# Practical no: 1

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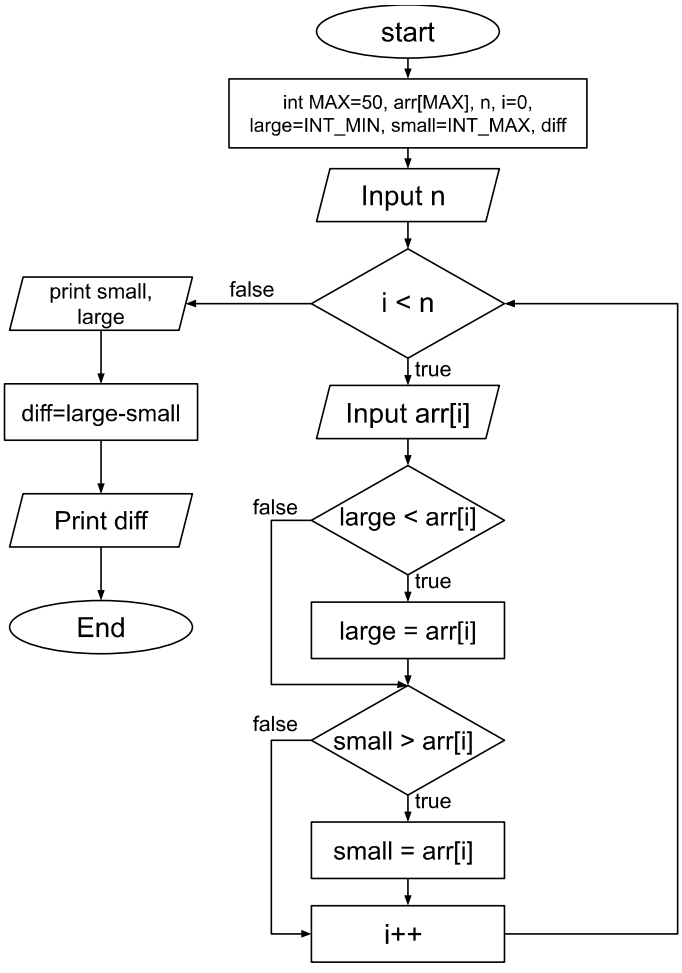
**Objective**: Write a program in C for following sub problems:-

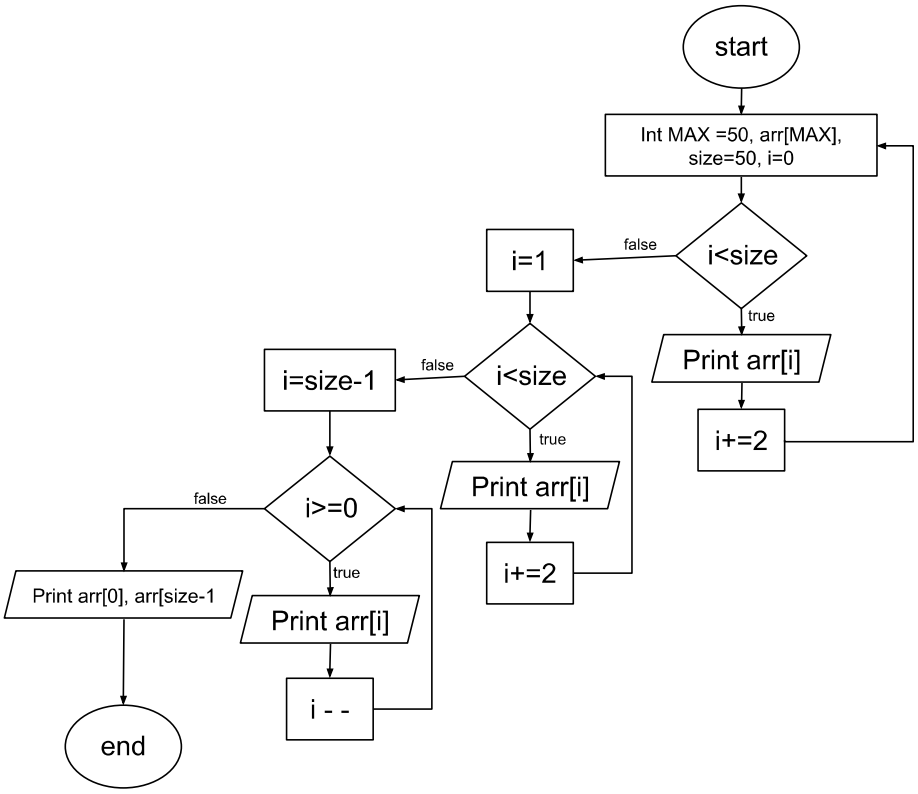
1. Create an array of integers of size n and return the difference between the largest and smallest value in that array.
2. Initialize an array with 10 random integers and then print 4 lines of output containing every element at-
    a. Even index
    b. Odd index
    c. All element in reverse order
    d. Only first and last element
3. Consider an integer array of size 5 and display following result
    a. Sum of all element
    b. Sum of all alternate elements
    c. Second highest element

**Algorithm**: Following are the flowchart/pseudocodes of the programs

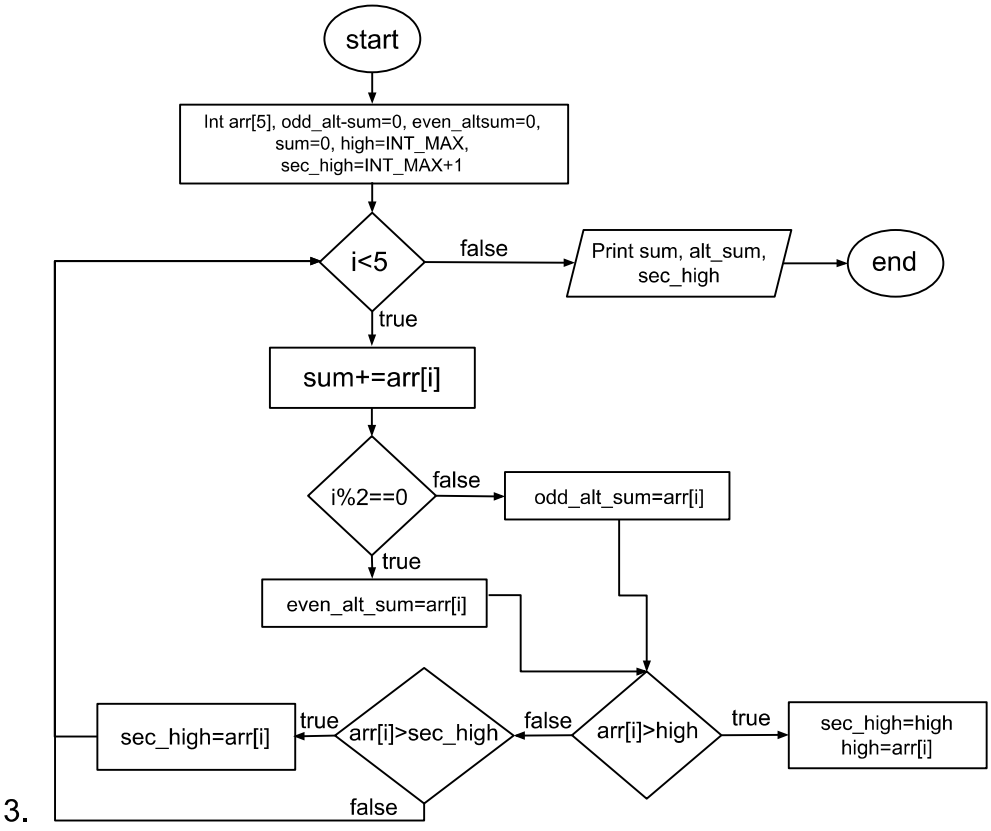
1.



2.


start
Int MAX =50, arr[MAX], size=50, i=0
i<size
false
true
i=1
Print arr[i]
i+=2
i<size
false
true
i=size-1
Print arr[i]
i+=2
i>=0
false
true
Print arr[0], arr[size-1
Print arr[i]
i - -
end

3.


start
Int arr[5], odd_alt-sum=0, even_altsum=0, sum=0, high=INT_MAX, sec_high=INT_MAX+1
i<5
false
Print sum, alt_sum, sec_high
end
true
sum+=arr[i]
i%2==0
false
odd_alt_sum=arr[i]
true
even_alt_sum=arr[i]
arr[i]>high
false
true
sec_high=high high=arr[i]
arr[i]>sec_high
true
sec_high=arr[i]
false

**Program Codes**: Following are the codes of the problems in C:-

1. Practical1a.c

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

int main(){
	//n: size of array, i: counter variable, diff: diff b/w small and large
	//small: initialized with largest num to ensure the storing of a[0]
	//large: initialized with smallest num to ensure the storing of a[0]
	int MAX=50, arr[MAX], n, i, large=INT_MIN, small=INT_MAX, diff;

	printf("Enter the array size: ");
	scanf("%d",&n);

	for(i=0; i<n; i++){
	//populating array
		printf("Enter value at arr[%d]: ",i);
		scanf("%d",&arr[i]);

	//extracting largest number
		if(large<arr[i])
			large=arr[i];

	//extracting smallest number
		if(small>arr[i])
			small=arr[i];
	}

	printf("\nSmallest number in the array: %d"
		"\nLargest number in the array: %d", small, large);

	//evaluating diff b/w small and large
	diff = large-small;
	printf("\nDifference of Smallest and largest number in the array i: %d",
diff);

	return 0;
}
```

2. Practical1b.c

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

int main(){
    //MAX: max permissible size of array
    //size: current size of the array
    //i: counter variable
    int MAX = 50, arr[MAX], size =10, i =0;

    //populating array with random numbers
    for (i = 0; i < size; i++){
        arr[i] = rand() % 101;
    }

    // printing even index element
    printf("Elements at even index: ");
    for (i = 0; i < size; i+=2){
        printf("%3d ", arr[i]);
    }

    // printing odd index element
    printf("\nElements at odd index: ");
    for (i = 1; i < size; i+=2){
        printf("%3d", arr[i]);
    }

    // printing in reverse order
    printf("\nElements in reverse : ");
    for (i = size - 1; i ⩾ 0; i--){
        printf("%3d", arr[i]);
    }

    printf("\nFirst element: %d and last element: %d", arr[0], arr[size -1]);

    return 0;
}
```

3. Practical1c.c

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

void main(){
    //odd_alt_sum:sum of element at even index,sum:sum of all element
    //even_alt_sum:sum of element at odd index,i:loop counter variable
    //high:holds highest num in array, sec_high:holds second highest
    int arr[5] ={61,52,43,24,15}, odd_alt_sum= 0, sum =0,
    even_alt_sum=0, high=INT_MIN, sec_high=INT_MIN+1, i=0;

    for (i = 0; i < 5; i++){
    // adding every element in sum
        sum += arr[i];

    // alternate sum
        if(i%2 == 0){
        // adding even index sum only
            even_alt_sum +=arr[i];
        }else{
        //adding odd index sum only
            odd_alt_sum +=arr[i];
        }

    // if larger num found, store that larger num in high
    // after passing high's value in sec_high
        if(arr[i]> high){
            sec_high = high;
            high = arr[i];
        }
    //store if array value is smaller then high but larger than sec_high
        else if(arr[i] > sec_high){
            sec_high =arr[i];
        }
    }
    printf("Sum of elements: %d\n"
           "Sum of elements at odd index: %d\n"
           "Sum of elements at even index: %d\n"
           "Second highest element in array: %d\n"
           , sum, odd_alt_sum, even_alt_sum, sec_high);
}
```

**Output:** Following are the respective outputs of the programs:-

1.
```
C:\Users\DV yadav\Documents\Programming Files\C,C++ files>gcc Practical1a.c && a.exe
Enter the array size: 4
Enter value at arr[0]: 72
Enter value at arr[1]: 3
Enter value at arr[2]: 54
Enter value at arr[3]: 34

Smallest number in the array: 3
Largest number in the array: 72
Difference of Smallest and largest number in the array i: 69
```

2.
```
C:\Users\DV yadav\Documents\Programming Files\C,C++ files>gcc Practical1b.c && a.exe
Elements at even index:  41  72  80  65  96
Elements at odd index:  85 38 69 68 22
Elements in reverse :  22 96 68 65 69 80 38 72 85 41
First element: 41 and last element: 22
```

3.
```
C:\Users\DV yadav\Documents\Programming Files\C,C++ files>gcc Practical1c.c && a.exe
Sum of elements: 195
Sum of elements at odd index: 76
Sum of elements at even index: 119
Second highest element in array: 52
```

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# LAB FILE

## Data Structures (ARD – 255)

## B.Tech – Artificial Intelligence & Data Science

**Submitted By:**

**Name**:
**Batch**: AIDS B1
**Roll No**.:

**Submitted To:**

Dr. Atul Tripathi

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