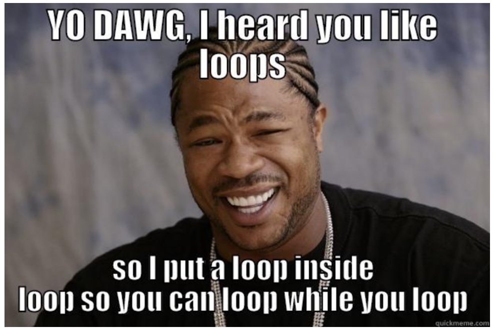
CS 1114

Introduction to Software Design

Spring 2017 - Michael Irwin


YO DAWG, I heard you like loops
so I put a loop inside loop so you can loop while you loop
quickmeme.com

How's Program 3?

Program 3 Notes

- The `act()` method should only perform one action
  - If your Greep goes from the tomato patch to the ship in a single act(), you’re doing it wrong
  - Makes it much easier to debug issues since you can see what’s going on
  - If a Greep gets stuck, others can still make progress

Idioms

- Represent a `conventional` way/pattern of structuring code
    - Programmers use them `by habit`
- They help you understand code written by others
- They help prevent errors

Example below... swapping the values `a` and `b` in three different languages

```
// Java
temp = a;
a = b;
b = temp;
```

```
# Perl
($a, $b) = ($b, $a);
```

```
# Python
a, b = b, a
```

For-each reminder

- Used when iterating through a collection (List, Sets, etc.)
- The loop is executed once for every element in the collection

```
List<String> names = new ArrayList<String>();
names.add("Bob");
names.add("Sally");

for (String name : names) {
  System.out.println("Hi " + name + "!");
}

// Prints out:
//   "Hi Bob!"
//   "Hi Sally!"
```

Many loops to do the same thing

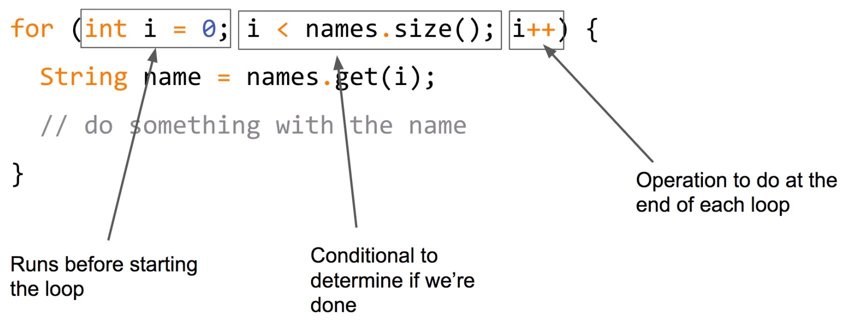
- Another construct to do looping
- All three loops below are equivalent, but structured very differently.

```
for (int i = 0; i < names.size(); i++) {
  String name = names.get(i);
  System.out.println("Hi " + name + "!");
}
```

```
int i = 0;
while (i < names.size()) {
  String name = names.get(i);
  System.out.println("Hi " + name + "!");
  i++;
}
```

```
for (String name : names) {
  System.out.println("Hi " + name + "!");
}
```

Breaking down the `for` loop



```java
for (int i = 0; i < names.size(); i++) {
  String name = names.get(i);
  // do something with the name
}
```

Runs before starting the loop
Conditional to determine if we're done
Operation to do at the end of each loop

Problem #1

Write a for loop that calculates the sum of all numbers between 1 and N.

Examples:

- `sumOneToN(5)` => 15
- `sumOneToN(7)` => 28

Problem #2

Write a loop that, when given a list of Strings, finds the first item that matches a substring. If no match is found, return `null`.

Examples:

- Using a list containing elements "Virginia Tech", "UVA", and "Duke"
    - `findFirstOccurrence(list, "uk")` => "Duke"
    - `findFirstOccurrence(list, "e")` => "Virginia Tech"
    - `findFirstOccurrence(list, "zz")` => null

Problem #3

Write a loop that, when given a list of Strings, finds the last item that matches a substring. If no match is found, return `null`.

Examples:

- Using a list containing elements "Virginia Tech", "University of Virginia", and "Virginia Commonwealth University"
  - `findLastOccurrence(list, "irginia")` => "Virginia Commonwealth University"
  - `findLastOccurrence(list, "T")` => "Virginia Tech"
  - `findLastOccurrence(list, "zz")` => null

Problem #4

- Given a List of positive numbers, find the largest number. If the list is empty, return -1.

Examples

- Given the list 2, 7, 3, 9, 1
    - `findLargest(list)` => 9

Problem #5

- Given a List of numbers, calculate the average as an integer. If the list is empty, return 0.

Example:

- Given the list 2, 7, 3, 7, 1
  - `findAverage(list)` => 4

Recap/Review

- **Use the idioms** (patterns) if possible
- Think about the **role** of each variable (do you need each of them?)
  - Accumulator, index, constant, etc.
- Always consider what happens if the loop does not repeat at all
  - Empty list, zero or negative limit, empty string, no matches found, etc.
- Ask yourself: should the loop end early?
  - Use `return`, if method ends too
  - Use `break`, if method has more work to do (must save result in a local variable, too)