Lecture 10

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Practice Only Class

- We will practice some programming problems today.
- Mostly related to condition and loop

Problem 1

Find the factorial of a number.

The factorial of a positive number n, say 5, is denoted by 5! and is given by:

5! = 1 * 2 * 3 * 4 * 5 = 120

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

int main() {
    int n;
    long int factorial = 1;

    cout << "Enter an integer: ";
    cin >> n;

    for(int i = 1; i <= n; ++i) {
        factorial *= i;
    }

    cout << "Factorial of " << n << "! is " << factorial;

    return 0;
}
```

Problem 1 - extension

Find the factorial of a number.

If the user input is negative print an error message instead of computation.

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

int main() {
    int n;
    long int factorial = 1;

    cout << "Enter an integer: ";
    cin >> n;

    if (n < 0)
        cout << "Error! Factorial of a negative number doesn't exist.";
    else {
        for(int i = 1; i <= n; ++i) {
            factorial *= i;
        }
        cout << "Factorial of " << n << "! is " << factorial;
    }

    return 0;
}
```

Problem 2

Check Whether a Number is Prime or Not

A positive integer which is only divisible by 1 and itself is known as prime number.

For example: 13 is a prime number because it is only divisible by 1 and 13 but, 15 is not prime number because it is divisible by 1, 3, 5 and 15.

Note: 0 and 1 are not prime numbers.

```cpp
int main() {
  int n;
  bool is_prime = true;

  cout << "Enter a positive integer: ";
  cin >> n;

  // 0 and 1 are not prime numbers
  if (n == 0 || n == 1) {
    is_prime = false;
  }

  // loop to check if n is prime
  for (int i = 2; i <= n/2; i++) {
    if (n % i == 0) {
      is_prime = false;
      break;
    }
  }

  if (is_prime)
    cout << n << " is a prime number";
  else
    cout << n << " is not a prime number";

  return 0;
}
```

```cpp
int main() {
  int n;

  cout << "Enter a positive integer: ";
  cin >> n;

  // 0 and 1 are not prime numbers
  if (n == 0 || n == 1) {
    cout << n << " is not a prime number";
    return 0;
  }
  cout << "...here...\n";
  // loop to check if n is prime
  for (int i = 2; i <= n/2; i++) {
    if (n % i == 0) {
      cout << n << " is not a prime number";
    return 0;
    }
  }

  cout << n << " is a prime number";

  return 0;
}
```

Problem 3

Display Fibonacci Series

The Fibonacci sequence is a series where the next term is the sum of pervious two terms. The first two terms of the Fibonacci sequence is 0 followed by 1.

The Fibonacci sequence: 0, 1, 1, 2, 3, 5, 8, 13, 21

```cpp
int main() {
    int n, t1 = 0, t2 = 1, nextTerm = 0;

    cout << "Enter the number of terms: ";
    cin >> n;

    cout << "Fibonacci Series: ";

    for (int i = 1; i <= n; i++) {
        // Prints the first two terms.
        if(i == 1) {
            cout << t1 << ", ";
            continue;
        }
        if(i == 2) {
            cout << t2 << ", ";
            continue;
        }
        nextTerm = t1 + t2;
        t1 = t2;
        t2 = nextTerm;

        cout << nextTerm << ", ";
    }
    return 0;
}
```

Problem 4

Generate Fibonacci Sequence Up to a Certain Number

```
Enter a positive number: 50
Fibonacci Series: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34,
```

```
Enter a positive number: 150
Fibonacci Series: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144,
```

```cpp
int main() {
    int t1 = 0, t2 = 1, nextTerm = 0, n;

    cout << "Enter a positive number: ";
    cin >> n;

    // displays the first two terms which is always 0 and 1
    cout << "Fibonacci Series: " << t1 << ", " << t2 << ", ";

    nextTerm = t1 + t2;

    while(nextTerm <= n) {
        cout << nextTerm << ", ";
        t1 = t2;
        t2 = nextTerm;
        nextTerm = t1 + t2;
    }
    return 0;
}
```

Problem 5

Reverse an Integer Number

```
Enter an integer: 2345
Reversed number = 5432
```

n	n != 0	remainder	reversed_number
2345	true	5	0 * 10 + 5 = 5
234	true	4	5 * 10 + 4 = 54
23	true	3	54 * 10 + 3 = 543
2	true	2	543 * 10 + 2 = 5432
0	false	-	Loop terminates.

```cpp
int main() {
    int n, reversed_number = 0, remainder;

    cout << "Enter an integer: ";
    cin >> n;

    while(n != 0) {
        remainder = n % 10;
        reversed_number = reversed_number * 10 + remainder;
        n /= 10;
    }

    cout << "Reversed Number = " << reversed_number;

    return 0;
}
```

Problem 6

Check if an Array is Palindrome or not

A palindrome is a word, number, phrase, or other sequence of characters which reads the same backward as forward, such as **madam**

For array, **{3, 6, 0, 6, 3}** print "**Palindrome**"

For array, **{1, 2, 3, 4, 5}** print "**Not Palindrome**"

```cpp
int main() {
    int flag = 0;
    int arr[5] = {1,0,2,0,1};
    int size = 5;

    // Loop till array size n/2.
    for (int i = 0; i <= size / 2; i++) {
        // Check if first and last element are different
        // Then set flag to 1.
        if (arr[i] != arr[size - i - 1]) {
            flag = 1;
            break;
        }
    }

    // If flag is set then print Not Palindrome
    // else print Palindrome.
    cout << (string) (flag == 1 ? "Not Palindrome" : "Palindrome");

    return 0;
}
```