



# Institute of Geographical Information Systems

## CS-212 - Object Oriented Programming LAB

Semester: Fall 2025

Class: SCEE-IGIS - 2024

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### LAB 02: Advanced Pointer Manipulation and Dynamic Memory Allocation

#### Question No 1:

Write a C++ program that:

1. Declares a pointer to an integer.
2. Declares a fixed-size array of integers
3. Uses the pointer to input values into the array (through pointer arithmetic).
4. Prints out the values in the array and the addresses of each element using the pointer.

#### Screenshot:

The screenshot shows a Microsoft Visual Studio Code interface. The left pane displays a C++ file named 'Problem1.cpp' with the following code:

```
1  /*
8  #include <iostream>
9  using namespace std;
10
11 int main()
12 {
13     int *ptr;
14     const int SIZE = 5;
15     int arr[SIZE];
16     ptr = arr;
17
18     cout << "Enter " << SIZE << " integers: ";
19     for (int i = 0; i < SIZE; i++)
20     {
21         cin >> *(ptr + i);
22     }
23
24     cout << "\nArray values and addresses:" << endl;
25     cout << "Index\tValue\tAddress" << endl;
26
27     for (int i = 0; i < SIZE; i++)
28     {
29         cout << i << "\t" << *(ptr + i) << "\t" << (ptr + i) << endl;
30     }
31
32     return 0;
33 }
```

The right pane shows the 'EXPLORER' view with a project structure for 'OOP' containing files like 'idea', 'cmake-build-debug', 'Week-01', 'Week-02', 'CMakeLists.txt', 'main.cpp', 'TFUGIslamabad', 'ok', and 'project.py'. The 'TERMINAL' tab at the bottom shows the command line output of the program execution:

```
alinnawaz@Ali's-MacBook-Air:~/Developer/Development/OOP/Week-02$ cd "/Users/alinnawaz/Developer/Development/OOP/Week-02/" && g++ Problem1.cpp -o Problem1 && ./Problem1
Enter 5 integers: 1
2
3
4
5
Array values and addresses:
Index Value Address
0 1 0x1f66e6a34
1 2 0x1f66e6a38
2 3 0x1f66e6a3c
3 4 0x1f66e6a40
4 5 0x1f66e6a44
```

## Question No 2:

Write a C++ program that:

1. Declares two integer variables.
2. Declares two pointers pointing to these variables.
3. Uses the pointers to swap the values of the two integers.
4. Prints the values before and after swapping.

## Screenshot:

The screenshot shows a Visual Studio Code (VS Code) interface with a dark theme. The left pane displays the code editor containing a C++ file named Problem2.cpp. The code implements a swap operation using pointers. The right pane shows the Explorer sidebar with a project structure for 'Week-02' containing files like Problem1.cpp, Problem2.cpp, and Problem3.cpp. Below the code editor is the Terminal tab, which shows the execution of the program and its output. The terminal output shows the user entering two numbers (4 and 5), followed by the program's output of 'Before swap: a = 4, b = 5' and 'After swap: a = 5, b = 4'.

```
1 //*
2 Write a C++ program that:
3 1. Declares two integer variables.
4 2. Declares two pointers pointing to these variables.
5 3. Uses the pointers to swap the values of the two integers.
6 4. Prints the values before and after swapping.
7 */
8 #include <iostream>
9 using namespace std;
10
11 int main()
12 {
13     int a, b;
14     cout << "Enter two numbers: ";
15     cin >> a >> b;
16
17     int *p1 = &a;
18     int *p2 = &b;
19
20     cout << "\nBefore swap: a = " << a << ", b = " << b << endl;
21
22     // Swapping using pointers
23     int temp = *p1;
24     *p1 = *p2;
25     *p2 = temp;
26
27     cout << "After swap: a = " << a << ", b = " << b << endl;
28
29     return 0;
30 }
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS SPELL CHECKER GITLENS

alinanaz@Alis-MacBook-Air Week-02 % cd "/Users/alinanaz/Developer/Development/OOP/Week-02/" && g++ Problem2.cpp -o Problem2 && "/Users/alinanaz/Developer/Development/OOP/Week-02/"'Problem2'

Enter two numbers: 4  
5

Before swap: a = 4, b = 5  
After swap: a = 5, b = 4

alinanaz@Alis-MacBook-Air Week-02 %

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### Question No 3:

Write a C++ program that:

1. Declares a static array of 7 integers.
2. Declares a pointer to the array.
3. Reverses the array in-place using pointer arithmetic.
4. Prints the reversed array.

### Screenshot:

The screenshot shows a Visual Studio Code (VS Code) interface with the following details:

- File Explorer:** Shows a project structure under "Week-02".
- Code Editor:** Displays the content of `Problem3.cpp`. The code reads 7 integers from standard input, prints them, then reverses the array in-place using pointer arithmetic, and prints the reversed array.
- Terminal:** Shows the command run in the terminal: `g++ Problem3.cpp -o Problem3 && ./Problem3`.
- Output:** Shows the program's output: "Original array: 1 2 3 4 5 6 7" followed by "Reversed array: 7 6 5 4 3 2 1".
- Status Bar:** Shows the current file is `Problem3.cpp`, line 37, column 21, and the file is saved.

```
8 #include <iostream>
9 using namespace std;
10
11 int main()
12 {
13     int arr[7];
14     const int SIZE = 7;
15     int *ptr = arr;
16
17     cout << "Enter 7 integers: ";
18     for (int i = 0; i < SIZE; i++)
19     {
20         cin >> *(ptr + i);
21     }
22
23     cout << "\nOriginal array: ";
24     for (int i = 0; i < SIZE; i++)
25     {
26         cout << *(ptr + i) << " ";
27     }
28     cout << endl;
29
30     int *start = ptr;
31     int *end = ptr + SIZE - 1;
32
33     while (start < end)
34     {
35         int temp = *start;
36         *start = *end;
37         *end = temp;
38         start++;
39     }
40
41     cout << "Reversed array: ";
42     for (int i = 0; i < SIZE; i++)
43     {
44         cout << *(ptr + i) << " ";
45     }
46     cout << endl;
47 }
```