Loops

OS x OD
Whitney Nelson

Loops are Repetition Statements

- Allows us to execute statements multiple times
- Controlled by boolean statements (true/false)

Why We Use Loops

Loops make code more manageable and organized. As we learn more about programming and writing complex programs, loops will be an important element to understand and use.

What’s your daily routine?

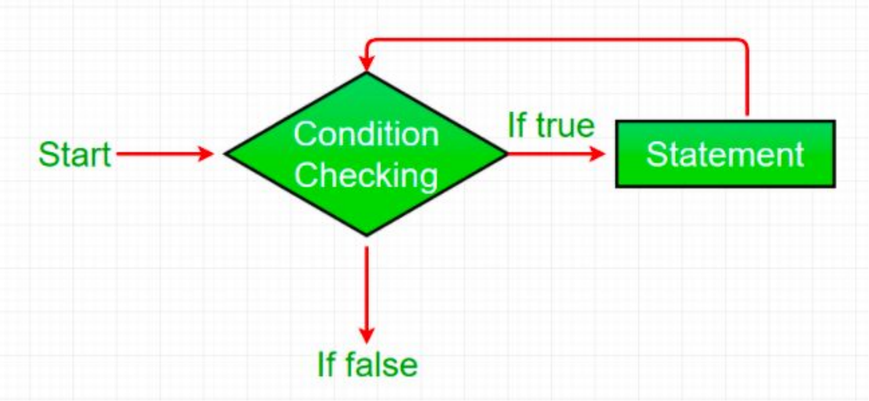
Types of Loops

- A *for* loop is a loop that runs for a preset number of times.
- A *while* loop is a loop that is repeated as long as an expression is true. An expression is a statement that has a value.
- A *do* while loop or repeat until loop repeats until an expression becomes false.
- An *infinite* or *endless* loop is a loop that repeats indefinitely because it has no terminating condition, the exit condition is never met or the loop is instructed to start over from the beginning. Although it is possible for a programmer to intentionally use an infinite loop, they are often mistakes made by new programmers.
- A *nested* loop appears inside any other for, while or do while loop.

While Loop

Like all loops, "while loops" execute blocks of code over and over again.The advantage to a while loop is that it will go (repeat) as often as necessary to accomplish its goal.

```
 while ( condition is true )
    do something
      % Note: the "something"
should eventually result
     % in the condition being
false
  end
```



Infinite Loops

If the action inside the loop does not modify the variables being tested in the loops condition, the loop will "run" forever.

Example 1

```
int y = 1
int x = 0
while ( y < 10 )
   x = x + 1;
  end
```

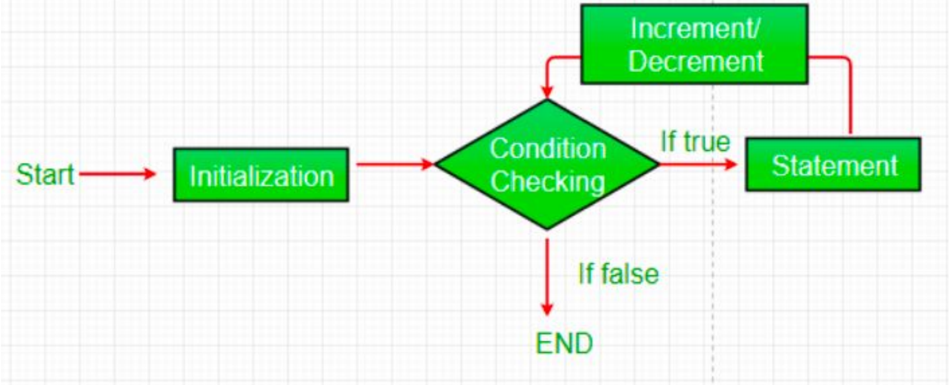
Example 2

```
while (  true )
   print('hello');
  end
```

For Loop

- A for loop is used for iterating over a sequence (that is either a list, a tuple, a dictionary, a set, or a string)
- The counter has the following three numeric values:
  - Initial counter value
  - Increment (the amount to add to the counter each time the loop runs)
  - Final counter value
- The loop ends when the counter reaches the final counter value, or, if there is an associated test condition, when the test condition is true.

For Loops Cont.



FOR loop syntax:

```
FOR (initial counter value,
final counter, increment)
Statement (Do Something)
```

What is the expected output?

```
FOR (x=1, x<5, x++)

PRINT “Hello World”
```

Output:

```
Hello World

Hello World

Hello World

Hello World
```

What is the expected output?

```
FOR (x=5, x>0, x--)

PRINT x
```

Output:

```
5

4

3

2

1
```

Write a program to print numbers from 1 to 10.

```
public class PrintNumbers{

    public static void main(String[] args){

        for(int i=1; i<=10; i++){

            System.out.println(i);

        }

    }

}
```

Two numbers are entered through the keyboard. Write a program to find the value of one number raised to the power of another. (Do not use Java built-in method)

```
import java.util.Scanner;
public class PowerDemo{
    public static void main(String[] args){
        Scanner console = new Scanner(System.in);
        int base;
        int power;
        int result = 1;

        System.out.print("Enter the base number ");
        base = console.nextInt();

        System.out.print("Enter the power ");
        power = console.nextInt();

        for(int i = 1; i <= power; i++{
          result *= base;
        }

        System.out.println("Result: "+ result);
    }
}
```

What’s wrong with the following while loop?

```
int counter = 0;

while {counter > 100}

if (counter % 2 == 1)

cout << counter << " is odd." << endl;

else

cout << counter << " is odd." << endl;

++counter; // same as: counter = counter + 1;
```

Describe the output produced by this while loop:

```
int K = 5;

int I = -2;

while (I <= K) {

I = I + 2;

--K; // same as: K = K - 1;

cout << (I + K) << endl;

}
```

Hackerrank Example

Java Loops I

https://www.hackerrank.com/challenges/java-loops-i/problem

Java Loops II

https://www.hackerrank.com/challenges/java-loops/problem

Draw flowchart diagram for the following programs using loop:

1. A program that display number 1 to 20
2. A program that display a person name x times.

Practice Problems

Java

http://www.beginwithjava.com/java/loops/questions.html

C++

https://www.codesdope.com/practice/cpp-loops/

Python

https://pynative.com/python-if-else-and-for-loop-exercise-with-solutions/

Additional Practice Problems

Write while loops to do the following:

- Repeatedly print the value of the variable xValue, decreasing it by 0.5 each time, as long as xValue remains positive.
- Print the square roots of the first 25 odd positive integers.
- Repeats a block of code as long as the user indicates they want it to.
- Drive the user crazy by insisting they re-enter a particular input no matter what they enter. Be creative...

Write a function that takes a list as a parameter and returns the number of items in the list.

Write a function that takes a list as a parameter and returns the reversed list.