Ruby Explorations II

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De Basics

Part II: Very, very small programs...

A: defining programs over several files

B: looking at defining classes

C: some methods...if, blocks, iterators

D: simple I/O and some reflections

What you should now know

- Using ***irb*** and ***ruby***
- How variables are assigned values
- How methods are defined in files
- Lots of Ruby kernel methods

```
+
=
==
obj.instance_of?(class)
ios.puts(obj, ...)
puts(obj, ...)
p(obj, ...)
str.length
obj.class
obj.to_s
string.to_i(base=10)
Float.induced_from(obj)
str.insert(index, other_str)
def
```

Part A:

defining programs over several files...

A Suite of Methods I

- most programs will involve a suite of classes and methods over many files
- methods will invoke other methods to achieve overall task
- let's look at the one-file case

```
def get_name
   puts "What is your surname?:"
   name = gets
   print_thanks
   if check_name_ok?(name)
  then print_new_name(name) end
end

def print_thanks
 puts "Thanks for that."
end

def check_name_ok?(nameo)
 if nameo.length > 10
    then error("way too long a name")
 else true end
end

def print_new_name(namer)
 newname = namer + "babygi"
 puts "Your new name is:"
 puts newname
end

def error(sp_message)
 puts "\n**ERROR**:#{sp_message}.\n"
end

get_name
```

name1.rb

seq of calls

```
def get_name
   puts "What is your surname?:"
   name = gets
   print_thanks
   if check_name_ok?(name)
  then print_new_name(name) end
end

def print_thanks
 puts "Thanks for that."
end

def check_name_ok?(nameo)
 if nameo.length > 10
     then error("way too long a name")
 else true end
end

def print_new_name(namer)
 newname = namer + "babygi"
 puts "Your new name is:"
 puts newname
end

def error(sp_message)
 puts "\n**ERROR**:#{sp_message}.\n"
end

get_name
```

name1.rb

gets
gets user input

simple conditional

printing variable values

file name

BW:
~ make sure double quotes are correct
~ spaces and <cr> as shown

\n is newline

method call

Running name1.rb

user added

why ?

use ***p*** to check

```
$ ruby name1.rb
What is your surname?:
marko
Thanks for that.
Your new name is:
marko
babygi
$ ruby name1_with_p.rb
What is your surname?:
marko
Thanks for that.
Your new name is:
"marko\nbabygi"
$
```

```
>> word1 = "gee\n"
=> "gee\n"
>> word2 = "whizz"
=> "whizz"
>> new = word1 + word2
=> "gee\nwhizz"
>> new
=> "gee\nwhizz"
>> puts new
gee
whizz
=> nil
>> word1.chomp
=> "gee"
>> new = word1.chomp +
word2
=> "geewhizz"
>> puts new
geewhizz
=> nil
```

A Suite of Methods II

- most programs will involve a suite of classes and methods over many files
- so, lets break these up
- and deal with the problems that arise...

A Suite of Files

```
require_relative 'thanks'
require_relative 'error'

def get_name
   puts "What is your surname?:"
   name = gets.chomp
   print_thanks
   if check_name_ok?(name)
  then print_new_name(name) end
end

def check_name_ok?(nameo)
 if nameo.length > 10
    then error("name too long")
 else true end
end

def print_new_name(namer)
 newname = namer + "babygi"
 puts "Your new name is:"
 puts newname
end
```

name2.rb

```
def print_thanks
 puts "Thanks for that."
end
```

thanks.rb

```
def error(sp_message)
 puts "\n**ERROR**:#{sp_message}.\n"
end
```

error.rb

Comments on many files...

- evaluation of prog is lazy, as needed, so missing file only throws error when the method is explicitly called
- nb, if you have same method name in two files, it will be overwritten
- classes will help

```
$ ruby name2.rb
ruby name2.rb
name2.rb:27: warning: method
redefined; discarding old
print_thanks
What is your surname?:
markeee
Thanks for that.
Your new name is:
markeebabygi
$
```

This is not OOP !

- What we have seen nicely shows how a suite of methods over many files might be built up
- it also shows how methods can invoke other methods in other files...
- but, this is just bog-standard functional programming rather than OOP-proper; *you will never do this!*
- OOP works with objects and their methods

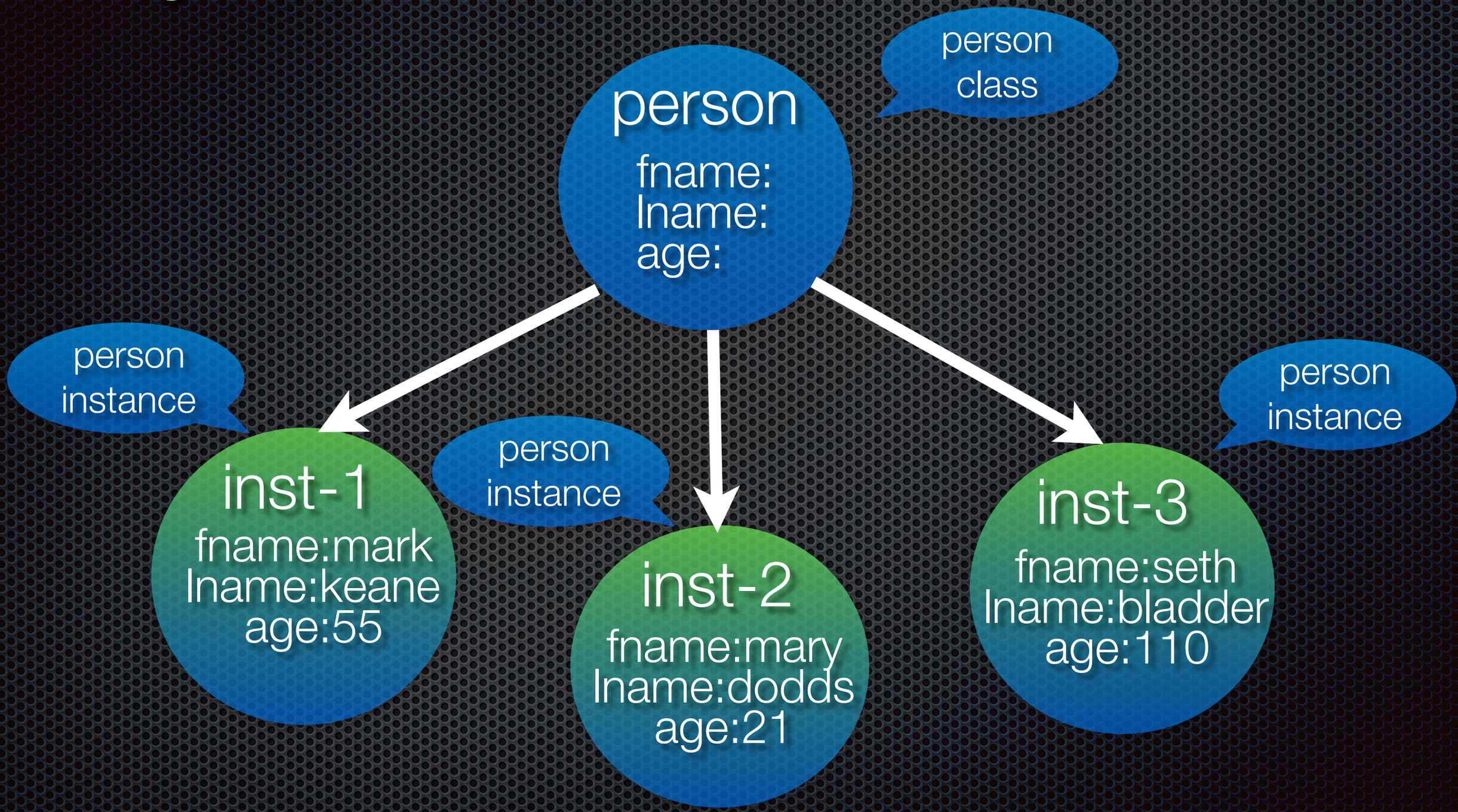
Part B:

looking at defining classes...

My First Class I

- In OOP everything is an object; typically an instance of a class
- A class is, like, the general type of thing we are going to deal with
- An instance, is one specific version of that class, with its specific details filled in
- Classes also have their associated methods

My First Class II



My First Class III

- the class usually has attributes (virtual & actual) to assigned...
- the class has methods (e.g., that assign values to attributes, that do things to instances of that class)
- Ruby handles these requirements neatly

Classes I

- Person class is defined
- one instance created
- four methods to give its instance-variables values
- nb, instance variables

```
class Person
   def fname
      @fname
   end

   def give_fname(name)
      @fname = name
   end

   def lname
      @lname
   end

   def give_lname(name)
      @lname = name
   end
end

inst1 = Person.new
inst1.give_fname(“mark”)
inst1.give_lname(“keane”)

p inst1
```

instance variable

people.rb

```
$ ruby people.rb
#<Person:0x27d80 @lname="keane",@fname="mark">
$
```

Classes II

- Person class is defined
- three instances created
- ***fname*** and ***lname*** are used to create and access its attributes and assign, change instance-var values

```
class Person
   attr_accessor :fname, :lname
end

inst1 = Person.new
inst1.fname = “mark”
inst1.lname = “keane”

inst2 = Person.new
inst2.fname = “mary”
inst2.lname = “dodds”

inst3 = Person.new
inst3.fname = “seth”
inst3.lname = “bladder”

p inst3
puts inst3
```

class def creates **new**

we will see its **Person::new**

people1.rb

```
$ ruby people1.rb
#<Person:0x27cb8 @lname="bladder", @fname=“seth">
#<Person:0x27cb8>
$
```

Classes IIa

- Person class is defined
- three instances created
- ***fname*** and ***lname*** are still available for access and assignment;but we have neater instance creation

```
class Person
   attr_accessor :fname, :lname
   def initialize(fname, lname)
     @fname = fname
     @lname = lname
   end
end


inst1 = Person.new(“mark”,”keane”)
inst2 = Person.new(“mary”,“dodds”)
inst3 = Person.new(“seth”,“bladder”)

p inst1
```

people1a.rb

```
$ ruby people1a.rb
#<Person:0x27cb8 @lname="keane", @fname="mark">
$
```

Classes IIa

- Person class is defined
- three instances created
- ***fname*** and ***lname*** are still available for access and assignment;but we have neater instance creation

```
class Person
   attr_accessor :fname, :lname
   def initialize(fname, lname)
     @fname = fname
     @lname = lname
   end
end


inst1 = Person.new(“mark”,”keane”)
inst2 = Person.new(“mary”,“dodds”)
inst3 = Person.new(“seth”,“bladder”)

p inst1
```

initialize is special

initalize throws weird..

people1a.rb

```
$ ruby people1a.rb
#<Person:0x27cb8 @lname="keane", @fname="mark">
$
```

Classes IIb: attr_assessor?

```ruby
class Person
    attr_accessor :name1, :name2
    def initialize(fname, lname)
      @fname = fname
      @lname = lname
    end
end

inst1 = Person.new(“mark”,”keane”)
p inst1
inst1.name1 = “blibbidy”
p inst1
```

people1a.rb*

```
$ ruby people1a*.rb
#<Person:0x007fb35994b268 @fname="mark", @lname="keane">
#<Person:0x007fb35994b268 @fname="mark", @lname="keane", @name1="blibbidy"
```

Classes IIIa

- Person class is defined
- we create a print method for the Person Class
- can use ***to_s***, as a special case for Person objects, like ***5.to_s***

```
class Person
   attr_accessor :fname, :lname
   def initialize(fname, lname)
     @fname = fname
     @lname = lname
   end

   def to_s
     “hi ” + @fname + ”, ” + @lname
   end
end

inst2 = Person.new(“mark”,“koo”)
p inst2
p inst2.to_s
puts inst2
```

people2.rb

```
$ ruby people2.rb
#<Person:0x27cb8 @lname="koo", @fname="mark">
"hi mark, koo"
hi mark, koo
$
```

Classes IIIa

- Person class is defined
- we create a print method for the Person Class
- can use ***to_s***, as a special case for Person objects, like ***5.to_s***

```
class Person
   attr_accessor :fname, :lname
   def initialize(fname, lname)
     @fname = fname
     @lname = lname
   end
   def to_s
     “hi ” + @fname + ”, ” + @lname
   end
end

inst2 = Person.new(“mark”,“koo”)
p inst2
p inst2.to_s
puts inst2
```

people2.rb

```
$ ruby people2.rb
#<Person:0x27cb8 @lname="keane", @fname="mark">
"hi mark, koo"
hi mark, koo
$
```

Classes IIIa

- Person class is defined
- we create a print method for the Person Class
- can use ***to_s***, as a special case for Person objects, like ***5.to_s***

```
class Person
   attr_accessor :fname, :lname
   def initialize(fname, lname)
     @fname = fname
     @lname = lname
   end
   def to_s
     “hi ” + @fname + ”, ” + @lname
   end
end

inst2 = Person.new(“mark”,“koo”)
p inst2
p inst2.to_s
puts inst2
```

why not use **print_person** rather than **to_s**

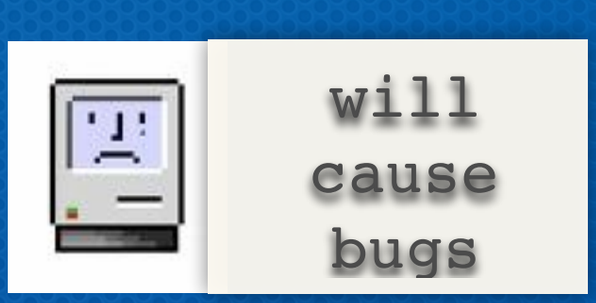
people2.rb

Classes IVa

- **Person** class has *our* method to create instances (what ***new*** +args does)
- **make_person** sort of does what **new** gives you for free; its a *class method*
- note use of ***self***

```
class Person
   attr_accessor :fname, :lname, :age

   def initialize(fname, lname)
     @fname = fname
     @lname = lname
   end

   def to_s
     “hi ” + @fname + ”, ” + @lname
   end

   def self.make_person(fnme, lnme, age)
     new_person = Person.new(fnme,lnme)
     new_person.age = age
     new_person
   end

   def age_person
     @age = @age + 1
   end
end

mk = Person.make_person(“mark”,”keane”,53)
p mk
puts mk
p mk.age_person
```

people3.rb




```
$ ruby people3.rb
#<Person:0x007fcfa39f9050 @fname="mark", @lname="keane", @age=53>
hi mark, keane
54
```

Classes IVa

- **Person** class has *our* method to create instances (what ***new*** +args does)
- **make_person** sort of does what **new** gives you for free
- note use of ***self***

```
class Person
   attr_accessor :fname, :lname, :age

   def initialize(fname, lname)
     @fname = fname
     @lname = lname
   end

   def to_s
     “hi ” + @fname + ”, ” + @lname
   end

   def self.make_person(fnme, lnme, age)
     new_person = Person.new(fnme,lnme)
     new_person.age = age
     new_person
   end

   def age_person
     @age = @age + 1
   end
end

mk = Person.make_person(“mark”,”keane”,53)
p mk
puts mk
mk.age person
```

self makes it a *class method*

this is an *instance method*

people3.rb

```
$ ruby people3.rb
#<Person:0x007fcfa39f9050 @fname="mark", @lname="keane", @age=53>
hi mark, keane
54
```

Classes IVb

- nb, other use of ***self***
- method returns last thing evaluated

```
class Person
   attr_accessor :fname, :lname, :age
   def initialize(fname, lname)
     @fname = fname
     @lname = lname
   end
   def to_s
     “hi ” + @fname + ”, ” + @lname
   end
   def self.make_person(fnme, lnme, age)
     new_person = Person.new(fnme,lnme)
     new_person.age = age
     new_person
   end
   def age_person
     self.age = self.age + 1
     @age
   end
end
mk = Person.make_person(“mark”,”keane”,53)
p mk
puts mk
p mk.age_person
```

using **self** like a variable

people3.rb

```
$ ruby people3.rb
#<Person:0x007f861a0f2880 @fname="mark", @lname="keane", @age=55>
hi mark, keane
56
```

Teaser

What sort of objects are **true**, **false** and **nil** ?

```
Last login: Wed Aug 31 09:17:38 on console
markkean% rib

>> "marko".class

=> String

>> 5.class
=> Fixnum

>> true.class
=> TrueClass

>> false.class
=> FalseClass

>> nil.class
=> NilClass

>> String.class
=> Class
```

Part C:

more methods...control, blocks and iterations

simple conditionals

Control la

- ***if*** is the conditional
- ***elsif*** and ***end*** are a great source of bugs

- best use explicit statements, nb **==**
- what do these do:
  p marko.is_he_old
  puts marko.is_he_old

```
class Male
  attr_accessor :name, :age
  def initialize(nme, age)
    @name = nme
    @age = age
  end

  def is_he_old
    age_of_pers = @age
    if age_of_pers > 21
      then puts “yea, an oldie”
    elsif age_of_pers == 21
      then puts “middle_aged...”
    else puts “just a child !”
    end
  end

end
marko = Male.new(“marko”, 55)
marko.is_he_old
```

test it with different inputs

oldie.rb

Control Ib

- ***if*** is the conditional
- ***elsif*** and ***end*** are a great source of bugs

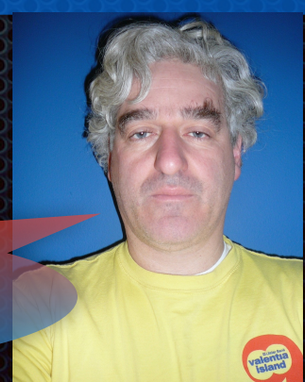
will cause bugs

- best use explicit statements, nb **==**
- turning ***is_he_old*** into a predicate ***is_he_old?***

```
class Male
  attr_accessor :name, :age

  def initialize(nme, age)
    @name = nme
    @age = age
  end

  def is_he_old?
    age_of_pers = @age
    if age_of_pers > 21
       then puts "yea, an oldie"
            true
    elsif age_of_pers == 21
       then puts "middle_aged..."
            false
    else puts "just a child !"
         false
    end
  end

end

marko = Male.new(“marko”, 55)
marko.is_he_old?
p marko.is_he_old?
```

oldie1.rb

what would happen if you gave it “aaah”



blocks... I said...bb...blocks

Block is MethodWithNoName

- blocks are one of the most thrilling aspects of Ruby
- they allow you to swap new bodies into a method
- like Lisp's anon-fns
- block is within the squiggly brackets

```ruby
def add_two(no)
  no += 2
end

p add_two(5) => 7

def add_two_b
  yield(10)
end

p add_two_b {|no| no + 2} => 12
```

defblock.rb

Block is MethodWithNoName

- blocks are one of the most thrilling aspects of Ruby
- they allow you to swap new bodies into a method
- like Lisp's anon-fns
- block is within the squiggly brackets

```
def add_two(no)
  no += 2
end

p add_two(5) => 7

def add_two_b
  yield(10)
end

p add_two_b {|no| no + 2} => 12
```

body of the method

placeholder for body

defblock.rb

put this block of code into the yield line binding the value to the local variable *no*

Passing water & blocks...

- blocks are one of the most thrilling aspects of Ruby
- just as you can invoke a method with a value that gets bound to its args
- so, too you can invoke a method with a block that is used as its body
- note the iterative nature of **upto**

```
>> 3.times{ print “ruby !”}
ruby !ruby !ruby !
=> 3

>> 1.upto(9){|x| print x}
 123456789
=> 1

>> 1.upto(9){|x| p x.to_s + “wagawaga”}
 "1wagawaga"
"2wagawaga"
"3wagawaga"
"4wagawaga"
"5wagawaga"
"6wagawaga"
"7wagawaga"
"8wagawaga"
"9wagawaga"
=> 1
```

Blocks shine in iteration

- blocks really come into their own when you use iterative constructs
- rem, often the essence of computation is breaking a problem down into small tasks done over and over again...
- imagine, I have a book of tickets in one hand and a block that punches holes in the other hand
- imagine, I have a simple command that says apply that block to every ticket; that command is **each**

Blocks & ***each*** I

- blocks are often used with iterators, like **each**
- so, **each** invokes the block-code on each item in the list/array
- very useful

```
listy = [“a_”, “b_”, “c_”]

def sheepify(an_array)
   an_array.each {|item| p item + “sheep”}
end

p sheepify(listy)
```

sheep.rb

```
$ ruby sheep.rb
“a_sheep”
“b_sheep”
“c_sheep”
["a_", "b_", "c_"]
$
```

what would happen if you dropped the **p**

Blocks & ***each*** lla

- blocks are often used with iterators, like **each**
- when the block is more than one line, ***do...end*** is often used instead of brackets
- does **object_id** change if you give it "**b_**" twice

```
listy =["a_", "b_", "c_"]

def sheepify_with_do(an_array)
  an_array.each do |item|
    new_sheep = item + "sheep"
    uniq_no = new_sheep.object_id
    puts "#{new_sheep} is no #{uniq_no}"
  end
end

sheepify_with_do(listy)
```

sheepdo.rb

```
$ ruby sheepdo.rb
a_sheep is no 56493
b_sheep is no 56890
c_sheep is no 50933
$
```

Blocks & ***each*** lla

- blocks are often used with iterators, like **each**
- when the block is more than one line, **do...end** is often used instead of brackets

```
listy =[“a_”, “b_”, “c_”]

def sheepify_with_do(an_array)
  an_array.each do |item| {
    new_sheep = item + “sheep”
    uniq_no = new_sheep.object_id
    puts “#{new_sheep} is no #{uniq_no}”
  end                                  }
end

sheepify_with_do(listy)
```

acts-like

acts-like

do...end match

sheepdo.rb

```
$ ruby sheepdo.rb
a_sheep is no 56493
b_sheep is no 56890
c_sheep is no 50933
$
```

Blocks & ***each*** llb

- blocks are often used with iterators, like **each**
- when the block is more than one line, **do...end** is often used instead

```
listy =[“a_”, “b_”, “c_”]

def sheepify_with_do(an_array)
  an_array.each do |item|
    new_sheep = item + “sheep”
    uniq_no = new_sheep.object_id
    puts “#{new_sheep} is no #{uniq_no}”
  end
end

sheepify_with_do(listy)
```

sheepdo.rb

will cause bugs

```
$ ruby sheepdo.rb
a_sheep is no 56493
b_sheep is no 56890
c_sheep is no 50933
$
```

Our forgotten ***ends***...

- most people remember **def...end**
- but, you will forget to put in **if...then...end**
- and, you will forget to put in **do...end**
- sometimes you will forget **{...}**
- So, please...please... use indentation

```
will
cause
bugs
```

Other Blocks

- Anything in curly brackets or between **do...end** is a block
- A block of code to be bandied around

```
def block_eg
  puts “this is the first message”
  yield
  puts “this is the middle message”
  yield
  puts “this is the last\n\n”
end

block_eg {puts “-------CUT HERE-------”}

def block_with_args
  puts “First we say this”
  yield(“CUT”, “HERE”)
  puts “this is the bit we cut out”
  yield(“CUT”, “AGAIN HERE”)
  puts “this is the last bit”
end

block_with_args {|a, b| puts “---#{a} #{b}---”}
```

the block

the block with args

block.rb

More Iteration...

- we can also pass blocks to **times**
- `int.times {|i| block}` `=> int`
- interesting to see what the value of ***i*** is (see **count**)

```
def five_it(item)
  5.times do |count|
    p item + count.to_s
  end
end

five_it("boo")

def print_several(no, item)
  no.times {p item}
end

print_several(10, "gpp")
```

times.rb

```
$ ruby times.rb
"boo0"
"boo1"
"boo2"
"boo3"
"boo4"
$
```

Part D:

simple I/O and some reflection...

Simple I/O

```
filo = File.open("info.txt", "r")
filo.each_line {|line| puts line + " tag"}
```

reader.rb

```
this is a text file
we will read from it
and we will feel good....
like making fire....
```

info.txt

- reading from a file
- we call the **open** method from the **File** Class
- we give it the file-name/ path and use **each_line**, which closes file too
- ***"r"*** for read, ***"w"*** for write
- nb **each_line** is using a block

```
$ ruby reader.rb
this is a text file
 tag
we will read from it
 tag
and we will feel good....
 tag
like making fire.... tag
$
```

Aside:

Methods & Their Syntax

Differing Method Syntax I

```
"string".length
"string".include?("in")
```

normal dot syntax
obj.method(arg...)

- *instance methods*
  invoked via an object
  (i.e., instance of class)
  with or without
  additional parameters

```
class String
  def length
    body-that-finds_length
  end

  def include?(str)
    body-that-matches str
  end
end
```

Differing Method Syntax II

```
a + b          a.+(b)
a = 1          a.=(1)
a == 2         a.==(2)
```

disguised
normal dot syntax
obj.method(arg...)

- *instance methods* with syntactic sugar that is easier to read for us humans

```
class Math
  def +(no)
    body-adds-stuff
  end
end
```

Differing Method Syntax III

```
puts “foo”
puts(“foo”)
```

```
$stdout.puts(“foo”)
```

still
normal dot syntax
obj.method(arg...)

- *instance methods* where parentheses are not required and have implicit objects...but we use the parentheses in this house

```
so...still defined
the usual way...
```

Differing Method Syntax IV

```
Person.new
Person.new(“migg”, “ure”)
File.open(“into.txt”, “r”)
```

still dot syntax
but object is a class
Class.method(arg...)

- *class methods* where we use the class as the object to the method

```
class Person
  def self.new
    creates-instance
  end
end
```

OR

```
class Person
  def self.new(a,b)
    creates-instance
  end
end
```

One Last Mystery...

```
Float(5)
Float 5
```

what the flip !

Well...

- Float is a Kernel function that attempts to convert its arguments; 3 others exist Array, String and Integer
- Kernel is a mixin for the Object class at the top of the Ruby Object hierarchy
- But, don’t worry your pretty head about it...
- By way of explication...

http://www.ruby-doc.org/core/classes/Kernel.html

So...

```
>> Float(5)
=> 5.0

>> Kernel::Float(5)
=> 5.0

>> String "foo"
=> "foo"

>> Kernel::String 5
=> "5"

>> Array(1..5)
=> [1, 2, 3, 4, 5]

>> Kernel::Array(1..6)
=> [1, 2, 3, 4, 5, 6]
```

The End