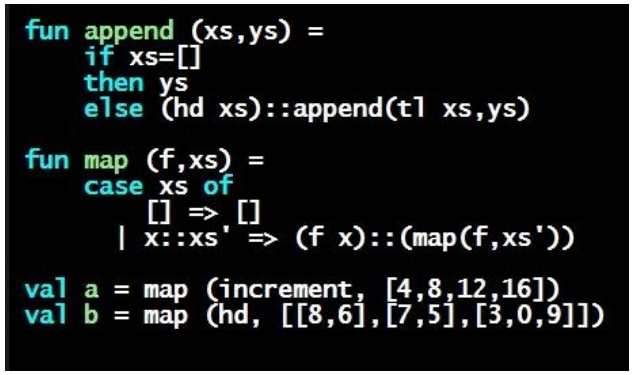

```
fun append (xs,ys) =
    if xs=[]
    then ys
    else (hd xs)::append(tl xs,ys)

fun map (f,xs) =
    case xs of
        [] => []
      | x::xs' => (f x)::(map(f,xs'))

val a = map (increment, [4,8,12,16])
val b = map (hd, [[8,6],[7,5],[3,0,9]])
```

Programming Languages

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2013

Introduction to Ruby

Ruby logistics

- Next two sections use the Ruby language
  - http://www.ruby-lang.org/
  - Installation / basic usage instructions on course website
    - Emacs in lectures, but many editors support Ruby well
    - Version 1.9.x required, but differences not so relevant

- Excellent documentation available, much of it free
  - So may not cover every language detail in course materials
  - http://ruby-doc.org/
  - http://www.ruby-lang.org/en/documentation/
  - Particularly recommend “Programming Ruby 1.9, The Pragmatic Programmers’ Guide”
    - Not required and not free

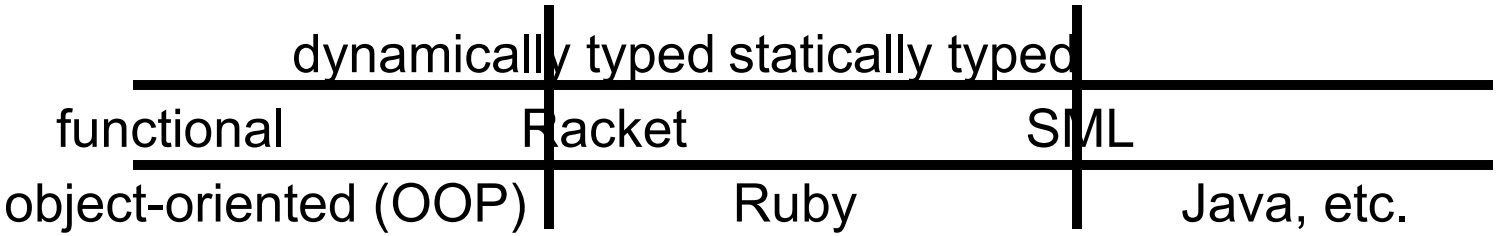
Ruby: Our focus

- *Pure object-oriented*: *all* values are *objects* (even numbers)
- *Class-based*: Every object has a class that determines behavior
  - Like Java, unlike Javascript
  - *Mixins* (neither Java interfaces nor C++ multiple inheritance)
- *Dynamically typed*
- Convenient *reflection*: Run-time inspection of objects
- Very *dynamic*: Can change classes during execution
- *Blocks* and libraries encourage lots of closure idioms
- Syntax, scoping rules, semantics of a "*scripting language*"
  - Variables "spring to life" on use
  - Very flexible arrays

Ruby: Not our focus

- Lots of support for string manipulation and regular expressions
- Popular for server-side web applications
  - Ruby on Rails
- Often many ways to do the same thing
  - More of a “why not add that too?” approach

Where Ruby fits



Note: Racket also has classes and objects when you want them

- In Ruby everything uses them (at least implicitly)

Historical note: *Smalltalk* also a dynamically typed, class-based, pure OOP language with blocks and convenient reflection

- Smaller just-as-powerful language
- Ruby less simple, more “modern and useful”

Dynamically typed OOP helps identify OOP's essence by not having to discuss types

A note on the homework

Next homework is about understanding and extending an *existing* program in an *unfamiliar* language

- Good practice
- Quite different feel than previous homeworks
- *Read* code: determine what you do and do not (!) need to understand

Homework requires the Tk graphics library to be installed such that the provided Ruby code can use it

Getting started

- See **`.rb`** file for our first program
  - (There are much shorter ways to write the same thing)
- Can run file **`foo.rb`** at the command-line with **`ruby foo.rb`**
- Or can use **`irb`**, which is a REPL
  - Run file **`foo.rb`** with **`load "foo.rb"`**