For Statement, Nested Loops

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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
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

\[ x \]
\[ x + 1 - y \]
\[ x == y && z == 0 \]
\[ \text{foo.equals(“cat”)} \]

• 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