CMSC 131
Object-Oriented Programming I

For Statement, Nested Loops

Dept of Computer Science
University of Maryland College Park

This material is based on material provided by Ben Bederson, Bonnie Dorr, Fawzi Emad, David Mount, Jan Plane
Overview

- For loops
- Nested Loops
- Expressions side effects
- Assignment operators
Types of loops

- Indefinite iteration
  - Usually tests something that is coming from outside the loop structure (e.g. input)
  - Needs to eventually change from true to false

- Counted iteration
  - Something that is controlled inside the loop
  - To start at some value and count up or down until some set ending point
**for loop**

- **for-loop**  The counter is set, the condition is tested before each body execution, the update is performed at the end of each iteration

  ```java
  for (initialization; condition; update) {
      <body>
  }
  ```

- Usually used for counted loops, but any of the parts can be left empty

- **Example**: ForExample.java
Infinite Loops

- Loops can run forever if condition never becomes false
- Be careful when programming loops!
  - Add statements for termination into loop body first
  - Often these statements are at end of body
  - e.g.

```java
while(i <= 10) {
    System.out.println(i);
    i = i + 1;
}
```
Nested Loops

- while, do-while are statement constructors (like if and if-else: they use blocks)
- Loops can thus be used inside other loops!
- **Example:** NestedWhile.java, NestedFor.java
- Let’s build a trace table for NestedWhile.java
About Local Variables

- When you declare local variables they are only accessible (in scope) within the block they are declared in
- **Example**: ScopeError.java
Expressions

- Java “expressions” that yield values
  e.g.
  
  \[
  x \\
  x + 1 - y \\
  x == y && z == 0 \\
  foo.equals(“cat”) \]

- Expressions have values of a specific type (int, boolean, etc.)

- Expressions can be assigned to variables, appear inside other expressions, etc.
Expressions and Side Effects

- Some expressions can also alter the values of variables e.g. $x=1$
- $x=1$ is an expression?
  - Yes!
  - Value is result of evaluation right-hand side of $=$
  - It also alters the value of $x$
- Such alterations are called side effects
Are the Following Legal?

- int x, y;
  x = y = 1;
  **Yes.** Result assigns 1 to x and to y
- int x = 0, y = 1;
  boolean b = false;
  if (b = (x <= y)){
    x = y;
  }
  **Yes.** Result assigns true to b and 1 to x
Other Assignment Operators

- Example: decrement operations (Basically equivalent to \( x = x - 1 \))
  - \( --x \) “Pre-decrement”
    - Decrements \( x \), returns the new value of \( x \)
  - \( x-- \) “Post-decrement”
    - Decrements \( x \), returns the old value of \( x \)
      - “return \( x \), then decrement it”

- General modification by constant
  - General form: \(<\text{var}> <\text{op with=} \text{constant}>\>
  - Examples
    - \( x += 2 \) equivalent to \( x = x + 2 \)
    - \( x -= 2 \) equivalent to \( x = x - 2 \)
    - \( x *= 2 \) equivalent to \( x = x * 2 \)
    - \( x /= 2 \) equivalent to \( x = x / 2 \)
Examples

- Let’s try to draw shapes with asterisks
  - Horizontal line
  - Vertical line
  - Square
  - Triangle of asterisks