



Computer Science Virtual Learning

HS Computer Science A

May 6th, 2020



Lesson: For Loops

Objective/Learning Target:

Understanding what a For Loop is and the how to apply it
using Java

What is a For Loop?

A for loop is usually used when you know how many times you want the loop to execute. A for loop has 3 parts: initialization, condition, and change. The parts are separated by semicolons (;).

Each of the three parts of a for loop declaration is optional (initialization, condition, and change), but the semicolons are not optional.

```
for (initialization; condition; change)
```

One of the strange things about a for loop is that the code doesn't actually execute where you see it in the declaration. The code in the initialization area is executed only one time before the loop begins, the condition is checked each time through the loop and the loop continues as long as the condition is true, at the end of each execution of the body of the loop the changes are done. When the loop condition is false execution will continue at the next statement after the body of the loop.

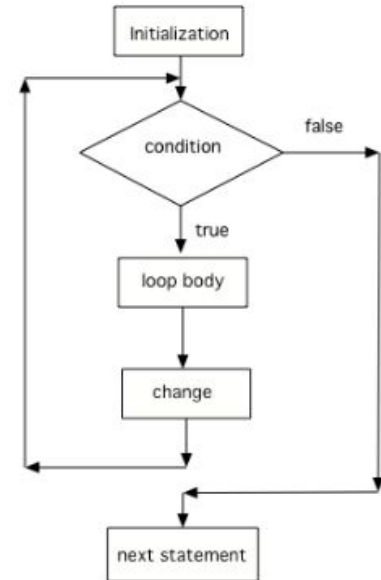
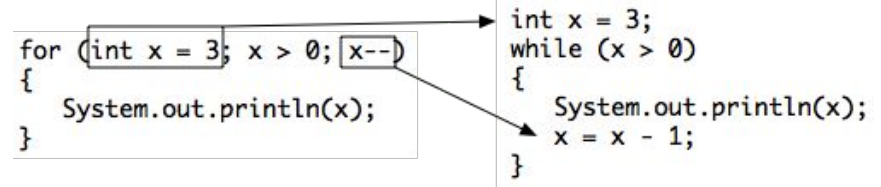


Figure 1: Flow in a for loop

What is a For Loop?

You can compare a while loop to a for loop to understand that a for loop actually executes like a while loop does if you use the while loop to repeat the body of the loop a specific number of times.

```
for (int x = 3; x > 0; x--)  
{  
    System.out.println(x);  
}  
  
int x = 3;  
while (x > 0)  
{  
    System.out.println(x);  
    x = x - 1;  
}
```



For Loops

How would it change if you changed line 11 to `i = 3`?

```
Run Original - 1 of 1
1 public class SongTest
2 {
3
4     public static void printPopSong()
5     {
6         String line1 = " bottles of pop on the wall";
7         String line2 = " bottles of pop";
8         String line3 = "Take one down and pass it around";
9
10        // loop 5 times (5, 4, 3, 2, 1)
11        for (int i = 5; i > 0; i--)
12        {
13            System.out.println(i + line1);
14            System.out.println(i + line2);
15            System.out.println(line3);
16        }
17    }
18 }
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```
5 bottles of pop on the wall
5 bottles of pop
Take one down and pass it around
4 bottles of pop on the wall

4 bottles of pop on the wall
4 bottles of pop
Take one down and pass it around
3 bottles of pop on the wall

3 bottles of pop on the wall
3 bottles of pop
Take one down and pass it around
2 bottles of pop on the wall

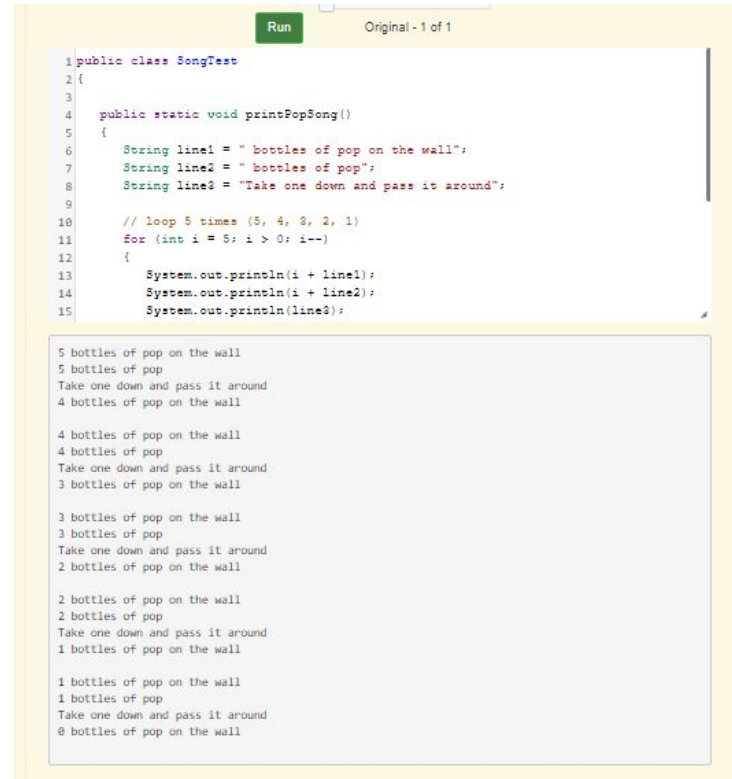
2 bottles of pop on the wall
2 bottles of pop
Take one down and pass it around
1 bottles of pop on the wall

1 bottles of pop on the wall
1 bottles of pop
Take one down and pass it around
0 bottles of pop on the wall
```

For Loops

The method `printPopSong` prints the words to a song. It initializes the value of the variable `i` equal to 5 and then checks if `i` is greater than 0. Since 5 is greater than 0, the body of the loop executes. Before the condition is checked again, `i` is decreased by 1. When the value in `i` is equal to 0 the loop stops executing.

The number of times a loop executes can be calculated by $(\text{largestValue} - \text{smallestValue} + 1)$. By the largest value I mean the largest value that allows the loop to execute and by the smallest value I mean the smallest value that allows the loop to execute. So in the code above the largest value is 5 and the smallest value that allows the loop to execute is 1 so this loop executes $(5 - 1 + 1 = 5 \text{ times})$.



```

1 public class SongTest
2 {
3
4     public static void printPopSong()
5     {
6         String line1 = " bottles of pop on the wall";
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9
10        // loop 5 times (5, 4, 3, 2, 1)
11        for (int i = 5; i > 0; i--)
12        {
13            System.out.println(i + line1);
14            System.out.println(i + line2);
15            System.out.println(line3);
16        }
17    }
18 }

```

```

5 bottles of pop on the wall
5 bottles of pop
Take one down and pass it around
4 bottles of pop on the wall

4 bottles of pop on the wall
4 bottles of pop
Take one down and pass it around
3 bottles of pop on the wall

3 bottles of pop on the wall
3 bottles of pop
Take one down and pass it around
2 bottles of pop on the wall

2 bottles of pop on the wall
2 bottles of pop
Take one down and pass it around
1 bottles of pop on the wall

1 bottles of pop on the wall
1 bottles of pop
Take one down and pass it around
0 bottles of pop on the wall

```



Check Your Understanding

1. What does the following code print?

```
for (int i = 3; i < 8; i++)  
{  
    System.out.print(i + " ");  
}
```

- A. 3 4 5 6 7 8
- B. 0 1 2 3 4 5 6 7 8
- C. 8 8 8 8 8
- D. 3 4 5 6 7

2. What does the following code print?

```
for (int i = 1; i <= 10; i++)  
{  
    System.out.print(i + " ");  
}
```

- A. 3 4 5 6 7 8
- B. 0 1 2 3 4 5 6 7 8 9
- C. 1 2 3 4 5 6 7 8 9 10
- D. 1 3 5 7 9

3. How many times does the following method print a *?

```
for (int i = 3; i <= 9; i++)  
{  
    System.out.print("*");  
}
```

- A. 10
- B. 6
- C. 7
- D. 9



For More Resources and to Check Answers

Go to: <https://runestone.academy/runestone/books/published/apcsareview/LoopBasics/IFor.html>