



Question 1 (10 points)

Write a program to ask the user for their name, and print “Hello, *name*” to the screen, where *name* is the name entered by the user. Use a standard string to read the name.

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

int main()
{
    string name;
    cout << "What is your name?" << endl;
    cin >> name;
    cout << "Hello, " << name << endl;
}
```

Question 2 (10 points)

Write a program to find the factorial of a number $n > 0$. The program should read the value of n from the user, and print the result to the screen. An error message should be displayed if the number is less than 0, and the program should end. **Remember:** $0! = 1$ and $n! = 1*2*3 \dots * n$ for $n \geq 1$

```
#include <iostream>
using namespace std;
int main() {
    int n;
    cout << "Enter number:" << endl;
    cin >> n;
    if(n < 0) {
        cout << "Error: Negative number" << endl;
        return -1; // or any number other than 0
    }
    else if (n == 0) return 1;

    long f = 1;
    for(int i = 1; i <= n; i++) {
        f *= i;
    }
    cout << "Factorial: " << f << endl;
}
```

Question 3 (10 points)

Write a program to find and print the maximum and minimum of an array of n numbers. The program should read the value of n and the numbers from the user, and print the maximum and minimum to the screen. Your program should work correctly for any numbers, i.e. do not assume minimum or maximum values for the numbers.

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

int main()
{
    int n;
    cout << "Enter number of numbers" << endl;
    cin >> n;
    int * x = new int[n];
    for(int i = 0; i < n; i++) {
        cin >> x[i];
    }
    int min, max;
    min = max = x[0];
    for(int i = 0; i < n; i++) {
        if(x[i] > max) max = x[i];
        else if(x[i] < min) min = x[i];
    }
    cout << "Max = " << max << endl;
    cout << "Min = " << min << endl;
}
```

Question 4 (10 points)

Using a loop (no functions), write a program to find element n of the Fibonacci series [1,1,2,3,5,8, ...]. The program should read the value of n from the user, and print the result to the screen. An error message should be displayed if the number is less than 0, and the program should end. **Hint:** Use an array of size $n+1$ with the first two elements set to 1

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

int main()
{
    int n;
    cout << "Enter number" << endl;
    cin >> n;
    if(n < 0) {
        cout << "Error";
        return -1;
    }
    else if (n <= 1) return 1;

    int * x = new int[n + 1];
    x[0] = x[1] = 1;
    for(int i = 2; i <= n; i++) {
        x[i] = x[i-1] + x[i-2];
    }
    cout << "Fib(n) = " << x[n] << endl;
}
```

Question 5 (10 points)

Write a program to reverse the characters of a standard string entered by the user and print the result to the screen, i.e. hello → olleh.

Solution 1:

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

int main()
{
    string s;
    cout << "Enter string" << endl;
    cin >> s;
    const int n = s.length();
    char str[n + 1];
    int j = 0;
    for (int i = n - 1; i >= 0; i--) {
        str[j++] = s[i];
    }
    str[j] = 0; // Add the null character at the end

    cout << str << endl;
}
```

Solution 2:

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

int main()
{
    string s;
    cout << "Enter string" << endl;
    cin >> s;
    const int n = s.length();
    char str[] = s.c_str();
    int start = 0, end = n - 1;
    while (start < end) {
        char temp = str[start];
        str[start] = str[end];
        str[end] = temp;
        start++;
        end--;
    }
    cout << str << endl;
}
```


Question 6 (10 points)

Print the output in each of the following cases. Explain your answer briefly

a. (1 point)

```
int x[] = {1,2,3,4};
int *p = x;
p++;
cout << *(p + 1);
```

Output: 3

Explanation: p points to element 1 of the array, so p+1 points to element 2 whose value is 3

b. (3 points)

```
int x = 3, y = 5;
int z = x++ - --y;
cout << x << "," << y << "," << z;
```

Output: 4,4,-1

Explanation: x is incremented to 4, y is decremented to 4, z takes the value of x before increment (3) minus the value of y after decrement (4)

c. (1 point)

```
int x = 4, y = 5;
float z = (x + y) / 2;
cout << z;
```

Output: 4

Explanation: $9/2 = 4$ since both $(x+y)$ are int and 2 is int, the result will also be int

d. (5 points)

```
const int n = 5
int x[] = {3,2,5,1,4};
for(int i = 0; i < n - 1; i++) {
    for(int j = i+1; j < n; j++) {
        if(x[i] > x[j]) swap(x[i], x[j]);
    }
}
for(int i = 0; i < n; i++) cout << x[i] << " ";
```

Output: 1,2,3,4,5

Explanation: The code sorts the array by going over the array element by element and comparing to all following elements (Bubble sort)