion has been achieved.

|  |  |
| --- | --- |
| Types of evidence | Portfolio assessment tools |
| * **Written** | * Multiple choices questions * Matching/ Sentence completion / Fill in blank * Presentation * Open questions or Short answer question * Essay |

|  |  |  |
| --- | --- | --- |
| Checklist | Score | |
| **Yes** | **No** |
| * **Indicator: Finite probability space is well explained** | | |
| * Counting with probability is well explained |  |  |
| * Probability of events is well explained |  |  |
| * Conditional probability is well explained |  |  |
| * Baye’s theorem is well explained |  |  |
| **Observation** |  |  |
|  | | |

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