Lecture #15
ARRAYS

Topics we will learn!!!

- Introduction to Arrays
- Declaration and initialization of Array
- Defining and processing

1 D Array

2D Array

Think about it?????

- How to organize test scores of 60 students in class?
- How to maintain salaries data of 100 employees in any organization?
- How to create a list of all even numbers?
- How to create list of students in college?

Can you observe your surroundings?

You'll see…..

Array of Trees

Array of Pencils

Array of Keys

Now let's Learn.....

What is an Array?

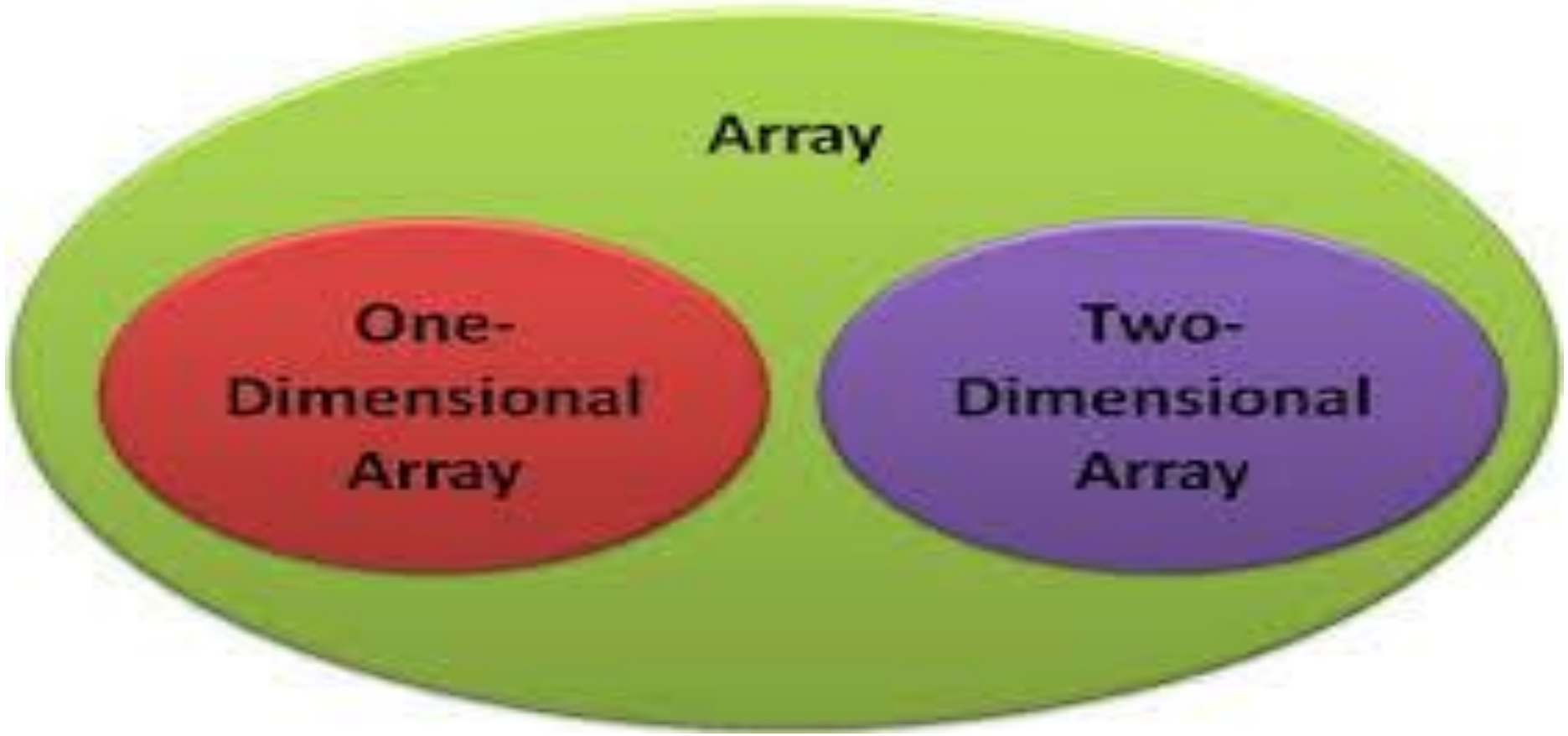
- It is a fixed size sequential collection of same data types that share a common name.
- It is simply group of data types.

- An array is derived data type.

- Array is used to represent list of numbers, list of names etc.
- Example:

```
int student_roll[10];
float marks[30];
char name[20];
```

Types of Array



Declaration of 1D Array

- A **one-dimensional array** (or single **dimension array**) is a type of linear **array**. Accessing its elements involves a single subscript which can either represent a row or column index
- It is like a list of elements.

Suppose we want to enter age of 5 students we will declare an array as:- int age[5];

Suppose we want to display temperature of 10 cities we will declare an array as:- float temperature[10];

Important points to understand…

- The general form of array declaration is :

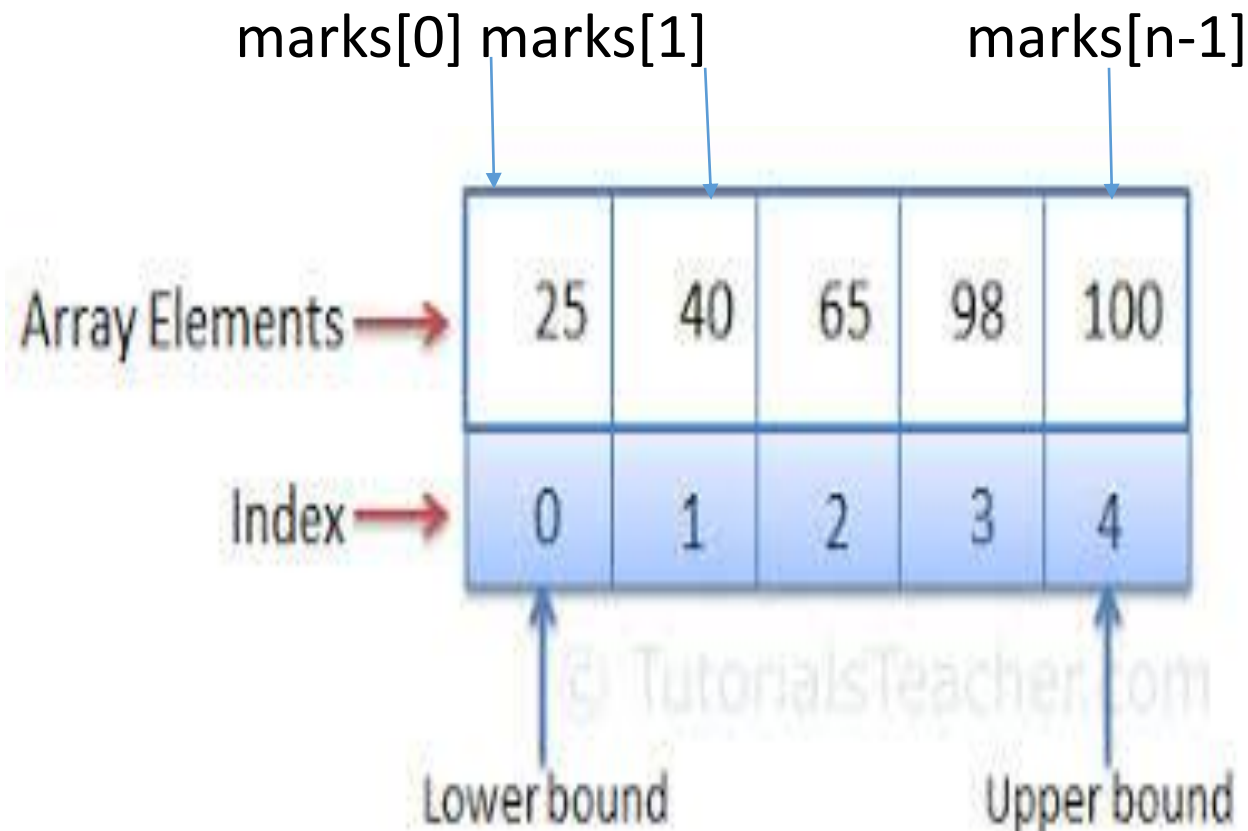
  type *array-name[size];*

- Here the type specifies the data type of elements contained in the array, such as int, float, or char.
- And the size indicates the maximum numbers of elements that can be stored inside the array.
- The size should be either a numeric constant or a symbolic constant.

Initialization of An Array

Now suppose we have create an array to display test scores of 5 students.

int marks[5]={25,40,65,98,100} ; or int marks[]={25,40,65,98,100};



Examples:

Example :

```
int number[ ] = {1,2,3,4};
```

- The character array can be initialized as follows :

```
char name[ ] = {'j','o','h','n','\0'};
```

- The character array can also be initialized as follows :

```
char name[ ] = "john";
```

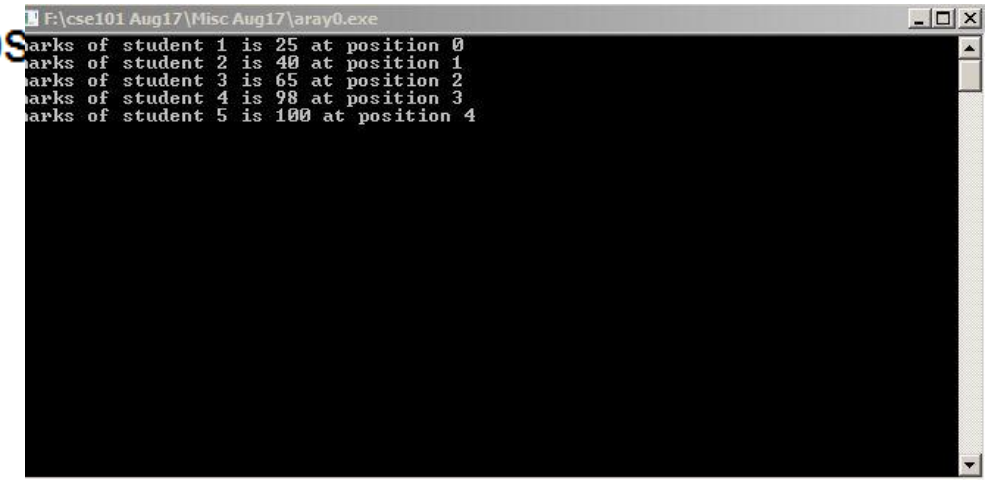
Now let's learn how to code…

#Problem 1

Declaration and initialization of marks of 5 students

```
#include<stdio.h>
#include<conio.h>
int main()
{

   int marks[5]={25,40,65,98,100};     //intilization of array
   int i;
   for(i=0;i<5;i++)                    // displaying marks
   {
   printf("marks of student %d is %d at pos
}
   getch();
}
```



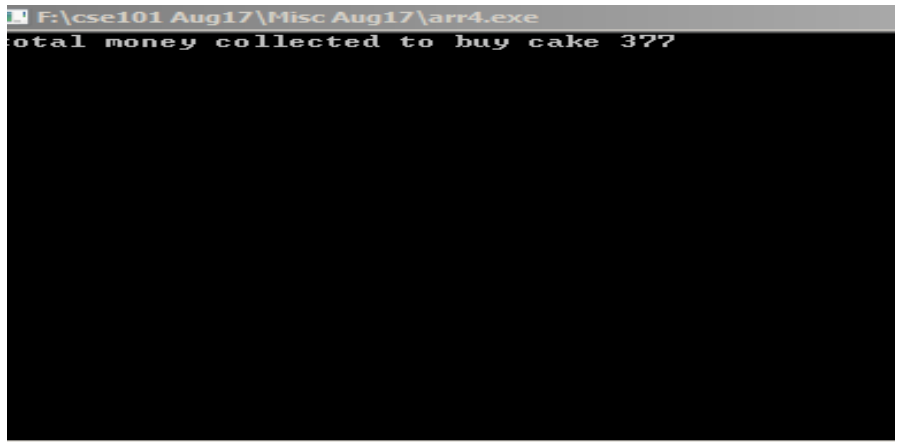
#Problem 2

There are 7 friends who want to buy a birthday cake.So they decided to collect money from each and buy cake from the total sum money collected from seven friends.

```c
#include<stdio.h>
#include<conio.h>
int main()
{
  int arr[7]={10,45,67,78,90,34,53} ;//amount of money each friend have
  int i,sum=0;
  for(i=0;i<7;i++)
  {
      sum=sum+arr[i];    // calculation of total sum

      }
      printf("total money collected to buy cake %d",sum);
      getch();

      }
```

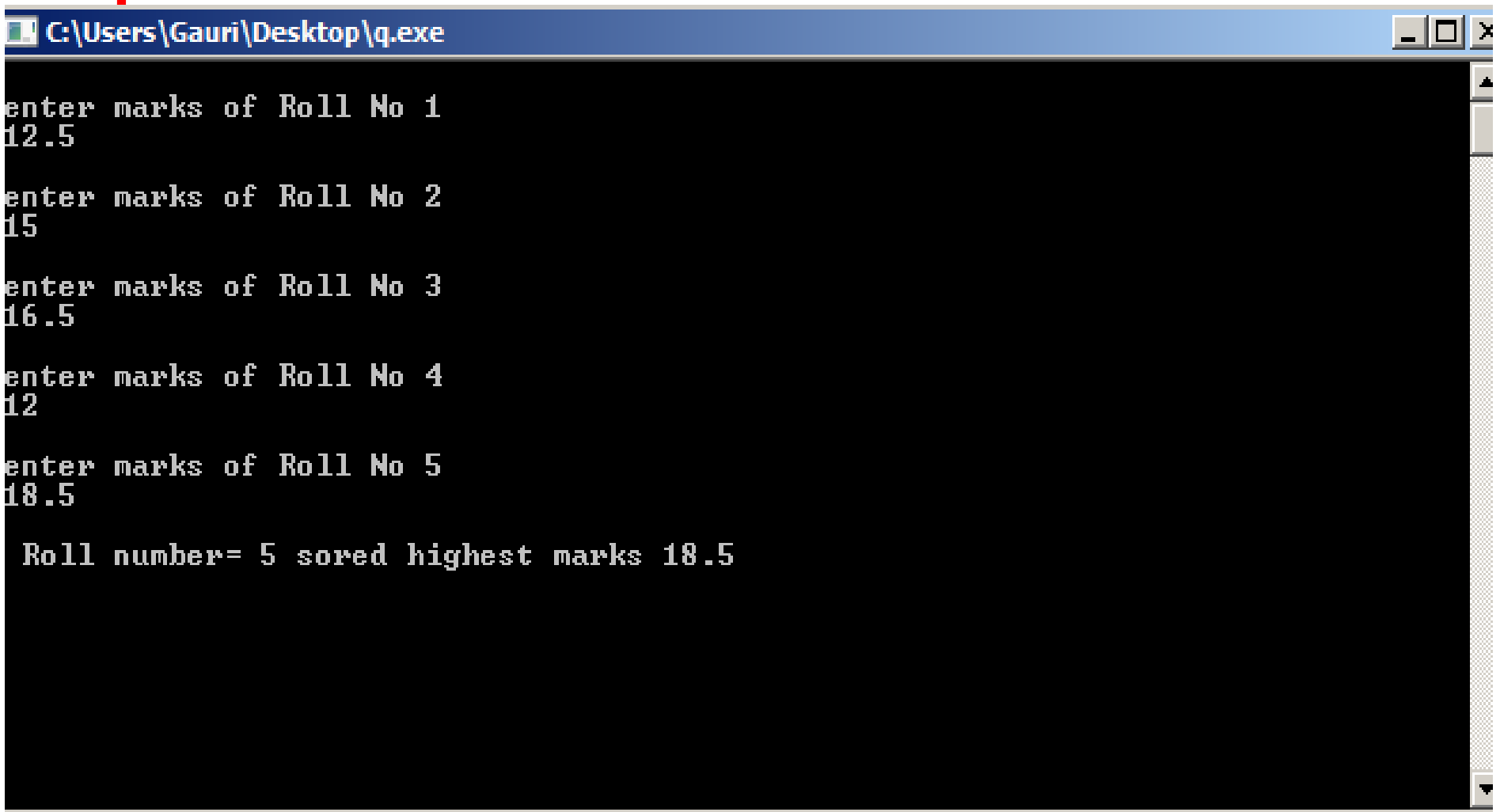


#Problem 3

A weekly test was conducted by teacher so write code to enter marks of 5 students roll number wise and find out the roll number who has scored highest marks in test.

```
#include<stdio.h>
int main()
{
 float arr[5], max;
    int i,pos;
    for(i=0;i<5;i++)      // entering of marks roll number wise
    {
    printf("\nenter marks of Roll No %d\n",i+1);
    scanf("%f",&arr[i]); }
max=arr[0];
for(i=0;i<5;i++)   // calculating and displaying of maximum marks
{
  if (arr[i]>max)
  {
    max=arr[i];
    pos=i;
    } }
printf("\n Roll number= %d sored highest marks %.1f",pos+1,max); }
```

Output 3

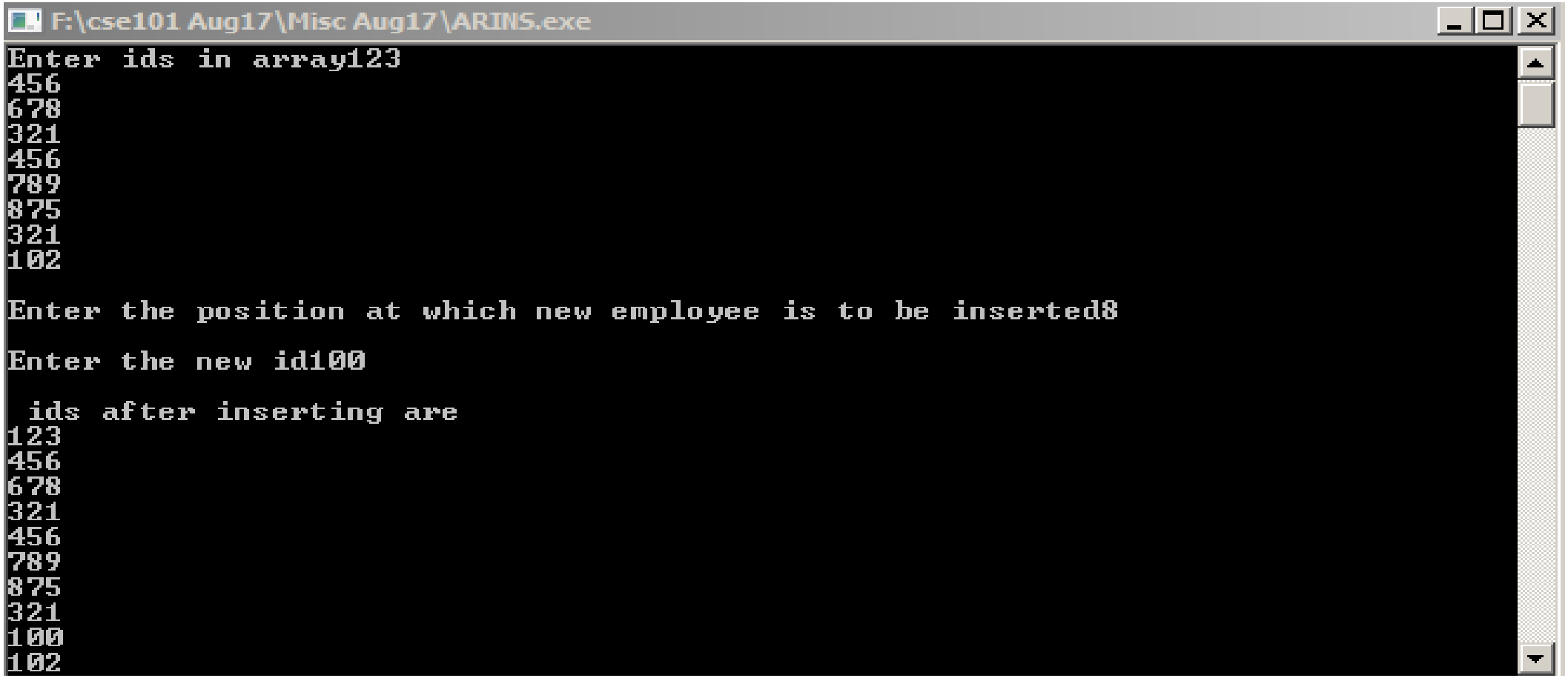

C:\Users\Gauri\Desktop\q.exe
enter marks of Roll No 1
12.5
enter marks of Roll No 2
15
enter marks of Roll No 3
16.5
enter marks of Roll No 4
12
enter marks of Roll No 5
18.5
Roll number= 5 sored highest marks 18.5

#Problem 4

Currently there were 9 employees in an organization having unique ids.Enter the data of current employees first and later a new employee joins the organization. So ask the user to enter the id of new employee along with position.Also display ids of all 10 employees

```
#include<stdio.h>
int main()
{
int arr[10],pos,val,i;     // declaration of array
printf("\nEnter ids in array");    // entering ids of 9 employees
for(i=0;i<9;i++)
scanf("%d",&arr[i]);
printf("\nEnter the position at which new employee is to be inserted");// enter position value of new employee
scanf("%d",&pos);
printf("\nEnter the new id");    // enter id of new employee
scanf("%d",&val);
for(i=9;i>pos;i--)      // inserting id of new emploee at desired position
{
arr[i]=arr[i-1];}
arr[pos]=val; }
printf("\n ids after inserting are");    // displaying ids of all employees
for(i=0;i<10;i++)
printf("\n%d",arr[i]);
}
```

Output 4


F:\cse101 Aug17\Misc Aug17\ARINS.exe
Enter ids in array123
456
678
321
456
789
875
321
102
Enter the position at which new employee is to be inserted8
Enter the new id100
ids after inserting are
123
456
678
321
456
789
875
321
100
102

Now let's learn about….
2- Dimensional array

- A variable which represent the list of items using two index (subscript) is called two-dimensional array.

- In Two dimensional arrays, the data is stored in rows and columns format.

- For example:

```
int table[2][3];
```

Declaration of 2-D Array

- The general form of two dimensional array declaration is :

  type *array-name[row_size][column_size];*

- Here the type specifies the data type of elements contained in the array, such as int, float, or char.
- The size should be either a numeric constant or a symbolic constant.

Initialization of 2-D Array

- The general form of initializing two-dimensional array is :

type array-name[row_size][column_size] = {list of values};

- Example :

```
int table[2][3] = {0,0,0,1,1,1};
```

- Here the elements of first row initializes to zero and the elements of second row initializes to one.
- This above statement can be written as :

```
int table[2][3] = {{0,0,0}, {1,1,1}};
```

- In two-dimensional array the row_size can be omitted.

Initialization of 2-D Array

- Example :

  int table[ ][3] = {{0,0,0}, {1,1,1}};
- If the values are missing in an initializer, they are automatically set to zero.

- Example :

  int table[2][3] = {1,1,2};
- Here first row initialize to 1,1 and 2, and second row initialize to 0,0 and 0 automatically.

Memory layout 2-D Array

- In Two dimensional arrays, the data is stored in rows and columns format.
- For example:

```
int table[2][3] = {1,2,3,4,5,6};
```

- The memory layout of above example :

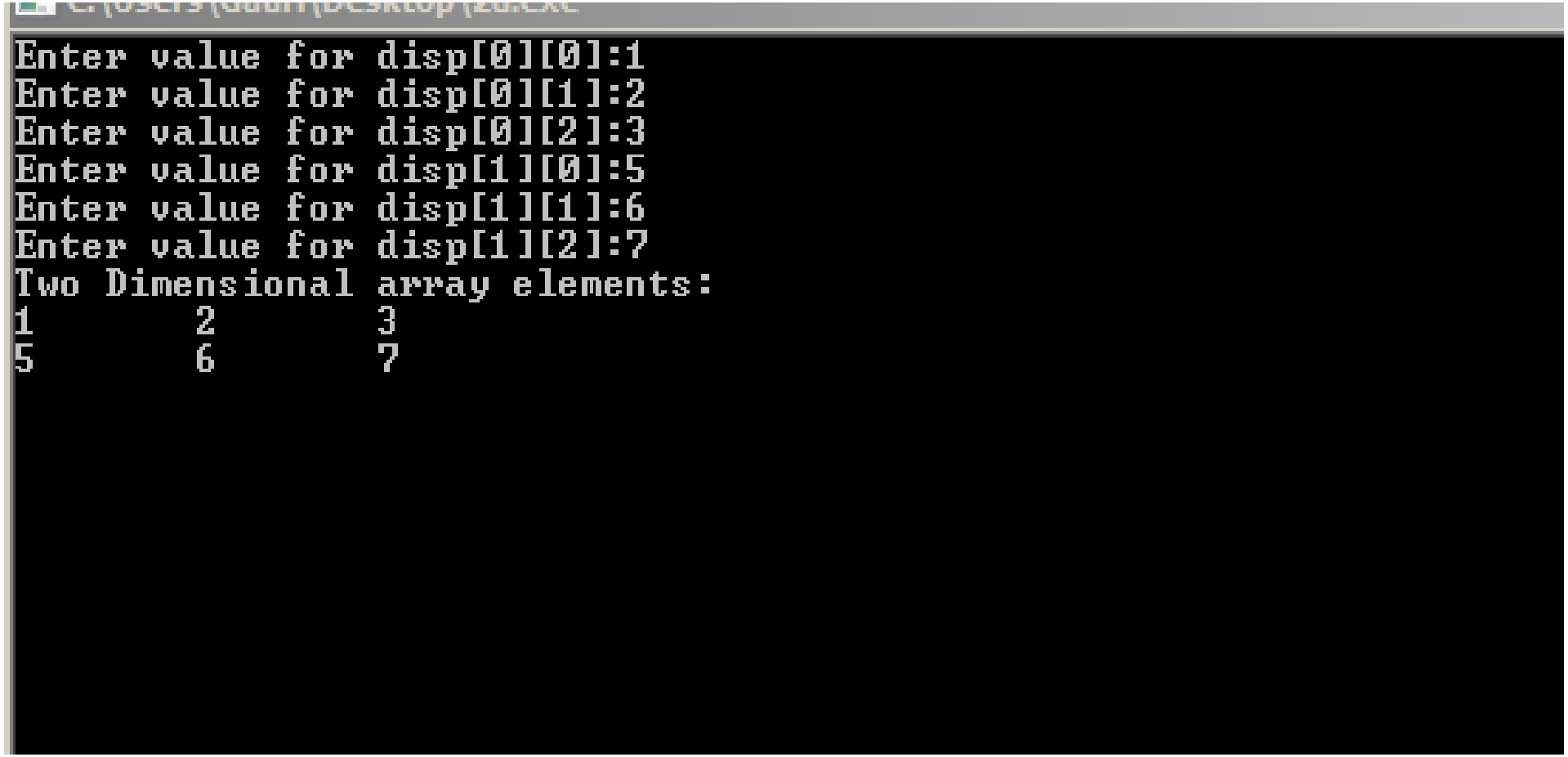
```
table[0][0] = 1;
table[0][1] = 2
table[0][2] = 3;
 table[1][0] = 4;
table[1][1] = 5;
 table[1][2] = 6;
```

Problem 5

This program demonstrates how to store the elements entered by user in a 2d array and how to display the elements of a two dimensional array.

```
#include<stdio.h>
#include<conio.h>
int main(){
  /* 2D array declaration*/
  int disp[2][3];
  /*Counter variables for the loop*/
  int i, j;
  for(i=0; i<2; i++) {
    for(j=0;j<3;j++) {
      printf("Enter value for disp[%d][%d]:", i,
j);
      scanf("%d", &disp[i][j]);
    } }
//Displaying array elements
  printf("Two Dimensional array elements:\n");
  for(i=0; i<2; i++) {
    for(j=0;j<3;j++)
    {
      printf("%d\t", disp[i][j]);
      }
    printf("\n");
  }
  getch();
}
```

Output 5


Enter value for disp[0][0]:1
Enter value for disp[0][1]:2
Enter value for disp[0][2]:3
Enter value for disp[1][0]:5
Enter value for disp[1][1]:6
Enter value for disp[1][2]:7
Two Dimensional array elements:
1 2 3
5 6 7

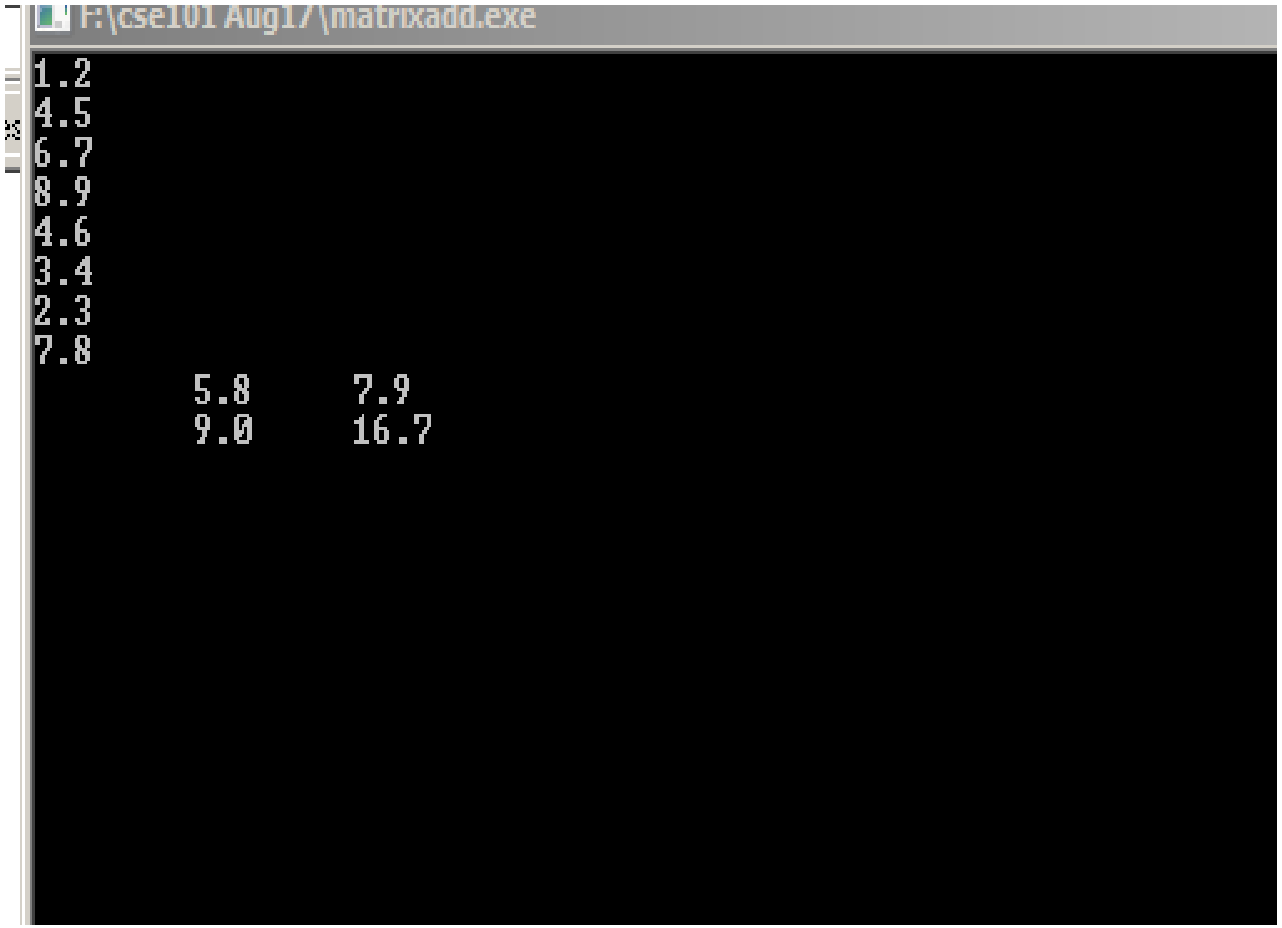
Problem 6

To demonstrate addition of two matrix

```
#include<stdio.h>
int main()
{  float a[2][2];
   float b[2][2],c[2][2];
   int i,j;
   for(i=0;i<2;i++) {
   for(j=0;j<2;j++)  {
    scanf("%f",&a[i][j]);
    }  }
    for(i=0;i<2;i++) {
   for(j=0;j<2;j++) {
    scanf("%f",&b[i][j]);
    }  }
```

```
for(i=0;i<2;i++)
  {
  for(j=0;j<2;j++)
  {
   c[i][j]=a[i][j]+b[i][j];
   } }
    for(i=0;i<2;i++)  {
    for(j=0;j<2;j++) {
     printf("\t%.1f",c[i][j])   }
     printf("\n");
     }
     getch();
     }
```

Output 6



Now…
You can try to solve below problems

Q1)Write C code to display the the elements of array that are even values.

Q2)Write C code to create array for storing marks of 60 students and find

a)Highest marks b)Lowest marks c)Average marks.

Count how many students failed(marks<30).

Q3) Write C code to multiply two [3*3] matrices

Q4) Write C code to find the sum of diagonal elements of a [3*3]matrix.

Q5) WAP to find transpose of a[2*2] matrix.


thank you!