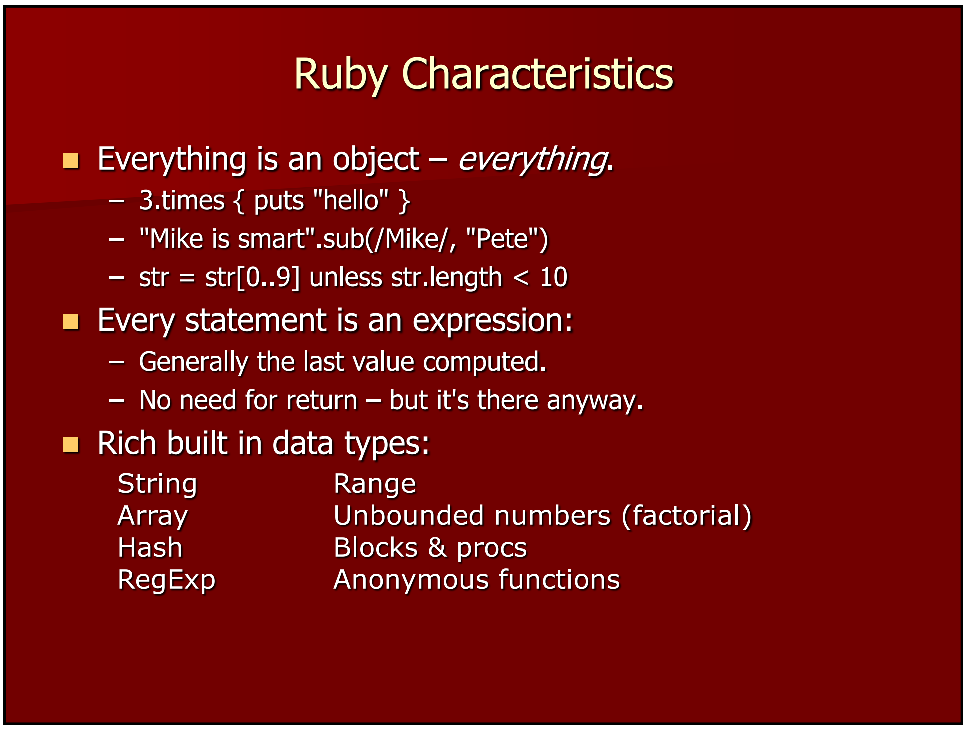
Introduction to Ruby

4010-350
Personal Software Engineering

A Bit of History

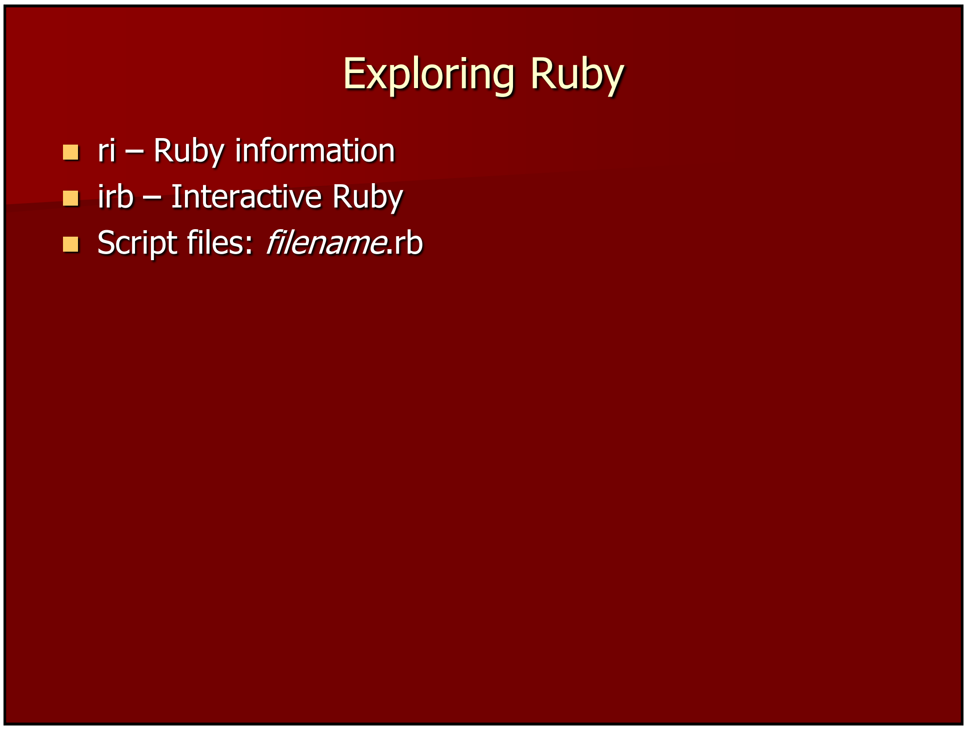
- Yukihiro "Matz" Matsumoto
  - Created a language he liked to work in.
  - Been around since mid-90s.
  - Caught on in early to mid 00s.
- Lineage
  - Smalltalk – dynamic, OO-centric
  - CLU – yield to blocks
  - Pascal – basic concrete syntax
  - AWK / Python / Perl – scripting & regular expressions
  - Matz's own predilections



Ruby Characteristics

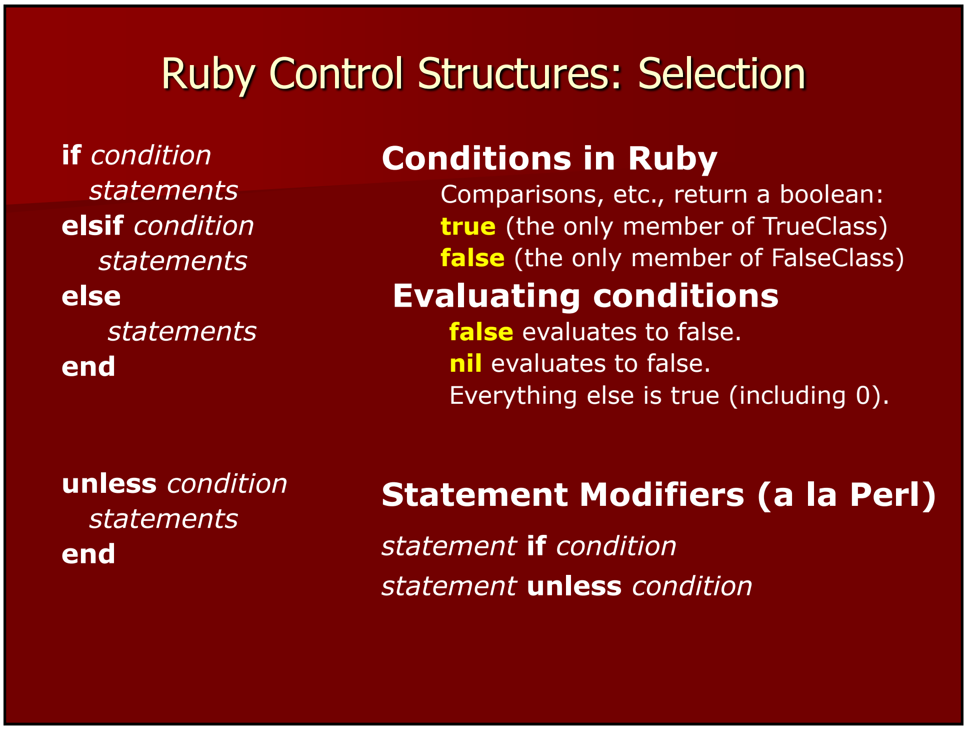
- Everything is an object – *everything*.
  - 3.times { puts "hello" }
  - "Mike is smart".sub(/Mike/, "Pete")
  - str = str[0..9] unless str.length < 10
- Every statement is an expression:
  - Generally the last value computed.
  - No need for return – but it's there anyway.
- Rich built in data types:

String	Range
Array	Unbounded numbers (factorial)
Hash	Blocks & procs
RegExp	Anonymous functions



Exploring Ruby

- ri – Ruby information
- irb – Interactive Ruby
- Script files: *filename*.rb



Ruby Control Structures: Selection

```
if condition
   statements
elsif condition
    statements
else
     statements
end
```

```
unless condition
   statements
end
```

Conditions in Ruby

Comparisons, etc., return a boolean:
true (the only member of TrueClass)
false (the only member of FalseClass)

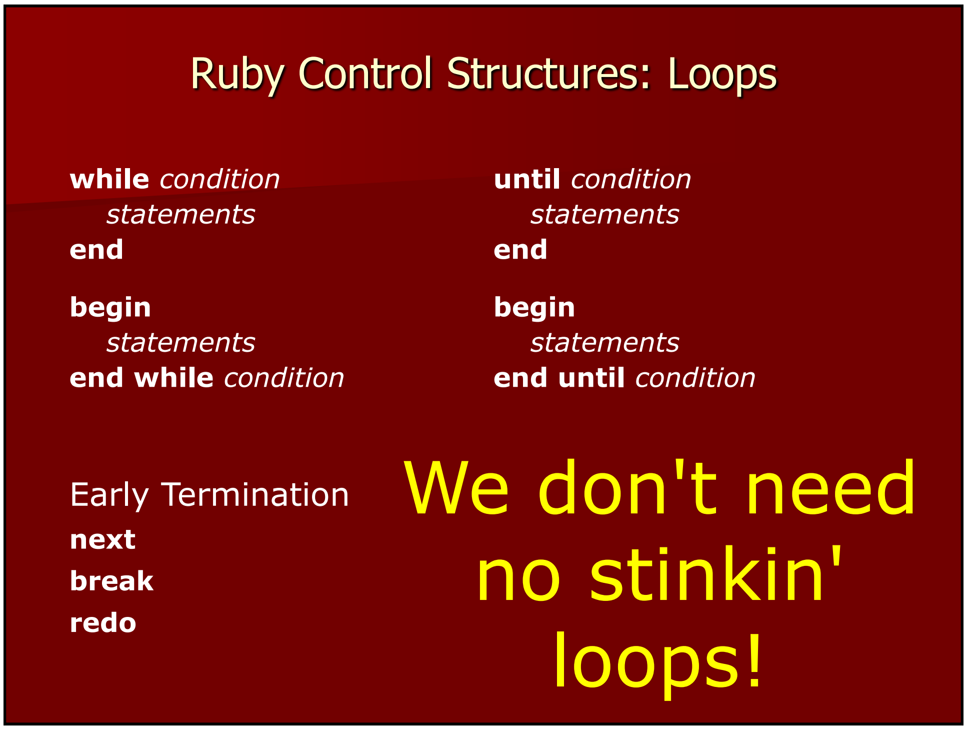
Evaluating conditions

false evaluates to false.
nil evaluates to false.
Everything else is true (including 0).

Statement Modifiers (a la Perl)

statement **if** *condition*

statement **unless** *condition*



Ruby Control Structures: Loops

```
while condition
    statements
end
```

```
until condition
    statements
end
```

```
begin
    statements
end while condition
```

```
begin
    statements
end until condition
```

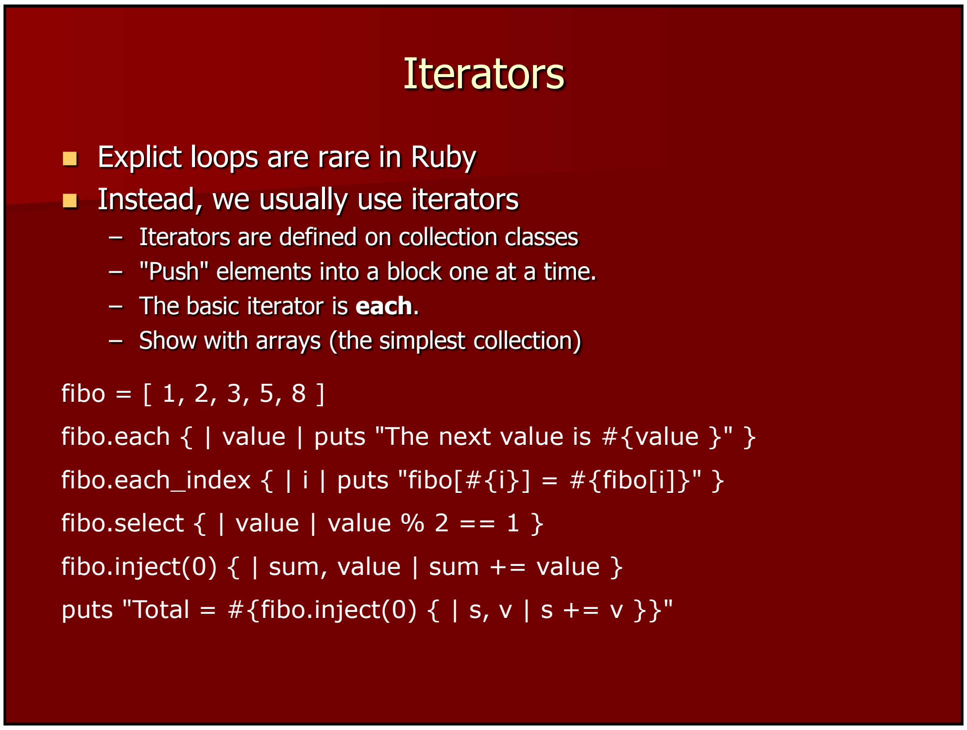
Early Termination

next

break

redo

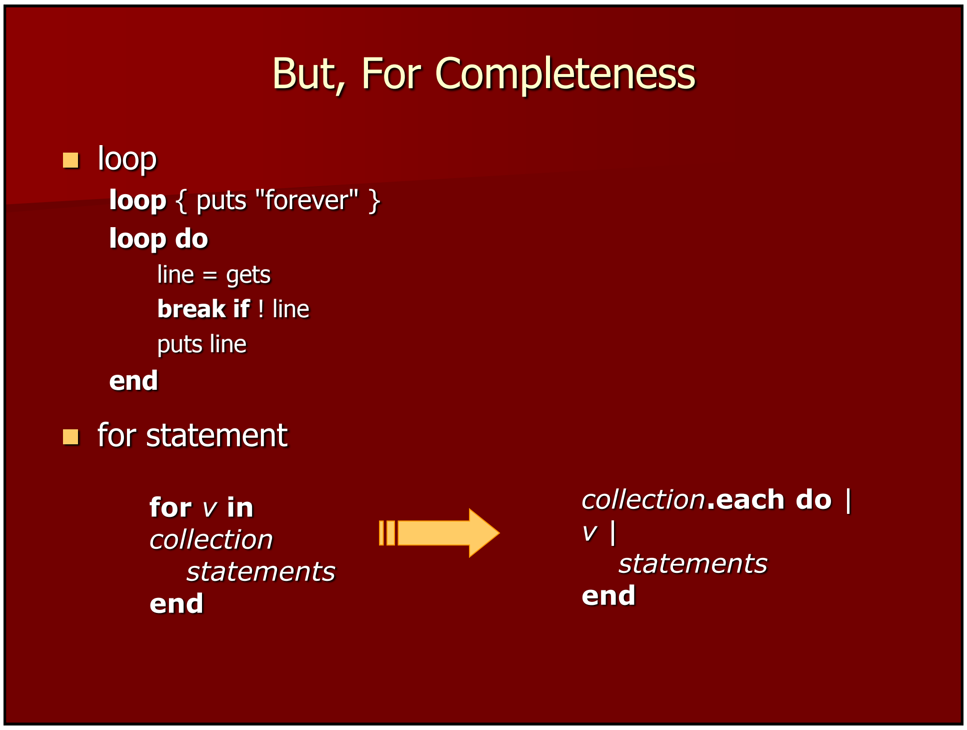
We don't need no stinkin' loops!



Iterators

- Explict loops are rare in Ruby
- Instead, we usually use iterators
  - Iterators are defined on collection classes
  - "Push" elements into a block one at a time.
  - The basic iterator is **each**.
  - Show with arrays (the simplest collection)

```
fibo = [ 1, 2, 3, 5, 8 ]
fibo.each { | value | puts "The next value is #{value }" }
fibo.each_index { | i | puts "fibo[#{i}] = #{fibo[i]}" }
fibo.select { | value | value % 2 == 1 }
fibo.inject(0) { | sum, value | sum += value }
puts "Total = #{fibo.inject(0) { | s, v | s += v }}"
```



But, For Completeness

- loop

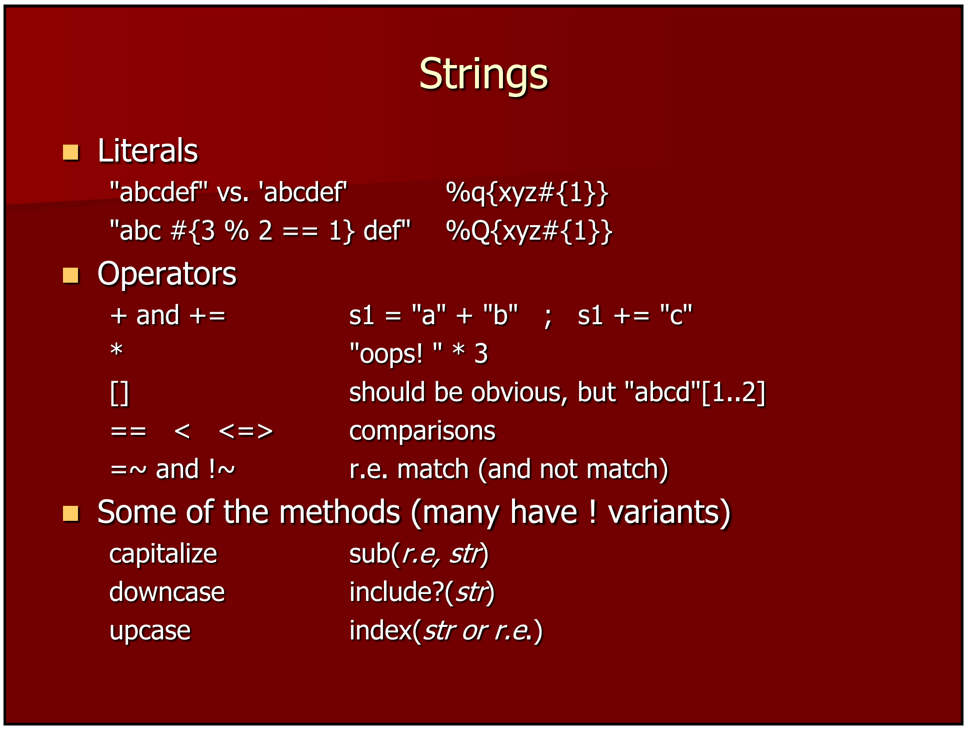
```
loop { puts "forever" }
loop do
    line = gets
    break if ! line
    puts line
end
```

- for statement

```
for v in
collection
    statements
end
```

⇒

```
collection.each do |
v |
    statements
end
```



Strings

- Literals

  "abcdef" vs. 'abcdef'   %q{xyz#{1}}

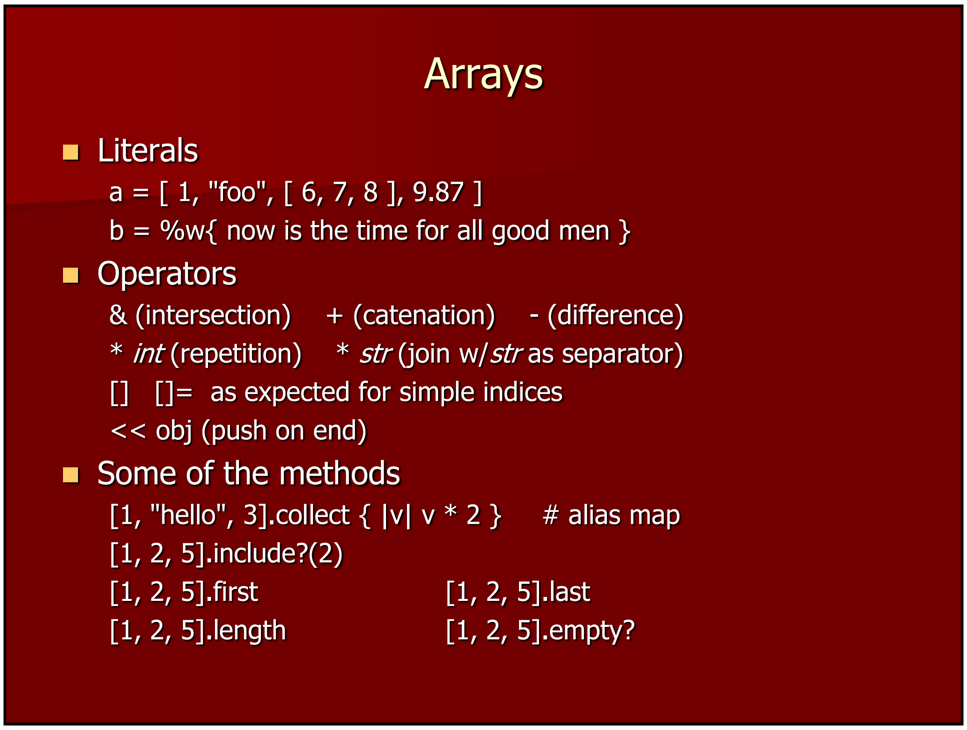
  "abc #{3 % 2 == 1} def"   %Q{xyz#{1}}

- Operators

+ and +=	s1 = "a" + "b" ; s1 += "c"
*	"oops! " * 3
[]	should be obvious, but "abcd"[1..2]
== < <=>	comparisons
=~ and !~	r.e. match (and not match)

- Some of the methods (many have ! variants)

capitalize	sub(*r.e, str*)
downcase	include?(*str*)
upcase	index(*str or r.e.*)



Arrays

- Literals

  a = [1, "foo", [6, 7, 8], 9.87]

  b = %w{ now is the time for all good men }

- Operators

  & (intersection)   + (catenation)   - (difference)

  * *int* (repetition)   * *str* (join w/ *str* as separator)

  []   []= as expected for simple indices

  << obj (push on end)

- Some of the methods

  [1, "hello", 3].collect { |v| v * 2 }   # alias map

  [1, 2, 5].include?(2)

  [1, 2, 5].first   [1, 2, 5].last

  [1, 2, 5].length   [1, 2, 5].empty?

Hashes

- Literals
  { "door" => "puerta", "pencil" => lapiz }
  new Hash(*default*)
- Operators
  h[*key*]   h[*key*] = value
- Some methods

each	each_key	each_value	
empty?	has_key?	has_value?	size

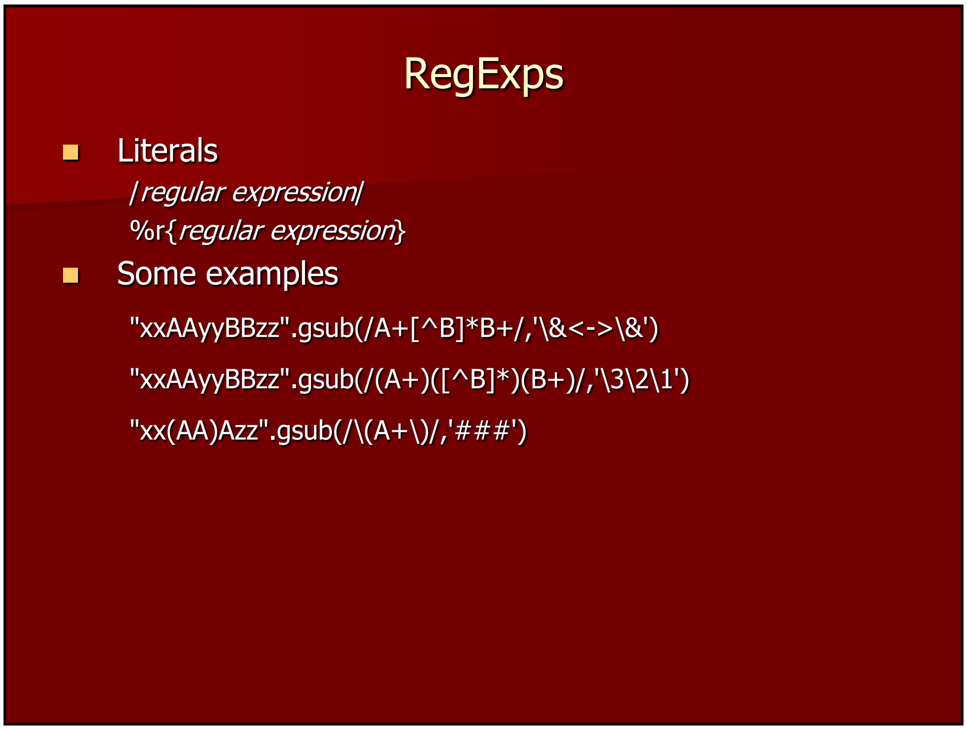
  keys (returns array)   values (returns array)
  sort (returns an array of 2-element arrays)
  sort { |p1, p2| *expression returning -1, 0, +1* }

I/O

- Class File
  f = File.new(*name*, *mode*)
  - *name* is a string giving the file name (host dependent).
  - *mode* is an access string: "r", "rw", "w", "w+"

  f.close
  f.puts, f.printf, f.gets, etc.
  - puts, printf are implicitly prefixed by $stdout.
  - gets is implicitly prefixed by $stdin

  File.open(*name*, *mode*) *block* – open the file *name*, call *block* with the open file, close file when block exits.
- Class Dir
  d = Dir.new(*name*) – open named directory.
  d.close
  Dir.foreach(*name*) *block* – pass each file name to *block*.



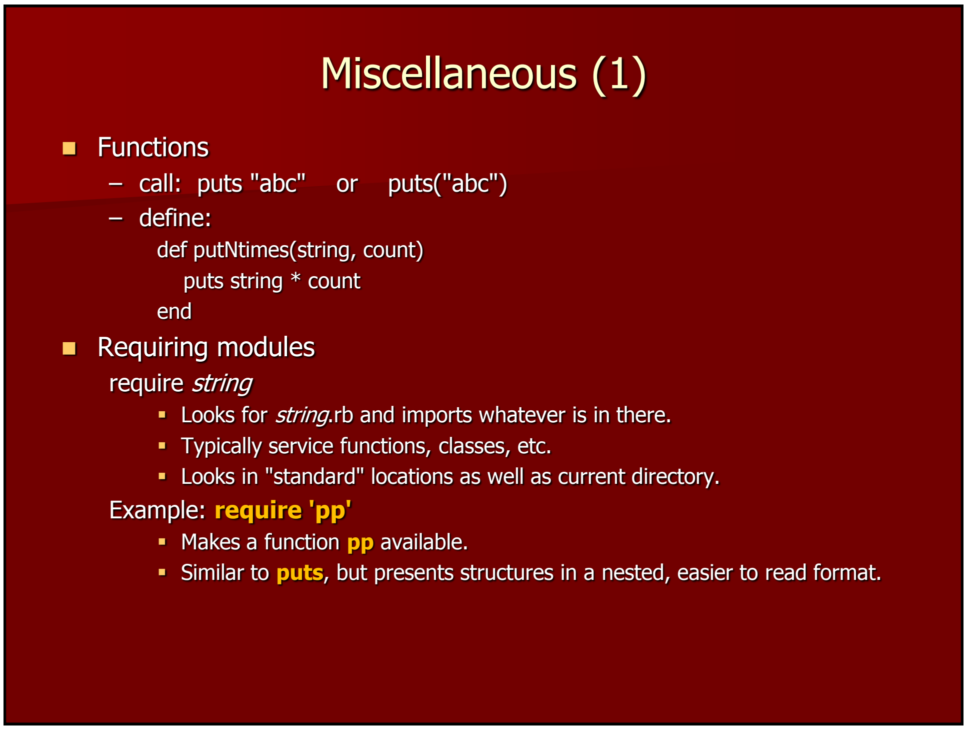
RegExps

- Literals

  /regular expression/

  %r{*regular expression*}
- Some examples

```
"xxAAyyBBzz".gsub(/A+[^B]*B+/,'\&<->\&')
"xxAAyyBBzz".gsub(/(A+)([^B]*)(B+)/,'\3\2\1')
"xx(AA)Azz".gsub(/\(A+\)/,'###')
```



Miscellaneous (1)

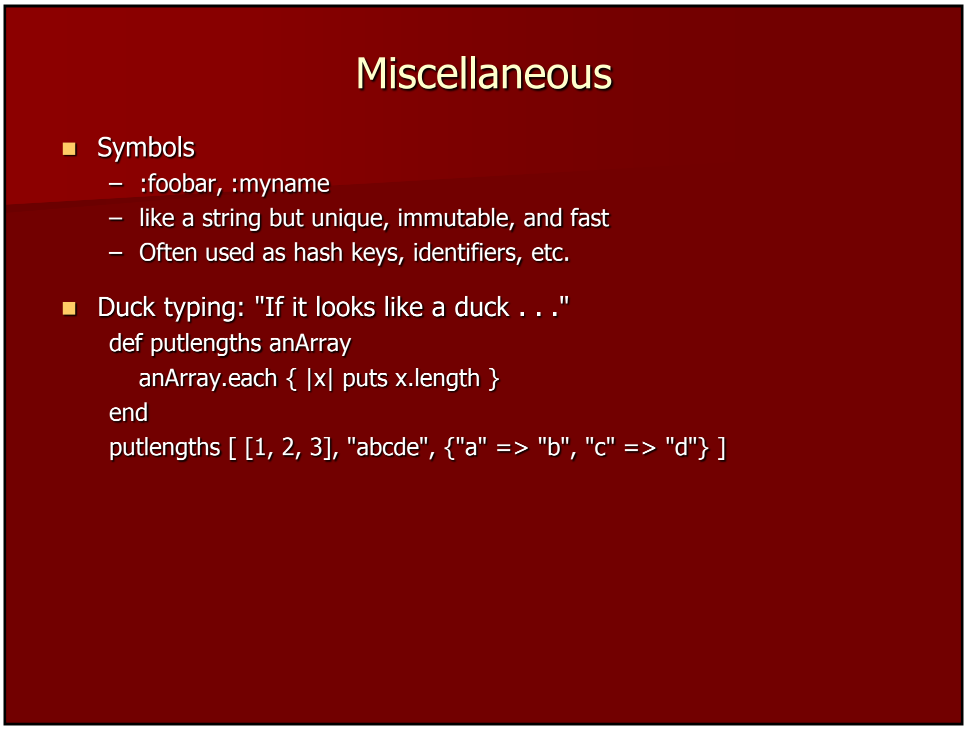
- Functions
  - call: puts "abc"   or   puts("abc")
  - define:

```
def putNtimes(string, count)
    puts string * count
end
```

- Requiring modules

  require *string*
  - Looks for *string*.rb and imports whatever is in there.
  - Typically service functions, classes, etc.
  - Looks in "standard" locations as well as current directory.

  Example: **require 'pp'**
  - Makes a function **pp** available.
  - Similar to **puts**, but presents structures in a nested, easier to read format.



Miscellaneous

- Symbols
  - :foobar, :myname
  - like a string but unique, immutable, and fast
  - Often used as hash keys, identifiers, etc.
- Duck typing: "If it looks like a duck . . ."

```
def putlengths anArray
   anArray.each { |x| puts x.length }
end
putlengths [ [1, 2, 3], "abcde", {"a" => "b", "c" => "d"} ]
```

ON TO THE ACTIVITY