Lab 6 Arrays

Please test the correctness of your programs in **Q-2, Q-3 and Q-4** on **PASS**.

Q-1.

Write a program that defines and initializes an array of 10 integers.

```
int num[10] = {5, 10, 2, 5, 8, 8, 7, 9, 1, 5};
```

a) Write a for-loop to print out the contents of the array, one element in one line.

b) Modify the programs in question a), such that it prints a bar chart for the values in the array as follows.

```
*****
**********
**
*****
********
********
*******
*********
*
*****
```

Hint: You may use nested for loops.

Q-2.

Write a program to read students' mid-term test score (a whole number ranging from 0 to 50), calculate the average score and prints the corresponding bar chart for the grades as in **Q-1-b**.

> *Hint-1. The number of students will not exceed 20.*
> *Hint-2. Display two decimal places of the average score by using $fixed$ and $setprecision$.*

Expected Outputs:

Example-1

Number of students?
3
Student 1:
30
Student 2:
20
Student 3:
50
Average = 33.33
`****************************`
`*******************`
`**********************************************`

Q-3. [will be marked]

Write a program that reads two sets of integer elements (10 elements for each set) and finds the intersection of two sets.

> *Hint-1.   The elements of set A and B should be unique according to set properties.*
> *Hint-2.   The intersected element is the common element in both sets.*

Expected Outputs:

Example-1
Enter 10 Elements of Set A: **1 2 3 4 5 6 7 8 9 10** Enter 10 Elements of Set B: **11 12 13 14 15 16 17 18 19 20** The Intersected Element of Set A and B are not Found.

Example-2
Enter 10 Elements of Set A: **1 2 3 4 5 6 7 8 9 10** Enter 10 Elements of Set B: **1 2 3 4 5 6 7 8 9 10** The Intersected Elements of Set A and B are: 1 2 3 4 5 6 7 8 9 10

Example-3
Enter 10 Elements of Set A: **1 2 3 4 5 6 7 8 9 10** Enter 10 Elements of Set B: **1 3 5 7 9 11 13 15 17 19** The Intersected Elements of Set A and B are: 1 3 5 7 9

Example-4
Enter 10 Elements of Set A: **-1 -2 -3 -4 -5 -6 -7 -8 -9 -10** Enter 10 Elements of Set B: **-1 -3 -5 -7 -9 -11 -13 -15 -17 -19** The Intersected Elements of Set A and B are: -1 -3 -5 -7 -9

Q-4.

You have learnt about the concept of sorting as well as bubble sort during the lecture. Now we consider another approach for sorting. The basic idea is to insert a new element into a sorted subarray during each iteration. If we can put the new element to the suitable position so that the subarray is still sorted, we will finally get the original array in order when we insert all the elements into the subarray.

For example, we have an array as 6, 3, 5, 2, and want to sort it in ascending order using insertion sort. We can go through the following steps to implement the sorting.

1. We start the method by considering the first element as the initial subarray, as we can regard the subarray consist of only one number as sorted. The subarray is now 6;
2. After the initialization, we will insert all the remaining elements to the correct positions in the subarray to keep it sorted. Then we consider the second element 3. It is smaller than 6, so we insert it before 6, and get the updated subarray 3, 6;
3. The next element is 5. It is larger than 3, and we move to the next element in the subarray for comparison. 5 is smaller than 6, which means we find the position for 5 to keep the subarray sorted. And the new subarray is 3, 5, 6;
4. The last remaining element is 2. We find that it is smaller than 3. We insert it before 3, and update the subarray as 2, 3, 5, 6. Now we insert all the elements into the subarray. The subarray now is in ascending order.

Implement the new sorting method in ascending order, given the size of the array is 6. Output the sorted array.

NOTE: You should not create any new array except for the input.

Expected Outputs:

Example-1
Enter the element in the array: 6 4 7 2 10 5 The sorted array is: 2, 4, 5, 6, 7, 10