SORBONNE UNIVERSITÉ

Nouvelles technologies du web

LI385

Olivier Pitton

Backend

Cloud, web, DevOps, etc.

Adrien Humilière

Frontend

iOS development, Swift

About me

Adrien Humilière

Mobile Lead @ Brut.

DANT 2011/2012

About me

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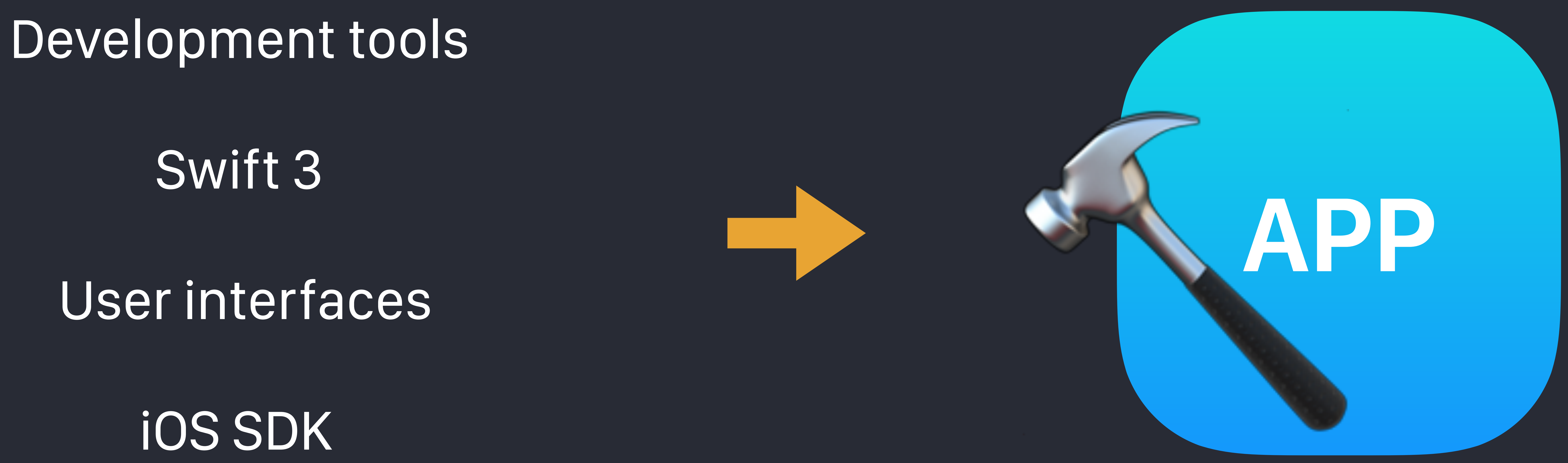


Development tools

Swift 3

User interfaces

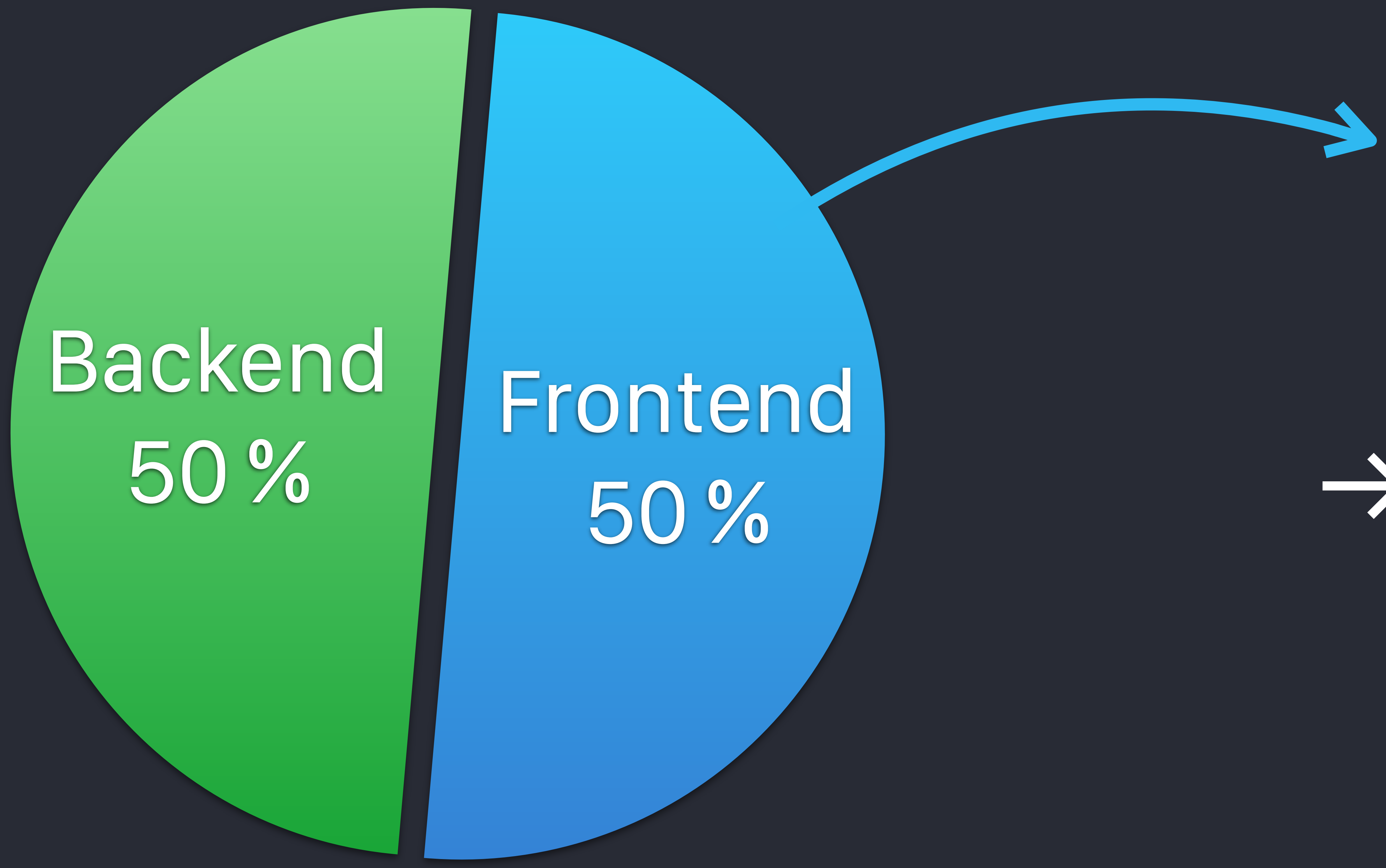
iOS SDK

Organisation

25 hours

Lessons + Labs

Notation



1 project · 2 steps

→ Swift library (February to April)

→ Application (April to June)

Practice at home

Have a mac ? Install Xcode.

Swift code can be written and built
on **Mac, Linux, iPad, and web**.

Developper account (free) on developer.apple.com
needed to build on device.

Practice at university

Salle 14-15, 409

available for you (if not in use)

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Introduction to iOS development with Swift

Lesson 1

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FEB
15

→ Swift and playgrounds

→ Constants, Variables, and Data Types

→ Operators

→ Control Flow

→ Strings

→ Functions

→ Structures

→ Classes and inheritance

→ Collections

→ Loops

Swift and playgrounds

A **modern** language

Fast

Safe

Expressive

A **safe** language

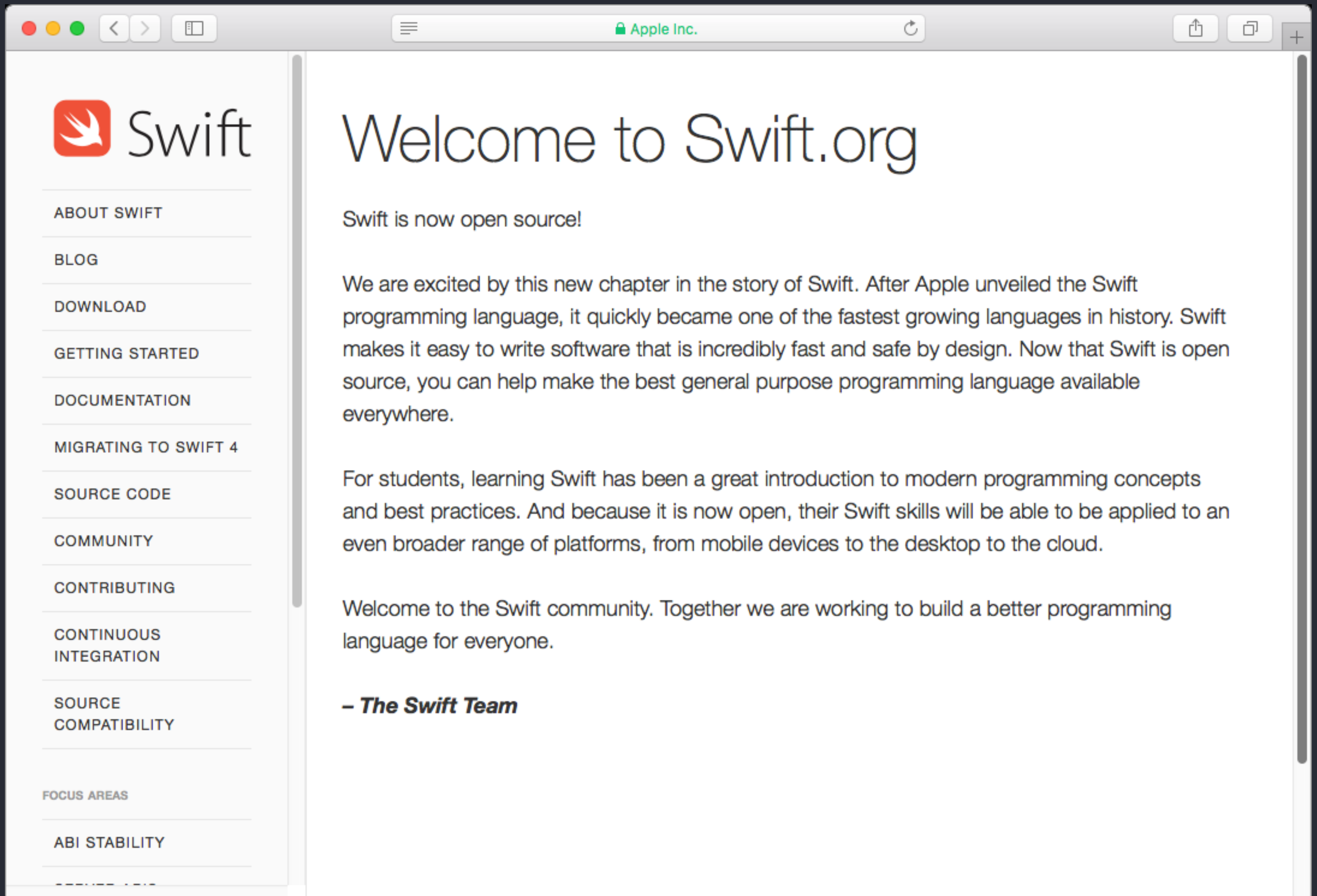
→ Explicit object « types »

→ Type inference

→ Optionals

→ Error handling

Open Source



Welcome to Swift.org

Swift is now open source!

We are excited by this new chapter in the story of Swift. After Apple unveiled the Swift programming language, it quickly became one of the fastest growing languages in history. Swift makes it easy to write software that is incredibly fast and safe by design. Now that Swift is open source, you can help make the best general purpose programming language available everywhere.

For students, learning Swift has been a great introduction to modern programming concepts and best practices. And because it is now open, their Swift skills will be able to be applied to an even broader range of platforms, from mobile devices to the desktop to the cloud.

Welcome to the Swift community. Together we are working to build a better programming language for everyone.

– The Swift Team

Hello, world!

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

Playgrounds

Constants, Variables, and Data Types

🧬

Constants

- → Defined using the let keyword

```
let name = "John"
```

- → Defined using the let keyword

```
let pi = 3.14159
```

- → Can’t assign a constant a new value

```
let name = "John"
name = "James"
```

Variables

- → Defined using the var keyword

```
var age = 29
```

- → Can assign a new value to a variable

```
var age = 29
age = 30
```

Naming constants and variables

- → No mathematical symbols
- → No spaces
- → Can’t begin with a number

```
let π = 3.14159
let 一百 = 100
let 🎲 = 6
let mañana = "Tomorrow"
let anzahlDerBücher = 15 //numberOfBooks
```

Naming constants and variables

- → Clear and descriptive
- → camelCase if multiple words

Types

```
struct Person {
  let firstName: String
  let lastName: String

  func sayHello() {
    print("Hello there! My name is \(firstName) \(lastName).")
  }
}
```

Most common types

`Int`

`Double`

`String`

`Bool`

Type safety

```
let playerName: String = "Julian"
var playerScore: Int = 1000
var gameOver: Bool = false
playerScore = playerName
```

! Cannot assign value of type ‘String’ to type ‘Int’

```
var wholeNumber: Int = 30
var numberWithDecimals: Double = 17.5
wholeNumber = numberWithDecimals
```

! Cannot assign value of type ‘Double’ to type ‘Int’

Type inference

```
let cityName = "San Francisco"
let pi = 3.1415927
```

Type annotation

```
let cityName: String = "San Francisco"
let pi: Double = 3.1415927
```

```
let number: Double = 3
print(number) // ~> 3.0
```

Mandatory type annotation

→ When you create a constant or variable before assigning it a value

```
let firstName: String
//...
firstName = "Layne"
```

Mandatory type annotation

→ When you create a constant or variable that could be inferred as two or more different types

```
let middleInitial: Character = "J"
var remainingDistance: Float = 30
```

Mandatory type annotation

→ When you add properties to a type definition

```
struct Car {
   let make: String
   let model: String
   let year: Int
}
```

Operators

👷‍♀️

Assign a value

→ Use the = operator to assign a value

```
var favoritePerson = "Luke"
```

→ Use the = operator to modify or reassign a value

```
var shoeSize = 8
shoeSize = 9
```

Basic arithmetic

- You can use the +, -, *, and / operators to perform basic math functions

```
var opponentScore = 3 * 8
var myScore = 100 / 4
```

Basic arithmetic

→ Use Double values for decimal precision

```
let totalDistance = 3.9
var distanceTravelled = 1.2
var remainingDistance = totalDistance - distanceTravelled
print(remainingDistance) // ~> 2.7
```

Basic arithmetic

```
let x = 51
let y = 4
let z = x / y
print(z) // ~> 12
```

Basic arithmetic

```
let x: Double = 51
let y: Double = 4
let z = x / y
print(z) // ~> 12.75
```

Compound assignment

```
var myScore = 10
myScore = myScore + 3

myScore += 3
myScore -= 5
myScore *= 2
myScore /= 2
```

Numeric type conversion

```
let x = 3
let y = 0.1415927
let pi = x + y
```

❗ Binary operator ‘+’ cannot be applied to operands of type ‘Int’ and ‘Double’

```
let x = 3
let y = 0.1415927
let pi = Double(x) + y
```

✅

Control Flow

🚦

Logical operators

==	Two items must be equal
!=	The values must not be equal to each other
>	Value on the left must be greater than the value on the right
>=	Value on the left must be greater than or equal to the value on the right
<	Value on the left must be less than the value on the right
<=	Value on the left must be less than or equal to the value on the right
&&	AND—The conditional statement on the left and right must be true
||	OR—The conditional statement on the left or right must be true
!	Returns the opposite of the conditional statement immediately following the operator

if statements

```
if condition {
  code
}
```

```
let temperature = 100
if temperature >= 100 {
  print("The water is boiling.")
}
```

if-else statements

```
if condition {
  code
} else {
  code
}
```

```
let temperature = 100
if temperature >= 100 {
  print("The water is boiling.")
} else {
  print("The water is not boiling.")
}
```

switch statement

```
switch value {
case n:
   code
case n:
   code
case n:
   code
default:
   code
}
```

switch statement

```
let numberOfWheels = 2
switch numberOfWheels {
case 1:
    print("Unicycle")
case 2:
    print("Bicycle")
case 3:
    print("Tricycle")
case 4:
    print("Quadcycle")
default:
    print("That's a lot of wheels!")
}
```

switch statement

```
let character = "z"

switch character {
case "a", "e", "i", "o", "u", "y":
    print("This character is a vowel.")
default:
    print("This character is not a vowel.")
}
```

switch statement

```
switch distance {
case 0...9:
    print("Your destination is close.")
case 10...99:
    print("Your destination is a medium distance from here.")
case 100...999:
    print("Your destination is far from here.")
default:
    print("Are you sure you want to travel this far?")
}
```

Strings

📝

Basics

```
let greeting = "Hello"
var otherGreeting = "Salutations"
```

```
let joke = """
  Q: Why did the chicken cross the road?
  A: To get to the other side!
  """
print(joke)
// Q: Why did the chicken cross the road?
// A: To get to the other side!
```

Basics – escaping

```
let greeting = "It is traditional in programming to print
\"Hello, world!\""
```

`\"`	Double quote
`\\`	Backslash
`\t`	Tab
`\r`	Carriage return (return to beginning of the next line)

Basics – Empty

```
var myString = ""

if myString.isEmpty {
  print("The string is empty")
}
```

Basics – Characters

```
let a = "a" // 'a' is a string
let b: Character = "b" // 'b' is a Character
```

Concatenation

```
let string1 = "Hello"
let string2 = ", world!"
var myString = string1 + string2 // "Hello, world!"

myString += " Hello!" // "Hello, world! Hello!"
```

Interpolation

```
let name = "Rick"
let age = 30
print("\(name) is \(age) years old")

// Rick is 30 years old
```

```
let a = 4
let b = 5
print("If a is \(a) and b is \(b), then a + b equals \(a+b)")
```

String equality and comparison

```
let name = "Johnny Appleseed"
if name.lowercased() == "joHnnY aPPleseeD".lowercased() {
  print("The two names are equal.")
}
```

String equality and comparison

```
let greeting = "Hello, world!"

print(greeting.hasPrefix("Hello"))
print(greeting.hasSuffix("world!"))
print(greeting.hasSuffix("World!"))
```

String equality and comparison

```
let greeting = "Hi Rick, my name is Amy."
if greeting.contains("my name is") {
  print("Making an introduction")
}
```

String equality and comparison

```
let name = "Ryan Mears"
let count = name.count
let newPassword = "1234"

if newPassword.count < 8 {
    print("This password is too short. Passwords should have
at least 8 characters.")
}
```

String equality and comparison

```
let cow = "🐮"
let credentials = "résumé"
let myBook = "私の本"
print("∞".characters.count)
```

String equality and comparison

```
let someCharacter: Character = "e"
switch someCharacter {
  case "a", "e", "i", "o", "u":
    print("\(someCharacter) is a vowel.")
  default:
    print("\(someCharacter) is not a vowel.")
}
```

Functions

📈

```
tieMyShoes()
```

```
makeBreakfast(food: "scrambled eggs", drink: "orange juice")
```

Defining a function

```
func functionName (parameters) -> ReturnType {
    // Body of the function
}
```

Defining a function

```
func displayPi() {
  print("3.1415926535")
}

displayPi() // 3.1415926535
```

Parameters

```
func triple(value: Int) {
  let result = value * 3
  print("If you multiply \(value) by 3, you'll get \
(result).")
}

triple(value: 10) // If you multiply 10 by 3, you'll get 30.
```

Multiple parameters

```
func multiply(firstNumber: Int, secondNumber: Int) {
  let result = firstNumber * secondNumber
  print("The result is \(result).")
}

multiply(firstNumber: 10, secondNumber: 5)
// The result is 50.
```

Return values

```
func multiply(firstNumber: Int, secondNumber: Int) -> Int {
  let result = firstNumber * secondNumber
  return result
}
```

Return values

```
func multiply(firstNumber: Int, secondNumber: Int) -> Int {
 return firstNumber * secondNumber
}
```

```
let myResult = multiply(firstNumber: 10, secondNumber: 5)
print("10 * 5 is \(myResult)")
```

```
print("10 * 5 is \(multiply(firstNumber: 10, secondNumber: 5))")
```

Argument labels

```
func sayHello(firstName: String) {
  print("Hello, \(firstName)!")
}

sayHello(firstName: "Amy")
```

Argument labels

```
func sayHello(to: String, and: String) {
  print("Hello \(to) and \(and)")
}

sayHello(to: "Luke", and: "Dave")
```

Argument labels

```
func sayHello(to person: String, and otherPerson: String) {
  print("Hello \(person) and \(otherPerson)")
}

sayHello(to: "Luke", and: "Dave")
```

Argument labels

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

```
func add(_ firstNumber: Int, to secondNumber: Int) -> Int {
    return firstNumber + secondNumber
}

let total = add(14, to: 6)
```

Default parameter values

```
func display(teamName: String, score: Int = 0) {
  print("\(teamName): \(score)")
}

display(teamName: "Wombats", score: 100)
display(teamName: "Wombats")
```

Structures

🗄️

```
struct Person {
  var name: String
}
```

→ Capitalize type names

→ Use lowercase for property names

Accessing property values

```
struct Person {
  var name: String
}

let person = Person(name: "Jasmine")
print(person.name) // Jasmine
```

Adding functionality

```
struct Person {
  var name: String

  func sayHello() {
    print("Hello there! My name is \(name)!")
  }

}

let person = Person(name: "Jasmine")
person.sayHello() // Hello there! My name is Jasmine!
```

Instances

```
struct Shirt {
  var size: String
  var color: String
}

let myShirt = Shirt(size: "XL", color: "blue")

let yourShirt = Shirt(size: "M", color: "red")
```

```swift
struct Car {
  var brand: String
  var year: Int
  var color: String

  func startEngine() {...}

  func drive() {...}

  func park() {...}

  func steer(direction: Direction) {...}
}

let firstCar = Car(brand: "Peugeot", year: 2010, color: "blue")
let secondCar = Car(brand: "Ford", year: 2013, color: "black")

firstCar.startEngine()
firstCar.drive()
```

Initializers

```
let string = String.init() // ""
let integer = Int.init() // 0
let bool = Bool.init() // false
```

Initializers

```
let string = String() // ""
let integer = Int() // 0
let bool = Bool() // false
```

Default values

```
struct Odometer {
  var count: Int = 0
}

let odometer = Odometer()
print(odometer.count) // 0
```

```
let odometer = Odometer(count: 27000)
print(odometer.count) // 27000
```

```
struct Person {
  let name: String
  let age: Int
}

let aPerson = Person(name: "Adrien", age: 32)


struct Car {
  let brand: String
  let year: Int
  let color: String
}

let firstCar = Car(brand: "Honda", year: 2010, color: "blue")
```

Custom initializers

```
struct Temperature {
  var celsius: Double
}

let temperature = Temperature(celsius: 30.0)
```

```
let fahrenheitValue = 98.6
let celsiusValue = (fahrenheitValue - 32) / 1.8

let newTemperature = Temperature(celsius: celsiusValue)
```

```
struct Temperature {
  var celsius: Double

  init(celsius: Double) {
    self.celsius = celsius
  }

  init(fahrenheit: Double) {
    celsius = (fahrenheit - 32) / 1.8
  }
}

let tempFromCelsius = Temperature(celsius: 18.5)
let tempFromFahrenheit = Temperature(fahrenheit: 212.0)
```

Instance methods

```
struct Size {
  var width: Double
  var height: Double

  func area() -> Double {
    return width * height
  }
}

var someSize = Size(width: 10.0, height: 5.5)

let area = someSize.area() // Area is assigned a value of 55.0
```

Mutating methods

```
struct Odometer {
  var count: Int = 0 // Assigns a default value to the 'count'
}
```

Need to:

- → Increment the mileage
- → Reset the mileage

```swift
struct Odometer {
  var count: Int = 0

  mutating func increment() {
    count += 1
  }

  mutating func increment(by amount: Int) {
    count += amount
  }

  mutating func reset() {
    count = 0
  }
}
```

Computed properties

```swift
struct Temperature {
  let celsius: Double
  let fahrenheit: Double
  let kelvin: Double
}

let temperature = Temperature(celsius: 0, fahrenheit: 32, kelvin: 273.15)
```

```
struct Temperature {
  var celsius: Double
  var fahrenheit: Double
  var kelvin: Double

  init(celsius: Double) {
    self.celsius = celsius
    fahrenheit = celsius * 1.8 + 32
    kelvin = celsius + 273.15
  }

  init(fahrenheit: Double) {
    self.fahrenheit = fahrenheit
    celsius = (fahrenheit - 32) / 1.8
    kelvin = celsius + 273.15
  }

  init(kelvin: Double) {
    self.kelvin = kelvin
    celsius = kelvin - 273.15
    fahrenheit = celsius * 1.8 + 32
  }
}
```

Computed properties

```
struct Temperature {
  let celsius: Double

  var fahrenheit: Double {
    return celsius * 1.8 + 32
  }

  var kelvin: Double {
    return celsius + 273.15
  }
}
```

Property observers

```
struct StepCounter {
    var totalSteps: Int = 0 {
        willSet {
            print("About to set totalSteps to \(newValue)")
        }
        didSet {
            if totalSteps > oldValue  {
                print("Added \(totalSteps - oldValue) steps")
            }
        }
    }
}
```

Property observers

```
var stepCounter = StepCounter()
stepCounter.totalSteps = 40
stepCounter.totalSteps = 100

// About to set totalSteps to 40
// Added 40 steps
// About to set totalSteps to 100
// Added 60 steps
```

Type properties and methods

```
struct Temperature {
  static var boilingPoint = 100.0

  static func convertedFromFahrenheit(_ temperatureInFahrenheit:
Double) -> Double {
    return(((temperatureInFahrenheit - 32) * 5) / 9)
  }

}

let boilingPoint = Temperature.boilingPoint
let currentTemperature = Temperature.convertedFromFahrenheit(99)
let positiveNumber = abs(-4.14)
```

Copying

```
var someSize = Size(width: 250, height: 1000)
var anotherSize = someSize

someSize.width = 500

print(someSize.width)
print(anotherSize.width)
```

self

```
struct Car {
  var color: Color

  var description: String {
    return "This is a \(self.color) car."
  }
}
```

self

```
struct Car {
  var color: Color

  var description: String {
    return "This is a \(color) car."
  }
}
```

→ Not required when property or method names exist on the current object

self

```
struct Temperature {
  var celsius: Double

  init(celsius: Double) {
    self.celsius = celsius
  }
}
```

Classes and inheritance

👩‍👧‍👧

```swift
class Person {
  let name: String

  init(name: String) {
    self.name = name
  }

  func sayHello() {
    print("Hello there!")
  }
}

let person = Person(name: "Jasmine")
print(person.name)
person.sayHello()
```

Inheritance

- → Base class: `Vehicle`
- → Subclass: `Tandem`
- → Superclass: `Bicycle`

Inheritance

```
class Vehicle {
   var currentSpeed = 0.0

   var description: String {
      return "traveling at \(currentSpeed) km per hour"
   }

   func makeNoise() {
      // do nothing - a vehicle doesn't necessarily make noise
   }
}
```

Subclass

```
class SomeSubclass: SomeSuperclass {
    // subclass definition goes here
}
```

```
class Bicycle: Vehicle {
    var hasBasket = false
}
```

Subclass

```
class Tandem: Bicycle {
    var currentNumberOfPassengers = 0
}
```

Override methods

```
class Train: Vehicle {
    override func makeNoise() {
        print("Choo Choo!")
    }
}
```

Override computed properties

```
class Car: Vehicle {
    var gear = 1
    override var description: String {
        return super.description + " in gear \(gear)"
    }
}
```

Override init

```
class Person {
  let name: String

  init(name: String) {
    self.name = name
  }
}

class Student: Person {
  var favoriteSubject: String
}
```

❗ Class ‘Student’ has no initializers

```
class Person {
  let name: String

  init(name: String) {
    self.name = name
  }
}

class Student: Person {
  var favoriteSubject: String

  init(name: String, favoriteSubject: String) {
    self.favoriteSubject = favoriteSubject
    super.init(name: name)
  }
}
```

References

→ **When you create an instance of a class:**

- Swift returns the address of that instance
- The returned address is assigned to the variable

→ **When you assign the address of an instance to multiple variables:**

- Each variable contains the same address
- Update one instance, and all variables refer to the updated instance

```
class Person {
  let name: String
  var age: Int

  init(name: String, age: Int) {
    self.name = name
    self.age = age
  }
}

var jack = Person(name: "Jack", age: 24)
var myFriend = jack

jack.age += 1

print(jack.age) // 25
print(myFriend.age) // 25
```

```
struct Person {
  let name: String
  var age: Int
}

var jack = Person(name: "Jack", age: 24)
var myFriend = jack

jack.age += 1

print(jack.age) // 25
print(myFriend.age) // 24
```

Memberwise initializers

- Swift does not create memberwise initializers for classes
- Common practice is for developers to create their own for their defined classes

Class or structure?

- → Start new types as structures
- → Use a class:
  - When you’re working with a framework that uses classes
  - When you want to refer to the same instance of a type in multiple places
  - When you want to model inheritance

Collections

📚

Collection types

Array

Dictionary

Arrays

```
[value1, value2, value3]
```

```
var names: [String] = ["Anne", "Gary", "Keith"]
```

Arrays

```
[value1, value2, value3]
```

```
var names = ["Anne", "Gary", "Keith"]
```

```
var numbers = [1, -3, 50, 72, -95, 115]
```

Arrays

```
[value1, value2, value3]
```

```
var names = ["Anne", "Gary", "Keith"]
```

```
var numbers: [Double] = [1, -3, 50, 72, -95, 115]
```

Arrays — contains

```
let numbers = [4, 5, 6]
if numbers.contains(5) {
  print("There is a 5")
}
```

Arrays types

```
var myArray: [Int] = []
var myArray: Array<Int> = []
var myArray = [Int]()
```

Working with arrays

```
var myArray = [Int](repeating: 0, count: 100)
let count = myArray.count
if myArray.isEmpty { }
```

Working with arrays

```
var names = ["Anne", "Gary", "Keith"]
let firstName = names[0]
print(firstName) // Anne
```

```
names[1] = "Paul"
print(names) // ["Anne", "Paul", "Keith"]
```

Working with arrays

```
var names = ["Amy"]
names.append("Joe")
names += ["Keith", "Jane"]
print(names) // ["Amy", "Joe", "Keith", "Jane"]
```

Working with arrays

```
var names = ["Amy", "Brad", "Chelsea", "Dan"]
names.insert("Bob", at: 0)
print(names) // ["Bob", "Amy", "Brad", "Chelsea", "Dan"]
```

Working with arrays

```
var names = ["Amy", "Brad", "Chelsea", "Dan"]
let chelsea = names.remove(at:2)
let dan = names.removeLast()
print(names) // ["Amy", "Brad"]
```

```
names.removeAll()
print(names) // []
```

Working with arrays

```
var myNewArray = firstArray + secondArray
```

Dictionaries

```
[key1: value1, key2: value2, key3: value3]
```

```
var scores = ["Richard": 500, "Luke": 400, "Cheryl": 800]
```

Dictionaries

```
var myDictionary = [String: Int]()
var myDictionary = Dictionary<String, Int>()
var myDictionary: [String: Int] = [:]
```

Add/remove/modify a dictionary

```
var scores = ["Richard": 500, "Luke": 400, "Cheryl": 800]

scores["Oli"] = 399

let oldValue = scores.updateValue(100, forKey: "Richard")
```

Add/remove/modify a dictionary

```
var scores = ["Richard": 500, "Luke": 400, "Cheryl": 800]

scores["Oli"] = 399

if let oldValue = scores.updateValue(100, forKey: "Richard") {
  print("Richard's old value was \(oldValue)")
}
```

Add/remove/modify a dictionary

```
var scores = ["Richard": 100, "Luke": 400, "Cheryl": 800]
scores["Richard"] = nil
print(scores) // ["Cheryl": 800, "Luke": 400]

if let oldValue = scores.removeValue(forKey: "Luke") {
  print("Luke's score was \(oldValue) before he stopped playing")
}
print(scores) // ["Cheryl": 800]
```

Accessing a dictionary

```
var scores = ["Richard": 500, "Luke": 400, "Cheryl": 800]

let players = Array(scores.keys) // ["Richard", "Luke", "Cheryl"]
let points = Array(scores.values) // [500, 400, 800]

print(myScore)
if let myScore = scores["Luke"] {
  print(myScore)
}
```

Accessing a dictionary

```
var scores = ["Richard": 500, "Luke": 400, "Cheryl": 800]

let players = Array(scores.keys) // ["Richard", "Luke", "Cheryl"]
let points = Array(scores.values) // [500, 400, 800]

print(scores["Luke"]) // Optional(400)
if let myScore = scores["Luke"] {
  print(myScore) // 400
}
```

Loops

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Loops

`for`

`while`

for loops

```swift
for index in 1...5 {
  print("This is number \(index)")
}
```

```swift
for _ in 1...5 {
  print("Hello!")
}
```

for loops

```
let names = ["Joseph", "Cathy", "Winston"]
for name in names {
  print("Hello \(name)")
}
```

```
for letter in "ABCDEFG".characters {
  print("The letter is \(letter)")
}
```

for loops

```
for (index, letter) in "ABCDEFG".characters.enumerated() {
  print("\(index): \(letter)")
}
```

for loops

```
let vehicles = ["unicycle" : 1, "bicycle" : 2, "tricycle" : 3]
for (vehicleName, wheelCount) in vehicles {
  print("A \(vehicleName) has \(wheelCount) wheels")
}
```

while loops

```
var numberOfLives = 3

while numberOfLives > 0 {
  playMove()
  updateLivesCount()
}
```

while loops

```swift
var numberOfLives = 3
var stillAlive = true

while stillAlive {
  print("I still have \(numberOfLives) lives.")
  numberOfLives -= 1
  if numberOfLives == 0 {
    stillAlive = false
  }
}
```