Introduction to Data structure, Array and its operations

Week-1: Introduction to Data structure, Array and its operations	
SL.No.	**Experiments**
1.	Write a program to calculate the mean, and standard deviation of the elements in the given one-dimensional array. The standard deviation measures the amount of variation or dispersion in the data set.
2.	Write a program to find the median of the elements in the given one-dimensional array. The median is the middle value of a sorted data set or the average of the two middle values for an even number of elements.
3.	Consider the array containing temperature data for a week (Sunday to Saturday)temperature_data = [25, 28, 27, 30, 31, 29, 26]Write a program to perform the following tasks: • Find the average temperature for the week. • Identify the hottest day (highest temperature) and the coldest day (lowest temperature) of the week. • Calculate the temperature range (difference between the hottest and coldest days).
4.	Consider the array containing test scores of 20 studentstest_scores = [85, 78, 92, 65, 89, 76, 94, 81, 87, 90,72, 88, 95, 79, 83, 91, 70, 84, 86, 93] Write a C program to: • Calculate the average score and the highest score achieved. • Count the number of students who passed (scored above a certain passing threshold) and the number of students who failed. • Determine the grade distribution, i.e., count the number of students falling into different grade ranges (e.g., O, E, A, B, F).

Q1.

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

int main(){
    int n; // Number of elements
    int xi; // current element
    float x = 0.0; // Mean
    float variance; // Variance
    float sd; // Standard Deviation
    float sum = 0.0; // Temp Variable

    printf("Number of elements to be entered : ");
    scanf("%d", &n);

    int arr1[n];

    for (int i = 0; i < n; i++)
    {
        printf("Enter number : ");
        scanf("%d", &arr1[i]);

        xi = arr1[i];
        x = x+xi;
    }

    x = x/n; // Mean Calculated

    for (int i = 0; i < n; i++)
    {
        xi = arr1[i];
        sum += pow(xi-x,2);
    }

    variance = sum/(n-1); // Variance Calculated
    sd = pow(variance, 0.5); // Standard Deviation Calculated

    printf("\nMean = %f\nVariance = %f\nStandard Deviation = %f", x, variance, sd);

    return 0;
}
```

```
Number of elements to be entered : 5
Enter number : 15
Enter number : 30
Enter number : 45
Enter number : 5
Enter number : 10

Mean = 21.000000
Variance = 267.500000
Standard Deviation = 16.355427
```

Q2.

```c
#include <stdio.h>

int main(){
    int temp;
    int n;

    printf("Enter number of elements you want to insert : ");
    scanf("%d", &n);

    int array[n]; // Declaration of array

    for (int i = 0; i < n; i++)
    {
        printf("Enter data : ");
        scanf("%d", &array[i]); // Insertion of data in array
    }

    for (int i = 0; i < n; i++)
    {
        for (int j = 0; j < n-i; j++)
        {
            temp = array[j+1];

            if(array[j]>array[j+1]){
                array[j+1]=array[j];
                array[j]=temp;
            }
        }

    }

    if(n%2==0){
        printf("Median : %d", (array[(n/2)-1]+array[(n/2)])/2);
    }
    else{
        printf("Median : %d", array[n/2]);
    }
    return 0;
}
```

```
Enter number of elements you want to insert : 5
Enter data : 15
Enter data : 1
Enter data : 30
Enter data : 45
Enter data : 5
Median : 15
```

```c
#include <stdio.h>

int main(){
    int temperature_data[]={25,28,27,30,31,29,26};
    float avg;
    int high = temperature_data[0];
    int low = temperature_data[0];

    for (int i = 0; i < sizeof(temperature_data)/sizeof(int); i++)
    {
        avg+=temperature_data[i];
        if(high<temperature_data[i]){
            high=temperature_data[i];
        }

        if(low>temperature_data[i]){
            low=temperature_data[i];
        }
    }

    printf("\nA. Average Temperature : %f\nB. Hottest : %d\t\tColdest : %d\nC.
Temperature Difference : %d\n", avg/(sizeof(temperature_data)/sizeof(int)), high, low,
high-low);

    return 0;
}
```

```
A. Average Temperature : 28.000000
B. Hottest : 31         Coldest : 25
C. Temperature Difference : 6
```

Q4.

```c
#include <stdio.h>

int main(){
    int test_scores[20]={
        85,78,92,65,89,76,94,81,87,90,72,88,95,79,83,91,70,84,86,93
    }; // Scores of 20 students.

    float avg=0;
    int pass=0,failed=0;
    int highest = test_scores[0];

    int gradeO=0, gradeE=0, gradeA=0, gradeB=0, gradeF=0;

    for (int i = 0; i < 20; i++)
    {
        int currentMark = test_scores[i];

        avg+=currentMark;

        if(highest<currentMark){
            highest=currentMark;
        }

        if(currentMark>=60){pass++;}else{failed++;}

        if(currentMark>90){gradeO++;}
        if(80<currentMark && currentMark<=90){gradeE++;}
        if(70<currentMark && currentMark<=80){gradeA++;}
        if(60<currentMark && currentMark<=70){gradeB++;}
        if(currentMark<=60){gradeF++;}
    }

    printf("Average Marks : %.2f\nHighest Marks : %d\n\n", avg/20, highest);
    printf("Pass : %d\nFailed : %d", pass, failed);
    printf("\n\nGrades :-\n\n");
    printf("Grade O:- %d\nGrade E:- %d\nGrade A:- %d\nGrade B:- %d\nGrade F:- %d",
gradeO, gradeE, gradeA, gradeB, gradeF);

    return 0;
}
```

```
Average Marks : 83.90
Highest Marks : 95

Pass : 20
Failed : 0

Grades :-

Grade O:- 5
Grade E:- 9
Grade A:- 4
Grade B:- 2
Grade F:- 0
```