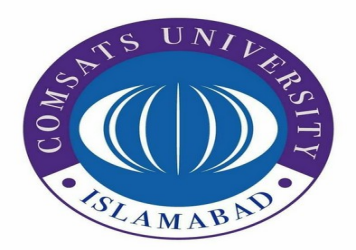


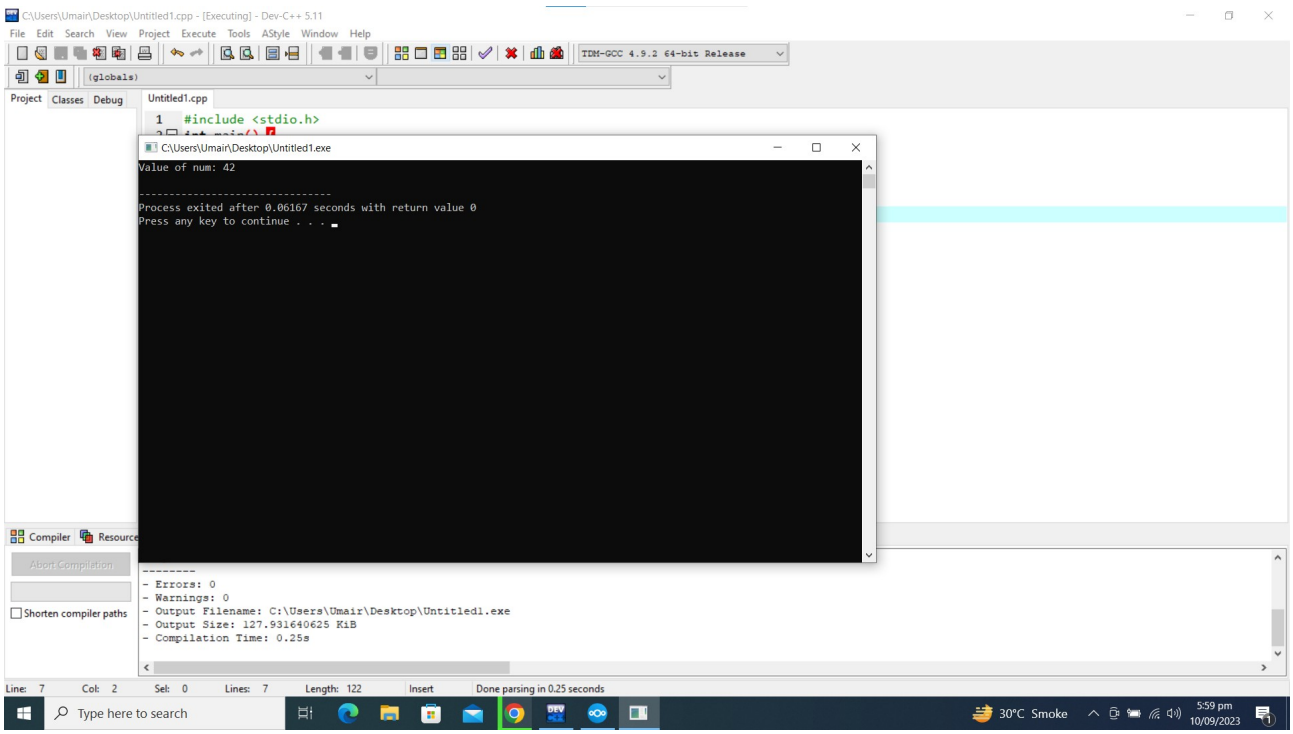
Assignment 01

Submitted by:	Zohaib Khalid
Reg. No:	SP22-BCS-064
Section:	A
Subject:	Data Structure
Title:	Pointers
Submitted to:	Maam Yasmeen

Comsats University Islamabad, Vehari Campus

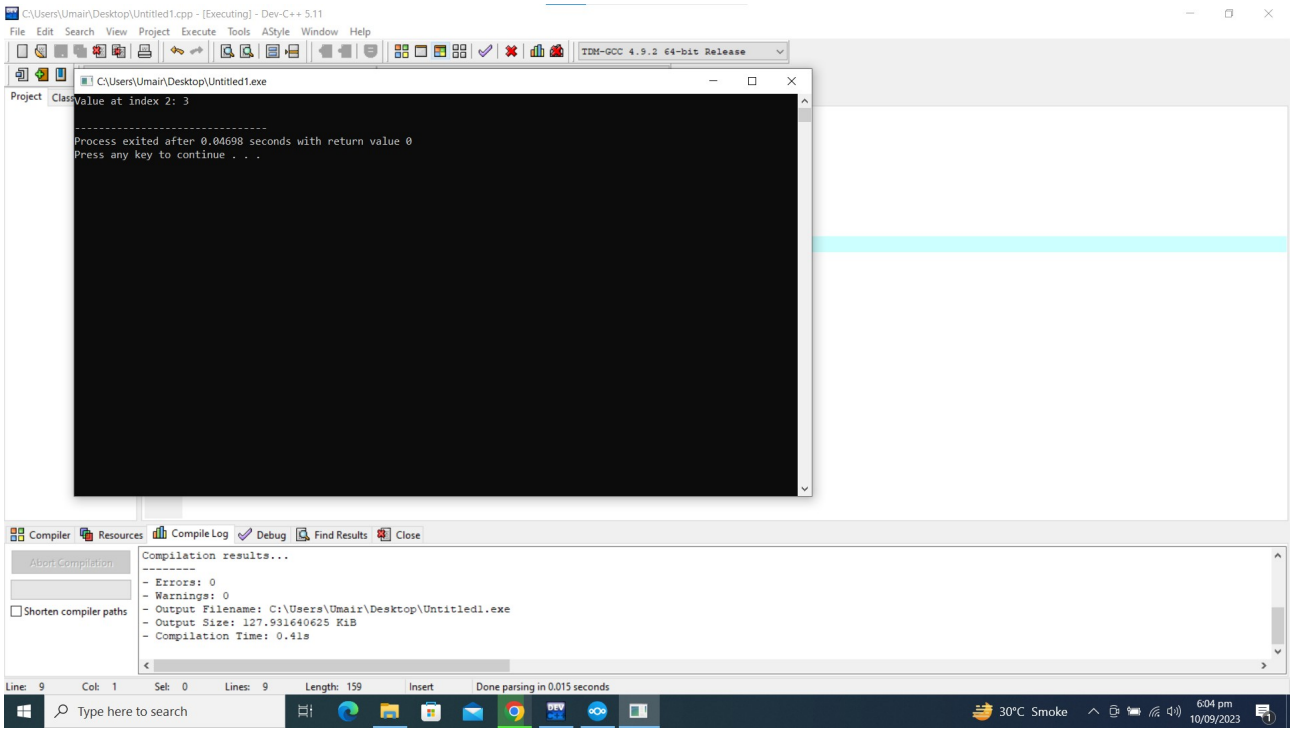
Program no 01:

```
#include <stdio.h>

int main() {
    int num = 42;
    int *ptr = &num;
    printf("Value of num: %d\n", *ptr);
    return 0;
}
```



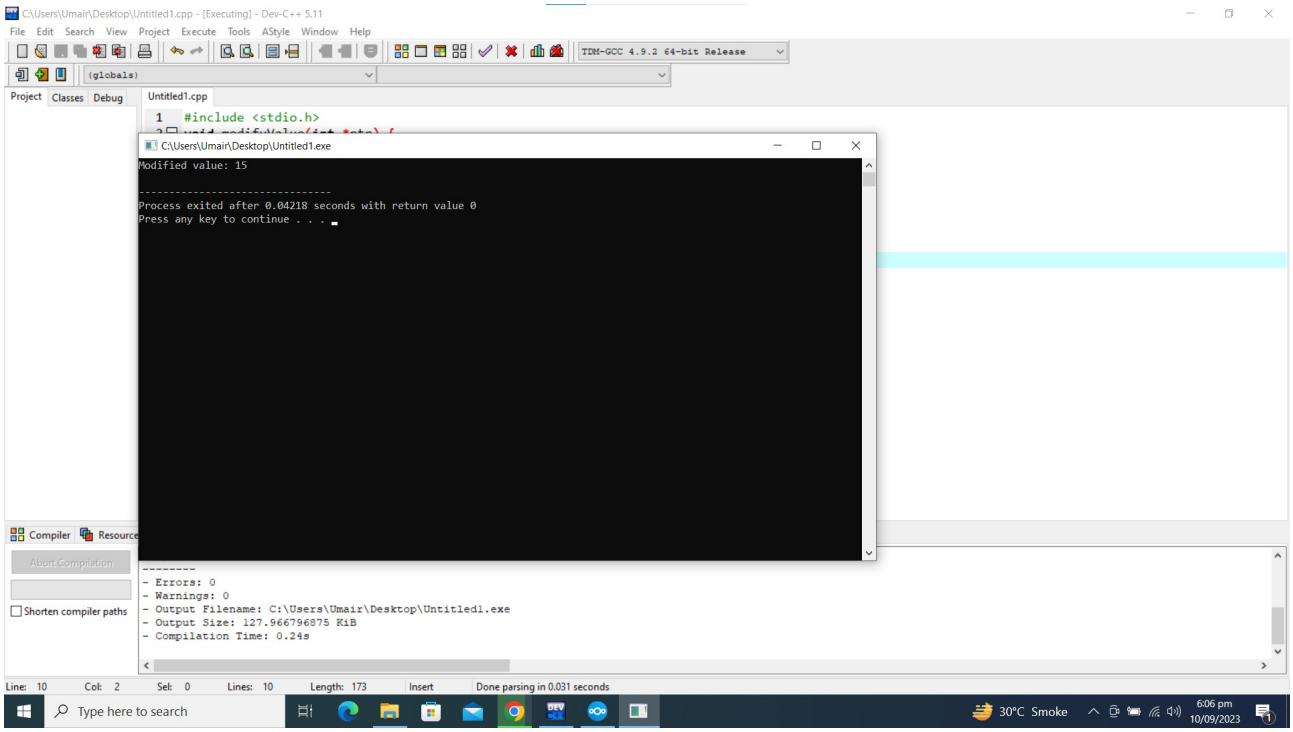
Program no 02:

```
#include <stdio.h>

int main() {
    int arr[] = {1, 2, 3, 4, 5};
    int *ptr = arr;
    ptr = ptr + 2;
    printf("Value at index 2: %d\n", *ptr);
    return 0;
}
```



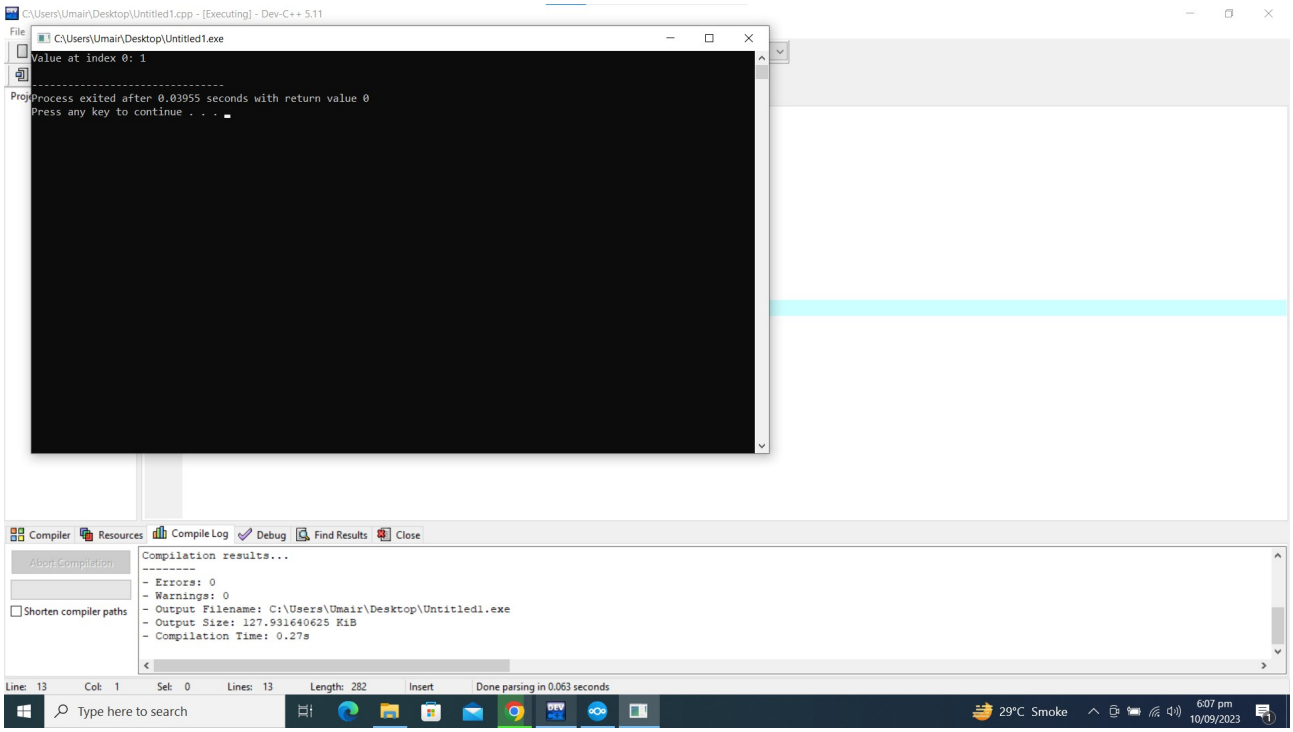
Program no 03:

```
#include <stdio.h>

int main() {
    int num = 42;
    int *ptr1 = &num;
    int **ptr2 = &ptr1;
    printf("Value of num via ptr2: %d\n", **ptr2);
    return 0;
}
```



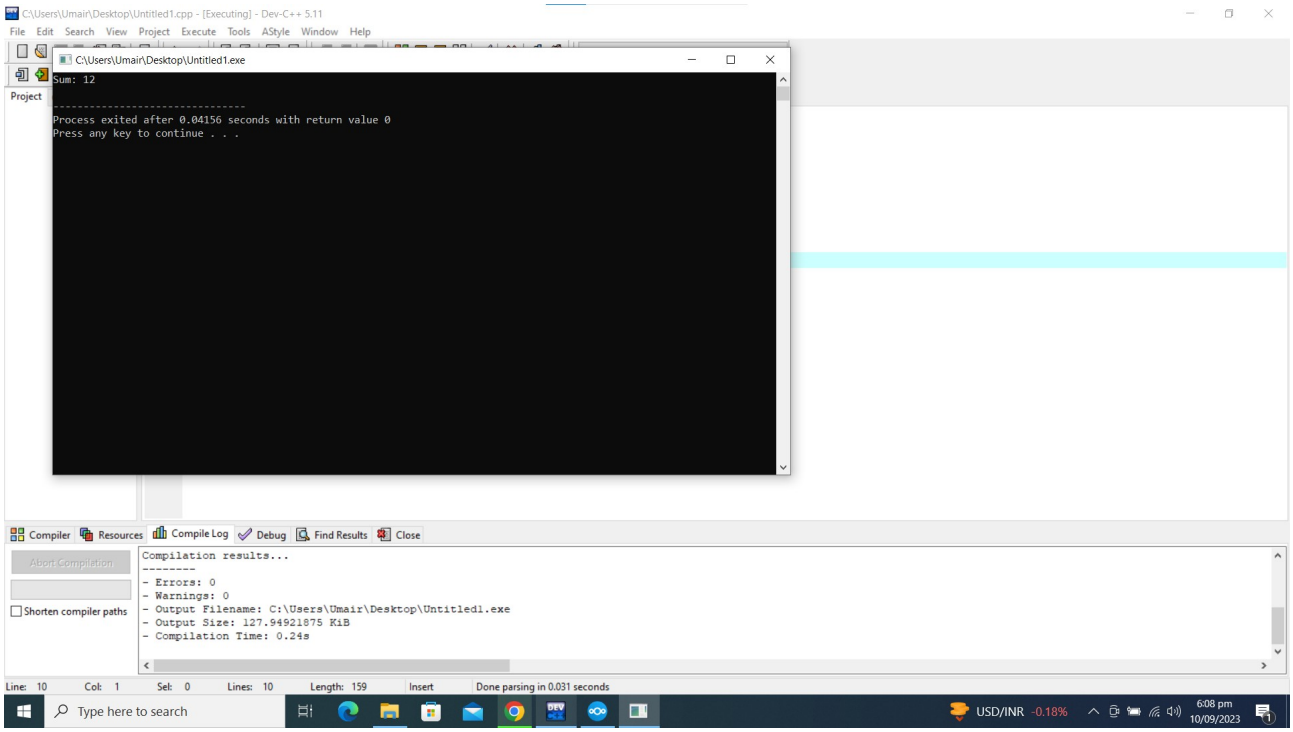
Program no 04:

```
#include <stdio.h>

void modifyValue(int *ptr) {
    (*ptr) += 10;
}

int main() {
    int num = 5;
    modifyValue(&num);
    printf("Modified value: %d\n", num);
    return 0;
}
```



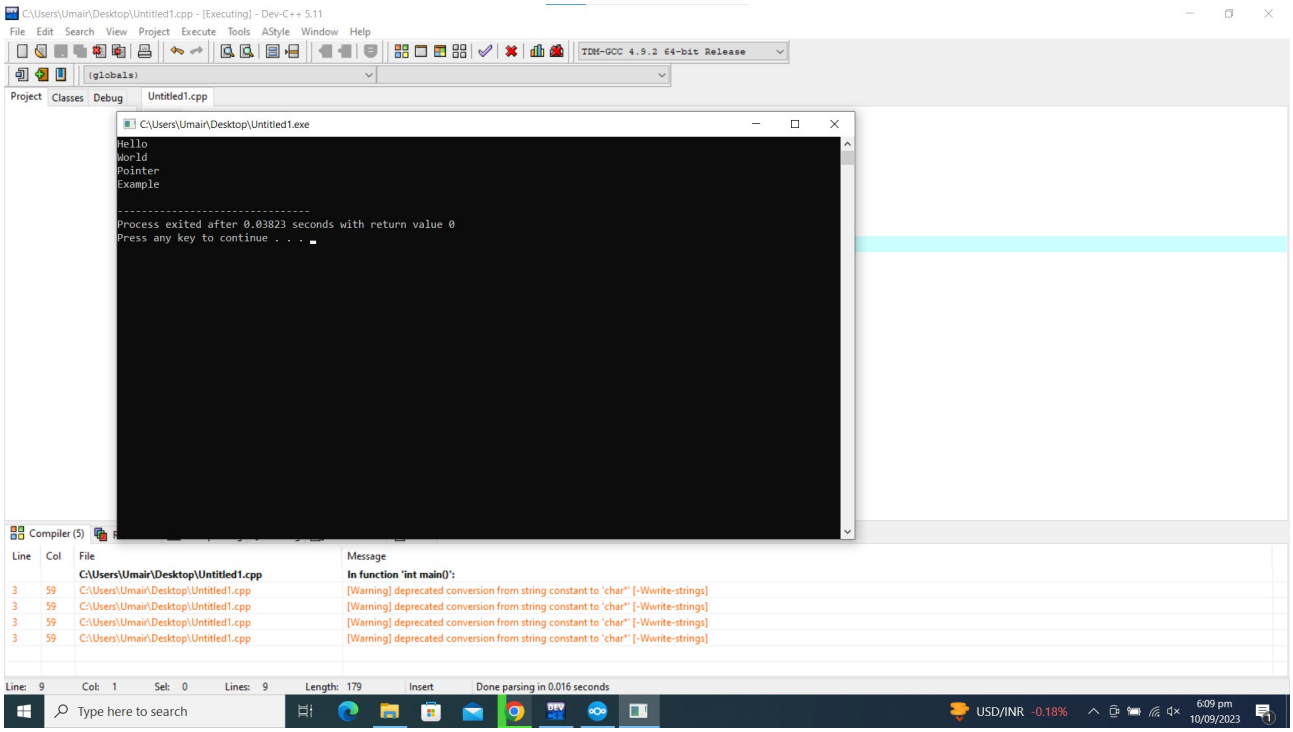
Program no 05:

```
#include <stdio.h>
#include <stdlib.h>

int main() {
    int *arr = (int *)malloc(5 * sizeof(int));
    if (arr != NULL) {
        // Initialize and use arr
        arr[0] = 1;
        printf("Value at index 0: %d\n", arr[0]);
        free(arr); // Don't forget to free allocated memory
    }
    return 0;
}
```



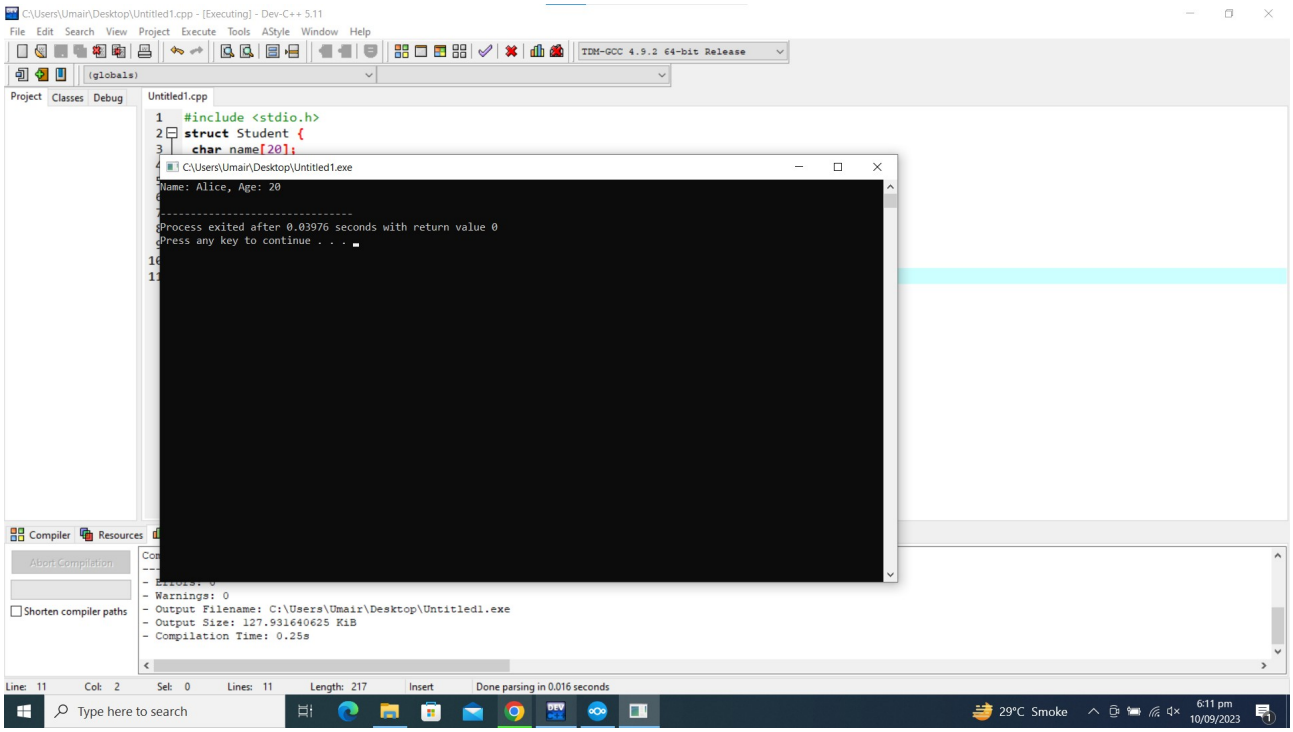
Program no 06:

```
#include <stdio.h>

int add(int a, int b) {
    return a + b;
}

int main() {
    int (*ptr)(int, int) = add;
    printf("Sum: %d\n", ptr(5, 7));
    return 0;
}
```



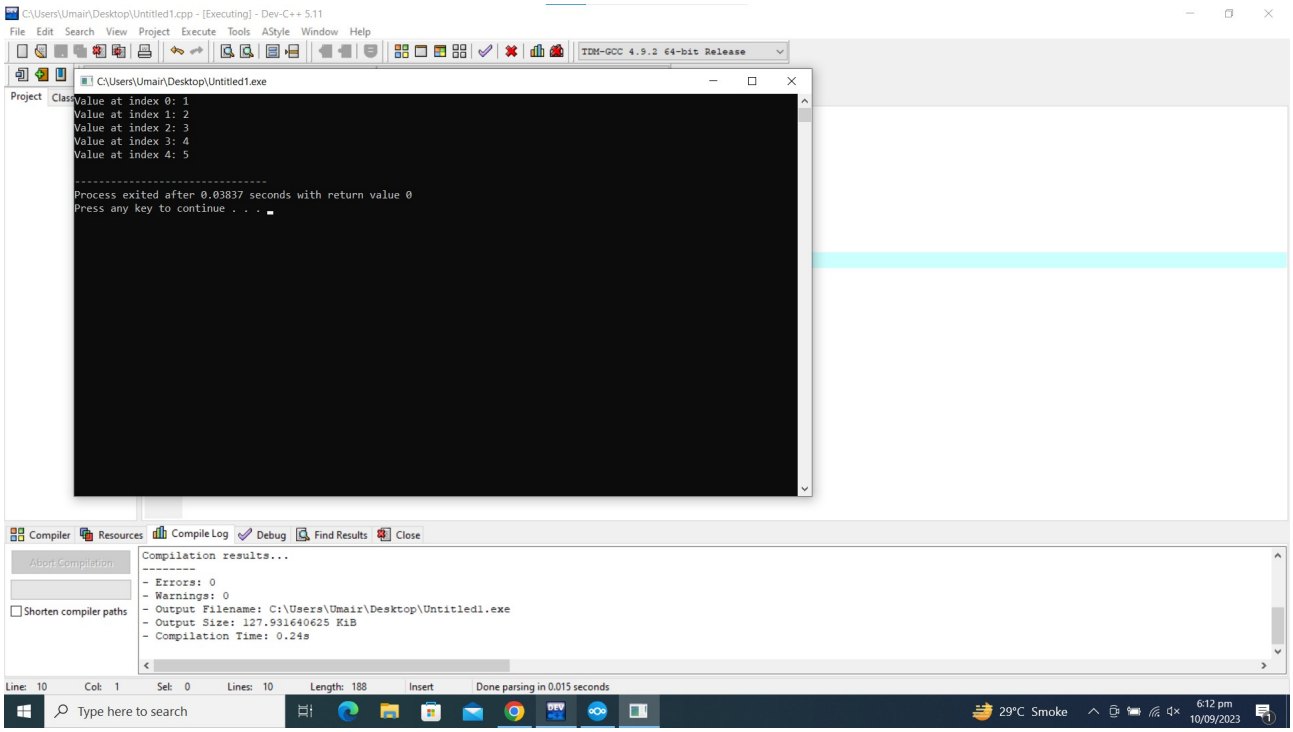
Program no 07:

```
#include <stdio.h>

int main() {
    char *strings[] = {"Hello", "World", "Pointer", "Example"};
    for (int i = 0; i < 4; i++) {
        printf("%s\n", strings[i]);
    }
    return 0;
}
```



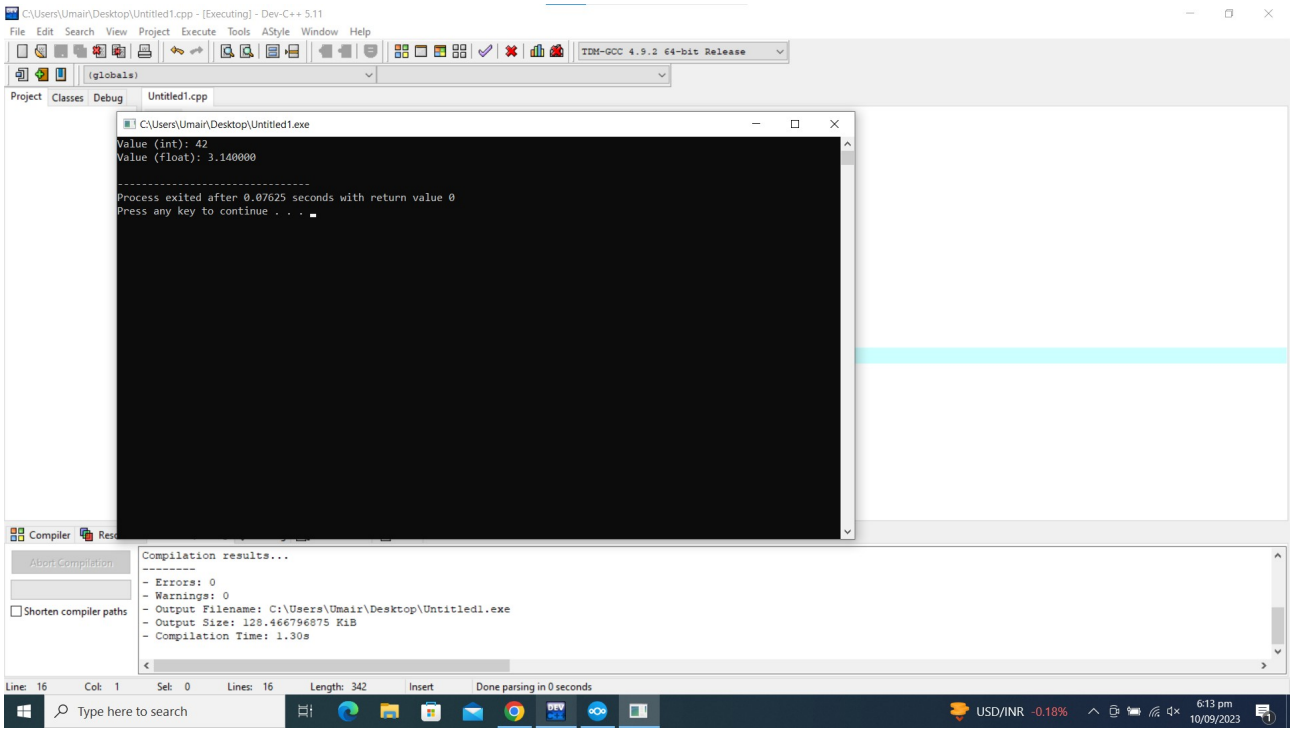
Program no 08:

```
#include <stdio.h>

struct Student {
    char name[20];
    int age;
};

int main() {
    struct Student s = {"Alice", 20};
    struct Student *ptr = &s;
    printf("Name: %s, Age: %d\n", ptr->name, ptr->age);
    return 0;
}
```



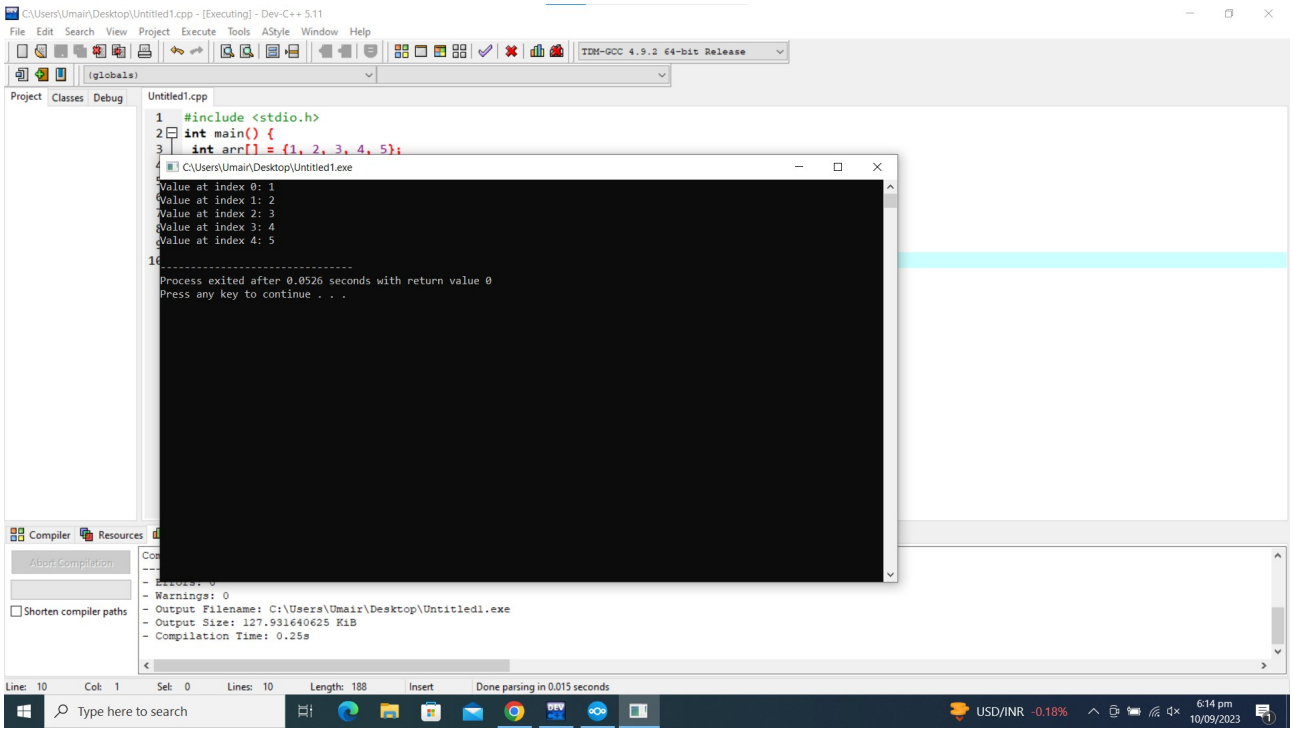
Program no 09:

```
#include <stdio.h>

int main() {
    int arr[] = {1, 2, 3, 4, 5};
    int *ptr = arr;
    for (int i = 0; i < 5; i++) {
        printf("Value at index %d: %d\n", i, *(ptr + i));
    }
    return 0;
}
```



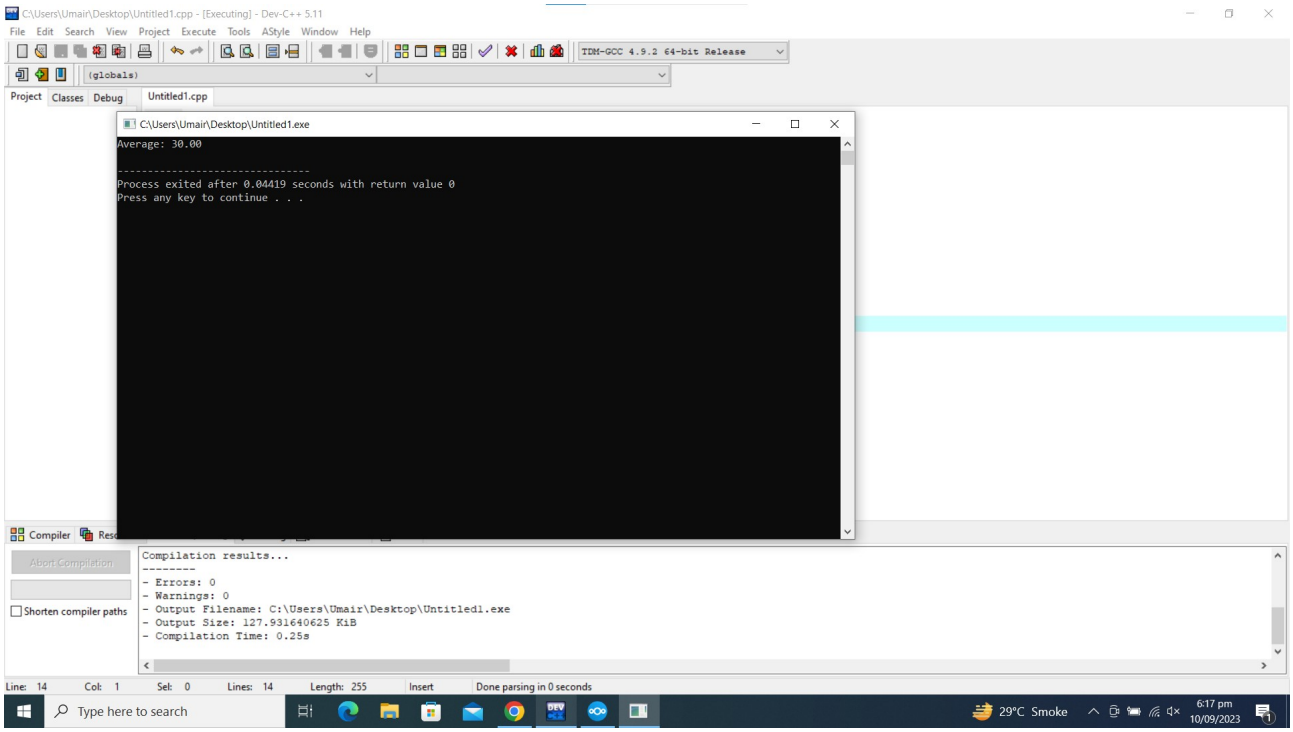
Program no 10:

```
#include <stdio.h>

void printValue(void *ptr, char type) {
    if (type == 'i') {
        printf("Value (int): %d\n", *((int *)ptr));
    } else if (type == 'f') {
        printf("Value (float): %f\n", *((float *)ptr));
    }
}

int main() {
    int iValue = 42;
    float fValue = 3.14;

    printValue(&iValue, 'i');
    printValue(&fValue, 'f');

    return 0;
}
```



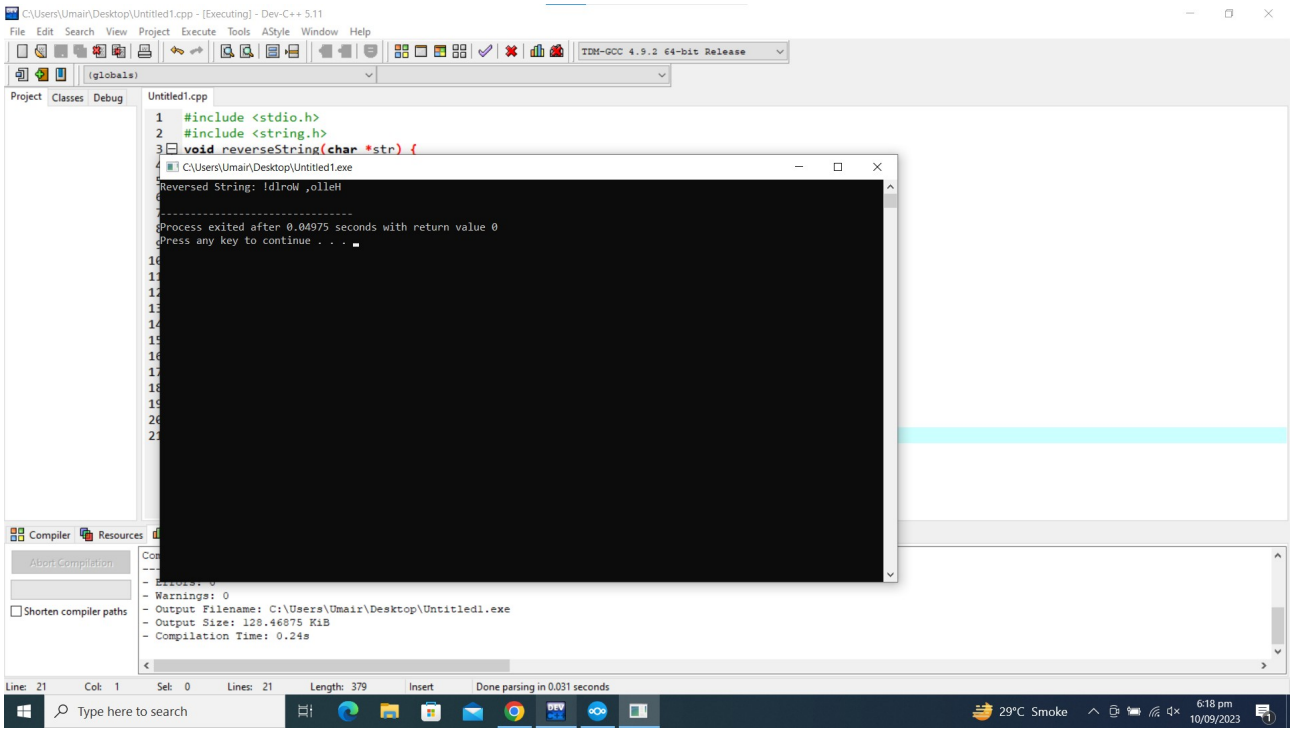
Program no 11:

```
#include <stdio.h>

int main() {
    int num1 = 42;
    int num2 = 50;

    const int *ptr1 = &num1; // Pointer to constant
    int const *ptr2 = &num1; // Also pointer to constant

    int *const ptr3 = &num2; // Constant pointer

    // Modify num1 through ptr3 (error) and num2 through ptr1 (ok)
    *ptr3 = 60; // Error
    *ptr1 = 55; // OK

    printf("num1: %d, num2: %d\n", num1, num2);
    return 0;
}
```



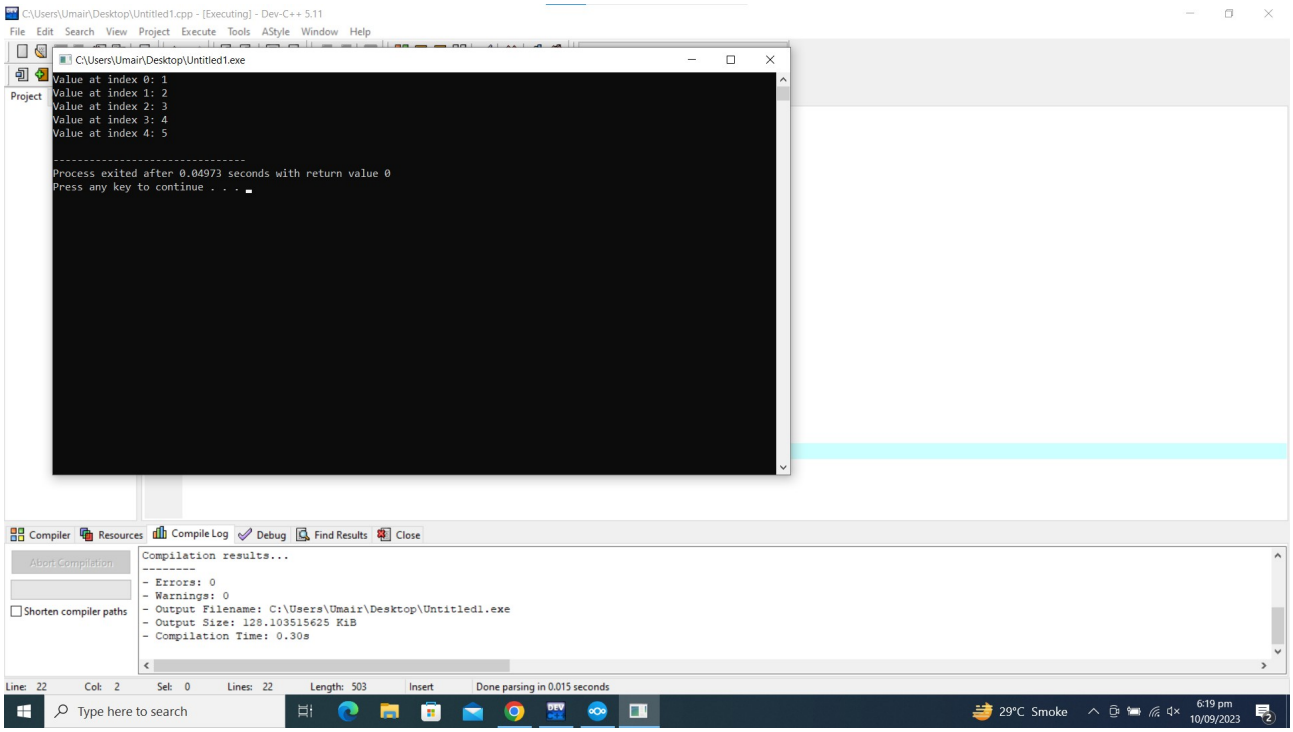
Program no 12:

```
#include <stdio.h>

int main() {
    int arr[] = {10, 20, 30, 40, 50};
    int *ptr = arr;
    int sum = 0;

    for (int i = 0; i < 5; i++) {
        sum += *ptr;
        ptr++;
    }

    double average = (double)sum / 5;
    printf("Average: %.2lf\n", average);

    return 0;
}
```



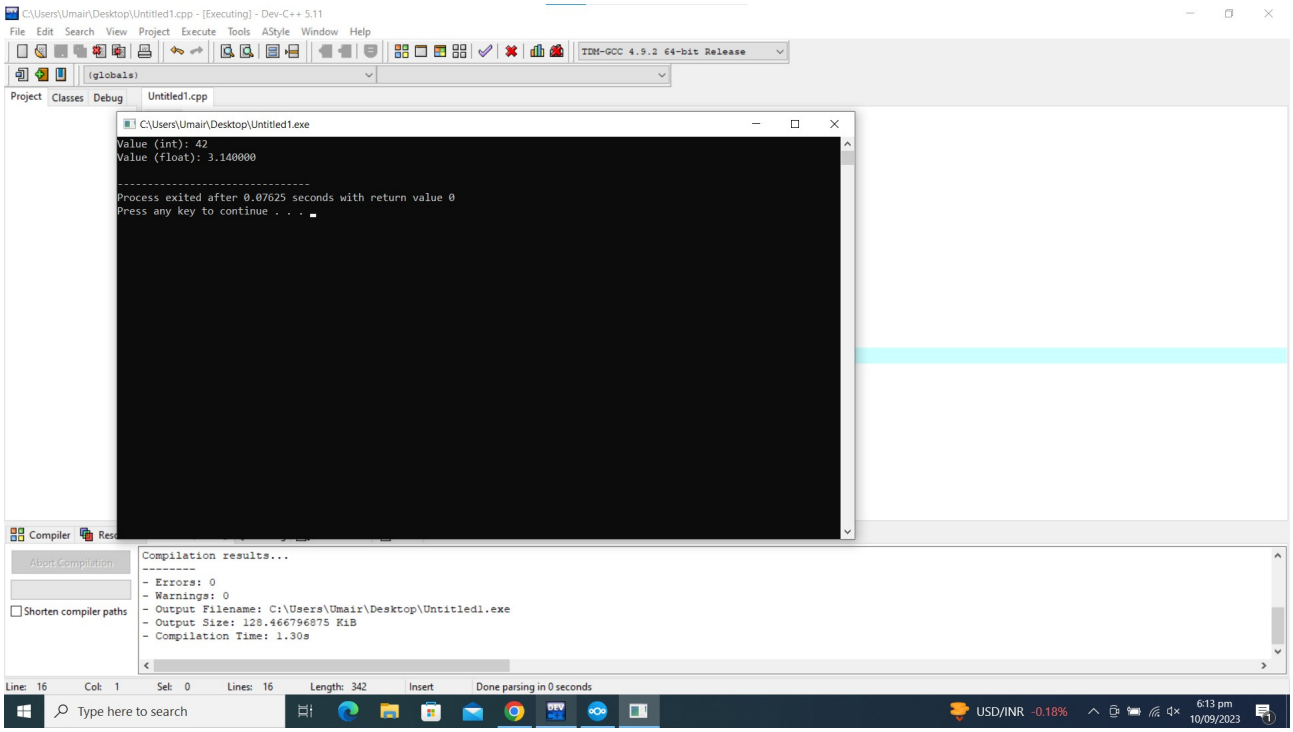
Program no 13:

```
#include <stdio.h>
#include <string.h>

void reverseString(char *str) {
    int len = strlen(str);
    char *start = str;
    char *end = str + len - 1;

    while (start < end) {
        char temp = *start;
        *start = *end;
        *end = temp;
        start++;
        end--;
    }
}

int main() {
    char str[] = "Hello, World!";
    reverseString(str);
    printf("Reversed String: %s\n", str);
    return 0;
}
```



Program no 14:

```
#include <stdio.h>
#include <stdlib.h>

int main() {
    int *arr = (int *)malloc(3 * sizeof(int)); // Initial allocation
    if (arr != NULL) {
        arr[0] = 1;
        arr[1] = 2;
        arr[2] = 3;

        // Resize the array to hold 5 elements
        int *temp = (int *)realloc(arr, 5 * sizeof(int));
        if (temp != NULL) {
            arr = temp;
            arr[3] = 4;
            arr[4] = 5;

            for (int i = 0; i < 5; i++) {
                printf("Value at index %d: %d\n", i, arr[i]);
            }
        }
        free(arr); // Don't forget to free allocated memory
    }
    return 0;
}
```



Program no 15:

```
#include <stdio.h>

void findMinMax(const int *arr, int size, int *min, int *max) {
    if (size <= 0) {
        // Handle the case where the array is empty or invalid.
        return;
    }

    *min = *max = arr[0]; // Initialize min and max with the first element

    for (int i = 1; i < size; i++) {
        if (arr[i] < *min) {
            // Update min if a smaller value is found
            *min = arr[i];
        } else if (arr[i] > *max) {
            // Update max if a larger value is found
            *max = arr[i];
        }
    }
}

int main() {
    int arr[] = {12, 5, 67, 2, 42, 8, 31};
    int size = sizeof(arr) / sizeof(arr[0]);
    int min, max;
```

```
    findMinMax(arr, size, &min, &max);

    printf("Minimum value: %d\n", min);
    printf("Maximum value: %d\n", max);

    return 0;
}
```