Data Structures

(CSL 209)

Lab Workbook

Faculty name:

Student name:

Roll No.:

Semester:

Group:

Department of Computer Science and Engineering

The NorthCap University, Gurugram- 122017, India

Session 2024-25

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2	Write a program that initializes an array with ten random integers and then prints four lines of output, containing: • Every element at an even index • Every odd element • All elements in reverse order Only the first and last element				CO2	
3	Write a program to read numbers in an integer array of size 5 and display the following: • Sum of all the elements • Sum of alternate elements in the array • Second highest element in the array				CO2	

4	Write a program to create a singly linked list of n nodes and perform: • Insertion o At the beginning o At the end o At a specific location • Deletion o At the beginning o At the end At a specific location				CO2	
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	list of n nodes and perform: • Insertion o At the beginning o At the end o At a specific location • Deletion o At the beginning o At the end At a specific location					
7	Write a program to implement stack using arrays and linked lists.				CO3	
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EXPERIMENT NO. 1

Student Name and Roll Number:
Semester /Section:
Date:
Faculty Signature:
Marks:

Objective(s):

To familiarize the students with linear data structure array and its basic operations

Outcome:

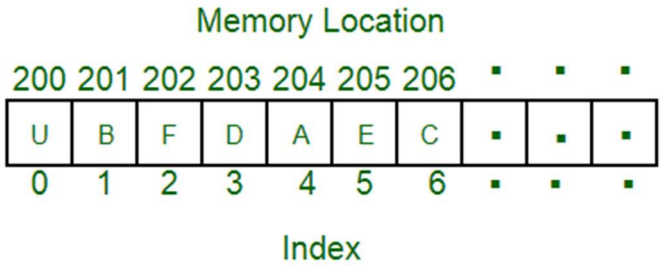
The students will be able to implement and use arrays for solving various problems

Problem Statement:

Create an array of integer with size n. Return the difference between the largest and the smallest value inside that array.

Background Study:

An Array is a data structure consisting of a collection of elements (values or variables), each identified by at least one array index or key. An array is stored such that the position of each element can be computed from its index tuple by a mathematical formula. The simplest type of data structure is a linear array, also called one-dimensional array.



Algorithm (Student Work Area):

1. Define a function to return biggest element of array.
2. Define a function to return smallest element of array.
3. Input the array.
4. Call function 1,2 to find the biggest and smallest elements.
5. Calculate the difference.
6. Print output.

Code (Student Work Area):

```
import java.util.Scanner;

public class ArrayDifference {

   // Method to find the maximum value in an array
   public static int findMax(int[] arr) {
      int max = arr[0];
      for (int i = 1; i < arr.length; i++) {
         if (arr[i] > max) {
            max = arr[i];
         }
      }
      return max;
   }

   // Method to find the minimum value in an array
   public static int findMin(int[] arr) {
      int min = arr[0];
      for (int i = 1; i < arr.length; i++) {
         if (arr[i] < min) {
            min = arr[i];
         }
      }
      return min;
   }

   // Main method
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);

      // Input size of the array
```

```
        System.out.print("Enter the size of the array: ");
        int n = scanner.nextInt();

        // Declare and initialize the array
        int[] arr = new int[n];

        // Input elements of the array
        System.out.println("Enter " + n + " elements:");
        for (int i = 0; i < n; i++) {
            arr[i] = scanner.nextInt();
        }

        // Find maximum and minimum values
        int max = findMax(arr);
        int min = findMin(arr);

        // Calculate and print the difference
        int difference = max - min;
        System.out.println("The difference between the largest and smallest values is: " + difference);
    }
}
```

Question Bank:

1. What is Data Structure?

   Structure and organisation of data in memory with related operation.

2. Why Array is called as Linear Data Structure?

   Because they are allocated contiguous memory locations.

3. What type of Indexing is used in Java?

   Multikey indexing. First element of array is indexed as 0 and last as ‘size-1’.

4. How to find the missing number in integer array of 1 to 100?

   Traverse through the array from 0 to size-1 and collect missing numbers.

5. How to find the second-highest value in a numeric array.

   Find the maximum value of array. Eliminate it and find the maxima of remaining elements as 'second highest' value.

6. How to swap the first and last elements of an array.

   temp= array[0];

   array[0]=array[size-1];

   arrary[size-1]=temp;

7. Write a Java Program to check if see if Array contains a specific value. (Linear Search)

   int elem=4;

   int array[10]={1,3,5,6,7,3,5,4,9,10};

   for (int i=0; i<10;i++){

   if(array[i]==elem)

   {

   System.out.println("Element found at position="+(i+1));

   break;

   }

   }

EXPERIMENT NO. 2

Student Name and Roll Number:
Semester /Section:
Date:
Faculty Signature:
Marks:

Objective(s):

To familiarize the students with linear data structure array and its basic operations

Outcome:

The students will be able to implement and use arrays for solving various problems

Problem Statement:

Write a program that initializes an array with ten random integers and then prints four lines of output, containing:

- Every element at an even index
- Every odd element
- All elements in reverse order
- Only the first and last element

Background Study:

An Array is a data structure consisting of a collection of elements (values or variables), each identified by at least one array index or key. An array is stored such that the position of each element can be computed from its index tuple by a mathematical formula. The simplest type of data structure is a linear array, also called one-dimensional array.