Problem-1: Given a sequence of positive integers, find the longest increasing and the longest decreasing subsequence of the sequence.

Solution:

```cpp
#include <bits/stdc++.h>

using namespace std;

void largest_increase(int arr[], int n)
{
   vector<int> lis[n];
   lis[0].push_back(arr[0]);

   for (int i = 1; i < n; i++)
   {
      for (int j = 0; j < i; j++)
      {
         if (arr[j] < arr[i] && lis[j].size() > lis[i].size())
            lis[i] = lis[j];
      }
      lis[i].push_back(arr[i]);
   }
   int j=0;
   for (int i = 0; i < n; i++)
   {
      if (lis[j].size() < lis[i].size())
         j = i;
```

```cpp
    }
    for (int i : lis[j])
    {
        cout << i << " ";
    }
}

void largest_decrease(int arr[], int n)
{
    vector<int> lds[n];
    lds[0].push_back(arr[0]);

    for (int i = 1; i < n; i++)
    {
        for (int j = 0; j < i; j++)
        {
            if (arr[j] > arr[i] && lds[j].size() > lds[i].size())
                lds[i] = lds[j];
        }
        lds[i].push_back(arr[i]);
    }
    int j = 0;
    for (int i = 0; i < n; i++)
    {
```

```cpp
            if (lds[j].size() < lds[i].size())

                j = i;

    }

    for (int i : lds[j])

        cout << i << " ";

}


main()

{

    int n;

    cout<<"Enter number of element: ";

    cin>>n;

    int arr[n];

    for(int i=0;i<n;i++)

    {

        cin>>arr[i];

    }

    cout<<"Largest Increase: ";

    largest_increase(arr, n);

    cout<<endl;

    cout<<"Largest Decrease: ";

    largest_decrease(arr, n);

    cout<<endl;

}
```

Problem-2: Given a positive integer n and a non-negative integer not exceeding n, find the number of r-permutations and r-combinations of a set with n elements.

Solution:

```cpp
#include<bits/stdc++.h>

using namespace std;

long long int fact(long long int x)

{

        long long int f=1;

        for(int i=2; i<=x; i++)

        { f=f*i; }

        return f;

}

 main()

{

        long long int n, r;

        long long int p, q;

        cout<<"Enter n : ";

        cin>>n;

        cout<<"Enter r : ";

        cin>>r;

        p=fact(n)/fact(n-r);

        q=p/fact(r);

        cout<<"NPR = "<<p<<endl;

        cout<<"NCR = "<<q<<endl;

}
```

Problem-3: Given a positive integer n. Expand the series (x+y)^n

Solution:

```cpp
#include<bits/stdc++.h>
using namespace std;
long long int fact(long long int x)
{
    long long int f=1;
        for(int i=2; i<=x; i++)
        {
                f=f*i;
        }
        return f;
}
long long int calculate_sum(long long int n,long long int r)
{
    long long int sum;
    sum = ((fact(n))/(fact(r)*fact(n-r)));
    return sum;
}
main()
{
    long long int x,y,n;
    cout<<"Enter value of n: ";
    cin>>n;
```

```cpp
        cout<<endl;
        for(int i=0;i<=n;i++){
            if(i==n){
                cout<<calculate_sum(n,i)<<" (x^"<<n-i<<") (y^"<<i<<")";
                break;
            }
            cout<<calculate_sum(n,i)<<" (x^"<<n-i<<") (y^"<<i<<") + ";
        }
        cout<<endl;
}
```