



CS 113 – Computer Science I

Lecture 11 – Loops 2

Tuesday 02/27/2024

Announcements

- HW04 released
 - **Start Early!**
 - **Previous students reported this is the hardest hw**
- All homework grades released
 - **IN THE FUTURE, YOU WILL GET THE POINTS YOU SEE ON THE AUTOGRADER**
 - **DON'T UPLOAD CODE THAT DOESN'T COMPILE LOCALLY**

Agenda

- While loop review
- for loops

Convenience syntax: Assignment

Exercise: rewrite these with a more convenient syntax

sum = sum + 2

count = count + 1

count = count - 1

product = product * 2

divisor = divisor / 2

message = message + "lol!"

Convenience syntax:

```
i = i + 1;
```

```
i += 1;
```

```
i++;
```

(all equivalent)

Loops

- Easy way to repeat some computation
- Two kinds of loops:
 - While
 - For
- Loops repeat block of code until the condition becomes false

While loop

While a condition is true, run a block of code

```
while(condition) {  
    //run the code in this block  
}
```

Exercise: Non-recursive blast off

take a number from the user, count down from that number to 0 and then print "BLAST OFF!"

Tracing Loops - ArrayEq

```
int[] x = {1, 1, 1};
int[] y = {2, 1, 1};

//ASSUME X AND Y ARE THE SAME SIZE
boolean isEqual; //false

int idx = 0;
while (idx < x.length) {
    isEqual = x[idx] == y[idx];

    if (!isEqual) {
        break;
    }

    idx = idx + 1;
}
```

idx < x.length	isEqual	idx

Tracing Loops - ArrayEq

```
int[] x = {1,1,1};
int[] y = {1,2,1};

//ASSUME X AND Y ARE THE SAME SIZE
boolean isEqual; //false

int idx = 0;
while (idx < x.length) {
    isEqual = x[idx] == y[idx];

    if (!isEqual) {
        break;
    }

    idx = idx + 1;
}
```

idx < x.length	isEqual	idx
T	F	0
T	T	1
T	F	-

Exercise 1: **abecedarian**

A word is said to be “abecedarian” if the letters in the word appear in alphabetical order.

Write a method **isAlphaOrder** that takes a word (of any length) and returns a boolean indicating if the letters in the word appear in alphabetical order

Use a while loop

Exercise 2: Isopsephy

Find the numeric value of a word by summing the values of the characters (a = 1, b = 2,)

Use a while loop

Dec	Hex	Char
96	60	`
97	61	a
98	62	b
99	63	c
100	64	d
101	65	e
102	66	f
103	67	g
104	68	h
105	69	i
106	6A	j
107	6B	k
108	6C	l
109	6D	m
110	6E	n
111	6F	o
112	70	p
113	71	q
114	72	r
115	73	s
116	74	t
117	75	u
118	76	v
119	77	w
120	78	x
121	79	y
122	7A	z

Exercise: Write a program that computes powers of 2

Write a program, LoopPow2.java, that computes powers of twos. For example,

```
$ java LoopPow
Enter an exponent: 1
2 to the power of 1 is 2

$ java LoopPow
Enter an exponent: 4
2 to the power of 4 is 16
```

Agenda

- While loop review
- **for loops**

While loop rewritten as a for loop

```
int count = 0;
while (count < 6) {
    count += 1;
    //print count
}
```

```
for (int count = 0; count < 6; count += 1) {
    //print count
}
```

Example: For Loop

initialize

condition

update

```
for (int count = 0; count < 6; count++) {  
}
```


Exercise: Tracing loops

```
String pattern = "";  
for (int i = 0; i < 3; i++) {  
    pattern += "*";  
}  
System.out.println(pattern);
```

i < 3	i	pattern

Exercise: Tracing loops

```
String pattern = "";  
for (int i = 0; i < 3; i++) {  
    pattern += "*";  
}  
System.out.println(pattern);
```

$i < 3$	i	pattern
T	0	""
T	1	"*"
T	2	"**"
F	3	"***"

Exercise 1: Blast Off with a for loop

take a number from the user, count down from that number to 0 and then print "BLAST OFF!"

Exercise 2: **abecedarian**

A word is said to be “abecedarian” if the letters in the word appear in alphabetical order.

Write a method **isAlphaOrder** that takes a word (of any length) and returns a boolean indicating if the letters in the word appear in alphabetical order

Use a for loop

Exercise 3: Isopsephy

Find the numeric value of a word by summing the values of the characters (a = 1, b = 2,)

Use a for loop

Dec	Hex	Char
96	60	`
97	61	a
98	62	b
99	63	c
100	64	d
101	65	e
102	66	f
103	67	g
104	68	h
105	69	i
106	6A	j
107	6B	k
108	6C	l
109	6D	m
110	6E	n
111	6F	o
112	70	p
113	71	q
114	72	r
115	73	s
116	74	t
117	75	u
118	76	v
119	77	w
120	78	x
121	79	y
122	7A	z

Nested Loops

Code Example

```
1. for (int i = 0; i <= 3; i++) {  
2.     for (int j = 0; j <= 3; j++) {  
3.         System.out.print(i + ", " + j + " ");  
4.     }  
5.     System.out.println();  
6. }
```

Code Example

```
for (int i = 0; i <= 3 ; i++) {  
    for (int j = 0; j <= 3; j++) {  
        System.out.print(i + ", " + j + " ");  
    }  
    System.out.println();  
}
```

i	j	i <= 3	j <= 3

Code Example

```
for (int i = 0; i <= 3 ; i++) {  
    for (int j = 0; j <= 3; j++) {  
        System.out.print(i + ", " + j + " ");  
    }  
    System.out.println();  
}
```

i	j	i <= 3	j <= 3
0	0	T	T
0	1	T	T
0	2	T	T
0	3	T	T
0	4	T	F
1	0	T	T
1	1	T	T
1	2	T	T
1	3	T	T
1	4	T	F
2	0	T	T
...

Exercise: Days in a week

Write a program to print the “even days” in 3 weeks

Week: 1

Day: 2

Day: 4

Day: 6

Week: 2

Day: 2

Day: 4

Day: 6

Week: 3

Day: 2

Day: 4

Day: 6

Exercise: Print a square

```
$ java Square
```

```
Enter a size: 5
```

```
*****
```

```
*****
```

```
*****
```

```
*****
```

```
*****
```

```
$ java Square
```

```
Enter a size: 2
```

```
**
```

```
**
```

```
$ java Square
```

```
Enter a size: 1
```

```
*
```

What does this code print?

```
for (int i = 0; i < size; i++) {  
    for (int j = 0; j <= i; j++) {  
        System.out.print("* ");  
    }  
    System.out.println();  
}
```

Exercise: Spelling

Write a method called `canSpell` that takes two strings (letters and word) and checks whether the set of letters can spell the word.

Exercise: LoopPattern.java

```
$ java LoopPattern
```

```
Enter a length: 5
```

```
*_*_*
```

```
$ java LoopPattern
```

```
Enter a length: 10
```

```
*_*_*_*_*_*
```

```
$ java LoopPattern
```

```
Enter a length: 0
```

```
$ java LoopPattern
```

```
Enter a length: 1
```

```
*
```