Student Information

- **Name**: [ATUL KUMAR]
- **Student ID**: [590011190]
- **Branch**: [MCA]
- **Batch**: [B1]
- **Instructor**: [Dr. Sourbh Kumar]
- **Date**: [28/10/2024]

Data Structure....

Lab Assignment 1: Basic Array Operations

Problem Statement: Write a program in C that performs the following operations on an array of integers:

1. Input n elements from the user.
2. Find the largest and smallest element in the array.
3. Sort the array in ascending order.
4. Find the sum and average of the array elements.

Assignment Tasks:

- Implement an integer array of size n entered by the user.
- Perform the operations of finding the largest, smallest elements, sorting, and calculating sum and average.
- Print the array after sorting.

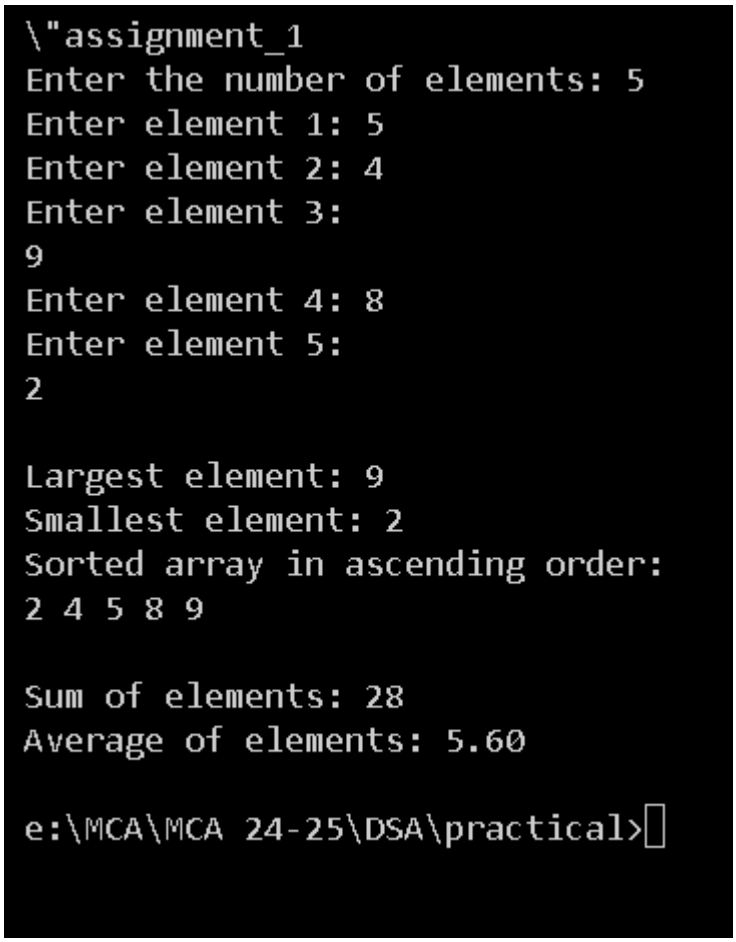
Solution:-

```
#include <stdio.h>

void inputArray(int arr[], int n);
int findLargest(int arr[], int n);
int findSmallest(int arr[], int n);
void sortArray(int arr[], int n);
int calculateSum(int arr[], int n);
float calculateAverage(int sum, int n);
void displayArray(int arr[], int n);
int main() {
int n;
printf("Enter the number of elements: ");
scanf("%d", &n);

int arr[n];

inputArray(arr, n);

int largest = findLargest(arr, n);
int smallest = findSmallest(arr, n);

printf("\nLargest element: %d", largest);
printf("\nSmallest element: %d", smallest);

sortArray(arr, n);
printf("\nSorted array in ascending order:\n");
```

```
displayArray(arr, n);

int sum = calculateSum(arr, n);
float average = calculateAverage(sum, n);

printf("\nSum of elements: %d", sum);
printf("\nAverage of elements: %.2f\n", average);
return 0;
}
void inputArray(int arr[], int n) {
for (int i = 0; i < n; i++) {
printf("Enter element %d: ", i + 1);
scanf("%d", &arr[i]);
}
}
int findLargest(int arr[], int n) {
int largest = arr[0];
for (int i = 1; i < n; i++) {
if (arr[i] > largest) {
largest = arr[i];
}
}
return largest;
}
int findSmallest(int arr[], int n) {
int smallest = arr[0];
for (int i = 1; i < n; i++) {
if (arr[i] < smallest) {
smallest = arr[i];
}
}
return smallest;
}
void sortArray(int arr[], int n) {
for (int i = 0; i < n - 1; i++) {
for (int j = i + 1; j < n; j++) {
if (arr[i] > arr[j]) {
int temp = arr[i];
arr[i] = arr[j];
arr[j] = temp;
}
}
}
}

int calculateSum(int arr[], int n) {
int sum = 0;
for (int i = 0; i < n; i++) {
sum += arr[i];
}
return sum;
}
float calculateAverage(int sum, int n) {
return (float)sum / n;
}
void displayArray(int arr[], int n) {
```

```
for (int i = 0; i < n; i++) {
printf("%d ", arr[i]);
}
printf("\n");
}
```

Output:-



Lab Assignment 2: Array of Structures

Problem Statement: Write a program to create an array of structures to store information about n , students (name, age, and marks). The program should allow the following:

1. **Input details for all students.**
2. **Display the details of all students.**
3. **Sort students based on marks in descending order.**
4. **Find and display the student with the highest marks.**

Assignment Tasks:

- **Define a structure Student with fields for name, age, and marks.**
- **Implement functions to input, display, sort, and find the student with the highest marks.**
- **Display the sorted list of students based on marks.**

Solution:-

```
#include <stdio.h>
struct Student {
char name[50];
```

```
int age;
float marks;
};
void inputStudents(struct Student students[], int n);
void displayStudents(struct Student students[], int n);
void sortStudents(struct Student students[], int n);
void displayTopStudent(struct Student students[], int n);
int main() {
int n;
printf("Enter the number of students: ");
scanf("%d", &n);
struct Student students[n];
inputStudents(students, n);
printf("\nStudent Details:\n");
displayStudents(students, n);
sortStudents(students, n);
printf("\nSorted Student List (by marks in descending order):\n");
displayStudents(students, n);
printf("\nStudent with highest marks:\n");
displayTopStudent(students, n);
return 0;
}
void inputStudents(struct Student students[], int n) {
for (int i = 0; i < n; i++) {
printf("\nEnter details for student %d:\n", i + 1);
printf("Name: ");
scanf("%s", students[i].name);
printf("Age: ");
scanf("%d", &students[i].age);
printf("Marks: ");
scanf("%f", &students[i].marks);
}
}
void displayStudents(struct Student students[], int n) {
for (int i = 0; i < n; i++) {
printf("Name: %s, Age: %d, Marks: %.2f\n", students[i].name,
students[i].age, students[i].marks);
}
}
void sortStudents(struct Student students[], int n) {
for (int i = 0; i < n - 1; i++) {
for (int j = i + 1; j < n; j++) {
if (students[i].marks < students[j].marks) {
struct Student temp = students[i];
```

```
students[i] = students[j];
students[j] = temp;
}
}
}
}
void displayTopStudent(struct Student students[], int n) {
struct Student topStudent = students[0];
for (int i = 1; i < n; i++) {
if (students[i].marks > topStudent.marks) {
topStudent = students[i];
}
}
printf("Name: %s, Age: %d, Marks: %.2f\n", topStudent.name,
topStudent.age, topStudent.marks);
}
```

Output:-

```
Enter the number of students: 5

Enter details for student 1:
Name: Atul
Age: 23
Marks: 98

Enter details for student 2:
Name: Ankit
Age: 22
Marks: 94

Enter details for student 3:
Name: Govind
Age: 24
Marks: 97

Enter details for student 4:
Name: Anjali
Age: 24
Marks: 99

Enter details for student 5:
Name: Namish
Age: 12
Marks: 85

Student Details:
Name: Atul, Age: 23, Marks: 98.00
Name: Ankit, Age: 22, Marks: 94.00
Name: Govind, Age: 24, Marks: 97.00
Name: Anjali, Age: 24, Marks: 99.00
Name: Namish, Age: 12, Marks: 85.00
```