THE INTERNATIONAL QUALIFICATIONS AND ASSESSMENT CENTRE (IQAC)

«Approved»

2025 y. «__» _____

Programme	**International Foundation Year Diploma in Information Technology (RQF)**		
Unit Number/ Unit Title	**UNIT 6 MATHEMATICS**		
Cohort Code:	L03MIT-U6		
Unit Level	Level 3		
Total GLH	Total qualification time 200/ Total Guided learning hours 90/ Self-guided learning hours 110		
Credits	20 CATS/ 10 ECTS		
Lecturer			
Start Date		**End Date**	
Unit Aims	The aim of the "Mathematics" module for the IT Diploma - Level 3 programme is to develop students' mathematical skills and knowledge essential for understanding and solving problems in information technology. This module focuses on fundamental mathematical concepts, techniques, and applications relevant to various IT domains, including algorithms, data structures, cryptography, and network analysis. By strengthening their mathematical foundation, students will be better equipped to tackle technical challenges, enhance their logical reasoning abilities, and apply quantitative methods to IT-related tasks and projects.		
Differentiation Strategies *(e.g. planned activities or support for individual learners according to their needs)*	The total number of students to be in the lesson is approximately 20. This is a multicultural group of students predominantly between the ages of 24 – 45, with numerous ethnic, gender, and creed background. These are UK academic level 5 students; hence it is assumed that they have practical, theoretical, or technological knowledge and understanding of a subject or field of work to find ways forward in broadly defined, complex contexts. These students must be able to generate information, evaluate, synthesise the use information from a variety of sources. Various approaches to addressing the various identified students needs will be adopted throughout the lesson. Such will include:- 1. Progressive tasks		

	2. Digital resources 3. Verbal support 4. Variable outcomes 5. Collaborative learning 6. Ongoing assessment 7. Flexible-pace learning
Equality & Diversity	Variety of teaching techniques will be employed to ensure that the needs of each individual learner are met.
Safeguarding & Prevent	Safeguarding policies and the Prevent duty are strictly observed to ensure the safety, well-being, and inclusivity of all students and staff.
Health & Safety	SIRM H&S policies will be maintained.
Learning Resources	**Teaching and Learning Materials**
	• "Project Management for IT-Related Projects" by Bob Hughes and Mike Cotterell • "Scrum: The Art of Doing Twice the Work in Half the Time" by Jeff Sutherland

Learning Outcome	Assessment Criteria
LO1. Understand fundamental mathematical concepts relevant to IT.	Explain basic arithmetic operations, algebraic expressions, and equations. 1.2 Describe the properties and applications of different types of functions (linear, quadratic, exponential, etc.). 1.3 Illustrate the principles of set theory and logical operations.
LO2. Apply appropriate methodologies and tools in project execution.	2.1 Use algebraic methods to solve equations and inequalities. 2.2 Employ trigonometric and geometric principles to solve problems involving angles, shapes, and distances. 2.3 Apply statistical methods to analyze data sets and interpret results.
LO3. Evaluate project outcomes and reflect on lessons learned.	3.1 Develop algorithms using mathematical principles such as recursion, iteration, and modular arithmetic. 3.2 Analyze the efficiency and complexity of algorithms using mathematical techniques. 3.3 Solve problems related to data structures, such as arrays, lists, and trees, using mathematical reasoning.

No	Learning Outcome / Topic	Learning and Teaching Activities	Which assessment criteria does the session relate to?	Day/month/ year/ signature
1.	**Understand fundamental mathematical concepts relevant to IT.**	Applications in IT • **Data Science**: Using statistics and probability to analyze and interpret data. • **Machine Learning**: Employing linear algebra and calculus in algorithms that learn from data. **Cryptography**: Utilizing number theory for secure data transmission	LO 1	
2.	1.1 Explain basic arithmetic operations, algebraic expressions, and equations.	Basic arithmetic operations include addition, subtraction, multiplication, and division, which are essential for performing calculations. Algebraic expressions combine numbers and variables using these operations, while equations assert the equality of two expressions, often requiring the solution for an unknown variable.	LO 1	
3.	1.1 Describe the properties and applications of different types of functions (linear, quadratic, exponential, etc.).	Different types of functions, such as linear, quadratic, and exponential functions, each have unique properties that define their behavior, such as constant slope for linear functions, parabolic shape for quadratic functions, and rapid growth for exponential functions. These functions are widely applied in various fields, including physics, economics, and biology, for modeling relationships and predicting outcomes based on their mathematical characteristics.	LO 1	
4.	Practice	Practice with linear math	LO 1	
5.	Illustrate the principles of set theory and logical operations	Set theory and logical operations are foundational concepts in mathematics and computer science.	LO 1	

6.	**Apply appropriate methodologies and tools in project execution.**	Set theory and logical operations are foundational concepts in mathematics and computer science. Set Theory • **Sets**: A set is a collection of distinct objects, represented by curly braces, e.g., A={1,2,3}A = \{1, 2, 3\}A={1,2,3}. • **Operations**: Key operations include: ○ **Union (A∪BA \cup BA∪B)**: Combines elements from both sets. ○ **Intersection (A∩BA \cap BA∩B)**: Contains elements common to both sets. ○ **Difference (A−BA - BA−B)**: Elements in set AAA that are not in set BBB. **Subset (A⊆BA \subseteq BA⊆B)**: Set AAA is a subset of BBB if all elements of AAA are in BBB.	LO 1	
7.	Practice	Logical Operations • **Logic**: Involves propositions that can be true or false. • **Operations**: Common logical operations include: ○ **AND (∧\land∧)**: True if both propositions are true. ○ **OR (∨\lor∨)**: True if at least one proposition is true. ○ **NOT (¬\neg¬)**: Inverts the truth value of a proposition.	LO 1	

		Implication (→\rightarrow→): Indicates a conditional relationship between propositions.		
8.	2.1 Use algebraic methods to solve equations and inequalities.	Using algebraic methods to solve equations and inequalities involves a systematic approach to isolating the variable and finding its value. Solving Equations 1. **Identify the Equation**: Start with a mathematical statement, such as ax+b=cax + b = cax+b=c. 2. **Isolate the Variable**: Use inverse operations (addition, subtraction, multiplication, division) to rearrange the equation and solve for the variable xxx. 3. **Check the Solution**: Substitute the found value back into the original equation to ensure it holds true. Solving Inequalities 1. **Identify the Inequality**: An example might be ax+b<cax + b < cax+b<c. 2. **Isolate the Variable**: Similar to equations, apply inverse operations, but remember that multiplying or dividing by a negative number reverses the inequality sign. 3. **Graph the Solution**: Represent the solution on a number line to visualize the range of values that satisfy the inequality. These algebraic methods provide a clear framework for solving both equations and inequalities, enabling effective problem-solving in various mathematical contexts.	LO2	
9.	Practice	Using Algebraic Methods to Solve Equations and Inequalities *Solving Equations* 1. **Identify the Equation**: Start with a simple	LO2	

		equation, e.g., 2x+5=152x + 5 = 152x+5=15. 2. **Isolate the Variable**: ○ Subtract 555 from both sides: 2x=102x = 102x=10 ○ Divide by 222: x=5x = 5x=5 3. **Check the Solution**: Substitute xxx back into the original equation to verify: 2(5)+5=15(True)2(5) + 5 = 15 \quad \text{(True)}2(5)+5=15(True) *Solving Inequalities* 1. **Identify the Inequality**: Consider an inequality like 3x−4<83x - 4 < 83x−4<8. 2. **Isolate the Variable**: ○ Add 444 to both sides: 3x<123x < 123x<12 ○ Divide by 333: x<4x < 4x<4 **Graph the Solution**: Represent the solution on a number line, indicating all values less than 4		
10.	Half-Term Exam	- Review of LO1 topics - Practice questions and mock assessment - **Half-term assessment** based on LO1 (theory)	LO2	
11.	1 Employ trigonometric and geometric principles to solve problems involving angles, shapes, and distances.	Employing trigonometric and geometric principles to solve problems involves applying mathematical concepts related to angles, shapes, and distances. Trigonometric Principles 1. **Understanding Angles**: Trigonometry deals with the relationships between the angles and sides of	LO2	

		triangles, particularly right triangles. 2. **Key Functions**: Sine, cosine, and tangent functions are used to relate angles to side lengths: ○ **Sine (sin\sinsin)**: Ratio of the opposite side to the hypotenuse. ○ **Cosine (cos\coscos)**: Ratio of the adjacent side to the hypotenuse. ○ **Tangent (tan\tantan)**: Ratio of the opposite side to the adjacent side. 3. **Applications**: Trigonometry is used to calculate unknown sides or angles in triangles, as well as in modeling periodic phenomena. Geometric Principles 1. **Shapes and Properties**: Understanding the properties of geometric shapes (triangles, circles, polygons) is essential for solving related problems. 2. **Formulas**: Area, perimeter, and volume formulas for various shapes allow for the calculation of dimensions and sizes. **Distance Calculation**: The distance between points can be found using the Pythagorean theorem or coordinate geometry.		
12.	Apply statistical methods to analyze data sets and interpret results.	Applying statistical methods to analyze data sets involves several key steps to summarize, interpret, and draw conclusions from the data. Steps in Statistical Analysis 1. **Data Collection**: ○ Gather relevant data through surveys,	LO2	

		experiments, or existing databases. 2. **Descriptive Statistics**: ○ **Summary Measures**: Calculate measures such as mean, median, mode, variance, and standard deviation to summarize the data. ○ **Data Visualization**: Use graphs (histograms, box plots, scatter plots) to visually represent the data distribution and identify patterns. 3. **Inferential Statistics**: ○ **Hypothesis Testing**: Formulate null and alternative hypotheses, then use tests (e.g., t-tests, chi-square tests) to determine if observed effects are statistically significant. ○ **Confidence Intervals**: Estimate the range within which a population parameter lies, providing a measure of uncertainty around sample estimates. 4. **Correlation and Regression Analysis**: ○ **Correlation**: Assess the strength and direction of relationships between variables using correlation coefficients (e.g., Pearson's r). ○ **Regression**: Model relationships between dependent and independent variables to predict outcomes and understand relationships. 5. **Interpretation of Results**: Analyze the statistical findings to make informed conclusions, considering the context of the data and potential limitations.		
13.	Practice	1. **Data Collection**: ○ Gather relevant data through surveys,	LO2	

		experiments, or existing databases. 2. **Descriptive Statistics**: ○ **Summary Measures**: Calculate measures such as mean, median, mode, variance, and standard deviation to summarize the data. ○ **Data Visualization**: Use graphs (histograms, box plots, scatter plots) to visually represent the data distribution and identify patterns. 3. **Inferential Statistics**: ○ **Hypothesis Testing**: Formulate null and alternative hypotheses, then use tests (e.g., t-tests, chi-square tests) to determine if observed effects are statistically significant. **Confidence Intervals**: Estimate the range within which a population parameter lies, providing a measure of uncertainty around sample estimates.		
14.	Exam Preparation & Review	- Comprehensive review of all learning outcomes - Practice questions and revision of key topics		
15.	Exam	- **Final-term assessment** covering all learning outcomes (theory and practical elements)		
16.	**Evaluate project outcomes and reflect on lessons learned.**	Evaluating project outcomes and reflecting on lessons learned is a critical process that helps organizations and teams understand the effectiveness of their efforts and improve future projects. Here's an overview of the topic: Importance of Evaluation 1. **Accountability**: Ensures that project teams are accountable for their performance and outcomes.	LO2	

		2. **Continuous Improvement**: Facilitates learning from both successes and failures, fostering a culture of growth. **Informed Decision-Making**: Provides insights that guide future project planning and execution.		
17.	Feedback & Reflection	- Review of final exam - Individual feedback on performance - Reflective discussion on key learning points	LO1, LO2	
18.	Develop algorithms using mathematical principles such as recursion, iteration, and modular arithmetic.	Introduction 1.1. What is an Algorithm? 1.2. Algorithm Specification 1.3. Analysis Framework 2. Performance Analysis 2.1. Space complexity 2.2.	LO3	
19.	3.1 Analyze the efficiency and complexity of algorithms using mathematical techniques.	Introduction 1.1. What is an Algorithm? 1.2. Algorithm Specification 1.3. Analysis Framework	LO3	
20.	Solve problems related to data structures, such as arrays, lists, and trees, using mathematical reasoning	Divide-and-conquer algorithm	LO3	
21.	Practice	Work with IDEF models IDEF0 and IDEF01	LO3	
22.	Practice	Work with IDEF models IDEF0 and IDEF01	LO3	
23.	**Demonstrate proficiency in mathematical tools and software relevant to IT.**	Space complexity 2.2. Time complexity 3. Asymptotic Notations 3.1. Big-Oh notation 3.2. Omega notation 3.3. Theta notation 3.4. Little-oh notation 3.5. Mathematical analysis	LO3	
24.	Half-Term Exam	LO3	LO3	

25.	Use graphing calculators, spreadsheets, and mathematical software to solve problems and visualize data.	Important Problem Types 4.1. Sorting 4.2. Searching 4.3. String processing 4.4. Graph Problems 4.5. Combinatorial Problems	LO3	
26.	Implement mathematical functions and algorithms in programming environments.	Fundamental Data Structures 5.1. Linear DataStructures 5.2. Graphs 5.3. Trees 5.4. Sets and Dictionaries	LO3	
27.	Practice	Implementation AI algorithm of difference social media	LO3	
28.	Practice	Analysing AI algorithms of you tube, Facebook, Instagram ext.	LO3	
29.	Final Exam Preparation & Review	LO1 LO2 LO3		
30.	Final Exam			
31.	**Understand fundamental mathematical concepts relevant to IT.**	Applications in IT • **Data Science**: Using statistics and probability to analyze and interpret data. • **Machine Learning**: Employing linear algebra and calculus in algorithms that learn from data. **Cryptography**: Utilizing number theory for secure data transmission	LO 1	