LAB EXERCISE 4 (SCSE1013)

FUNDAMENTAL PROGRAMMING

SEM 1, 2024/2025

1. Write a program that declares an integer variable and a pointer to that integer. Assign a value to the integer variable and then use the pointer to display the value of the integer and its memory address.
   Example Output:
   Value of the integer: 42
   Address of the integer: 0x7ffeefbff4c

2. Write a program to dynamically allocate memory for an array of integers. Read the size of the array from the user and populate it with random numbers using the rand() function. Finally, display the array contents and release the allocated memory.
   Example:
   Input: Enter the size of the array: 5
   Output: Array contents: 12 34 56 78 90

3. Write a program with a function that swaps the values of two integers using pointers. In the main function, declare two integers, pass their addresses to the swap function, and display their values before and after swapping.
   Example Output:
   Before swapping: x = 5, y = 10
   After swapping: x = 10, y = 5

4. Write a program that dynamically allocates memory for a 2D matrix (a rectangular array). The program should:
   1. Ask the user for the number of rows and columns for the matrix.
   2. Dynamically allocate memory for the matrix using pointers.
   3. Populate the matrix with random integers between 1 and 100.
   4. Calculate and display the sum of each row and each column.
   5. Release the allocated memory after use.

   Example Input/Output:

   Input:
   Enter the number of rows: 3
   Enter the number of columns: 4

   Output:

Matrix:
12 45 78 34
56 89 23 67
45 12 89 90

Row Sums:
Row 1: 169
Row 2: 235
Row 3: 236

Column Sums:
Column 1: 113
Column 2: 146
Column 3: 190
Column 4: 191

Hints:

1. Use a double pointer (int** matrix) to create a dynamically allocated 2D array.
2. Allocate memory for each row using a loop.
3. Use nested loops for populating and processing the matrix.
4. Carefully release memory for both the rows and the matrix itself after calculations.