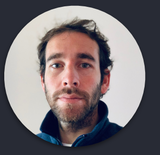
SORBONNE UNIVERSITÉ

Introduction to iOS development with Swift

Lesson 3



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- → Guard
- → Constant and Variable Scope
- → Closures
- → Extensions
- → HTTP and URL Session
- → Decoding JSON
- → Concurrency

Guard

```
func singHappyBirthday() {
  if birthdayIsToday {
    if invitedGuests > 0 {
      if cakeCandlesLit {
        print("Happy Birthday to you!")
      } else {
        print("The cake candle's haven't been lit.")
      }
    } else {
      print("It's just a family party.")
    }
  } else {
    print("No one has a birthday today.")
  }
}
```

```
func singHappyBirthday() {
  guard birthdayIsToday else {
    print("No one has a birthday today.")
    return
  }
  guard invitedGuests > 0 else {
    print("It's just a family party.")
    return
  }
  guard cakeCandlesLit else {
    print("The cake's candles haven't been lit.")
    return
  }
  print("Happy Birthday to you!")
}
```

guard

```
guard condition else {
  //false: execute some code
}

//true: execute some code
```

guard

```
func divide(_ number: Double, by divisor: Double) {
  if divisor != 0.0 {
    let result = number / divisor
    print(result)
  }
}
```

```
func divide(_ number: Double, by divisor: Double) {
  guard divisor != 0.0 else { return }

  let result = number / divisor
  print(result)
}
```

```
func processBook(title: String?, price: Double?, pages: Int?) {
  if let theTitle = title, let thePrice = price, let thePages =
pages {
    print("\(theTitle) costs $\(thePrice) and has \(thePages)
pages.")
  }
}
```

```
func processBook(title: String?, price: Double?, pages: Int?){
  guard let theTitle = title, let thePrice = price, let
thePages = pages else { return }
  print("\(theTitle) costs $\(thePrice) and has \(thePages)
pages.")
}
```

Constant and Variable Scope

Scope

Global scope — Defined outside of a function
Local scope — Defined within braces ({})

```
var globalVariable = true

if globalVariable {
  let localVariable = 7
}
```

Scope

```
var age = 55

func printMyAge() {
  print("My age: \(age)")
}

print(age)
printMyAge()
```

Scope

```
func printBottleCount() {
    let bottleCount = 99
    print(bottleCount)
}

printBottleCount()
print(bottleCount)
```

Scope

```
func printTenNames() {
  var name = "Richard"
  for index in 1...10 {
    print("\(index): \(name)")
  }
  print(index)
  print(name)
}

printTenNames()
```

Use of unresolved identifier 'index'

Variable shadowing

```
let points = 100

for index in 1...3 {
  let points = 200
  print("Loop \(index): \(points+index)")
}
print(points)
```

Variable shadowing

```
var name: String? = "Robert"

if let name = name {
 print("My name is \(name)")
}
```

Variable shadowing

```
func exclaim(name: String?) {
  if let name = name {
    print("Exclaim function was passed: \(name)")
  }
}
```

```
func exclaim(name: String?) {
  guard let name = name else { return }
  print("Exclaim function was passed: \(name)")
}
```

Shadowing and initializers

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

let todd = Person(name: "Todd", age: 50)
print(todd.name)
print(todd.age)
```

Shadowing and initializers

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

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

Closures

Closures

```
(firstTrack: Track, secondTrack: Track) -> Bool in
 return firstTrack.trackNumber < secondTrack.trackNumber
```

```
let sortedTracks = tracks.sorted (    )
```

Syntax

```
func sum(numbers: [Int]) -> Int {
  // Code that adds together the numbers array
  return total
}
```

```
let sumClosure = { (numbers: [Int]) -> Int in
  // Code that adds together the numbers array
  return total
}
```

```
let printClosure = { () -> Void in
  print("This closure does not take any parameters and does not
return a value.")
}

let printClosure = { (string: String) -> Void in
  print(string)
}

let randomNumberClosure = { () -> Int in
  // Code that returns a random number
}

let randomNumberClosure = { (minValue: Int, maxValue: Int) -> Int in
  // Code that returns a random number between `minValue` and
`maxValue`
}
```

Passing closures as arguments

```
let sortedTracks = tracks.sorted { (firstTrack: Track,
secondTrack: Track) -> Bool in
  return firstTrack.trackNumber < secondTrack.trackNumber
}
```

```
let sortedTracks = tracks.sorted { (firstTrack: Track,
secondTrack: Track) -> Bool in
  return firstTrack.starRating < secondTrack.starRating
}
```

Syntactic sugar

```
let sortedTracks = tracks.sorted { (firstTrack: Track,
secondTrack: Track) -> Bool in
  return firstTrack.starRating < secondTrack.starRating
}
```

Syntactic sugar

```
let sortedTracks = tracks.sorted { (firstTrack, secondTrack) ->
Bool in
  return firstTrack.starRating < secondTrack.starRating
}
```

Syntactic sugar

```
let sortedTracks = tracks.sorted { (firstTrack, secondTrack) in
  return firstTrack.starRating < secondTrack.starRating
}
```

Syntactic sugar

```
let sortedTracks = tracks.sorted { return $0.starRating <
$1.starRating }
```

Syntactic sugar

```
let sortedTracks = tracks.sorted { $0.starRating <
$1.starRating }
```

Collection functions using closures

- Map
- Filter
- Reduce

Collection functions using closures

```
// Initial array
let firstNames = ["Johnny", "Nellie", "Aaron", "Rachel"]

// Creates an empty array that will be used
// to store the full names
var fullNames: [String] = []

for name in firstNames {
    let fullName = name + " Smith"
    fullNames.append(fullName)
}
```

Collection functions using closures

```
// Initial array
let firstNames = ["Johnny", "Nellie", "Aaron", "Rachel"]

// Creates a new array of full names by adding "Smith"
// to each first name
let fullNames = firstNames.map { (name) -> String in
    return name + " Smith"
}
```

Collection functions using closures

```
// Initial array
let firstNames = ["Johnny", "Nellie", "Aaron", "Rachel"]

// Creates a new array of full names by adding "Smith"
// to each first name
let fullNames = firstNames.map{ $0 + " Smith" }
```

Collection functions using closures

```
let numbers = [4, 8, 15, 16, 23, 42]

var numbersLessThan20: [Int] = []

for number in numbers {
    if number < 20 {
        numbersLessThan20.append(number)
    }
}
```

Collection functions using closures

```
let numbers = [4, 8, 15, 16, 23, 42]

let numbersLessThan20 = numbers.filter { (number) -> Bool in
    return number < 20
}
```

Collection functions using closures

```
let numbers = [4, 8, 15, 16, 23, 42]

let numbersLessThan20 = numbers.filter{ $0 < 20 }
```

Collection functions using closures

```
let numbers = [8, 6, 7, 5, 3, 0, 9]

var total = 0

for number in numbers {
    total = total + number
}
```

Collection functions using closures

```
let numbers = [8, 6, 7, 5, 3, 0, 9]

let total = numbers.reduce(0) { (currentTotal, newValue) ->
Int in
    return currentTotal + newValue
}
```

Collection functions using closures

```
let numbers = [8, 6, 7, 5, 3, 0, 9]

let total = numbers.reduce(0,{ $0 + $1})
```

Extensions

Extensions

```
extension SomeType {
  // new functionality to add to SomeType goes here
}
```

Adding computed properties

```
extension UIColor {
  static var favoriteColor: UIColor {
    return UIColor(red: 0.5, green: 0.1, blue: 0.5, alpha: 1.0)
  }
}
```

Adding instance or type methods

```
extension String {
  func pluralized() -> String {
    // Complex code that takes the current value (self) and
returns the plural version
  }
}

var apple = "Apple"
var person = "Person"

print(apple.pluralized()) // Apples
print(person.pluralized()) // People
```

Organising code

```
class Restaurant {
  let name: String

  var menuItems: [MenuItem]
  …
}

extension Restaurant {
  func add(menuItem: MenuItem)
  func remove(menuItem: MenuItem)
}
```

HTTP and URL Session

Basics

```
https://sales.pretendco.com:80/orders/strack?
order=233282&api_key=QREPORT
```

HTTP methods

Method	Description
GET	Requests information from a server
POST	Sends information to a server
PUT	Updates information from a server
DELETE	Deletes information from a server

HTTP headers

Allows the client and the server to exchange information

- → Used for authentication
- → Sends information such as the computer or browser type to the server
- → Responds with information such as the server type and software used to handle the request

HTTP body

Includes the data sent from the client or server following the HTTP headers

- → Sends form data to the server
- → Responds with a web page content and images

Network request

```
let url = URL(string: "https://www.apple.com")!
let task = URLSession.shared.dataTask(with: url) { (data,
response, error) in
    if let data = data,
       let string = String(data: data, encoding: .utf8) {
         print(string)
    }
}
task.resume()
```

Work with an API

```
let url = URL(string: "https://api.nasa.gov/planetary/apod?
date=2005-2-22&api_key=DEMO_KEY")!

let task = URLSession.shared.dataTask(with: url) { (data,
response, error) in
    if let data = data,
        let string = String(data: data, encoding: .utf8) {

        print(string)
    }
}
task.resume()
```

URL Components

```
extension URL {
    func withQueries(_ queries: [String: String]) -> URL? {
        var components = URLComponents(url: self,
                                       resolvingAgainstBaseURL: true)
        components?.queryItems = queries.flatMap {
            URLQueryItem(name: $0.0, value: $0.1)
        }
        return components?.url
    }
}
```

```
let baseURL = URL(string: "https://api.nasa.gov/planetary/apod")!
let query: [String: String] = [
    "api_key": "DEMO_KEY",
    "date": "2011-07-13"
]
let url = baseURL.withQueries(query)!
let task = URLSession.shared.dataTask(with: url) { (data,
response, error) in
    if let data = data,
        let string = String(data: data, encoding: .utf8) {
        print(string)

    } }
task.resume()
```

Decoding JSON

JSON

An open standard format that uses human readable text to transmit objects

→ Each object consists of attribute-value pairs

Used primarily to transmit data between a server and applications

Language-independent data format

```
{
    "name": "Daren Estrada",
    "favorite_movie": {
        "title": "Finding Dory",
        "release_year": "2016"
    }
}
```

JSON basics

```
{
    "name": "Daren Estrada",
    "favorite_movies": [
        {
            "title": "Finding Dory",
            "release_year": 2016
        },
        {
            "title": "Inside Out",
            "release_year": 2015
        }
    ]
}
```

JSON data to Swift types

```
let task = URLSession.shared.dataTask(with: url) { (data,
response, error) in
    let jsonDecoder = JSONDecoder()
    if let data = data,
        let report = try? jsonDecoder.decode([String:
AnyObject].self, from: data) {
        print(report)
    }
}

task.resume()
```

JSON data to custom model objects

```
{
  "report_date": "2018-01-20",
  "profile_id": "136442",
  "name": "Final Results for Q4 2017",
  "read_count": "5"
}
```

JSON data to custom model objects

```
struct Report {
    let name: String
    let creationDate: Date
    let profileID: String
    let readCount: Int?
}
```

JSON data to custom model objects

```
struct Report: Codable {
    let name: String
    let creationDate: Date
    let profileID: String
    let readCount: Int?

    enum CodingKeys: String, CodingKey {
        case name
        case creationDate = "report_date"
        case profileID = "profile_id"
        case readCount = "read_count"
    }
}
```

JSON data to custom model objects

```
init(from decoder: Decoder) throws {
    let valueContainer = try decoder.container(keyedBy:
                                CodingKeys.self)
    self.creationDate = try valueContainer.decode(String.self,
                               forKey: CodingKeys.creationDate)
    self.profileID = try valueContainer.decode(URL.self,
                             forKey: CodingKeys.profileID)
    self.readCount = try? valueContainer.decode(String.self,
                             forKey: CodingKeys.readCount)
}
```

JSON data to Swift types

```
let task = URLSession.shared.dataTask(with: url) {
    (data, response, error) in

    let jsonDecoder = JSONDecoder()
    if let data = data,
        let report = try? jsonDecoder.decode(Report.self,
from: data) {
        print(report)
    }
}

task.resume()
```

Concurrency

Concurrency

- → Run multiple tasks at the same time
- → Run slow or expensive tasks in the background
- → Free the main thread so it responds to the UI

Synchronous and asynchronous

Synchronous

→ One task completes before another begins

→ Ties up the main thread (main queue)

Asynchronous

→ Multiple tasks run simultaneously on multiple threads (concurrency)

→ Tasks run in the background thread (background queue)

→ Frees up the main thread

Grand Central Dispatch

Grand Central Dispatch

- Allows your app to execute multiple tasks concurrently on multiple threads
- Assigns tasks to "dispatch queues" and assigns priority
- Controls when your code is executed

Grand Central Dispatch

- Main queue
  - Created when an app launches
  - Highest priority
  - Used to update the UI and respond quickly to user input
- Background queues
  - Lower-priority
  - Used to run long-running operations

Dispatch Queue

Use the DispatchQueue type to create and assign tasks to different queues

For example:

→ Assign a UI task to the main dispatch queue

→ Tasks added with main.async(...) run sequentially

```
DispatchQueue.main.async {
    // Code here will be executed on the main queue
}
```

Protocols

Protocols

- Defines a blueprint of methods, properties, and other requirements that suit a particular task or piece of functionality
- Swift standard library defines many protocols, including these:

```
CustomStringConvertible
Equatable
Comparable
Codable
```

- When you adopt a protocol, you must implement all required methods.

CustomStringConvertible

Printing with CustomStringConvertible

```
let string = "Hello, world!"
print(string) // Hello, world!

let number = 42
print(number) // 42

let boolean = false
print(boolean) // false
```

Printing with CustomStringConvertible

```
class Shoe {
  let color: String
  let size: Int
  let hasLaces: Bool

  init(color: String, size: Int, hasLaces: Bool) {
    …
  }
}

let myShoe = Shoe(color: "Black", size: 12, hasLaces: true)
print(myShoe) // __lldb_expr_1.Shoe
```

```
class Shoe: CustomStringConvertible {
    let color: String
    let size: Int
    let hasLaces: Bool

    init(color: String, size: Int, hasLaces: Bool) {
      …
    }




}
```

```
class Shoe: CustomStringConvertible {
    let color: String
    let size: Int
    let hasLaces: Bool

    init(color: String, size: Int, hasLaces: Bool) {
      …
    }

    var description: String {
      return "Shoe(color: \(color), size: \(size),
hasLaces: \(hasLaces))"
    }
}
```

```
let myShoe = Shoe(color: "Black", size: 12, hasLaces: true)
print(myShoe)
    // Shoe(color: Black, size: 12, hasLaces: true)
```

Equatable

Comparing information with Equatable

```
struct Employee {
  let firstName: String
  let lastName: String
  let jobTitle: String
  let phoneNumber: String
}

struct Company {
  let name: String
  let employees: [Employee]
}
```

Comparing information with Equatable

```
let currentEmployee = Session.currentEmployee
let selectedEmployee = Employee(firstName: "Adrien",
                                lastName: "Humilière",
                                jobTitle: "Engineer",
                                phoneNumber: "0612345678")

if currentEmployee == selectedEmployee {
  // Enable "Edit" button
}
```

Comparing information with Equatable

```
struct Employee: Equatable {
  let firstName: String
  let lastName: String
  let jobTitle: String
  let phoneNumber: String

  static func ==(lhs: Employee, rhs: Employee) -> Bool {
    // Equality logic
  }
}
```

Comparing information with Equatable

```
struct Employee: Equatable {
  let firstName: String
  let lastName: String
  let jobTitle: String
  let phoneNumber: String

  static func ==(lhs: Employee, rhs: Employee) -> Bool {
    return lhs.firstName == rhs.firstName
           && lhs.lastName == rhs.lastName
  }
}
```

Comparing information with Equatable

```
let currentEmployee = Employee(firstName: "Adrien",
                               lastName: "Humilière",
                               jobTitle: "Mobile engineer",
                               phoneNumber: "0612345678")
let selectedEmployee = Employee(firstName: "Adrien",
                                lastName: "Humilière",
                                jobTitle: "Support",
                                phoneNumber: "0612345678")

if currentEmployee == selectedEmployee {
  // Enable "Edit" button
}
```

Comparing information with Equatable

```
struct Employee: Equatable {
  let firstName: String
  let lastName: String
  let jobTitle: String
  let phoneNumber: String

  static func ==(lhs: Employee, rhs: Employee) -> Bool {
    return lhs.firstName == rhs.firstName
           && lhs.lastName == rhs.lastName
           && lhs.jobTitle == rhs.jobTitle
           && lhs.phoneNumber == rhs.phoneNumber
  }
}
```

Comparable

Sorting information with Comparable

```
let employee1 = Employee(firstName: "Ben",
                         lastName: "Atkins")
let employee2 = Employee(firstName: "Vera",
                         lastName: "Carr")
let employee3 = Employee(firstName: "Grant",
                         lastName: "Phelps")
let employee4 = Employee(firstName: "Sang",
                         lastName: "Han")

let employees = [employee1,
                 employee2,
                 employee3,
                 employee4]
```

```
struct Employee: Equatable, Comparable {
  let firstName: String
  let lastName: String
  let jobTitle: String
  let phoneNumber: String

  static func ==(lhs: Employee, rhs: Employee) -> Bool {
      return …
  }

  static func < (lhs: Employee, rhs: Employee) -> Bool {
    return lhs.lastName < rhs.lastName
  }
}
```

```
let employees = [employee1, employee2, employee3,
                 employee4, employee5]

let sortedEmployees = employees.sorted(by: <)

for employee in sortedEmployees {
  print(employee)
}

// Employee(firstName: "Ben", lastName: "Atkins")
// Employee(firstName: "Vera", lastName: "Carr")
// Employee(firstName: "Sang", lastName: "Han")
// Employee(firstName: "Grant", lastName: "Phelps")
```

```
let employees = [employee1, employee2, employee3,
employee4, employee5]

let sortedEmployees = employees.sorted(by:>)

for employee in sortedEmployees {
  print(employee)
}

// Employee(firstName: "Grant", lastName: "Phelps")
// Employee(firstName: "Sang", lastName: "Han")
// Employee(firstName: "Vera", lastName: "Carr")
// Employee(firstName: "Ben", lastName: « Atkins")
```

Codable

Encoding and decoding objects with Codable

```
struct Employee: Equatable, Comparable, Codable {
    var firstName: String
    var lastName: String
    var jobTitle: String
    var phoneNumber: String

    …
}
```

Encoding and decoding objects with Codable

```
let ben = Employee(firstName: "Ben", lastName: "Atkins",
     jobTitle: "Front Desk", phoneNumber: "415-555-7767")

let jsonEncoder = JSONEncoder()
if let jsonData = try? jsonEncoder.encode(ben),
    let jsonString = String(data: jsonData,
encoding: .utf8) {
    print(jsonString)
}
```

```
{"firstName":"Ben","lastName":"Atkins","jobTitle":"Front
Desk","phoneNumber":"415-555-7767"}
```

Protocol creation

Creating a protocol

```
protocol FullyNamed {
  var fullName: String { get }

  func sayFullName()
}

struct Person: FullyNamed {
  var firstName: String
  var lastName: String
}
```

Creating a protocol

```
struct Person: FullyNamed {
  var firstName: String
  var lastName: String

  var fullName: String {
    return "\(firstName) \(lastName)"
  }

  func sayFullName() {
    print(fullName)
  }
}
```

Delegation

Delegation

Enables a class or structure to hand off responsibilities to an instance of another type

```
protocol ButtonDelegate {
  func userTappedButton(_ button: Button)
}

class GameController: ButtonDelegate {
  func userTappedButton(_ button: Button) {
    print("User tapped the \(button.title) button.")
  }
}
```

Delegation

```
class Button {
  let title: String
  var delegate: ButtonDelegate? // Add a delegate property

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

  func tapped() {
    self.delegate?.userTappedButton(self)
          // If the delegate exists, call the delegate
          // function `userTappedButton` on the delegate
  }
}
```

Delegation

```
let startButton = Button(title: "Start Game")
let gameController = GameController()
startButton.delegate = gameController

startButton.tapped()
```