

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: vasmeenjana@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 = #
           printf("Value of num: %d\n", *ptr);
           return 0;
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                                                                                                            int main() {
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int *ptr = #
printf("Value of num: %d\n", *ptr);
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```

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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   int arr[] = {1, 2, 3, 4, 5};
   int *ptr = arr;
   printf("First element: %d\n", *ptr);
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Program 03: Pointer to Pointer:

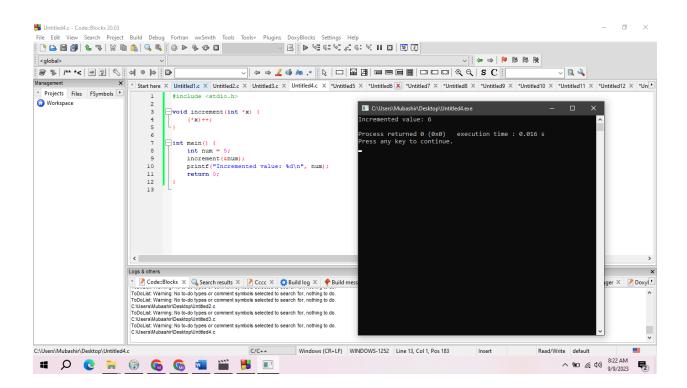
```
#include <stdio.h>
int main() {
         int num = 10;
         int *ptr1 = #
         int **ptr2 = &ptr1;
        printf("Value of num: %d\n", **ptr2);
         return 0;
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                                                                                         int main() {
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  int "ptr2 = dptrl;
  printf("Value of num: %d\n", "*ptr2);
}
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    # A C = 3 G + 6 = 1
```

Program 04: Passing Pointers to Functions:

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



Program 05: Arrays and Pointers:

```
#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;
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    int arr[] = {1, 2, 3, 4, 5};
    int *ptr = arr;
    for (int i = 0; i < 5; i++) {
        printf("%d ", *(ptr + i));
    }
}</pre>
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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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    char *str = "Hello, World!";
    printf("String: %s\n", str);
    return 0;
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```

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

```
#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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#include <stdlib.h>
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                                                                                                                                                ☐ int main() {
    int *ptr = (int *)malloc(sizeof(int));
    if (ptr != NULL) {
        *ptr = 42;
        printf("Dynamic memory value: %d\n", *ptr);
}
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```

Program 08: Pointer to Array:

D C = G & W W B

#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;
}
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int ('ptr)[5] = &arr;
printf("First element: %d\n", (*ptr)[0]
return 0;
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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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                                        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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```

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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int numl = 10, num2 = 20;
int *ptrl = &num1, *ptr2 = &num2;
if (ptrl == ptr2) {
    printf("Pointers are equal.\n");
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Program 11: Void Pointer (Generic Pointer):

#include <stdio.h>

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```
int main() {
             int num = 42;
            void *ptr = #
             printf("Value through void pointer: %d\n", *(int *)ptr);
            return 0;
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                                                                                                                                            int num = 42;
                                                                                                                                             void *ptr = #
printf("Value through void pointer: %d\n", *(int *)ptr);
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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;
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☐int main() (
    struct Point p = {3, 5};
    struct Point *ptr = 4p;
    printf("Coordinates: (%d, %d)\n", ptr->x, ptr->y);
    return 0;
...

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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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                                                                                           #include <stdio.h>
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                                                                                        struct Student (
                                                                                                      char name[50];
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                                                                                                     int age;
                                                                                       int main() {
    struct Student students[3];
    struct Student "ptr = students;
    ptr->age = 20;
    printf("Age of first student: %d\n", ptr->age);
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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;
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return a + b;
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                                                                                            int subtract(int a, int b) {
return a - b;
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                                                                                             int main() {
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int ('ptr2)(int, int) = &subtract;
printf("Sum: &d\n", ptrl(5, 7));
printf("Difference: &d\n", ptr2(10, 3));
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Program 15: Pointer Arithmetic with Character Strings:

```
#include <stdio.h>
int main() {
           char str[] = "Hello";
            char *ptr = str;
          while (*ptr!='\0') {
                       printf("%c", *ptr);
                       ptr++;
           }
           printf("\n");
           return 0;
}
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    char *ptr = str;
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                                                                                                                                 while (*ptr != '\0') {
   printf("%c ", *ptr);
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