Date:10/11/2023

A4: USING ARRAYS IN C

Aim:

To be familiar with Single dimension and Double dimension Arrays in C.

Question 1:

1. Write a program that accepts a set of digits (0 to 9) as input and prints a vertical histogram
representing the occurrences of each digit.
Test your program with the set of 13 digits: 1, 7, 2 ,9,6, 7, 1, 3, 7, 5, 7, 9, 0
Example
Enter a Number : 12
Enter 12 digits: 1,7,2,6,7,1,3,7,5,7
0 1 2 3 4 5 6 7 8 9

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

Code:

```
#include <stdio.h>
void main()
{       int num,dig[100],i,j,a;
        printf("Enter the number :");
        scanf("%d",&num);
        printf("Enter the digits:");
        for(i=0;i<num;i++)
        {       scanf("%d",&dig[i]);
        }
        printf("0      1       2       3       4       5       6       7       8       9");
        printf("\n");
        for (i = 0; i<num;i++)
       {
         for (j=i+1;j<num;j++)
         {   if (dig[i] > dig[j])
            {
               a =dig[i];
               dig[i] = dig[j];
               dig[j] = a;
             }
          }
         }
         for(i=0;i<num;i++)
         {       for(j=0;j<=dig[i];j++)
                 {       if(dig[i]==j)
                         {printf("*\n");
                         }
```

```
                else
                {printf("\t");
                }
            }
        }
}
```

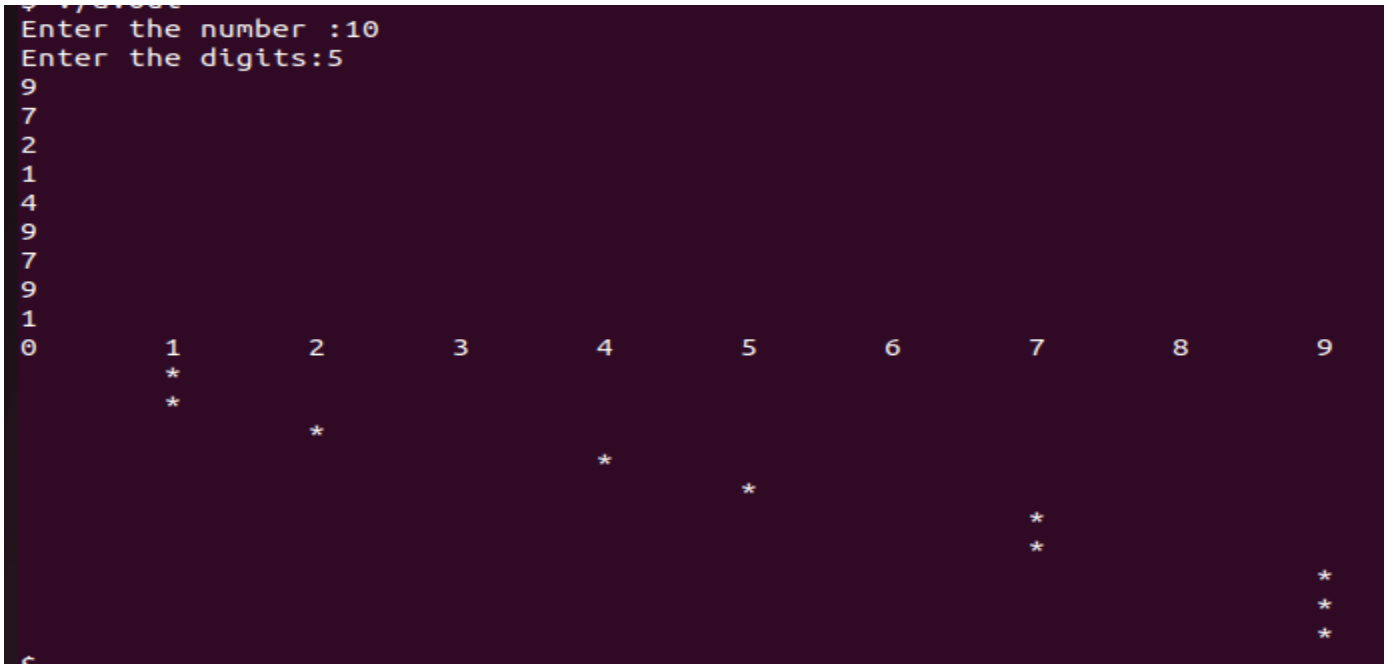
Test Cases:

1.Enter a Number : 13
Enter the digits: 1,7,2,9,6,7,1,3,7,5,7,9,0

2.Enter a Number : 10
Enter the digits:5,9,7,2,1,4,9,7,9,1

Output: (Terminal Screen Shot)

1.



2.

Question 2:

Given an array of integers, push all the zeros of a given array to the end of the array.

Example:

Input : arr[] = {5, 3, 0, 1, 3, 0, 8, 0};

Output : arr[] = {5, 3, 1, 3, 8, 0, 0, 0};

Input : arr[] = {10, 20, 0, 0, 0, 30, 60};

Output : arr[] = {10, 20, 30, 60, 0, 0, 0};

Code:

```
#include <stdio.h>
void main()
{       int arr[100],num,i,j,temp;
        printf("Enter the number of elements :");
        scanf("%d",&num);
        for(i=0;i<num;i++)
        {       scanf("%d",&arr[i]);
        }
        for(i=0;i<num;i++)
        {       for(j=0;j<num-1;j++)
                {if(arr[j]==0)
                {       temp=arr[j];
                        arr[j]=arr[j+1];
                        arr[j+1]=temp;
                }

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

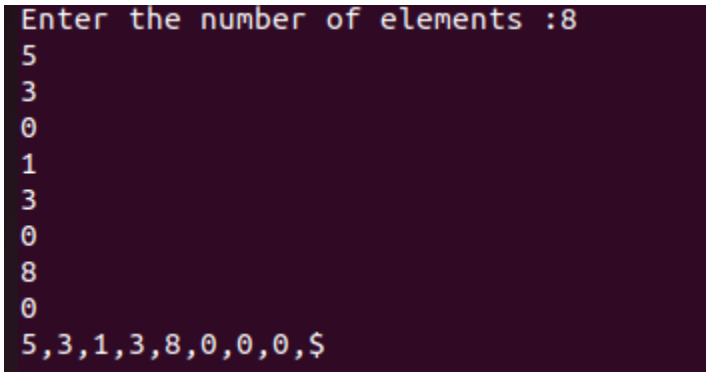
Test Cases: (Minimum 5 Test Cases)

1.Enter the number of elements :[5,3,0,1,3,0,8,0]

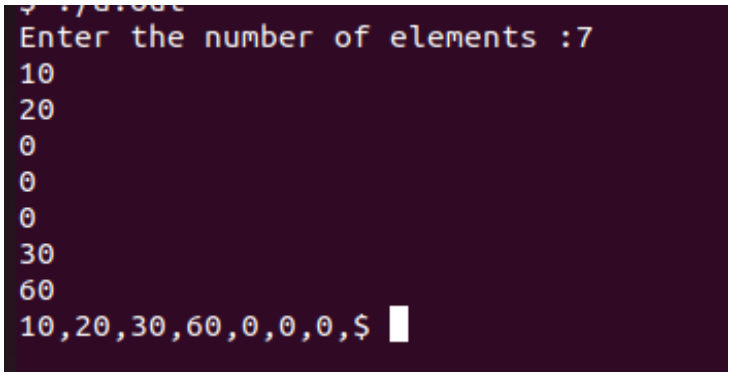
2.Enter the number of elements :[10,20,0,0,0,30,60]

Output: (Terminal Screen Shot)

1.



2.



Question 3:

Write an interactive C program to process the exam scores for a group of students in a C programming course. Begin by specifying the number of exam scores for each student (assume this value is the same for all students in the class). Then enter each student's name and exam scores. Calculate an average score for each student, and an overall class average (an average of the individual student averages). Display the overall class average, followed by the name, the individual exam scores and the average score for each student. Store the student names in a two-dimensional character array and store the exam scores in a two-dimensional floating-point array.

Make the program as general as possible. Label the output clearly. Test the program using the following set of student exam grades.

Adams 45 80 80 95 55 75
Brown 60 50 70 75 55 80
Davis 40 30 10 45 60 55
Fisher 0 5 5 0 10 5
Hamilton 90 85 100 95 90 90
Jones 95 90 80 95 85 80
Ludwig 35 50 55 65 45 70
Osborne 75 60 75 60 70 80
Prince 85 75 60 85 90 100
Richards 50 60 50 35 65 70
Smith 70 60 75 70 55 75
Thomas 10 25 35 20 30 10
Wolfe 25 40 65 75 85 95
Zorba 65 80 70 100 60 95

a) Modify this program to allow for unequal weightage of the individual exam scores. In particular, assume that each of the first four exams contributes 15 percent to the final score, and each of the last two exams contributes 20 percent.

b) Extend the program so that the deviation of each student's average about the overall class average will be determined. Display the class average, followed by each student's name, individual exam scores, final score, and the deviation about the class average. Be sure that the output is logically organized and clearly labelled

Code :

```
#include <stdio.h>

void main()
{
   char name[100][100],d[]="Name";
   int marks[100][6], average[100], i, j, sum, stud,avg;
```

```
int classavg,weight[100][6],total[100],sum1;
printf("Enter the number of students:");
scanf("%d", &stud);
for (i = 0; i < stud; i++)
{
    printf("Enter the student's name:");
    scanf("%s", name[i]);
    sum = 0;sum1=0;
    for (j=0;j<=5;j++)
    {   printf("Enter %d subject mark:",j+1);
        scanf("%d",&marks[i][j]);
        if(j<=3)
        {   weight[i][j]=0.15*marks[i][j];
        }
        else
        {   weight[i][j]=0.20*marks[i][j];
        }
        sum = sum+marks[i][j];
        sum1=sum1+weight[i][j];
    }
    average[i]=sum/6;
    avg=avg+average[i];
    total[i]=sum1;
     }
    classavg=avg/stud;
printf("%10s\tm1\tm2\tm3\tm4\tm5\tm6\tavg\t",d);
printf("total\tdiff\n");
for (i=0;i<stud;i++)
{
```

```
        printf("%10s\t", name[i]);
        for(j=0;j<6;j++)
        {   printf("%d\t",marks[i][j]);
        }
        printf("%d\t",average[i]);
        printf("%d\t",total[i]);
         printf("%d\n",average[i]-classavg);
         }
    printf("The class average is : %d",classavg);
}
```

Test cases(Minimum 5 cases) :

1. Enter the number of students:5
Enter the student's name:Gokul
Enter 1 subject mark:98
Enter 2 subject mark:95
Enter 3 subject mark:96
Enter 4 subject mark:90
Enter 5 subject mark:99
Enter 6 subject mark:97
Enter the student's name:Kirthic
Enter 1 subject mark:95
Enter 2 subject mark:95
Enter 3 subject mark:96
Enter 4 subject mark:83
Enter 5 subject mark:91
Enter 6 subject mark:100
Enter the student's name:Sukhirthan
Enter 1 subject mark:98

Enter 2 subject mark:97
Enter 3 subject mark:91
Enter 4 subject mark:96
Enter 5 subject mark:92
Enter 6 subject mark:97
Enter the student's name:Ragul
Enter 1 subject mark:75
Enter 2 subject mark:35
Enter 3 subject mark:46
Enter 4 subject mark:55
Enter 5 subject mark:33
Enter 6 subject mark:80
Enter the student's name:Shriram
Enter 1 subject mark:75
Enter 2 subject mark:70
Enter 3 subject mark:62
Enter 4 subject mark:80
Enter 5 subject mark:35
Enter 6 subject mark:51

2. Enter the number of students:3
Enter the student's name:Ram
Enter 1 subject mark:98
Enter 2 subject mark:56
Enter 3 subject mark:79
Enter 4 subject mark:49
Enter 5 subject mark:85
Enter 6 subject mark:35
Enter the student's name:Raj

Enter 1 subject mark:56
Enter 2 subject mark:86
Enter 3 subject mark:46
Enter 4 subject mark:78
Enter 5 subject mark:52
Enter 6 subject mark:100
Enter the student's name:Ravi
Enter 1 subject mark:65
Enter 2 subject mark:74
Enter 3 subject mark:58
Enter 4 subject mark:61
Enter 5 subject mark:39
Enter 6 subject mark:52

3. Enter the number of students:2
Enter the student's name:Ashwin
Enter 1 subject mark:80
Enter 2 subject mark:90
Enter 3 subject mark:70
Enter 4 subject mark:50
Enter 5 subject mark:60
Enter 6 subject mark:40
Enter the student's name:Ajay
Enter 1 subject mark:54
Enter 2 subject mark:68
Enter 3 subject mark:75
Enter 4 subject mark:94
Enter 5 subject mark:52
Enter 6 subject mark:41

4. Enter the number of students:4
Enter the student's name:Pradeep
Enter 1 subject mark:94
Enter 2 subject mark:65
Enter 3 subject mark:76
Enter 4 subject mark:84
Enter 5 subject mark:52
Enter 6 subject mark:36
Enter the student's name:Antony
Enter 1 subject mark:95
Enter 2 subject mark:65
Enter 3 subject mark:75
Enter 4 subject mark:84
Enter 5 subject mark:59
Enter 6 subject mark:86
Enter the student's name:Mukesh
Enter 1 subject mark:58
Enter 2 subject mark:56
Enter 3 subject mark:54
Enter 4 subject mark:52
Enter 5 subject mark:53
Enter 6 subject mark:51
Enter the student's name:Ambani
Enter 1 subject mark:98
Enter 2 subject mark:75
Enter 3 subject mark:46
Enter 4 subject mark:38
Enter 5 subject mark:25
Enter 6 subject mark:19

5. Enter the number of students:2
Enter the student's name:Vikram
Enter 1 subject mark:26
Enter 2 subject mark:46
Enter 3 subject mark:52
Enter 4 subject mark:16
Enter 5 subject mark:38
Enter 6 subject mark:45
Enter the student's name:Kamal
Enter 1 subject mark:76
Enter 2 subject mark:94
Enter 3 subject mark:25
Enter 4 subject mark:16
Enter 5 subject mark:35
Enter 6 subject mark:85

OUTPUT:

1.

```
gokul@DESKTOP-5K1QIC5:/mnt/c/Users/user/Desktop$ ./a.out
Enter the number of students:5
Enter the student's name:Gokul
Enter 1 subject mark:98
Enter 2 subject mark:95
Enter 3 subject mark:96
Enter 4 subject mark:90
Enter 5 subject mark:99
Enter 6 subject mark:97
Enter the student's name:Kirthic
Enter 1 subject mark:95
Enter 2 subject mark:95
Enter 3 subject mark:96
Enter 4 subject mark:83
Enter 5 subject mark:91
Enter 6 subject mark:100
Enter the student's name:Sukhirthan
Enter 1 subject mark:98
Enter 2 subject mark:97
Enter 3 subject mark:91
Enter 4 subject mark:96
Enter 5 subject mark:92
Enter 6 subject mark:97
Enter the student's name:Ragul
Enter 1 subject mark:75
Enter 2 subject mark:35
Enter 3 subject mark:46
Enter 4 subject mark:55
Enter 5 subject mark:33
Enter 6 subject mark:80
Enter the student's name:Shriram
Enter 1 subject mark:75
Enter 2 subject mark:70
Enter 3 subject mark:62
Enter 4 subject mark:80
Enter 5 subject mark:35
Enter 6 subject mark:51
     Name      m1      m2      m3      m4      m5      m6      avg     total   diff
    Gokul      98      95      96      90      99      97      95      93      16
   Kirthic     95      95      96      83      91      100     93      92      14
Sukhirthan     98      97      91      96      92      97      95      92      16
    Ragul      75      35      46      55      33      80      54      52      -25
   Shriram     75      70      62      80      35      51      62      59      -17
The class average is : 79gokul@DESKTOP-5K1QIC5:/mnt/c/Users/user/Desktop$
```

2.

```
Enter the number of students:3
Enter the student's name:Ram
Enter 1 subject mark:98
Enter 2 subject mark:56
Enter 3 subject mark:79
Enter 4 subject mark:49
Enter 5 subject mark:85
Enter 6 subject mark:35
Enter the student's name:Raj
Enter 1 subject mark:56
Enter 2 subject mark:86
Enter 3 subject mark:46
Enter 4 subject mark:78
Enter 5 subject mark:52
Enter 6 subject mark:100
Enter the student's name:Ravi
Enter 1 subject mark:65
Enter 2 subject mark:74
Enter 3 subject mark:58
Enter 4 subject mark:61
Enter 5 subject mark:39
Enter 6 subject mark:52
     Name      m1      m2      m3      m4      m5      m6      avg     total   diff
      Ram      98      56      79      49      85      35      67      64      3
      Raj      56      86      46      78      52      100     69      67      5
     Ravi      65      74      58      61      39      52      58      54      -6
The class average is : 64gokul@DESKTOP-5K1QIC5:/mnt/c/Users/user/Desktop$
```

3.

```
Enter the number of students:2
Enter the student's name:Ashwin
Enter 1 subject mark:80
Enter 2 subject mark:90
Enter 3 subject mark:70
Enter 4 subject mark:50
Enter 5 subject mark:60
Enter 6 subject mark:40
Enter the student's name:Ajay
Enter 1 subject mark:54
Enter 2 subject mark:68
Enter 3 subject mark:75
Enter 4 subject mark:94
Enter 5 subject mark:52
Enter 6 subject mark:41
      Name      m1      m2      m3      m4      m5      m6      avg     total   diff
    Ashwin      80      90      70      50      60      40      65      62      1
      Ajay      54      68      75      94      52      41      64      61      0
The class average is : 64gokul@DESKTOP-5K1QIC5:/mnt/c/Users/user/Desktop$
```

4.

```
gokul@DESKTOP-5K1QIC5:/mnt/c/Users/user/Desktop$ ./a.out
Enter the number of students:4
Enter the student's name:Pradeep
Enter 1 subject mark:94
Enter 2 subject mark:65
Enter 3 subject mark:76
Enter 4 subject mark:84
Enter 5 subject mark:52
Enter 6 subject mark:36
Enter the student's name:Antony
Enter 1 subject mark:95
Enter 2 subject mark:65
Enter 3 subject mark:75
Enter 4 subject mark:84
Enter 5 subject mark:59
Enter 6 subject mark:86
Enter the student's name:Mukesh
Enter 1 subject mark:58
Enter 2 subject mark:56
Enter 3 subject mark:54
Enter 4 subject mark:52
Enter 5 subject mark:53
Enter 6 subject mark:51
Enter the student's name:Ambani
Enter 1 subject mark:98
Enter 2 subject mark:75
Enter 3 subject mark:46
Enter 4 subject mark:38
Enter 5 subject mark:25
Enter 6 subject mark:19
      Name      m1      m2      m3      m4      m5      m6      avg     total   diff
   Pradeep      94      65      76      84      52      36      67      63      5
    Antony      95      65      75      84      59      86      77      74      15
    Mukesh      58      56      54      52      53      51      54      51      -8
    Ambani      98      75      46      38      25      19      50      44      -12
The class average is : 62gokul@DESKTOP-5K1QIC5:/mnt/c/Users/user/Desktop$
```

5.

```
gokul@DESKTOP-5K1QIC5:/mnt/c/Users/user/Desktop$ ./a.out
Enter the number of students:2
Enter the student's name:Vikram
Enter 1 subject mark:26
Enter 2 subject mark:46
Enter 3 subject mark:52
Enter 4 subject mark:16
Enter 5 subject mark:38
Enter 6 subject mark:45
Enter the student's name:Kamal
Enter 1 subject mark:76
Enter 2 subject mark:94
Enter 3 subject mark:25
Enter 4 subject mark:16
Enter 5 subject mark:35
Enter 6 subject mark:85
      Name      m1      m2      m3      m4      m5      m6      avg     total   diff
    Vikram      26      46      52      16      38      45      37      34      -9
     Kamal      76      94      25      16      35      85      55      54      9
The class average is : 46gokul@DESKTOP-5K1QIC5:/mnt/c/Users/user/Desktop$
```

Question 4:

Implement the children's hand game Rock-paper-scissors: Rock Paper Scissors is a two player game. Each player chooses one of rock, paper or scissors, without knowing the other player's choice. The winner is decided by a set of rules:

- Rock's strength is doubled (temporarily) when fighting scissors, but halved (temporarily) when fighting paper.
- In the same way, paper has the advantage against rock, and scissors against paper

If both players choose the same thing, there is no winner for that round. For this task, the computer will be one of the players. Make 10 rounds of choice, display the score and winner.

Code :

```
#include <stdio.h>
void main()
{       int i,j;
        float player1,player2,inp1,inp2;
        printf("Welcome to the game of Rock,Paper and Scissors\n");
        printf("Enter 1 for ROCK\tEnter 2 for PAPER\tEnter 3 for SCISSORS\n");
        player1=100,player2=100;
        for(i=0;i<10;i++)
        {       printf("Round %d\n",i+1);
                inp1=0,inp2=0;
                printf("Player 1:");
                scanf("%f",&inp1);
                printf("Player 2:");
                scanf("%f",&inp2);
```

```
        if (inp1==1.0&&inp2==2.0)
        {       player1=player1*0.5;
                player2=player2*2;
        }
        else if(inp1==1.0&&inp2==3.0)
        {       player1=player1*2;
                player2=player2*0.5;
        }
        else if(inp1==2.0&&inp2==1.0)
        {       player1=player1*2;
                player2=player2*0.5;
        }
        else if(inp1==3.0&&inp1==1.0)
        {       player1=player1*0.5;
                player2=player2*2;
        }
        else if(inp1==2.0&&inp2==3.0)
        {       player1=player1*0.5;
                player2=player2*2;
        }
        else if(inp1==3.0&&inp2==2.0)
        {       player1=player1*2;
                player2=player2*0.5;
        }
        else
        {       continue;
        }
}
printf("The score of player 1 is :%f\n",player1);
```

```
        printf("The score of player 2 is :%f\n",player2);
        if (player1>player2)
        {       printf("The winner is player 1");
        }
        else if(player1<player2)
        {       printf("The winner is player 2");
        }
        else
        {       printf("Draw");
        }
}
```

Test cases(Minimum 5 cases) :

1.

Round 1
Player 1:1
Player 2:3
Round 2
Player 1:2
Player 2:3
Round 3
Player 1:1
Player 2:1
Round 4
Player 1:3
Player 2:1
Round 5
Player 1:2
Player 2:1
Round 6

Player 1:2
Player 2:3
Round 7
Player 1:1
Player 2:3
Round 8
Player 1:2
Player 2:3
Round 9
Player 1:3
Player 2:3
Round 10
Player 1:1
Player 2:3

2.

Round 1
Player 1:1
Player 2:2
Round 2
Player 1:2
Player 2:3
Round 3
Player 1:1
Player 2:3
Round 4
Player 1:2
Player 2:1
Round 5

Player 1:3
Player 2:3
Round 6
Player 1:2
Player 2:2
Round 7
Player 1:1
Player 2:3
Round 8
Player 1:2
Player 2:3
Round 9
Player 1:3
Player 2:1
Round 10
Player 1:2
Player 2:1

3.

Round 1
Player 1:1
Player 2:3
Round 2
Player 1:2
Player 2:3
Round 3
Player 1:2
Player 2:1
Round 4
Player 1:3

Player 2:2
Round 5
Player 1:1
Player 2:2
Round 6
Player 1:3
Player 2:2
Round 7
Player 1:1
Player 2:3
Round 8
Player 1:2
Player 2:3
Round 9
Player 1:1
Player 2:2
Round 10
Player 1:1
Player 2:1

4.
Round 1
Player 1:1
Player 2:3
Round 2
Player 1:2
Player 2:3
Round 3
Player 1:1

Player 2:2
Round 4
Player 1:3
Player 2:2
Round 5
Player 1:2
Player 2:3
Round 6
Player 1:1
Player 2:3
Round 7
Player 1:2
Player 2:2
Round 8
Player 1:1
Player 2:1
Round 9
Player 1:3
Player 2:2
Round 10
Player 1:1
Player 2:1
5.
Round 1
Player 1:1
Player 2:1
Round 2
Player 1:2
Player 2:2

Round 3
Player 1:3
Player 2:3
Round 4
Player 1:1
Player 2:1
Round 5
Player 1:2
Player 2:2
Round 6
Player 1:3
Player 2:3
Round 7
Player 1:1
Player 2:3
Round 8
Player 1:3
Player 2:2
Round 9
Player 1:2
Player 2:1
Round 10
Player 1:2
Player 2:1

Output:

1.

```
The winner is player 1gokul@DESKTOP-5K1QIC5:/mnt/c/Users/user/Desktop$ ./a.out
Welcome to the game of Rock,Paper and Scissors
Enter 1 for ROCK        Enter 2 for PAPER       Enter 3 for SCISSORS
Round 1
Player 1:1
Player 2:3
Round 2
Player 1:2
Player 2:3
Round 3
Player 1:1
Player 2:1
Round 4
Player 1:3
Player 2:1
Round 5
Player 1:2
Player 2:1
Round 6
Player 1:2
Player 2:3
Round 7
Player 1:1
Player 2:3
Round 8
Player 1:2
Player 2:3
Round 9
Player 1:3
Player 2:3
Round 10
Player 1:1
Player 2:3
The score of player 1 is :200.000000
The score of player 2 is :50.000000
```

2.

```
Welcome to the game of Rock,Paper and Scissors
Enter 1 for ROCK        Enter 2 for PAPER       Enter 3 for SCISSORS
Round 1
Player 1:1
Player 2:2
Round 2
Player 1:2
Player 2:3
Round 3
Player 1:1
Player 2:3
Round 4
Player 1:2
Player 2:1
Round 5
Player 1:3
Player 2:3
Round 6
Player 1:2
Player 2:2
Round 7
Player 1:1
Player 2:3
Round 8
Player 1:2
Player 2:3
Round 9
Player 1:3
Player 2:1
Round 10
Player 1:2
Player 2:1
The score of player 1 is :200.000000
The score of player 2 is :50.000000
The winner is player 1gokul@DESKTOP-5K1QIC5:/mnt/c/Users/user/Desktop$ gcc gokul3.c
```

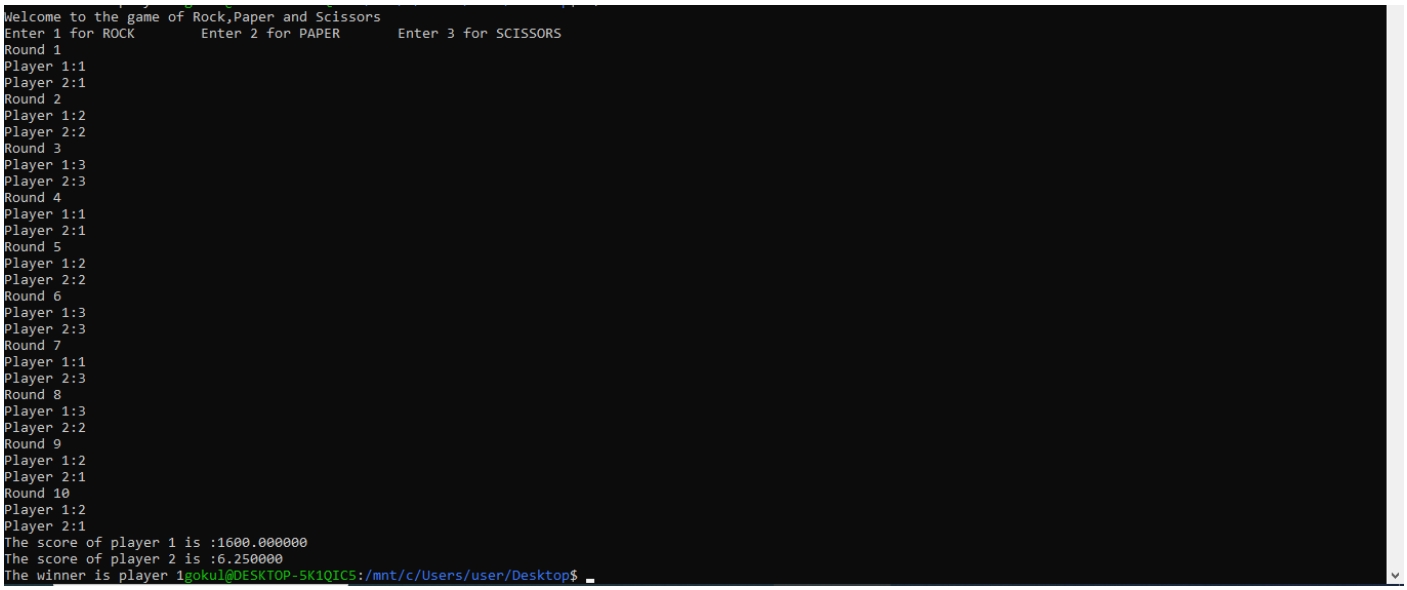
3.

```
The winner is player 1gokul@DESKTOP-5K1QIC5:/mnt/c/Users/user/Desktop$ ./a.out
Welcome to the game of Rock,Paper and Scissors
Enter 1 for ROCK        Enter 2 for PAPER       Enter 3 for SCISSORS
Round 1
Player 1:1
Player 2:3
Round 2
Player 1:2
Player 2:3
Round 3
Player 1:2
Player 2:1
Round 4
Player 1:3
Player 2:2
Round 5
Player 1:1
Player 2:2
Round 6
Player 1:3
Player 2:2
Round 7
Player 1:1
Player 2:3
Round 8
Player 1:2
Player 2:3
Round 9
Player 1:1
Player 2:2
Round 10
Player 1:1
Player 2:1
The score of player 1 is :200.000000
The score of player 2 is :50.000000
The winner is player 1gokul@DESKTOP-5K1QIC5:/mnt/c/Users/user/Desktop$
```

4.

```
Welcome to the game of Rock,Paper and Scissors
Enter 1 for ROCK        Enter 2 for PAPER       Enter 3 for SCISSORS
Round 1
Player 1:1
Player 2:3
Round 2
Player 1:2
Player 2:3
Round 3
Player 1:1
Player 2:2
Round 4
Player 1:3
Player 2:2
Round 5
Player 1:2
Player 2:3
Round 6
Player 1:1
Player 2:3
Round 7
Player 1:2
Player 2:2
Round 8
Player 1:1
Player 2:1
Round 9
Player 1:3
Player 2:2
Round 10
Player 1:1
Player 2:1
The score of player 1 is :200.000000
The score of player 2 is :50.000000
The winner is player 1gokul@DESKTOP-5K1QIC5:/mnt/c/Users/user/Desktop$
```

5.



Learning Outcomes:

From this assignment, I learn to use arrays in various problems and to work with these in programs.