In the Name of Allah, the Most Gracious, the Most Merciful

COMSATS UNIVERSITY ISLAMABAD

Department: Computer Science

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- **Assignment NO :** 1
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- **Section :** B
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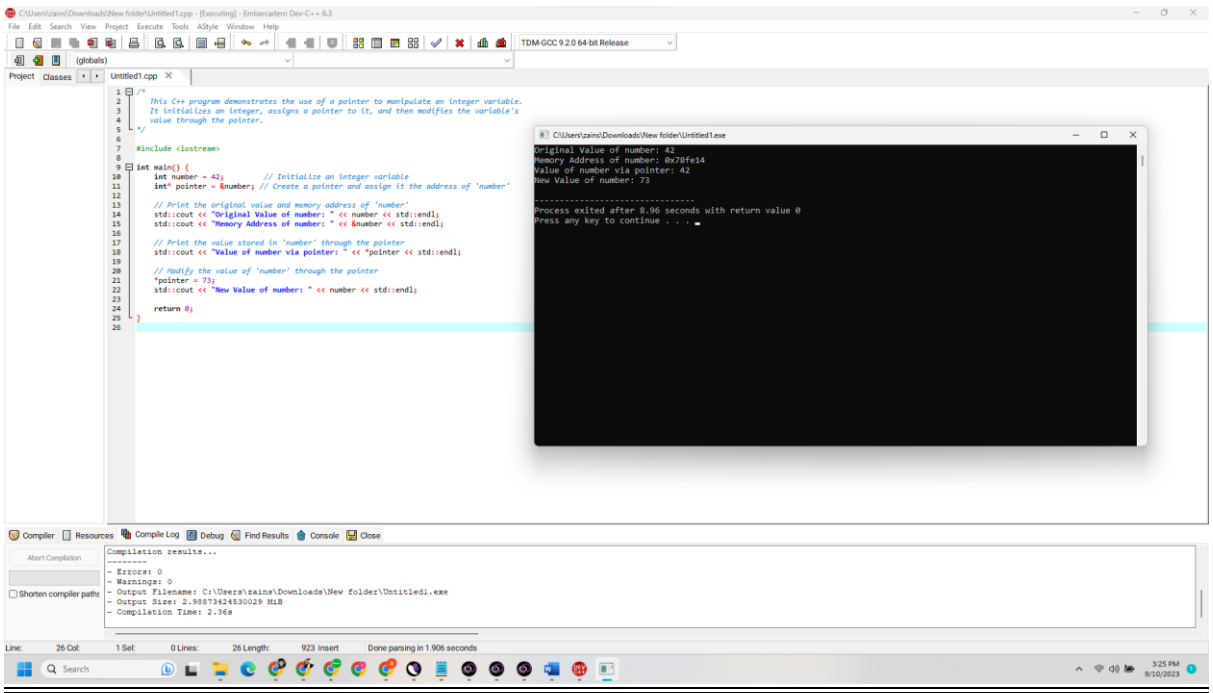
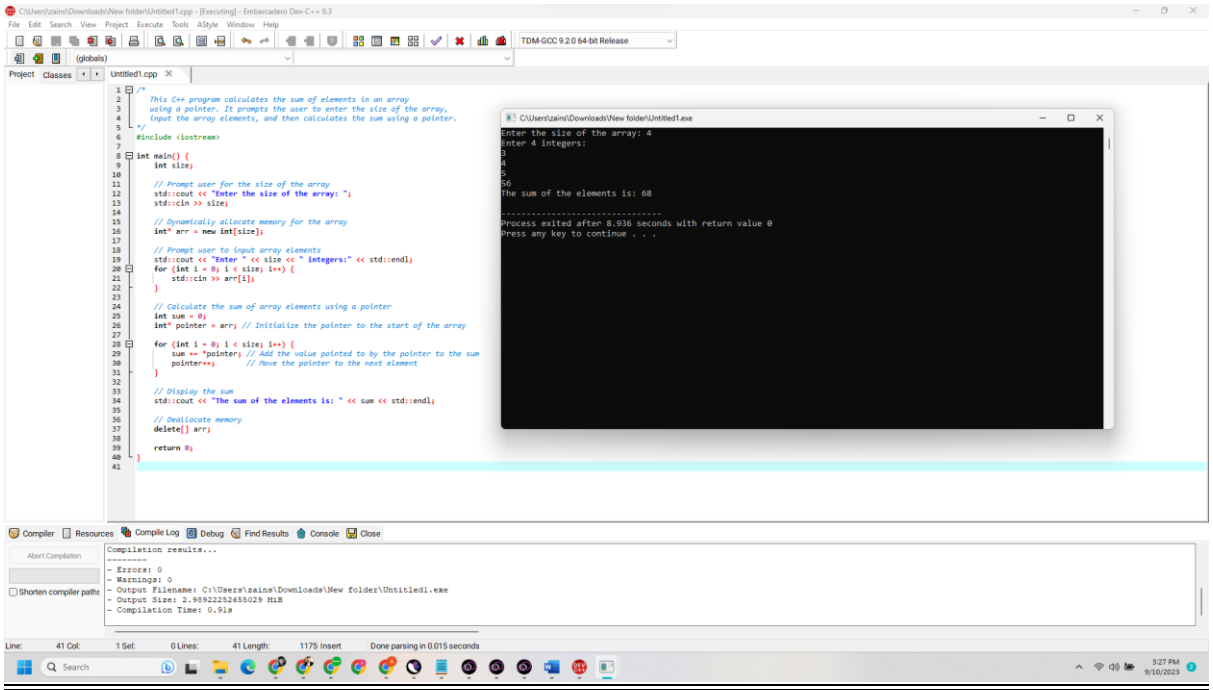
PROGRAM # 01

```
/*
   This C++ program demonstrates the use of a pointer to manipulate an integer variable.
   It initializes an integer, assigns a pointer to it, and then modifies the variable's
   value through the pointer.
*/

#include <iostream>

int main() {
    int number = 42;         // Initialize an integer variable
    int* pointer = &number; // Create a pointer and assign it the address of 'number'

    // Print the original value and memory address of 'number'
    std::cout << "Original Value of number: " << number << std::endl;
    std::cout << "Memory Address of number: " << &number << std::endl;

    // Print the value stored in 'number' through the pointer
    std::cout << "Value of number via pointer: " << *pointer << std::endl;

    // Modify the value of 'number' through the pointer
    *pointer = 73;
    std::cout << "New Value of number: " << number << std::endl;

    return 0;
}
```



PROGRAM # 02

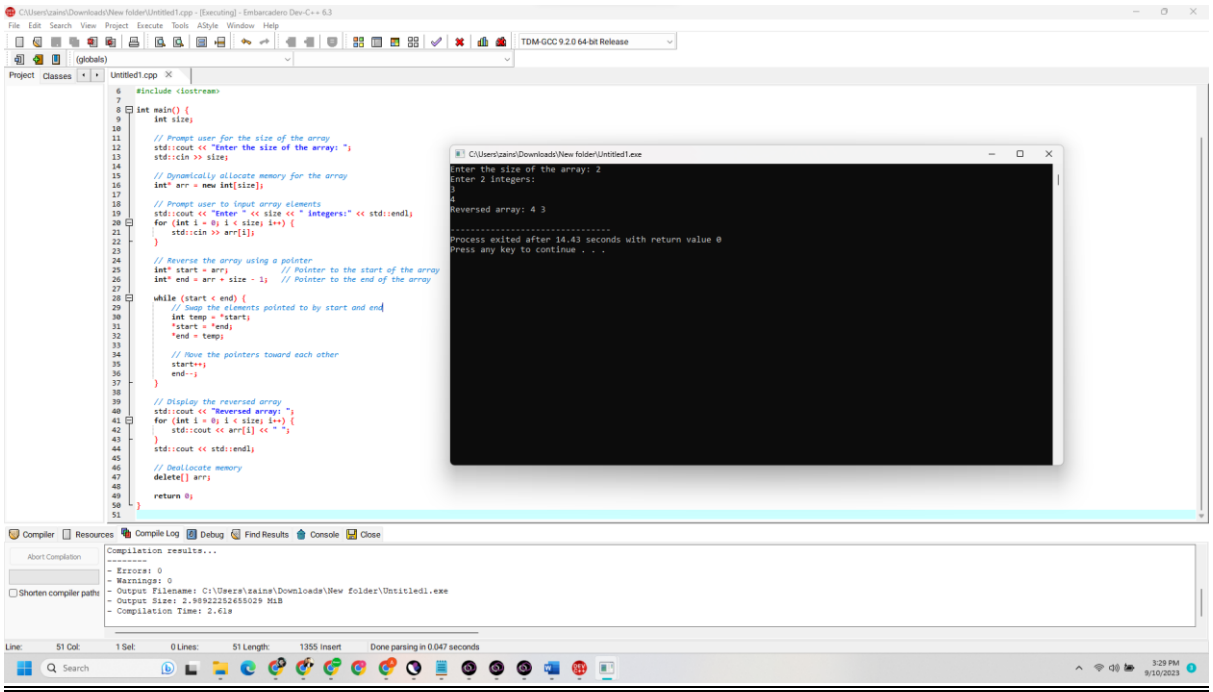
```
/*
  This C++ program calculates the sum of elements in an array
  using a pointer. It prompts the user to enter the size of the array,
  input the array elements, and then calculates the sum using a pointer.
*/
#include <iostream>

int main() {
    int size;

    // Prompt user for the size of the array
    std::cout << "Enter the size of the array: ";
    std::cin >> size;

    // Dynamically allocate memory for the array
    int* arr = new int[size];

    // Prompt user to input array elements
    std::cout << "Enter " << size << " integers:" << std::endl;
    for (int i = 0; i < size; i++) {
        std::cin >> arr[i];
    }

    // Calculate the sum of array elements using a pointer
    int sum = 0;
    int* pointer = arr; // Initialize the pointer to the start of the array

    for (int i = 0; i < size; i++) {
        sum += *pointer; // Add the value pointed to by the pointer to the sum
        pointer++;       // Move the pointer to the next element
    }

    // Display the sum
    std::cout << "The sum of the elements is: " << sum << std::endl;

    // Deallocate memory
    delete[] arr;

    return 0;
}
```



PROGRAM # 03

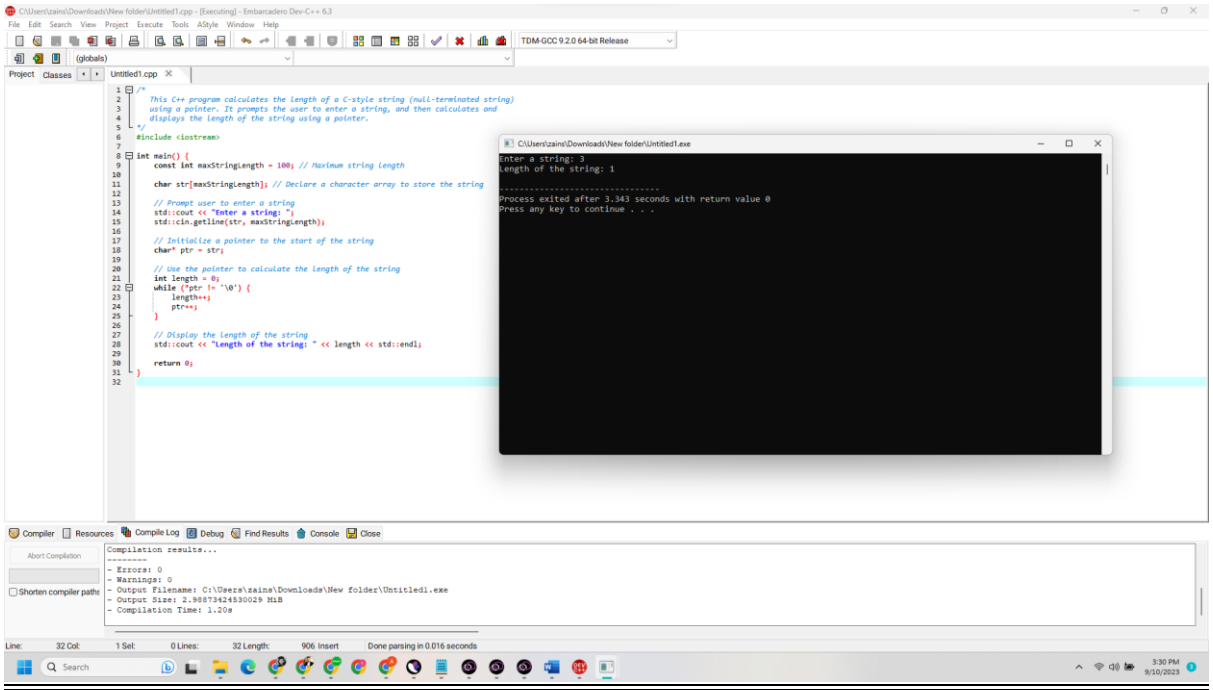
```
/*
  This C++ program reverses an array using a pointer.
  It prompts the user to enter the size of the array, input the array elements,
  and then reverses the order of the elements in the array using a pointer.
*/
#include <iostream>

int main() {
    int size;

    // Prompt user for the size of the array
    std::cout << "Enter the size of the array: ";
    std::cin >> size;

    // Dynamically allocate memory for the array
    int* arr = new int[size];

    // Prompt user to input array elements
    std::cout << "Enter " << size << " integers:" << std::endl;
    for (int i = 0; i < size; i++) {
        std::cin >> arr[i];
    }
```

```
    // Reverse the array using a pointer
    int* start = arr;           // Pointer to the start of the array
    int* end = arr + size - 1;   // Pointer to the end of the array

    while (start < end) {
        // Swap the elements pointed to by start and end
        int temp = *start;
        *start = *end;
        *end = temp;

        // Move the pointers toward each other
        start++;
        end--;
    }

    // Display the reversed array
    std::cout << "Reversed array: ";
    for (int i = 0; i < size; i++) {
        std::cout << arr[i] << " ";
    }
    std::cout << std::endl;

    // Deallocate memory
    delete[] arr;

    return 0;
}
```



PROGRAM # 04

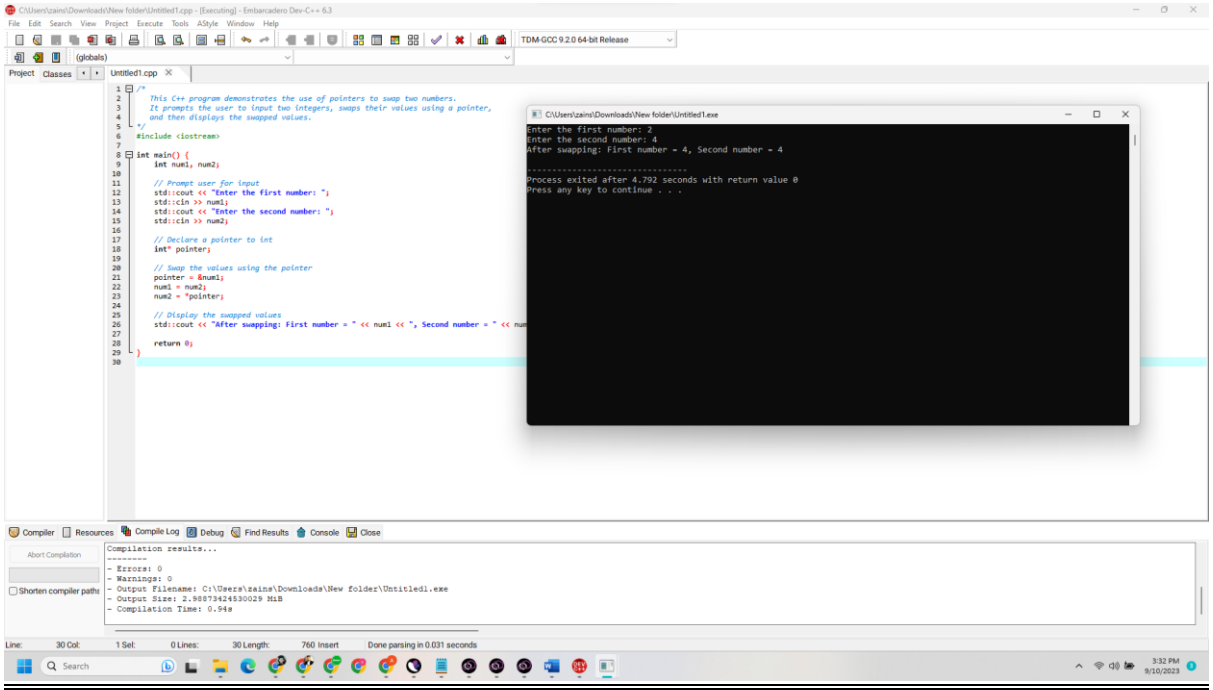
```
/*
  This C++ program calculates the length of a C-style string (null-terminated string)
  using a pointer. It prompts the user to enter a string, and then calculates and
  displays the length of the string using a pointer.
*/
#include <iostream>

int main() {
    const int maxStringLength = 100; // Maximum string length

    char str[maxStringLength]; // Declare a character array to store the string

    // Prompt user to enter a string
    std::cout << "Enter a string: ";
    std::cin.getline(str, maxStringLength);

    // Initialize a pointer to the start of the string
    char* ptr = str;

    // Use the pointer to calculate the length of the string
    int length = 0;
    while (*ptr != '\0') {
        length++;
        ptr++;
    }

    // Display the length of the string
    std::cout << "Length of the string: " << length << std::endl;

    return 0;
}
```



PROGRAM # 05

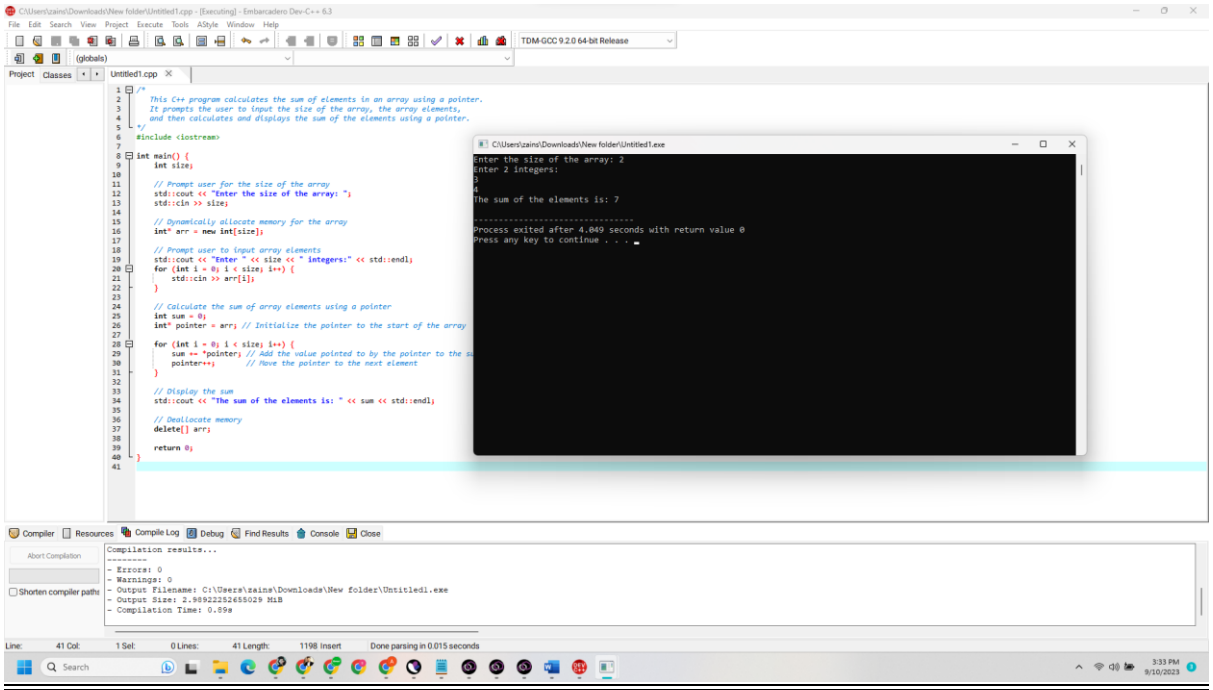
```
/*
  This C++ program demonstrates the use of pointers to swap two numbers.
  It prompts the user to input two integers, swaps their values using a pointer,
  and then displays the swapped values.
*/
#include <iostream>

int main() {
    int num1, num2;

    // Prompt user for input
    std::cout << "Enter the first number: ";
    std::cin >> num1;
    std::cout << "Enter the second number: ";
    std::cin >> num2;

    // Declare a pointer to int
    int* pointer;

    // Swap the values using the pointer
    pointer = &num1;
    num1 = num2;
    num2 = *pointer;
```

```
    // Display the swapped values
    std::cout << "After swapping: First number = " << num1 << ", Second number = " << num2 << std::endl;

    return 0;
}
```



PROGRAM # 06

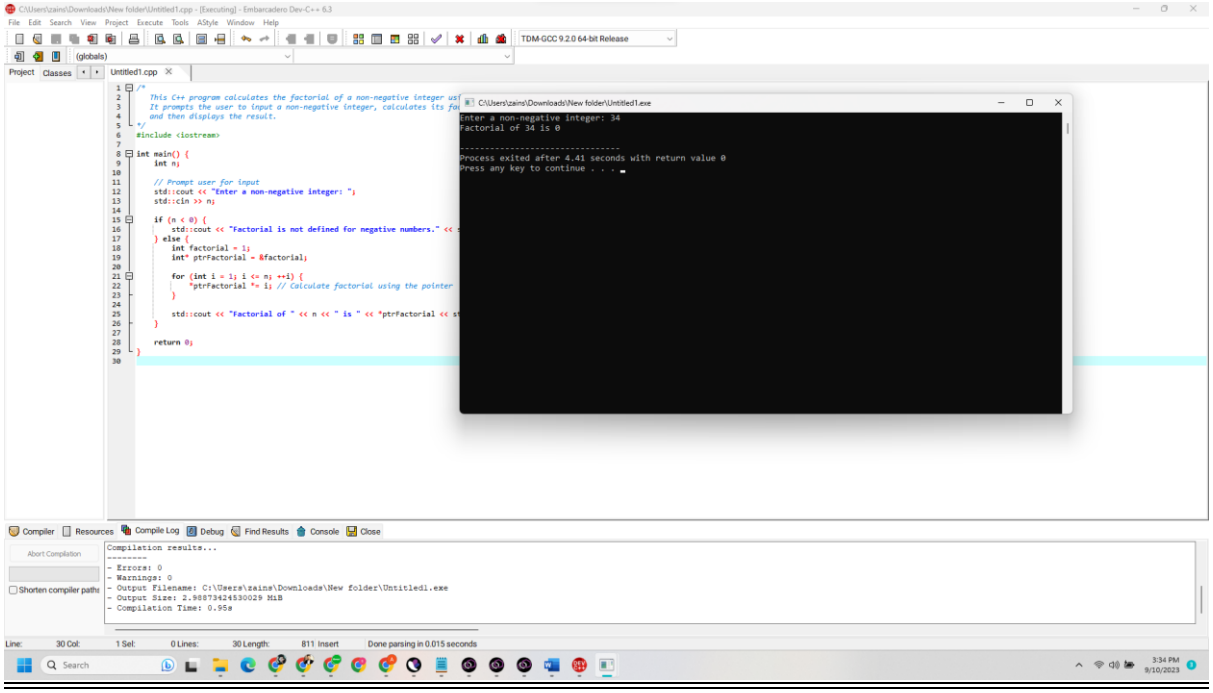
```
/*
  This C++ program calculates the sum of elements in an array using a pointer.
  It prompts the user to input the size of the array, the array elements,
  and then calculates and displays the sum of the elements using a pointer.
*/
#include <iostream>

int main() {
    int size;

    // Prompt user for the size of the array
    std::cout << "Enter the size of the array: ";
    std::cin >> size;

    // Dynamically allocate memory for the array
    int* arr = new int[size];

    // Prompt user to input array elements
    std::cout << "Enter " << size << " integers:" << std::endl;
    for (int i = 0; i < size; i++) {
        std::cin >> arr[i];
    }

    // Calculate the sum of array elements using a pointer
    int sum = 0;
    int* pointer = arr; // Initialize the pointer to the start of the array

    for (int i = 0; i < size; i++) {
        sum += *pointer; // Add the value pointed to by the pointer to the sum
        pointer++;       // Move the pointer to the next element
    }

    // Display the sum
    std::cout << "The sum of the elements is: " << sum << std::endl;

    // Deallocate memory
    delete[] arr;

    return 0;
}
```



PROGRAM # 07

```
/*
   This C++ program calculates the factorial of a non-negative integer using a pointer.
   It prompts the user to input a non-negative integer, calculates its factorial using a pointer,
   and then displays the result.
*/
#include <iostream>

int main() {
    int n;

    // Prompt user for input
    std::cout << "Enter a non-negative integer: ";
    std::cin >> n;

    if (n < 0) {
        std::cout << "Factorial is not defined for negative numbers." << std::endl;
    } else {
        int factorial = 1;
        int* ptrFactorial = &factorial;

        for (int i = 1; i <= n; ++i) {
            *ptrFactorial *= i; // Calculate factorial using the pointer
        }
```

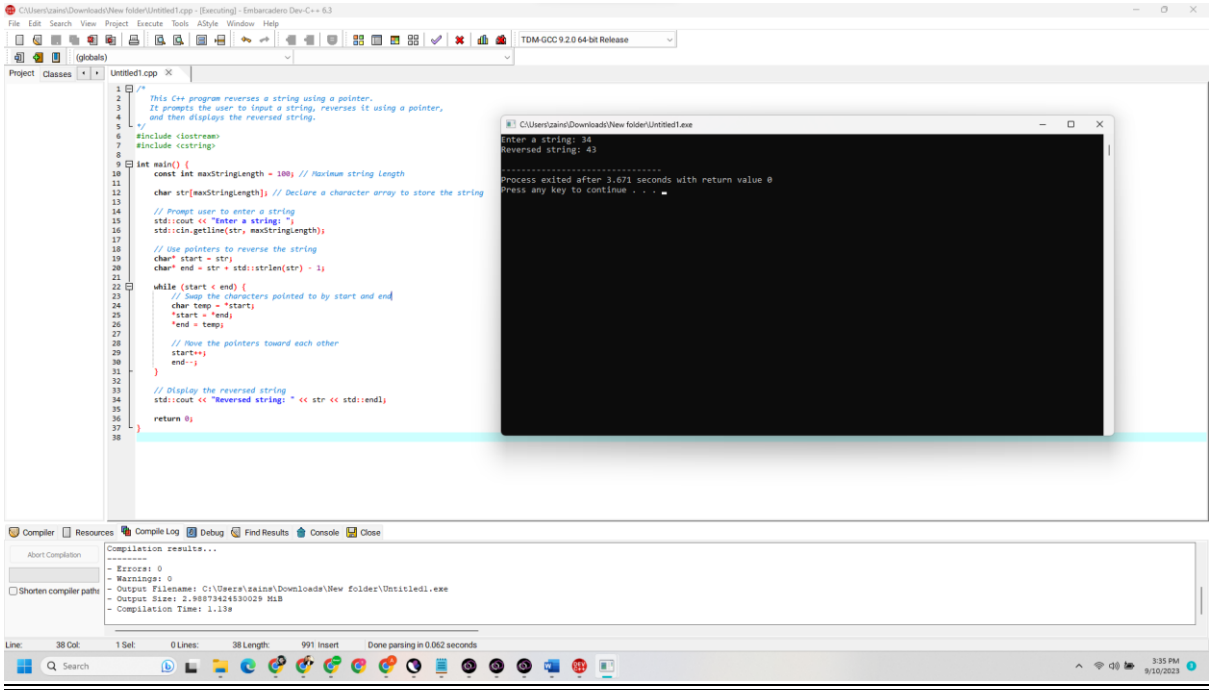
```
        std::cout << "Factorial of " << n << " is " << *ptrFactorial << std::endl;
    }

    return 0;
}
```



PROGRAM # 08

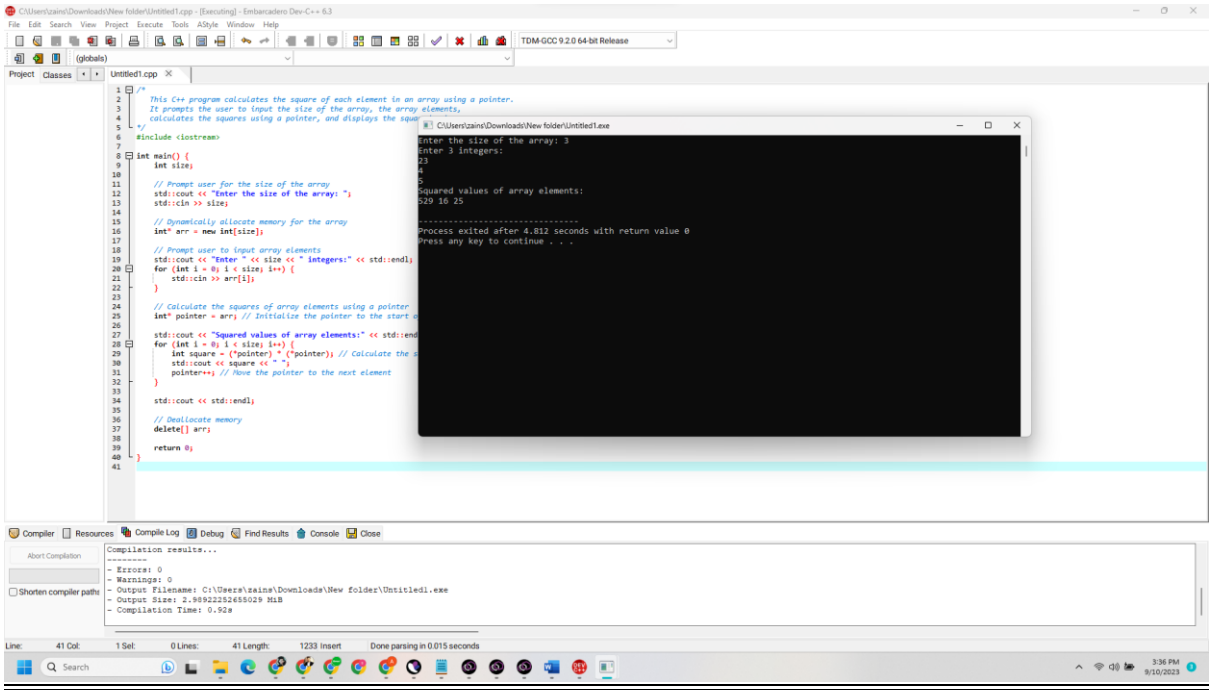
```
/*
   This C++ program reverses a string using a pointer.
   It prompts the user to input a string, reverses it using a pointer,
   and then displays the reversed string.
*/
#include <iostream>
#include <cstring>

int main() {
    const int maxStringLength = 100; // Maximum string length

    char str[maxStringLength]; // Declare a character array to store the string

    // Prompt user to enter a string
    std::cout << "Enter a string: ";
    std::cin.getline(str, maxStringLength);
```

```
    // Use pointers to reverse the string
    char* start = str;
    char* end = str + std::strlen(str) - 1;

    while (start < end) {
        // Swap the characters pointed to by start and end
        char temp = *start;
        *start = *end;
        *end = temp;

        // Move the pointers toward each other
        start++;
        end--;
    }

    // Display the reversed string
    std::cout << "Reversed string: " << str << std::endl;

    return 0;
}
```



PROGRAM # 09

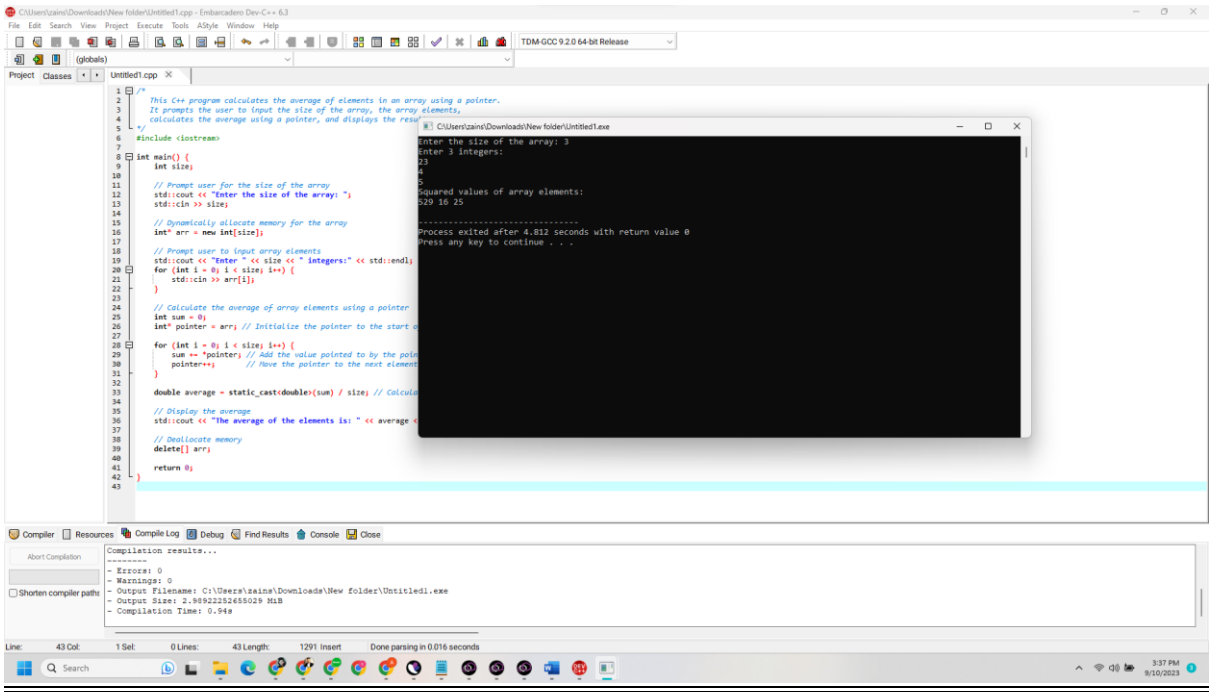
```
/*
  This C++ program calculates the square of each element in an array using a pointer.
  It prompts the user to input the size of the array, the array elements,
  calculates the squares using a pointer, and displays the squared values.
*/
#include <iostream>

int main() {
    int size;

    // Prompt user for the size of the array
    std::cout << "Enter the size of the array: ";
    std::cin >> size;

    // Dynamically allocate memory for the array
    int* arr = new int[size];

    // Prompt user to input array elements
    std::cout << "Enter " << size << " integers:" << std::endl;
    for (int i = 0; i < size; i++) {
        std::cin >> arr[i];
    }

    // Calculate the squares of array elements using a pointer
    int* pointer = arr; // Initialize the pointer to the start of the array

    std::cout << "Squared values of array elements:" << std::endl;
    for (int i = 0; i < size; i++) {
        int square = (*pointer) * (*pointer); // Calculate the square using the pointer
        std::cout << square << " ";
        pointer++; // Move the pointer to the next element
    }

    std::cout << std::endl;

    // Deallocate memory
    delete[] arr;

    return 0;
}
```



PROGRAM # 10

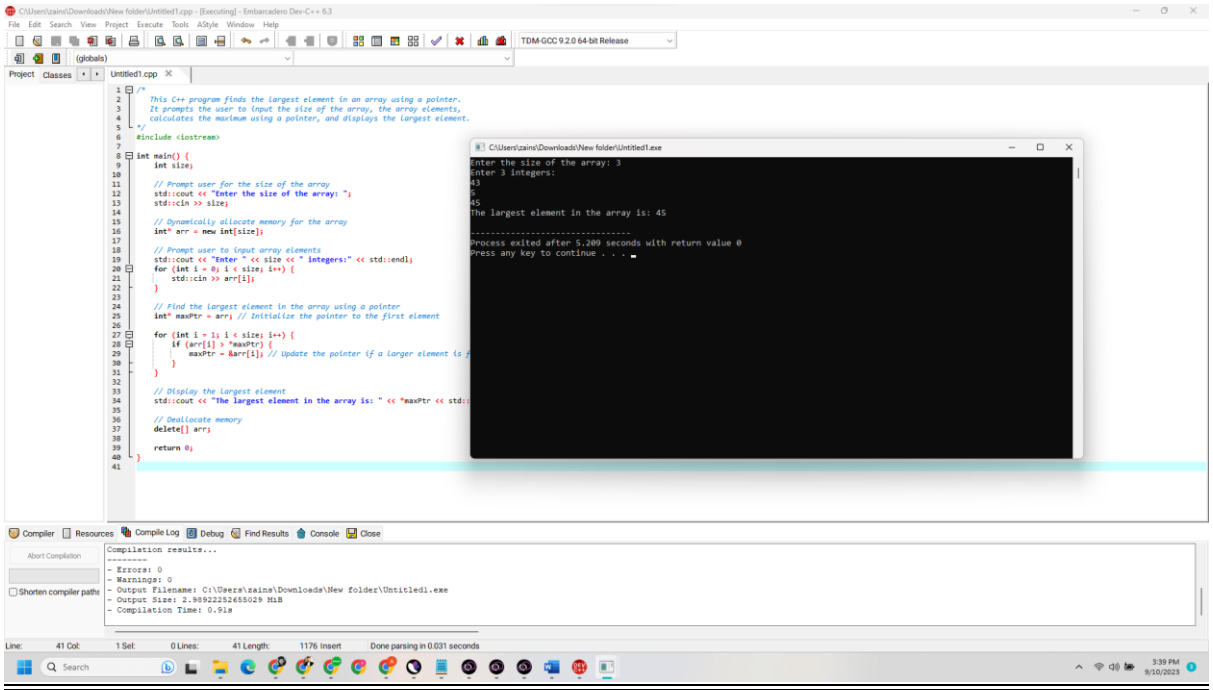
```
/*
   This C++ program calculates the average of elements in an array using a pointer.
   It prompts the user to input the size of the array, the array elements,
   calculates the average using a pointer, and displays the result.
*/
#include <iostream>

int main() {
    int size;

    // Prompt user for the size of the array
    std::cout << "Enter the size of the array: ";
    std::cin >> size;

    // Dynamically allocate memory for the array
    int* arr = new int[size];

    // Prompt user to input array elements
    std::cout << "Enter " << size << " integers:" << std::endl;
    for (int i = 0; i < size; i++) {
        std::cin >> arr[i];
    }

    // Calculate the average of array elements using a pointer
    int sum = 0;
```

```
    int* pointer = arr; // Initialize the pointer to the start of the array

    for (int i = 0; i < size; i++) {
        sum += *pointer; // Add the value pointed to by the pointer to the sum
        pointer++;       // Move the pointer to the next element
    }

    double average = static_cast<double>(sum) / size; // Calculate the average

    // Display the average
    std::cout << "The average of the elements is: " << average << std::endl;

    // Deallocate memory
    delete[] arr;

    return 0;
}
```



PROGRAM # 11

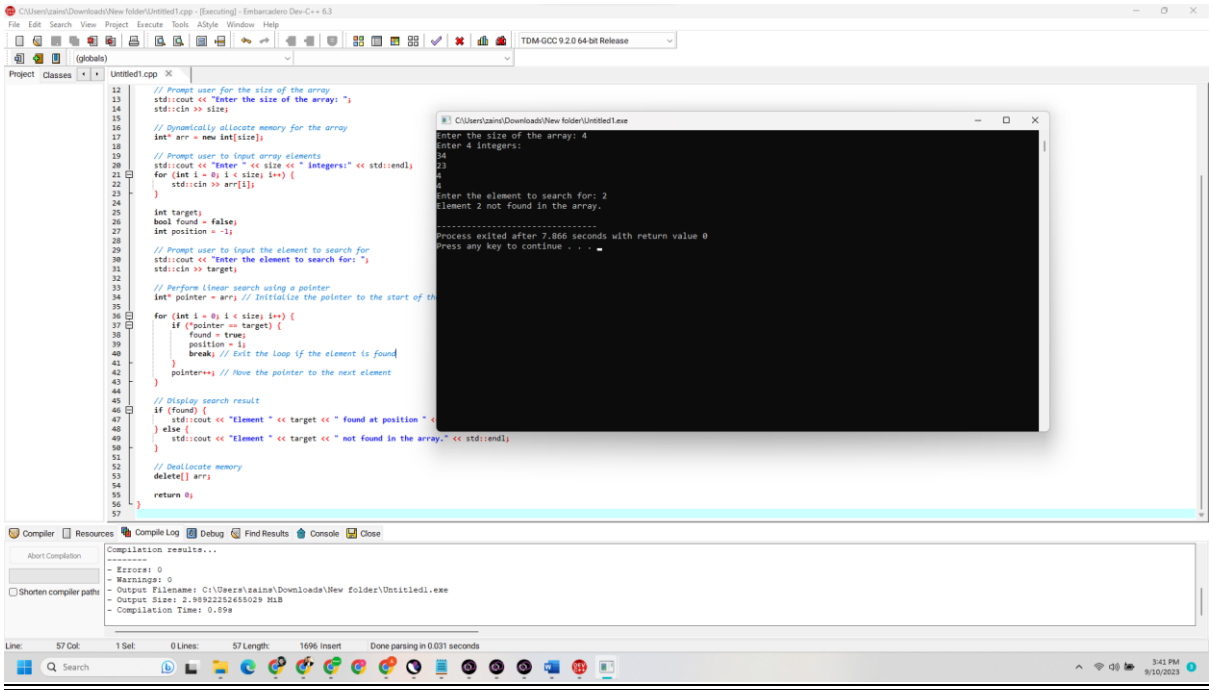
```
/*
  This C++ program finds the largest element in an array using a pointer.
  It prompts the user to input the size of the array, the array elements,
  calculates the maximum using a pointer, and displays the largest element.
*/
#include <iostream>

int main() {
    int size;

    // Prompt user for the size of the array
    std::cout << "Enter the size of the array: ";
    std::cin >> size;

    // Dynamically allocate memory for the array
    int* arr = new int[size];

    // Prompt user to input array elements
    std::cout << "Enter " << size << " integers:" << std::endl;
    for (int i = 0; i < size; i++) {
        std::cin >> arr[i];
    }

    // Find the largest element in the array using a pointer
    int* maxPtr = arr; // Initialize the pointer to the first element

    for (int i = 1; i < size; i++) {
        if (arr[i] > *maxPtr) {
            maxPtr = &arr[i]; // Update the pointer if a larger element is found
        }
    }

    // Display the largest element
    std::cout << "The largest element in the array is: " << *maxPtr << std::endl;

    // Deallocate memory
    delete[] arr;

    return 0;
}
```



PROGRAM # 12

```
/*
   This C++ program performs a linear search in an array to find a specific element using a
pointer.
   It prompts the user to input the size of the array, the array elements,
   and the element to search for. It uses a pointer to perform the search
   and displays whether the element was found and its position if present.
*/
#include <iostream>

int main() {
    int size;

    // Prompt user for the size of the array
    std::cout << "Enter the size of the array: ";
    std::cin >> size;

    // Dynamically allocate memory for the array
    int* arr = new int[size];

    // Prompt user to input array elements
    std::cout << "Enter " << size << " integers:" << std::endl;
    for (int i = 0; i < size; i++) {
        std::cin >> arr[i];
    }

    int target;
    bool found = false;
```

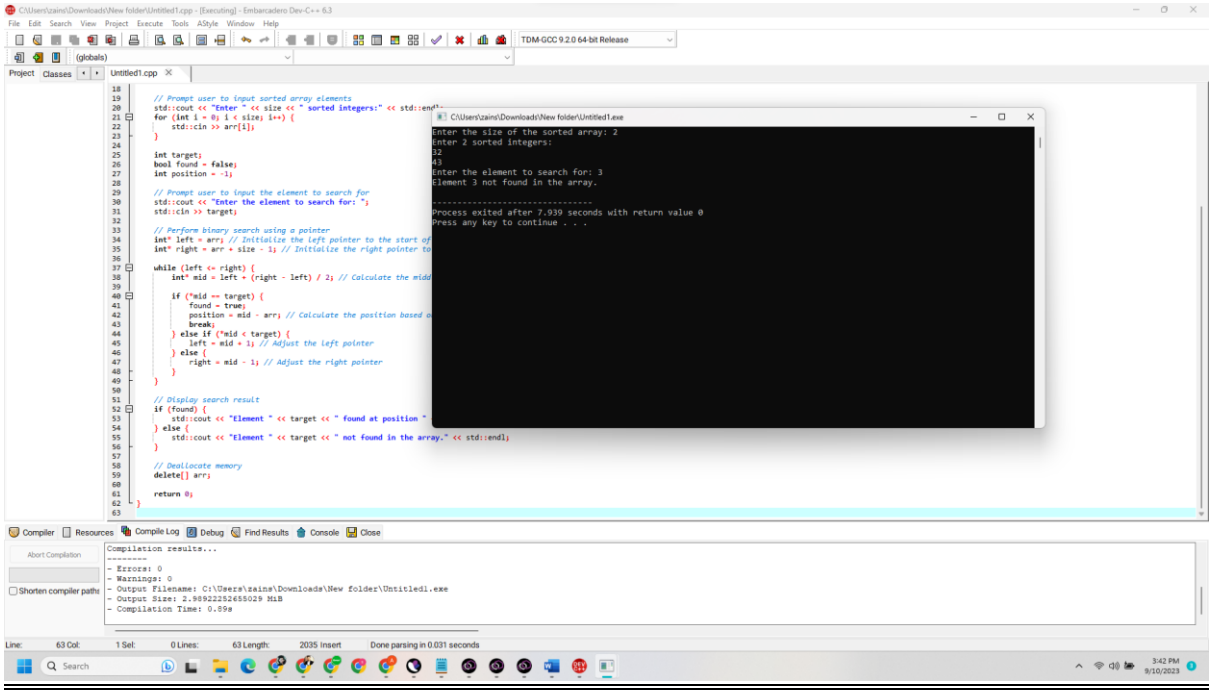
```
    int position = -1;

    // Prompt user to input the element to search for
    std::cout << "Enter the element to search for: ";
    std::cin >> target;

    // Perform linear search using a pointer
    int* pointer = arr; // Initialize the pointer to the start of the array

    for (int i = 0; i < size; i++) {
        if (*pointer == target) {
            found = true;
            position = i;
            break; // Exit the loop if the element is found
        }
        pointer++; // Move the pointer to the next element
    }

    // Display search result
    if (found) {
        std::cout << "Element " << target << " found at position " << position << std::endl;
    } else {
        std::cout << "Element " << target << " not found in the array." << std::endl;
    }

    // Deallocate memory
    delete[] arr;

    return 0;
}
```



PROGRAM # 13

```
/*
  This C++ program performs a binary search in a sorted array to find a specific element
using a pointer.
  It prompts the user to input the size of the array, the sorted array elements,
  and the element to search for. It uses a pointer to perform the binary search
  and displays whether the element was found and its position if present.
*/
#include <iostream>

int main() {
    int size;

    // Prompt user for the size of the array
    std::cout << "Enter the size of the sorted array: ";
    std::cin >> size;

    // Dynamically allocate memory for the sorted array
    int* arr = new int[size];

    // Prompt user to input sorted array elements
    std::cout << "Enter " << size << " sorted integers:" << std::endl;
    for (int i = 0; i < size; i++) {
        std::cin >> arr[i];
    }

    int target;
    bool found = false;
    int position = -1;

    // Prompt user to input the element to search for
    std::cout << "Enter the element to search for: ";
    std::cin >> target;

    // Perform binary search using a pointer
    int* left = arr; // Initialize the left pointer to the start of the array
    int* right = arr + size - 1; // Initialize the right pointer to the end of the array

    while (left <= right) {
        int* mid = left + (right - left) / 2; // Calculate the middle pointer

        if (*mid == target) {
            found = true;
            position = mid - arr; // Calculate the position based on pointer subtraction
            break;
        } else if (*mid < target) {
            left = mid + 1; // Adjust the left pointer
        } else {
            right = mid - 1; // Adjust the right pointer
```

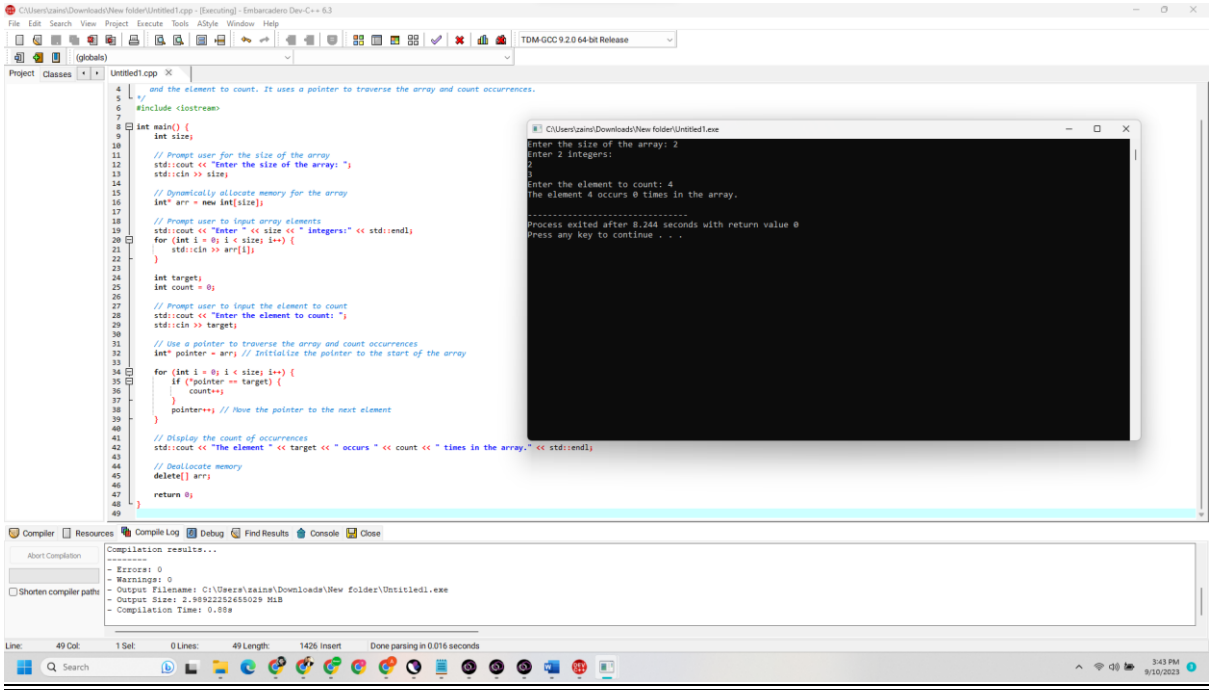
```
        }
    }

    // Display search result
    if (found) {
        std::cout << "Element " << target << " found at position " << position << std::endl;
    } else {
        std::cout << "Element " << target << " not found in the array." << std::endl;
    }

    // Deallocate memory
    delete[] arr;

    return 0;
}
```



PROGRAM # 14

```
/*
  This C++ program counts the number of occurrences of a specific element in an array using
a pointer.
  It prompts the user to input the size of the array, the array elements,
  and the element to count. It uses a pointer to traverse the array and count occurrences.
*/
#include <iostream>

int main() {
    int size;

    // Prompt user for the size of the array
    std::cout << "Enter the size of the array: ";
    std::cin >> size;

    // Dynamically allocate memory for the array
    int* arr = new int[size];

    // Prompt user to input array elements
    std::cout << "Enter " << size << " integers:" << std::endl;
    for (int i = 0; i < size; i++) {
        std::cin >> arr[i];
    }

    int target;
    int count = 0;

    // Prompt user to input the element to count
    std::cout << "Enter the element to count: ";
    std::cin >> target;

    // Use a pointer to traverse the array and count occurrences
    int* pointer = arr; // Initialize the pointer to the start of the array

    for (int i = 0; i < size; i++) {
        if (*pointer == target) {
            count++;
        }
        pointer++; // Move the pointer to the next element
    }

    // Display the count of occurrences
    std::cout << "The element " << target << " occurs " << count << " times in the array." <<
std::endl;

    // Deallocate memory
    delete[] arr;
```

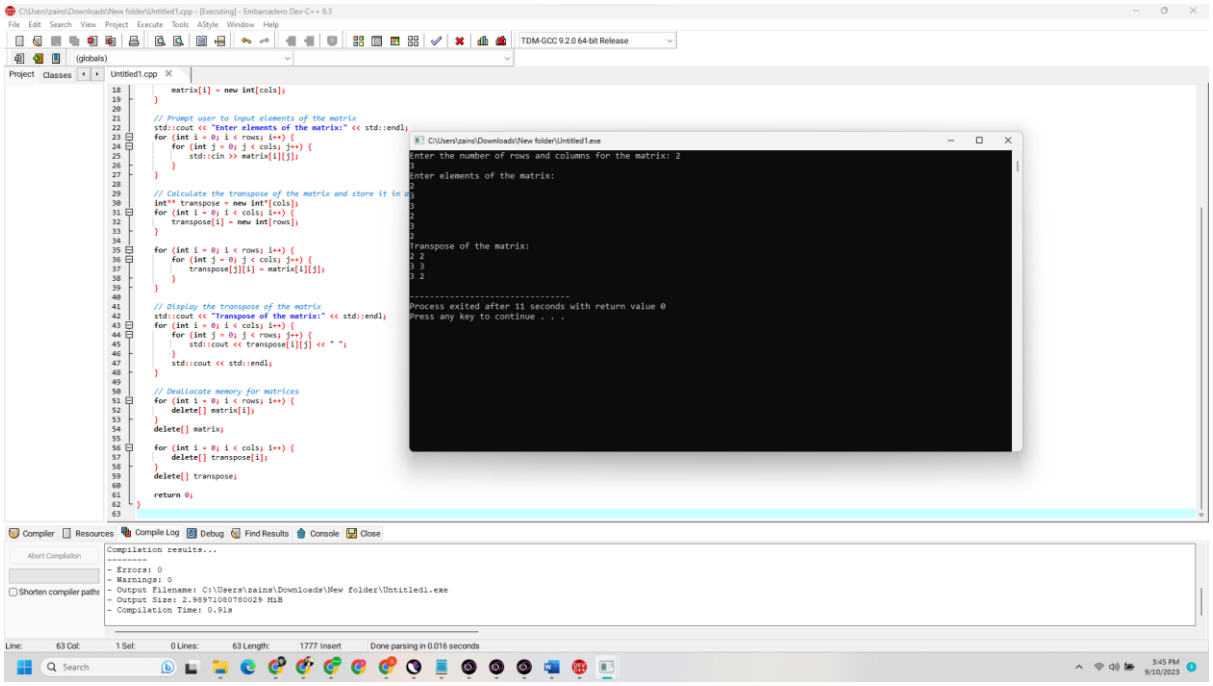
```
    return 0;
}
```



PROGRAM # 15

```
/*
   This C++ program calculates the transpose of a matrix using pointers.
   It prompts the user to input the dimensions of a matrix and its elements,
   and then calculates the transpose using pointers. It displays the transpose.
*/
#include <iostream>

int main() {
    int rows, cols;

    // Prompt user for the dimensions of the matrix
    std::cout << "Enter the number of rows and columns for the matrix: ";
    std::cin >> rows >> cols;

    // Dynamically allocate memory for the matrix
    int** matrix = new int*[rows];
    for (int i = 0; i < rows; i++) {
        matrix[i] = new int[cols];
    }

    // Prompt user to input elements of the matrix
    std::cout << "Enter elements of the matrix:" << std::endl;
    for (int i = 0; i < rows; i++) {
```

```
        for (int j = 0; j < cols; j++) {
            std::cin >> matrix[i][j];
        }
    }

    // Calculate the transpose of the matrix and store it in a new matrix
    int** transpose = new int*[cols];
    for (int i = 0; i < cols; i++) {
        transpose[i] = new int[rows];
    }

    for (int i = 0; i < rows; i++) {
        for (int j = 0; j < cols; j++) {
            transpose[j][i] = matrix[i][j];
        }
    }

    // Display the transpose of the matrix
    std::cout << "Transpose of the matrix:" << std::endl;
    for (int i = 0; i < cols; i++) {
        for (int j = 0; j < rows; j++) {
            std::cout << transpose[i][j] << " ";
        }
        std::cout << std::endl;
    }

    // Deallocate memory for matrices
    for (int i = 0; i < rows; i++) {
        delete[] matrix[i];
    }
    delete[] matrix;

    for (int i = 0; i < cols; i++) {
        delete[] transpose[i];
    }
    delete[] transpose;

    return 0;
}
```


C:\Users\zains\Downloads\New folder\Untitled1.cpp - [Executing] - Embarcadero Dev-C++ 6.3
File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 9.2.0 64-bit Release
(globals)
Project Classes
Untitled1.cpp
matrix[i] = new int[cols];
}
// Prompt user to input elements of the matrix
std::cout << "Enter elements of the matrix:" << std::endl;
for (int i = 0; i < rows; i++) {
for (int j = 0; j < cols; j++) {
std::cin >> matrix[i][j];
}
}
// Calculate the transpose of the matrix and store it in a
int** transpose = new int*[cols];
for (int i = 0; i < cols; i++) {
transpose[i] = new int[rows];
}
for (int i = 0; i < rows; i++) {
for (int j = 0; j < cols; j++) {
transpose[j][i] = matrix[i][j];
}
}
// Display the transpose of the matrix
std::cout << "Transpose of the matrix:" << std::endl;
for (int i = 0; i < cols; i++) {
for (int j = 0; j < rows; j++) {
std::cout << transpose[i][j] << " ";
}
std::cout << std::endl;
}
// Deallocate memory for matrices
for (int i = 0; i < rows; i++) {
delete[] matrix[i];
}
delete[] matrix;
for (int i = 0; i < cols; i++) {
delete[] transpose[i];
}
delete[] transpose;
return 0;
}
C:\Users\zains\Downloads\New folder\Untitled1.exe
Enter the number of rows and columns for the matrix: 2
3
Enter elements of the matrix:
2
2
3
2
3
2
Transpose of the matrix:
2 2
3 3
3 2

Process exited after 11 seconds with return value 0
Press any key to continue . . .
Compiler Resources Compile Log Debug Find Results Console Close
Abort Compilation
Shorten compiler paths
Compilation results...

- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\zains\Downloads\New folder\Untitled1.exe
- Output Size: 2.98971088780029 MiB
- Compilation Time: 0.91s
Line: 63 Col: 1 Sel: 0 Lines: 63 Length: 1777 Insert Done parsing in 0.016 seconds
Search
3:45 PM
9/10/2023