Announcements

- **Wednesday** is our first "lab day", we will meet in Whitaker 316

- **If you have a Mac laptop**
  - Install Xcode 8.2.1
    - [https://developer.apple.com/download/more/](https://developer.apple.com/download/more/)

Today’s Topics

- **Swift**
  - Overview
  - Syntax
  - Examples

- **Xcode 8**
  - Playgrounds
Swift

- New programming language developed by Apple
- Announced at WWDC 2014
- Interoperates with Objective-C
  - Both are considered first class citizens
- Still a work in progress
- We are using Swift version 3.0.2
  - Released on December 13th 2016

Hello World in Swift

```swift
print("Hello World")
```

- No semicolons
- No main method needed
Variables and Constants

- **Swift uses `var` and `let` to describe variables and constants**
- **Variables and constants have a type**
  - `let languageName: String = "Swift"
  - `var version: Double = 1.0`
  - `let isEverChanging: Bool = true`
- **Swift supports type inference**
  - `let languageName = "Swift" //inferred as String`
  - `var version = 1.0 //inferred as Double`
  - `let isEverChanging = true //inferred as Bool`

Common Data Types in Swift

- String
- Character
- Int
- Float
- Double
- Bool
- Optional
Strings

- **Swift makes working with strings easy**
  
  ```swift
  let firstName = "John"
  let lastName = "Smith"
  let fullName = firstName + " " + lastName
  ```

- **Enumerating through them is familiar**
  
  ```swift
  for character in firstName.characters{
    print(character)
  }
  J
  o
  h
  n
  ```

String Interpolation

```swift
let a = 2, b = 3

// "2 times 3 is 6"
let mathResult = "\(a) times \(b) is \(a * b)"
```
var names = ["Bob", "Alice", "Mike", "Jen"]
   – Inferred as a typed collection of Strings

• I could also be more explicit:
   var names: [String] = ["Bob", "Alice", "Mike", "Jen"]

var numberOfLegs = ["ant": 6, "snake": 0, "cow": 4]
   – Inferred as a typed dictionary of Strings and Ints

• Or I could be more explicit:
   var numberOfLegs: [String: Int] = ["ant": 6, "snake": 0, "cow": 4]

Collections – Sets

A collection that stores distinct elements with no defined order

var favoriteGenres: Set<String> = ["Rock", "Classical", "Hip hop"]

var favoriteGenres: Set = ["Rock", "Classical", "Hip hop"]
   – Inferred as a set of type Set<String> collection of Strings

print("I have \(favoriteGenres.count) music genres.")
   //Prints "I have 3 favorite music genres."

if favoriteGenres.isEmpty {
   print("Nothing here")
}

• Add unique strings to the set
   favoriteGenres.insert("Jazz")
Loops

```python
while !done {
    keepDoingSomething()
}
for num in 1...5 {  //Prints from 1 up to and including 5
    print("\(num) times 4 is \(num * 4)")
}
for num in 1..<5 {  //Prints from 1 up to 4
    doSomething(i)
}
```

Conditionals

```python
if legCount == 0 {
    print("Does not walk")
} else if legCount == 1 {
    print("Hopping around")
} else {
    print("I can walk")
}
```

```python
switch legCount {
    case 0:
        print("Does not walk")
    case 1, 3, 5, 7:
        print("Limps around")
    default:
        print("I can walk")
}
```
Functions

```swift
func sayHi() {
    print("Hi")
}
sayHi()

func sayHi(name: String) {
    print("Hi \(name)!")
}
sayHi(name: "Bob")

func sayHi(name: String = "CSE 438") -> String {
    return "Hi " + name
}
let name = sayHi() //Name contains "Hi CSE 438"

func refreshWebSite() -> (Int, String) {
    // refresh
    return (200, "Success")
}
let (statusCode, message) = refreshWebSite()
```
Closures

- Self-contained blocks of functionality that can be passed around

```swift
let displayGreeting = {
    print("Hello Class")
}

let displayGreeting: () -> () = {
    print("Hello Class")
} //Inferred as this

//looks very similar to a function (named closure)
displayGreeting()
```

Optionals

- Optionals handle the absence of a value
  - There is a value and it equals x or there isn’t a value

```swift
var numberOfLegs = ["ant": 6, "snake": 0, "cow": 4]
let possibleNumLegs = numberOfLegs["goat"] ??
let possibleNumLegs: Int? = numberOfLegs["goat"] //Value or nil

if possibleNumLegs != nil {
    let legCount = possibleNumLegs!
    print("Goat has \(legCount) legs")
} //Use ! to unwrap the optional

//Use ! to unwrap the optional

- Shorthand for above, if let

```swift
if let legCount = possibleNumLegs {
    print("Goat has \(legCount) legs")
}
```
Enumerations

- A common type for a group of related values
- Much more powerful than enumerations in the C language
- Allows for associated values of ANY type (not just integer values)

enum CompassPoint {
    case north
    case south
    case east
    case west
}

var directionToHead = CompassPoint.west
directionToHead = .south

switch directionToHead {
    case .north:
        print("Lots of planets have a north")
    case .south:
        print("Watch out for penguins")
    case .east:
        print("Where the sun rises")
    case .west:
        print("Where the skies are blue")
}

// Prints "Watch out for penguins"
Classes and Structures (structs)

- General purpose constructs which are the building blocks of your code
- You define methods and properties to add functionality

- Classes have additional capabilities that structs do not
  - Inheritance enables one class to inherit characteristics of another
  - Type casting allows you to treat an instance as a superclass or subclass from their class hierarchy

Classes

class Person {
  var age = 21 //defines the properties

  var description: String {
    //defines a computed property
    get {
      return "You are \(age) years old"
    }
  }

  let somePerson = Person()
  print("Hello, you are \(somePerson.age) years old")
}
**Properties**

- Associated values with a particular class, struct, or enum
- Properties are either stored or computed
  - Stored properties are constants and variables associated with an instance
    - Not available in an enum
  - Computed properties are calculated

```swift
struct FixedLengthRange {
    var firstValue: Int
    let length: Int
}
```

```swift
var rangeOfThreeItems = FixedLengthRange(firstValue: 0, length: 3)
// the range represents integer values 0, 1, and 2

rangeOfThreeItems.firstValue = 6
// the range now represents integer values 6, 7, and 8
```

**Extensions**

- Adds new functionality to an existing structure, class, enumeration or protocol

- Extensions support the following features:
  - Add computed instance and type properties
  - Specify instance and type methods
  - Make existing type conform to a protocol

- Extensions may add new functionality to a type, but are unable to override existing functionality
Extensions

```swift
extension Double {
    var km: Double { return self * 1_000.0 }
    var m: Double { return self }
    var cm: Double { return self / 100.0 }
    var mm: Double { return self / 1_000.0 }
    var ft: Double { return self / 3.28084 }
}

let oneInch = 25.4.mm
print("One inch is \(oneInch) meters")
// Prints "One inch is 0.0254 meters"

let threeFeet = 3.ft
print("Three feet is \(threeFeet) meters")
// Prints "Three feet is 0.914399970739201 meters"
```

More Information about Swift Language

- Official Swift Programming Guide

- WWDC 2016 and 2017 Videos
  – developer.apple.com
Examples in Playground