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**OCCUPATIONAL CERTIFICATE:**

**SOFTWARE ENGINEER**

**Week One Practical (C#)**

## **Mathematics**

## **MAT621**

**2025**

**OCCUPATIONALCERTIFICATE:**

**SOFTWARE ENGINEER**

**Formative Assessment 1**

# Software Design Engineering

## **SDE631**

**2025**

 **Project Question: Set Operations Analysis System (100 Marks)**

Problem Statement:

You are tasked with developing a C# console application to analyse student enrolment in two courses and a universal set of all registered students at a university. The application must compute and display the union, intersection, and complements of the sets, representing students enrolled in Course A, Course B, and the universal set of all students. The program should allow user input for set data, validate inputs, and present results in a clear, formatted manner.

Requirements:

1. Define three sets:

* Set A: Students enrolled in Course A.
* Set B: Students enrolled in Course B.
* Universal Set U: All registered students.

2. Implement functions to compute:

* Union of A and B (students in either course).
* Intersection of A and B (students in both courses).
* Complement of A (students not in Course A).
* Complement of B (students not in Course B).

3. Allow user input for student IDs (integers) for sets A, B, and U.

4. Validate inputs to ensure:

* No duplicate IDs in a single set.
* Sets A and B are subsets of U.
* Non-empty sets.

5. Display results in a sorted, comma-separated format.

6. Include error handling for invalid inputs.

Sample Sets for Testing:

Universal Set U = {1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008}

Set A = {1001, 1002, 1003, 1004}

Set B = {1003, 1004, 1005, 1006}

**Marking Rubric (100 marks):**

Correct set definitions and input handling: 20 marks

Union implementation and correctness: 20 marks

Intersection implementation and correctness: 20 marks

Complement implementation and correctness: 20 marks

Input validation and error handling: 10 marks

Output formatting and clarity: 10 marks