Jaypee University of Engineering and Technology,
Guna

[LAB ACTIVITY 2]

DATA STRUCTURES(18B11CI311)

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1. WAP to generate a Fibonacci series up to n terms.

Input

Input number of terms: 10

Output

Fibonacci series:

0, 1, 1, 2, 3, 5, 8, 13, 21, 34

Solution:

```
#include <iostream>
using namespace std;
int x1=0,x2=1,x3;

int fibonacci(int n){
    if(n>0){
        x3=x1+x2;
        x1=x2;
        x2=x3;
        cout<<""<<x3<<" ";
        fibonacci(n-1);
    }
}

int main(){
```

```
    int n;
    cout << "Enter the number of terms" << endl;
    cin >> n;
    cout<<"0 "<<"1 ";
    fibonacci(n-2);
    return 0;
}
```

Output:

```
Windows PowerShell
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PS C:\Users\hp\Desktop\lab files DS> cd "c:\Users\hp\Desktop\lab files DS\lab2\" ; if ($?) { g++ question1.cpp -o question1 } ; if ($?) { .\question1 }
Enter the number of terms
5
0 1 1 2 3
PS C:\Users\hp\Desktop\lab files DS\lab2>
```

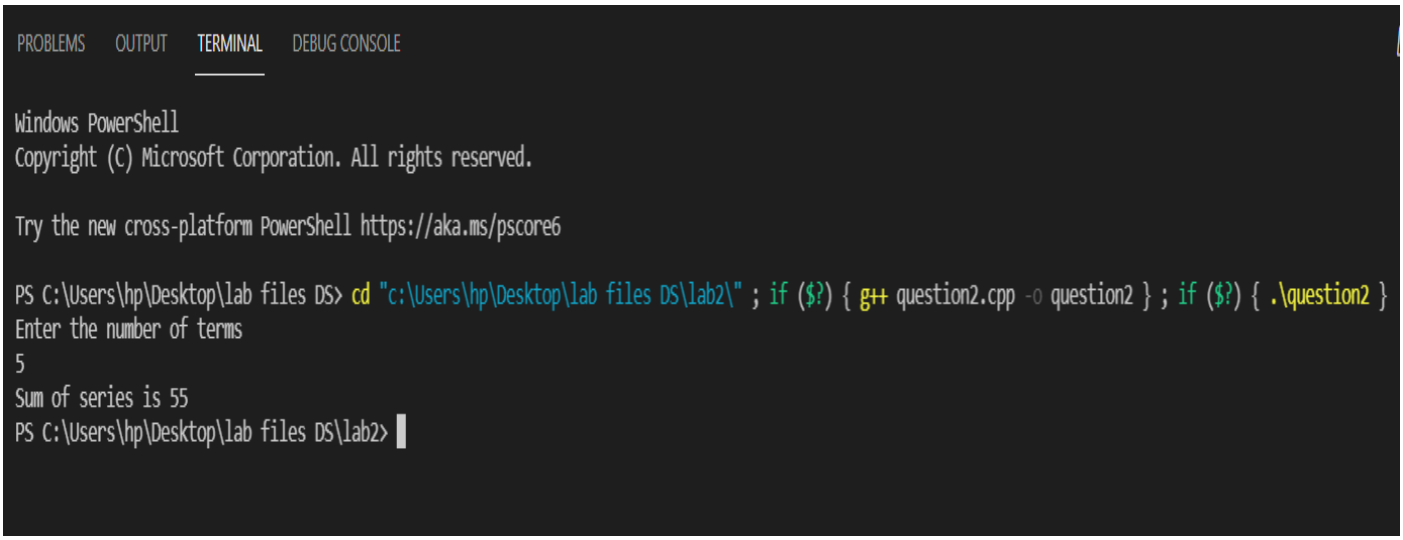
2. WAP to find out series sum of 1^2 + 2^2 + …. + n^2

Solution:

```
#include<iostream>
using namespace std;
int main(){
    int n,sum=0;
    cout<<"Enter the number of terms"<<endl;
    cin>>n;
    sum = (n * (n + 1) * (2 * n + 1 )) / 6;
```

```
    cout<<"Sum of series is "<<sum<<endl;
}
```

Output:



3. WAP to find out GCD of two numbers.

Solution:

```
#include<iostream>
using namespace std;

int main(){
    int a,b,result;
    cout<<"Enter the two numbers"<<endl;
    cin>>a>>b;
    for(int i=1;i<=a && i<=b;i++){
        if(a%i==0 && b%i==0){
            result = i;
        }
```

```
    }
    cout<<"GCD is "<<result<<endl;
}
```

Output:

4. WAP to multiply two numbers by using addition.

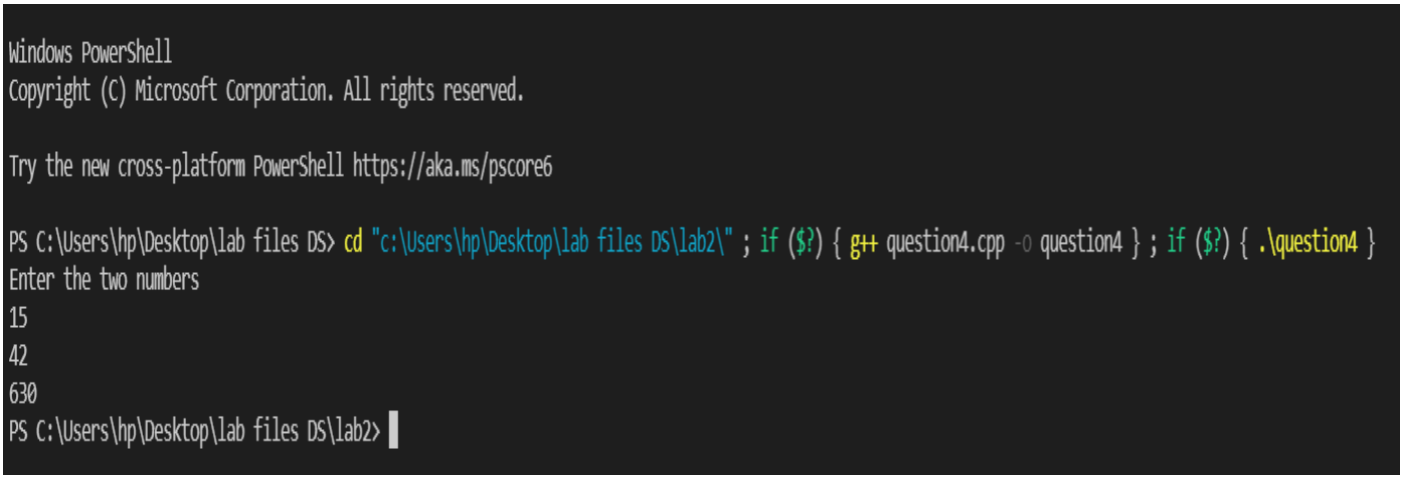
Solution:

```
#include<iostream>
using namespace std;

int main(){
    int a,b,result=0;
    cout<<"Enter the two numbers"<<endl;
    cin>>a>>b;
    for(int i=0;i<b;i++){
        result += a;
    }
```

```
    cout<<result<<endl;
}
```

Output:



5. WAP to convert a binary number into decimal.

Solution:

```
#include<stdio.h>
#include<math.h>
int main()
{
    int dig;
    printf("Enter Your Digits in the binary number \n");
    scanf("%d",&dig);
    int bin_num[dig],temp=0,rem,dec=0;
    printf("Enter Your binary number with a space \n");
    for(int i=0;i<dig;i++)
    {
        scanf("%d",&bin_num[i]);
```

```
    }
    for(int i=dig;i>0;i--)
    {
        rem=bin_num[dig-1];
        dec=dec+rem*(pow(2,temp));
        temp++;
        dig--;
    }
    printf("Decimal number is : %d",dec);
    return 0;
}
```

Output:

```
Windows PowerShell
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PS C:\Users\hp\Desktop\lab files DS> cd "c:\Users\hp\Desktop\lab files DS\lab2\" ; if ($?) { gcc question5.c -o question5 } ; if ($?) { .\question5 }
Enter Your Digits in the binary number

4
Enter Your binary number with a space
1 0 1 1
Decimal number is : 11
PS C:\Users\hp\Desktop\lab files DS\lab2>
```

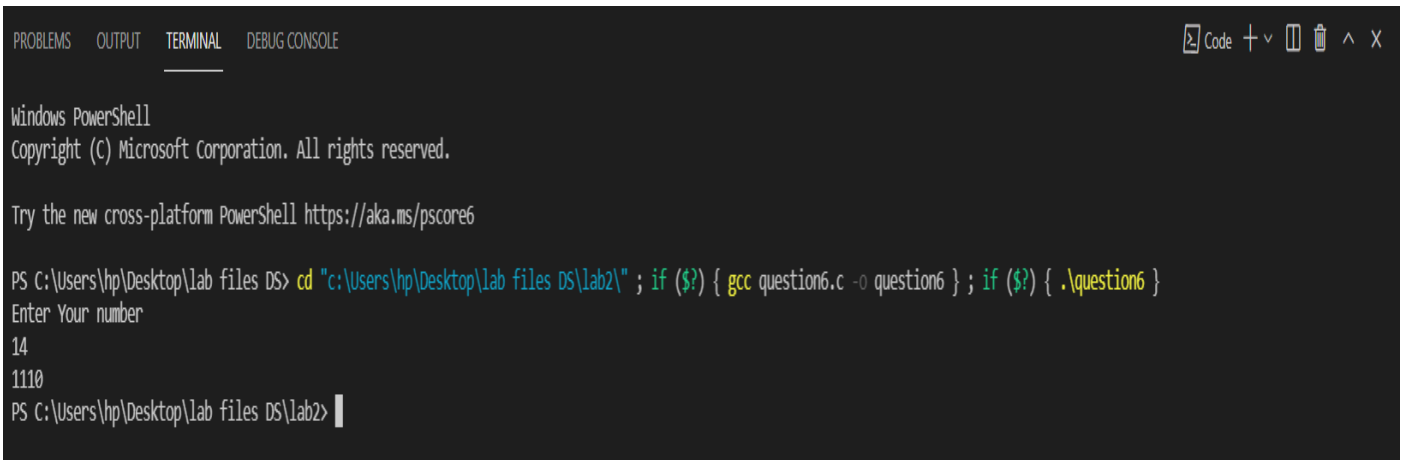
6. WAP to convert a decimal into binary number.

Solution:

```
#include <stdio.h>
int main()
{
    int i = 1, dec_num, rem[50];
```

```
    printf("Enter Your number \n");
    scanf("%d", &dec_num);
    while (dec_num != 0)
    {
        rem[i] = dec_num % 2;
        dec_num = dec_num / 2;
        i++;
    }
    for (int j = i - 1; j > 0; j--)
    {
        printf("%d", rem[j]);
    }
    return 0;
}
```

Output:



7. WAP to display lower triangular matrix of a given n by n size matrix entered by user.

Solution:

```
#include <stdio.h>


void main()
   {
  int arr1[10][10],i,j,n;
  float determinant=0;



       printf("\n\nDisplay the lower triangular of a given
matrix :\n");
       printf("-----------------------------------------
\n");



     printf("Input the size of the square matrix : ");
     scanf("%d", &n);
       printf("Input elements in the first matrix :\n");
       for(i=0;i<n;i++)
        {
           for(j=0;j<n;j++)
           {
```

```
            printf("element - [%d],[%d] : ",i,j);
            scanf("%d",&arr1[i][j]);
        }
    }
    printf("The matrix is :\n");
    for(i=0;i<n;i++)
    {
      for(j=0;j<n ;j++)
        printf("% 4d",arr1[i][j]);
       printf("\n");
    }

  printf("\nSetting zero in lower triangular matrix\n");
  for(i=0;i<n;i++){
     printf("\n");
     for(j=0;j<n;j++)
         if(i>j)
           printf("% 4d",arr1[i][j]);
  }
     printf("\n\n");
}
```

Output:

```
element - [2],[0] : 7
element - [2],[1] : 8
element - [2],[2] : 9
The matrix is :
  1  2  3
  4  5  6
  7  8  9

Setting zero in lower triangular matrix


  4
  7  8
```

8. WAP to find out n C r factor of given numbers.

Note: n Cr = n! /((n-r)!r!)

Solution:

```
#include <bits/stdc++.h>
using namespace std;
 void printNcR(int n, int r)
{

    long long p = 1, k = 1;

    if (n - r < r)
        r = n - r;

    if (r != 0) {
        while (r) {
            p *= n;
            k *= r;
```

```
            long long m = __gcd(p, k);

            p /= m;
            k /= m;

            n--;
            r--;
        }

    }

    else
        p = 1;


    cout << p << endl;
}

int main()
{
    int n,r;
    cout<<"Enter the value of n and r :\n";
    cin>>n>>r;

    printNcR(n, r);

    return 0;
}
```

Output:

```
Windows PowerShell
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PS C:\Users\hp\Desktop\lab files DS> cd "c:\Users\hp\Desktop\lab files DS\lab2\" ; if ($?) { g++ question8.cpp -o question8 } ; if ($?) { .\question8 }
Enter the value of n and r :
14
2
91
PS C:\Users\hp\Desktop\lab files DS\lab2>
```

Advanced Problems:

9. WAP for finding the element which appears maximum number of times in the array.

Solution:

```
#include <bits/stdc++.h>
using namespace std;
int mostFrequent(int arr[], int n)
{

    sort(arr, arr + n);

    int max_count = 1, res = arr[0], curr_count = 1;
    for (int i = 1; i < n; i++)
    {
        if (arr[i] == arr[i - 1])
            curr_count++;
```

```
        else
        {
            if (curr_count > max_count)
            {
                max_count = curr_count;
                res = arr[i - 1];
            }
            curr_count = 1;
        }
    }
    if (curr_count > max_count)
    {
        max_count = curr_count;
        res = arr[n - 1];
    }

    return res;
}
int main()
{
    int size;
    cout << "Enter the size: ";
```

```
    cin>>size;
    int arr[size];
    cout << "Enter the elements in array : \n";
    for (int i = 0; i < size; i++)
    {
        cin >> arr[i];
    }
    int n = sizeof(arr) / sizeof(arr[0]);
    cout << mostFrequent(arr, n);
    return 0;
}
```

Output:

```
Windows PowerShell
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PS C:\Users\hp\Desktop\lab files DS> cd "c:\Users\hp\Desktop\lab files DS\lab2\" ; if ($?) { g++ question9.cpp -o question9 } ; if ($?) { .\question9 }
Enter the size: 5
Enter the elements in array :
3 3 2 1 4
3
PS C:\Users\hp\Desktop\lab files DS\lab2>
```

10. Consider that you are given with a database of employee records (at least 5).

Each employee record having following information –

Emp_id(integer) Emp_name(string) Emp_city(string)

Assume that Emp_id is unique. Write a function for taking database and put

it in your header file. Use this function by including your own header file for

following questions.

{Use the structure for creating database}

a. Write a function to find out the employee record from this database on

the basis of Emp_id.

b. Write a function to sort the employee records on the basis of Emp_id.

c. Write a function to sort (alphabetically) the array of characters.

d. Write a function to count the number of employees in database.

e. Write a function to add 5 more records in database.