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Using Blocks in Ruby

A Brain-Friendly Report

Do heavy lifting easily with blocks

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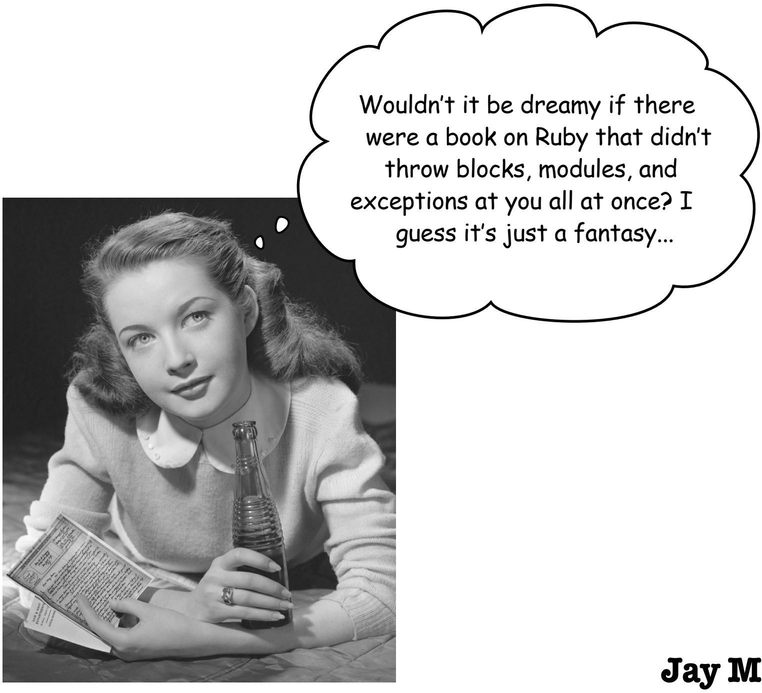
Bend your mind around blocks and methods

Avoid embarrassing mistakes

Jay McGavren

Using Blocks in Ruby


Wouldn't it be dreamy if there were a book on Ruby that didn't throw blocks, modules, and exceptions at you all at once? I guess it's just a fantasy...

Jay McGavren

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Using Blocks in Ruby

by Jay McGavren

Published by O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.

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Series Creators: Kathy Sierra, Bert Bates

Editor: Susan Conant

Cover Designer: Randy Comer

Production Editor: Melanie Yarbrough

Printing History:

October 2017 (first).

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ISBN: 978-1-491-96915-1

Using Blocks in Ruby

This report is an excerpt from a larger book.

Any references to chapters are referring to *Head First Ruby*.

A **block** is a chunk of code that you associate with a method call. While the method runs, it can *invoke* (execute) the block one or more times. *Methods and blocks work in tandem to process your data.* Blocks are a way of encapsulating or packaging statements up and using them wherever you need them. They turn up all over Ruby code.

Blocks are mind-bending stuff. But stick with it!

Even if you've programmed in other languages, you've probably never seen anything like blocks. But *stick with it*, because the payoff is *big*.

Imagine if, for all the methods you have to write for the rest of your career, someone else *wrote half of the code for you*. For free. *They'd* write all the tedious stuff at the beginning and end, and just leave a little blank space in the middle for you to insert *your* code, the clever code, the code that runs your business.

If we told you that blocks can give you that, you'd be willing to do whatever it takes to learn them, right?

Well, here's what you'll have to do: be patient, and persistent. We're here to help. We'll look at each concept repeatedly, from different angles. We'll provide exercises for practice. Make sure to *do them*, because they'll help you understand and remember how blocks work.

A few hours of hard work now are going to pay dividends for the rest of your Ruby career, we promise. Let's get to it!

Defining a method that takes blocks

Blocks and methods work in tandem. In fact, you can't *have* a block without also having a method to accept it. So, to start, let's define a method that works with blocks.

(On this page, we're going to show you how to use an ampersand, `&`, to accept a block, and the `call` method to call that block. This isn't the quickest way to work with blocks, but it *does* make it more obvious what's going on. We'll show you `yield`, which is more commonly used, in a few pages!)

Since we're just starting off, we'll keep it simple. The method will print a message, invoke the block it received, and print another message.

This method takes a block as a parameter!

```
def my_method(&my_block)
  puts "We're in the method, about to invoke your block!"
  my_block.call
  puts "We're back in the method!"
end
```

The "call" method calls the block.

If you place an ampersand before the last parameter in a method definition, Ruby will expect a block to be attached to any call to that method. It will take the block, convert it to an object, and store it in that parameter.

```
def my_method(&my_block)
  ...
end
```

When you call this method with a block, it will be stored in "my_block".

Remember, a block is just a chunk of code that you pass into a method. To execute that code, stored blocks have a `call` instance method that you can call on them. The `call` method invokes the block's code.

No ampersand; that's only used when you're defining the parameter.

```
def my_method(&my_block)
  ...
  my_block.call
  ...
end
```

Run the block's code.

Okay, we know, you still haven't *seen* an actual block, and you're going crazy wondering what they look like. Now that the setup's out of the way, we can show you…

Your first block

Are you ready? Here it comes: your first glimpse of a Ruby block.

A block must always follow a method call.

Start of the block

Block body

```
my_method do
  puts "We're in the block!"
end
```

End of the block

There it is! Like we said, a block is just a *chunk of code* that you pass to a method. We invoke `my_method`, which we just defined, and then place a block immediately following it. The method will receive the block in its `my_block` parameter.

- The start of the block is marked with the keyword `do`, and the end is marked by the keyword `end`.
- The block *body* consists of one or more lines of Ruby code between `do` and `end`. You can place any code you like here.
- When the block is called from the method, the code in the block body will be executed.
- After the block runs, control returns to the method that invoked it.

So we can call my_method and pass it the above block. The method will receive the block as a parameter, my_block, so we can refer to the block inside the method.

```
def my_method(&my_block)
  puts "We're in the method, about to invoke your block!"
  my_block.call
  puts "We're back in the method!"
end

my_method do
  puts "We're in the block!"
end
```

The block. It will be stored in the "my_block" parameter.

The call to my_method

…and here's the output we'd see:

```
We're in the method, about to invoke your block!
We're in the block!
We're back in the method!
```

Flow of control between a method and block

We declared a method named `my_method`, called it with a block, and got this output:

```
my_method do
  puts "We're in the block!"
end
```

```
We're in the method, about to invoke your block!
We're in the block!
We're back in the method!
```

Let's break down what happened in the method and block, step by step.

1. The first `puts` statement in `my_method`'s body runs.

The method:

```
def my_method(&my_block)
  puts "We're in the method, about to invoke your block!"
  my_block.call
  puts "We're back in the method!"
end
```

The block:

```
do
  puts "We're in the block!"
end
```

```
We're in the method, about to invoke your block!
```

2. The `my_block.call` expression runs, and control is passed to the block. The `puts` expression in the block's body runs.

```
def my_method(&my_block)
  puts "We're in the method, about to invoke your block!"
  my_block.call
  puts "We're back in the method!"
end
```

```
do
  puts "We're in the block!"
end
```

```
We're in the block!
```

3. When the statements within the block body have all run, control returns to the method. The second call to `puts` within `my_method`'s body runs, and then the method returns.

```
def my_method(&my_block)
  puts "We're in the method, about to invoke your block!"
  my_block.call
  puts "We're back in the method!"
end
```

```
do
  puts "We're in the block!"
end
```

```
We're back in the method!
```

Calling the same method with different blocks

You can pass *many different blocks* to a *single method*.

We can pass different blocks to the method we just defined, and do different things:

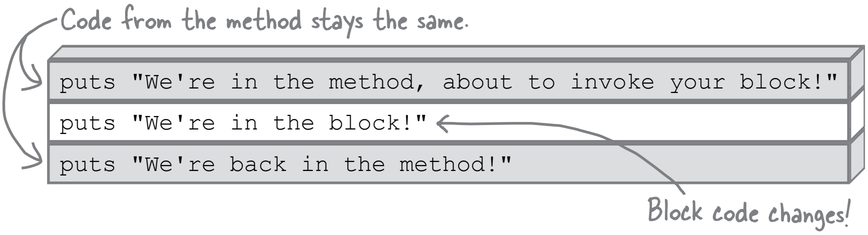
```
my_method do
  puts "It's a block party!"
end
```

```
We're in the method, about to invoke your block!
It's a block party!
We're back in the method!
```

```
my_method do
  puts "Wooooo!"
end
```

```
We're in the method, about to invoke your block!
Wooooo!
We're back in the method!
```

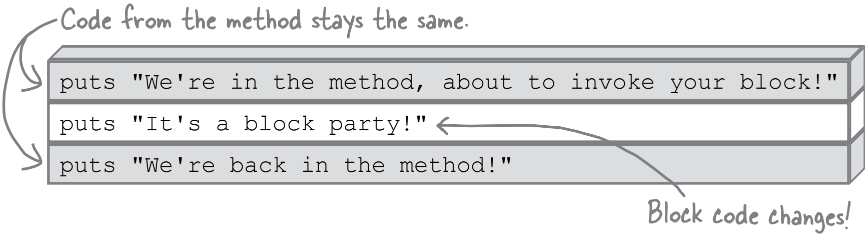
The code in the method is always the *same*, but you can *change* the code you provide in the block.



Code from the method stays the same.

```
puts "We're in the method, about to invoke your block!"
puts "We're in the block!"
puts "We're back in the method!"
```

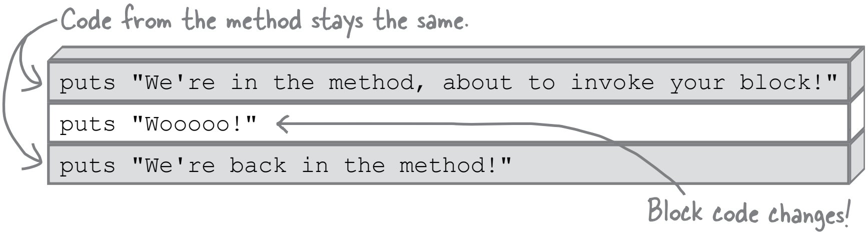
Block code changes!



Code from the method stays the same.

```
puts "We're in the method, about to invoke your block!"
puts "It's a block party!"
puts "We're back in the method!"
```

Block code changes!



Code from the method stays the same.

```
puts "We're in the method, about to invoke your block!"
puts "Wooooo!"
puts "We're back in the method!"
```

Block code changes!

Calling a block multiple times

A method can invoke a block as many times as it wants.

This method is just like our previous one, except that it has *two* `my_block.call` expressions:

Declaring another method that takes a block.

```
def twice(&my_block)
  puts "In the method, about to call the block!"
  my_block.call
  puts "Back in the method, about to call the block again!"
  my_block.call
  puts "Back in the method, about to return!"
end
```

Call the block.

Call the block AGAIN.

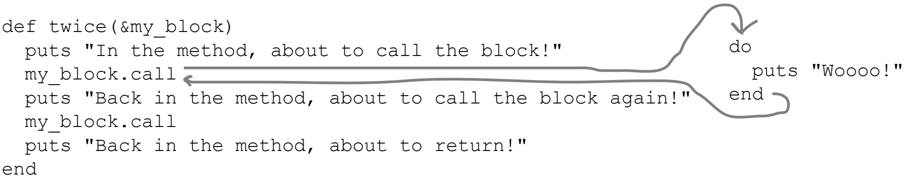
Calling the method and passing it a block.

```
twice do
  puts "Woooo!"
end
```

The method name is appropriate: as you can see from the output, the method does indeed call our block twice!

```
In the method, about to call the block!
Woooo!
Back in the method, about to call the block again!
Woooo!
Back in the method, about to return!
```

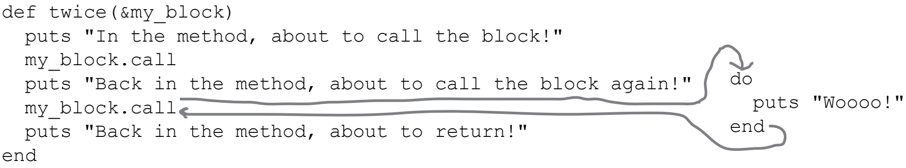
1. Statements in the method body run until the first `my_block.call` expression is encountered. The block is then run. When it completes, control returns to the method.



```
def twice(&my_block)
  puts "In the method, about to call the block!"
  my_block.call
  puts "Back in the method, about to call the block again!"
  my_block.call
  puts "Back in the method, about to return!"
end
```

```
do
  puts "Woooo!"
end
```

2. The method body resumes running. When the second `my_block.call` expression is encountered, the block is run again. When it completes, control returns to the method so that any remaining statements there can run.



```
def twice(&my_block)
  puts "In the method, about to call the block!"
  my_block.call
  puts "Back in the method, about to call the block again!"
  my_block.call
  puts "Back in the method, about to return!"
end
```

```
do
  puts "Woooo!"
end
```

Block parameters

We learned back in Chapter 2 that when defining a Ruby method, you can specify that it will accept one or more parameters:

```
def print_parameters(p1, p2)
  puts p1, p2
end
```

You're probably also aware that you can pass arguments when calling the method that will determine the value of those parameters.

```
print_parameters("one", "two")
```

```
one
two
```

In a similar vein, a method can pass one or more arguments to a block. Block parameters are similar to method parameters; they're values that are passed in when the block is run, and that can be accessed within the block body.

there are no Dumb Questions

Q: Can I define a block once, and use it across many methods?

A: You can do something like this using Ruby *procs* (which are beyond the scope of this book). But it's not something you'll want to do in practice. A block is intimately tied to a particular method call, so much that a particular block will usually only work with a single method.

Q: Can a method take more than one block at the same time?

A: No. A single block is by far the most common use case, to the point that it's not worth the syntactic mess it would create for Ruby to support multiple blocks. If you ever want to do this, you could also use Ruby procs (but again, that's beyond the scope of this book).

Arguments to `call` get forwarded on to the block:

Passed to block

Passed to block

```
def give(&my_block)
  my_block.call("2 turtle doves", "1 partridge")
end
```

You can have a block accept one or more parameters from the method by defining them between vertical bar (`|`) characters at the start of the block:

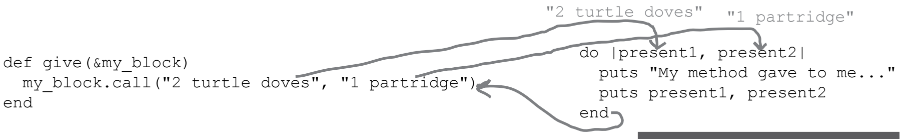
Parameter 1

Parameter 2

```
give do |present1, present2|
  puts "My method gave to me..."
  puts present1, present2
end
```

If there are multiple parameters, separate them with commas.

So, when we call our method and provide a block, the arguments to `call` are passed into the block as parameters, which then get printed. When the block completes, control returns to the method, as normal.



```
def give(&my_block)
  my_block.call("2 turtle doves", "1 partridge")
end
```

```
do |present1, present2|
  puts "My method gave to me..."
  puts present1, present2
end
```

```
My method gave to me...
2 turtle doves
1 partridge
```

Using the "yield" keyword

So far, we've been treating blocks like an argument to our methods. We've been declaring an extra method parameter that takes a block as an object, then using the `call` method on that object.

```
def twice(&my_block)
  my_block.call
  my_block.call
end
```

We mentioned that this wasn't the easiest way to accept blocks, though. Now, let's learn the less obvious but more concise way: the `yield` keyword.

The `yield` keyword will find and invoke the block a method was called with—there's no need to declare a parameter to accept the block.

This method is functionally equivalent to the one above:

```
def twice
  yield
  yield
end
```

Just like with `call`, we can also give one or more arguments to `yield`, which will be passed to the block as parameters. Again, these methods are functionally equivalent:

```
def give(&my_block)
  my_block.call("2 turtle doves", "1 partridge")
end

def give
  yield "2 turtle doves", "1 partridge"
end
```

Conventional Wisdom

Declaring a `&block` parameter is useful in a few rare instances (which are beyond the scope of this book). But now that you understand what the `yield` keyword does, you should just use that in most cases. It's cleaner and easier to read.

Block formats

So far, we've been using the do...end format for blocks. Ruby has a second block format, though: "curly brace" style. You'll see both formats being used "in the wild," so you should learn to recognize both.

```
def run_block
  yield
end

run_block do
  puts "do/end"
end
```

The do...end format we've been using so far

"Curly brace" format

Start of block

End of block

```
run_block { puts "braces" }
```

Block body, just like with "do...end"

Aside from do and end being replaced with curly braces, the syntax and functionality are identical.

```
do/end
braces
```

And just as do...end blocks can accept parameters, so can curly-brace blocks:

```
def take_this
  yield "present"
end

take_this do |thing|
  puts "do/end block got #{thing}"
end

take_this { |thing| puts "braces block got #{thing}" }
```

```
do/end block got present
braces block got present
```

By the way, you've probably noticed that all our do...end blocks span multiple lines, but our curly-brace blocks all appear on a single line. This follows another convention that much of the Ruby community has adopted. It's valid *syntax* to do it the other way:

Breaks convention!

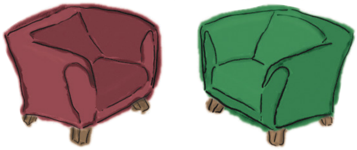
```
take_this { |thing|
  puts "braces: got #{thing}"
}
take_this do |thing| puts "do/end: got #{thing}" end
```

Breaks convention (and is really ugly)!

```
braces: got present
do/end: got present
```

But not only is that out of line with the convention, it's really ugly.

Fireside Chats



Tonight's talk: **A method and a block talk about how they became associated with each other.**

Method: **Block:**

Thanks for coming, Block! I called you here tonight so we could educate people on how blocks and methods work together. I've had people ask me exactly what you contribute to the relationship, and I think we can clear those questions up for everyone.

Sure, Method! I'm here to help whenever you call.

So most parts of a method's job are pretty clearly defined. My task, for example, is to loop through each item in an array.

Right. Not a very glamorous job, but an important one.

Sure! It's a task lots of developers need done; there's a lot of demand for my services. But then I encounter a problem: what do I do with each of those array elements? Every developer needs something different! And that's where blocks come in…

Precisely. Every developer can write their own block that describes exactly what they need done with each element in the array.

I know another method that does nothing but open and close a file. He's very good at that part of the task. But he has no clue what to do with the contents of the file…

…and so he calls on a block, right? And the block prints the file contents, or updates them, or whatever else the developer needs done. It's a great working relationship!

I handle the general work that's needed on a wide variety of tasks…

And I handle the logic that's specific to an individual task.

Exercise

Here are three Ruby method definitions, each of which takes a block:

```
def call_block(&block)
  puts 1
  block.call
  puts 3
end
```

```
def call_twice
  puts 1
  yield
  yield
  puts 3
end
```

```
def pass_parameters_to_block
  puts 1
  yield 9, 3
  puts 3
end
```

And here are several calls to the above methods. Match each method call to the output it produces.

(We've done the first one for you.)

B ......

```
call_block do
  puts 2
end
```

......

```
call_block { puts "two" }
```

......

```
call_twice { puts 2 }
```

......

```
call_twice do
  puts "two"
end
```

......

```
pass_parameters_to_block do |param1, param2|
  puts param1 + param2
end
```

......

```
pass_parameters_to_block do |param1, param2|
  puts param1 / param2
end
```

A

```
1
2
2
3
```

B

```
1
2
3
```

C

```
1
3
3
```

D

```
1
12
3
```

E

```
1
two
3
```

F

```
1
two
two
3
```

Exercise Solution

Here are three Ruby method definitions, each of which takes a block:

```
def call_block(&block)
  puts 1
  block.call
  puts 3
end
```

```
def call_twice
  puts 1
  yield
  yield
  puts 3
end
```

```
def pass_parameters_to_block
  puts 1
  yield 9, 3
  puts 3
end
```

And here are several calls to the above methods. Match each method call to the output it produces.

B ......

```
call_block do
  puts 2
end
```

E ......

```
call_block { puts "two" }
```

A ......

```
call_twice { puts 2 }
```

F ......

```
call_twice do
  puts "two"
end
```

D ......

```
pass_parameters_to_block do |param1, param2|
  puts param1 + param2
end
```

C ......

```
pass_parameters_to_block do |param1, param2|
  puts param1 / param2
end
```

A

```
1
2
2
3
```

B

```
1
2
3
```

C

```
1
3
3
```

D

```
1
12
3
```

E

```
1
two
3
```

F

```
1
two
two
3
```

The "each" method

We had a lot to learn in order to get here: how to write a block, how a method calls a block, how a method can pass parameters to a block. And now, it's finally time to take a good, long look at the method that will let us get rid of that repeated loop code in our `total`, `refund`, and `show_discounts` methods. It's an instance method that appears on every `Array` object, and it's called `each`.

You've seen that a method can yield to a block more than once, with different values each time:

```
def my_method
  yield 1
  yield 2
  yield 3
end

my_method { |param| puts param }
```

```
1
2
3
```

The `each` method uses this feature of Ruby to loop through each of the items in an array, yielding them to a block, one at a time.

```
["a", "b", "c"].each { |param| puts param }
```

```
a
b
c
```

If we were to write our own method that works like `each`, it would look very similar to the code we've been writing all along:

```
class Array

  def each
    index = 0
    while index < self.length
      yield self[index]
      index += 1
    end
  end

end
```

This is just like the loops in our "total", "refund", and "show_discounts" methods!

Remember, "self" refers to the current object—in this case, the current array.

The key difference: we yield the current element to a block!

Then move to the next element, just like before.

We loop through each element in the array, just like in our `total`, `refund`, and `show_discounts` methods. The key difference is that instead of putting code to process the current array element in the *middle of the loop*, we use the `yield` keyword to *pass the element to a block*.

The "each" method, step-by-step

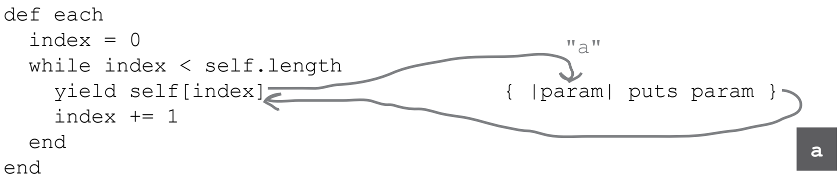
We're using the `each` method and a block to process each of the items in an array:

```
["a", "b", "c"].each { |param| puts param }
```

```
a
b
c
```

Let's go step-by-step through each of the calls to the block and see what it's doing.

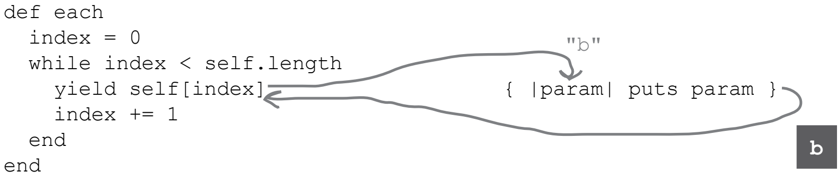
1. For the first pass through the `while` loop, `index` is set to `0`, so the first element of the array gets yielded to the block as a parameter. In the block body, the parameter gets printed. Then control returns to the method, `index` gets incremented, and the `while` loop continues.



```
def each
  index = 0
  while index < self.length
    yield self[index]
    index += 1
  end
end
```

```
{ |param| puts param }
```

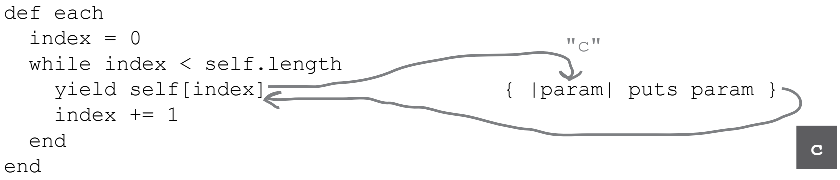
2. Now, on the second pass through the `while` loop, `index` is set to `1`, so the *second* element in the array will be yielded to the block as a parameter. As before, the block body prints the parameter, control then returns to the method, and the loop continues.



```
def each
  index = 0
  while index < self.length
    yield self[index]
    index += 1
  end
end
```

```
{ |param| puts param }
```

3. After the third array element gets yielded to the block for printing and control returns to the method, the `while` loop ends, because we've reached the end of the array. No more loop iterations means no more calls to the block; we're done!



```
def each
  index = 0
  while index < self.length
    yield self[index]
    index += 1
  end
end
```

```
{ |param| puts param }
```

That's it! We've found a method that can handle the repeated looping code, and yet allows us to run our own code in the middle of the loop (using a block). Let's put it to use!

DRYing up our code with "each" and blocks

Our invoicing system requires us to implement these three methods. All three of them have nearly identical code for looping through the contents of an array.

It's been difficult to get rid of that duplication, though, because all three methods have *different* code in the *middle* of that loop.

```ruby
def total(prices)
  amount = 0
  index = 0
  while index < prices.length
    amount += prices[index]
    index += 1
  end
  amount
end
```

Highlighted lines are duplicated among the three methods.

This line in the middle differs, though...

```ruby
def refund(prices)
  amount = 0
  index = 0
  while index < prices.length
    amount -= prices[index]
    index += 1
  end
  amount
end
```

Differs...

```ruby
def show_discounts(prices)
  index = 0
  while index < prices.length
    amount_off = prices[index] / 3.0
    puts format("Your discount: $%.2f", amount_off)
    index += 1
  end
end
```

Differs...

But now we've finally mastered the each method, which loops over the elements in an array and passes them to a block for processing.

```ruby
["a", "b", "c"].each { |param| puts param }
```

```
a
b
c
```

Let's see if we can use each to refactor our three methods and eliminate the duplication.

Refactored

- □ Given an array of prices, add them all together and return the total.
- □ Given an array of prices, subtract each price from the customer's account balance.
- □ Given an array of prices, reduce each item's price by 1/3, and print the savings.

DRYing up our code with "each" and blocks (continued)

First up for refactoring is the `total` method. Just like the others, it contains code for looping over prices stored in an array. In the middle of that looping code, `total` adds the current price to a total amount.

The `each` method looks like it will be perfect for getting rid of the repeated looping code! We can just take the code in the middle that adds to the total, and place it in a block that's passed to `each`.

```
index = 0
while index < prices.length
  amount += prices[index]
  index += 1
end
```

From here...

...to here!

```
                 prices.each { |price| amount += price }
```

We don't have to pull the item out of the array anymore; "each" does that for us!

Let's redefine our `total` method to utilize `each`, then try it out.

```
def total(prices)
  amount = 0
  prices.each do |price|
    amount += price
  end
  amount
end
```

Start the total at 0.

Process each price.

Add the current price to the total.

Return the final total.

```
prices = [3.99, 25.00, 8.99]

puts format("%.2f", total(prices))
```

```
37.98
```

Perfect! There's our total amount. The `each` method worked!

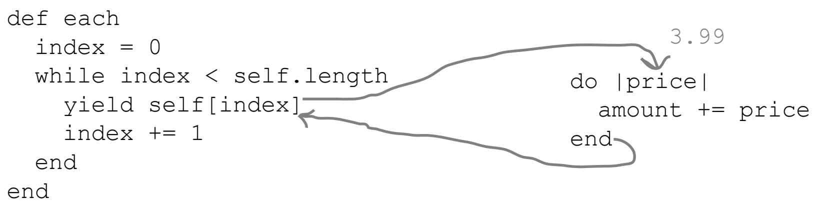
DRYing up our code with "each" and blocks (continued)

For each element in the array, each passes it as a parameter to the block. The code in the block adds the current array element to the amount variable, and then control returns back to each.

```
prices = [3.99, 25.00, 8.99]
puts format("%.2f", total(prices))
```

```
37.98
```

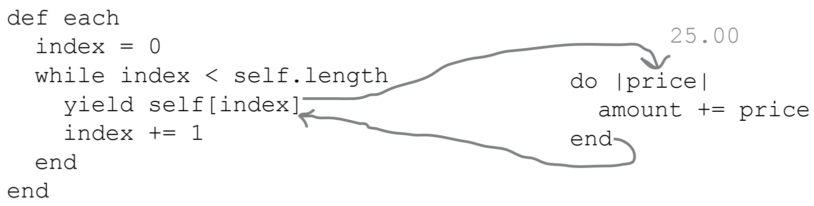
1



```
def each
  index = 0
  while index < self.length
    yield self[index]
    index += 1
  end
end
```

```
do |price|
  amount += price
end
```

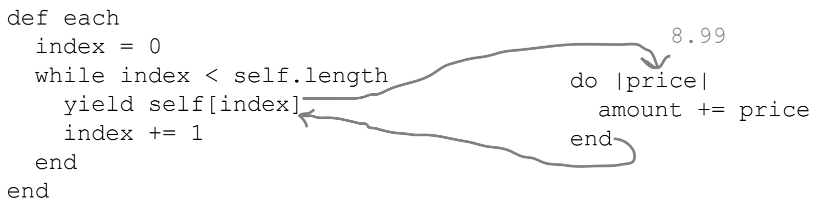
2



```
def each
  index = 0
  while index < self.length
    yield self[index]
    index += 1
  end
end
```

```
do |price|
  amount += price
end
```

3



```
def each
  index = 0
  while index < self.length
    yield self[index]
    index += 1
  end
end
```

```
do |price|
  amount += price
end
```

We've successfully refactored the total method!

But before we move on to the other two methods, let's take a closer look at how that amount variable interacts with the block.

Refactored

☑ Given an array of prices, add them all together and return the total.

□ Given an array of prices, subtract each price from the customer's account balance.

□ Given an array of prices, reduce each item's price by 1/3, and print the savings.

Blocks and variable scope

We should point something out about our new `total` method. Did you notice that we use the `amount` variable both *inside* and *outside* the block?

```
def total(prices)
  amount = 0
  prices.each do |price|
    amount += price
  end
  amount
end
```

As you may remember from Chapter 2, the *scope* of local variables defined within a method is limited to the body of that method. You can't access variables that are local to the method from *outside* the method.

```
def my_method
  greeting = "hello"
end
```

Define the variable within the method.

```
my_method
```

Call the method.

```
puts greeting
```

Try to print the variable.

Error

```
undefined local variable
or method `greeting'
```

The same is true of blocks, *if* you define the variable for the first time *inside* the block.

```
def run_block
  yield
end

run_block do
  greeting = "hello"
end
```

Define the variable within the block.

```
puts greeting
```

Try to print the variable.

Error

```
undefined local variable
or method `greeting'
```

But, if you define a variable *before* a block, you can access it *inside* the block body. You can *also* continue to access it *after* the block ends!

```
greeting = nil
```

Define the variable BEFORE the block.

```
run_block do
  greeting = "hello"
end
```

Assign a new value within the block.

```
puts greeting
```

Print the variable.

```
hello
```

Blocks and variable scope (continued)

Since Ruby blocks can access variables declared outside the block body, our `total` method is able to use `each` with a block to update the `amount` variable.

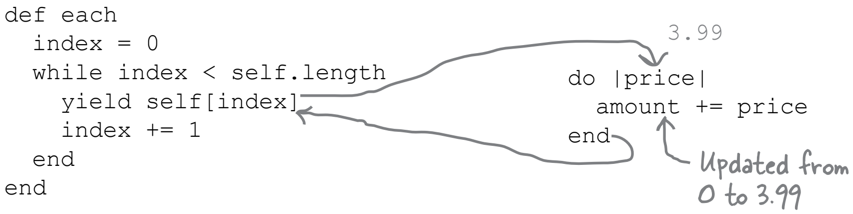
```
def total(prices)
  amount = 0
  prices.each do |price|
    amount += price
  end
  amount
end
```

We can call `total` like this:

```
total([3.99, 25.00, 8.99])
```

The `amount` variable is set to `0`, and then `each` is called on the array. Each of the values in the array is passed to the block. Each time the block is called, `amount` is updated:

1

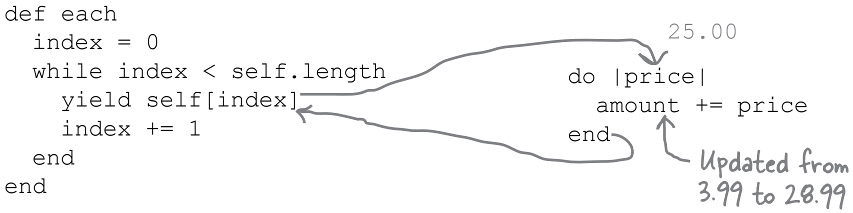


```
def each
  index = 0
  while index < self.length
    yield self[index]
    index += 1
  end
end
```

```
do |price|
  amount += price
end
```

Updated from 0 to 3.99

2

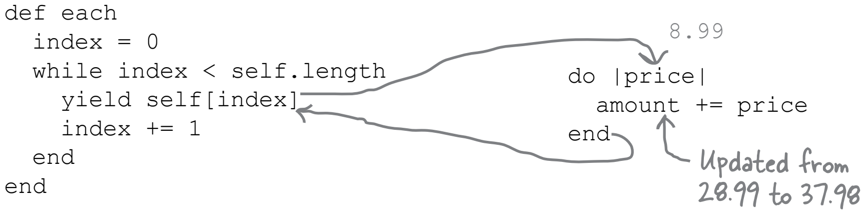


```
def each
  index = 0
  while index < self.length
    yield self[index]
    index += 1
  end
end
```

```
do |price|
  amount += price
end
```

Updated from 3.99 to 28.99

3



```
def each
  index = 0
  while index < self.length
    yield self[index]
    index += 1
  end
end
```

```
do |price|
  amount += price
end
```

Updated from 28.99 to 37.98

When the `each` method completes, `amount` is still set to that final value, `37.98`. It's that value that gets returned from the method.

Using "each" with the "refund" method

We've revised the `total` method to get rid of the repeated loop code. We need to do the same with the `refund` and `show_discounts` methods, and then we'll be done!

The process of updating the `refund` method is very similar to the process we used for `total`. We simply take the specialized code from the middle of the generic loop code, and move it to a block that's passed to `each`.

```
def refund(prices)
  amount = 0
  index = 0
  while index < prices.length
    amount -= prices[index]
    index += 1
  end
  amount
end
```

From here... ...to here!

```
def refund(prices)
  amount = 0
  prices.each do |price|
    amount -= price
  end
  amount
end
```

Again, we don't have to pull the item out of the array; "each" gets it for us!

Much cleaner, and calls to the method still work just the same as before!

```
prices = [3.99, 25.00, 8.99]
puts format("%.2f", refund(prices))
```

```
-37.98
```

Within the call to `each` and the block, the flow of control looks very similar to what we saw in the `total` method:

1

```
def each
  index = 0
  while index < self.length
    yield self[index]
    index += 1
  end
end
```

3.99

```
do |price|
  amount -= price
end
```

Updated from 0 to -3.99

2

```
def each
  index = 0
  while index < self.length
    yield self[index]
    index += 1
  end
end
```

25.00

```
do |price|
  amount -= price
end
```

Updated from -3.99 to -28.99

3

```
def each
  index = 0
  while index < self.length
    yield self[index]
    index += 1
  end
end
```

8.99

```
do |price|
  amount -= price
end
```

Updated from -28.99 to -37.98

Using "each" with our last method

One more method, and we're done! Again, with `show_discounts`, it's a matter of taking the code out of the middle of the loop and moving it into a block that's passed to `each`.

```
def show_discounts(prices)
  index = 0
  while index < prices.length
    amount_off = prices[index] / 3.0
    puts format("Your discount: $%.2f", amount_off)
    index += 1
  end
end
```

From here...

To here!

```
def show_discounts(prices)
  prices.each do |price|
    amount_off = price / 3.0
    puts format("Your discount: $%.2f", amount_off)
  end
end
```

Again, as far as users of your method are concerned, no one will notice you've changed a thing!

```
prices = [3.99, 25.00, 8.99]
show_discounts(prices)
```

```
Your discount: $1.33
Your discount: $8.33
Your discount: $3.00
```

Here's what the calls to the block look like:

1

```
def each
  index = 0
  while index < self.length
    yield self[index]
    index += 1
  end
end
```

3.99

```
prices.each do |price|
  amount_off = price / 3.0
  puts format("Your discount: $%.2f", amount_off)
end
```

```
Your discount: $1.33
```

2

```
def each
  index = 0
  while index < self.length
    yield self[index]
    index += 1
  end
end
```

25.00

```
prices.each do |price|
  amount_off = price / 3.0
  puts format("Your discount: $%.2f", amount_off)
end
```

```
Your discount: $8.33
```

3

```
def each
  index = 0
  while index < self.length
    yield self[index]
    index += 1
  end
end
```

8.99

```
prices.each do |price|
  amount_off = price / 3.0
  puts format("Your discount: $%.2f", amount_off)
end
```

```
Your discount: $3.00
```

Our complete invoicing methods

prices.rb

```
def total(prices)
  amount = 0
  prices.each do |price|
    amount += price
  end
  amount
end
```

Start the total at 0.

Process each price.

Add the current price to the total.

Return the final total.

```
def refund(prices)
  amount = 0
  prices.each do |price|
    amount -= price
  end
  amount
end
```

Start the total at 0.

Process each price.

Refund the current price.

Return the final total.

```
def show_discounts(prices)
  prices.each do |price|
    amount_off = price / 3.0
    puts format("Your discount: $%.2f", amount_off)
  end
end
```

Process each price.

Calculate discount.

Format and print the current discount.

```
prices = [3.99, 25.00, 8.99]

puts format("%.2f", total(prices))
puts format("%.2f", refund(prices))
show_discounts(prices)
```

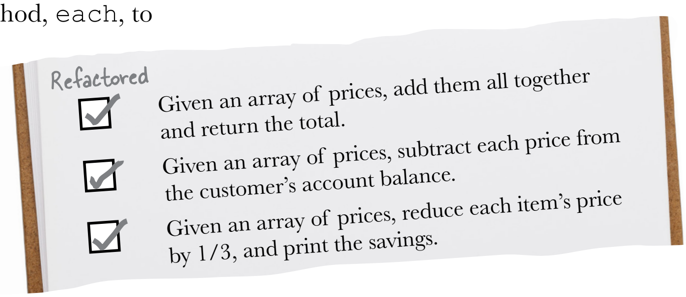
Do this!

Save this code in a file named *prices.rb*. Then try running it from the terminal!

```
$ ruby prices.rb
37.98
-37.98
Your discount: $1.33
Your discount: $8.33
Your discount: $3.00
```

We've gotten rid of the repetitive loop code!

We've done it! We've refactored the repetitive loop code out of our methods! We were able to move the portion of the code that *differed* into blocks, and rely on a method, each, to replace the code that remained the *same!*



Refactored

☑ Given an array of prices, add them all together and return the total.

☑ Given an array of prices, subtract each price from the customer's account balance.

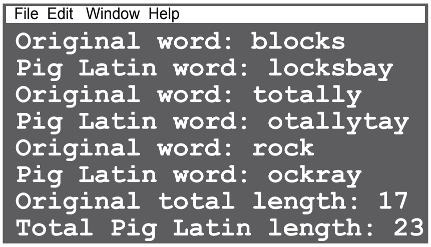
☑ Given an array of prices, reduce each item's price by 1/3, and print the savings.

Pool Puzzle

Your **job** is to take code snippets from the pool and place them into the blank lines in the code. **Don't** use the same snippet more than once, and you won't need to use all the snippets. Your **goal** is to make code that will run and produce the output shown.

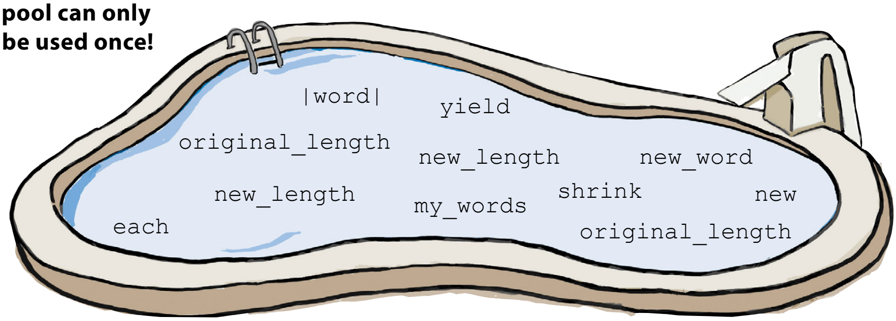
```
def pig_latin(words)

  original_length = 0
  __________ = 0

  words.____ do ______
    puts "Original word: #{word}"
    _______________ += word.length
    letters = word.chars
    first_letter = letters.shift
    new_word = "#{letters.join}#{first_letter}ay"
    puts "Pig Latin word: #{________}"
    __________ += new_word.length
  end

  puts "Total original length: #{_______________}"
  puts "Total Pig Latin length: #{new_length}"

end

my_words = ["blocks", "totally", "rock"]
pig_latin(________)
```

Output:



```
Original word: blocks
Pig Latin word: locksbay
Original word: totally
Pig Latin word: otallytay
Original word: rock
Pig Latin word: ockray
Original total length: 17
Total Pig Latin length: 23
```

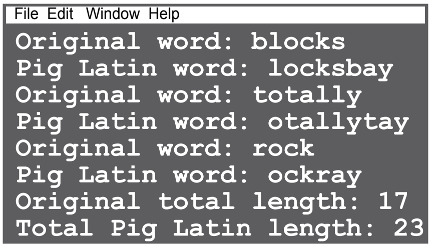
Note: each thing from the pool can only be used once!



Pool Puzzle Solution

```
def pig_latin(words)

  original_length = 0
  new_length = 0

  words.each do |word|
    puts "Original word: #{word}"
    original_length += word.length
    letters = word.chars
    first_letter = letters.shift
    new_word = "#{letters.join}#{first_letter}ay"
    puts "Pig Latin word: #{new_word}"
    new_length += new_word.length
  end

  puts "Total original length: #{original_length}"
  puts "Total Pig Latin length: #{new_length}"

end

my_words = ["blocks", "totally", "rock"]
pig_latin(my_words)
```

Output:



```
Original word: blocks
Pig Latin word: locksbay
Original word: totally
Pig Latin word: otallytay
Original word: rock
Pig Latin word: ockray
Original total length: 17
Total Pig Latin length: 23
```

Utilities and appliances, blocks and methods

Imagine two electric appliances: a mixer and a drill. They have very different jobs: one is used for baking, the other for carpentry. And yet they have a very similar need: electricity.

Now, imagine a world where, any time you wanted to use an electric mixer or drill, you had to wire your appliance into the power grid yourself. Sounds tedious (and fairly dangerous), right?

That's why, when your house was built, an electrician came and installed *power outlets* in every room. The outlets provide the same utility (electricity) through the same interface (an electric plug) to very different appliances.

The electrician doesn't know the details of how your mixer or drill works, and he doesn't care. He just uses his skills and training to get the current safely from the electric grid to the outlet.

Likewise, the designers of your appliances don't have to know how to wire a home for electricity. They only need to know how to take power from an outlet and use it to make their devices operate.

You can think of the author of a method that takes a block as being kind of like an electrician. They don't know how the block works, and they don't care. They just use their knowledge of a problem (say, looping through an array's elements) to get the necessary data to the block.

```
def wire
  yield "current"
end
```

You can think of calling a method with a block as being kind of like plugging an appliance into an outlet. Like the outlet supplying power, the block parameters offer a safe, consistent interface for the method to supply data to your block. Your block doesn't have to worry about how the data got there, it just has to process the parameters it's been handed.

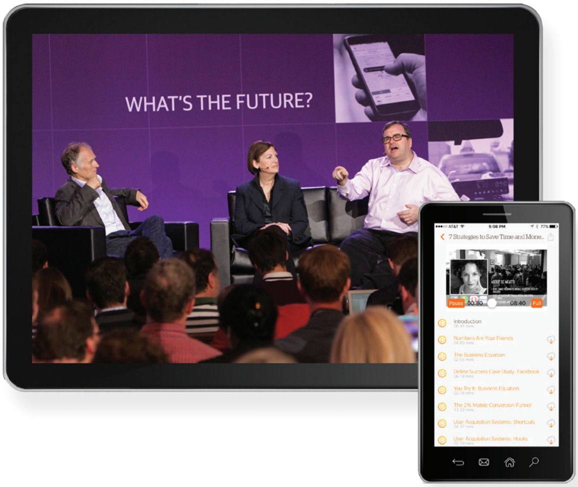
Like a power outlet

```
wire { |power| puts "Using #{power} to turn drill bit" }
wire { |power| puts "Using #{power} to spin mixer" }
```

```
Using current to turn drill bit
Using current to spin mixer
```

Not every appliance uses electricity, of course; some require other utilities. There are stoves and furnaces that require gas. There are automatic sprinklers and spray nozzles that use water.

Just as there are many kinds of utilities to supply many kinds of appliances, there are many methods in Ruby that supply data to blocks. The `each` method was just the beginning. Blocks, also sometimes known as lambdas, are crucial components of Ruby. They are used in loops, in functions that have to run code at some future time (known as callbacks), and other contexts.


WHAT'S THE FUTURE?
AT&T
5:08 PM
77%
7 Strategies to Save Time and Mone...
Pause
00:50
08:40
Full
Introduction
Numbers Are Your Friends
The Business Equation
Define Success Case Study: Facebook
You Try It: Business Equation
The 2% Mobile Conversion Funnel
User Acquisition Systems: Shortcuts
User Acquisition Systems: Hooks