THE “FOR” LOOP

CS302 – Introduction to Programming
University of Wisconsin – Madison
Lecture 9

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Motivation for the “For” Loop

- You oftentimes need to execute a segment of code for a specific number of iterations. We can do this with a “while” loop if we really wanted to:

```
int count = 0;                  // 1. Initialize

while (count < 10)              // 2. Check Condition
{
        // DO STUFF
        count++;                // 3. Update
}
```

The “For” Loop

- The “For” loop provides a better way of doing this
- It groups together the initialization, condition, and update:

```
for (initialization; condition; update)
{
        statements
}
```

How Does It Work?

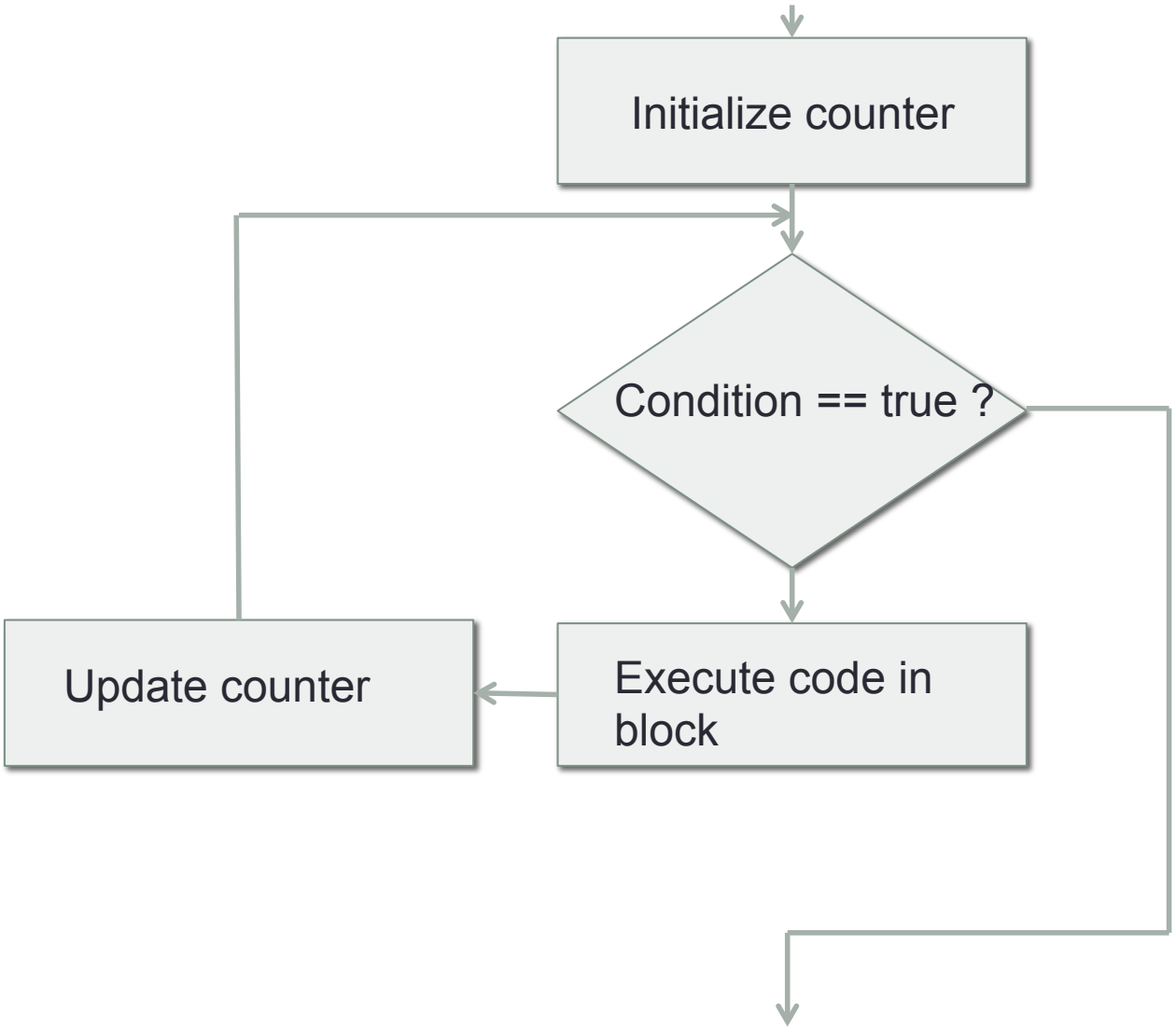
Before each iteration of the loop, check this condition. If it is true, then execute the loop's code

Initialize variable i to 0. This is executed ONCE!

After each iteration of the loop, update the variable

```
for ( int i = 0;    i < 10;     i++ )
{
        // DO STUFF
}
```

Flowchart of a “For” Loop



Examples 1

Using i++ for incrementing your value (pretty standard example of “for” loop):

```
for (int i = 0; i <= 5; i++)
{
        System.out.println(i);
}
```

Will print the following numbers:

0 1 2 3 4 5

Examples 2

Using i-- to decrement your value of i:

```
for (i = 5; i >= 0; i--)
{
        System.out.println(i);
}
```

Will print the following numbers:

5 4 3 2 1 0

Examples 3

Using i = i + 2 for a step size of 2:

```
for (i = 0; i < 9; i = i + 2)
{
        System.out.println(i);
}
```

Will print the following numbers:

0 2 4 6 8

Examples 4

This will result in an infinite loop:

```
for (i = 0; i != 9; i = i + 2)
{
        System.out.println(i);
}
```

Will print the following numbers:

0 2 4 6 8 10 11 12 14 … (infinity)

Examples 5

You can specify any rule for updating your "counter":

```
for (i = 1; i <= 20; i = i * 2)
{
        System.out.println(i);
}
```

Will print the following numbers:

1 2 4 8 16

Programming Exercise: Fibonacci Numbers

- Print the Fibonacci Sequence to the n^{th} element:
- Example:

$n = 6$

0

1

1

2

3

5

Programming Exercise: Asterisk Square

- Draw a square with sides of length n:
- Example:

n = 4

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

Programming Exercise: Asterisk Stairs

- Draw a staircase with asterisks using *n* steps
- Example:

n = 4

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

Programming Exercise: Asterisk Diamond

- Programming exercise P4.21 from Chapter 4
- Draw an asterisk diamond with side length of *n*
- Example:

n = 4

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

Cool CS Link of the Day

- 60 Minutes interview with Elon Musk, the CEO of PayPal, Tesla, and SpaceX:
- http://www.cbsnews.com/video/watch/?id=7410538n