COMSATS University Islamabad, Vehari Campus

Department of Computer Science

Class: BCS-SP22-4B | **Submission Deadline: 10 Sep2023**

Subject: Data Structures and Algorithms-Lab | **Instructor: Yasmeen Jana**

Max Marks: 10 | **Reg. No: SP22-BCS-087**

Email: yasmeenjana@cuivehari.edu.pk

You can ask queries related to Lab Activities on the above email.

Activity 1: Creating a Github Account

Create a GitHub Account. Make a repository with the name "**DSA_Lab**". **Mention the link here after the account creation.**

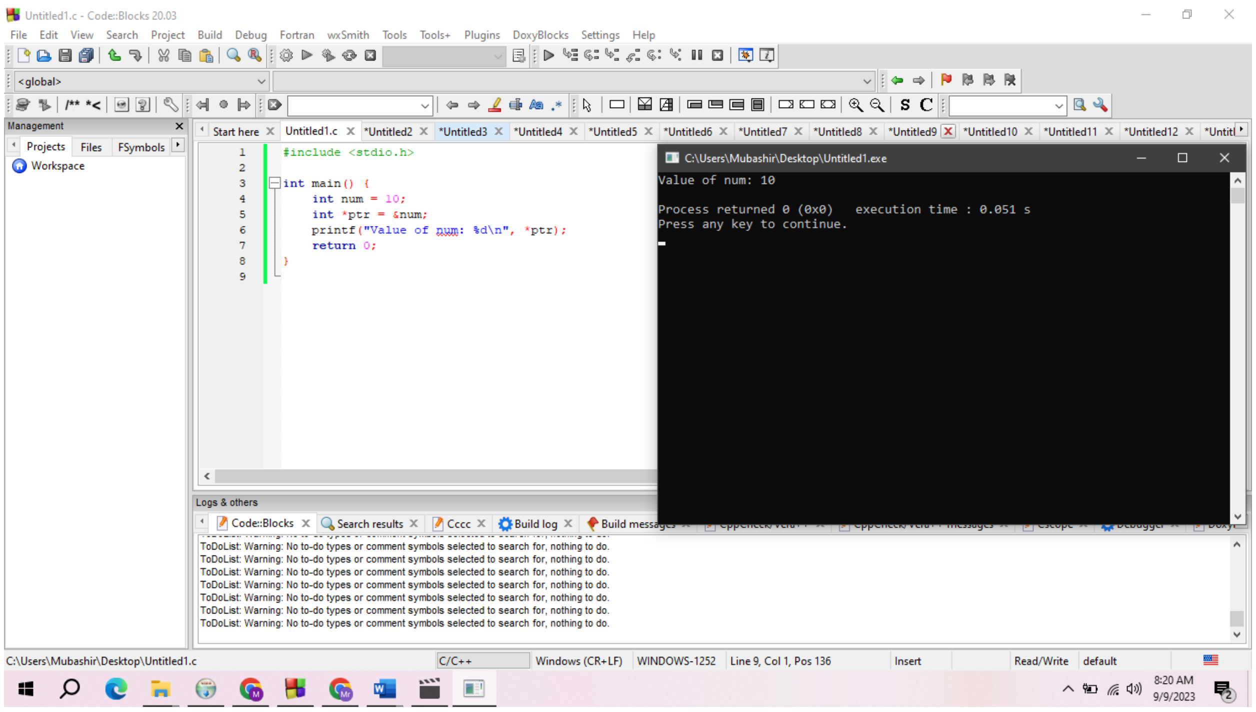
SOLUTION:

LINK: https://github.com/Mubashir-087/DSA_LAB

Activity 2: 15 Programs related to Pointers

Program 01: Pointer Declaration and Initialization:

```
#include <stdio.h>
int main() {
    int num = 10;
    int *ptr = &num;
    printf("Value of num: %d\n", *ptr);
    return 0;
}
```



```
#include <stdio.h>

int main() {
    int num = 10;
    int *ptr = &num;
    printf("Value of num: %d\n", *ptr);
    return 0;
}
```

```
Value of num: 10

Process returned 0 (0x0)   execution time : 0.051 s
Press any key to continue.
```

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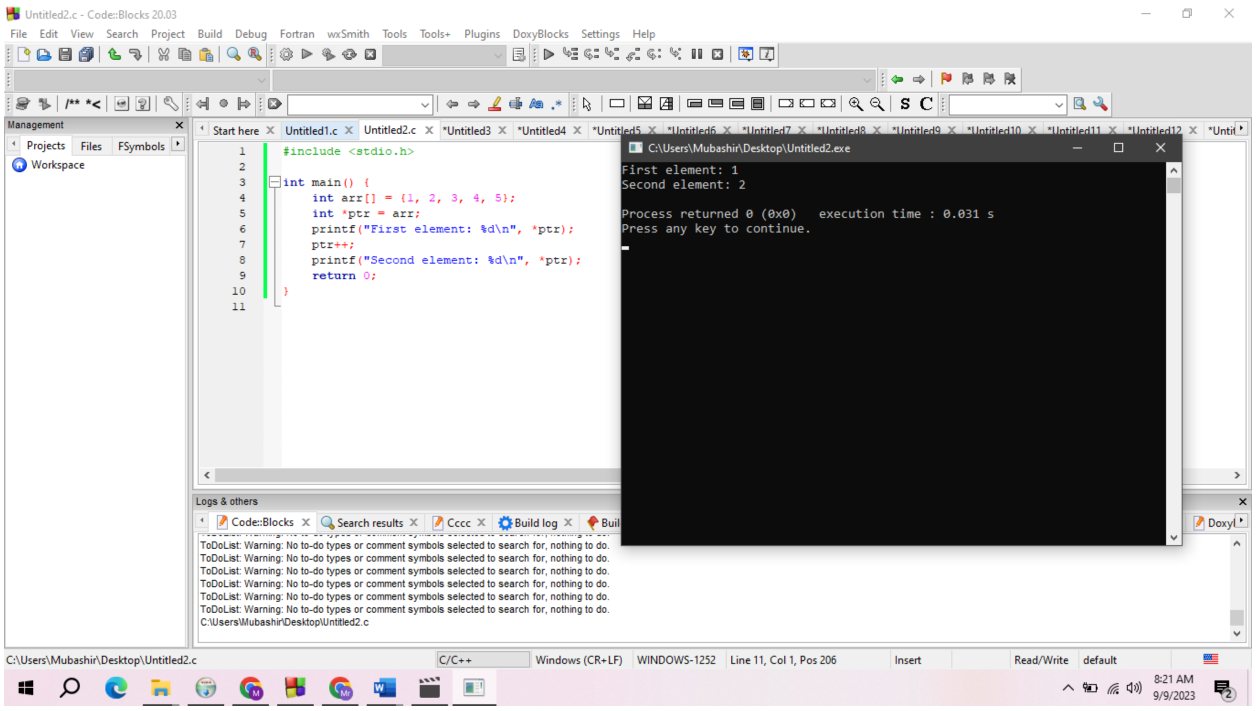
9/9/2023

Program 02: Pointer Arithmetic:

```
#include <stdio.h>
int main() {
   int arr[] = {1, 2, 3, 4, 5};
   int *ptr = arr;
   printf("First element: %d\n", *ptr);
   ptr++;
   printf("Second element: %d\n", *ptr);
   return 0;
}
```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Logs & others
Code::Blocks Search results Cccc Build log

```
#include <stdio.h>

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

```
First element: 1
Second element: 2

Process returned 0 (0x0)   execution time : 0.031 s
Press any key to continue.
```

```
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```

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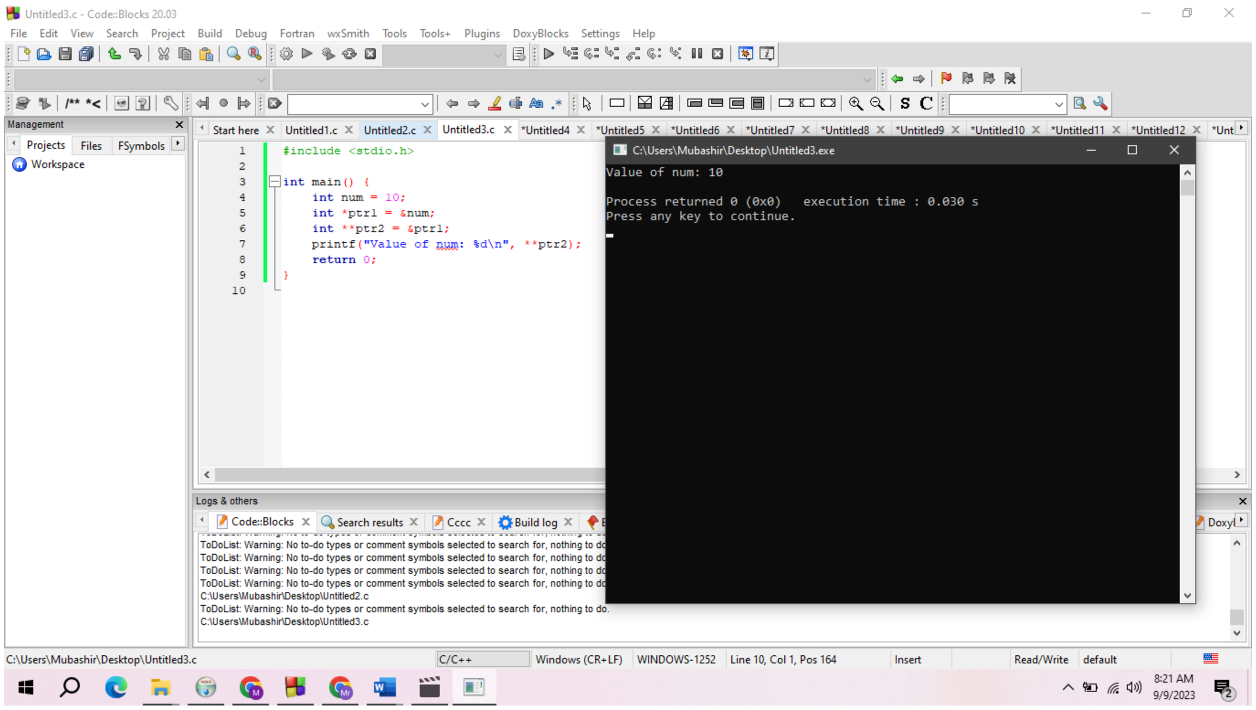
Program 03: Pointer to Pointer:

```
#include <stdio.h>
int main() {
   int num = 10;
   int *ptr1 = &num;
   int **ptr2 = &ptr1;
   printf("Value of num: %d\n", **ptr2);
   return 0;
}
```



```
#include <stdio.h>

int main() {
    int num = 10;
    int *ptr1 = &num;
    int **ptr2 = &ptr1;
    printf("Value of num: %d\n", **ptr2);
    return 0;
}
```

```
Value of num: 10

Process returned 0 (0x0)   execution time : 0.030 s
Press any key to continue.
```

```
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C:\Users\Mubashir\Desktop\Untitled3.c
```
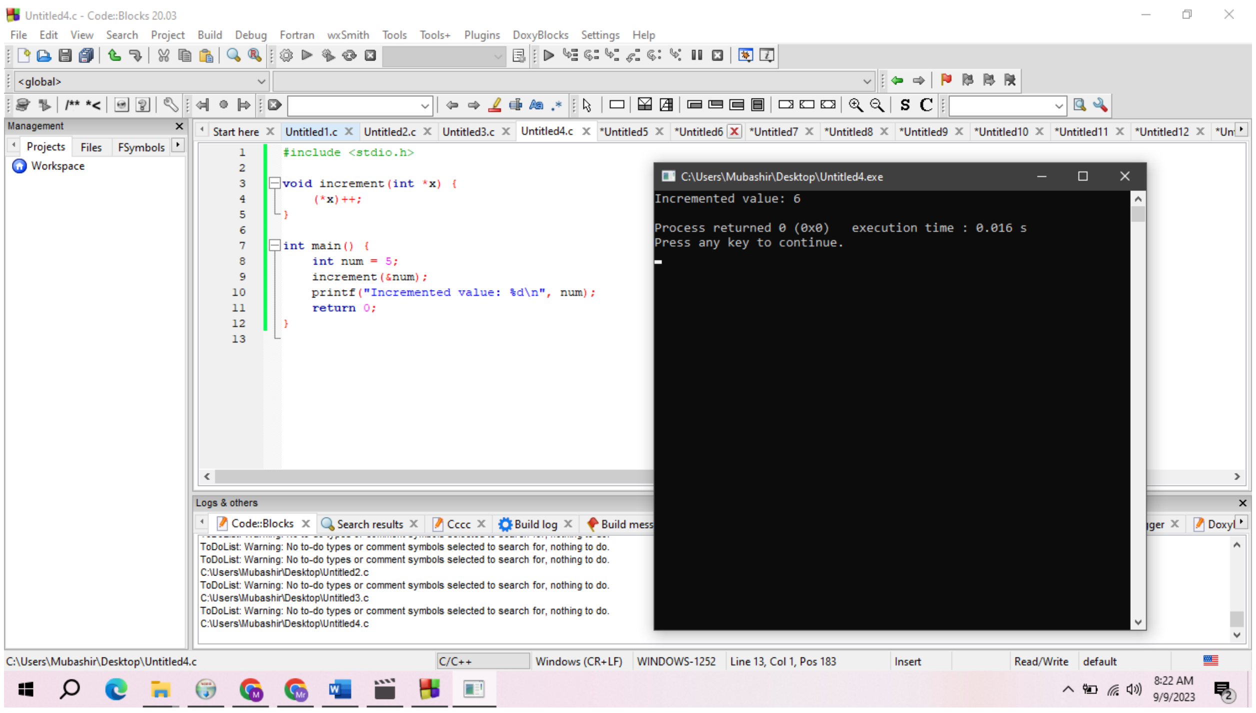

Program 04: Passing Pointers to Functions:

```c
#include <stdio.h>
void increment(int *x) {
   (*x)++;
}
int main() {
   int num = 5;
   increment(&num);
   printf("Incremented value: %d\n", num);
   return 0;
}
```



```c
#include <stdio.h>

void increment(int *x) {
    (*x)++;
}

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

```
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Incremented value: 6

Process returned 0 (0x0)   execution time : 0.016 s
Press any key to continue.
```

```
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```

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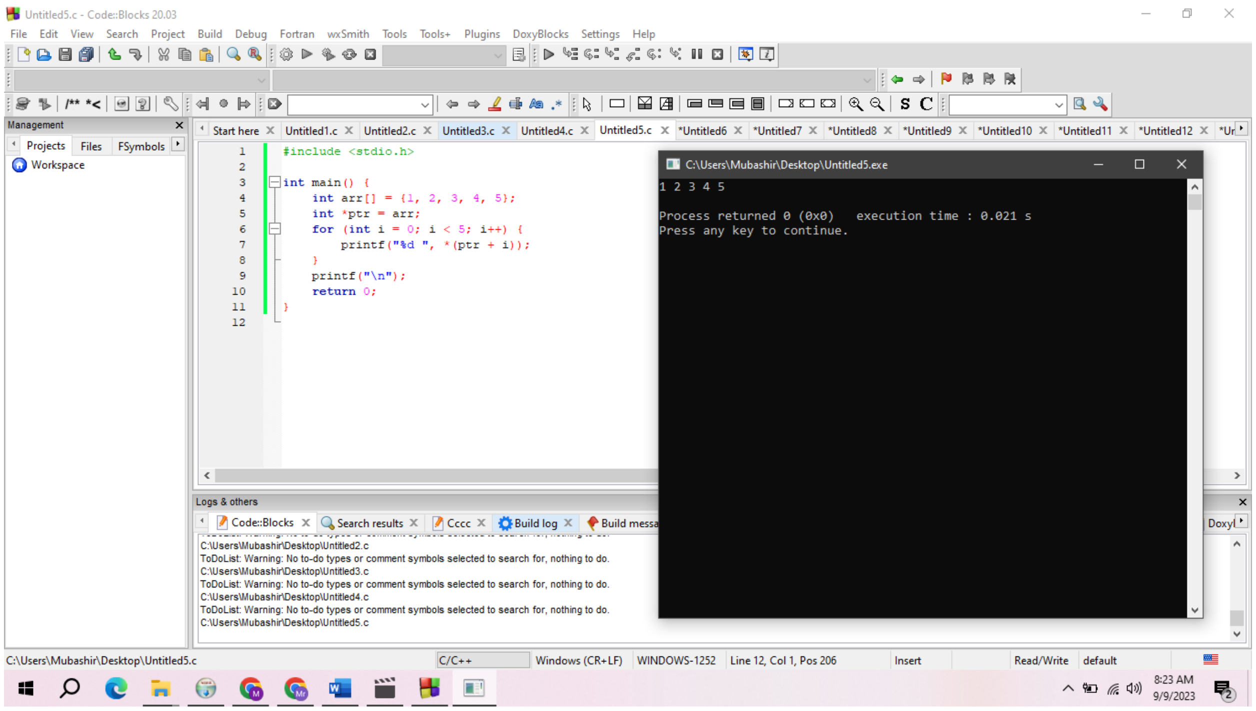
Program 05: Arrays and Pointers:

```c
#include <stdio.h>
int main() {
  int arr[] = {1, 2, 3, 4, 5};
  int *ptr = arr;
  for (int i = 0; i < 5; i++) {
    printf("%d ", *(ptr + i));
  }
  printf("\n");
  return 0;
}
```



```c
#include <stdio.h>

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

```
1 2 3 4 5

Process returned 0 (0x0)   execution time : 0.021 s
Press any key to continue.
```

```
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```

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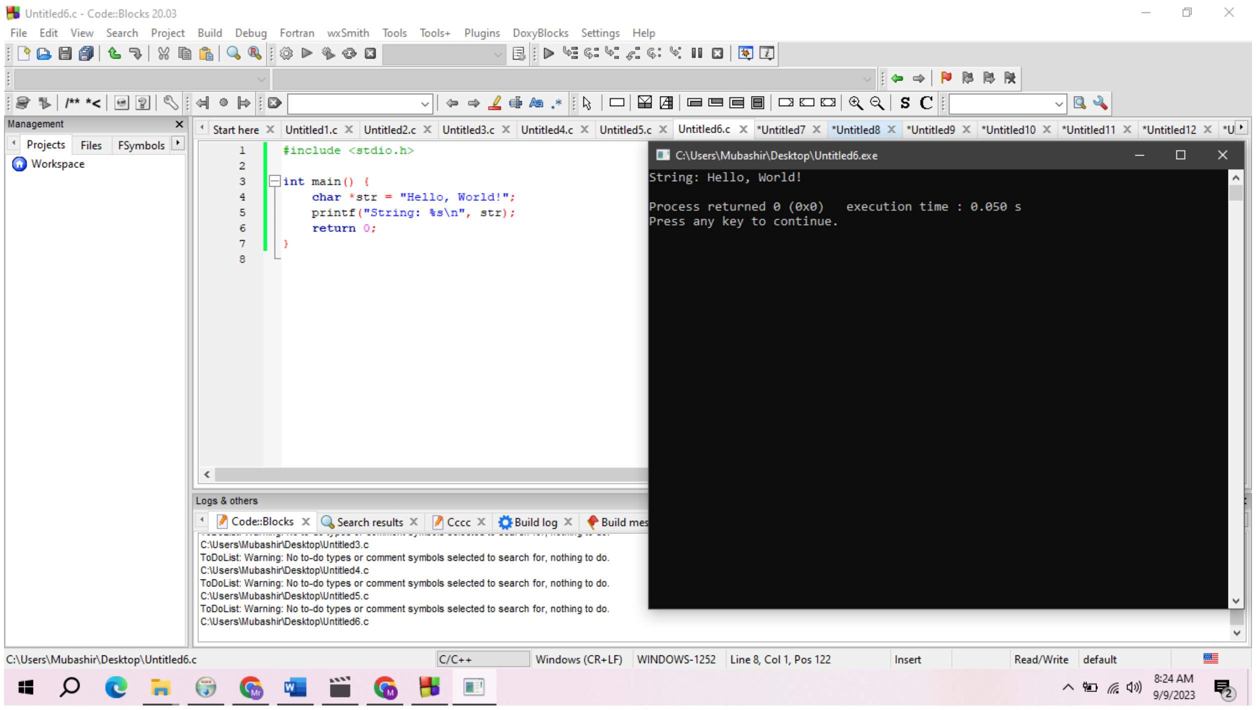
Program 06: Pointer and Strings:

```
#include <stdio.h>


int main() {
    char *str = "Hello, World!";
    printf("String: %s\n", str);
    return 0;
}
```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```
#include <stdio.h>

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

```
String: Hello, World!

Process returned 0 (0x0)   execution time : 0.050 s
Press any key to continue.
```

```
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```
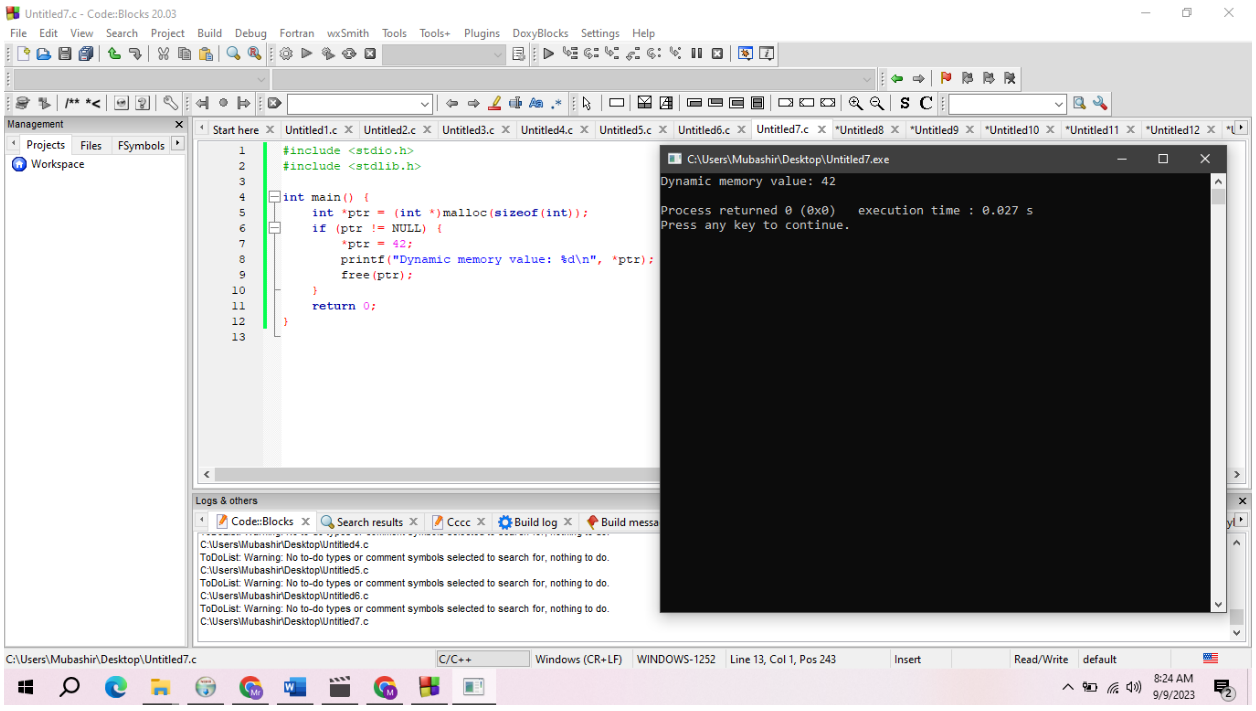

Program 07: Dynamic Memory Allocation (malloc and free):

```c
#include <stdio.h>

#include <stdlib.h>

int main() {

   int *ptr = (int *)malloc(sizeof(int));

   if (ptr != NULL) {

      *ptr = 42;

      printf("Dynamic memory value: %d\n", *ptr);

      free(ptr);

   }

   return 0;

}
```



```
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```

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

int main() {
    int *ptr = (int *)malloc(sizeof(int));
    if (ptr != NULL) {
        *ptr = 42;
        printf("Dynamic memory value: %d\n", *ptr);
        free(ptr);
    }
    return 0;
}
```

```
C:\Users\Mubashir\Desktop\Untitled7.exe
Dynamic memory value: 42

Process returned 0 (0x0)   execution time : 0.027 s
Press any key to continue.
```

```
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```

```
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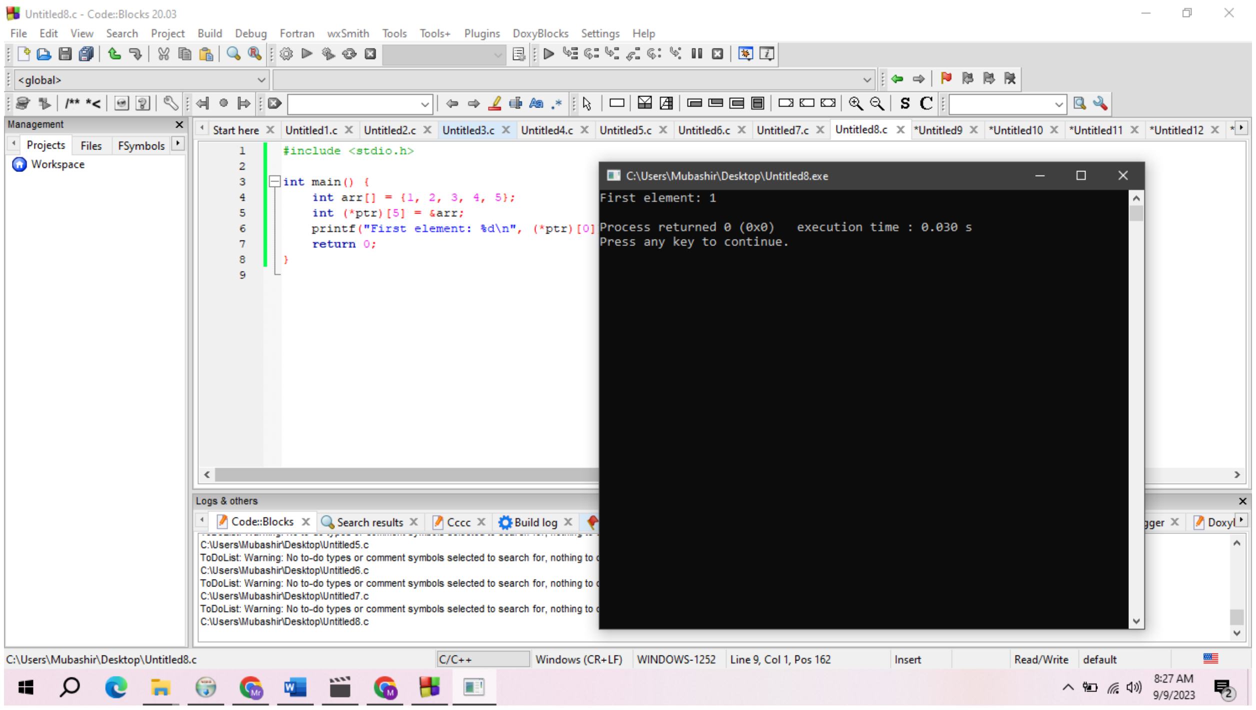
Program 08: Pointer to Array:

```c
#include <stdio.h>


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



```c
#include <stdio.h>

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

```
First element: 1

Process returned 0 (0x0)   execution time : 0.030 s
Press any key to continue.
```

```
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```
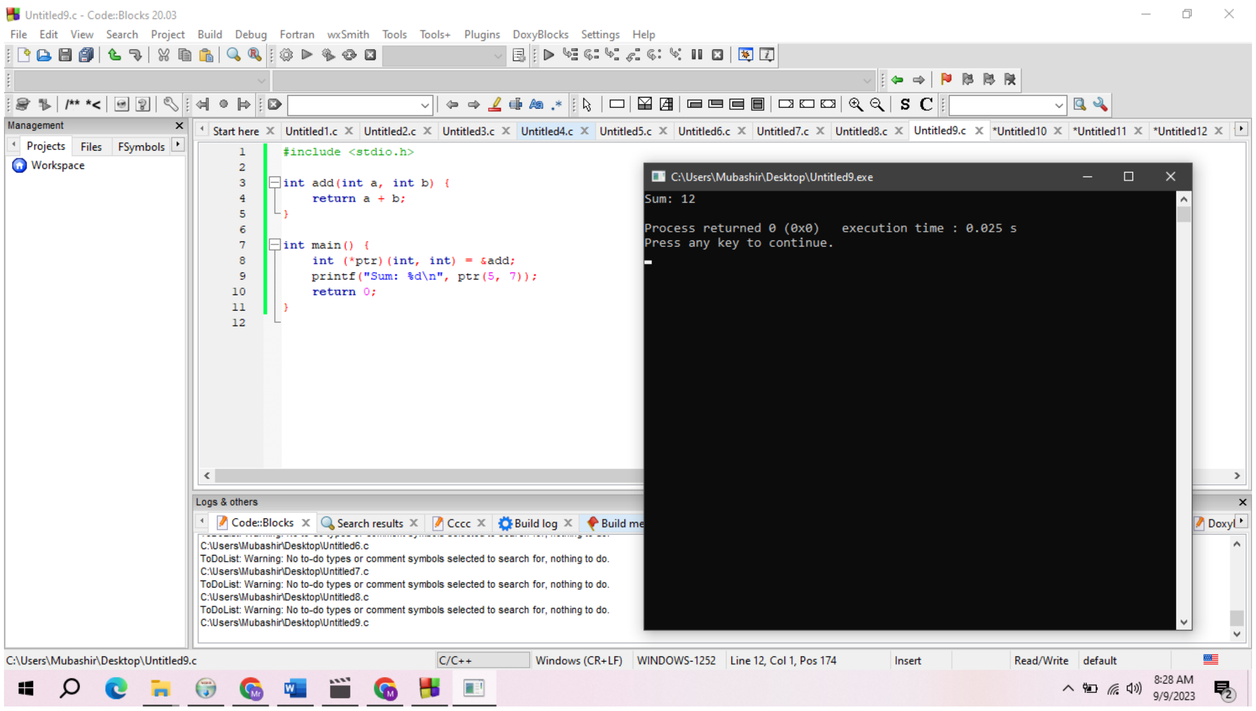

Program 09: Pointer to Function:

```
#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;
}
```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```
#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;
}
```

```
Sum: 12

Process returned 0 (0x0)   execution time : 0.025 s
Press any key to continue.
```

```
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C:\Users\Mubashir\Desktop\Untitled8.c
ToDoList: Warning: No to-do types or comment symbols selected to search for, nothing to do.
C:\Users\Mubashir\Desktop\Untitled9.c
```
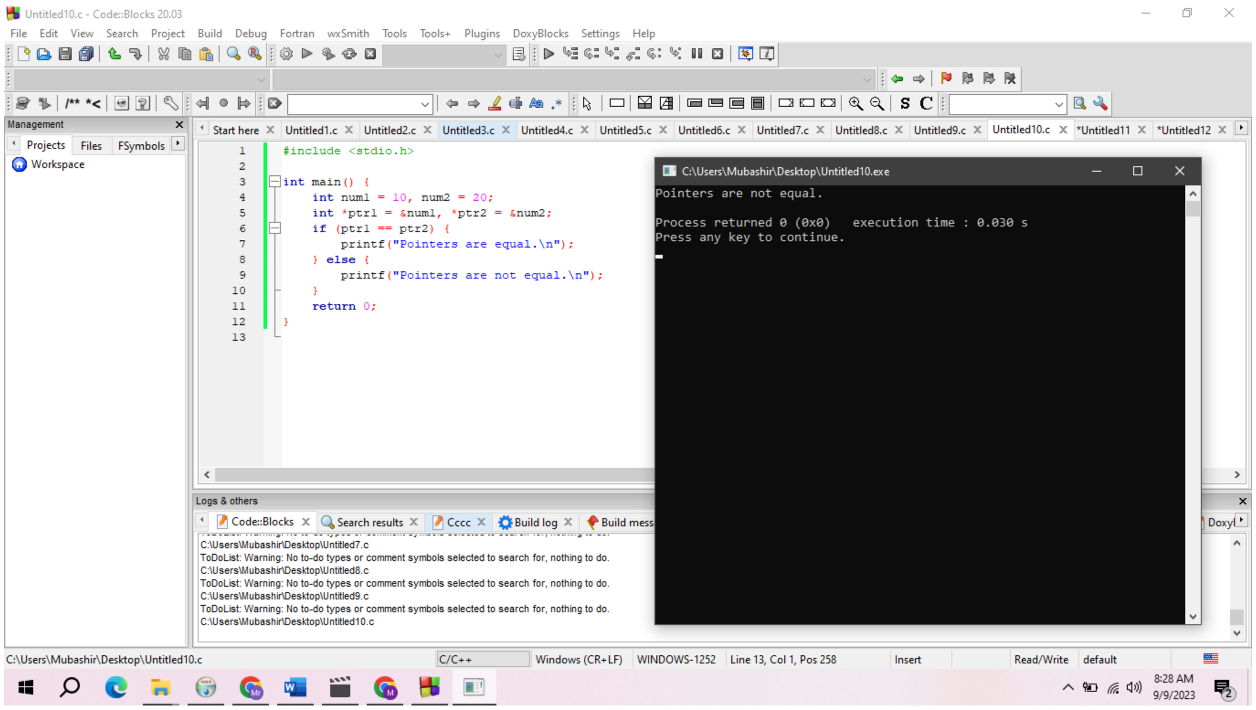

Program 10: Pointer Comparison:

```
#include <stdio.h>

int main() {

   int num1 = 10, num2 = 20;

   int *ptr1 = &num1, *ptr2 = &num2;

   if (ptr1 == ptr2) {

      printf("Pointers are equal.\n");

   } else {

      printf("Pointers are not equal.\n");

   }

   return 0;

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

int main() {
    int num1 = 10, num2 = 20;
    int *ptr1 = &num1, *ptr2 = &num2;
    if (ptr1 == ptr2) {
        printf("Pointers are equal.\n");
    } else {
        printf("Pointers are not equal.\n");
    }
    return 0;
}
```

```
Pointers are not equal.

Process returned 0 (0x0)   execution time : 0.030 s
Press any key to continue.
```

```
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C:\Users\Mubashir\Desktop\Untitled9.c
ToDoList: Warning: No to-do types or comment symbols selected to search for, nothing to do.
C:\Users\Mubashir\Desktop\Untitled10.c
```
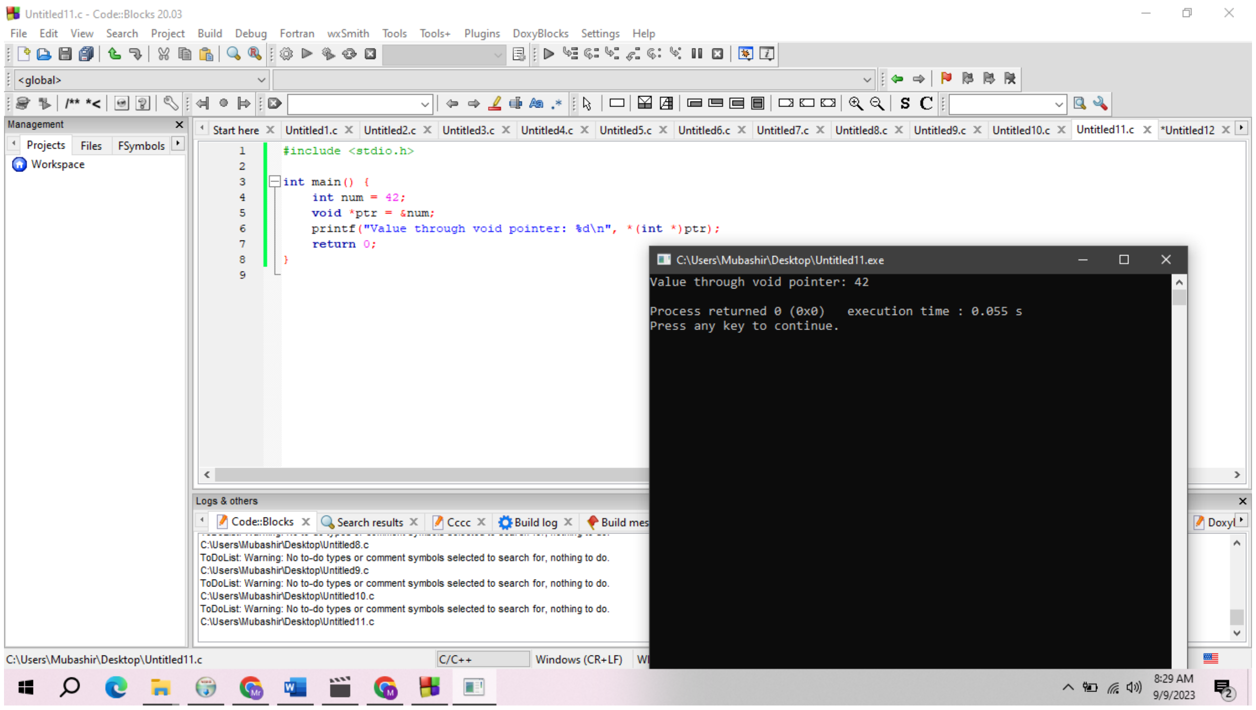

C:\Users\Mubashir\Desktop\Untitled10.c C/C++ Windows (CR+LF) WINDOWS-1252 Line 13, Col 1, Pos 258 Insert Read/Write default

Program 11: Void Pointer (Generic Pointer):

```
#include <stdio.h>


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



```
#include <stdio.h>

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

```
Value through void pointer: 42

Process returned 0 (0x0)   execution time : 0.055 s
Press any key to continue.
```

```
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ToDoList: Warning: No to-do types or comment symbols selected to search for, nothing to do.
C:\Users\Mubashir\Desktop\Untitled11.c
```
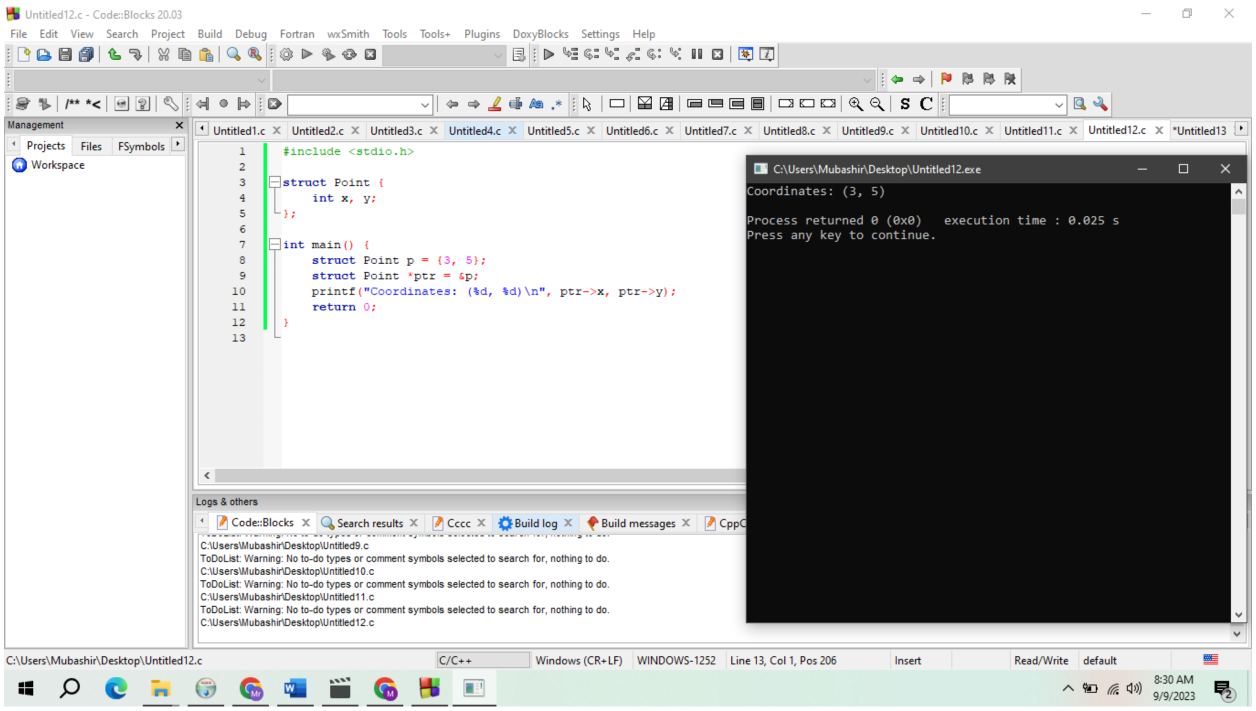

Program 12: Pointer to Structures:

```
#include <stdio.h>


struct Point {
    int x, y;
};


int main() {
    struct Point p = {3, 5};
    struct Point *ptr = &p;
    printf("Coordinates: (%d, %d)\n", ptr->x, ptr->y);
    return 0;
}
```



```
#include <stdio.h>

struct Point {
    int x, y;
};

int main() {
    struct Point p = {3, 5};
    struct Point *ptr = &p;
    printf("Coordinates: (%d, %d)\n", ptr->x, ptr->y);
    return 0;
}
```

```
C:\Users\Mubashir\Desktop\Untitled12.exe
Coordinates: (3, 5)

Process returned 0 (0x0)   execution time : 0.025 s
Press any key to continue.
```

```
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ToDoList: Warning: No to-do types or comment symbols selected to search for, nothing to do.
C:\Users\Mubashir\Desktop\Untitled12.c
```
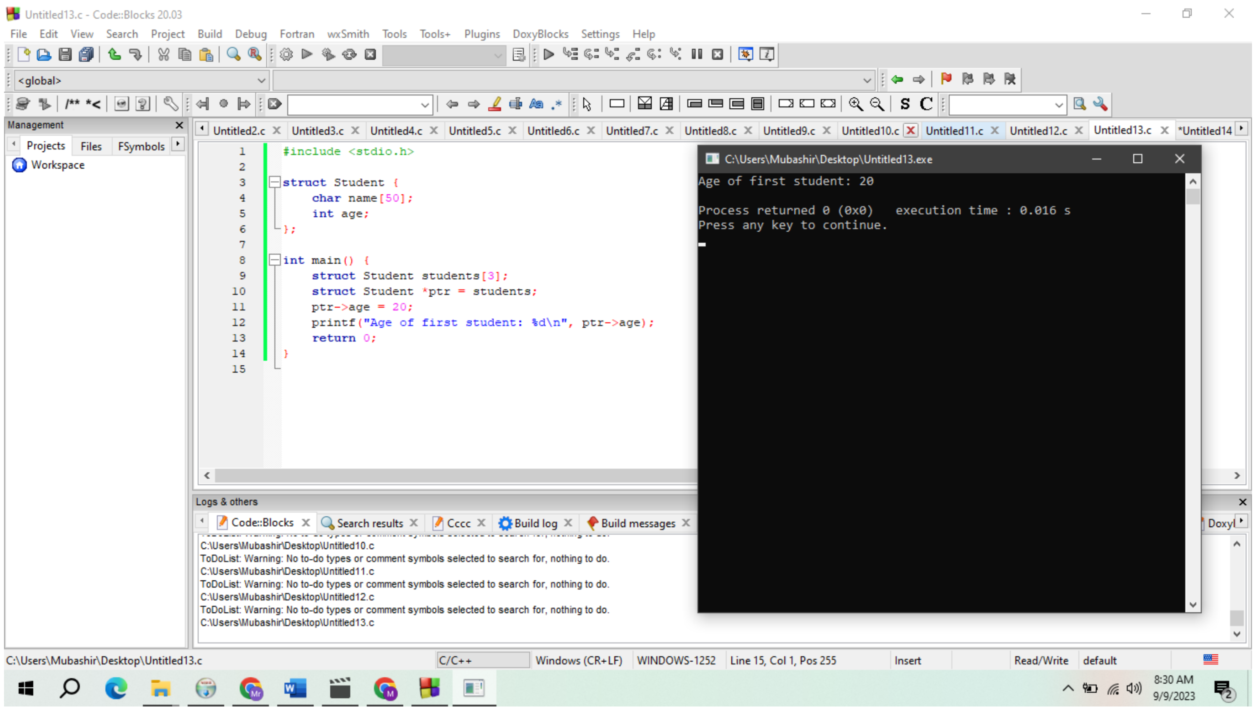

Program 13: Pointer to Array of Structures:

```
#include <stdio.h>
struct Student {
    char name[50];
    int age;
};
int main() {
    struct Student students[3];
    struct Student *ptr = students;
    ptr->age = 20;
    printf("Age of first student: %d\n", ptr->age);
    return 0;
}
```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Logs & others
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```
#include <stdio.h>

struct Student {
    char name[50];
    int age;
};

int main() {
    struct Student students[3];
    struct Student *ptr = students;
    ptr->age = 20;
    printf("Age of first student: %d\n", ptr->age);
    return 0;
}
```

```
Age of first student: 20

Process returned 0 (0x0)   execution time : 0.016 s
Press any key to continue.
```

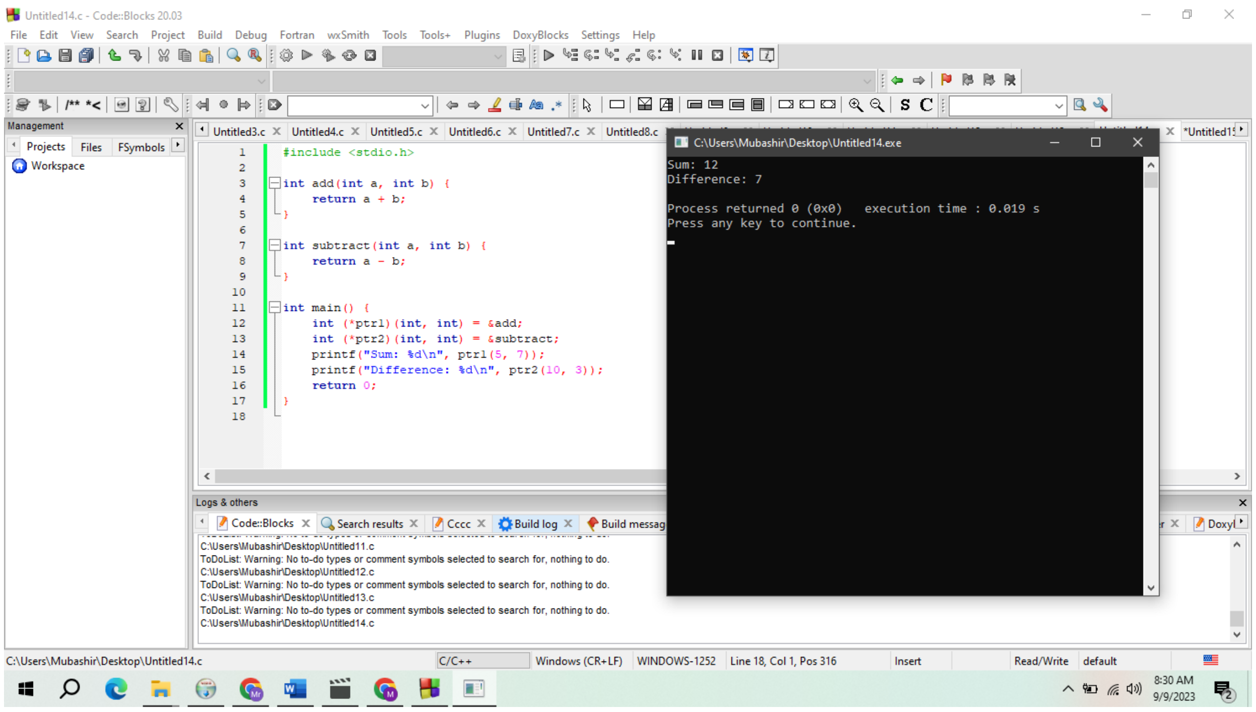
```
C:\Users\Mubashir\Desktop\Untitled10.c
ToDoList: Warning: No to-do types or comment symbols selected to search for, nothing to do.
C:\Users\Mubashir\Desktop\Untitled11.c
ToDoList: Warning: No to-do types or comment symbols selected to search for, nothing to do.
C:\Users\Mubashir\Desktop\Untitled12.c
ToDoList: Warning: No to-do types or comment symbols selected to search for, nothing to do.
C:\Users\Mubashir\Desktop\Untitled13.c
```

C:\Users\Mubashir\Desktop\Untitled13.c | C/C++ | Windows (CR+LF) | WINDOWS-1252 | Line 15, Col 1, Pos 255 | Insert | Read/Write | default

8:30 AM 9/9/2023

Program 14: Pointer to Function Pointer:

```
#include <stdio.h>

int add(int a, int b) {

    return a + b;

}

int subtract(int a, int b) {

    return a - b;

}

int main() {

    int (*ptr1)(int, int) = &add;

    int (*ptr2)(int, int) = &subtract;

    printf("Sum: %d\n", ptr1(5, 7));

    printf("Difference: %d\n", ptr2(10, 3));

    return 0;

}
```



```
#include <stdio.h>

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

int subtract(int a, int b) {
    return a - b;
}

int main() {
    int (*ptr1)(int, int) = &add;
    int (*ptr2)(int, int) = &subtract;
    printf("Sum: %d\n", ptr1(5, 7));
    printf("Difference: %d\n", ptr2(10, 3));
    return 0;
}
```

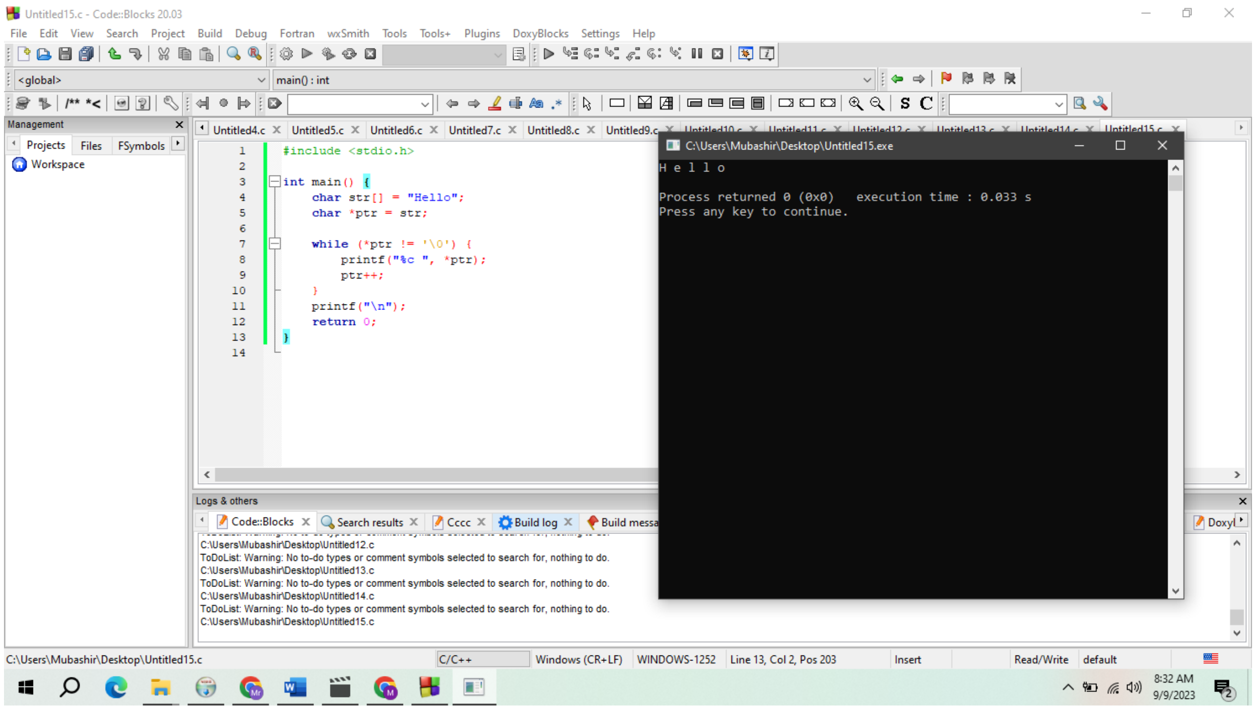
```
Sum: 12
Difference: 7

Process returned 0 (0x0)   execution time : 0.019 s
Press any key to continue.
```

```
C:\Users\Mubashir\Desktop\Untitled11.c
ToDoList: Warning: No to-do types or comment symbols selected to search for, nothing to do.
C:\Users\Mubashir\Desktop\Untitled12.c
ToDoList: Warning: No to-do types or comment symbols selected to search for, nothing to do.
C:\Users\Mubashir\Desktop\Untitled13.c
ToDoList: Warning: No to-do types or comment symbols selected to search for, nothing to do.
C:\Users\Mubashir\Desktop\Untitled14.c
```

Untitled14.c - Code::Blocks 20.03
File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoxyBlocks Settings Help
C:\Users\Mubashir\Desktop\Untitled14.exe
Logs & others
C:\Users\Mubashir\Desktop\Untitled14.c
Windows (CR+LF) WINDOWS-1252 Line 18, Col 1, Pos 316 Insert Read/Write default
8:30 AM 9/9/2023

Program 15: Pointer Arithmetic with Character Strings:

```c
#include <stdio.h>

int main() {

  char str[] = "Hello";

  char *ptr = str;

  while (*ptr != '\0') {

    printf("%c ", *ptr);

    ptr++;

  }

  printf("\n");

  return 0;

}
```



```c
#include <stdio.h>

int main() {
    char str[] = "Hello";
    char *ptr = str;

    while (*ptr != '\0') {
        printf("%c ", *ptr);
        ptr++;
    }
    printf("\n");
    return 0;
}
```

```
H e l l o

Process returned 0 (0x0)   execution time : 0.033 s
Press any key to continue.
```

```
C:\Users\Mubashir\Desktop\Untitled12.c
ToDoList: Warning: No to-do types or comment symbols selected to search for, nothing to do.
C:\Users\Mubashir\Desktop\Untitled13.c
ToDoList: Warning: No to-do types or comment symbols selected to search for, nothing to do.
C:\Users\Mubashir\Desktop\Untitled14.c
ToDoList: Warning: No to-do types or comment symbols selected to search for, nothing to do.
C:\Users\Mubashir\Desktop\Untitled15.c
```

Untitled15.c - Code::Blocks 20.03
File Edit View Search Project Build Debug Fortran wxSmith Tools Tools+ Plugins DoxyBlocks Settings Help
<global>
main() : int
Management
Projects Files FSymbols
Workspace
C:\Users\Mubashir\Desktop\Untitled15.exe
Logs & others
Code::Blocks Search results Cccc Build log Build messa
C:\Users\Mubashir\Desktop\Untitled15.c C/C++ Windows (CR+LF) WINDOWS-1252 Line 13, Col 2, Pos 203 Insert Read/Write default
8:32 AM 9/9/2023