Loops (while, do while)

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

- while loops
- do while
- scope
Loops in Java

- So far our programs execute every program statement at most once
- Often, we want to perform operations more than once
  - “Sum all numbers from 1 to 10”
  - “Repeatedly prompt user for input”
- Loops allow statements to be executed multiple times
- Loop types in Java:
  - while
  - do-while
  - for
- Called “iteration”
while and do-while Loops

- **while** and **do-while** loops contain
  - A statement, called the body
  - A boolean condition
  - Idea $\rightarrow$ the body is executed one more time as long as the condition is true

- **while-loop** $\rightarrow$ The condition is tested before each body execution
  ```java
  while (condition) {
    body
  }
  ```

- **do-while-loop** $\rightarrow$ The condition is tested after each body execution
  ```java
  do{
    body
  } while (condition);
  ```

- **Main difference:** do-while loop bodies always executed at least once because it is “bottom tested” rather than “top tested”
- No need for {} if only one statement is executed (you should always use them regardless the number of statements 😊)
- **Example:** SimpleWhile.java, SimpleDoWhile.java, AskAge.java
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
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
  - How to stop a loop in Eclipse?
- **Example:** FastArithmetic.java
Variables, Blocks and Scoping

- Variables can be declared anywhere in a Java program
- When are the declarations active?
  - After they are executed
  - *Only inside the block in which they are declared*
- **Scope rules** formalize which variable declaration are active when
  - **Global variables** $\rightarrow$ scope is entire program
  - **Local variables** $\rightarrow$ scope is a block
Trace Tables

- Mechanism to keep track of values in a program
- Allows you to understand the program behavior
- Let’s create a trace table for one of our examples
Combination of Statements

- You can have any combination of conditionals and iteration statements
  - Conditionals inside of loops
  - Conditionals inside conditionals
  - Loops inside conditionals
  - Loops inside loops
JOptionPane

- JOptionPane
  - Provides dialog boxes
  - We need "import javax.swing.*";
- showMessageDialog
  - For output
- Example: DaysCalculator.java