For Loop

1. For Loop

The keyword `for` is used to perform one or more statements many times and the number of times is known beforehand.

```cpp
int i;
for (i = 1; i <= 10; i++) {
    cout << i;
    cout << " banana" << endl;
}
cout << "the END" << endl;
```

Sample output:

```
1 banana
2 banana
3 banana
4 banana
5 banana
6 banana
7 banana
8 banana
9 banana
10 banana
the END
```

Notice in the next program segment, it is just like the previous one except without the braces around the first two `cout` commands.

```cpp
int i;
for (i = 1; i <= 10; i++)
    cout << i;
    cout << " banana" << endl;

cout << "the END" << endl;
```

The resulting output is:

```
12345678910 banana
the END
```

The reason is that the body of the for loop statement is just the next statement, which without the braces is just the first `cout` statement. However, with the braces, the body of the for loop is the entire block of statements inside the braces. To improve readability, the `cout banana` statement should line up with the for statement to show that it is outside of the loop like this:

```cpp
for (i = 1; i <= 10; i++)
    cout << i;
    cout << " banana" << endl;
```
2. Exercises (Problems with an asterisk are more difficult)

You need to use the FOR loop in all of the following problems.

1. Write a program to print out your name 10 times on one line.

2. Write a program to print out your name 10 times on separate lines.

3. Write a program to print out your name, address, and phone numbers 10 times on separate lines. The name, address and phone numbers are also on separate lines like this

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   4500 Riverwalk Parkway
   Riverside, CA 92515
   951-785-2054

4. Write a program to count from 1 to 100, i.e., prints out the numbers from 1 to 100.

5. Write a program to print out the even numbers from 1 to 100.

6. Write a program to print out the multiples of 7 from 1 to 100.

7. Write a program to print out 10 lines with each line containing the numbers from 1 to 10 using only one FOR loop.

8. * Write a program to print out 10 lines with each line containing the numbers from 1 to 10 using two FOR loops. You can use more than one cout command, but you only can have one cout that prints out only one number at a time, i.e., something like

   cout << i;

9. * Enter two numbers into two variables named c and r. Print out a rectangle using asterisks (*) having c columns and r rows. For example, if the user enters 5 for c and 2 for r, then the print out will be:

   ****
   ****

10. Write a program to input 5 numbers, and print these 5 numbers out anytime.

11. * Input a positive number n. After that have the user input n more numbers.

12. * Input a positive number n. After that have the user input n more numbers. Print out the average of the n numbers (not including the first number n).

13. Write a program to enter one number and then print out the multiplication table from 1 to 10 for that one number. For example, if you enter 3, then print out $1 \times 3 = 3$, $2 \times 3 = 6$, etc.
14. * Write a program to print out the multiplication table from 1 to 10 using one FOR loop as shown next:

\[
\begin{array}{cccccccccc}
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\
2 & 4 & 6 & 8 & 10 & 12 & 14 & 16 & 18 & 20 \\
3 & 6 & 9 & 12 & \ldots & & & & 30 \\
4 & 8 & 16 & \ldots & \ldots & & & & & \\
5 & & & & & & & & & \\
6 & & & & & & & & & \\
7 & & & & & & & & & \\
8 & & & & & & & & & \\
9 & 18 & 27 & \ldots & & & & & 90 \\
10 & 20 & 30 & \ldots & & & & & 100 \\
\end{array}
\]

15. ** Write a program to print out the multiplication table from 1 to 10 like above but using two FOR loops. You can use more than one cout command, but you only can have one cout that prints out only one number at a time, i.e., something like

\[
\text{cout} \ll i;
\]

16. *** Write a program to automatically generate the first 40 Fibonacci numbers. Look up Fibonacci numbers in Wikipedia.

17. Repeat question 16 but print out the first 100 Fibonacci numbers. What happened? What is the problem?