

# Swift/iOS Tutorial for 6.808

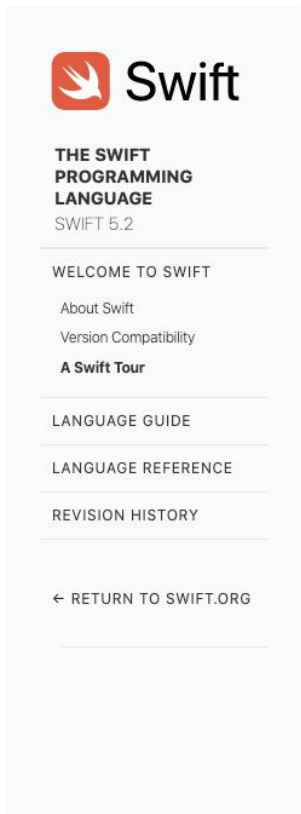
Feb 4, 2022

# This tutorial is based on Apple's Official Guide

I will point out important features that may be used in 6.808 labs.

## Links

- [A Swift Tour](#)
- [The Basics](#)



The screenshot shows the navigation menu for the Swift Programming Language website. At the top is the Swift logo (a red square with a white bird) and the word "Swift". Below this is the text "THE SWIFT PROGRAMMING LANGUAGE" and "SWIFT 5.2". The menu items are: "WELCOME TO SWIFT" (with sub-items "About Swift" and "Version Compatibility"), "A Swift Tour", "LANGUAGE GUIDE", "LANGUAGE REFERENCE", "REVISION HISTORY", and a link "← RETURN TO SWIFT.ORG".

ON THIS PAGE ▾

## A Swift Tour

Tradition suggests that the first program in a new language should print the words "Hello, world!" on the screen. In Swift, this can be done in a single line:

```
1 print("Hello, world!")
2 // Prints "Hello, world!"
```

If you have written code in C or Objective-C, this syntax looks familiar to you—in Swift, this line of code is a complete program. You don't need to import a separate library for functionality like input/output or string handling. Code written at global scope is used as the entry point for the program, so you don't need a `main()` function. You also don't need to write semicolons at the end of every statement.

This tour gives you enough information to start writing code in Swift by showing you how to accomplish a variety of programming tasks. Don't worry if you don't understand something—everything introduced in this tour is explained in detail in the rest of this book.

### NOTE

For the best experience, open this chapter as a playground in Xcode. Playgrounds allow you to edit the code listings and see the result immediately.

[Download Playground](#)

# Constants, Variables, Types

Constants (`let`) and Variables (`var`)

```
var myVariable = 42
myVariable = 50
let myConstant = 42
```

Type Safety

- Auto type inference
- Annotate with a colon if needed
- Static type checking
- Explicit type conversion required
  - e.g. `Int <-> Double`

```
let implicitInteger = 70
let implicitDouble = 70.0
let explicitDouble: Double = 70
```

# String Interpolation \ ( . . . )

- Convert values to string
- Allow calculations

```
let apples = 3
let oranges = 5
let appleSummary = "I have \ (apples) apples."
let fruitSummary = "I have \ (apples + oranges) pieces of fruit."
```

# Printing

- `print` vs. `NSLog`
  - `NSLog` adds a timestamp and identifier (slower)
  - `NSLog` is used in Lab 0 video tutorials

Xcode console

```
print("Hello, world!") → Hello, world!
```

```
NSLog("Hello, world!") → 2020-02-07 09:22:39.947443-0500 Lab0[87933:5960518] Hello, world!
```

# Arrays, Dictionaries

## Arrays

```
var shoppingList = ["catfish", "water", "tulips"]
shoppingList[1] = "bottle of water"
shoppingList.append("blue paint")
```

**Dictionaries** use [k:v], not {k:v}.

```
var occupations = [
    "Malcolm": "Captain",
    "Kaylee": "Mechanic",
]
occupations["Jayne"] = "Public Relations"
```

## Methods

- `lst.count`
- `lst.enumerated()`
- `lst.isEmpty`

Python

`len()`

`enumerate()`

# Control Flow

- Conditionals: `if`, `switch`
- Loops: `for-in`, `while`, `repeat-while`

```
    let interestingNumbers = [  
        "Prime": [2, 3, 5, 7, 11, 13],  
        "Fibonacci": [1, 1, 2, 3, 5, 8],  
        "Square": [1, 4, 9, 16, 25],  
    ]  
    var largest = 0  
Iterate over a dict → for (kind, numbers) in interestingNumbers {  
Iterate over a list →   for number in numbers {  
                           if number > largest { ← Braces required  
                               largest = number      ← Parenthesis optional  
                           }  
                       }  
    }  
    print(largest)  
    // Prints "25"
```

# Range Operators

- Closed range operator `a...b`
- Half-open range operator `a..<b`
- One-sided ranges `...a`, `a...1`, `..1a`

```
let names = ["Anna", "Alex", "Brian", "Jack"]
let count = names.count
for i in 0..
```

```
for name in names[2...] {
    print(name)
}
// Brian
// Jack

for name in names[...2] {
    print(name)
}
// Anna
// Alex
// Brian
```



# Optionals

- Value or `nil`

Type followed by ?



```
var optionalString: String? = "Hello"  
print(optionalString == nil)  
// Prints "false"
```

- Optional binding: `if/while + let` pattern

```
var optionalName: String? = "John Appleseed"  
var greeting = "Hello!"  
if let name = optionalName { ← name's type is String  
    greeting = "Hello, \(name)"  
}
```

Can add the `else` case for `nil`

# Forced unwrapping, Downcasting

- Forced unwrapping: a!
  - “I know that this optional definitely has a value; please use it.”

```
let possibleNumber = "123"  
let convertedNumber = Int(possibleNumber)  
// convertedNumber is inferred to be of type "Int?", or "optional Int"  
  
if convertedNumber != nil {  
    print("convertedNumber has an integer value of \((convertedNumber!).)")  
}  
// Prints "convertedNumber has an integer value of 123."
```




- Downcasting: type cast operator
  - `as?` Conditional: return an optional value
  - `as!` Forced: trigger a runtime error if downcast to an incorrect class type

# Functions

- `func`; use `->` followed by return type

```
func greet(person: String, day: String) -> String {  
    return "Hello \$(person), today is \$(day)."  
}  
greet(person: "Bob", day: "Tuesday")
```

- Custom/no argument labels

```
func greet( _ person: String,  on day: String) -> String {  
    return "Hello \$(person), today is \$(day)."  
}  
greet( "John",  on: "Wednesday")
```

# Extra: Closures

- Functions are actually a special case of closures: blocks of code that can be called later
- Closure without a name: `{... in ...}`

```
numbers.map({ (number: Int) -> Int in
    let result = 3 * number
    return result
})
```

- Concise: omit types

```
let mappedNumbers = numbers.map({ number in 3 * number })
print(mappedNumbers)
// Prints "[60, 57, 21, 36]"
```

- Concise: Refer parameters by number

```
let sortedNumbers = numbers.sorted { $0 > $1 }
print(sortedNumbers)
// Prints "[20, 19, 12, 7]"
```

# Extra: Empty array/dictionary

- Initializer

```
let emptyArray = [String]()  
let emptyDictionary = [String: Float]()
```

- If type can be inferred, e.g. set value, pass an argument to a function

```
shoppingList = []  
occupations = [:]
```