Programs and Design Recipes
Last Lecture

- Why we chose DrScheme
- Mathematical numbers
- Numbers on the machine
- Our first program
- Step by step evaluation
- Things we can and can’t do with what we know of DrScheme
Today’s Goals

- Programs can go wrong in different ways:
  - Syntactically
  - At runtime
- Ingredients of a design recipe
  - Components
  - Order
Let's Take a Closer Look at Programs

- A syntactically correct program can be
  - An atom, like a number 17, "rabbit", of a variable \textit{radius}, or
  - A compound program,
    - starting with \( (\)
    - followed by \textit{operator (variable name)}
    - then one (for now) or more \textit{programs}
    - and, finally, ending with \( )\)

- Syntax errors: \textit{3) , (3 + 4) , [+ 3 1], )+(, ...}
Runtime Errors

- Happen when operators are “surprised”
- Consider the following examples:
  - (/ 1 0)
  - (sqrt 1 2 3 4)
  - (rabbit 17)
- Try things like that in DrScheme, and make a mental note of the error messages you get back.
Our First Design Recipe

;; Contract: area-of-ring : number number -> number
;; Purpose: to compute the area of a ring whose radius is
;; outer and whose hole has a radius of inner
;; Example: (area-of-ring 5 3) should produce 50.24
;; Definition: [refines the header]
(define (area-of-ring outer inner)
  (- (area-of-disk outer)
     (area-of-disk inner)))

;; Tests:
(area-of-ring 5 3)
;; expected value
50.24
Contract (a), Purpose (b), and Examples (c)

- area-of-rectangle:
  - a) Area-of-rectangle: p-real p-real -> p-real
  - b) To compute area of a rectangle
  - c) Use several!
    - a) (= (area-of-rectangle 2 3) 6)
    - b) (= (area-of-rectangle 3 2) 6)
    - c) (= (area-of-rectangle 3 3) 9)
    - d) (= (area-of-rectangle 2 5) 10) …
Always write examples before definition!

- Compare this to the scientific method
- If you don't, you become a "Hacker"
  - Not good 😞

To get full credit for assignments, always follow recipe carefully, and submit all parts of recipe.