**CONTROL FLOW IN RUBY**

**How It Works**

You may have noticed that the kinds of programs we’ve written so far in Ruby aren’t very flexible. Sure, they can take user input, but they always produce the same result based on that input; they don’t change their behavior in reaction to the **environment** (the collection of all variables and their values that exist in the program at a given time).

**Control flow** gives us the flexibility we’re looking for. We can select different outcomes depending on information the user types, the result of a computation, or the value returned by another part of the program.

**Instructions**

**1.**

Check out the code in the editor. There’s some new syntax there, but we’ll bet you can guess what it does. Click Run to see the program in action! (Go ahead and give Ruby an integer—that is, a positive or negative number with no decimal bit.)

Checkpoint 2 Passed

Hint

Note: Be sure to give input for the terminal. When it expects input but never receives it an error will be displayed after some time. This prevents it from running indefinitely.

**script.rb**

print "Integer please: "

user\_num = Integer(gets.chomp)

if user\_num < 0

  puts "You picked a negative integer!"

elsif user\_num > 0

  puts "You picked a positive integer!"

else

  puts "You picked zero!"

end

**If**

Ruby’s if statement takes an **expression**, which is just a fancy word for something that has a value that evaluates to either true or false. If that expression is true, Ruby executes the block of code that follows the if. If it’s not true (that is, false), Ruby doesn’t execute that block of code: it skips it and goes on to the next thing.

Here’s an example of an if statement in action:

if 1 < 2  
  print "I'm getting printed because one is less than two!"  
end

Ruby doesn’t care about **whitespace** (spaces and blank lines), so the indentation of the print statement isn’t *necessary*. However, it’s a convention that Rubyists (Ruby enthusiasts) follow, so it’s good to get in the habit now. The block of code following an if should be indented two spaces.

When you’re done with your if, you have to tell Ruby by typing end.

**Instructions**

**1.**

Write your own if statement in the editor. It can take any expression you want (even just true!), but it should evaluate to true. When it does, it should print a string of your choice to the console (using print or puts).

**script.rb**

if "four".length > "two".length

  puts "The word four is longer than the word two"

  end

**Else**

The partner to the if statement is the else statement. An if/else statement says to Ruby: “If this expression is true, run this code block; otherwise, run the code after the else statement.” Here’s an example:

if 1 > 2  
  print "I won't get printed because one is less than two."  
else  
  print "That means I'll get printed!"  
end

**Instructions**

**1.**

Try it yourself in the editor! Use any expression you like in your if/else statement, but make sure both branches print a string of your choice to the console.

**script.rb**

if "four".length > "two".length

  puts "The word four is longer than the word two"

else

  puts "The word four is shorter than the word two"

end

**Elsif**

What if you want more than two options, though? It’s elsif to the rescue! The elsif statement can add any number of alternatives to an if/else statement, like so:

if x < y  # Assumes x and y are defined  
  puts "x is less than y!"  
elsif x > y  
  puts "x is greater than y!"  
else  
  puts "x equals y!"  
end

**Instructions**

**1.**

Add an elsif block to your if/else statement in the editor.

**script.rb**

if "four".length > "two".length

  puts "The word four is longer than the word two"

elsif "two".length > "four".length

  puts "The word two is longer than the word four"

else

  puts "The length of the two words is the same"

end

**Unless**

Sometimes you want to use control flow to check if something is *false*, rather than if it’s true. You could reverse your if/else, but Ruby will do you one better: it will let you use an unless statement.

Let’s say you don’t want to eat *unless* you’re hungry. That is, while you’re not hungry, you write programs, but if you *are* hungry, you eat. You might write that program in Ruby like this:

unless hungry  
  # Write some sweet programs  
else  
  # Have some noms  
end

**Instructions**

**1.**

We’ve started you off in the editor. Replace the \_\_\_s with the correct unless statement code so your program prints out "I'm writing Ruby programs!"

**script.rb**

hungry = false

unless hungry

  puts "I'm writing Ruby programs!"

else

  puts "Time to eat!"

end

**Equal or Not?**

In Ruby, we assign values to variables using =, the **assignment operator**. But if we’ve already used = for assignment, how do we check to see if two things are equal? Well, we use ==, which is a **comparator** (also called a **relational operator**). == means “is equal to.” When you type

x = 2  
y = 2  
if x == y  
  print "x and y are equal!"  
end

you’re saying: “if x equals y, print ‘x and y are equal!’” You can also check to see if two values are *not* equal using the != comparator.

**Instructions**

**1.**

We’ve got two variables in the editor: is\_true and is\_false. Replace the \_\_ with == or != to make is\_true evaluate to true and is\_false evaluate to false.

**script.rb**

is\_true = 2 != 3

is\_false = 2 == 3

## Less Than or Greater Than

We can also check to see if one value is less than, less than or equal to, greater than, or greater than or equal to another. Those operators look like this:

* Less than: <
* Less than or equal to: <=
* Greater than: >
* Greater than or equal to: >=

**script.rb**

test\_1 = 17 > 16

test\_2 = 21 < 30

test\_3 = 9 <= 9

test\_4 = -11 < 4

**Practice Makes Perfect**

Great work so far! You know what they say: practice makes perfect. Let’s try a few more comparators to make sure you’ve got the hang of this.

**Instructions**

**1.**

For this round, we’ll show you the comparators and you set each variable to true or false depending on what value you expect the expression to return. Remember: no quotes around true and false!

**script.rb**

# test\_1 = 77 != 77

test\_1 =  false

# test\_2 = -4 <= -4

test\_2 = true

# test\_3 = -44 < -33

test\_3 = true

# test\_4 = 100 == 1000

test\_4 = false

**And**

Comparators aren’t the only operators available to you in Ruby. You can also use **logical** or **boolean operators**. Ruby has three: and (&&), or (||), and not (!). Boolean operators result in boolean values: true or false.

The boolean operator **and**, &&, only results in true when **both** expression on either side of && are true. Here’s how && works:

true && true # => true  
true && false # => false  
false && true # => false  
false && false # => false

For example, 1 < 2 && 2 < 3 is true because it’s true that one is less than two **and** that two is less than three.

**Instructions**

**1.**

Let’s practice a bit with &&. Check out the boolean expressions and set each variable to true or false depending on what value you expect the expression to return.

**script.rb**

# boolean\_1 = 77 < 78 && 77 < 77

boolean\_1 = false

# boolean\_2 = true && 100 >= 100

boolean\_2 = true

# boolean\_3 = 2\*\*3 == 8 && 3\*\*2 == 9

boolean\_3 = true

**Or**

Ruby also has the **or** operator (||). Ruby’s || is called an **inclusive or** because it evaluates to true when one or the other *or both* expressions are true. Check it out:

true || true # => true  
true || false # => true  
false || true # => true  
false || false # => false

**Instructions**

**1.**

Set each variable to true or false depending on what value you expect the expression to return.

**script.rb**

# boolean\_1 = 2\*\*3 != 3\*\*2 || true

boolean\_1 = true

# boolean\_2 = false || -10 > -9

boolean\_2 = false

# boolean\_3 = false || false

boolean\_3 = false

**Not**

Finally, Ruby has the boolean operator **not** (!). ! makes true values false, and vice-versa.

!true # => false  
!false # => true

**Instructions**

**1.**

Set each variable to true or false depending on what value you expect the expression to return.

**script.rb**

# boolean\_1 = !true

boolean\_1 = false

# boolean\_2 = !true && !true

boolean\_2 = false

# boolean\_3 = !(700 / 10 == 70)

boolean\_3 = false

**Combining Boolean Operators**

You can combine boolean operators in your expressions. Combinations like

(x && (y || w)) && z

are not only legal expressions, but are extremely useful tools for your programs.

These expressions may take some getting used to, but you can always use parentheses to control the order of evaluation. Expressions in parentheses are always evaluated before anything outside parentheses.

**Instructions**

**1.**

Last one! Set each variable to true or false depending on what value you expect the expression to return.

**script.rb**

# boolean\_1 = (3 < 4 || false) && (false || true)

boolean\_1 = true

# boolean\_2 = !true && (!true || 100 != 5\*\*2)

boolean\_2 = false

# boolean\_3 = true || !(true || false)

boolean\_3 = true

**If, Else, and Elsif**

All right! You’re all on your lonesome. (Well, not *quite*. We’ll just leave this example here.)

a = 10  
b = 11  
if a < b  
  print "a is less than b!"  
elsif b < a  
  print "b is less than a!"  
else  
  print "b is equal to a!"  
end

**Instructions**

**1.**

Create an if/else statement in the editor. Make sure to include at least one elsif. Each branch of the statement should print something to the console.

Checkpoint 2 Passed

Hint

The syntax for if/elsif/else looks like this:

if expression  
  # Do something  
elsif expression  
  # Do something else  
else  
  # Do yet another thing  
end

**script.rb**

name = "Andres"

last\_name = "Bucheli"

if name.length < last\_name.length

  print "The name is shorter than the last name"

elsif last\_name.length > name.length

  print "The name is longer than the last name"

else

  print "The name and the last name have the same length"

end

**Unless**

Good! Now let’s review the unless statement.

problem = false  
print "Good to go!" unless problem

Remember, this is basically a short hand if statement. It will do whatever you ask unless the condition is true. In our example, problem is false, so we don’t have a problem. We print Good to go!

**Instructions**

**1.**

Create an unless statement in the editor. The statement should print something to the console.

Checkpoint 2 Passed

Hint

Remember, unless syntax looks like this:

unless condition  
  # Do something!  
end

For unless, the # Do something! bit will execute if the condition evaluates to false.

**script.rb**

name = "Andres"

print "My name is Fernando" unless (name != "Andres")

**Dare to Compare**

Now let’s review comparators / relational operators. We’ve turned the tables a bit!

Remember, comparators need to compare two values to each other to result in true or false

10 > 8 # true  
8 > 10 # false  
8 == 10 # false  
8 != 10 # true

**Instructions**

**1.**

We’re letting you know what value (true or false) we want each variable to have, and your job is to add an expression that evaluates to the correct value using comparators.

Checkpoint 2 Passed

Hint

Remember, comparators are ==, !=, >, >=, <, and <=.

**script.rb**

# test\_1 should be false

test\_1 = 8 == 9

# test\_2 = should be false

test\_2 = 7 > 14

# test\_3 = should be true

test\_3 = true == (2\*5 == 10)

**Billions of Booleans**

Home stretch! Let’s go over boolean operators.

( 1 == 1 ) && ( 2 == 2 )  # true  
( 1 == 2 ) || ( 2 == 2 ) # true  
!( false ) # true

1. With && both comparisons on the left and right must evaluate to true for the entire statement to return true. If the left side does not return true it will not bother trying the right side
2. With || either the right or left side must evaluate to true. If the left side evaluates to true, the right side will not be tried because it has met the condition of one side being true.
3. With ! you reverse the result. If you’re false you’re now true. if you’re true you’re now false! Just think of it as opposite day!

**Instructions**

**1.**

The code in the editor indicates what value (true or false) we want each variable to have, and your job is to add an expression that evaluates to the correct value using boolean operators (&&, ||, or !).

**script.rb**

# test\_1 should be true

test\_1 = true && (2 == 4/2)

# test\_2 = should be true

test\_2 = (9 == 3\*\*2) || (1 == 3)

# test\_3 = should be false

test\_3 = !(6\*3 == 9\*2)