Iteration (Repetition) statements

Nested `for` statements

```
cout<<"i\tj\n";
for (int i = 1 ; i <= 3 ; i++)
  for (int j = 1 ; j <= 3 ; j++)
     cout << i << "\t" << j <<"\n";
```

The output is:

i	j
1	1
1	2
1	3
2	1
2	2
2	3
3	1
3	2
3	3

Example: Write a C++ program that prints the multiplication table.

```
#include <iostream>
using namespace std;
int main()
{
 cout << "\t\t\t\tMultiplication Table\n\n\n ";
 for ( int i = 1 ; i <= 10 ; i++ )
   cout << "\t" << i;
 for ( int i = 1 ; i <= 10 ; i++ )
  {
    cout<< "\n\n" << i << "\t";
    for ( int j = 1 ; j <= 10 ; j++ )
      cout << i*j << "\t";
  }
 return 0;
}
```

`break` and `continue` statements

The `break` statement is used to exit immediately from the loop in which it is contained.

The `continue` statement is used to skip the remaining statements in the body of the loop and then continue with the next iteration of the loop.

Example: break statement

```
#include <iostream>
using namespace std;
int main()
{
  for ( int i = 1 ; i <= 10 ; i++ )
     {
       if ( i == 5)
          break;
       cout<< i << " ";
     }
  cout << "\nBroke out of loop at i =  " << i
       << endl;
  return 0;
}
```

Example: continue statement

```
#include <iostream>
using namespace std;
int main()
{
  for ( int i = 1 ; i <= 10 ; i++ )
     {
       if ( i == 5)
          continue;
       cout<< i << " ";
     }
  cout << "\nUsed continue to skip printing 5"
<< endl;
  return 0;
}
```

We can also include two conditions or more to the `for` statement.

Example: Find Greatest Common Divisor (GCD) of two numbers in C++ program

```
#include <iostream>
using namespace std;
int main()
 {
  int f , s ,gcd;
  cout<<"Enter First Number : " ;   cin >> f ;
  cout<<"Enter Second Number: ";  cin >> s ;
  for(int i=1 ; i<= f  &&  i<= s ;i++)
    {
     if(f %i==0 && s %i == 0 )
        gcd=i;
    }
  cout<<"Greatest Common Divison (GCD):"<<gcd<<endl;
 return 0;
}
```

Exercise:

1. Write a C++ program that prints the following shape:

```
*
*  *
*  *  *
*  *  *  *
*  *  *  *  *
```

2. Write a program that computes the following equation:

$$y = 1 + \frac{1}{x} + \frac{2}{x^2} + \cdots + \frac{n}{x^n}$$

3. Write a C++ program that computes the following series:

$$z = x - \frac{x^2}{2!} + \frac{x^3}{3!} - \frac{x^4}{4!} + \cdots \frac{x^n}{n!}$$

4. An integer number is said to be a prime if it is divisible only by 1 and itself. Write a C++ program that determines if a number is a prime and use this program to determine and print all the prime numbers between 10 and 30.

5. Replace the following `for` loop with a corresponding `while` loop.

```
float a = 8;
for (int i = 0 ; i < 10 ; i ++)
{
  if (a = = 0) continue;
  cout << 1/a << end L;
  a = a - 1;
}
```