

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) {</pre>
   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) {</pre>
   isEqual = x[idx] == y[idx];
   if (!isEqual) {
            break;
    idx = idx + 1;
```

idx < x.length	isEqual	idx
Т	F	0
Т	Т	1
Т	F	_

Exercise 1: abecedarian

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

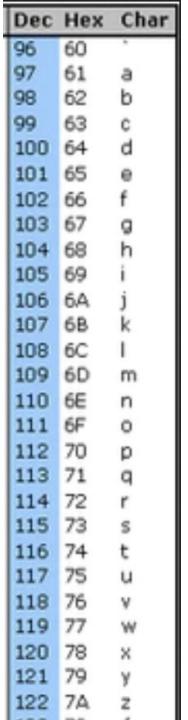
Write a method **isAlphaOrder** that takes a word (of any length) and returns a boolean indicating if the letters in the word appear in alphabetical order

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



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
}</pre>
```

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

Example: For Loop

initialize condition update

for (int count = 0; count < 6; count++) {</pre>

Exercise: Tracing loops

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

i < 3	i	pattern

Exercise: Tracing loops

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

i < 3	i	pattern
Т	0	un
Т	1	<i>((*)</i>
Т	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.

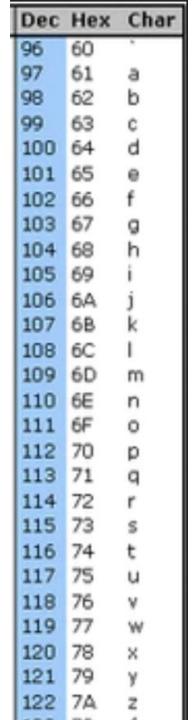
Write a method **isAlphaOrder** that takes a word (of any length) and returns a boolean indicating if the letters in the word appear in alphabetical order

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



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. }</pre>
```

Code Example

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

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();
}</pre>
```

i	j	i <= 3	j <= 3
0	0	Т	Т
0	1	Т	Т
0	2	Т	Т
0	3	Т	Т
0	4	Т	F
1	0	Т	Т
1	1	Т	Т
1	2	Т	Т
1	3	Т	Т
1	4	Т	F
2	0	Т	Т
•••	•••	•••	•••

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();
}</pre>
```

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
```