CIS 110: Introduction to Computer Programming

Lecture 12 Authoring Solid Helper Methods (§ 4.4)

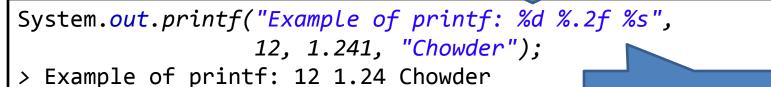
Outline

- Authoring Helper Methods
 - Pre- and post-conditions
 - Exceptions

System.out.printf

• An alternative to println/print that lets you *format* the output.

A format specifier. A placeholder for a thing to print.



Specifiers have the form: %<formatting><type>

Need to provide one argument per format specifier. They are consumed in-order.

See p. 260 of the book for more information about format specifiers.

Helper Methods

See PalindromeChecker.java

Sample Problem

 Problem: write a program that reads in a String from the user, checks to see if that String is a palindrome, and informs the user of the results of the check.

Example output
> Enter a string to check:
> abba
> The reverse of the line is: abba
> The line is a palindrome!

Our Methodology

- 1. Try some example inputs to get a feel for the problem.
- 2. Start with a skeleton of the solution.
- 3. Decompose the problem into sub-problems.
- 4. Make helper methods to solve the subproblems.
- 5. Use those helper methods to solve your main problem.

Helper Methods

- Critical pieces of code that *do the work*.
 - Decomposition allows us to *identify these methods* and focus our time on getting them right.

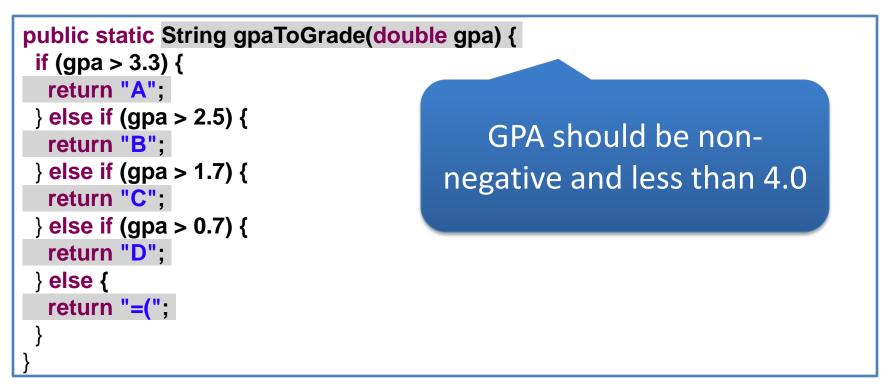
public static String reverse(String s) {

```
String ret = "";
for (int i = 0; i < s.length(); i++) {
  ret = s.charAt(i) + ret;
}</pre>
```

return ret;

Restrictions on Method Parameters

• Like user input, sometimes we wish to limit what we can pass into a method.



Pre- and Post-Conditions

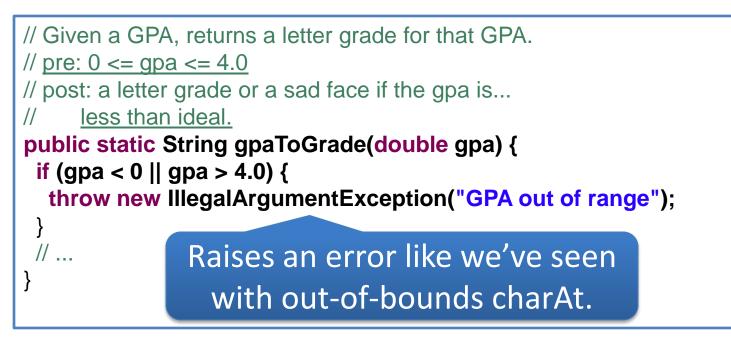
- Pre- and post-conditions formalize these restrictions.
 - Pre-condition: a requirement on the parameters that must be true for the method to work correctly.
 - *Post-condition*: a guarantee made by the method if all of its pre-conditions are met.

// Given a GPA, returns a letter grade for that GPA.
// pre: 0 <= gpa <= 4.0
// post: a letter grade or a sad face if the gpa is...
// less than ideal.
public static String gpaToGrade(double gpa) {
// ...
}</pre>

Exceptions

• We can use *exceptions* to enforce the precondition instead of trusting the programmer!

– Example of *defensive programming*.



Anatomy of Throwing an Exception

throw *raises the exception*, immediately exiting successive methods until the entire program is aborted. An informative message to be printed by the Exception

throw new IllegalArgumentException("GPA out of range");

"new ..." creates a new object of type IllegalArgumentException.

We'll learn how to *catch* exceptions and author our own later in the course.

Control Flow in a Method

- Both throw and return allow us to exit a method prematurely.
 - throw: with an error
 - return: with a value
- Aside: we can return from methods that don't return values to immediately stop execution.

```
public static void printlfPositive(int x) {
    if (x < 0) {
        return;
    }
    System.out.println(x + " is positive!");
}</pre>
```