



iOS Development

with Swift2

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About the Tutorial

iOS (formerly iPhone OS) is a mobile operating system created and developed by Apple Inc. exclusively for its hardware. It is the operating system, which presently powers most of the mobile devices. The most popular ones include the iPhone, iPad and iPod Touch.

In this tutorial, we will be covering some basic to advance concepts of iOS, after which you will find yourself at an intermediate level in iOS development.

Audience

This tutorial is designed for programmers who want to understand the iOS Application development using the Objective Swift Programming Language. In this tutorial, we will be implementing and Learning at the same time.

This tutorial is intended to make you comfortable in getting started with iOS Development with Swift and its various functions.

Prerequisites

Before proceeding with this tutorial, you should have a basic understanding of Computer Programming terminologies. A basic understanding of any of the programming languages, especially Swift language, which will help you learn the concepts of iOS programming faster, (though not compulsory as we are going to cover every concept).

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1. iOS Development – Xcode IDE

To develop iOS applications, you need to have an Apple device like MacBook Pro, Mac Mini, or any Apple device with OS X operating system, and the following:

- **Xcode:** It can be downloaded from – <https://developer.apple.com/downloads/>. You need an Apple developer account, which is free of cost.
- **Simulator:** This is your virtual iPhone/iPad (iOS Device), installed on your Computer, so you do not need to install this separately.

About Xcode

Xcode is the default IDE (Integrated Development Environment) provided by apple for iOS/OS X Application Development. It is an IDE that includes everything you need for developing iOS, OS X, Watch OS, TV OS Applications, etc.

To Run Xcode, you must have:

- A Mac Device Running OS X, i.e., Apple's official Operating System.
- Apple ID (Free of Cost): To download the IDE.

Installation

To install Xcode in your device, follow the subsequent steps. Skip if you have already installed.

- Go to the App Store, Login if you have not already, search for Xcode. Click on Get and Install.
- Once Downloaded, go to Applications or Launchpad and Run your application.
- On the First Run, it might ask for some additional Downloads, let it download everything, enter password if it asks for.

Once all this is done, the Welcome Screen will appear as shown below.



2. iOS Development – First Application

In this tutorial, we will be learning some of the elementary concepts of our iOS development, which include –

- Making a New Project
- Features of our IDE
- Navigating through the IDE
- Adding a Label to your View
- Running the application
- Adjusting the simulator according to your comfort.

If you are a beginner, then this tutorial is going to be of immense help.

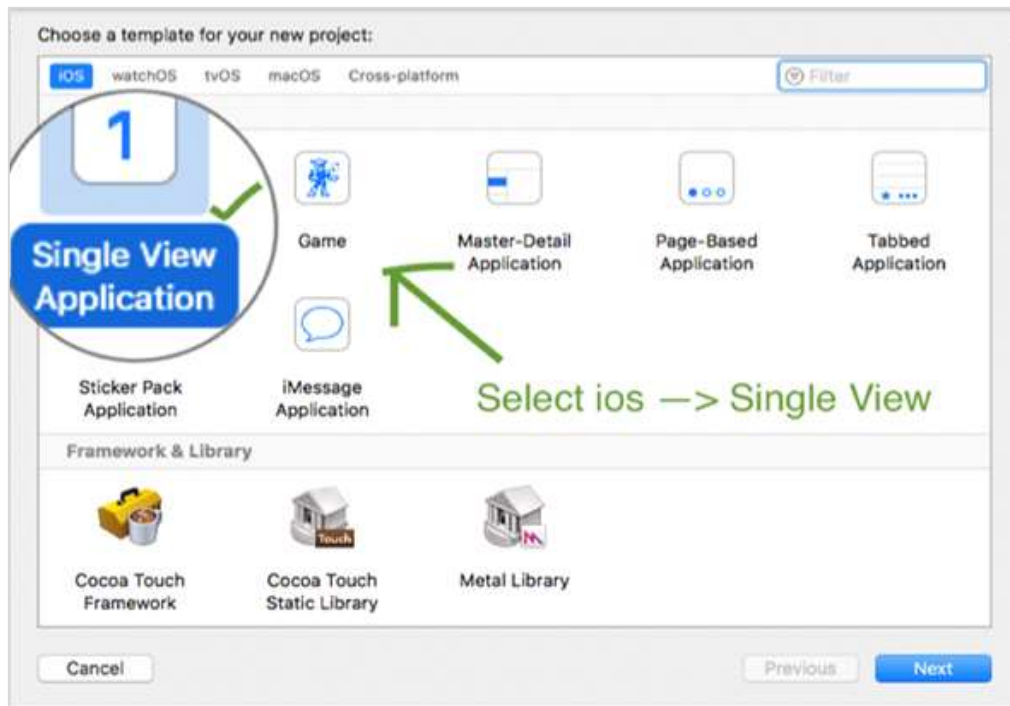
Creating a New Xcode Project

To create a new Xcode Project, we should follow the steps given below.

Step 1: Click on the Xcode icon in your Launchpad, then select **Create a new Xcode project.**



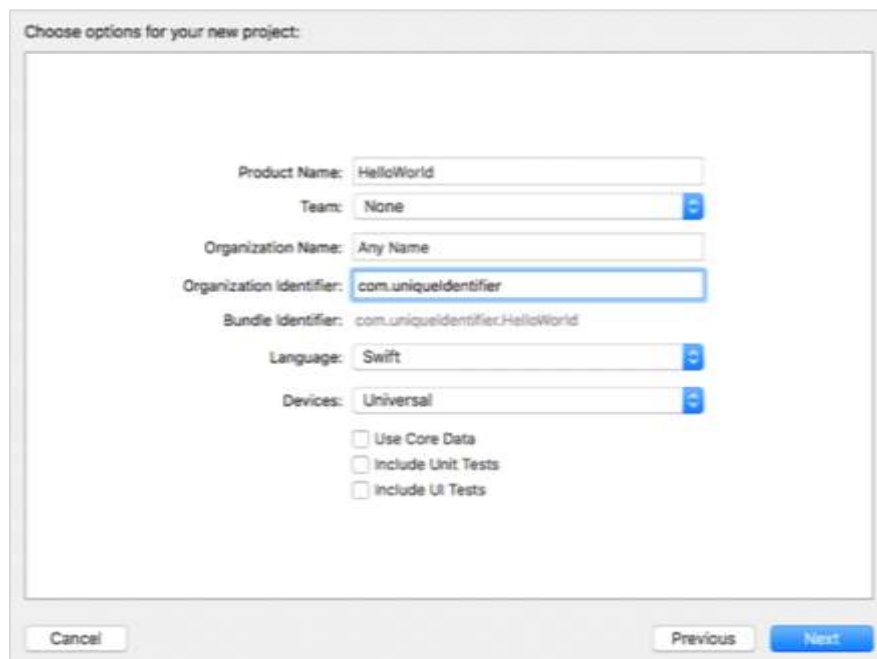
Step 2: Select iOS and then select Single View Application, click on Next.



Step 3: The subsequent screen that comes up will have a few fields to fill. The following points explain how to fill each of these fields.

- Enter the Project Name – it can be a name resembling your project.
- The Team Field can be left empty for now. It is used when we make an application in the team.
- The organization name is the name of your organization or if it is your personal project, you can name it anything. It does not matter until you want to publish your app on the app store.
- Identifier is generally a unique identifier for your application, which must not match any other app on the app store (only when you choose to upload your app on app store).
- Language will be Swift, device will be universal, and all other options will be unchecked for now.

Once all the details are filled, click the Next button.

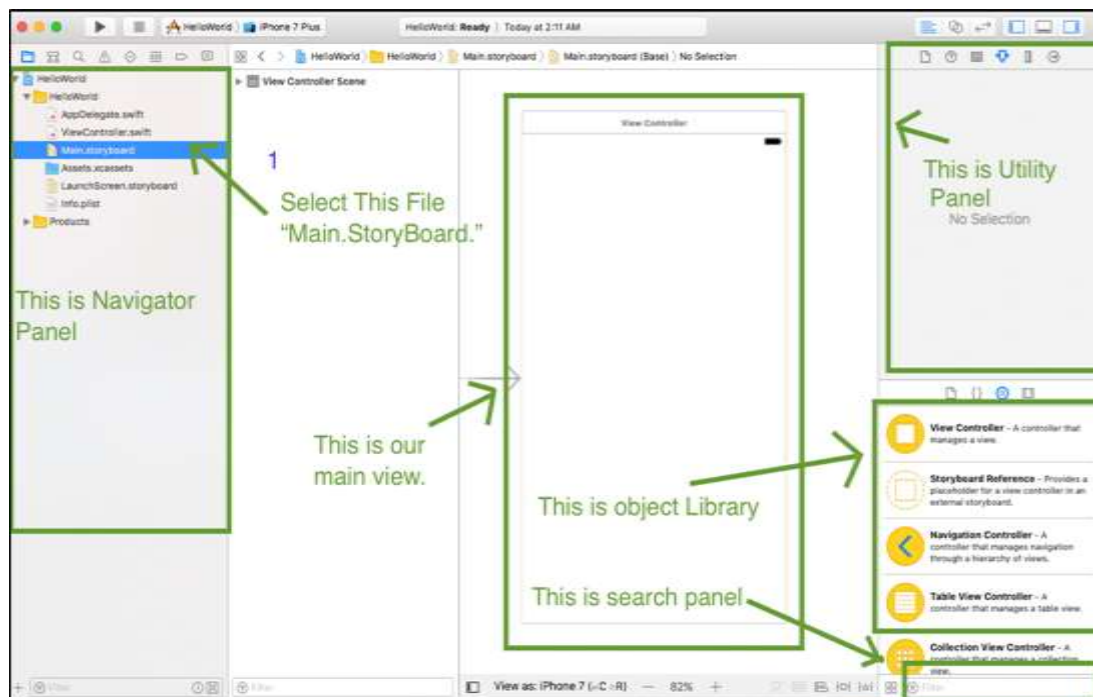


Step 4: Select the location where you want to store the project. Let "Create Git Repository" checkbox be unchecked for now, as we do not need it right now. Click on Create.

Congratulations! Your project has been created.

Navigation through Xcode Environment

Click on the **Main.storyboard** option inside your navigator panel. This will bring up the main view, which will appear when the application runs.

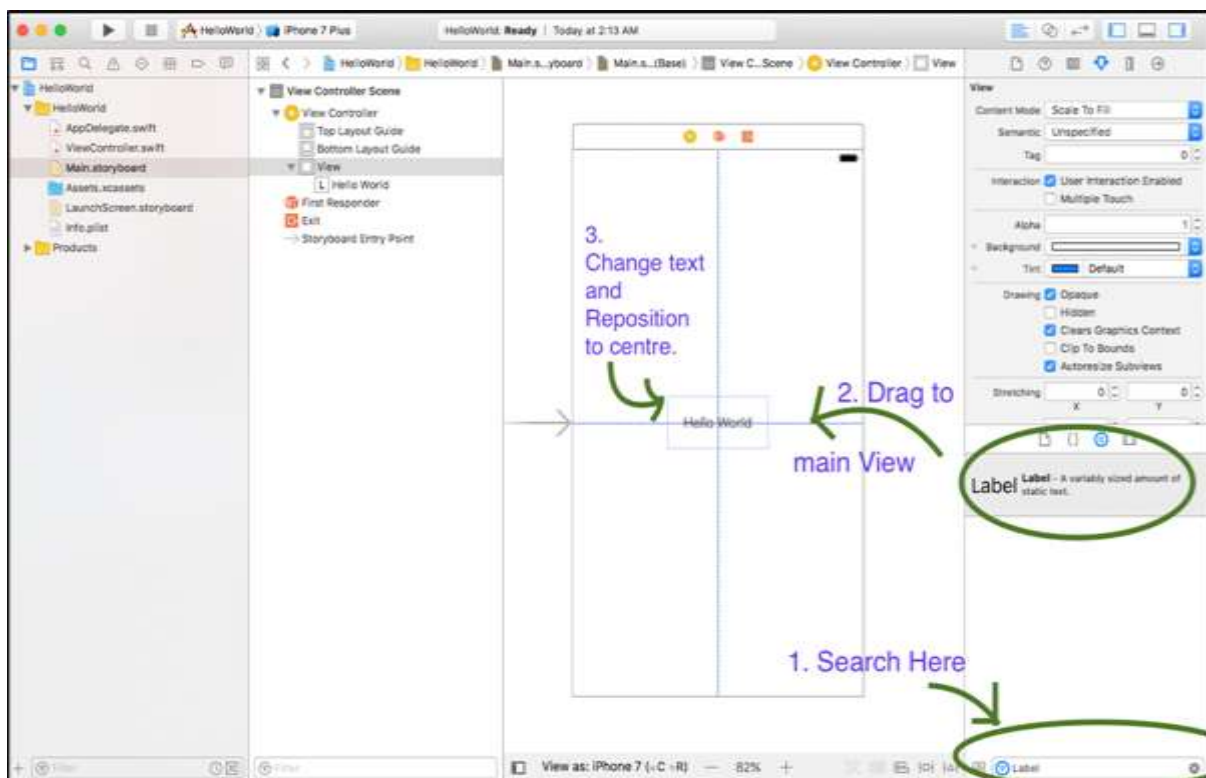


Adding Labels

In the right bottom corner of your screen there is a search bar. Type label in that search bar and press return.

- After searching the Label drag and drop the Label to your main view. Double click on the label text and Type "Hello World".
- Drag the label to the center of the view, when the label is exactly in the center, two lines intersecting at the center will appear.

Now your view should look like the following screenshot.

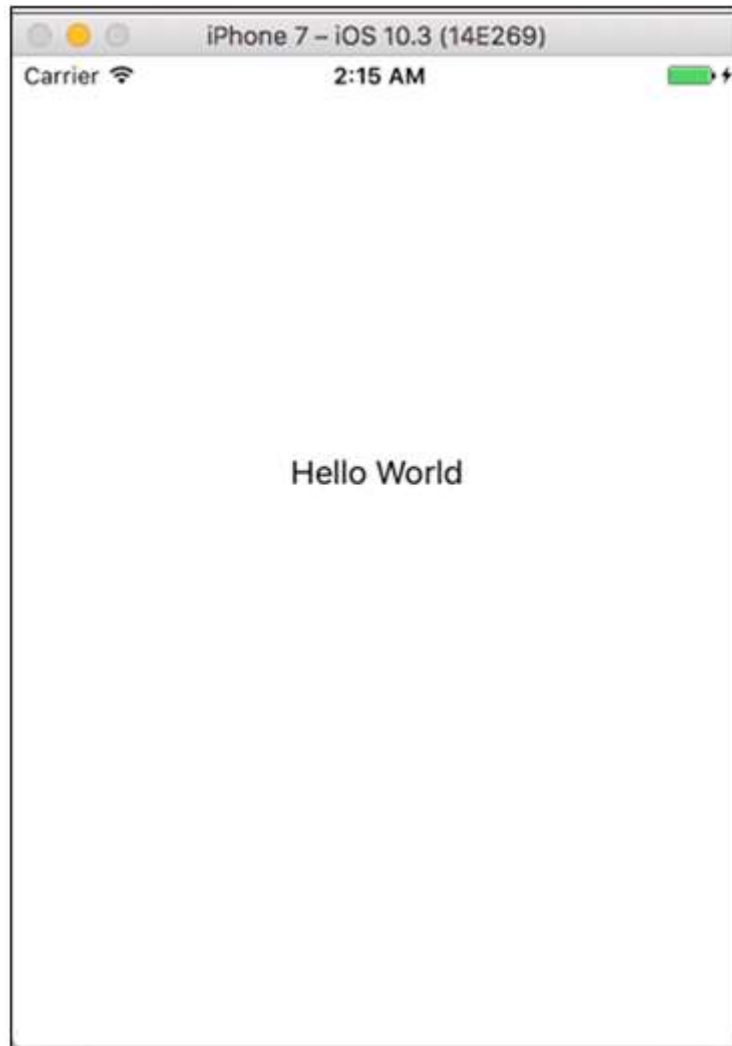


Running the Application

Select your device, click on the Play button at the top right corner.

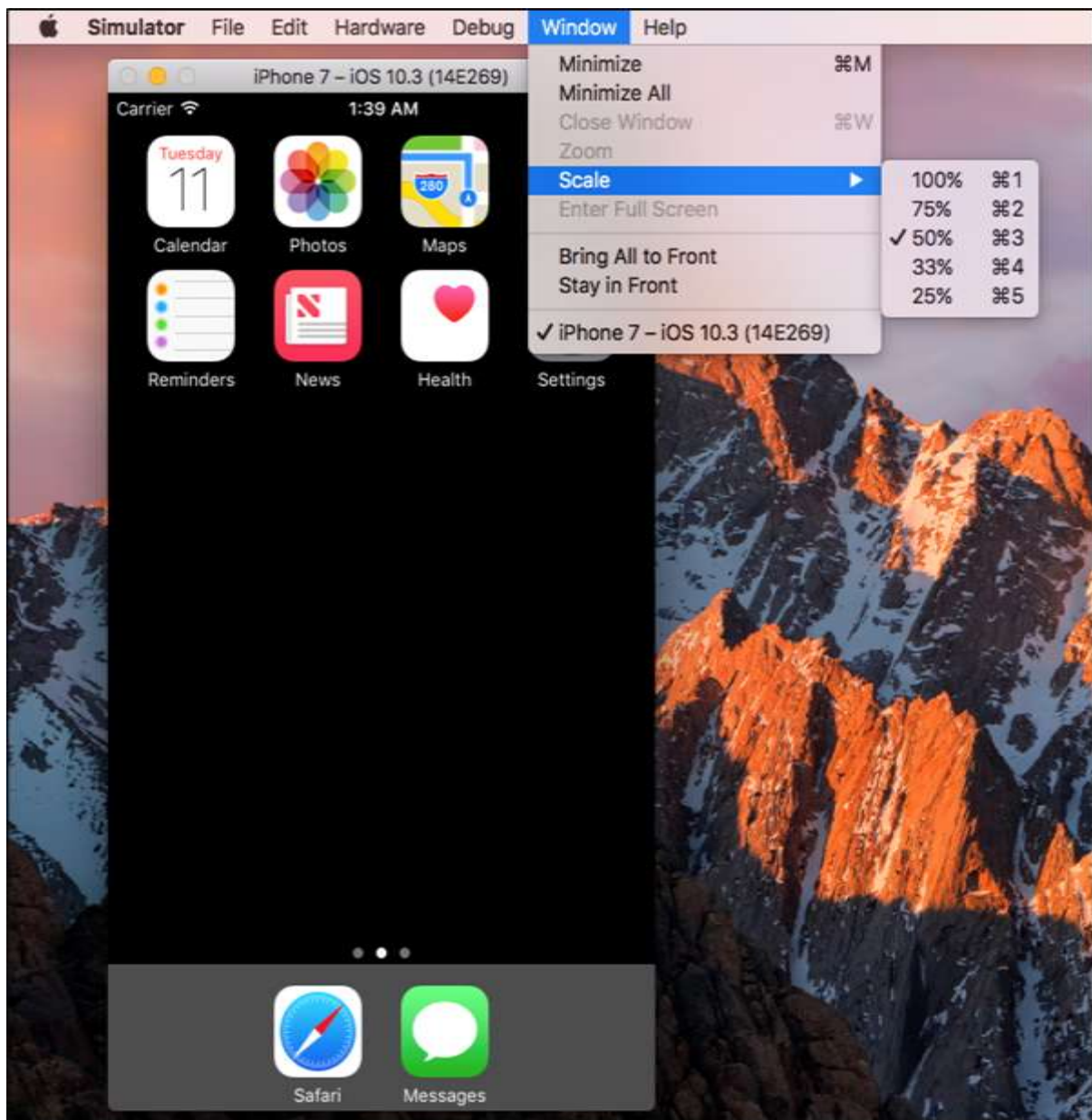


This is our final application, running on the iPhone 7 simulator.



Adjusting Simulator Properties

When we run our application for the first time, the screen of your simulator might not fit for your desktop or laptop screen. So, while your simulator is running in the foreground, click on Window → Scale, and choose a Simulator Screen size percentage that will suit your display.



We will continue discussing about the simulator features, as and when we use them in this tutorial.

Well done, this was the First Application, which you completed successfully. Cheers!

3. iOS Development – Making the App Interactive

In this chapter, we will introduce some new things and UI features that iOS provides for interaction with the user. We will be adding –

- Text Fields
- Labels
- Buttons and their actions

Additionally, we will be writing the code in swift for a Dynamic Label, which will show the calculated result of the input entered by the user.

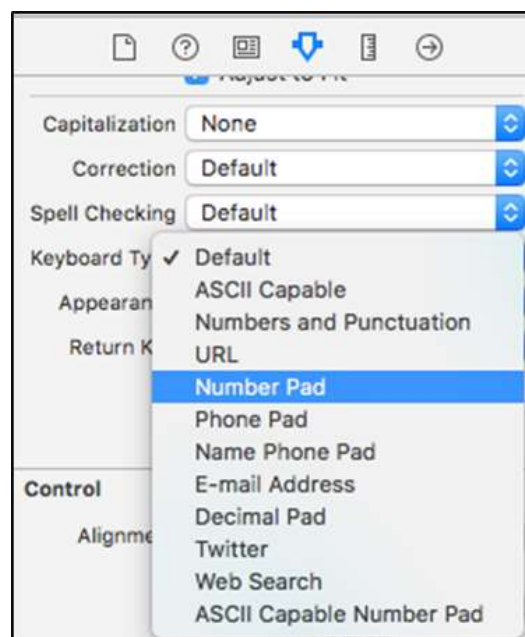
By the title “Making our app interactive”, we mean making our application interact with the user. Therefore, here we give user the power to interact and control the application.

Adding Text Fields

Here, we will again make a new project. It should be easily manageable, as we have already discussed how to create a new project in Xcode.

Okay, so we will now create a New Project Called “My Dog’s Age.” After creating this project, we will click on our “Main.storyboard” File and follow the steps given below.

- In the utility Pane’s Search bar (located in the bottom right corner of Xcode), search for Label. Click and Drag that Label to your main.storyboard / (View). Then, double click on the label and rename it as – “My Dog’s Age”.
- Search for “text field”, click and drag that text field to your View. While this text field is selected, go to attribute inspector and change the keyboard type to Number pad, so that only number can be entered as shown in the screenshot below.



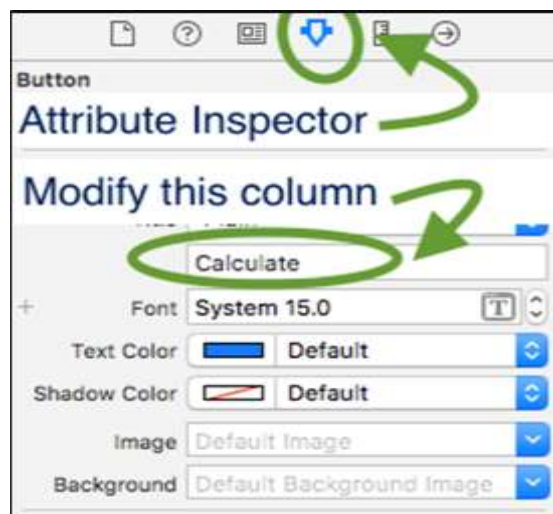
Adding Buttons to our View

Now search for a Button in the search bar. Drag that to your view, double click on it and rename as "Calculate".

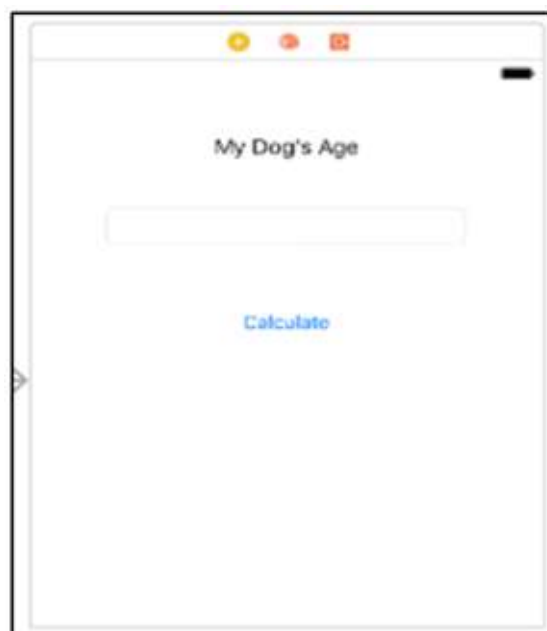
Adding Label to View

Search for label and add it below the button, to show the age output. Double click and make the label empty and stretch it a little bit, so that the complete output is visible.

Tip: If you are not able to rename by double clicking, then select the item and in the utility pane – **Attribute inspector**, there is the title of that item, modify there and press Return as shown in the following screenshot.



Now, your Main.storyboard should look like the following screenshot.



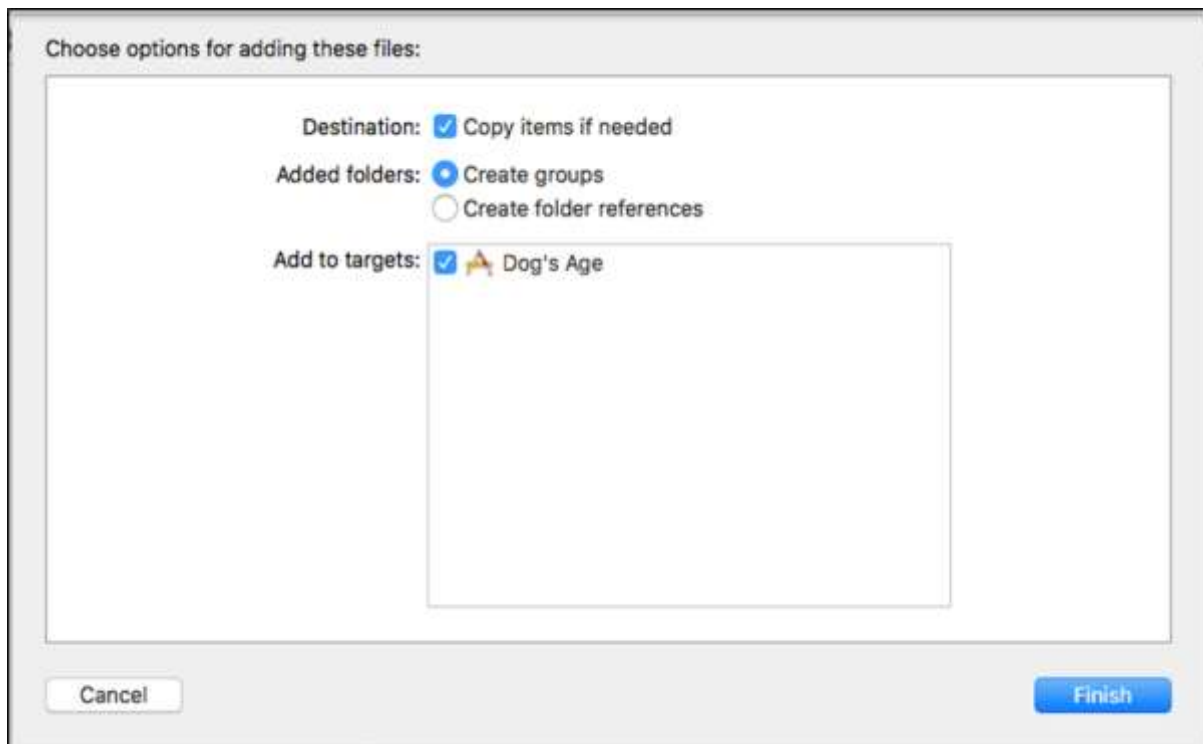
We do not stop here, now we will be discussing how to add images to the main.storyboard.

Adding Images to Our View

To begin with, we should first search for an image, which we want to add in the project. You can download the image given below:



Copy this image into your project, or drag this image to your project, then you will see the following window.

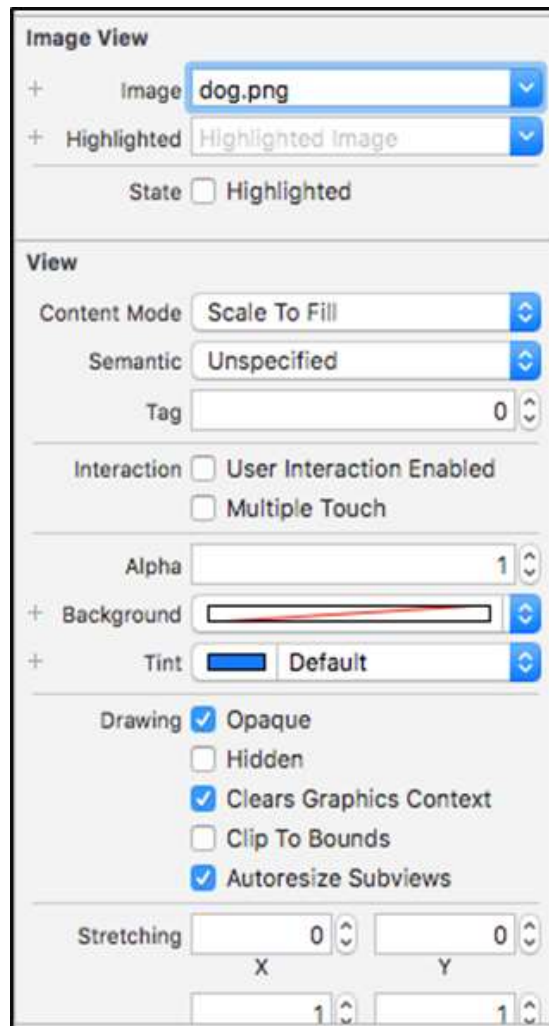
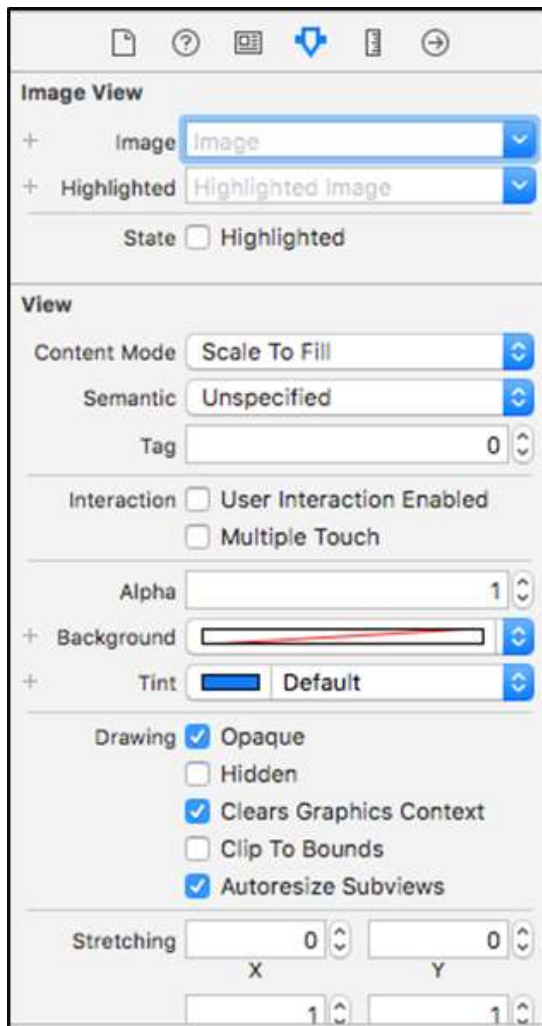


Make sure you select, copy items if needed and create groups. Click on the Finish button.

Now, go to Utility Pane → Object Library and search for Image views. Drag the image view to your view. Now your view should look like the screenshot given below.

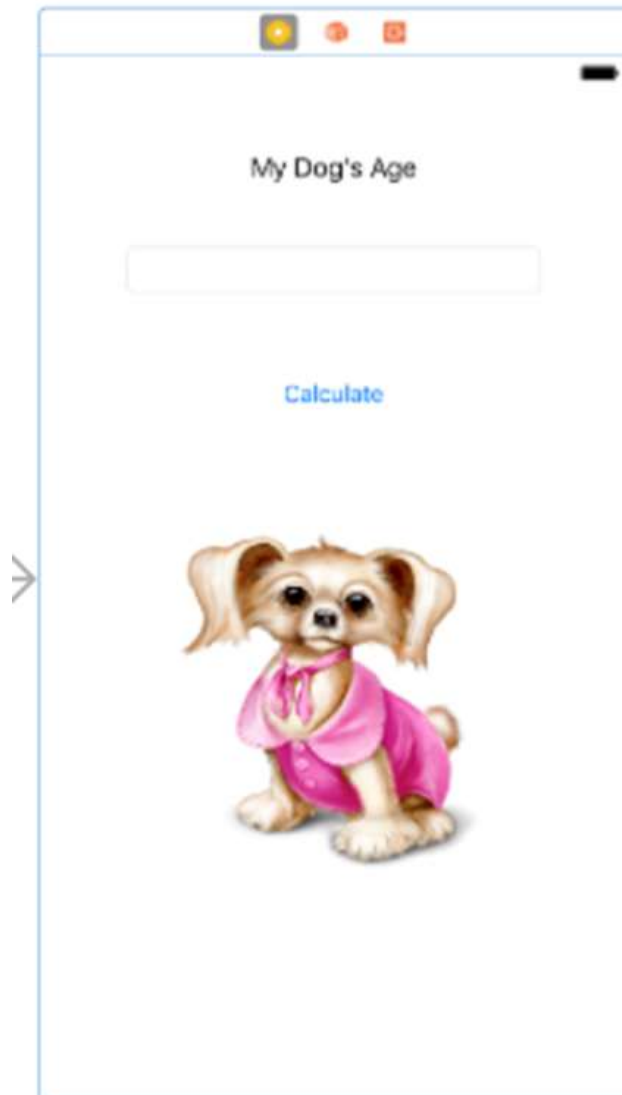


Now, click on this Image View, you just dragged in your view and then you will see that in the utility area there is an option named "Image" to select the image. Click on that arrow and you will see all the images available. Make sure you have selected this newly added image view.



Now that you have selected the image for your image view, your final view should look like the following screenshot. This is the only thing that we will do with our main.storyboard, for this application.

This is our view now after adding all the UI elements.

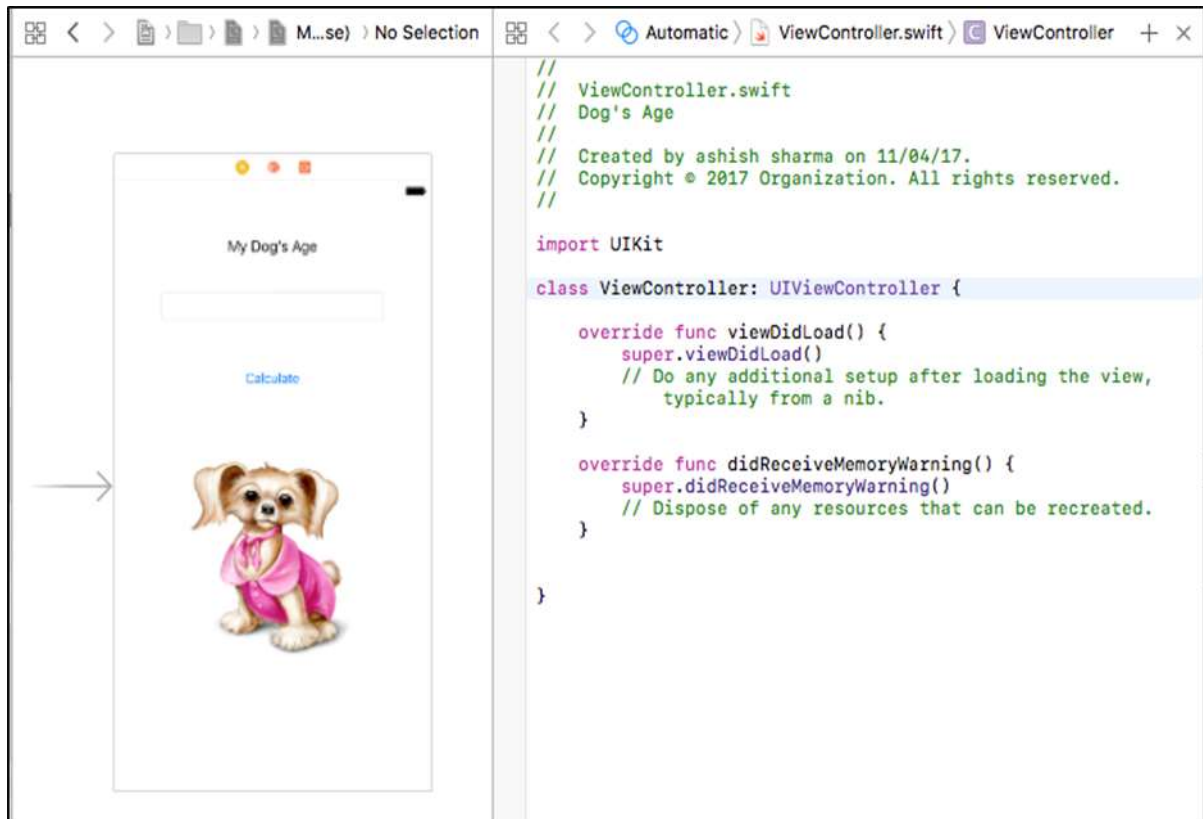


After this, we have a logical implementation of our code that we will continue if you have completed until this step.

Now, select your view controller and open assistant editor by clicking the assistant editor button in the top right corner (as shown in the screenshot below).



Now, our view should look like the following screenshot.



Adding Functionality to Our Application

Until now, our application is just a Static Application, which does not respond to anything and does not change on the user interaction.

Now comes the main part of connecting our UI Elements to our Code and the UI will change according to users Input. The “**ViewController.swift**” file is our main file in which we will be writing code for our Current view.

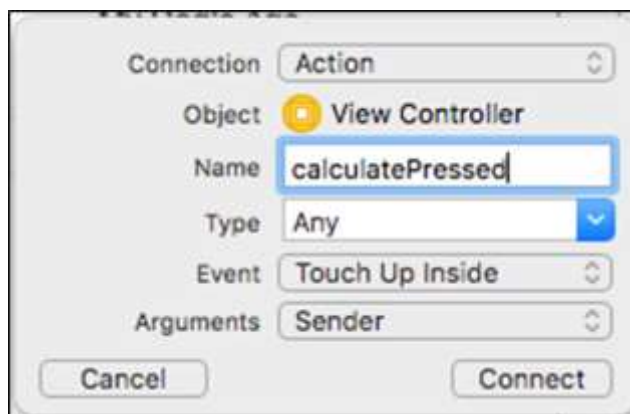
Note: Currently we are working with single views, later when we discuss about multiple views. We will discuss how different files control different Views.

Click on the text field, press control and drag your cursor to Second part of screen, i.e. viewController.swift file. You will see a blue line connecting our view and swift file. When you release the mouse, you will see a popup, asking for input.



TIP: Fill the Name field with any Name that resembles to your Input field. One important point is that the name cannot have a space, so you can write it like shown in the earlier image, i.e. if the name has multiple words, then the first word should be written in small case, then the first alphabet of every next word will be capital.

Follow the same procedure and connect the rest of the Elements. Remember that for a text field and a label, the type is Outlet. However, while adding a button, the type must be action as shown in the screenshot below.



At this stage, our viewController.swift will look like –

```
import UIKit

class ViewController: UIViewController {

    @IBOutlet weak var enteredAge: UITextField!
    @IBAction func calculatePressed(_ sender: Any)
    {
    }
    @IBOutlet weak var yearsLabel: UILabel!

    override func viewDidLoad() {
        super.viewDidLoad()
        // Do any additional setup after loading the view,
        typically from a nib.
    }

    override func didReceiveMemoryWarning() {
        super.didReceiveMemoryWarning()
        // Dispose of any resources that can be recreated.
    }

}
```

Now, inside your button action, add the following lines:

```
var age = Int(enteredAge.text!)! * 8
yearsLabel.text = String(age);
```

Tip: We do not need to add a semicolon to end a line in swift, but even if we put a semicolon, the compiler would not report any error.

In the above code, the first line declares a variable 'age', which we will discuss in the next chapter. Then we assign the value entered by the user, by converting it into an Integer, and multiplying it by 8.

In the second line, we assign the value of 'age' to our output label. At this stage, our view controller will look as follows:

```
import UIKit

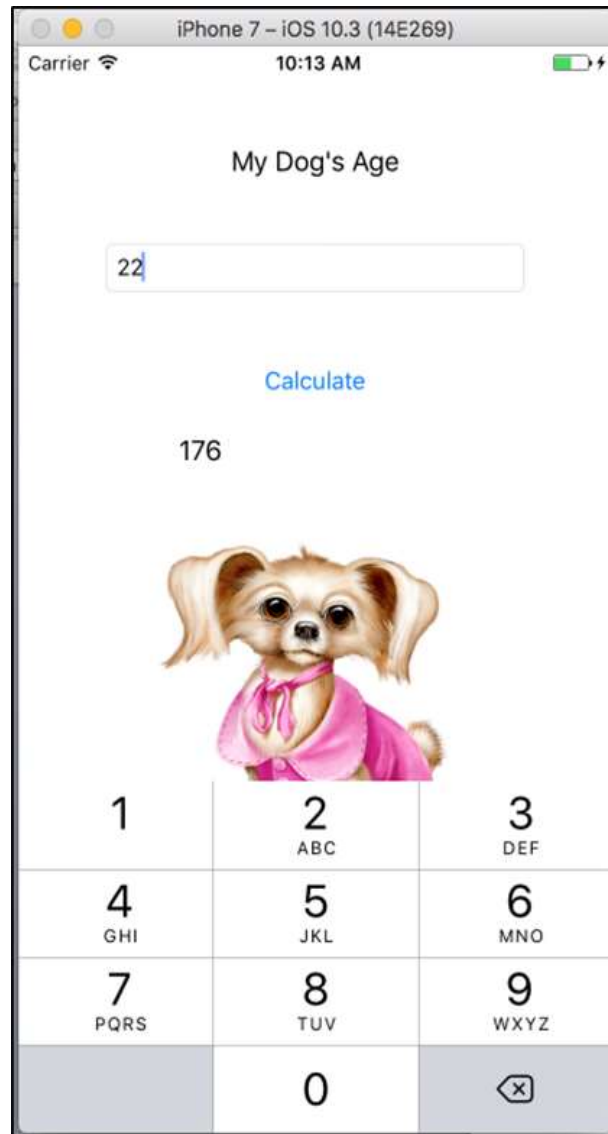
class ViewController: UIViewController {

    @IBOutlet weak var enteredAge: UITextField!
    @IBAction func calculatePressed(_ sender: Any)
    {
        var age = Int(enteredAge.text!)! * 8
        yearsLabel.text = String(age)
    }
    @IBOutlet weak var yearsLabel: UILabel!

    override func viewDidLoad() {
        super.viewDidLoad()
        // Do any additional setup after loading t
    }

    override func didReceiveMemoryWarning() {
        super.didReceiveMemoryWarning()
        // Dispose of any resources that can be re
    }
}
```

Now, we will run our application and this is how it will appear.



Tip: If your keyboard does not appear on the first run, open your simulator, click on hardware, go to keyboard and click on Toggle Software Keyboard.

In the next chapter, we will discuss about a new tool called **Playground**. We will also learn some more swift concepts like Variables, Dictionaries, Arrays Loops, Classes and objects.

4. iOS Development – Swift Playground

In this chapter, we will introduce a new environment where we can write and execute a swift code. We will also cover the following aspects of the swift playground –

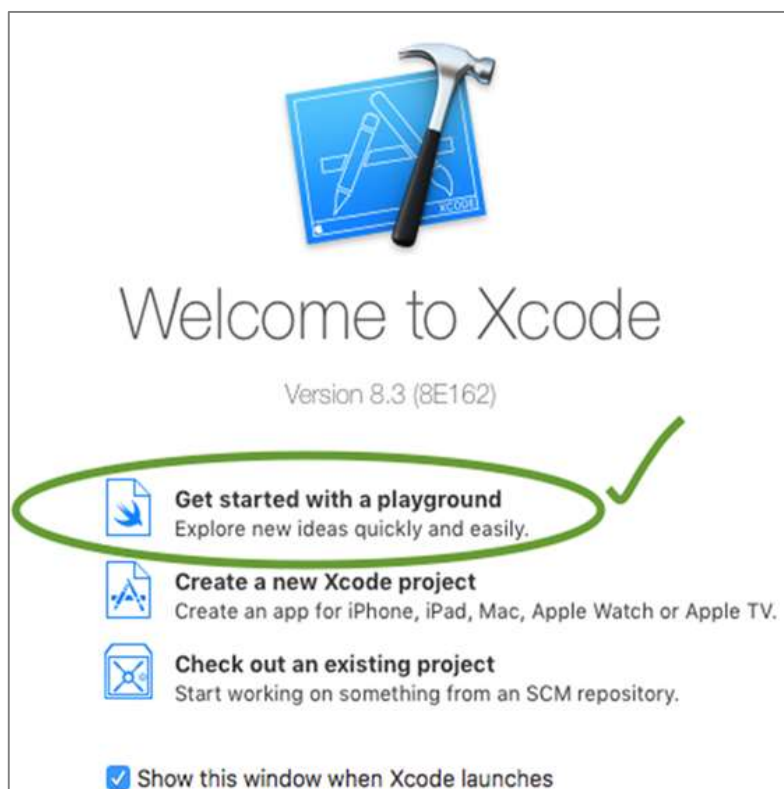
- Variables
- Dictionaries
- Arrays
- Loops
- Classes
- Objects

Note: We will look only through those basic concepts, which we will be using in this tutorial, if you want to learn swift deeply, you can check our [Swift Tutorial](#).

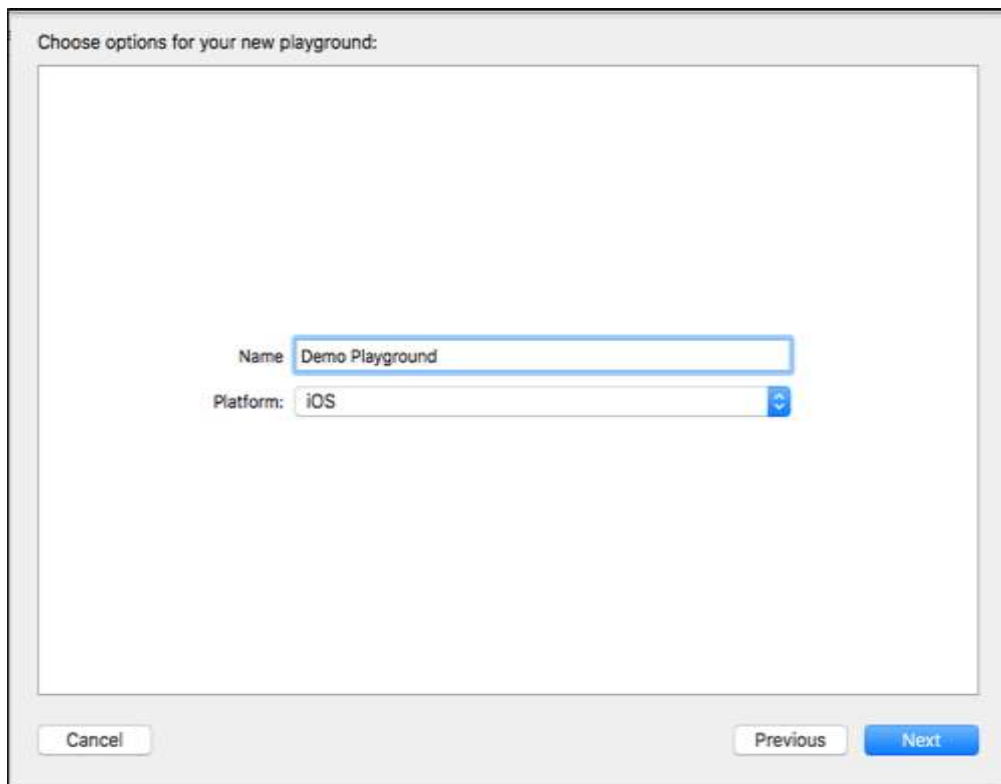
Playground is a tool provided with Xcode for executing the swift code. We will start by creating a new playground.

Starting Swift Playground

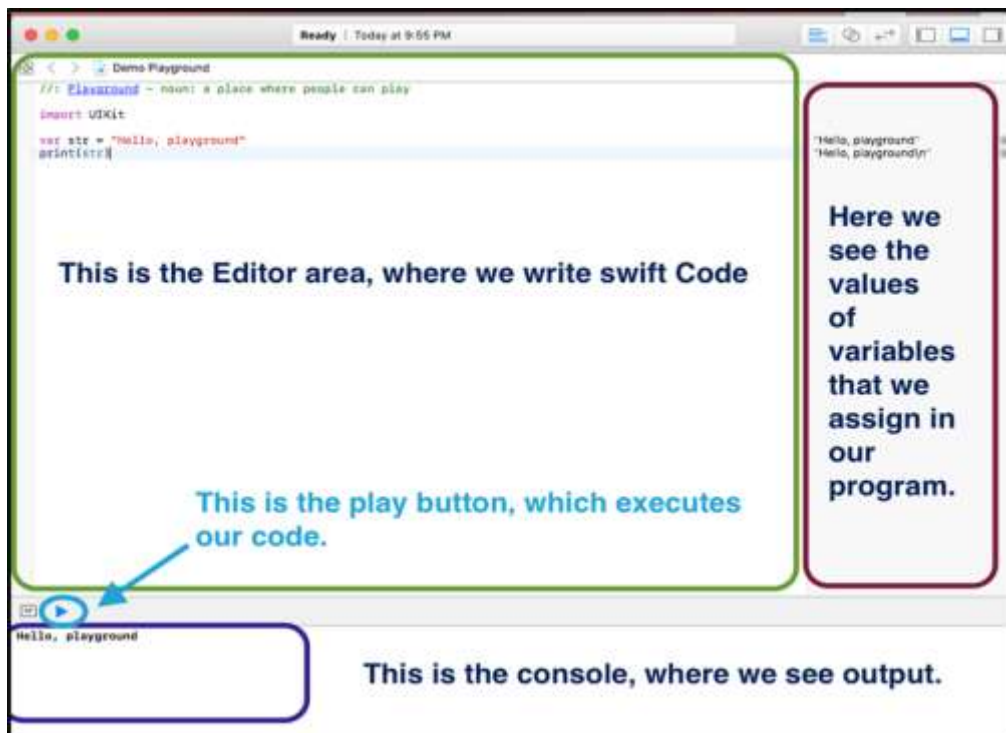
To create a swift playground, click on Xcode icon, and choose the first option, get started with a swift playground.



Give the name to your playground and select Platform as iOS. Let us name our playground as the Demo Playground. Click on Next.



These are the only steps you need to follow to make a Playground. The following screenshot shows the Playground.



Variables

A variable is a memory / storage that our program can use to store and manipulate data. Each variable has a specific data type, which determines the size that a variable will occupy in memory.

Swift provides the following data types:

- **Int** – Used to store integer / Whole numbers within our program.
- **Double** – This is used to store large floating (64-bit) values, e.g. -378.878.
- **Float** – This is used to store small floating values. E.g. 3.14
- **Char (character)** – This is used to store a single character. E.g. 'A'
- **String** – This is a collection of characters. E.g. – "This is String".
- **Bool** – This data type is used to store a value in true or false only.

Swift also allows using other Data types such as:

- Arrays
- Dictionaries
- Classes
- Structures
- Optionals

All of these will be discussed in the subsequent chapters.

Variable Declaration

Variable declaration is used to declare a variable i.e. allot space to that variable in the memory. To declare a variable in swift, we need to use a keyword, **var**.

```
var variableName = Initial Value
var x= 10 or var x = "Hello"
// We can use this method of declaration if we
// don't know that kind of data will be stored.
var variableName : Data type = Initial Value      // if we know the data type.
Var x: Int = 10          // can only store integer type of data.
```

As shown above, we can add any number of variables to our code in any of the above method, whichever is suitable for our use.

Dictionaries

A dictionary is a collection that stores values in a key value pair, i.e. the data stored in a dictionary is stored in a method where each value is related to a key. Here, every key is unique and cannot appear twice in the same dictionary. Whereas the value related to keys

may be repeating/Duplicate. A dictionary is not stored in any order and it can be accessed using the keys.

Creating an Empty Dictionary

The following command will create an empty dictionary where the key will be the integer and the value will be of String Data type.

```
var DictionaryName = [Int : String]()
```

A dictionary is stored like –

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

Assigning Values to Dictionary.

Let us consider the following example that shows how values are assigned to the dictionary.

```
var airports = [String : String]()
airports = ["Delhi" : "IGI" , "Bengaluru":"Kempegowda","DelhiTwo":
"Safdarjung"]
```

Operations on Dictionary

The following points describe the various operations that are performed on a dictionary.

- DictionaryName.count – returns the number of key-value pairs in dictionary.
- DictionaryName.isEmpty – returns true if dictionary is empty.
- DictionaryName[Key] = Value – Adds the key value pair to Dictionary.
- DictionaryName.updateValue("Value" ,forKey : "key") – Updates a key, if exist.
- DictionaryName.removeValue(forKey : key) – removes the value for key.

<pre>var airports = [String : String]() airports = ["Delhi" : "IGI" , "Bengaluru":"Kempegowda"] airports.count airports["Mumbai"] = "airport" airports.count airports["Mumbai"] airports.updateValue("Mumbai's Airport", forKey: "Mumbai") airports.removeValue(forKey: "Mumbai") airports.count</pre>	<pre>[:] ["Bengaluru": "Kempegowda", "Delhi": "IGI"] 2 "airport" 3 "airport" "airport" "Mumbai's Airport" 2</pre>
--	---

Arrays

Arrays are the data types that store the same type of data in an ordered list. The same value can appear at multiple indexes/Places in an array.

Operations on an Array

Swift provides multiple operations that we can apply on arrays according to the user Requirement. Some of the most commonly used ones are given below.

- `var ArrayName = [Datatype]()` // Creates an empty Array of Datatype
- `var newArray = [Int]()` // Creates an empty Integer Array.
- `newArray = [1,2,3]` // Assigns Three Values to the Array.
- `newArray.count` // Prints the count of Array.
- `newArray.isEmpty` // Checks if array is empty.
- `newArray.append(4)` // Adds an element at the end of array.
- `var firstItem = newArray[0]`
// creates a variable with value of first element of newArray.
- `newArray.insert(7, at: 0)` // inserts value 7 at 0th index of newArray
- `newArray.remove(at: 2)` // removes value from 2nd index of newArray.

<code>var newArray = [Int]()</code>	<code>[]</code>
<code>newArray = [1,2,3]</code>	<code>[1, 2, 3]</code>
<code>newArray.count</code>	<code>3</code>
<code>newArray.isEmpty</code>	<code>false</code>
<code>newArray.append(4)</code>	<code>[1, 2, 3, 4]</code>
<code>newArray.count</code>	<code>4</code>
<code>var firstItem = newArray[0]</code>	<code>1</code>
<code>newArray.insert(7, at: 0)</code>	<code>[7, 1, 2, 3, 4]</code>
<code>newArray.remove(at: 2)</code>	<code>2</code>
<code>newArray</code>	<code>[7, 1, 3, 4]</code>

Loops (Control Flow)

Swift provides a variety of Control Flow Statements. Loops are generally used to iterate over a condition or statement multiple times, until a Condition / Programmer's need from that loop is satisfied. Swift provides the following kind of loops:

For-in loop

To perform a task multiple times. We use the 'for-in loop' to iterate over a sequence, such as an array, range of numbers or characters in the string.

Let us consider the following **example**:

```
var items = [1,2,3]
for item in items
{
    print(item)
}
```

The **output** would be as follows:

```
1
2
3
```

While loop

The While Loop is used to perform a task multiple times. It is used when we need to iterate over a condition until it becomes false. The While loop is used best when the number of iterations is not known at start. **While** loop is of the following two types:

- While Loop
- Repeat-While

A **while** loop starts by evaluating a single condition, if the condition is true, then it iterates over the loop until the condition becomes false. The **syntax** of the **while** loop is as follows:

```
while (condition) {
    Statements; }
```

Let us consider the following **example**.

```
var i = 2
while (i > 0)
{
    print(i)
    var i = 2
    while (i > 0)
    {
        print(i)
        i = i - 1;
    }
}
```

Its **output** would be as follows:

```
2
1
```

Repeat-while loop

This is another version of **while** loop. In this loop, the control passes through the statement at least once before checking the condition. The **syntax** of the repeat-while loop is as follows:

```
repeat
{
statements
}
while(condition)
```

Let us consider the following **example**.

```
repeat
{
print(i)
i = i - 1;
}
while (i>0)
```

The **output** would be as follows:

```
2
1
```

Conditional Statements

These type of statements are often useful when we have to execute some code depending on some condition. You might want to perform different actions on different input from the user.

In such cases, conditional statements are very helpful. Following are the conditional statements available in swift.

'If' Conditional Statement

If condition is the smallest possible condition, which executes a set of lines only if the condition is satisfied.

The **syntax** of the **if** condition is as follows:

```
if (condition) {  
    Statements to execute }
```

Let us consider the following example.

```
var x = 5  
if (x > 4)  
{  
    print(x)  
}
```

Its **output** would be as follows:

```
5
```

'Else' Conditional Statement

This condition is used with the 'IF' condition, if the 'IF' condition fails, then the control will come to else. The **syntax** of the **else** condition is as follows:

```
if(condition)  
{  
    Statement to execute  
}  
else  
{  
    Statement to execute  
}
```

Let us consider the following **example**.

```
var x = 6  
if(x > 6)  
{  
    print("this is if condition")  
}  
else  
{  
    print("this is else condition")  
}
```

Its **output** would be as follows:

```
this is else condition
```

If-else Conditional Statement

The "if else" conditional statement is used when we have more than one condition, which we want to check. For example, first we want to check if the value is smaller than 4, we will print loop 1, else if the value is between 4 and 8 we will print loop 2, and else if the value is greater than 8 we will print loop 3.

The **syntax** of the if-else condition is as follows:

```
if(condition) {
    Statement to execute }
else if() {
    Statement to execute }
else {
    Statement to execute }
```

Let us consider the following **example**.

```
var x = 6
if(x <4) {
    print("loop 1")
}
else if(x>4 && x<8) {
    print("loop 2")
}
else {
    print("loop 3")
}
```

Its **output** would be as follows:

```
loop 2
```

Switch Conditional Statement

The Switch statement considers a value and compares it against several possible matching patterns. A switch statement provides an alternative to the 'IF' statement by responding to multiple states.

Switch cases are Case sensitive, i.e. 'a' & 'A' are different.

The **syntax** of the Switch statement is as follows:

```
switch value to consider {
    case value1 : response for value one.
    case value2, value3 : response for value 2, value3
    default : if none of the value matches, do this.
}
```

Let us consider the following **example**:

```
let somechar: character = 'c'
switch somechar {
    case "a" : print("first Alphabet")
    case "c" : print("Third Alphabet")
    default : print("anything other")
}
```

Its **output** would be as follows.

```
Third Alphabet
```

Control Transfer Statements

These statements change the order in which your code is executed, by transferring your control from piece of code to another.

Following are the type of control transfer statements available in swift.

- **Continue:** This statement tells the loop to stop whatever it is doing and continue the loop from the beginning of the next iteration.
- **Break:** The break statement stops the execution of loop and exits the loop. It transfers the control to the code written after that loop.
- **Return:** This statement returns some value to its parent.

Functions

Functions are a block of code that execute some code and return the result. Functions have a name using which they are called, they have a return type and they produce a result of that type only. Swift functions may have any parameter or not, but they are flexible.

Defining a function

When we define a function, the function must have a name, a return type and optionally some input that the function would take, which are known as parameters.

The **syntax** of defining a function is as follows:

```
func functionName(parameterName : parameterType) -> returnType
{
    // code
    return (some Value of returnType)
}
```

Let us consider the following **example**.

```
func sayHello(personName : String) -> String
{
    let greeting = "Hello" + personName + "!"
    return greeting
}
```

Calling a Function

After writing a function, the **call must be made** using the function name, and if it has some parameters, then they must be passed in the function calls.

If we want to call the above function, we should use the following command:

```
sayHello(TutorialPoint)
```

Its output would be as follows.

```
Hello TutorialPoint!
```

A function can be without parameters, it can have multiple parameters or it can be without a return type also.

Classes & Objects in Swift

Let us understand what Classes and Objects are in detail.

Classes

Classes are the general-purpose flexible constructs that are the building blocks of your program's code. You can define properties and methods for your classes by using the same syntax as we did for variables and functions.

The **syntax** of defining a **class** is as follows.

```
class className
{
    var anyVariable = anyValue
}
```



```
// Function Definition etc.  
}
```

Objects

Object is the term that is generally used to refer to instance of a class, so we can call it instance instead of objects.

Example: Making a class and its object.

```
class Person  
{  
    var firstName = "Tutorials"  
    var lastName = "Point"  
    func printName()  
    {  
        print(firstName + " " + lastName)  
    }  
}
```

Initializing an object: To initialize an object, we should use the following command:

```
let anyone = Person()    // We can initialize an object by default constructor.
```

5. iOS Development – Making Applications with Swift

In this chapter, we will create two new Applications using Swift.

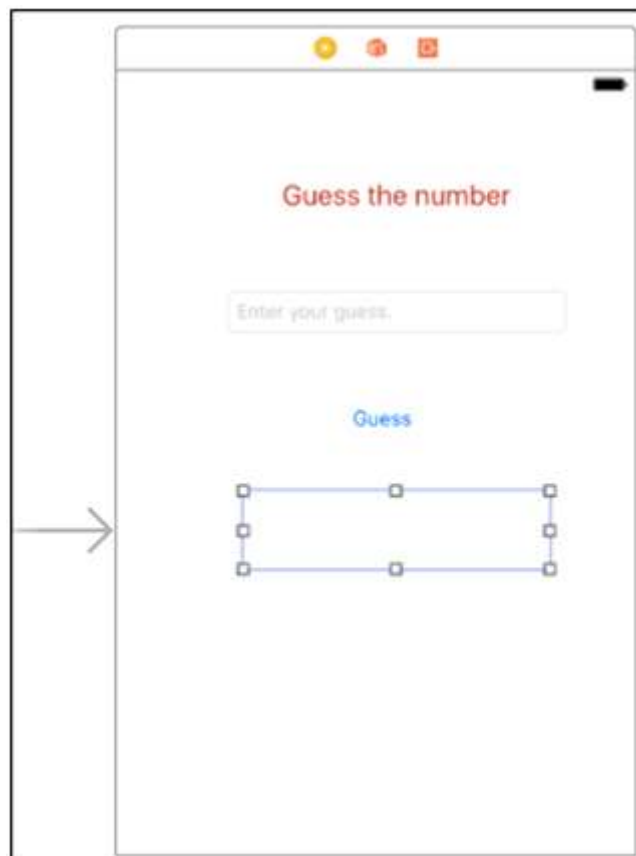
First Application – "Guess the Number"

In this section, we will create an Application called "Guess the number". To make this application, create a new iOS Single View Application and name it whatever you want.

Click on the **main.storyboard** and select your main view.

- Add a text label → Change the text to "Guess the number". Change the color, size properties and make it as per your requirement.
- Add an Input field, stretch to full view.
- Add a button and name it "Guess".
- Add one more label, stretch it, and clear the text box.

This is how your **view** should look like after adding all the elements.



Now Switch to assistant editor and Click on drag from your UI element to view controller file, then connect the text field as an outlet and name it userInput. Similarly,

- Connect empty label as outlet and name it as resultLabel.
- Connect Guess button as action and name it as guessButtonPressed.

What is the logic?

The logic is simple, we will generate random numbers between 0-9 and see if that is equal to the number the user entered, or not. If it is equal, we will show "you are right", else we will show "you are wrong!"

Applying the logic

To generate a random number between 0-9, we will use the following command.

```
let rollIt = String(arc4random_uniform(10))
```

Then we will use the following logic to check whether it is same as the user input or not.

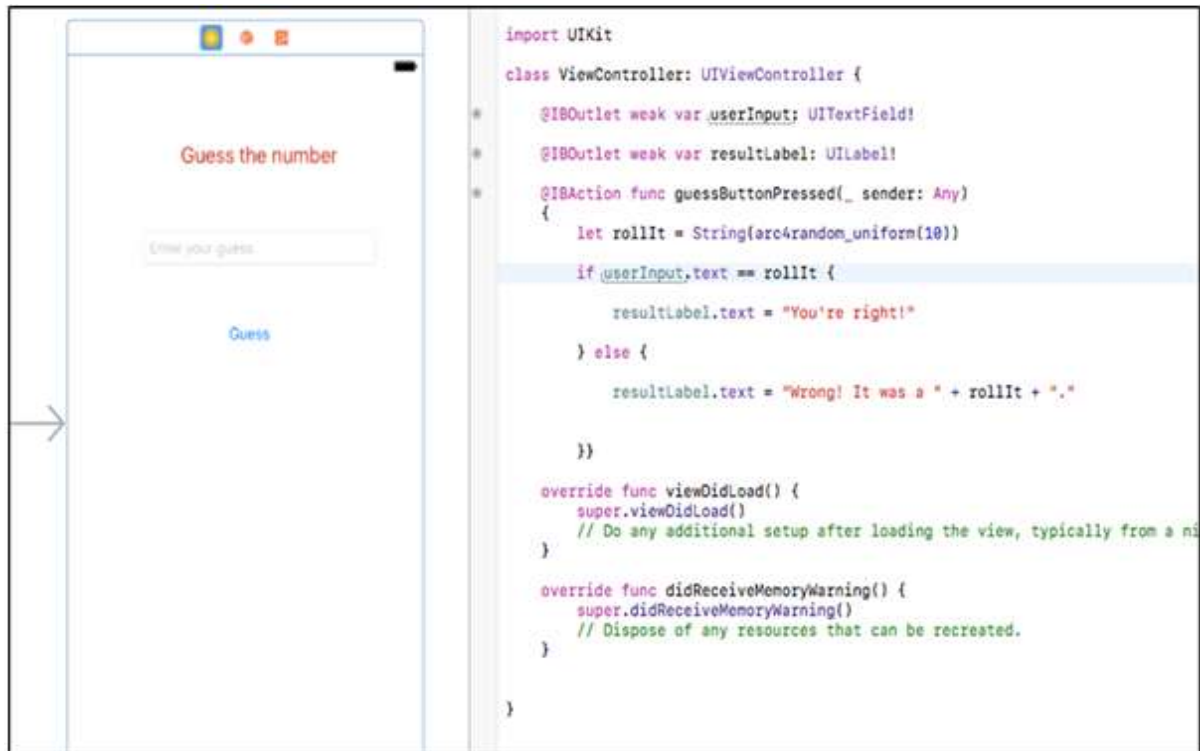
```
if userInput.text == rollIt
{
    resultLabel.text = "You're right!"
}
else
{
    resultLabel.text = "Wrong! It was a " + rollIt + "."
}
```

This is how your final logic in button action function will look like.

```
@IBAction func guessButtonPressed(_ sender: Any)
{
    let rollIt = String(arc4random_uniform(10))

    if userInput.text == rollIt {
        resultLabel.text = "You're right!"
    } else {
        resultLabel.text = "Wrong! It was a " + rollIt + "."
    }
}
```

Your final application should look like this now.



Let us now run our Application and check its **output**. The opening screen should look as follows:



Next, feed a number in the **input** area:



Let's feed another number and check its output:



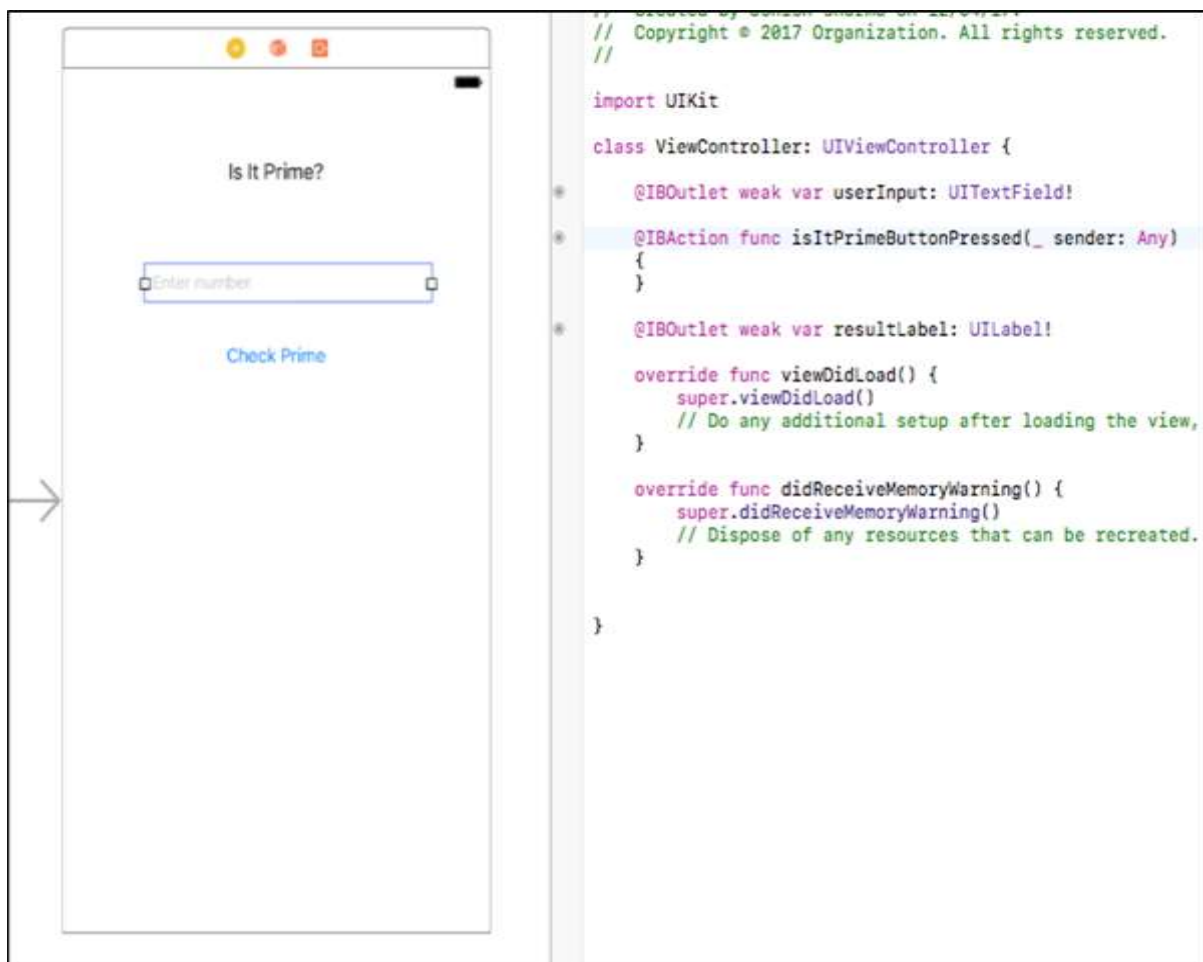
We have completed one more Application. Try to run this application, and enter different inputs.

Second Application – "Is It Prime"

In this application, we will be taking an input from the user and we will check whether that number is prime or not.

- **Layout:** Similar to the previous application, we need an input, a button and an output label.
- **Challenges:** Create the UI and connect the elements to code. Also, try if you can create the complete project yourself. If you managed to create it by yourself, then it is great and you are doing excellent with iOS Development.

If you could not manage, do not worry. Look at the following image and try to do the same.



Try to create a view like this, if you are not able to do it yet, please read the previous section where we have developed a Guess Game.

What is the Logic?

Prime numbers are the numbers that cannot be divided by any other number except 1 and the number itself.

Example: 7 is a prime number as any other number except 1 and 7 cannot divide it.

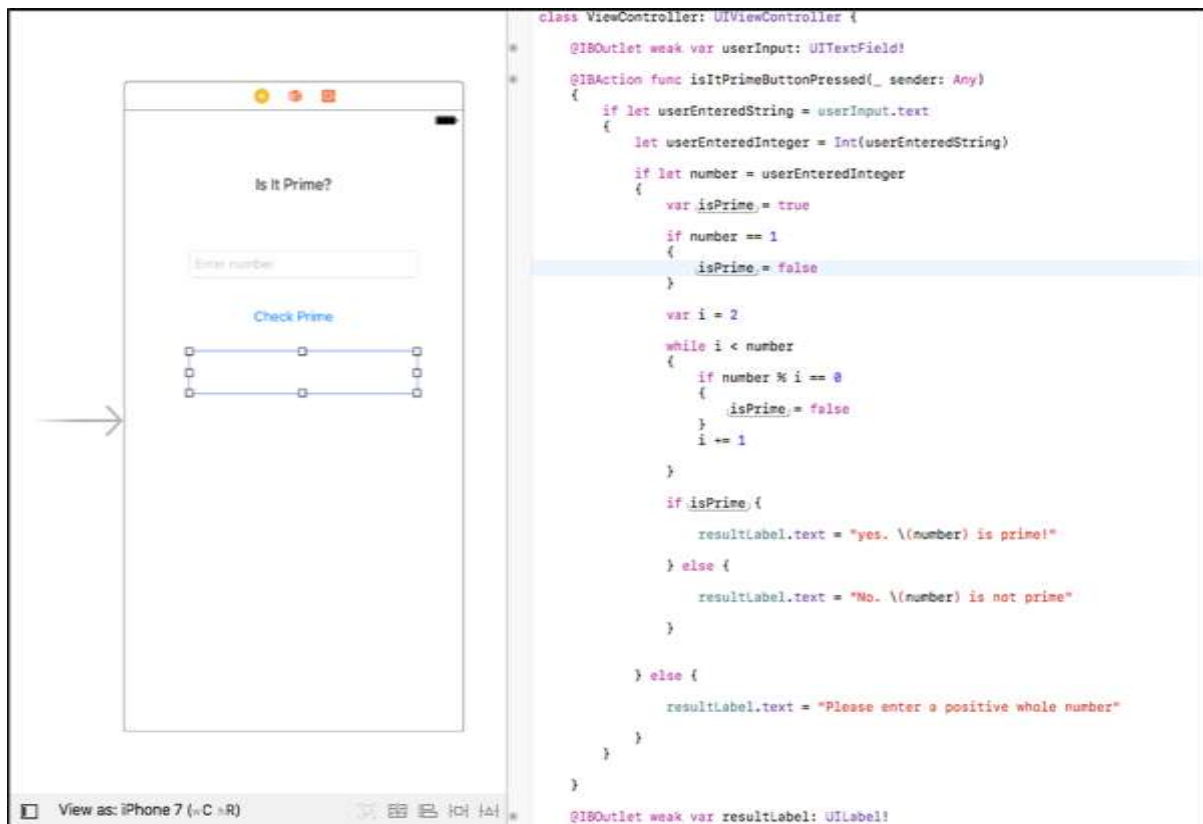
How to Implement?

Try to write a code for checking prime numbers. Then take the user input and see if that is a prime or not. If yes, then show prime; otherwise show not prime in your result label.

Here is the code to check whether a supplied number is "prime" or not:

```
@IBAction func isItPrimeButtonPressed(_ sender: Any)
{
    if let userEnteredString = userInput.text
    {
        let userEnteredInteger = Int(userEnteredString)
        if let number = userEnteredInteger
        {
            var isPrime = true
            if number == 1
            {
                isPrime = false
            }
            var i = 2
            while i < number
            {
                if number % i == 0
                {
                    isPrime = false
                }
                i += 1
            }
            if isPrime {
                resultLabel.text = "yes. \(number) is prime!"
            } else {
                resultLabel.text = "No. \(number) is not prime"
            }
        } else {
            resultLabel.text = "Please enter a positive whole number"
        }
    }
}
```

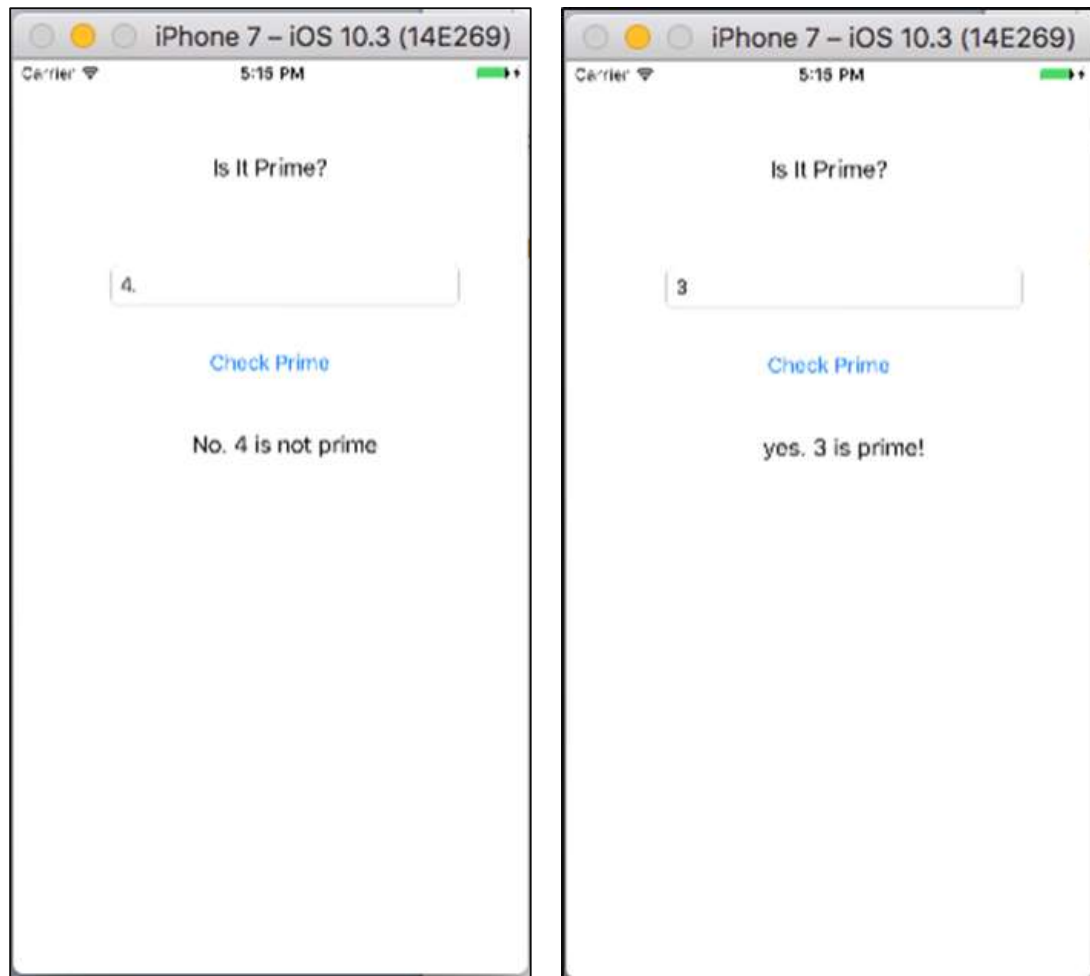
This is how your button action should look like. Following is the image of the final code and view.



This is how your running application should look like if you followed the procedure.



Now, let us test our Application by supplying input values:



6. iOS Development – Advanced iOS

In this chapter, we will cover some advance features like Creating Multiple Views on our Application, Adding Navigation Bars, Adding Table Views, Storing Data in the Application, Making Web Applications, etc.

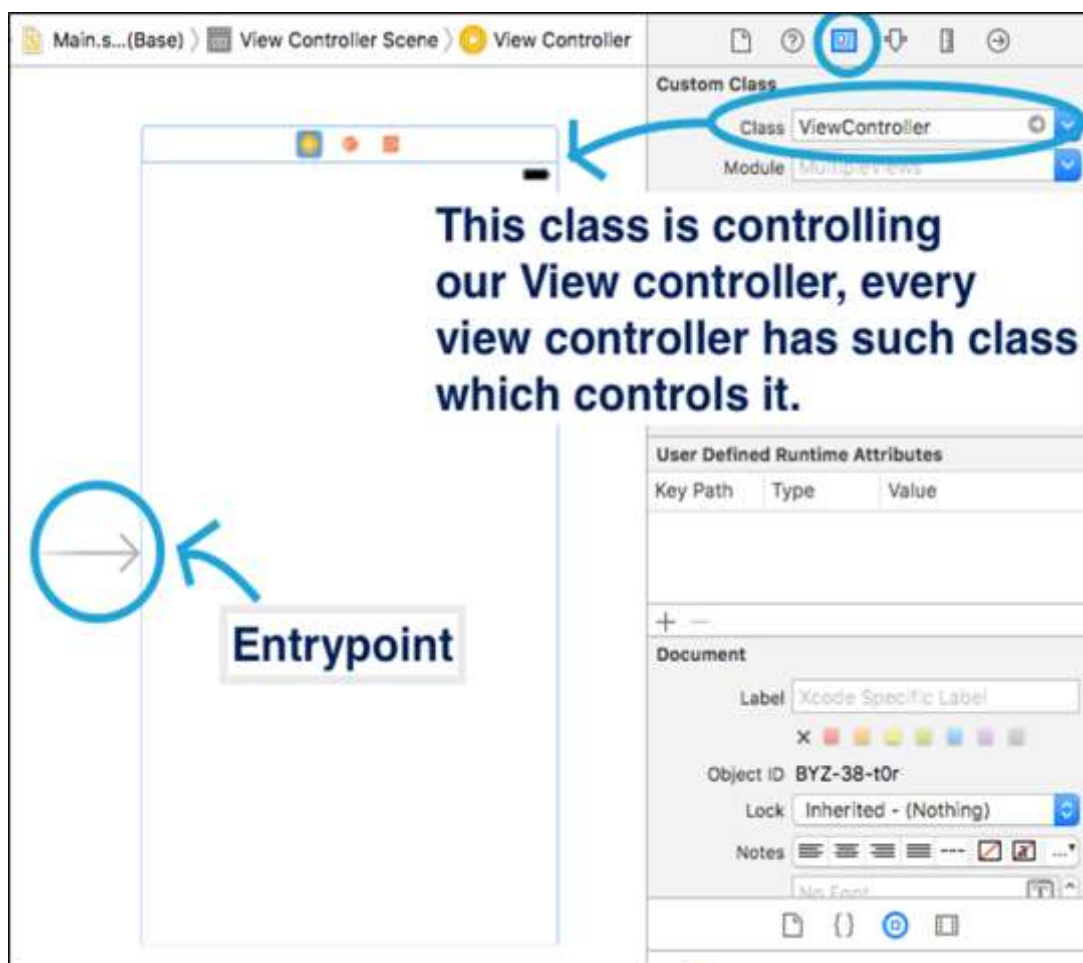
Please go through every section carefully, as this chapter contains most of the things, which we need while developing applications.

Multiple View Controller

In our previous applications, we only gave a single view / view controller. However, we can have multiple views in our application and we can perform on any of those independently.

Therefore, we will start by creating a new project; the name of this project has multiple views. As every other project, this project also has a View Controller and a Swift File for that controller. (This you can see by selecting view & seeing its properties in the Identity Inspector.)

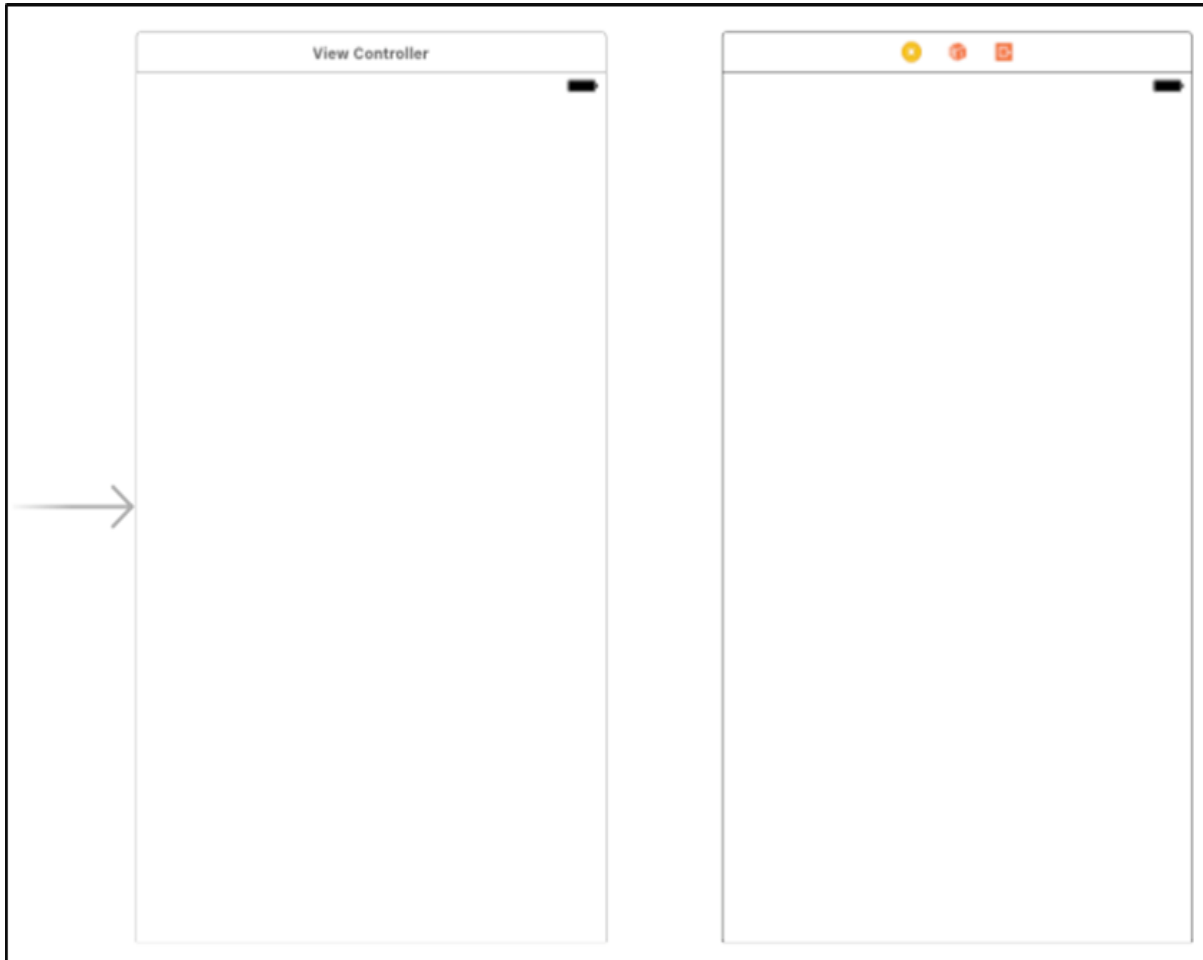
The following screenshot shows how our current view looks like:



On the right-hand side (Identity inspector), we can see the class that is related to our view controller. This arrow on the left is the entry point. This is the first view of our application that will show after the application starts running.

Adding Second Multiple View Controller

To add other view controllers to our application, we will search view controller in our object library. Once we find it, we will drag the view controller to our main.storyboard, just outside any other views.

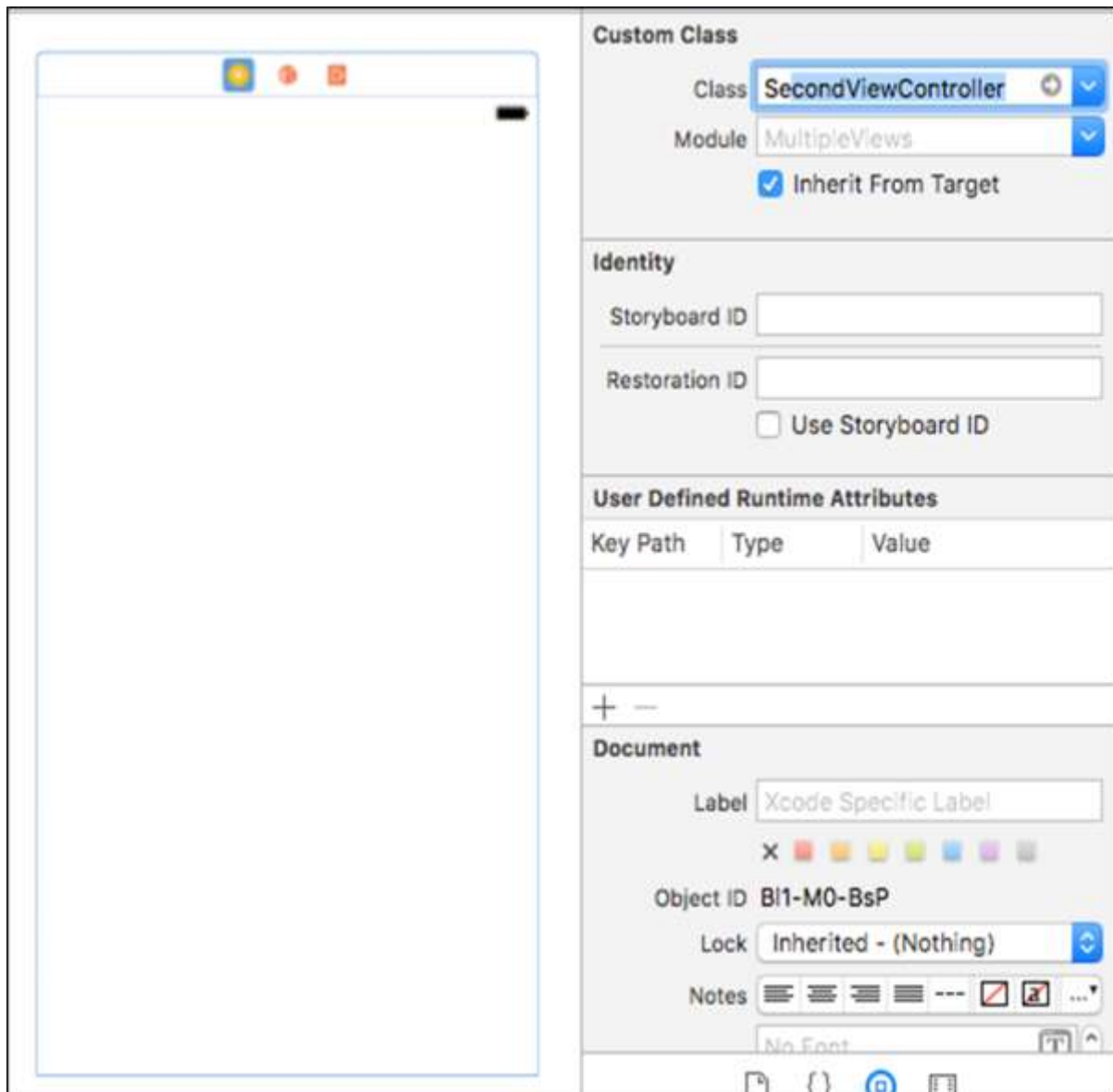


This is how your application should look like. Now, we have added a view controller, but now we will also need to create a view controller class for our newly added view.

Right click on your project → new File → cocoa Touch Class → Name it anything you want to, we will name it "SecondViewController".

This is how you create a class file for your view controller. Now, go back to your "main.storyboard", click on your second view controller and see its Identity Inspector.

The class field must be empty right now, so click on that field and start typing your class name that you added in last step. If it appears, click enter.

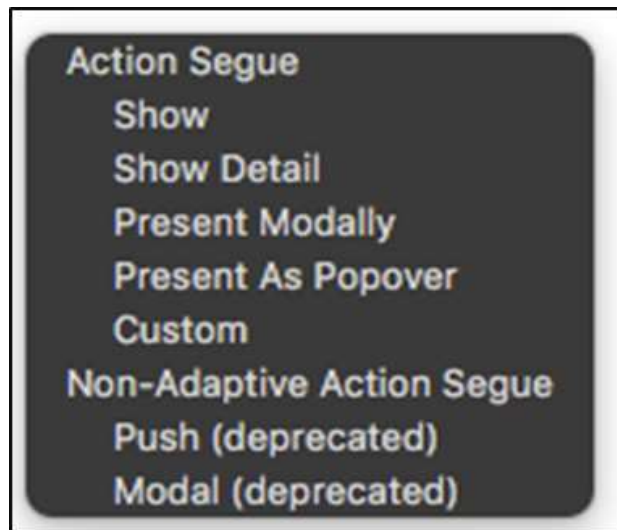


We have now created a multiple view controller and added the controller class file for that View. However, if you run the application, it will not show your second view still. Why?

Because we have not added a function, which will take us to that view. In short, we have not yet added Navigation to our Application. Do not worry; we will cover it in the following section.

Adding Navigation to the Application

The process of transition from one view to another is called **Segueing**, i.e. done by creating segue between the two views. To do this, add a button in the first view controller, and control drag from it to your second view. When you release the button, you will see some options as shown in the screenshot below.

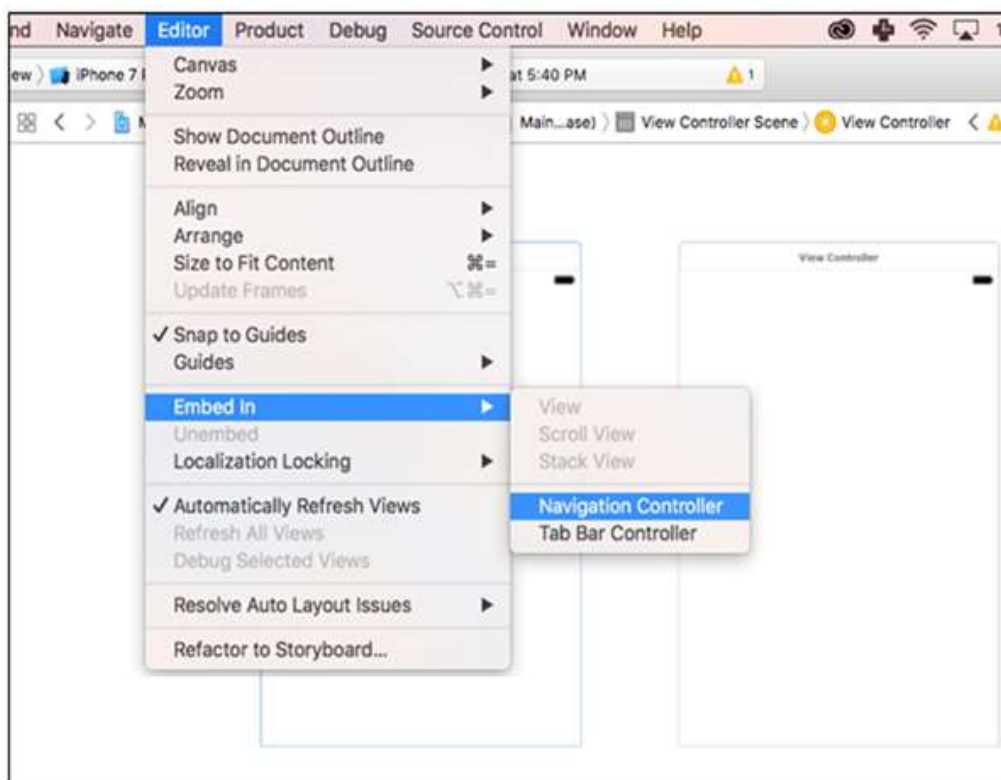


Select the Show option from the Action Segue. Now run your application, you will see that on the click of a button, your second view appears (To see more clearly add something in your second view, so that you can identify).

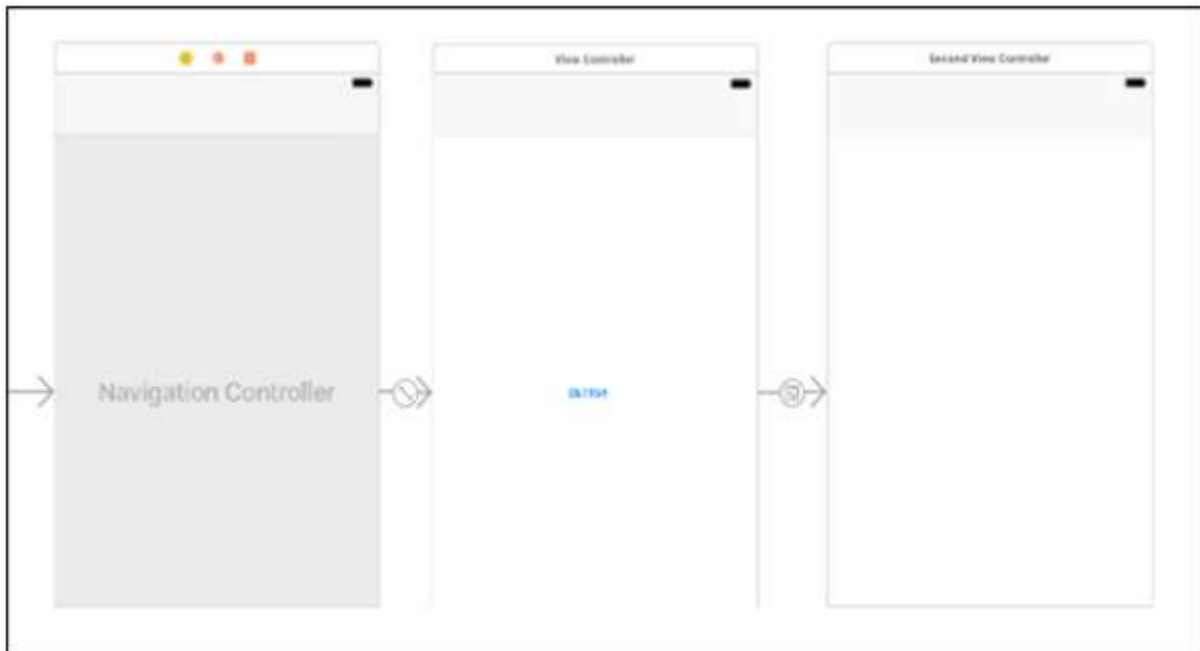
However, now you cannot go back to your first view. For that, we have **Navigation controllers**.

Adding a Navigation Controller

Select your first view controller and in the top bar, click **Editor → Embed in → Navigation controller**.



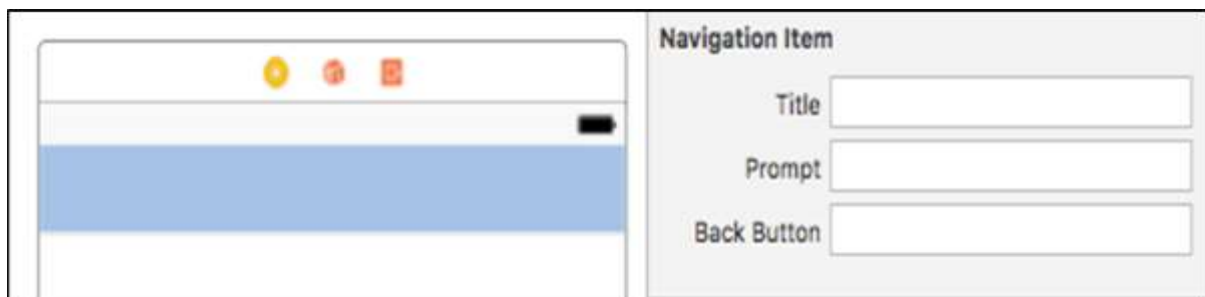
Now, our application should look like the following screenshot.



We should see to it that, there is a little light grey row on top of the view. Now, when we Run the application, we can see that there is a navigation bar on top of the view. When we click on the button, we will go to second view, where we will see a back button in that navigation bar. Click on this and we will come back to the Initial View.

Adding Title & Back Button to the Navigation Bar

To add a title to your navigation bar, click on the navigation bar, and see its attribute inspector. There we will see –

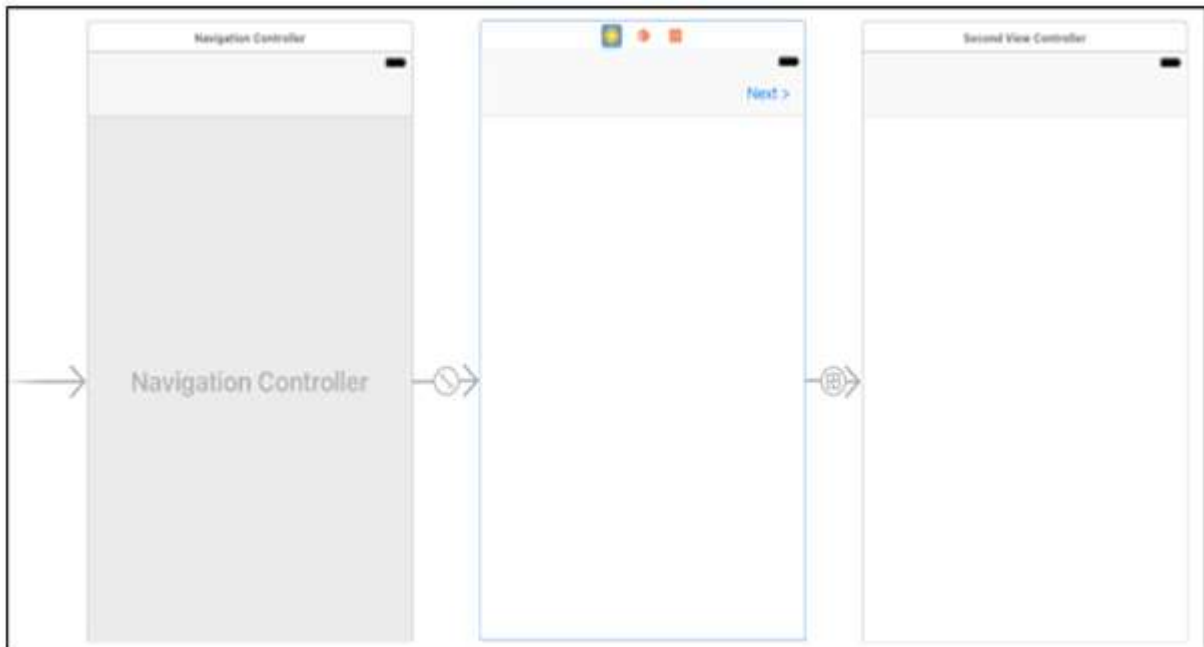


- **Title:** This will be the title of Navigation bar, which appears in center.
- **Prompt:** This appears on top of title bar, in center.
- **Back Button:** Here you can modify the Text that appears in back button.

Currently the button that is passing the view is located on our view, which might not suit if we want something else to appear on the screen. Therefore, we will add a Bar Button item in the navigation bar, which will take us to our second view. However, for this we should first delete the last button we added.

Adding a Bar Button Item

Search for bar button item in the object library and drag drop to the right hand side of the navigation bar. Name it as – “Next >”, control drag from it to the second view, select Show as we did with the last button we added.



Now run the application, it will look cleaner and better. This is all we will do with Navigation right now. In the subsequent chapters, we will modify the navigation bar using the Swift Code, when required.

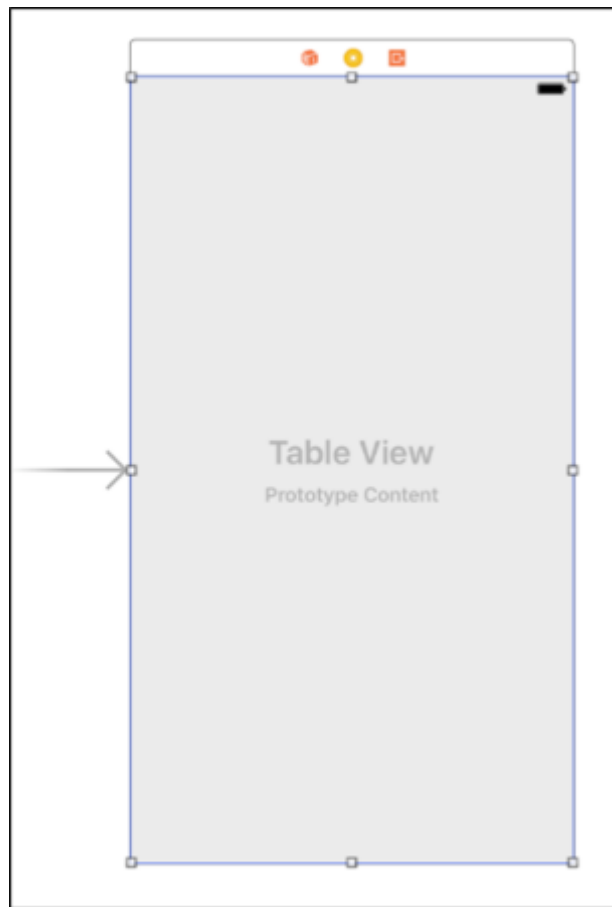
Table Views

A table presents data as a single column list containing multiple rows, which can be further divided into sections. Tables should be used to present data in a clean and efficient way.

In this section, we will understand how to add table views, adding prototype cells, adding data source and delegates for a table view, changing properties of a table and setting dynamic data for table view cells.

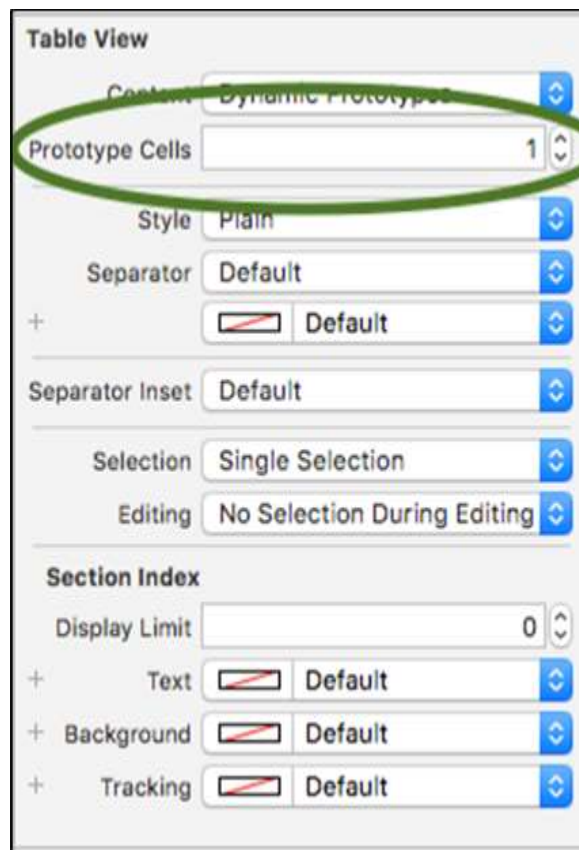
Adding a Table View

To add a table view, we will first create a new project and name it as – “tableView”. Then, go to the object library and search for Table View, we will see the table view, the table view controller and many other options. However, we should select table view, drag it and add to the default view Controller.



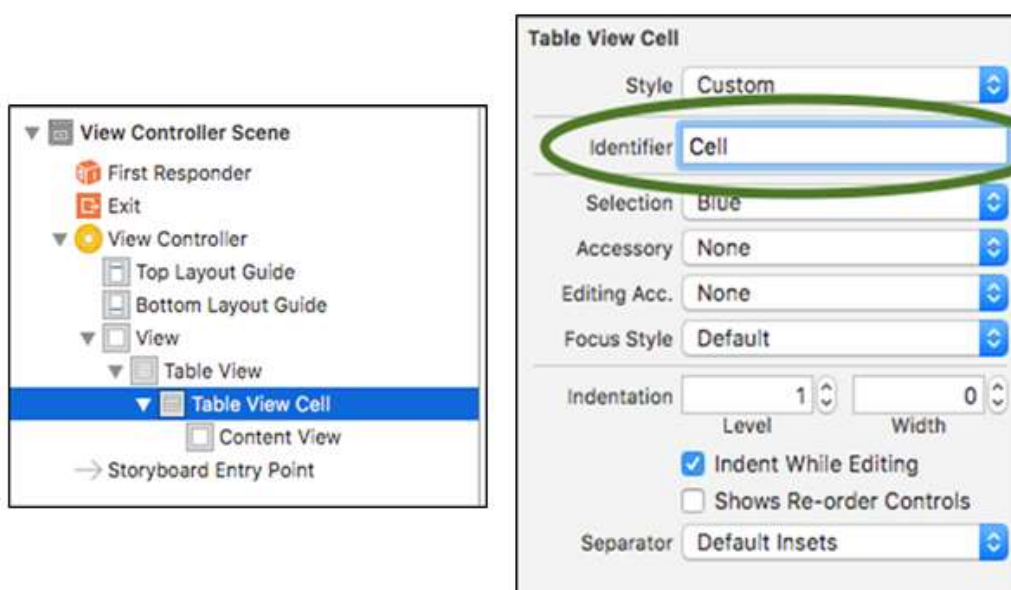
Adding a Prototype Cell

Stretch the table view so that it covers the complete view, while your table view is highlighted. Check its attribute inspector, there is a field called Prototype cells, which is currently 0. We should change its value to 1, now your view should look as follows:



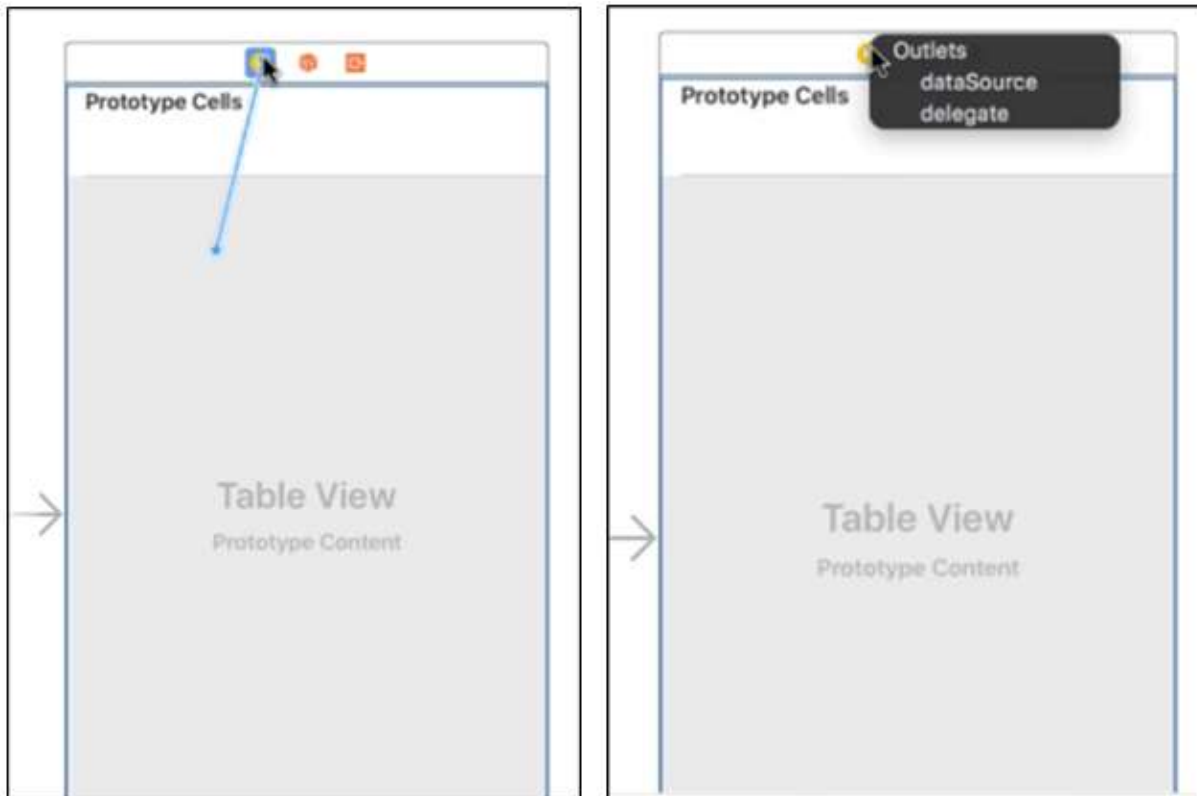
Changing Cell Identifier

Now, inside your view, click on your prototype cell (which is a little tricky). So, in your Document outline, click on View controller → View → Table View → Table View Cell, and now in its attribute inspector there is a column called Identifier, click on that and name it as "Cell". See the following screenshots to understand the above steps.



Adding Delegate & Data Source

To make our table views dynamic, we need them to load dynamic data. Therefore, we need a delegate and a data source for that. To make delegate and data source of your table, control drag from table view to your view controller or the yellow button on top of the view controller as shown in the screenshot below.



When we release the cursor, we will see two options there, dataSource and delegate, select them one by one (when you select any one option, the pop up will hide, you will need to repeat the above step to add a second option). Now it should look like:



This is all we will do with our UI / Main.Stroyboard, right now. Now switch to "ViewController.swift" file. Add **UITableViewDelegate**, **UITableViewDataSource**, to your viewController.swift as shown below:

```
class ViewController: UIViewController, UITableViewDelegate, UITableViewDataSource
```

However, now Xcode will show an error in this line.



This is because there are a couple of methods where we need to use **UITableView**.

To see these methods, Command + click on the UITableViewDataSource, and copy the first two methods, having "numberOfRowsInSection", "cellForRowAtIndex" Arguments and paste them in the ViewController.swift, before our viewDidLoad().

Remove this line **@available(iOS 2.0, *)**, from both the methods and add the opening and closing braces "{}". Now, the view will look as follows:



Xcode must be showing error in both the functions. However, do not worry as this is because we have not added a return type of those functions.

numberOfRowsInSection: This function defines the number of rows our section will contain. So right now add this line to your method.

```
return 1 //This will return only one row.
```

cellForRowAt: This method returns the content for every cell, **indexPath** contains the index of every cell. We will create a cell and then we will assign some Value to that Cell and finally return the cell.

Now, your functions should look as follows:

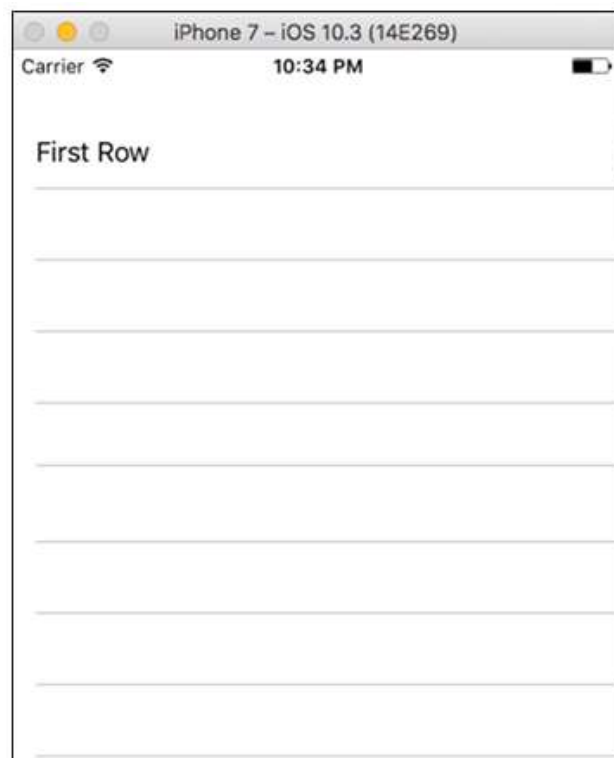
```
internal func tableView(_ tableView: UITableView, numberOfRowsInSectionSection: Int) -> Int
{
    return 1;
}

internal func tableView(_ tableView: UITableView, cellForRowAt indexPath: IndexPath) -> UITableViewCell
{
    let cell = UITableViewCell(style: UITableViewCellStyle.default, reuseIdentifier: "Cell")
    cell.textLabel?.text = "First Row"
    return cell
}
```

In the first line, we are creating a cell with default style, and **reuseIdentifier** is the name of the prototype cell we made.

Cell.textLabel?.text – This defines the text that should appear as title of that cell.

Finally, we return a cell from there. Try running your Application now, it should look as follows:



Time Table Application

In this application, we will continue our last project, and we will make an application where we print the table of 2 (2... 10.... 20).

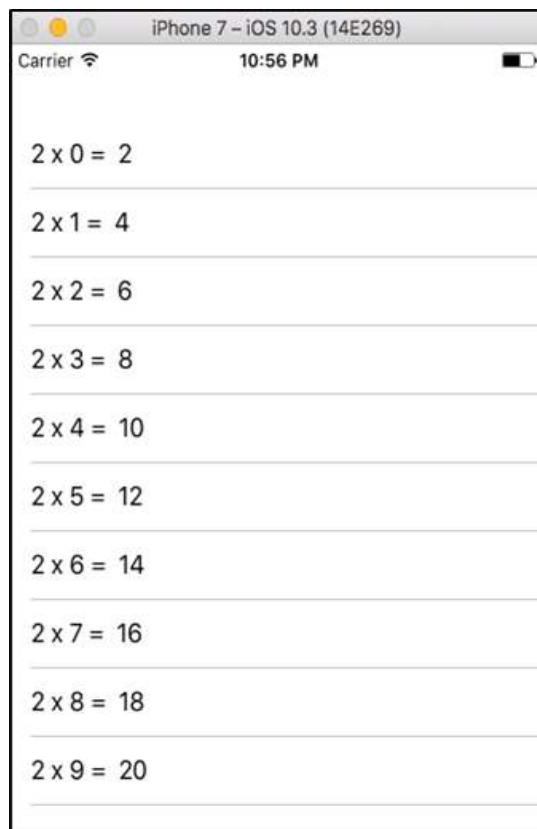
So, to make this application, just change the project's view controller file.

Change the functions as shown below:

```
internal func tableView(_ tableView: UITableView, numberOfRowsInSectionSection: Int) -> Int
{
    return 10;
}

internal func tableView(_ tableView: UITableView, cellForRowAt indexPath: IndexPath) -> UITableViewCell
{
    let cell = UITableViewCell(style: UITableViewCellStyle.default, reuseIdentifier: "Cell")
}
```

Now, run your application. It should look as shown below.



Now, as we have completed the table views and made an application, so here is a quick challenge for us to solve.

Challenge

Make an application, where we print the counting table of whichever number the user inputs.

Hint: Take input, add a button, which when pressed will load the table with counting of that number. Here we will also need the following function, which will reload the table data.

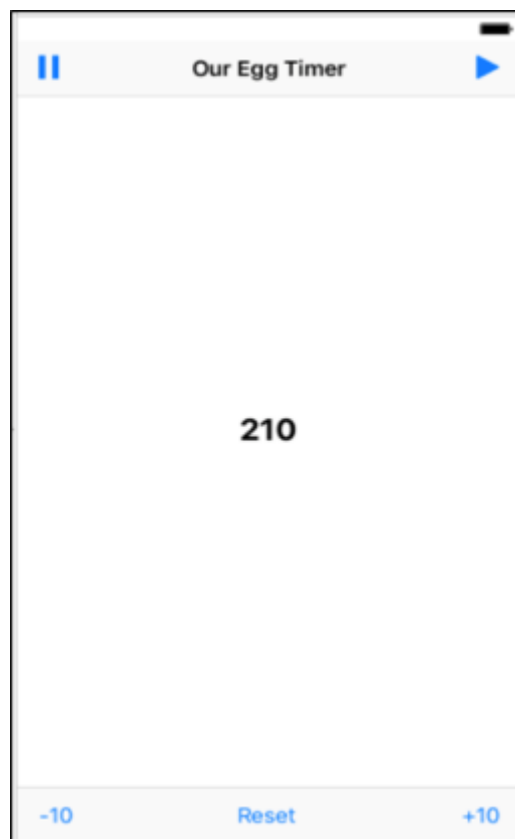
```
tableView.reloadData()
```

This is a challenge for you as we have covered all topics about this application, so we will not provide solution for this.

Egg Timer Application

In this application, We will use the concept of **Timer()** and **Class Constructor**, which manages time. We will provide you the concept and the coding. You have to make the UI yourself as we have already discussed every UI Element many times in our previous chapters. (Though we will provide hints for everything that looks quite new).

Your final app layout should look like this:



What happens in this application?

- The title label has a starting value 210.
- On click of play button, value should decrease by one every second.
- On click of pause, value should stop there only.
- On click of -10, value should be reduced by 10, and decrement should continue.
- On click of +10, value should be increased by 10, and decrement should continue.
- On click of Reset, value should become 210.
- Value should never go below 0.

Concept

- We will use a variable of class Timer() → `var timer = Timer()`.
- We will set a value to this timer variable we just created:
 - `timer = Timer.scheduledTimer(timeInterval: 1, target: self, selector: #selector(ViewController.processTimer), userInfo: nil, repeats: true)`
 - `timeInterval` -> is the time interval which we want to use,
 - `target` -> is the view controller which should be effected,
 - `selector` -> is the function name which will use this timer,
 - `userInfo` -> null and repeats, yes we want to repeat so It'll be true.

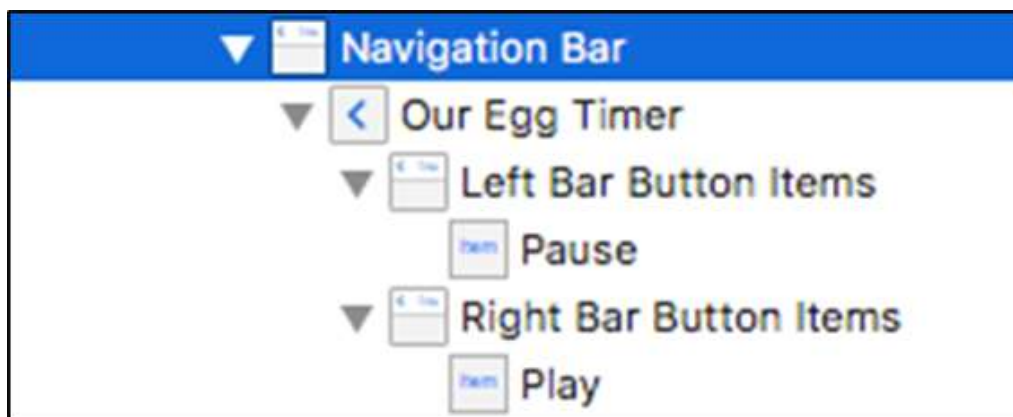
Invalidating Timer

To stop a timer through programming, we will add **`timer.invalidate()`** function.

Elements we have used:

Navigation bar: In the navigation bar, we have added three items.

- Bar Button Item, one on left and one on right.
- Title named as – “Our Egg Timer”.

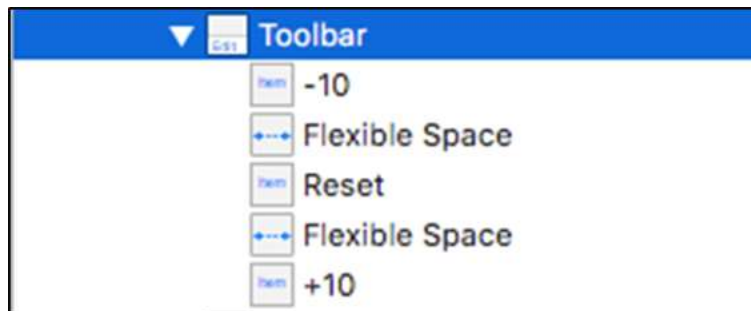


Toolbar: A toolbar appears at the bottom of an app screen and contains buttons for performing actions relevant to the current view or content within it.

Toolbars are translucent and may have a background tint. They often hide when people are unlikely to need them.

We have added a toolbar at the bottom of our UI, which has 5 items.

- Three Bar button items, named -10, Reset and +10
- Two flexible Space: Flexible space between bar button items.



How to add an icon to bar button item?

Select your bar button item. Click on your bar button item, go to attribute inspector, click on Select Item and choose the item from the Dropdown that appears.



Similarly, select items for all other buttons and create a UI as given above. Add a label to the center of the View and connect it as an outlet, name it as – **timeLeftLabel**.

Action for Start Timer

Following is the program for the start timer.

```
@IBAction func startTimerButton(_ sender: Any) {
    if !timerActive {
        timerActive = true
        eggTimer = Timer.scheduledTimer(timeInterval: 1, target: self,
        selector: #selector(ViewController.processTimer), userInfo: nil, repeats:
        true)
    }
}
```



```
}

```

Create the following function:

```
func stopTimer() {
    timerActive = false
    eggTimer.invalidate()
}
```

Action for Stop Function

Following is the program for the stop function.

```
@IBAction func pauseTimerButton(_ sender: Any)
{
    stopTimer()
}
```

Action for Subtracting Time

Following is the program for subtracting time.

```
@IBAction func subtractTime(_ sender: Any) {
    if timeLeft > 10 {
        timeLeft = timeLeft - 10
        timeLeftLabel.text = String(timeLeft)
    }
}
```

Action for Resetting Time

Following is the program for resetting the time.

```
@IBAction func resetTimer(_ sender: Any) {
    timeLeft = 210
    timeLeftLabel.text = String(timeLeft)
}
```

Action for addTime

Following is the program for adding time.

```
@IBAction func addTime(_ sender: Any) {
    timeLeft = timeLeft + 10
    timeLeftLabel.text = String(timeLeft)
}
```

Now, the viewController.swift should look like:

```
import UIKit
class ViewController: UIViewController {

    @IBOutlet weak var timeLeftLabel: UILabel!
    var eggTimer = Timer() // Initialize the Timer class.
    var timerActive = false // Prevents multiple timers from firing.
    var timeLeft = 210

    func stopTimer()
    {
        timerActive = false
        eggTimer.invalidate()
    }

    func processTimer() {
        if timeLeft <= 0 {
            stopTimer()
            return
        }
        timeLeft = timeLeft - 1;
        timeLeftLabel.text = String(timeLeft)
    }

    @IBAction func startTimerButton(_ sender: Any) {
        if !timerActive {
```

```

        timerActive = true
        eggTimer = Timer.scheduledTimer(timeInterval: 1, target: self,
selector: #selector(ViewController.processTimer), userInfo: nil, repeats:
true)
    }
}

@IBAction func pauseTimerButton(_ sender: Any) {
    stopTimer()
}

@IBAction func subtractTime(_ sender: Any) {
    if timeLeft > 10 {
        timeLeft = timeLeft - 10
        timeLeftLabel.text = String(timeLeft)
    }
}

@IBAction func resetTimer(_ sender: Any) {
    timeLeft = 210
    timeLeftLabel.text = String(timeLeft)
}

@IBAction func addTime(_ sender: Any) {
    timeLeft = timeLeft + 10
    timeLeftLabel.text = String(timeLeft)
}

override func viewDidLoad() {
    super.viewDidLoad()
    // Do any additional setup after loading the view, typically from a
nib.
}

override func didReceiveMemoryWarning() {
    super.didReceiveMemoryWarning()
    // Dispose of any resources that can be recreated.
}

```

```
}
}
```

This is all we will do in our application, try to run the application, it should run fine.

Storing Data on Local Storage

Storing data on local storage means to use the local device's storage to store data related to application on the device. We have two ways to store the data on a local storage namely **NSUserDefaults** and **CoreData**.

Let us understand them in detail.

NSUserDefaults

NSUserDefaults are meant to store small pieces of data such as preferences, settings or individual values. To use UserDefaults in our application, we just need to create a reference to the nsuserDefaults through our code as shown below.

```
let defaultValues = UserDefaults.standardUserDefaults()
```

To set values to data in UserDefaults we can use the following code:

```
defaultValues.setObject("Simplified iOS", forKey: "nameKey")

func setDouble(value: Double, forKey defaultName: String)
func setBool(value: Bool, forKey defaultName: String)
func setObject(value: AnyObject?, forKey defaultName: String)
func setURL(url: NSURL?, forKey defaultName: String)
func setInteger(value: Int, forKey defaultName: String)
func setFloat(value: Float, forKey defaultName: String)
```

To get values from UserDefaults, we can use the following code.

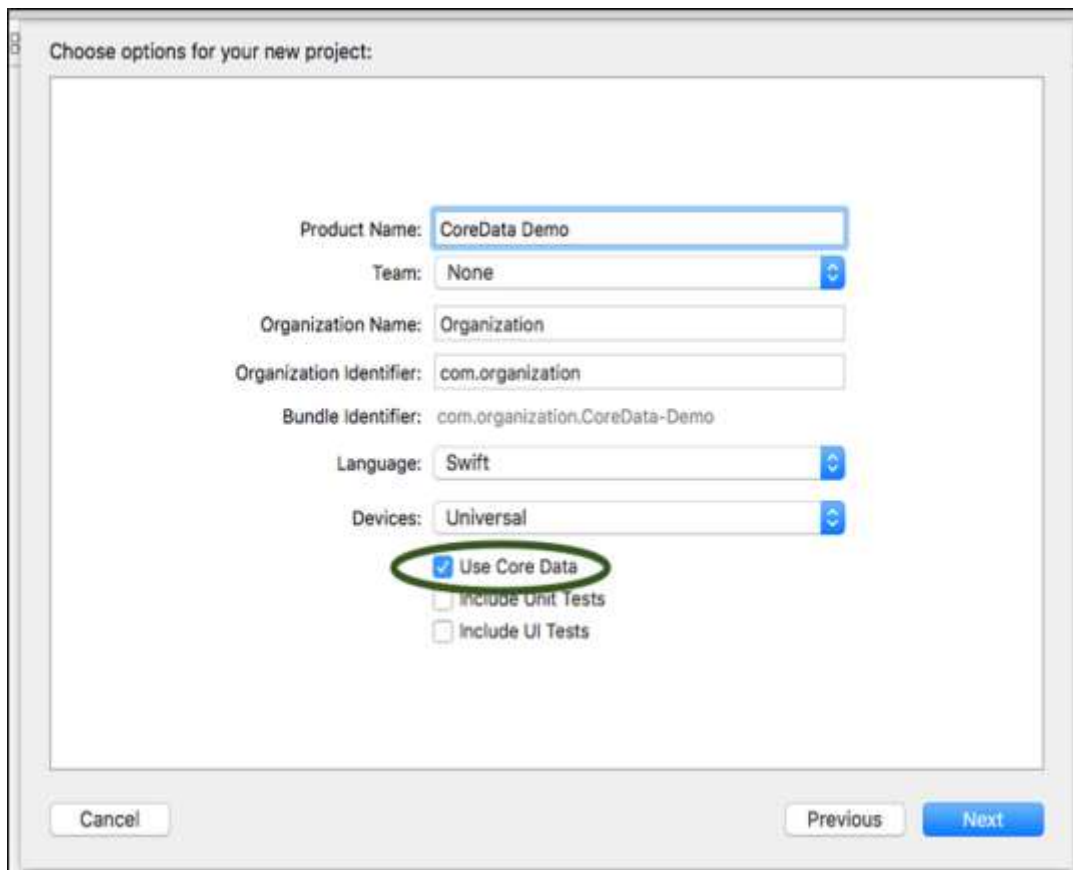
```
func boolForKey(defaultName: String) -> Bool
func integerForKey(defaultName: String) -> Int
func floatForKey(defaultName: String) -> Float
func doubleForKey(defaultName: String) -> Double
func objectForKey(defaultName: String) -> AnyObject?
func URLForKey(defaultName: String) -> NSURL?
```

CoreData

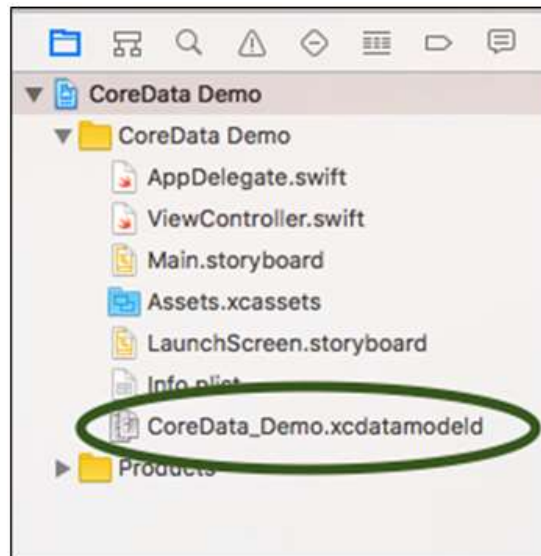
CoreData is a persistent framework, which supports large data transactions. CoreData allows you to build relational entity-attribute model for storing user data. CoreData is a framework and can use SQLite, binary formats to store data.

To use CoreData in our application, we will start with a new project and make sure you check "Use Core Data", while creating the project.

Login Using core Data: Create a new project, select use CoreData as shown in the following screenshot.



Continue until the project is open, now we see that the project has more files than our previous projects.

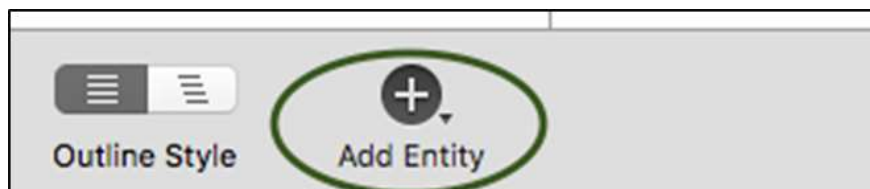


This file **CoreData_demo.xcdatamodeld** is our database in which we will be making our user table and storing data.

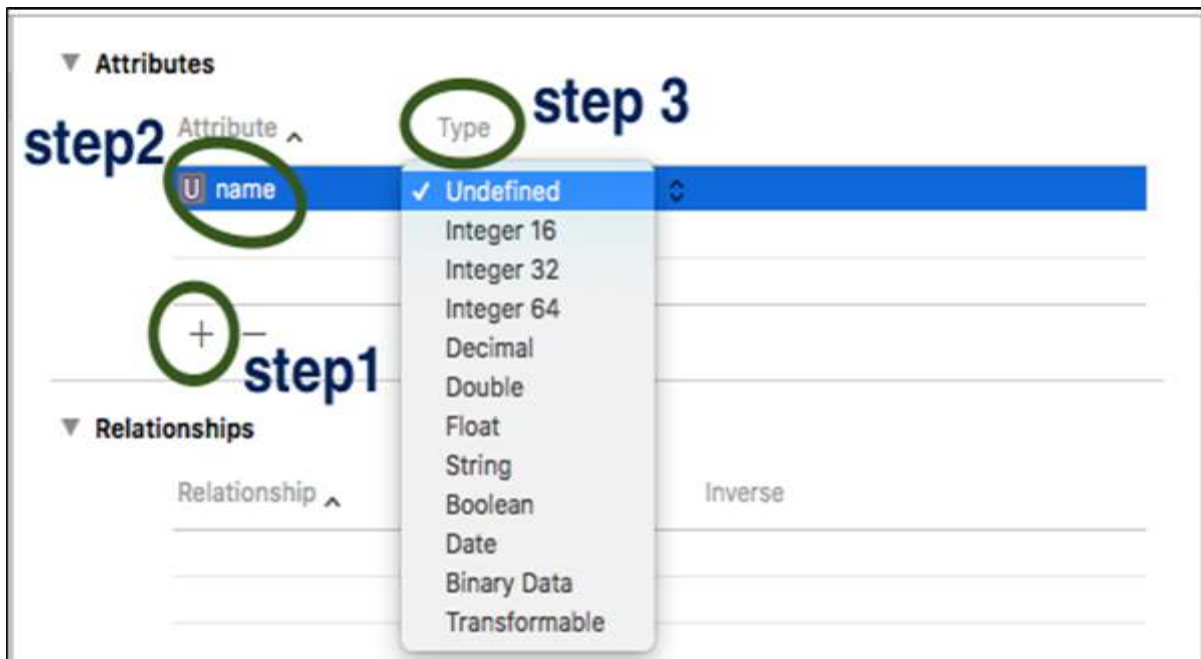
Concept: The thing about CoreData is, even if we close the app, and open it after months, it will still have the data we stored, which we will see in the next application we make.

Now we will see how to add core data and retrieve core data.

Adding Core Data: To add CoreData, click on the file CoreData_demo.xcdatamodeld and then we will see that the entities are empty. Click on add Entity button, it will add an entity, now double click on the entity name and rename it anything you like.



Now click on the entity and we can see that the attributes field is empty. Click on the plus symbol and rename the entity. Select the type of the entity from the next field.



We have added an Entity and one Attribute in it. Now, if we go to the **AppDelegate.swift**, we can see that two new functions have been added because we selected CoreData. The two functions added are:

```
// MARK: - Core Data stack

lazy var persistentContainer: NSPersistentContainer = {
    /*
     The persistent container for the application. This implementation
     creates and returns a container, having loaded the store for the
     application to it. This property is optional since there are legitimate
     error conditions that could cause the creation of the store to fail.
     */
    let container = NSPersistentContainer(name: "CoreData_Demo")
    container.loadPersistentStores(completionHandler: { (storeDescription, error) in
        if let error = error as NSError? {
            // Replace this implementation with code to handle the error appropriately.
            // fatalError() causes the application to generate a crash log and terminate. You should not use this function in a shipping
            // application, although it may be useful during development.

            /*
             Typical reasons for an error here include:
             * The parent directory does not exist, cannot be created, or disallows writing.
             * The persistent store is not accessible, due to permissions or data protection when the device is locked.
             * The device is out of space.
             * The store could not be migrated to the current model version.
             Check the error message to determine what the actual problem was.
             */
            fatalError("Unresolved error \(error), \(error.userInfo)")
        }
    })
    return container
}()

// MARK: - Core Data Saving support

func saveContext() {
    let context = persistentContainer.viewContext
    if context.hasChanges {
        do {
            try context.save()
        } catch {
            // Replace this implementation with code to handle the error appropriately.
            // fatalError() causes the application to generate a crash log and terminate. You should not use this function in a shipping
            // application, although it may be useful during development.
            let nserror = error as NSError
            fatalError("Unresolved error \(nserror), \(nserror.userInfo)")
        }
    }
}
```

Note: Import CoreData in your file before proceeding.

Saving data to Core Data: To save some data in CoreData, we need to make an object of AppDelegate Class.

```
let appDelegate = UIApplication.shared.delegate as! AppDelegate
```

And, a context object

```
let context = appDelegate.persistentContainer.viewContext
```

Then, we need to create an entity object, which will call our entity:

```
let newValue = NSEntityDescription.insertNewObject(forEntityName: "Users",
into: context)
```

We will now set the value of that attribute we created.

```
newValue.setValue(textField.text, forKey: "name")
```

We will save the data using

```
context.save();
```

Fetching from core data: While fetching, the above two steps (creating appDelegate and context) will be the same. Then, we will create a fetch request.

```
let request = NSFetchRequest<NSFetchRequestResult>(entityName: "Users")
```

We will create an object to store the result.

```
let results = try context.fetch(request)
```

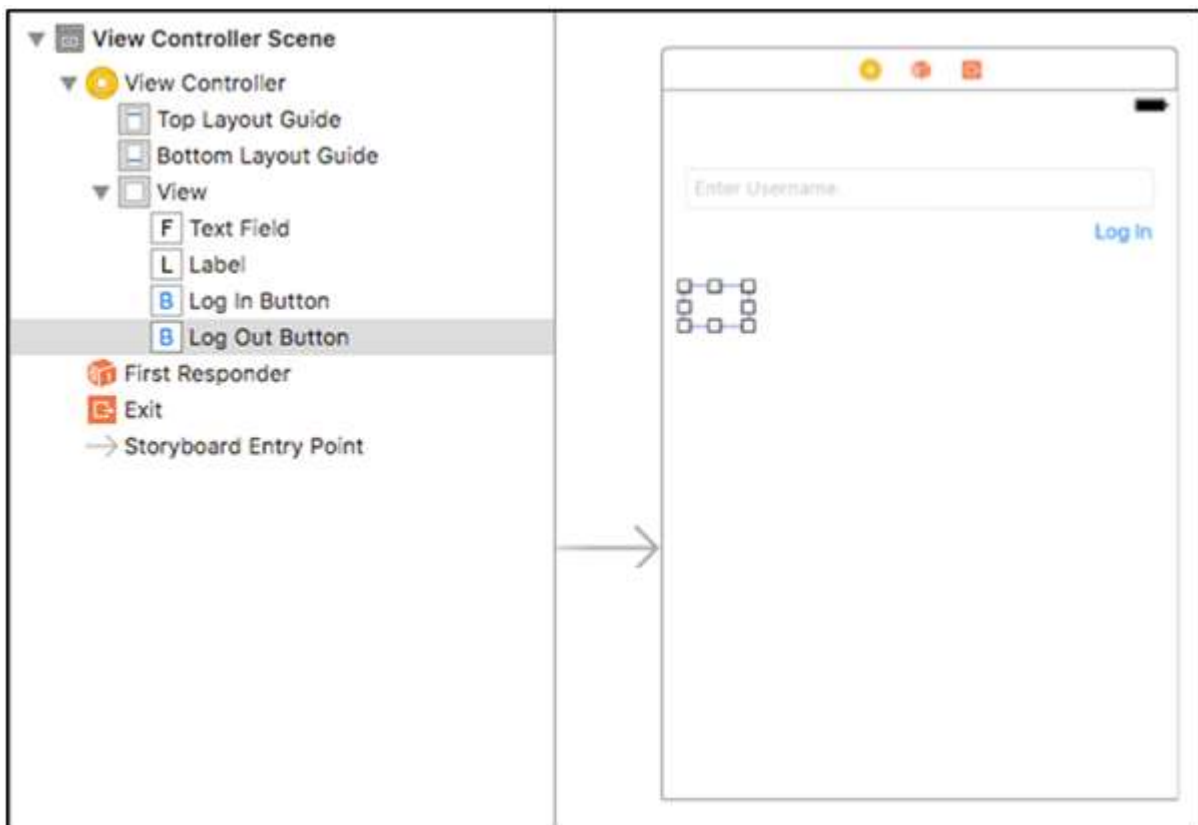
Then we will go through the results as per our requirement. We will see more of CoreData with the next application we create.

Challenge: Try to create an application, where the user enters the name, then clicks on login and closes the application. When the next time the user opens the application, he should be still logged in. Then add a button – logout, and if he clicks on that, the application will ask for the username again.

Login/Logout using CoreData

Create a single view project called 'Login', select use of CoreData. Click on CoreData_demo.xcdatamodeld and add an entity called 'Users'. Inside that, add an attribute called 'name'.

Go to the main.storyboard, Add a text field and a login button. Below that, add a label, double click on it and remove its content. Then, add a logout button, go to its attribute inspector and make 'alpha' equal to 0. Now, our view should look as follows:



Now, go to your view controller file, open assistant editor and create connections between the UI Elements and your controller file.

Note: We will also create outlets for both the buttons, because we need to modify the look of those buttons. For example – When a user is logged in, we will hide the login button, if the user is not logged in we will show login and hide the logout button.

As we have already discussed about adding and fetching data from CoreData, we will put the code here.

Try-Catch: You will notice that we have used try-catch block many times in the code. It is because if we do not use the try-catch blocks and there is some exception or error in our program, the execution will stop. Whereas, if we are using the try catch blocks and if some error occurs, then the catch block handles the error. Read more about it in our [Swift Tutorial](#).

Code for Login/Logout Application

Let us understand the different components and the code that is used for a login/logout application.

Login Button Action: The following code explains how to add a login button action.

```
var isLoggedIn = false

@IBAction func logIn(_ sender: AnyObject) {
    let appDelegate = UIApplication.shared.delegate as! AppDelegate
```

```

        let context = appDelegate.persistentContainer.viewContext
        if isLoggedIn {
            let request = NSFetchRequest<NSFetchRequestResult>(entityName:
"Users")
            do {
                let results = try context.fetch(request)
                if results.count > 0 {
                    for result in results as! [NSManagedObject] {
                        result.setValue(textField.text, forKey: "name")
                        do {
                            try context.save()
                        }
                        catch {
                            print("Update username failed")
                        }
                    }
                    label.text = "Hi " + textField.text! + "!"
                }
            }
            catch {
                print("Update failed")
            }
        } else {
            let newValue = NSEntityDescription.insertNewObject(forEntityName:
"Users", into: context)
            newValue.setValue(textField.text, forKey: "name")
            do {
                try context.save()
                loginButton.setTitle("Update username", for: [])
                label.alpha = 1
                label.text = "Hi " + textField.text! + "!"
                isLoggedIn = true
                logoutButton.alpha = 1
            }
            catch {
                print("Failed to save")
            }
        }
    }
}

```

```

    }
}

```

Logout Button Action: The following code explains how to add a logout button action.

```

@IBAction func logOut(_ sender: AnyObject) {
    let appDelegate = UIApplication.shared.delegate as! AppDelegate
    let context = appDelegate.persistentContainer.viewContext
    let request = NSFetchRequest<NSFetchRequestResult>(entityName:
"Users")
    do {
        let results = try context.fetch(request)
        if results.count > 0 {
            for result in results as! [NSManagedObject] {
                context.delete(result)
                do {
                    try context.save()
                } catch {
                    print("Individual delete failed")
                }
            }
            label.alpha = 0
            logOutButton.alpha = 0
            loginButton.setTitle("Login", for: [])
            isLoggedIn = false
            textField.alpha = 1
        }
    } catch {
        print("Delete failed")
    }
}

```

ViewDidLoad(): The following code explains how to use the ViewDidLoad() function.

```

override func viewDidLoad() {
    super.viewDidLoad()
    // Do any additional setup after loading the view, typically from a
nib.

```

```

        let appDelegate = UIApplication.shared.delegate as! AppDelegate
        let context = appDelegate.persistentContainer.viewContext
        let request = NSFetchRequest<NSFetchRequestResult>(entityName:
"Users")
        request.returnsObjectsAsFaults = false
        do {
            let results = try context.fetch(request)

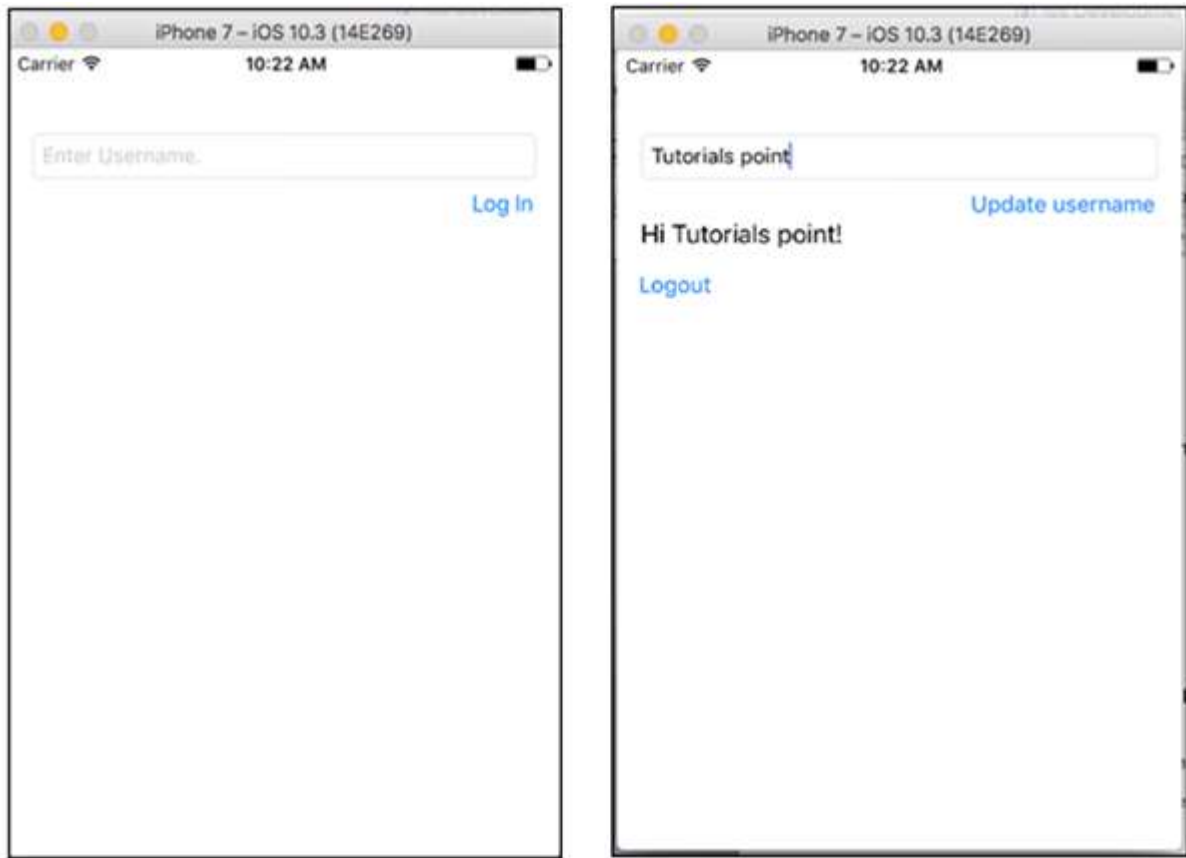
            for result in results as! [NSManagedObject] {
                if let username = result.value(forKey: "name") as? String {
                    loginButton.setTitle("Update username", for: [])
                    loginButton.alpha = 1
                    label.alpha = 1
                    label.text = "Hi there " + username + "!"
                }
            }

        } catch {
            print("Request failed")
        }
    }
}

```

Remember you had to create an outlet and an action, for both the buttons.

Now, save and run the application. Login, close the application and run it again. It should look as follows.



That is all we will do with CoreData. Using the same concepts, we can build many CoreData applications.

Controlling the Keyboard

In this section, we will learn to control the keyboard behavior. For example – When we click outside a text field after entering some text, the keyboard does not close. Here, we will understand how to control the keyboard.

Keyboard should disappear on clicking outside the input field

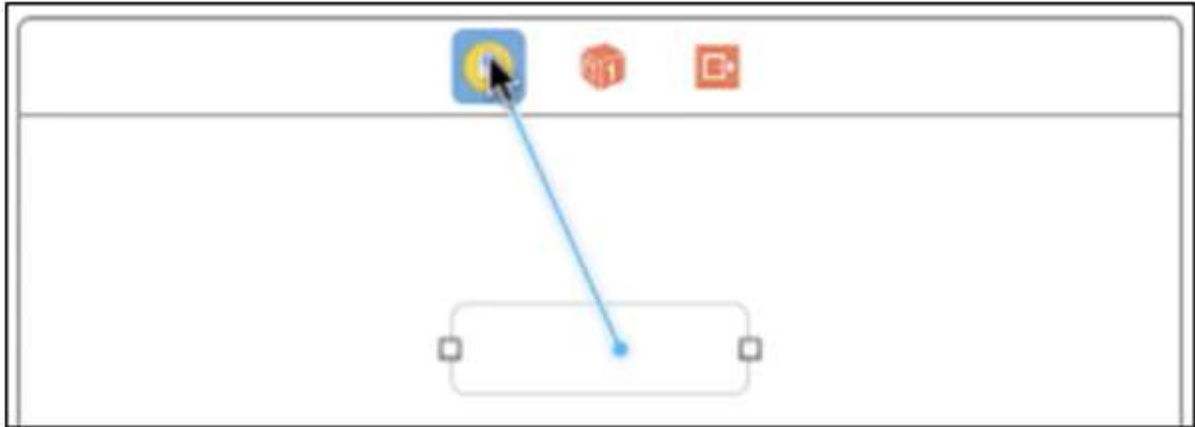
This is a simple task, to do this just paste the following code into your viewController file, before the closing the curly braces.

```
override func touchesBegan(_ touches: Set<UITouch>, with event: UIEvent?) {
    self.view.endEditing(true)
}
```

By doing this, it will make the keyboard disappear on clicking outside the input field.

Keyboard should disappear on return key tap

To make the keyboard disappear, we should add a new Type for our view Controller. We will also add a text field and create its outlet called `textField`. Lastly, we will add the **UITextFieldDelegate**.



We will also **control + drag** from our input field to the view controller and select delegate from the options that appear.

Then, we will add the following function.

```
func textFieldShouldReturn(_ textField: UITextField) -> Bool {
    textField.resignFirstResponder()
    return true
}
```

The final View Controller file should look as follows:

```
import UIKit

class ViewController: UIViewController, UITextFieldDelegate {
    override func viewDidLoad() {
        super.viewDidLoad()
        // Do any additional setup after loading the view, typically from a
nib.
    }

    override func didReceiveMemoryWarning() {
        super.didReceiveMemoryWarning()
        // Dispose of any resources that can be recreated.
    }
    override func touchesBegan(_ touches: Set<UITouch>, with event: UIEvent?)
{
        self.view.endEditing(true)
    }
}
```

```
func textFieldShouldReturn(_ textField: UITextField) -> Bool {
    textField.resignFirstResponder()
    return true
}
}
```

Downloading Web Content – Opening Facebook/Google

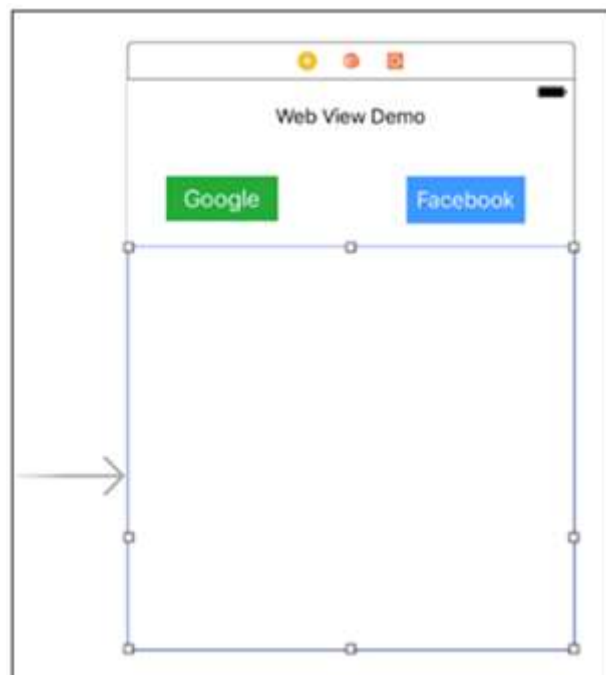
In this section, we will learn about making an application, which will open Facebook and Google, when each button is pressed respectively. We will also learn the concept of Web Views and App transport layer Security. After this, you will be able to make a browser of your own.

Note: We need an Internet Connection in this application.

Making a Web Application.

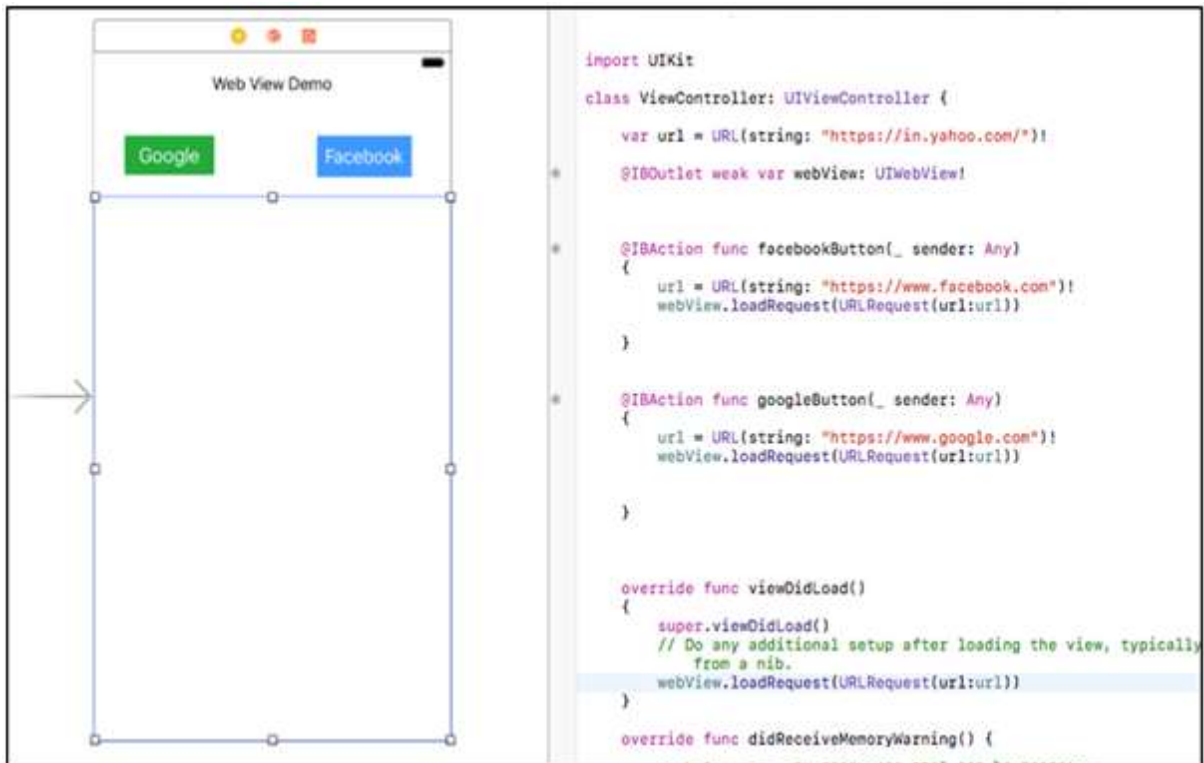
We will make a new single view application, iOS project. In the Search bar of the object library, we will search for web view, drag it and add it to our View controller in the main.Storyboard.

After adding the web view, we will stretch it to all the corners. The Application UI should look like as follows:

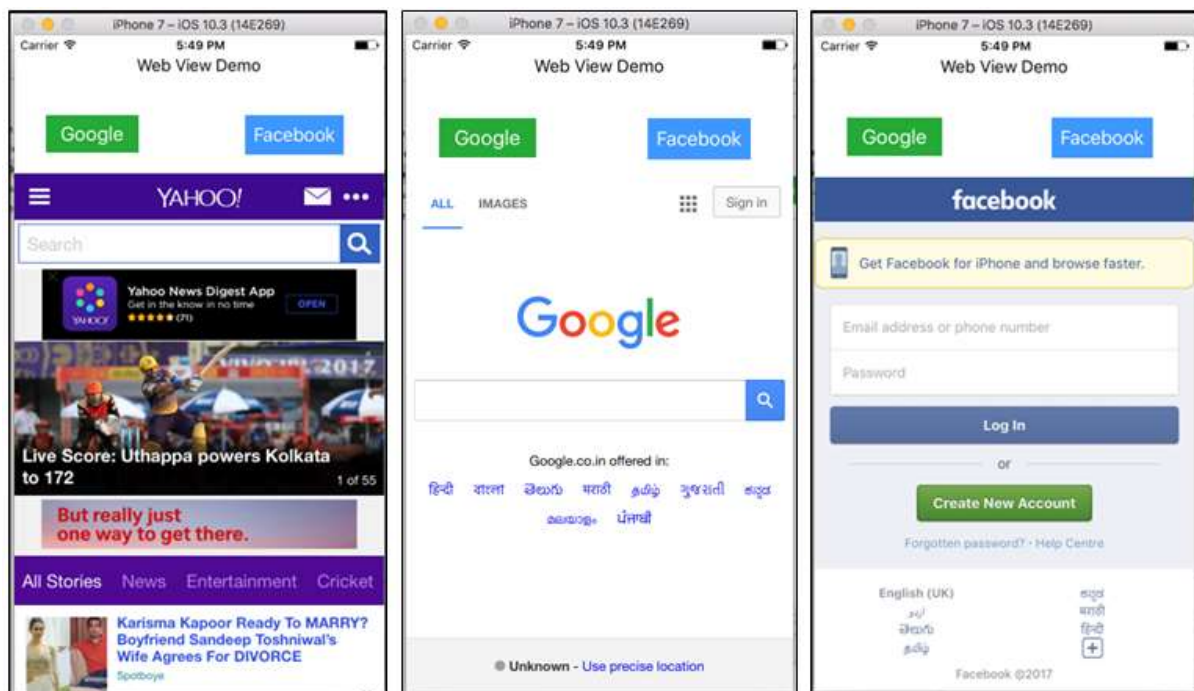


We will open our main.storyboard and view controller by clicking on the assistant editor. We will create an outlet for our webView and action for both the buttons. On load, the application will load yahoo in webView. On clicking google, it should load Google, and on clicking the Facebook button, it should load the Facebook page.

The final view should look as follows:



The following screenshots show how the different screens of our application should look like. If you try to open a web service that is not https, it will show an error and we will have to add an App Transport Layer Security exception in your **info.plist** file.



7. iOS Development – Integrating Maps

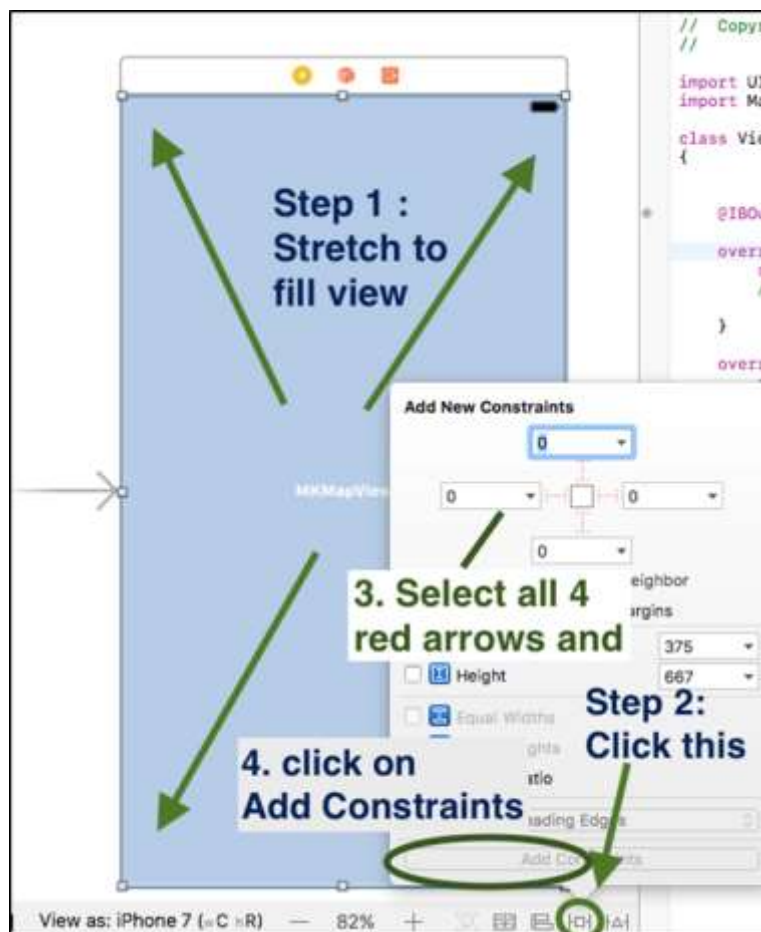
Maps have become a part of everyone's daily life. They have become so useful when we travel to places or search for some place.

Integrating Maps and Locating India Gate

We will make maps in our application, which will be showing us the India Gate in the center. We will learn maps by implementing in a project. So, create a single view iOS application and name it whatever you want.

Adding Map Kit View

Go to the object library and search for map kit view, click drag and bring it to your view, stretch it so that it fills the complete view.



Adding Constraints

Create an outlet for mapViewKit by control + drag to view the controller.swift file. It might show an error right now, but we will handle it. On top of the file, below the import UIKit, add import MapKit, this will remove the error.

After that, add MKMapViewDelegate after class ViewController: UIViewController. Now, the file should look like as follows:

```
import UIKit
import MapKit

class ViewController: UIViewController, MKMapViewDelegate
{

    @IBOutlet var mapView: MKMapView!

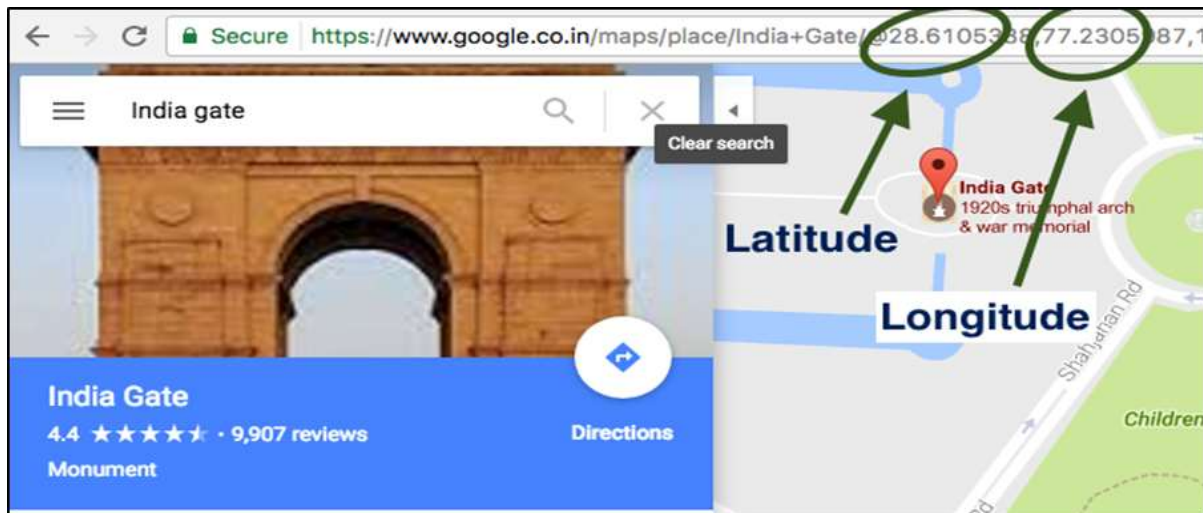
    override func viewDidLoad() {
        super.viewDidLoad()
        // Do any additional setup after loading the view,
        nib.
    }

    override func didReceiveMemoryWarning() {
        super.didReceiveMemoryWarning()
        // Dispose of any resources that can be recreated.
    }

}
```

Now, we will create Latitude and Longitude, Delta, Span, Location and Region for our Map. Before that, we will tell you how to get latitude and longitude of a place.

Go to maps.google.com and search for some location. On the top, we will see its latitude and longitude in the URL. For example: Let us search for India Gate.



Setting Latitude and Longitude

After getting the latitude and longitude, we will make variables for them.

```
let latitude: CLLocationDegrees = 28.610
let longitude: CLLocationDegrees = 77.230
```

Setting Delta for Latitude and Longitude

After adding latitude and longitude, we will add delta for them, which is the value that can verify our latitude and longitude. They should be kept minimum for more locations that are exact.

```
let latDelta: CLLocationDegrees = 0.04
let lonDelta: CLLocationDegrees = 0.04
```

Setting Span, Location and Region for Map

Then we will create a Span, Location and Region for our map.

```
let span: MKCoordinateSpan = MKCoordinateSpan(latitudeDelta: latDelta,
longitudeDelta: lonDelta)

let location: CLLocationCoordinate2D = CLLocationCoordinate2D(latitude:
latitude, longitude: longitude)

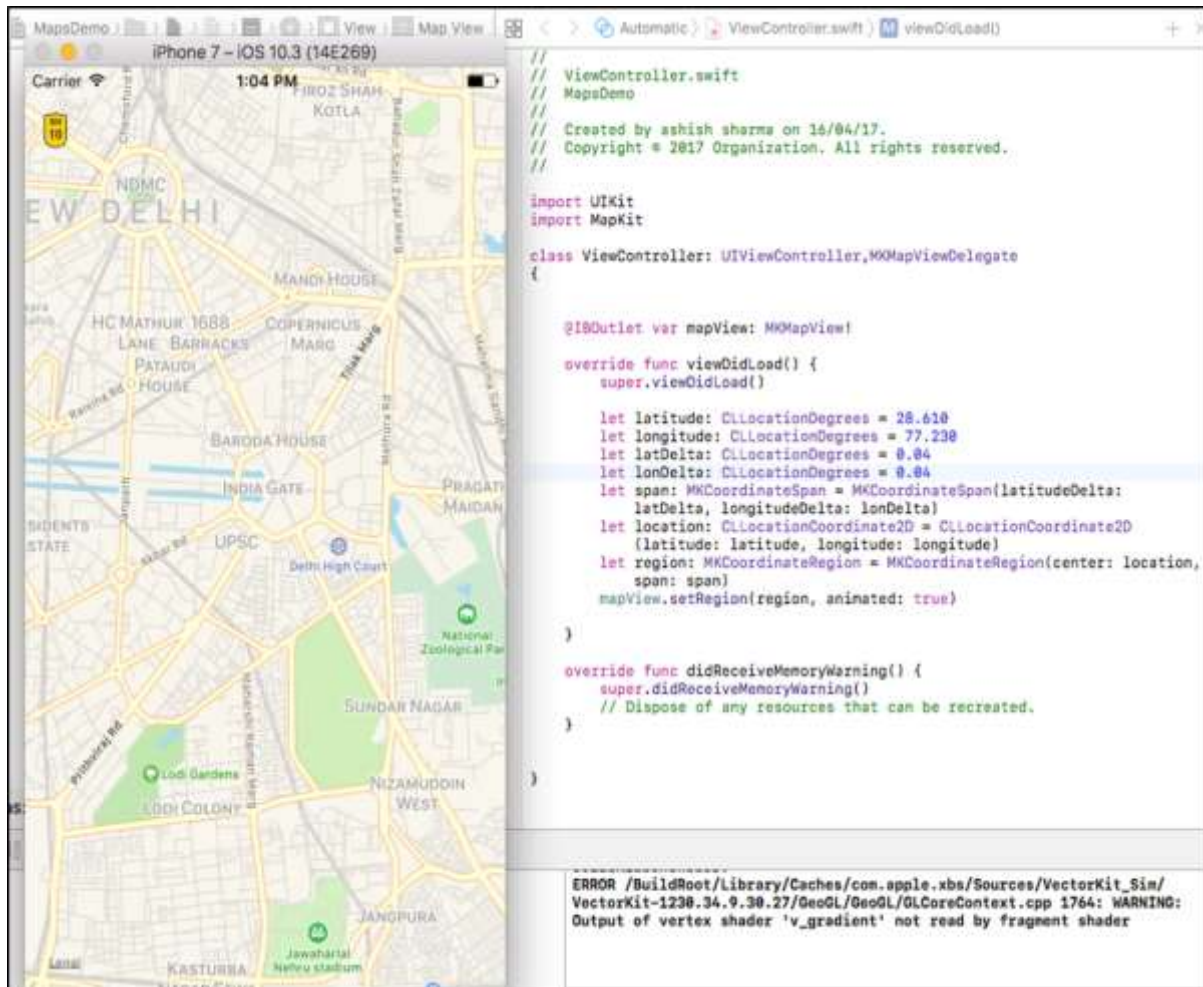
let region: MKCoordinateRegion = MKCoordinateRegion(center: location, span:
span)
```

Setting the Map

We will set the map with the following command.

```
mapView.setRegion(region, animated: true)
```

Our final Application should look like the screenshot shown below.



We should take care that our location set is exactly in the center of our application. This is all we will do with maps right now.

8. iOS Development – Auto Layouts

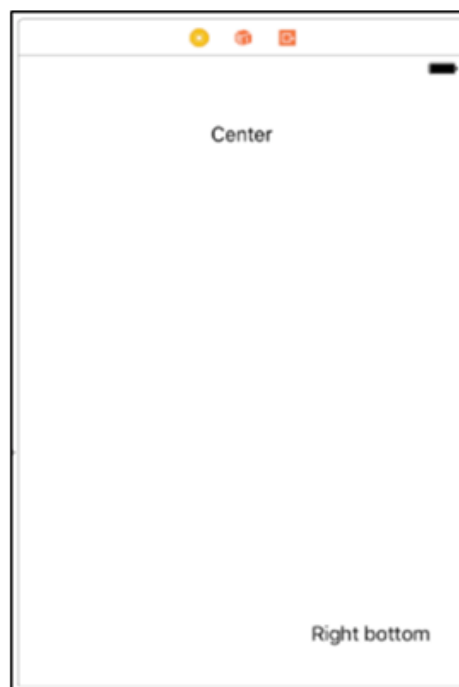
When we make iOS applications and we add UI Elements in that application, they might seem perfect on one device. Nevertheless, now we should try the same application on some other device. We will certainly see drastic changes in the UI and some elements might not appear as well.

Auto layout is the technique that we will use to resolve this issue. In this chapter, we will understand how to make Auto Layout, Apply Constraints and Stack View to make your application look perfect and best on every Device.

We will start by making a new single view application.

Adding Elements

Add a label in the top center of the view and one in the bottom right of the view as shown below:



Now, try to change the orientation and we will see that the right bottom does not appear, while the Center is not in the center.

(**Tip:** You do not need to run the simulator to see layouts, just click on View as – iPhone x, in the bottom of the screen as shown in the following screenshot.)



Select the iPhone version and the orientation. We will see that the UI elements are not arranged properly. Therefore, when we change our orientation, device, or both, the right bottom label will disappear and the center will not be in the center.



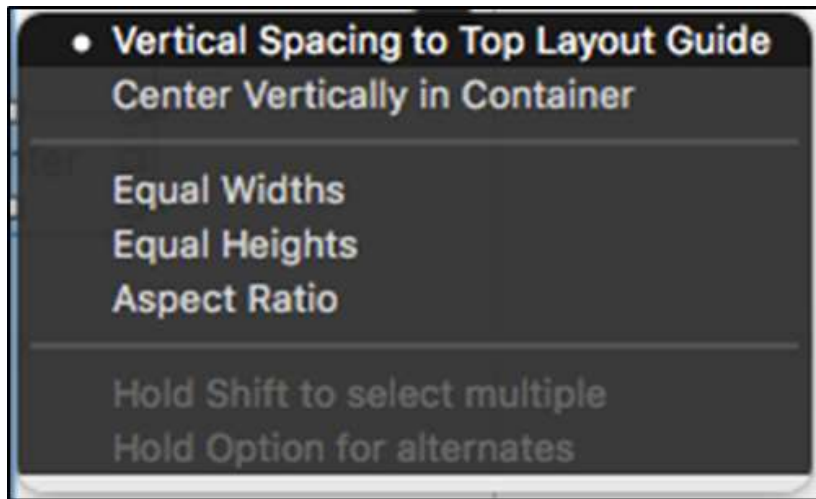
This happens because we have not specified the fixed position for elements. To solve this, we will use Constraints.

Applying Constraints to UI Elements.

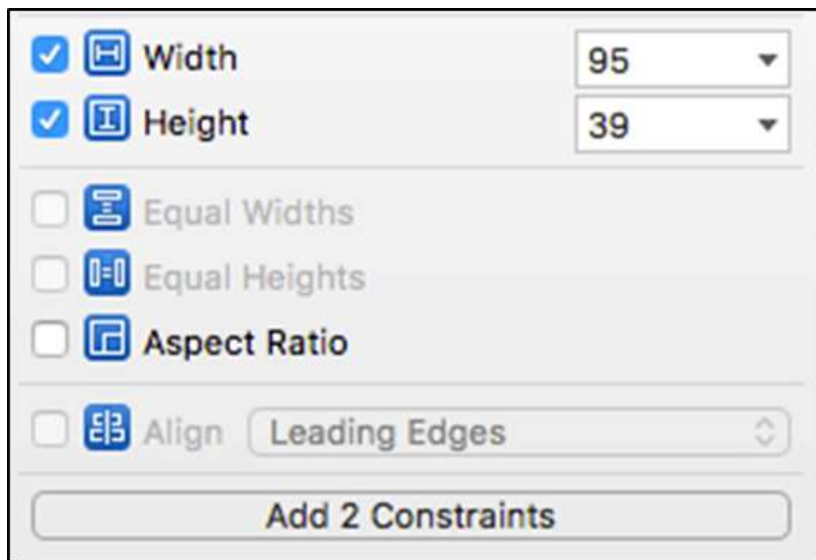
Click on the Center Label, press control and drag anywhere inside the view, release. Now you must be seeing –



Select **Center Horizontally in Container**. Again, repeat the above step and choose, Vertical Spacing to Top Layout Guide.



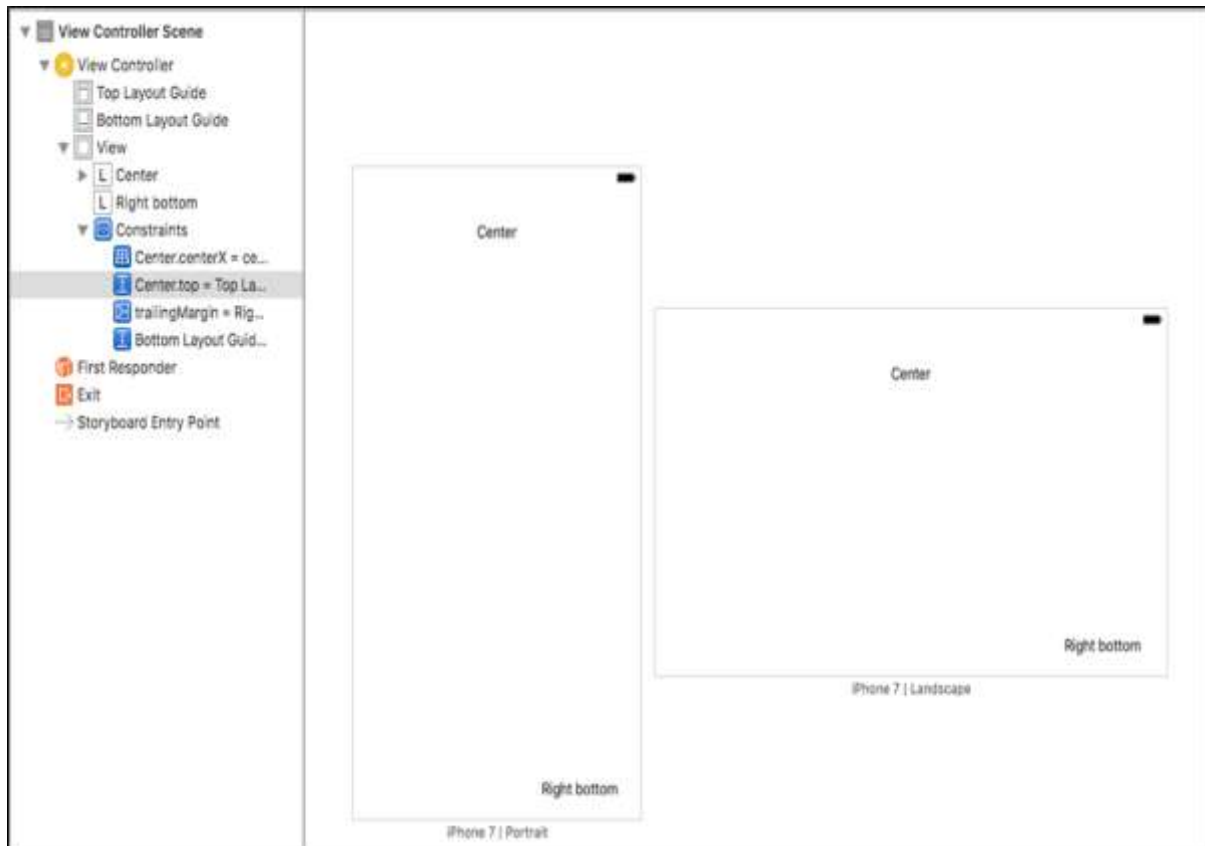
Now, click on Add new constraint button and select height and width, and click Add 2 Constraints.



Click on the Right bottom label, control drag from label to anywhere inside the view, and choose "Trailing space to container Margin". Similarly choose, Vertical spacing to Bottom layout Guide.

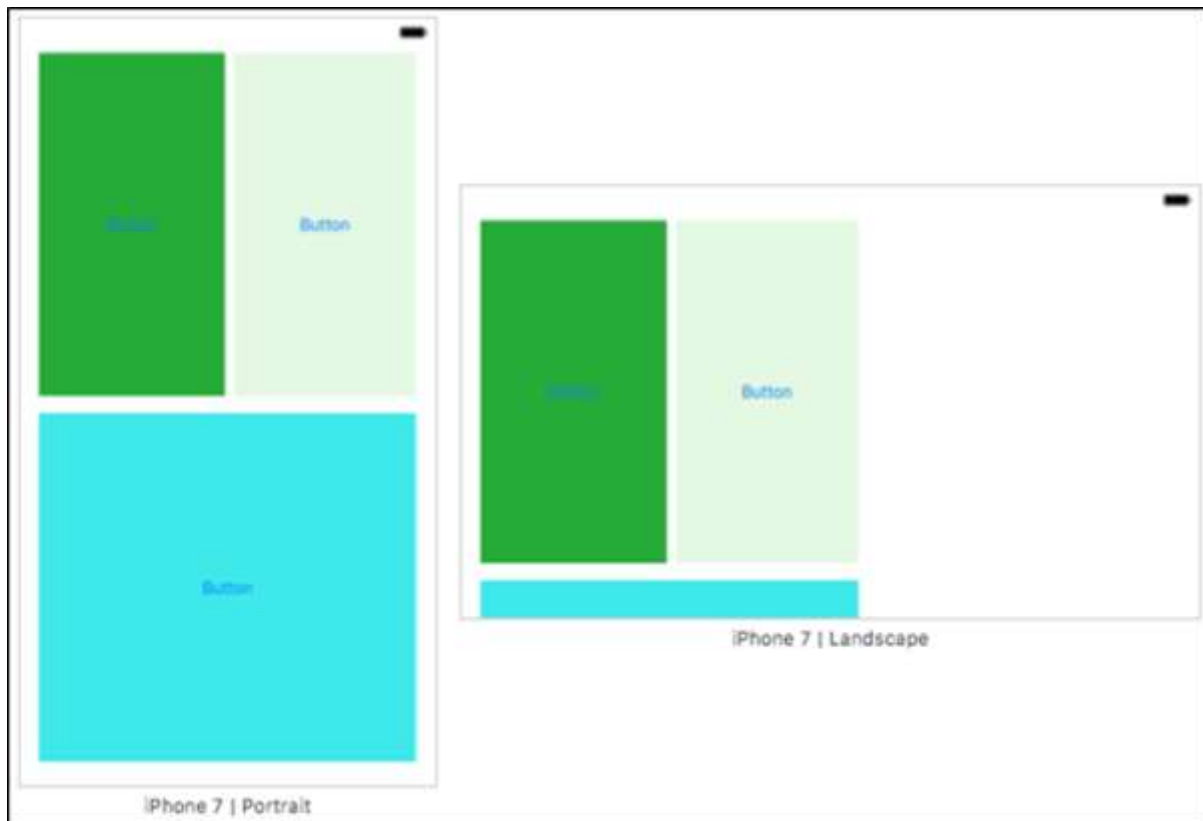
(**Tip:** To select multiple options at once, press shift and choose the options. Ensure that you do not release shift until you have selected everything.)

After applying all the constraints, the view should look as follows:



Stack View

Stack view works by arranging elements in stacks. After arranging, we define the constraints only once, and all the elements are arranged accordingly. To start with stack view, create the following view, which will not look better in other devices. However, we will make it suitable for other devices in this section.



Now, select the top two buttons – select one button, press command and then select the second one. To embed them in a stack view, go to editor → embed In → stack view.

OR



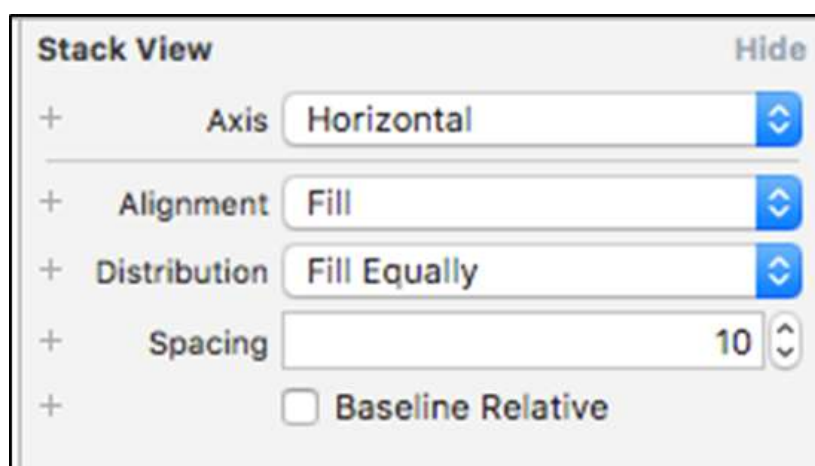
At the bottom right-hand corner, there is an option – . Select this option and this will embed the views into the stack view.

Horizontal Stack View

The Horizontal Stack View would look as shown in the following screenshot.



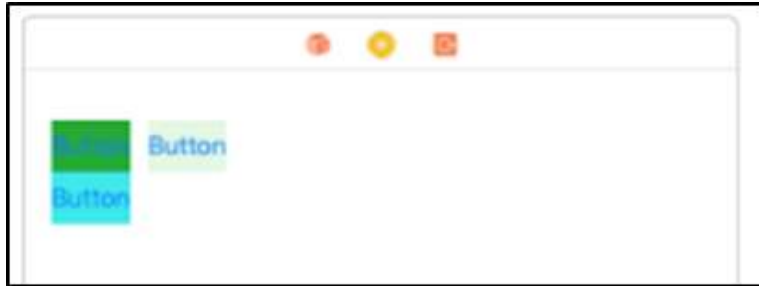
While this stack view is selected, go to attribute inspector. Change Distribution to Fill Equally and Spacing to 10.



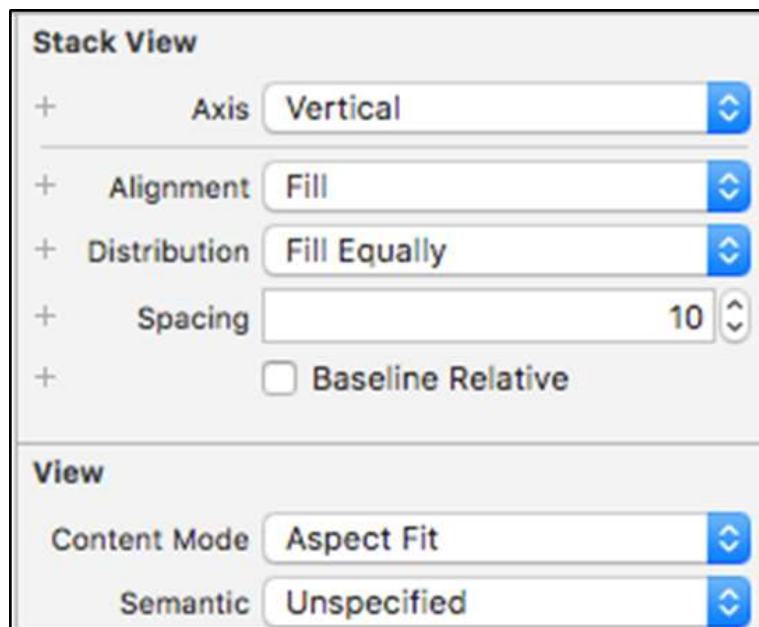
Now, select this stack view and the bottom button and again embed into the stack view. This time the stack view axis will be vertical, while in the previous stack view, it was horizontal.

Vertical Stack Views

Now your view will look like:



While this stack view is selected, go to its attribute inspector and make sure it matches the screenshot below.



Now, your view should look as follows:



The last step is to make constraints for this stack view.

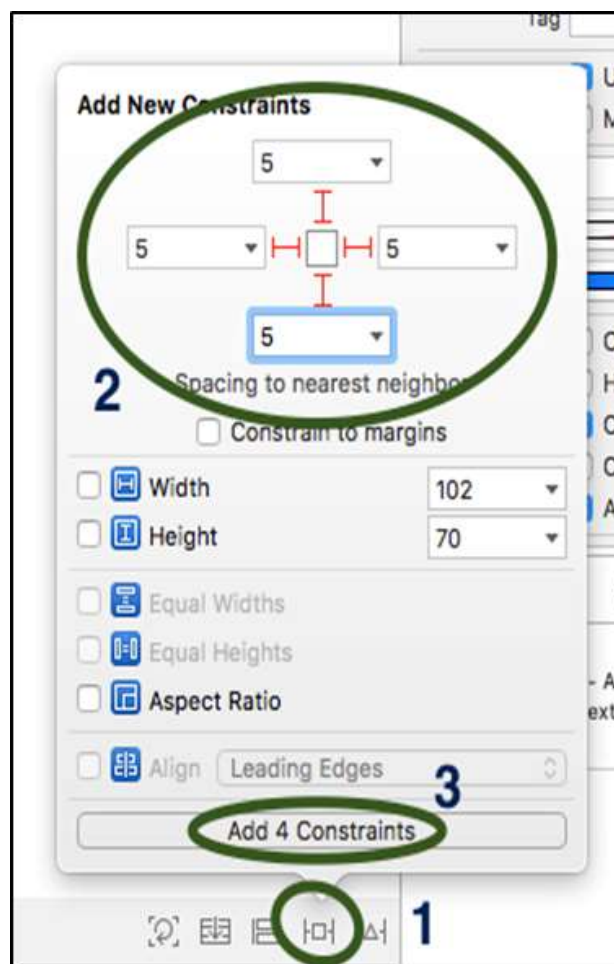
Select the stack view → Click on add new constraint button.



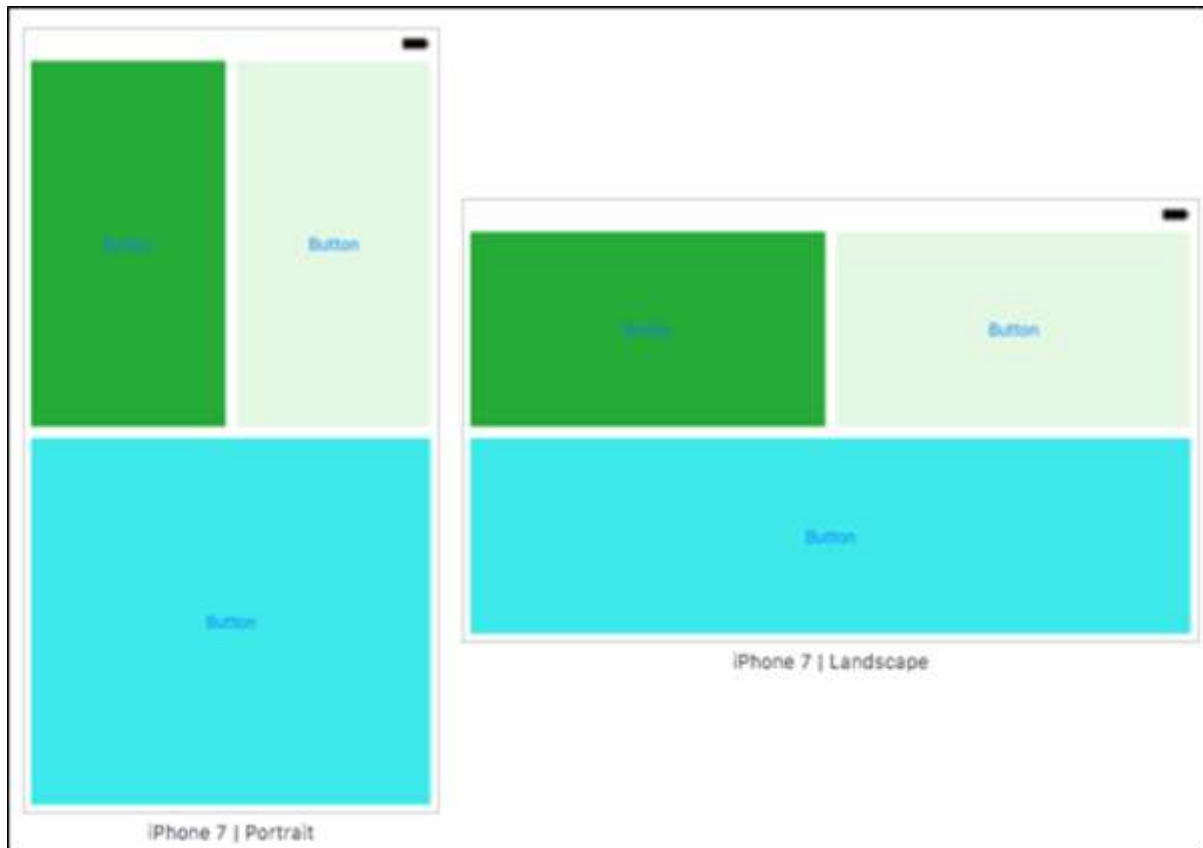
This will open a new window in which we have to follow the steps shown in the next screenshot.

Adding Constraints to Stack View

The following screenshot will describe how to add constraints to a stack view.



This will make it an auto layout view and it should look as follows:



That is all we will do with auto layouts. In the next chapter, we will discuss about Animations.

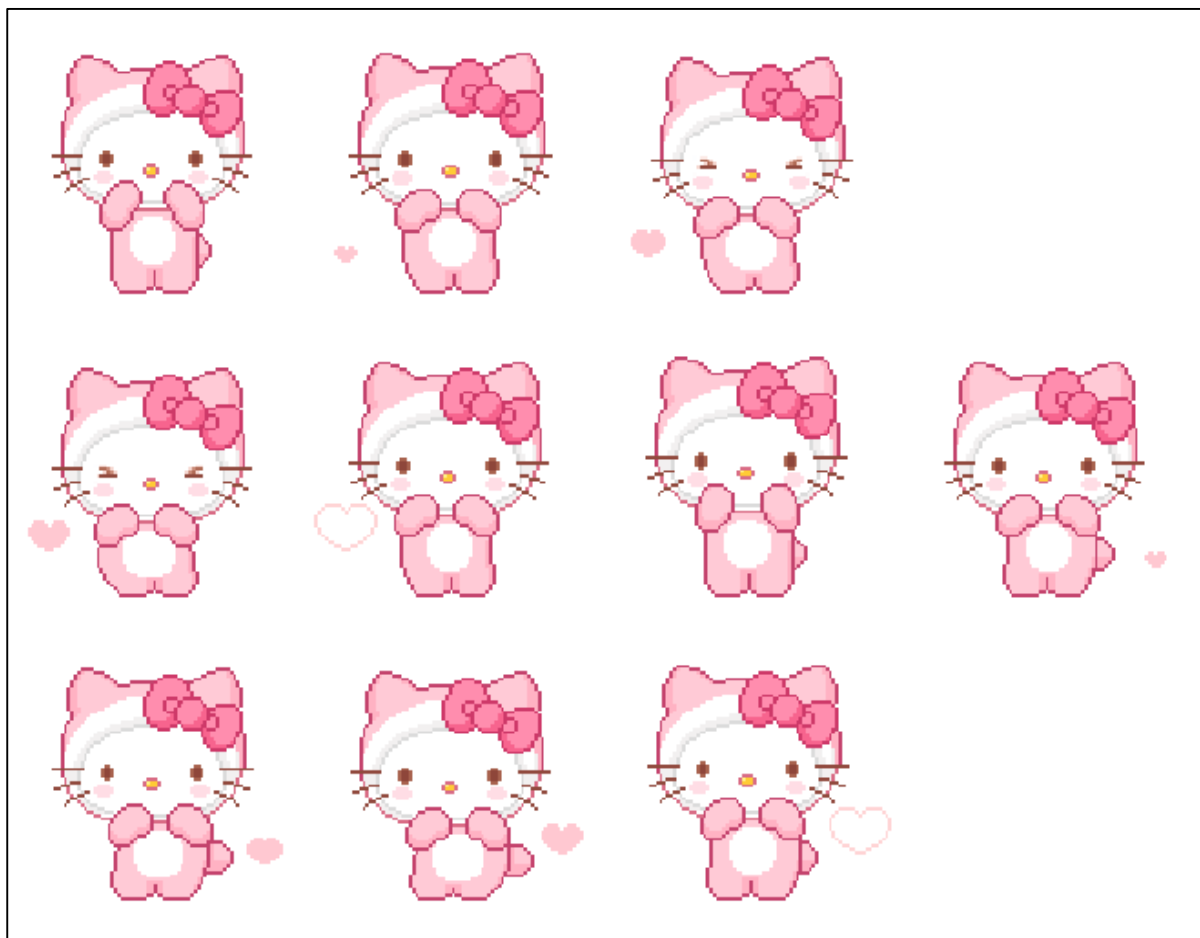
9. iOS Development – Animations

Animation is an important part of any Application as it draws user attention to the application. Animation is just a collection of images that repeat at a fast rate. It also makes your application stand different from others.

Making an Animation Project – Kitty Animation

This will be a simple project, wherein we will run an animation when a button is clicked. We will use multiple images to create a GIF, so download any GIF and convert it to images, which will give you multiple frames of that GIF.

In this section, we will use the following images.



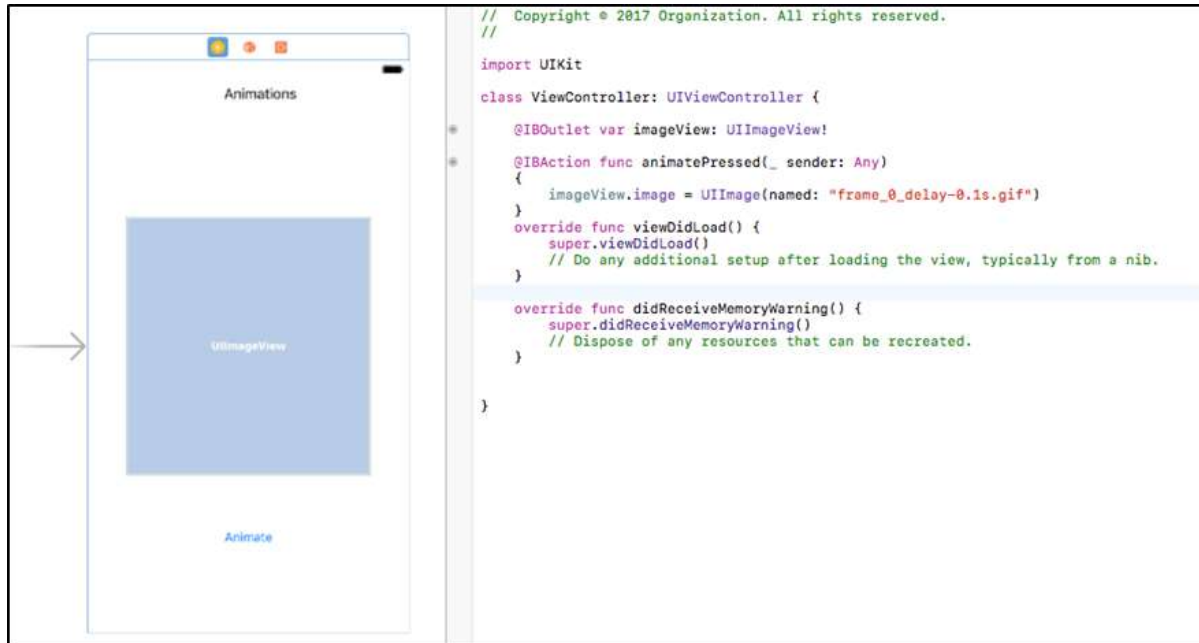
These images, when played together, create an animation. Therefore, we will make a single view application. We will then drag an image view option, a label and a button inside the main view controller. Once this is done, we will connect the image view and the button to our swift file.

(If you do not want to use these images, search for any gif and convert it to image online by using some gif to image converter.)

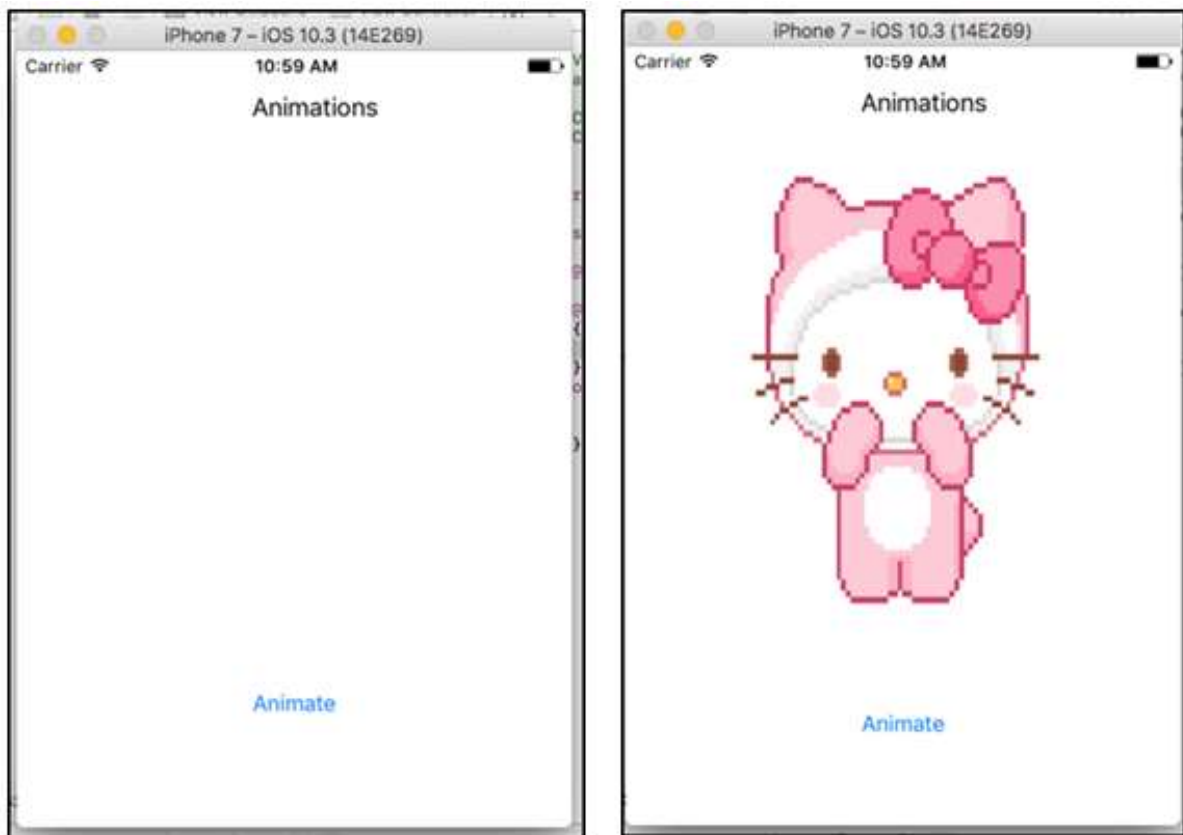
Inside the button action, we will insert the following command to show the image when a button is pressed.

```
imageView.image = UIImage(named: "frame_0_delay-0.1s.gif")  
// frame_0_delay-0.1s.gif, is the name of image.
```

This is how we programmatically assign image to an Image View. The view should now look as follows:



The first view will appear when we run the application. When we click on the Animate Button, the image will appear.



This is not an animation, but just an image. We will create the animation now:

Add a variable below the image outlet: **var counter = 1.**

See that our images have a common name and only one character is different. Change your animate button's code as shown below:

```
@IBAction func animatePressed(_ sender: Any)
{
    imageView.image = UIImage(named: "frame_\(counter)_delay-0.1s.gif")
    counter += 1
    if counter == 9 {
        counter = 0
    }
}
```

Now, when you press the **animate** button, the image changes every time. The next step is to create the following:

- Create a variable – **isAnimating** and assign False to it.
- Create a timer variable and assign a **Timer()** function to it.

Once the above two steps are done, then create a function animate and paste the following code.

```
func animate() {  
    imageView.image = UIImage(named: "frame_\(counter)_delay-s.gif")  
    counter += 1  
    if counter == 9  
    {  
        counter = 0  
    }  
}
```

Where, counter is our counter variable we made in the previous file. Now, inside the animate button function, add the following code:

```
if isAnimating {  
    timer.invalidate()  
    isAnimating = false  
}  
else {  
    timer = Timer.scheduledTimer(timeInterval: 0.1, target: self, selector:  
#selector(ViewController.animate), userInfo: nil, repeats: true)  
    isAnimating = true  
}
```

Try to run the application and we will see that an animation is being run on your device.

Challenge: Add a stop button that will stop the animation.

10. iOS Development – Accessing Web Services

In our application, we might need to connect to API and retrieve data from that API and use in our application.

Firstly, we need the URL, which will provide us the data.

```
api.openweathermap.org/data/2.5/forecast?id=524901&APPID=1111111111
```

After that, we need to add transport layer security exception to allow our application to communicate to the web service, if the service is not https. We will make these changes in the **info.plist** file.

Finally, we will create an URLSession to create a network request.

```
let urlString = URL(string: "your URL")    // Making the URL

if let url = urlString {

let task = URLSession.shared.dataTask(with: url)
{ (data, response, error) in    // Creating the URL Session.
    if error != nil {          // Checking if error exist.
        print(error)
    } else {
        if let usableData = data { // Checking if data exist.
            print(usableData)      // printing Data.
        }
    }
}

task.resume()
```

This is how you can Use Web services in your application using URL sessions.

Alamofire

Alamofire is a HTTP networking library written in swift. It can be used to make URL Requests, Post Data, Receive Data, Upload File, Data, Authentication, Validation, etc.

To install Alamofire, you can go to Alamofire officially on [GitHub](#), and read their installation guide.

Making a Request in Alamofire.

For making a request in Alamofire, we should use the following command.

```

import Alamofire
Alamofire.request("url");

```

Response Handling

The following command is used for response handling.

```

Alamofire.request("url").responseJSON
{
    response in
        print(response.request)    // original URL request
        print(response.response)   // HTTP URL response
        print(response.data)       // server data
        print(response.result)     // result of response serialization
        if let JSON = response.result.value
        {
            print("JSON: \(JSON)")
        }
}

```

Response Validation

The following command is used for response handling.

```

Alamofire.request("https://httpbin.org/get").validate().responseJSON
{
    response in
        switch response.result
        {
            case .success:
                print("Validation Successful")
            case .failure(let error):
                print(error)
        }
}

```

These are the basics of making URL request, using URL Sessions and Alamofire. For more advanced Alamofire, please visit [Alamofire Documentation](#), and you can read about it in detail.

11. iOS Development – Concurrency Control

Concurrency is a way to execute more than one thing at the same time. In an application, Concurrency refers to multiple tasks running at the same time/concurrently.

Concurrency can make your application faster, cleaner and gives a better experience to the user. Use of multithreading seems difficult to many developers, but API's like **NSOperation** and **Dispatch Queues** makes it easy to use concurrency and multi-threading in the application.

Grand Central Dispatch

GCD is the most commonly used API to manage concurrent code and execute operations asynchronously at the system level. GCD provides and uses queues of task. These Queues are the data structure that use FIFO terminology, i.e. the task at first place in a queue will be executed first and the task in last of a queue will be executed at last.

For example – Suppose a movie ticket booking line, if you are the last person, you will get ticket last, and if someone comes after you, he will get a ticket after you.

Dispatch Queue

Dispatch queue are an easy way to perform a task asynchronously and concurrently in your application. There are two types of queues –

- **Serial Queues:** They store tasks in a series manner and execute one task at a time.
- **Concurrent Queues:** Concurrent queues allow you to execute multiple task in parallel.

Some of the functions that are used to create or get queues are:

<code>dispatch_queue_create</code>	<code>// create a serial or concurrent queue</code>
<code>dispatch_queue_get_label</code>	<code>// get the label of a given queue</code>
<code>dispatch_get_main_queue</code>	<code>// get the one and only main queue</code>
<code>dispatch_get_global_queue</code>	<code>// get one of the global concurrent queues</code>

Adding Tasks to the Queues

There are two types of functions, which help in adding tasks to the queues. They are:

Synchronous Functions:

- **dispatch_once** – will submit the task only once it is over the application lifetime.
- **dispatch_sync** – will submit a task to the queue and return only when the task is completed.

Asynchronous Functions:

- **Dispatch_async** – will submit a task and return.
- **Dispatch_after** – returns immediately but delays for a specific time.
- **Dispatch_apply** – returns immediately but the task is submitted multiple times.

Example Code

Following is the example code for adding tasks to the queue.

```
dispatch_async(dispatch_get_main_queue(), update_block);
// add update_block to main queue

dispatch_apply(i, some_queue, work_block)
// add work_block to some_queue i times

dispatch_sync(background_queue, blocking_block)
// add blocking block to background queue and wait for completion.
```

General Example of using a Queue

The following code is an example of using a queue.

```
dispatch_async(background_queue, ^
{
    // Perform code that takes long time, here.
    Dispatch_async(dispatch_get_main_queue(), ^
    {
        //Some other task, generally UI.
    });
});
```

This is all we will do with concurrency control, as it is enough information until you become an intermediate iOS Developer.

Keep practicing the concepts you have learnt and try to modify and integrate them according to your requirement.

12. iOS Development – Interview Questions

Q1. What is Xcode?

Ans. Xcode is Apple's integrated development environment (IDE) that you use to design apps for Apple products. It provides various tools to manage your entire development workflow from creating your app, to testing, submitting and optimizing it to the App store.

Q2. How multiple line comments can be written in swift?

Ans. Multiple line comments can be written as forward-slash followed by an asterisk (/*) and end with an asterisk followed by a forward slash (*/).

Q3. What are the collection types available in Swift?

Ans. In Swift, collection types come in two varieties Array and Dictionary.

Q4. What are the control transfer statements used in Swift?

Ans. Control transfer statements used in Swift include:

- Break
- Continue
- Fallthrough
- Return

Q5. How base-class is defined in Swift?

Ans. In Swift, the classes are not inherited from the base class and the classes that you define without specifying its superclass, automatically becomes the base-class.

Q6. What is the characteristics of Switch in Swift?

Ans. It supports any kind of data and not only Synchronizes it, but also checks for equality. The Switch statement must be exhaustive, which means that you have to cover all possible values for your variable.

Q7. What is the question mark (?) in Swift?

Ans.: The question mark (?) is used during the declaration of a property. It tells the compiler that this property is **optional** and whether the property may hold a value or not.

Q8. What is the use of double question marks (??)?

Ans: To provide a default value for a variable.

Q9. What is the difference between let and var in Swift?

Ans: The let keyword is used to declare constants, while var is used for declaring variables.

Q10. How should one handle errors in Swift?

Ans. You simply declare that a function can throw an error by appending the throws keyword to the function name. Any function that calls such a method must call it from a try block.

Q11. What is a *guard* statement in Swift?

Ans. The guard statement evaluates a Boolean condition and proceeds with program execution if the evaluation is true.

Q12. What is GCD? How is it used?

Ans: GCD is the most commonly used API to manage concurrent code and execute operations asynchronously at the UNIX level of the system. GCD provides and manages queues of tasks.

Q13. What is Synchronous vs. Asynchronous in GCD?

Ans: A synchronous function returns only after the completion of a task that it orders.

An asynchronous function, on the other hand, returns immediately, ordering the task to be done, but not waiting for it.

Q14. What is MVC?

Ans. MVC is a design pattern that stands for Model View Controller. This design pattern separates the data from its display, mediated by a View Controller.

Q15. What are delegates?

Ans: Delegates are a design pattern. A delegate is just an object that another object sends messages to when certain things happen.

Q16. What is Core Data?

Ans: Core Data is an object graph manager, which also has the ability to persist object graphs to a persistent store, on a disk.

Q17. What is the purpose of the reuseIdentifier?

Ans: Reusability of an already allocated object.