Lab Assignment 3: Array and Structures: C Programming

CS-153 Computer Programming Lab

Autumn Semester, 2016, IIT Indore

Date: 17-08-16

Note: Write following programs in C language. Also note that this assignment will be evaluated by TA's in the upcoming labs of next week (22-08-16 onward) for each batch.

1. Write a program to compute the frequencies of all distinct numbers that appear in the array of size N. Read N and the actual numbers in the array from the keyboard before you compute the frequency.

2. Write a program to display Pascal's triangle. Pascal's triangle represents the *binomial coefficients**. The first few rows of Pascal's triangle are displayed below. Observe how a row is related to the row above it.

```
                1
              1   1
            1   2   1
          1   3   3   1
        1   4   6   4   1
      1   5   10  10  5   1
    1   6   15  20  15  6   1
```

Extra Point: How many arrays did you use? Try solving the problem with just one array.
* Example of *binomial coefficient* for 6th row is $(x + y)^5 = \mathbf{1}\, x^5 + \mathbf{5}\, x^4y + \mathbf{10}\, x^3y^2 + \mathbf{10}\, x^2y^3 + \mathbf{5}\, x\, y^4 + \mathbf{1}\, y^5$

3. Write a program to produce the following output:

```
A B C D E F G F E D C B A
A B C D E F     F E D C B A
A B C D E         E D C B A
A B C D             D C B A
A B C                 C B A
A B                     B A
A                         A
```

4. Create a structure to specify data on students given below: Roll number, Name, Department, Course, Year of joining Assume that there are not more than 450 students in the institute.

5. Create a structure to specify data of customers in a bank. The data to be stored is: Account number, Name, Balance in account. Assume maximum of 200 customers in the bank.

```
#include<stdio.h>
#include<conio.h>

int main(){
   int n, t, i, j, arr[30],len, halflen,flag=0,count=0;

   printf("Enter number of elements to insert in an array:\n");
   scanf("%d",&len);
   printf("Enter elements to insert in an array:\n");
   for(i=0;i<len;i++){
      scanf("%d",&t);
      arr[i]=t;
   }
   printf("\n");

   /*****************************/
   for(i=0;i<len;i++){                          //loop for pass 1 to len
      count=1;                                  //again initialize the count variable with 1
      for(j=i+1;j<=len-1;j++){
         if(arr[i]==arr[j] && arr[i]!='\0'){       //if same value of arr[i] find at index 'j' and it is
not null then
            count++;                            //increment the count of frequency for the value
            arr[j]='\0';                        //store null value to arr[j]
         }
      }
      if(arr[i]!='\0'){                         //if value of arr[i] is not null then
         printf("%d is %d times.\n",arr[i],count); //print the value if arr[i] and it frequency
count
      }
   }

   /*****************************/
   getch();
   return 0;
}
```

```
#include<stdio.h>
#include<conio.h>

int main()
{
   int array[10][10];
   int i, j, k, rows;
   printf("Enter the number of rows\n");
   scanf("%d",&rows);
   for(i=1; i<=rows; i++)              //create array of size rows
   {
         for(j=1; j<=i; j++)          //count of the values in a row will be same as the index 'i'
of the rows
         {
               if(j==1||j==i)       //if it is first value of a row or count of the values in a row
matches with the row index 'i'
               {
                  array[i][j]=1;   //then store value 1 in array[i][j]
               }
               else
               {
                  array[i][j]=array[i-1][i-j]+array[i-1][i-j+1];     //else sum the two values on
above row of
               }
         }
    }

    for(i=1; i<=rows; i++)                //print array of size rows
    {
         for(k=1; k<=rows-i; k++)       //adjust the spaces between printed values for the
index 1 to row-i
         {
               printf(" ");
         }
         for(j=1; j<=i; j++)           //print values form the index 1 to i
         {
               printf("%d ",array[i][j]);
         }
         printf("\n");
    }
    getch();
}
```

```
#include<stdio.h>
#include<conio.h>

main() {

    int i,j,k,l;

    for(i=71;i>=65;i--) {
        /* loop for printing ascending letters */

        for(j=65;j<=i;j++) {
            printf("%c ",j);
        }

        /* loop for making a space between patterns */

        for(k=i+1;k<=71;k++) {

            if(k==71)
            printf("  ");

            if(k<71)
            printf("    ");
        }

        /* loop to print descending letters */

        for(l=i;l>=65;l--) {

            if(l==71) {     /* to skip printing 'G' twice */
            continue;
            }

            printf("%c ",l);
        }

            printf("\n");
    }

    getch();

    return 0;
}
```

```
#include<stdio.h>
#include<conio.h>
#define N 450

struct students {
  int rlnm;
  char name[25];
  char dept[25];  /* structure defined outside of main(); */
  char course[25];
  int year;
  };

main() {
        /* main() */

        struct students s[N];
        int i, ch;

        /* taking input of 450 students in an array of structure */
        for (i = 0; i < N; i++) {

            printf("  Enter data of student %d\t\t\t\ttotal students: %d\n", i + 1, N);
            printf("*****************************\n\n");

            printf("enter rollnumber:  ");
            scanf("%d",  & s[i].rlnm);

            printf("\n\nenter name:  ");
            scanf(" %s",  & s[i].name);

            printf("\n\nenter department:  ");
            scanf("%s",  & s[i].dept);

            printf("\n\nenter course:  ");
            scanf("%s",  & s[i].course);

            printf("\n\nenter year of joining:  ");
            scanf("%d",  & s[i].year);

        }

        getch();
    }
```

```
#include<stdio.h>
#include<conio.h>
#define N 200

struct bank {
    int acn;
    char name[20];
    int bal;        /* defined out of main() */
    };

void main() {

       struct bank b[N];

       int i, ch, lw = 100, ch2, ac, am;


       for (i = 0; i < N; i++) {
          /* inputting customer data */

          printf("\tEnter information of customers \n");
          printf("\t*****************************\n\n");

          printf("enter account no.: ");
          scanf("%d",  & b[i].acn);

          printf("\n\nenter customer name: ");
          scanf("%s",  & b[i].name);

          printf("\n\nenter balance: ");
          scanf("%d",  & b[i].bal);

       }

       getch();
}
```