

Chapter 1

A Simple iOS Application

- Creating an Xcode Project
- Building Interface
- Model-View-Controller
- Declarations
- Making Connections
- Implementing Methods
- Building and Running on Simulator
- Application Icons
- Launch Images

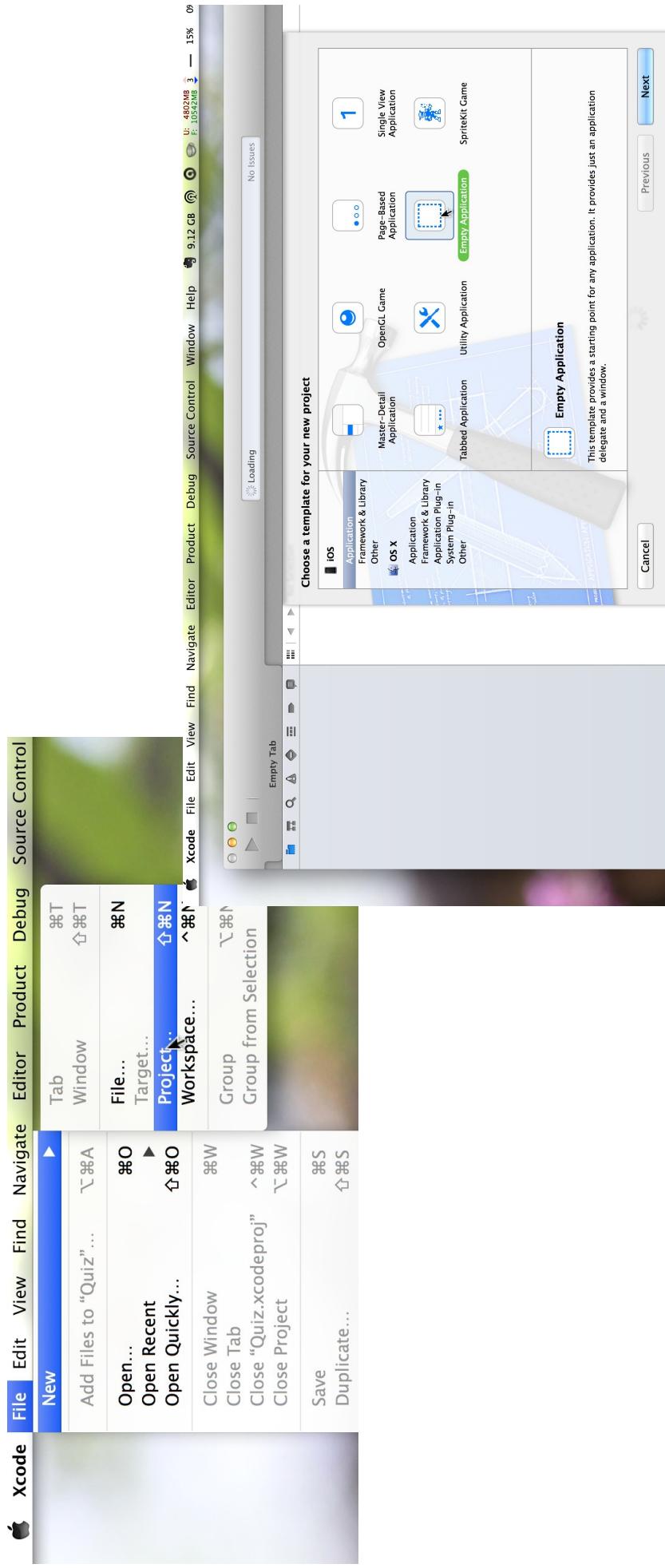
Needed Resources

- To get the needed tools for the course and see the latest Apple has to offer please go to:

<http://developer.apple.com/library/ios/#reference/library/GettingStarted/RoadMapiOS/Introduction/Introduction.html>

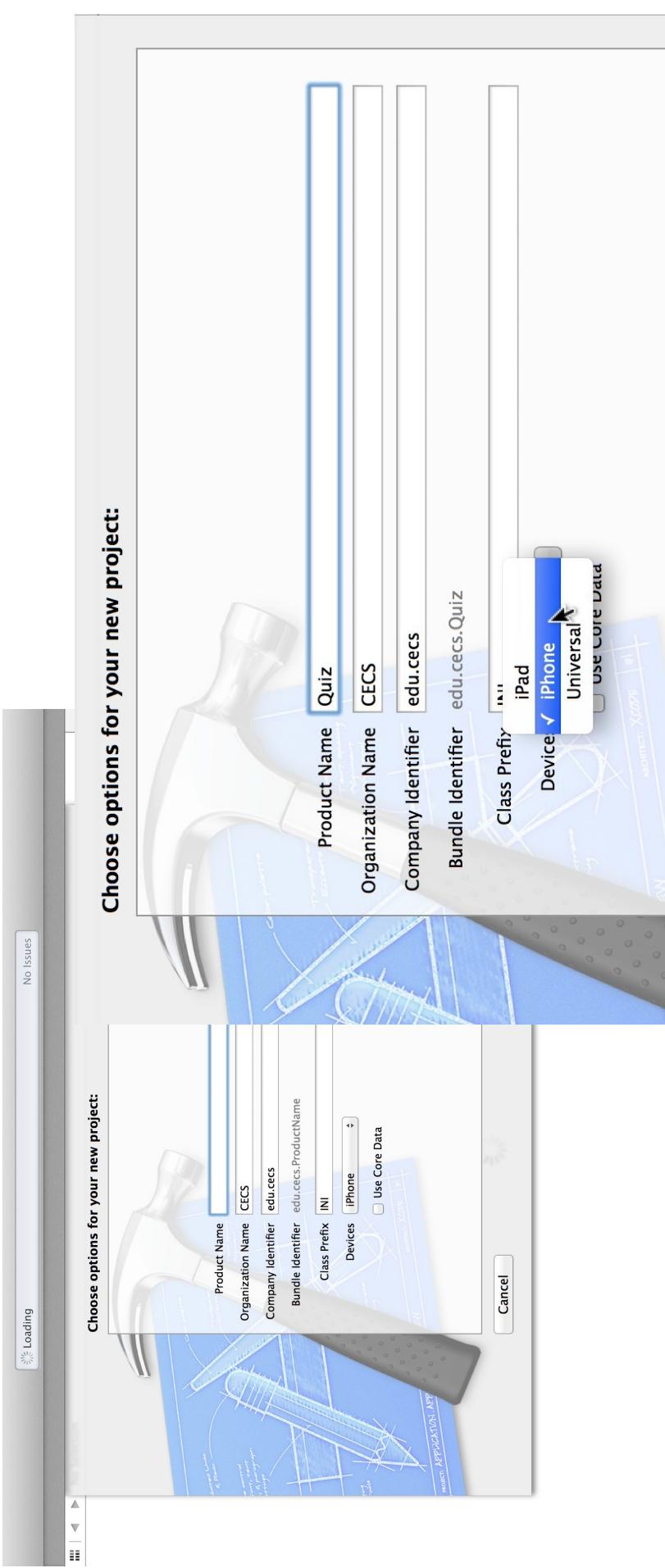
Creating an Xcode Project

- Start Xcode
- Select File => New => Project
 - From the list of Templates select the desired application type.
- For our simple iOS application we selected iOS => Empty Application

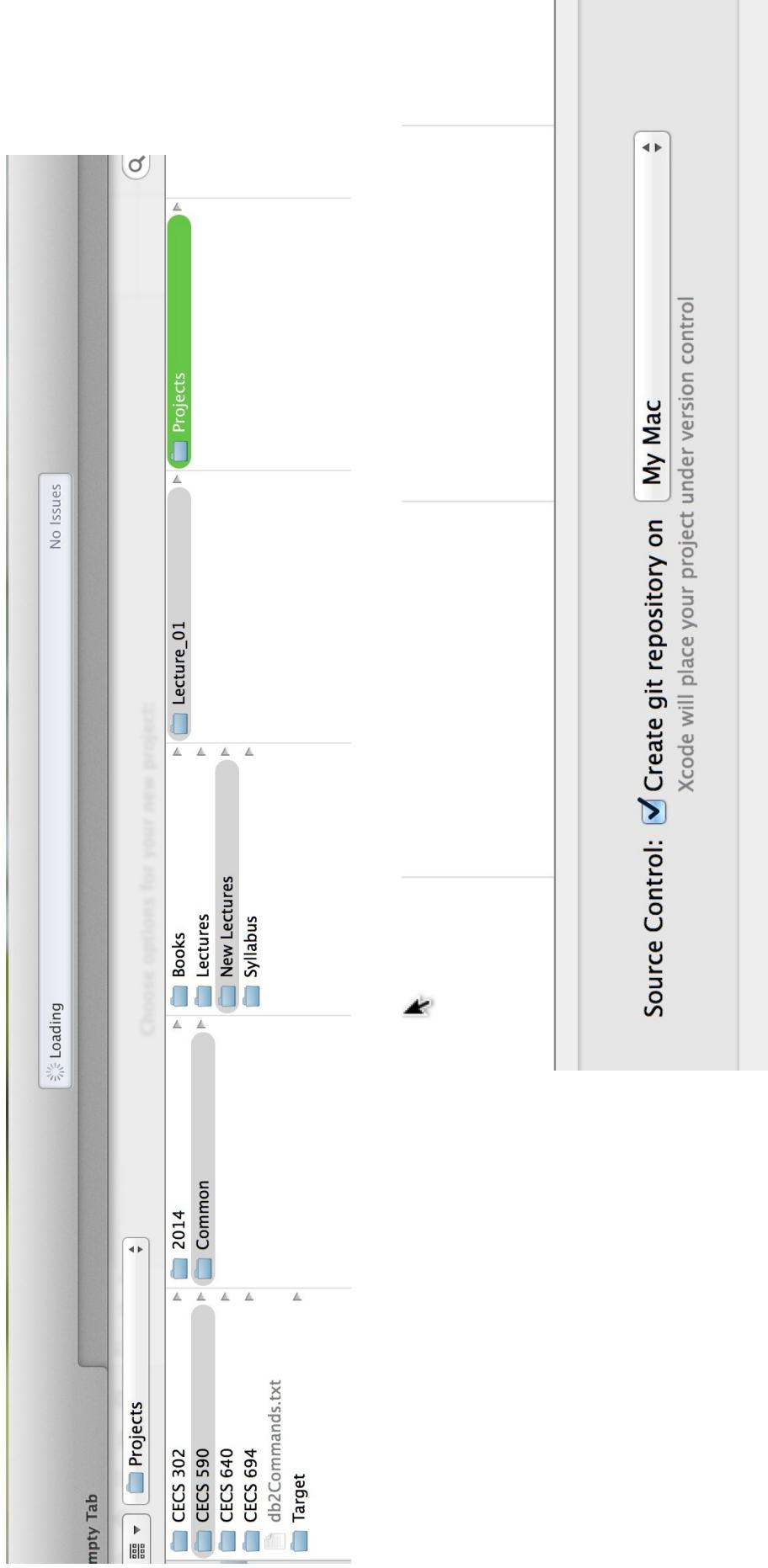


Creating an Xcode Project (cont.)

- Name your project (Quiz)
- Use reverse DNS naming convention to specify a company identifier that will make your application bundle name unique (I use “edu.cecs”).
- Select a Class Prefix (The textbook uses BNR, I use INI which are my initials)
- Select the Device Family (iPhone)
- Select Next to specify where to save your project



Project location and git



Quiz

Quiz: Ready | Today at 8:00 PM

No Issues

Quiz.xcodeproj

PROJECT Quiz

TARGETS Quiz

INAppDelegate.h
INAppDelegate.m
Images.xcassets
Supporting Files
QuizTests
Frameworks
Products

General

Capabilities

Info

Build Settings

Build Phases

Build Rules

Identity and Type

Name Quiz

Location Absolute

Quiz.xcodeproj

Full Path /Users/inimam/Documents/CECS 590/Common/New Lectures/Lecture_01/Projects/Quiz/Quiz.xcodeproj

Project Document

Project Format Xcode 3.2-compatible

Organization CECS

Class Prefix INI

Text Settings

Indent Using Spaces

Widths 4 Tab 4 Indent 4

Wrap lines

Source Control

Repository

Type --

Current Branch --

Version --

Status No changes

Location

Deployment Info

Deployment Target 7.1

Devices iPhone

Main Interface

Device Orientation Portrait

Upside Down

Landscape Left

Landscape Right

Status Bar Style Default

Hide during application launch

App Icons

Source AppIcon

Launch Images

Source LaunchImage

Linked Frameworks and Libraries

Name

CoreGraphics.framework

UIKit.framework

Foundation.framework

Gradient Button - intercepts mouse-down events and sends an action message to a target object...

Push Button - intercepts mouse-down events and sends an action message to a target object when it's...

Rounded Rect Button - intercepts mouse-down events and sends an action message to a target object...

The image shows a screenshot of the Xcode IDE. The top navigation bar indicates the project is ready and the current file is `INIAAppDelegate.h`. The main area displays the code for the `INIAAppDelegate` interface:

```

1 // INIAAppDelegate.h
2 // Quiz
3 // Created by Ibrahim Imam on 5/4/14.
4 // Copyright (c) 2014 CECS. All rights reserved.
5 //
6
7
8 #import <UIKit/UIKit.h>
9
10 @interface INIAAppDelegate : UIResponder <UIApplicationDelegate>
11
12 @property (strong, nonatomic) UIWindow *window;
13
14
15
16

```

The file inspector on the right shows the `INIAAppDelegate.h` file selected, along with other files like `INIAAppDelegate.m`, `Quiz`, and `INIAAppDelegate.h`. The document outline at the bottom shows the project's structure, including `Quiz`, `INIAAppDelegate.m`, `INIAAppDelegate.h`, `QuizTests.xctest`, `Products`, `Quiz.app`, and `QuizTests.xctest`.

- iOS development (Objective-C) is object-oriented, and an iOS application consists primarily of a set of objects working together.
- When the Quiz application is launched, an object of the `INIAAppDelegate` kind will be created. We refer to a `INIAAppDelegate` object as an instance of the `INIAAppDelegate` class.
- A delegate is equivalent to a listener in Java.

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 - A delegate is equivalent to a listener in Java

Object-Oriented Design Paradigm

- Applications are designed into three components, the Model, the View, and the Controller. Hence, the MVC abbreviation.
- View objects are visible to the user. Examples of view objects are buttons, text fields, and sliders. View objects make up an application's user interface. In Quiz, the labels showing the question and answer and the buttons beneath them are view objects.
- Model objects hold data and know nothing about the user interface. In Quiz, the model objects will be two ordered lists of strings: one for questions and another for answers.
- Controller objects are the managers of an application. Controllers configure the views that the user sees and make sure that the view and model objects keep in sync.

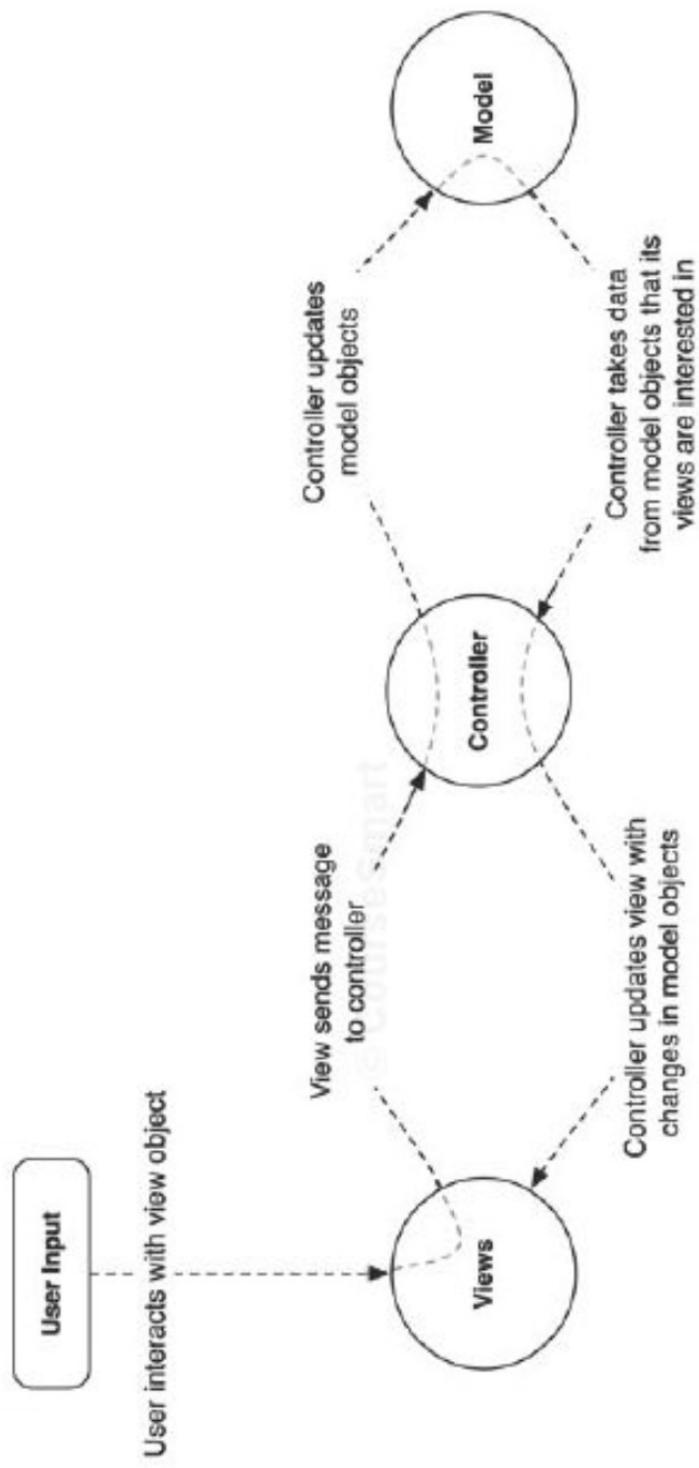
Model-View-Controller

- iOS employees the MVC paradigm in applications design to try to achieve maximum reuse and maximum separation between the model and the visual aspects of the application.

The Controller is the only layer allowed to communicate with the model.

The Controller communicate with the view through “outlets” to pass data back and forth and though “actions” to trap events

Figure 1.6 MVC pattern

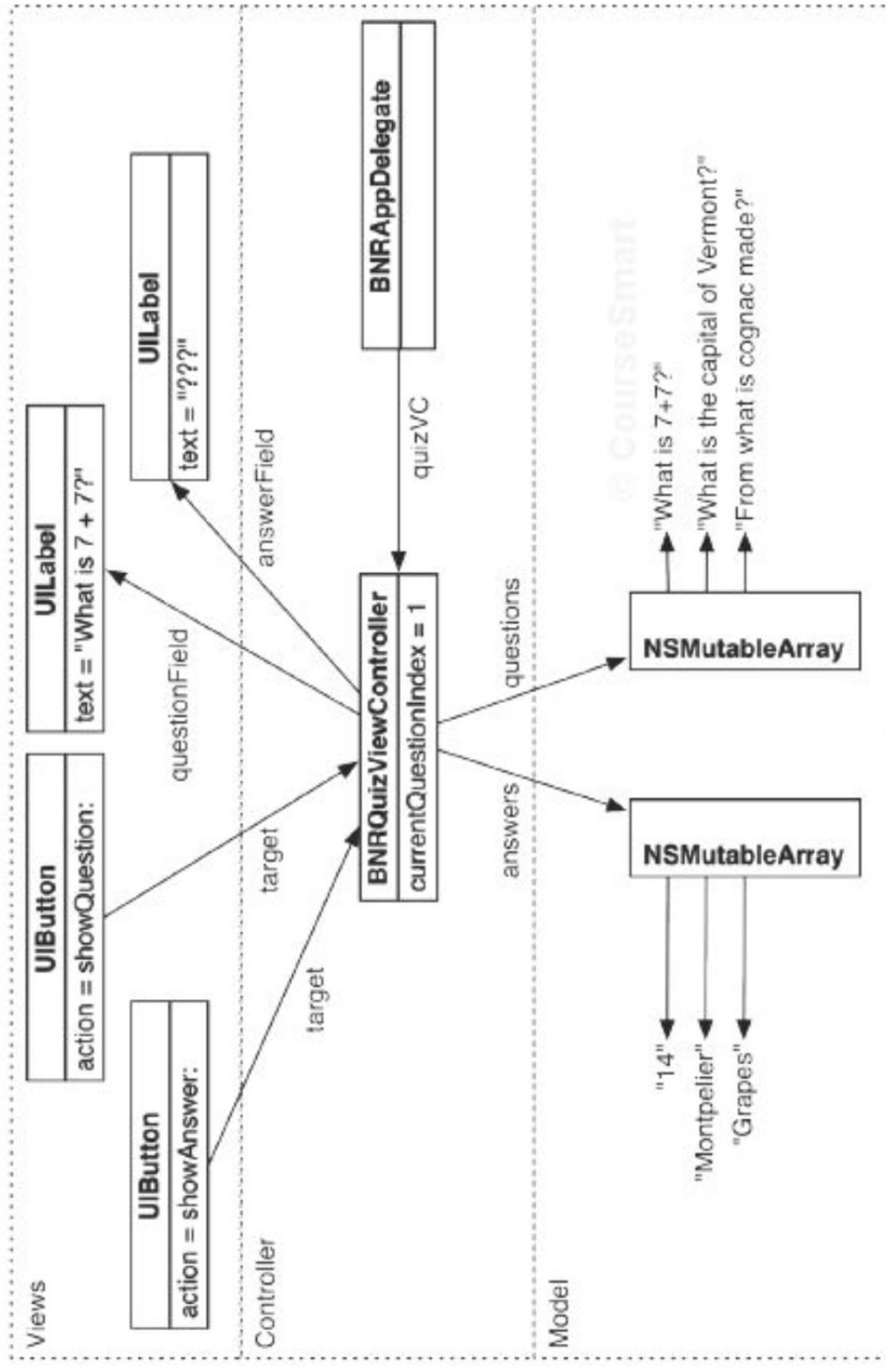


The Quiz Application Design

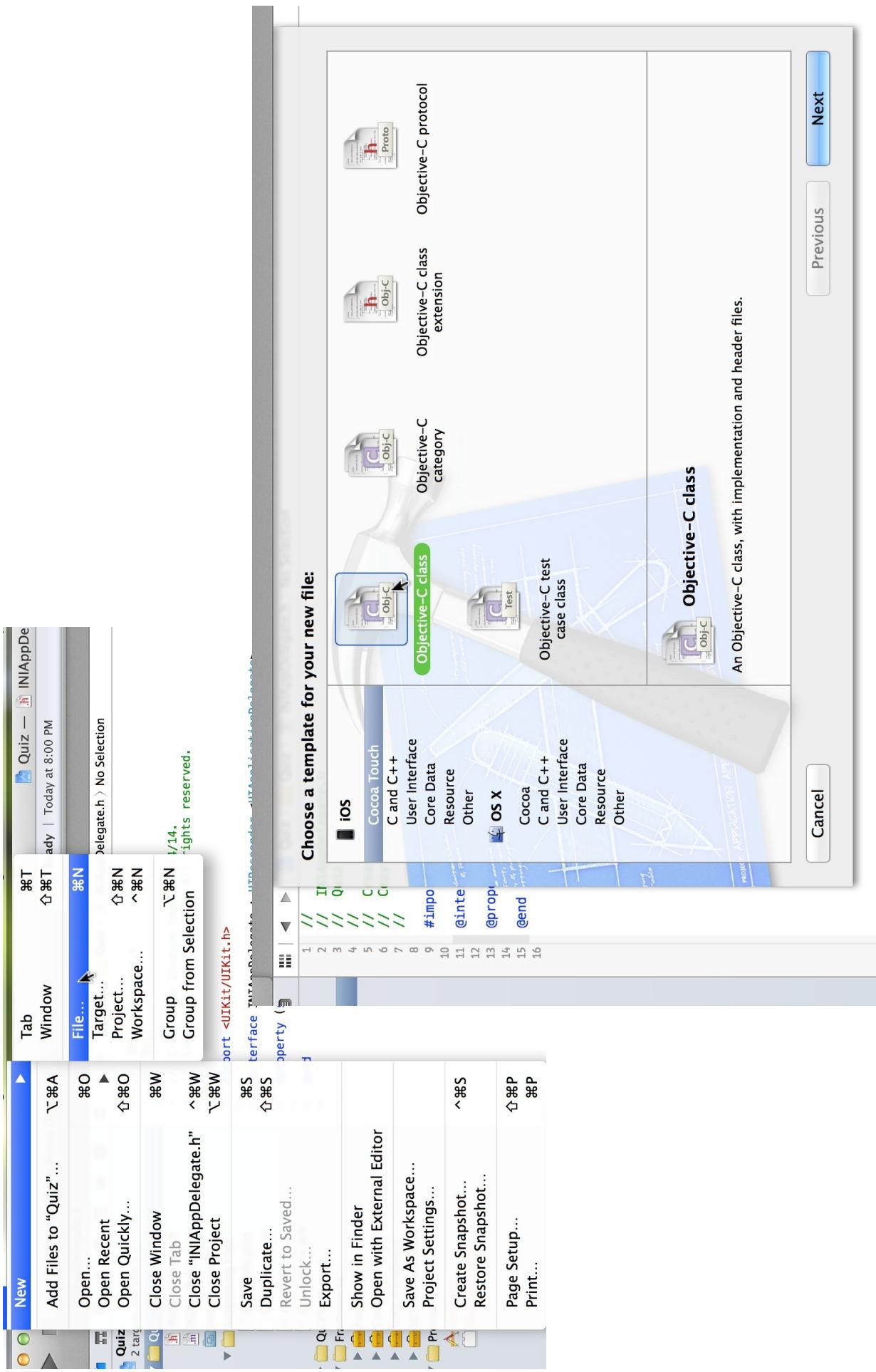
- We will be writing the Quiz application using the MVC pattern.
- The break down of the objects we will be creating and working with:
 - 4 view objects: two instances of UILabel and two instances of UIButton
 - 2 controller objects: an instance of BNRApDelegate and an instance of BNRRQuizViewController
 - 2 model objects: two instances of NSMutableArray

The Big Picture

Figure 1.7 Object diagram for Quiz



Create the Controller File



Choose options for your new file:

```

1 // 
2 // Q
3 // C
4 // C
5 // C
6 // C
7 //
8 #import "INQuizView.h"
9 @interface INQuizViewController : UIViewController
10 @property (strong, nonatomic) IBOutlet UITableView *quizTable;
11 @end
12 @implementation INQuizViewController
13 - (void)viewDidLoad {
14     [super viewDidLoad];
15 }
16 @end

```

Class: **INQuizViewController**

Subclass of: **UIViewController**

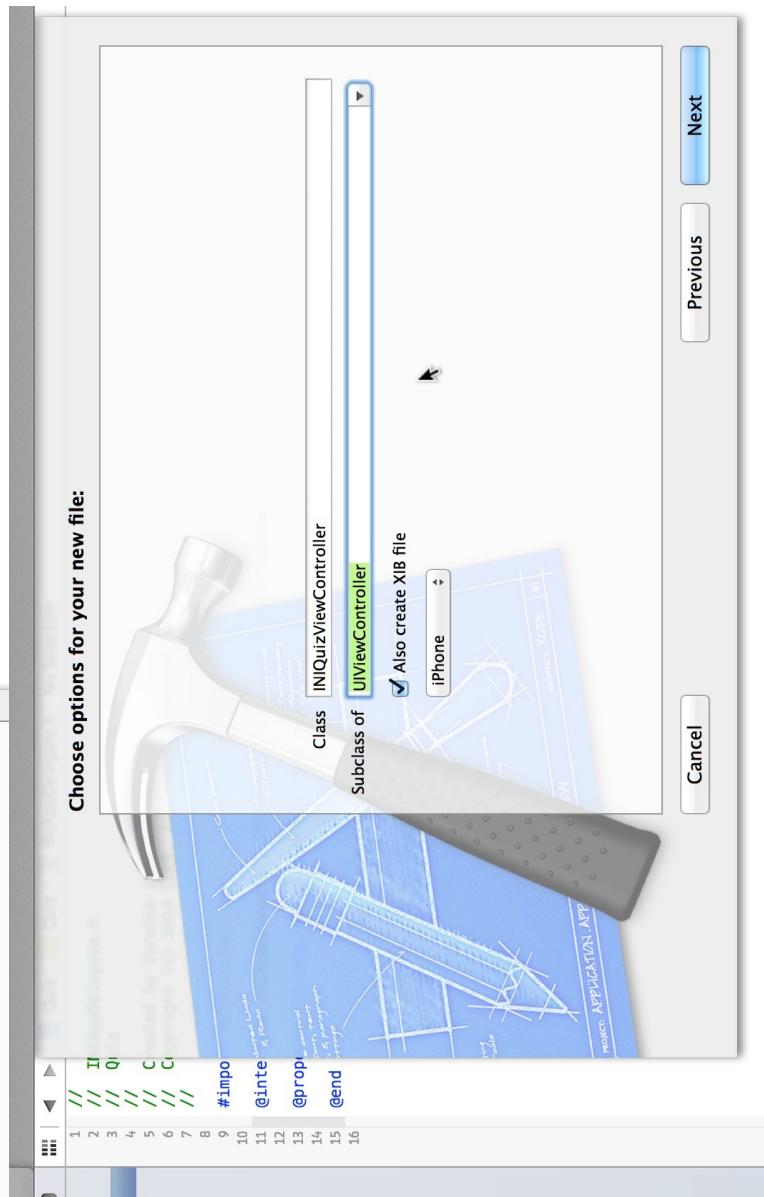
NSObject

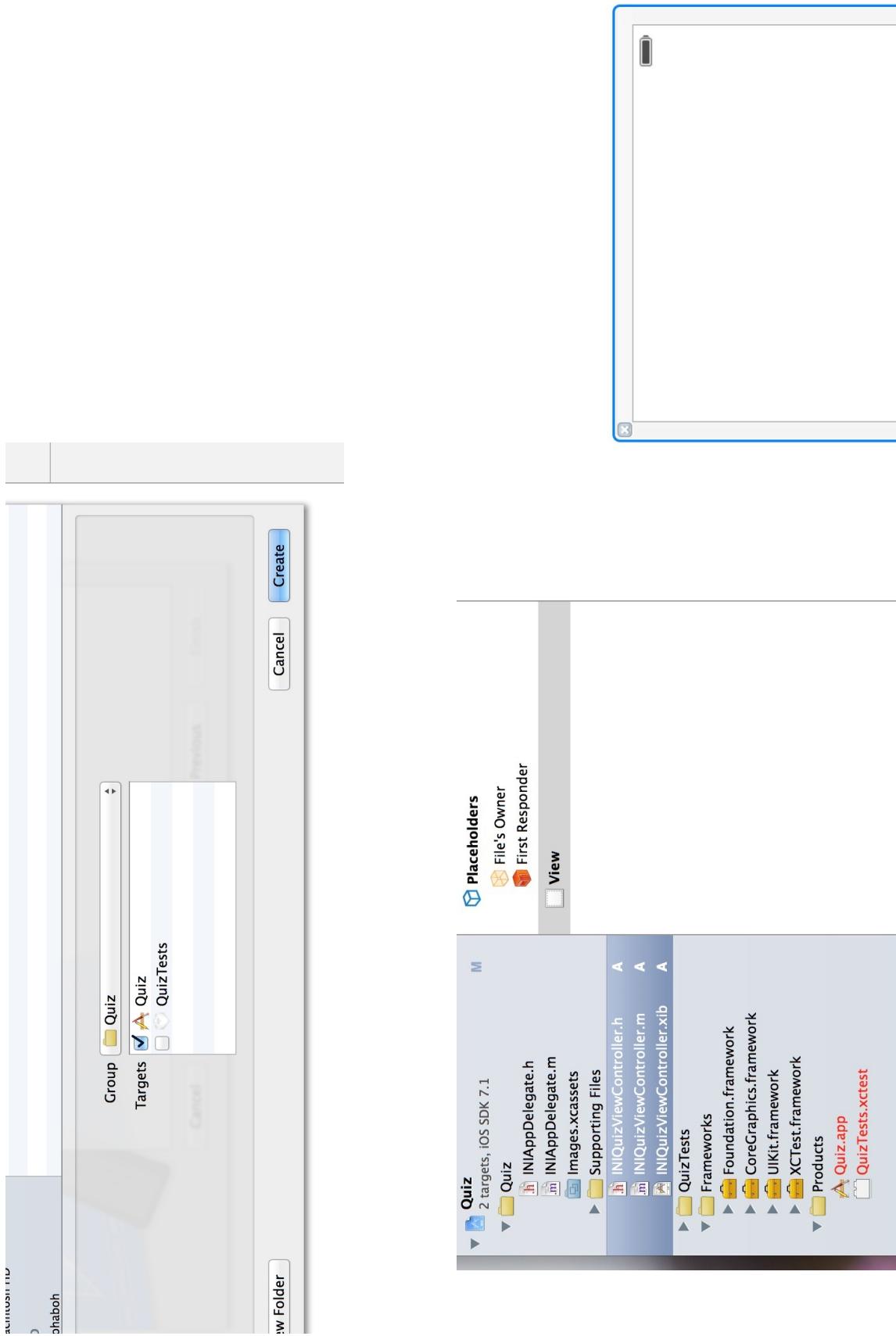
UIView

UIViewController

UITableView

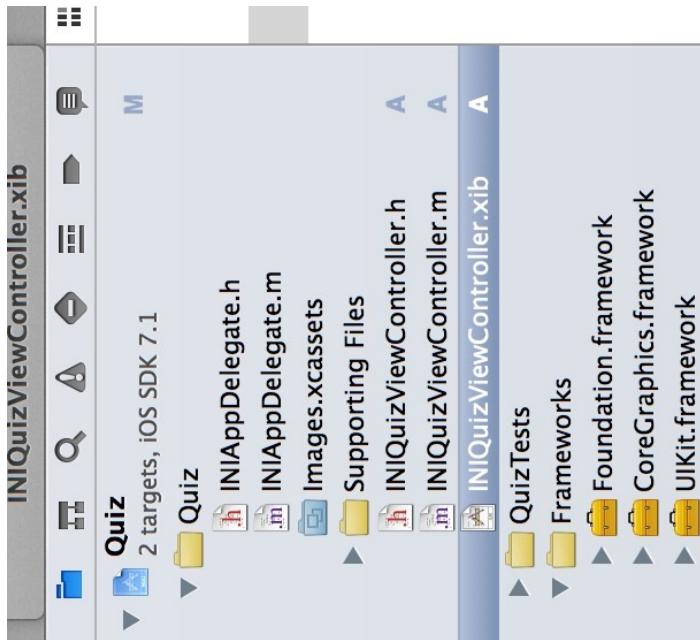
UITableViewCell





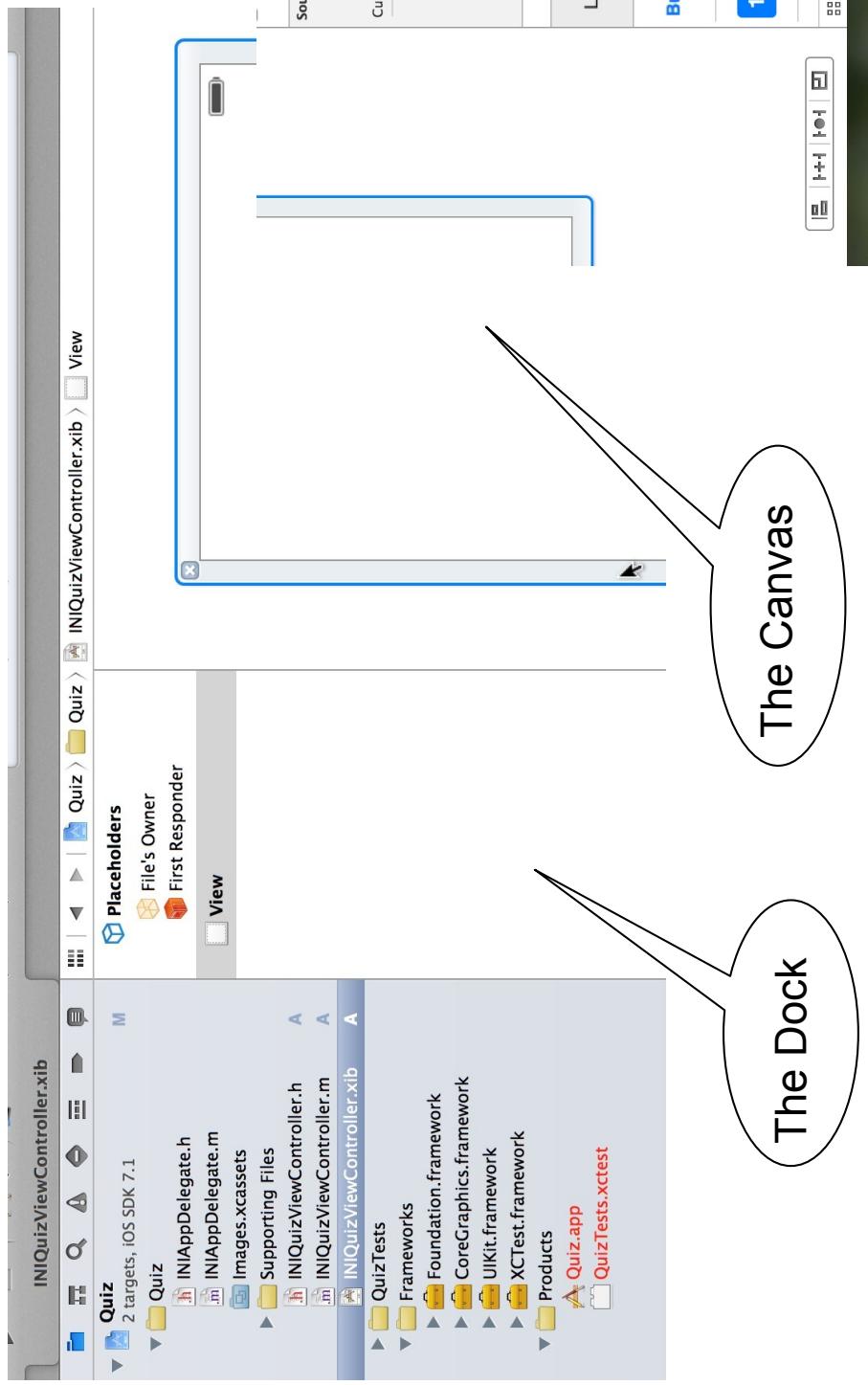
Project Files

- Most of our work will be:
 - Building the user interface of our application by modifying and adding views and controls to the xib (nib or xip) file “INQuizViewController.xib”
 - Updating the INQuizViewController interface by editing “INQuizViewController.h”
 - Adding the needed implementation to our application by editing “INQuizViewController.m”



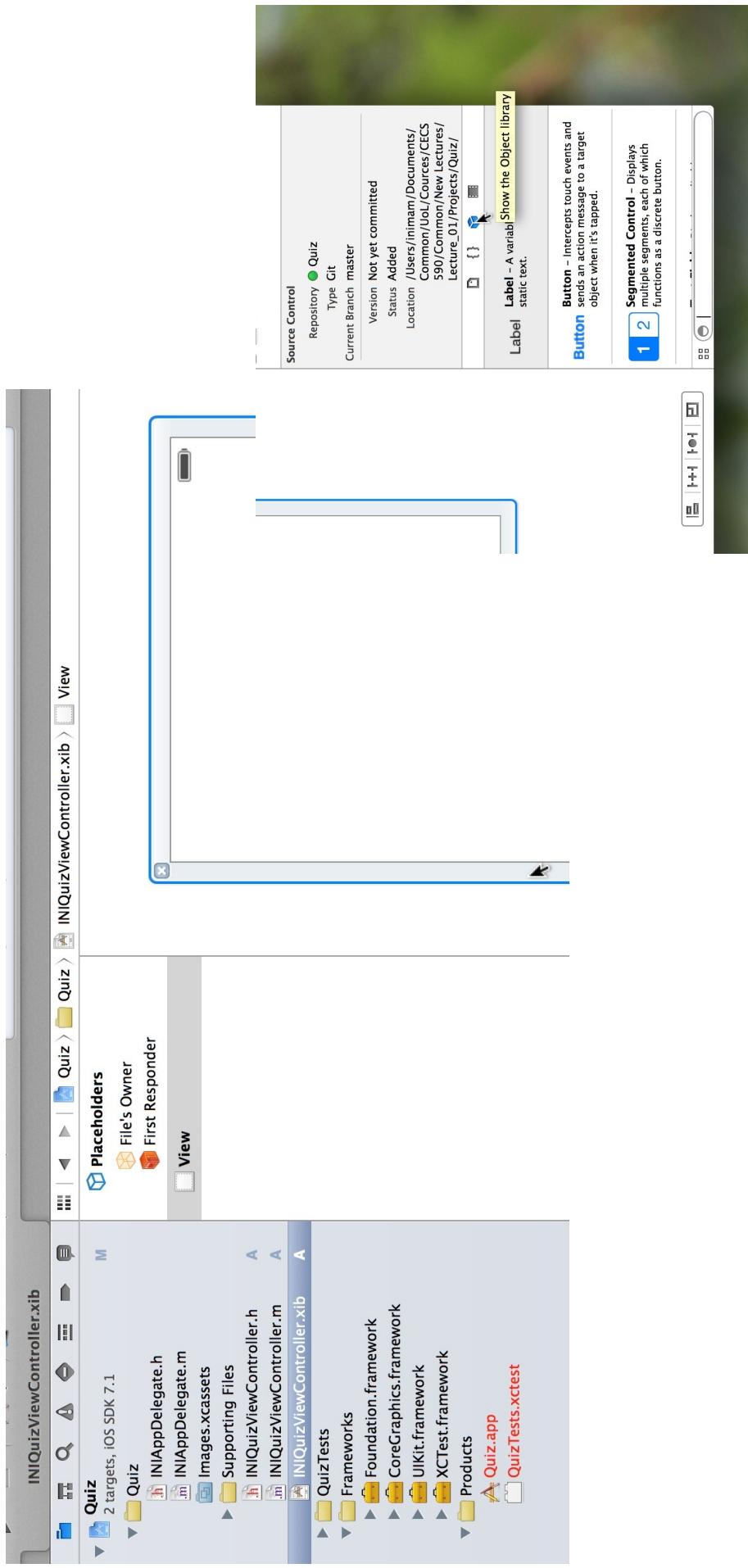
Interface Builder

- When Xcode opens a XIB (pronounced “zib”) file, it opens it with Interface Builder, a visual tool where you can add and arrange objects to create a graphical user interface. In fact, XIB stands for XML Interface Builder.

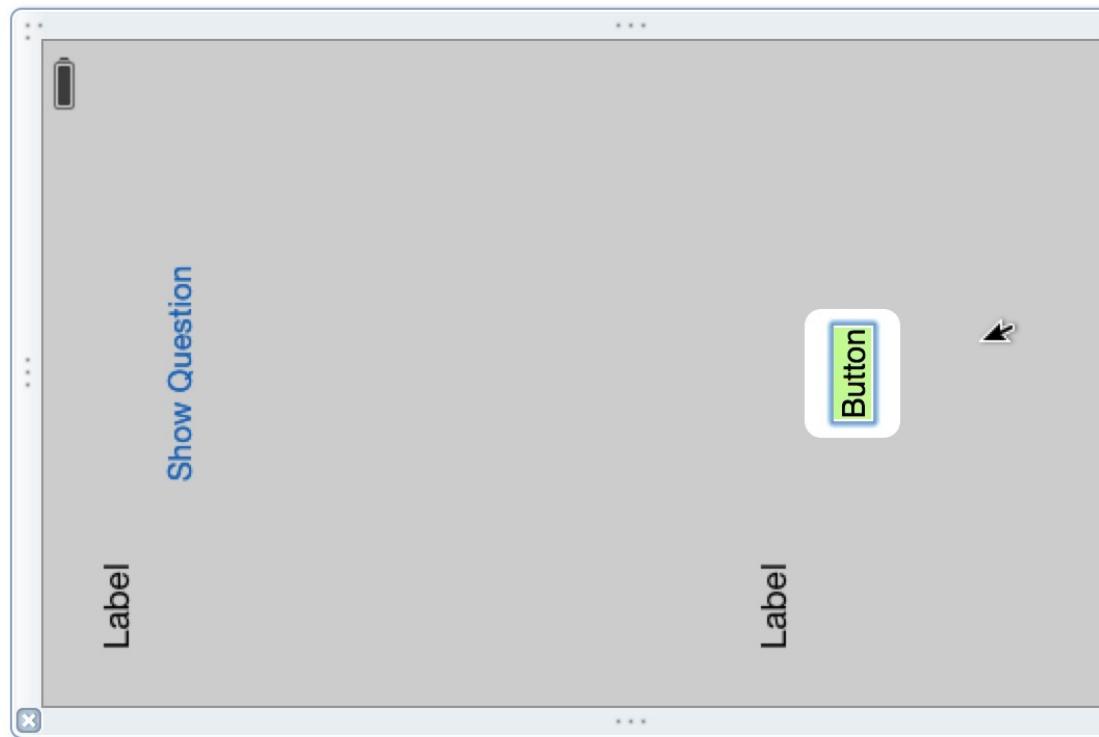
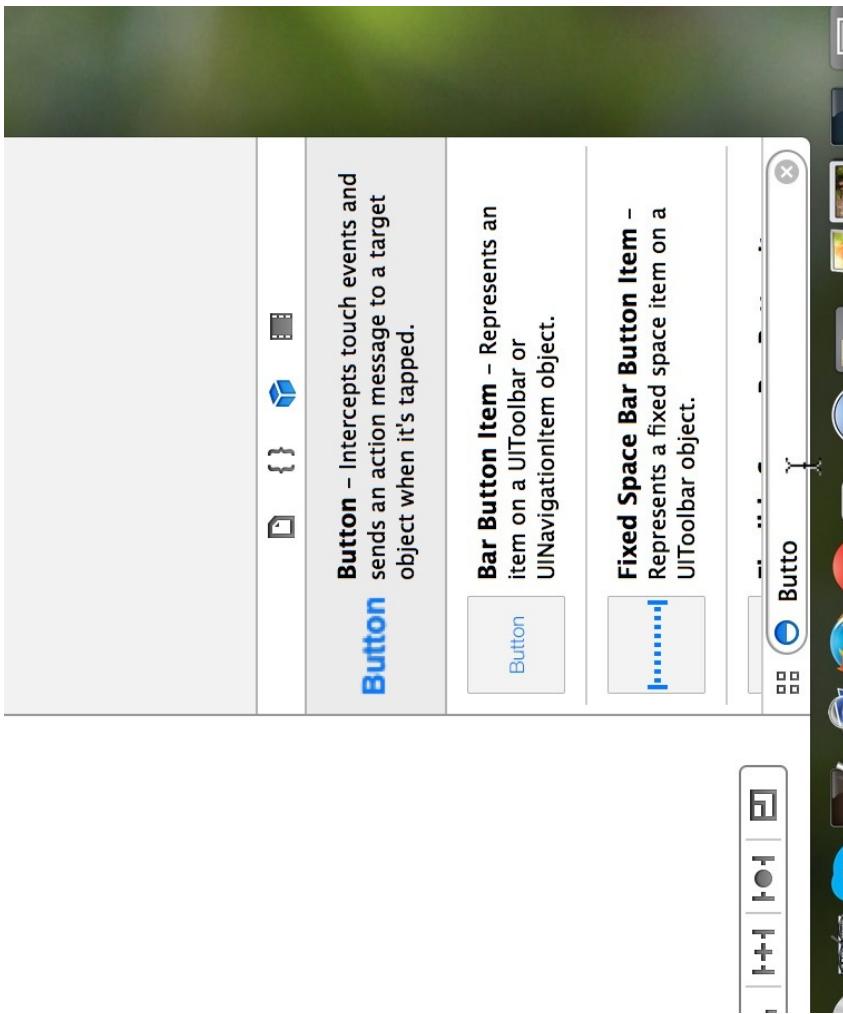


Building Interface

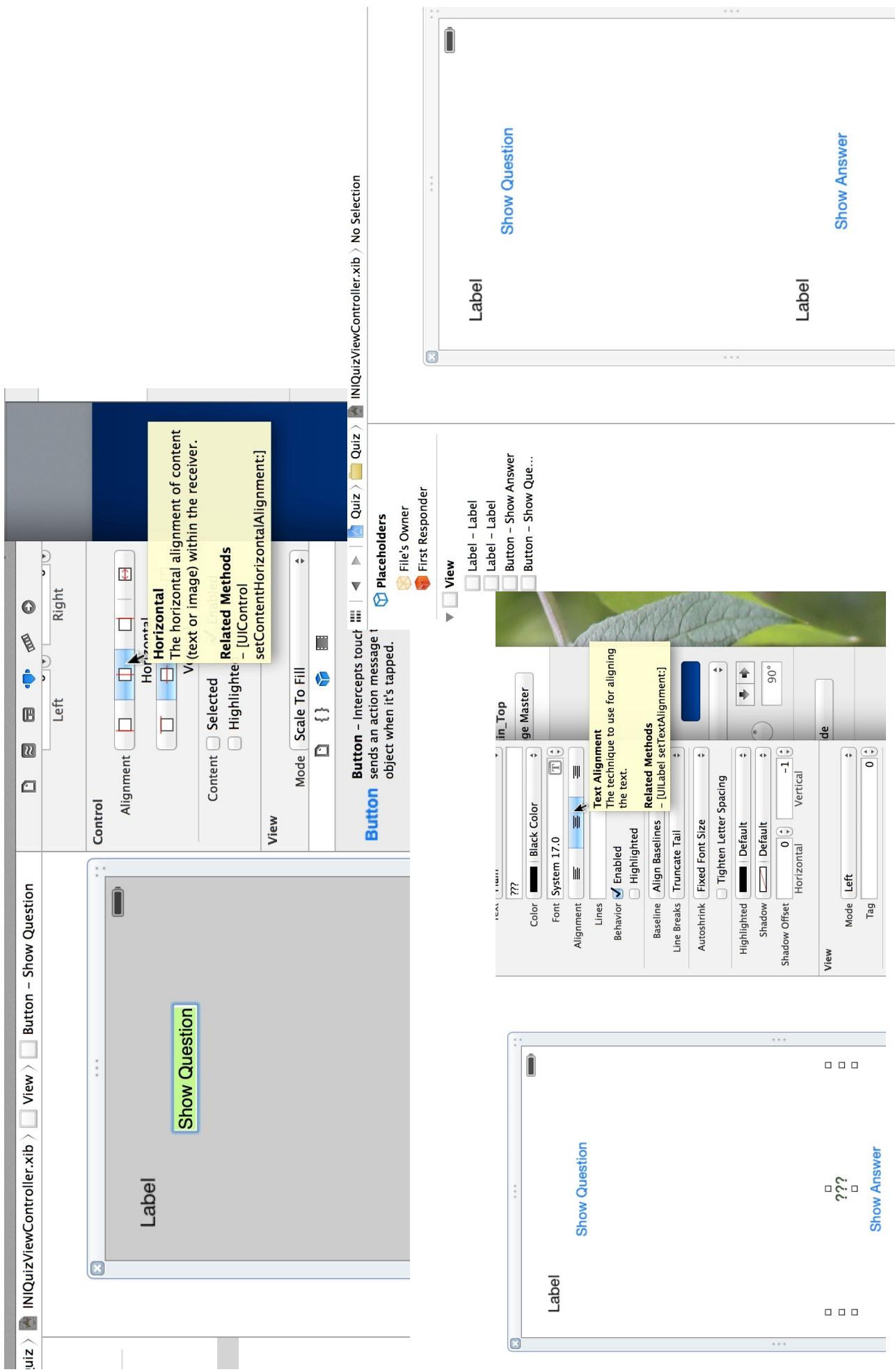
- Drag the desired controls from the objects pallet on the right to the application view on the left.
- Use two “Label” controls and two “Round Rect Button” controls



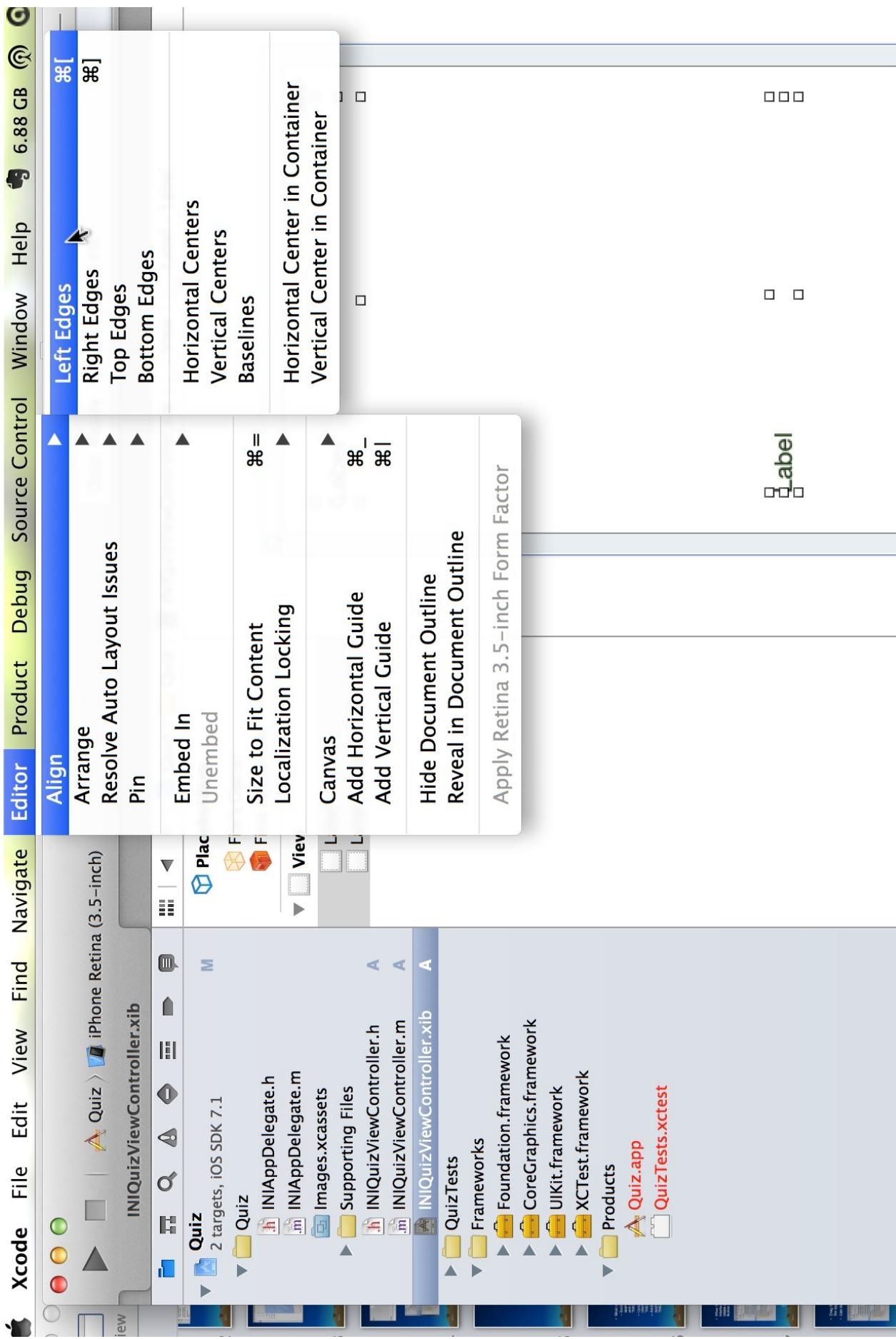
Adding The Buttons



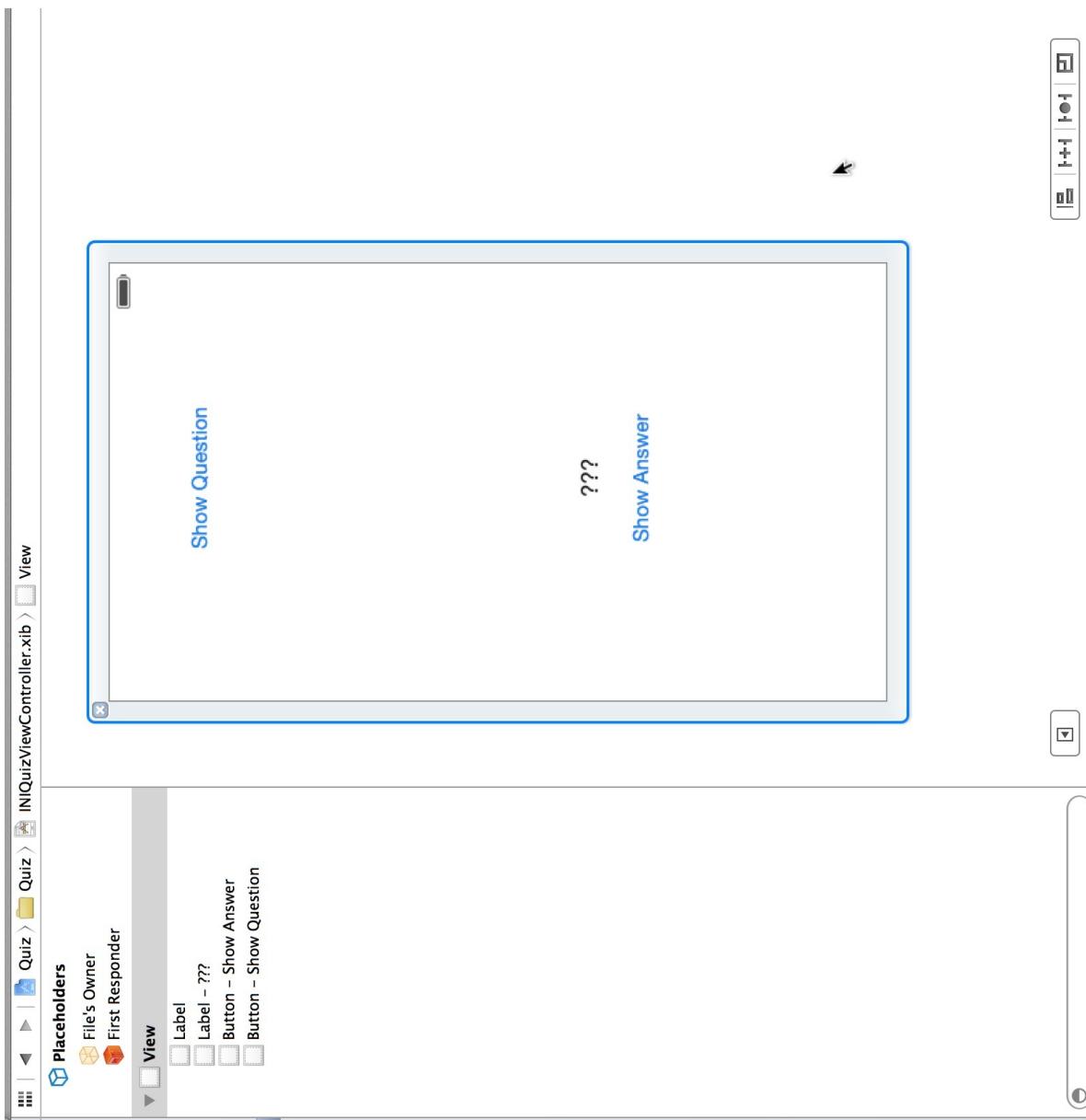
Align Text



Aligning Controls



Building Interface



- After adding needed text to the buttons and labels and adjust the properties of both we get the following interface:

ZIB and NIB files

- When you build your application INIQuizViewController.xib will be compiled into a NIB file that is smaller and easier for the application to parse and load.
- Then the NIB file is copied into the application's bundle.
- The bundle is a directory containing the application's executable and any resources the executable uses.

Connections, outlets, and actions

- A connection lets one object know where another object is in memory so that the two objects can communicate.
- You can connect to one of two things in Interface Builder: outlets and actions.
 - An outlet is a pointer to an object.
 - An action is a method that gets triggered by a button or some other view that the user can interact with, like a slider or a picker.

Clear the ViewController file

```
Quiz
  2 targets, iOS SDK 7.1
    ▶ Quiz
      ▶ INAppDelegate.h
      ▶ INAppDelegate.m
      ▶ Images.xcassets
      ▶ Supporting Files
        ▶ INQuizViewController.h
          INQuizViewController.m
          INQuizViewController.xib
        QuizTests
      Frameworks
        Foundation.framework
        CoreGraphics.framework
        UIKit.framework
        XCTest.framework
      Products
        Quiz.app
        QuizTests.xctest
  QuizTests
  INQuizViewController.xib
  INQuizViewController.m / No Selection
```

```
1 // INQuizViewController.m / No Selection
2 // Quiz
3 // Quiz
4 // Created by Ibrahim Imam on 5/4/14.
5 // Copyright (c) 2014 CECS. All rights reserved.
6 //
7 //
8 #import "INQuizViewController.h"
9
10 @interface INQuizViewController : UIViewController
11 @implementation INQuizViewController
12 @end
13 @end
14
15 @implementation INQuizViewController
16 - (id)initWithNibName:(NSString *)NibNameOrNil bundle:(NSBundle *)ribBundleOrNilOrNil
17 {
18     self = [super initWithNibName:NibNameOrNil bundle:ribBundleOrNilOrNil];
19     if (self) {
20         // Custom initialization
21     }
22     return self;
23 }
24
25 - (void)viewDidLoad
26 {
27     [super viewDidLoad];
28     // Do any additional setup after loading the view from its nib.
29 }
30
31 - (void)didReceiveMemoryWarning
32 {
33     [super didReceiveMemoryWarning];
34     // Dispose of
35     // 2 targets, iOS SDK 7.1
36 }
37
38 @end
39
40 INAppDelegate.h
41 INAppDelegate.m
42 Images.xcassets
43 Supporting Files
44   INQuizViewController.h
45   INQuizViewController.m
46   INQuizViewController.xib
47   QuizTests
48   Frameworks
49     Foundation.framework
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```

Create your IBOOutlets

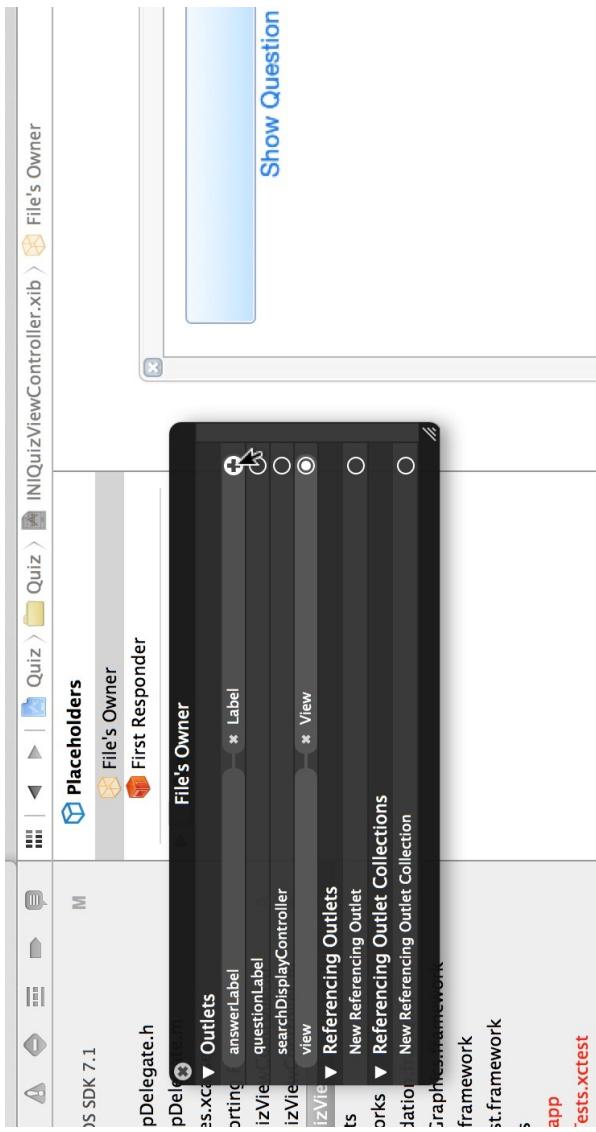
The screenshot shows the Xcode interface with the 'Quiz' project selected. The project structure is visible on the left, showing targets for 'Quiz' and 'QuizTests', and various files like 'INIAppDelegate.h', 'INIAppDelegate.m', 'INISupportingFiles.xcassets', 'INISupportingFiles.xib', 'INISupportingFiles.xctest', and 'INISupportingFiles.xib'. The main area displays two files:

```
1 // INIQuizViewController.m
2 // Quiz > Quiz > INIQuizViewController.m > P @property
3 // INIQuizViewController.m
4 // Created by Ibrahim Imam on 5/4/14.
5 // Copyright (c) 2014 CECS. All rights reserved.
6 //
7 //
8 #import "INIQuizViewController.h"
9
10 @interface INIQuizViewController : UIViewController
11
12 @property (nonatomic, strong) IBOutlet UILabel *questionLabel;
13
14 @end
15
16 @implementation INIQuizViewController
17
18 @synthesize questionLabel = _questionLabel;
19
20 @end
```

```
1 // INIQuizView.h
2 // Quiz > Quiz > INIQuizView.h > P @property
3 // INIQuizView.h
4 // INIAppDelegate.h
5 // INIAppDelegate.m
6 // Images.xcassets
7 // Supporting Files
8 // INIQuizViewController.h
9 #import "INIQuizViewController.h"
10 @interface INIQuizView : UIView
11
12 @property (nonatomic, strong) IBOutlet UILabel *questionLabel;
13
14 @end
15
16 @implementation INIQuizView
17
18 @synthesize questionLabel = _questionLabel;
19
20 @end
```

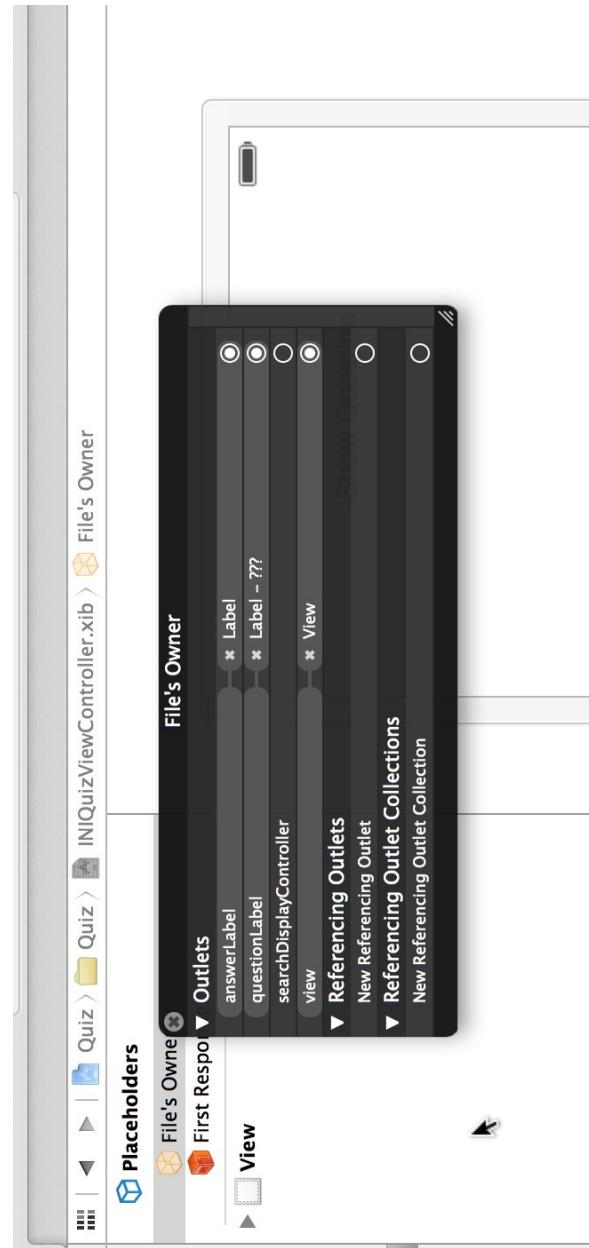
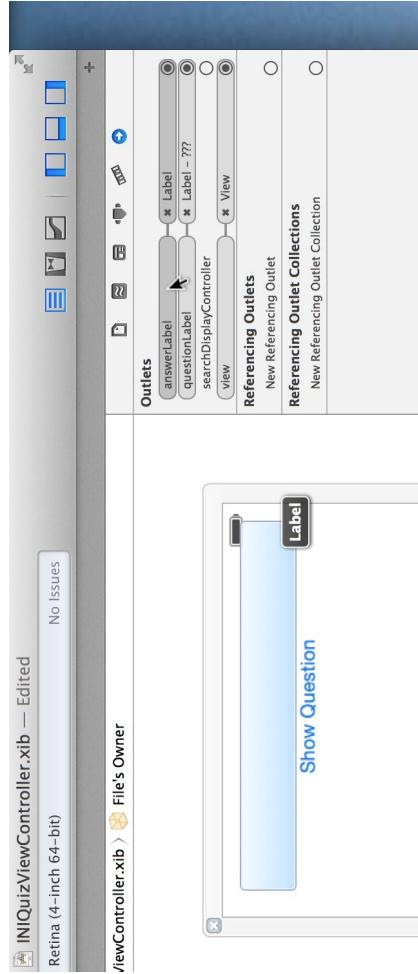
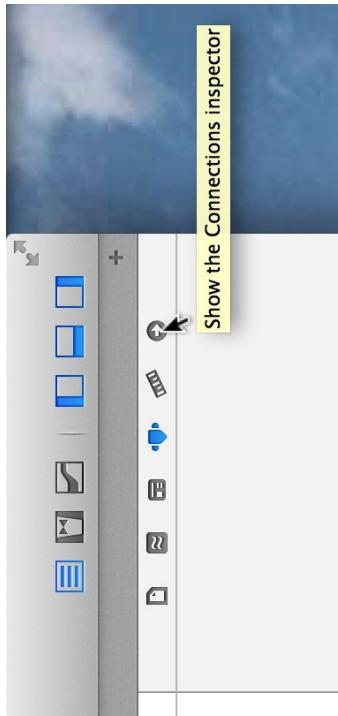
Making Connections

- To make the needed connections between the user interface controllers and the ViewController interface file “QuizViewController.h”
Open the “INQuizViewController.xib” file,
“right-click” or Use the “control-click” the file’s owner in the placeholders section to expose the IBOutlets that we just created
connect the + sign to the appropriate label



In instance of the class defined
INQuizViewController will be
responsible for managing the user
interface defined in
INQuizViewController.xib.
The File's Owner is a place holder
for this instance and has a place
holder for all the pointers pointing
outlets and actions

Verify connections



Adding Actions

The screenshot shows the Xcode interface with the 'Quiz' project selected. The left sidebar displays the project structure, including files like INIAppDelegate.h, INIAppDelegate.m, Images.xcassets, Supporting Files (INIQuizViewController.h, INIQuizViewController.m, INIQuizViewController.xib), Frameworks (Foundation.framework, CoreGraphics.framework, UIKit.framework, XCTest.framework), Products (Quiz.app, QuizTests.xctest), and a folder for QuizTests.xctest.

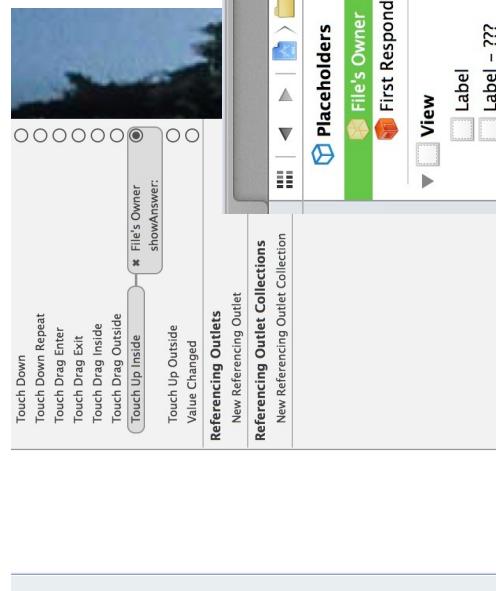
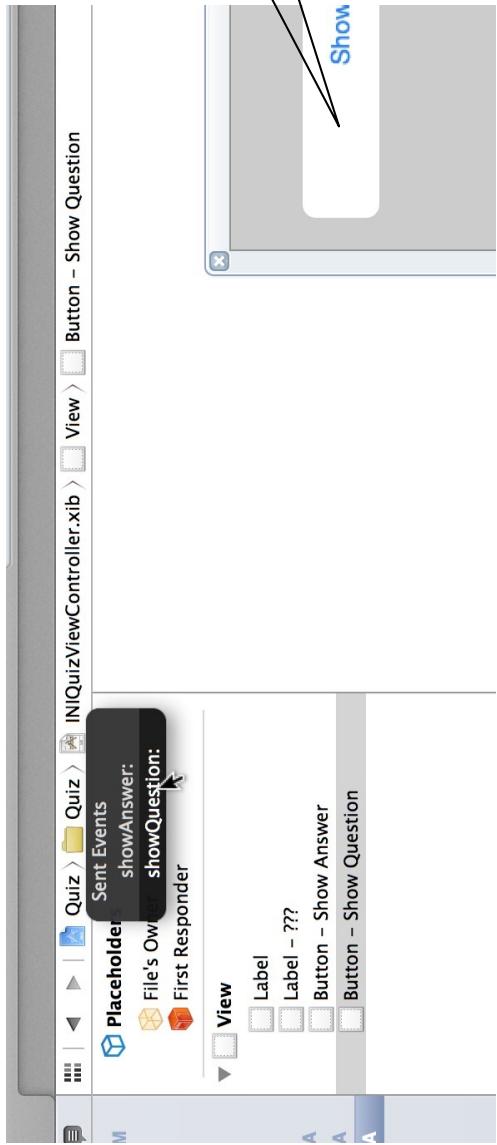
The main editor area shows the code for `INIQuizViewController.h`:

```
3 // Quiz
4 // Created by Ibrahim Imam on 5/4/14.
5 // Copyright (c) 2014 CECS. All rights reserved.
6 //
7 //
8 #import "INIQuizViewController.h"
9
10 @interface INIQuizViewController : UIViewController
11
12 @property (nonatomic, weak) IBOutlet UILabel *questionLabel;
13 @property (nonatomic, weak) IBOutlet UILabel *answerLabel;
14
15 @end
16
17
18 @implementation INIQuizViewController
19
20 @IBAction
21
22
23
24
25
26
27
28
29
30
```

The code for `INIQuizViewController.m` is partially visible at the bottom:

```
6 // Copyright (c) 2014 CECS. All rights reserved.
7 //
8 #import "INIQuizViewController.h"
9
10 @interface INIQuizViewController : UIViewController
11
12 @property (nonatomic, weak) IBOutlet UILabel *questionLabel;
13 @property (nonatomic, weak) IBOutlet UILabel *answerLabel;
14
15 @end
16
17
18 @implementation INIQuizViewController
19
20
21
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```

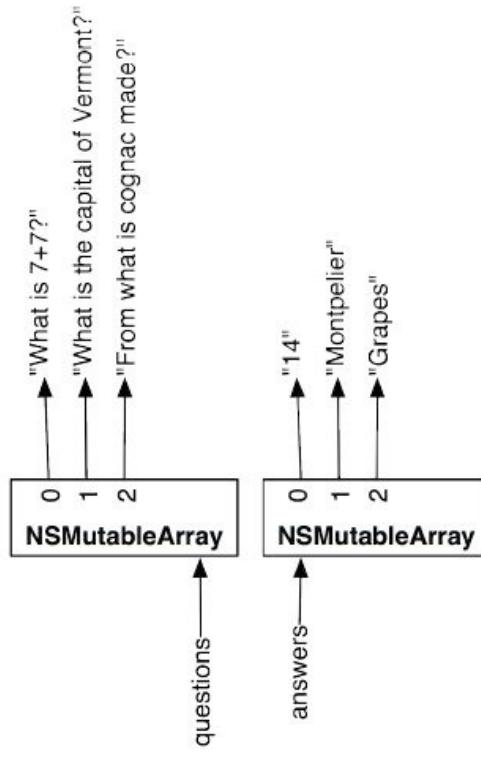
Linking buttons to actions



Creating Model Objects

- The application's Model contains:
 - an array containing the list of the questions,
 - an array containing the list of the corresponding answers, and
 - an index counter to keep track of the number of the question displayed.
- The is model usually kept in its own files, but for the sake of simplicity it is being integrated in the controller files for this application (We should refrain from this in the future).

Diagram of model objects in Quiz



```
1 // INIQuizViewController.m
2 // Quiz
3 //
4 // Created by Ibrahim Imam on 5/4/14.
5 // Copyright (c) 2014 CECS. All rights reserved.
6 //
7 //
8 #import "INIQuizViewController.h"
9
10 @interface INIQuizViewController : UIViewController
11
12 @property (nonatomic) int currentQuestionIndex;
13
14 @property (nonatomic, copy) NSMutableArray *questions;
15 @property (nonatomic, copy) NSMutableArray *answers;
16
17 @property (nonatomic, weak) IBOutlet UILabel *questionLabel;
18 @property (nonatomic, weak) IBOutlet UILabel *answerLabel;
19
20 @end
21
22
23 @implementation INIQuizViewController
24
25 - (IBAction)showQuestion: (id)sender
26 {
27
28 }
29
30 - (IBAction)showAnswer: (id)sender
31 {
32
33 }
34
35 @end
```

Initializing with the nib file

```
A 12 @property (nonatomic) int currentQuestionIndex;
A 13
A 14 @property (nonatomic, copy) NSArray *questions;
A 15 @property (nonatomic, copy) NSArray *answers;
A 16
A 17 @property (nonatomic, weak) IBOutlet UILabel *questionLabel;
A 18 @property (nonatomic, weak) IBOutlet UILabel *answerLabel;
A 19 @property (nonatomic, weak) IBOutlet UILabel *answerLabel;
A 20
A 21 @end
A 22
A 23 @implementation NIQuizViewController
A 24
A 25 - (instancetype)initWithNibName:(NSString *)NibNameOrNil bundle:(NSBundle *)nibBundleOrNil
A 26
A 27 {
A 28 - (IBAction) init
A 29 {
A 30     [self initWithNibName:(NSCoder *)aDecoder
A 31         bundle:(NSBundle *)nibBundleOrNil];
A 32 }
A 33 Returns a newly initialized view controller with the nib file in the specified bundle. More...
A 34 {
A 35 }
A 36 }
A 37 @end
A 38

Y

25 - (instancetype)initWithNibName:(NSString *)NibNameOrNil bundle:(NSBundle *)nibBundleOrNil
26 {
27     self = [super initWithNibName:nibNameOrNil bundle:nibBundleOrNil];
28     if (self) {
29         self.questions = @[@"From what is cognac made?", "
30             @"What is 7 + 7?", "
31             @"What is the capital of Vermont?"];
32
33     self.answers = @[@"Grapes",
34         @"14",
35         @"Montpelier"];
36
37
38     return self;
39 }
```

Implementing Methods

- Add the necessary code to initialize the arrays and the `currentQuestionIndex` to the `viewDidLoad` method in the implementation file `“QuizViewController.m”`.
 - Update the `showQuestion` and `showAnswer` methods as shown to the right.

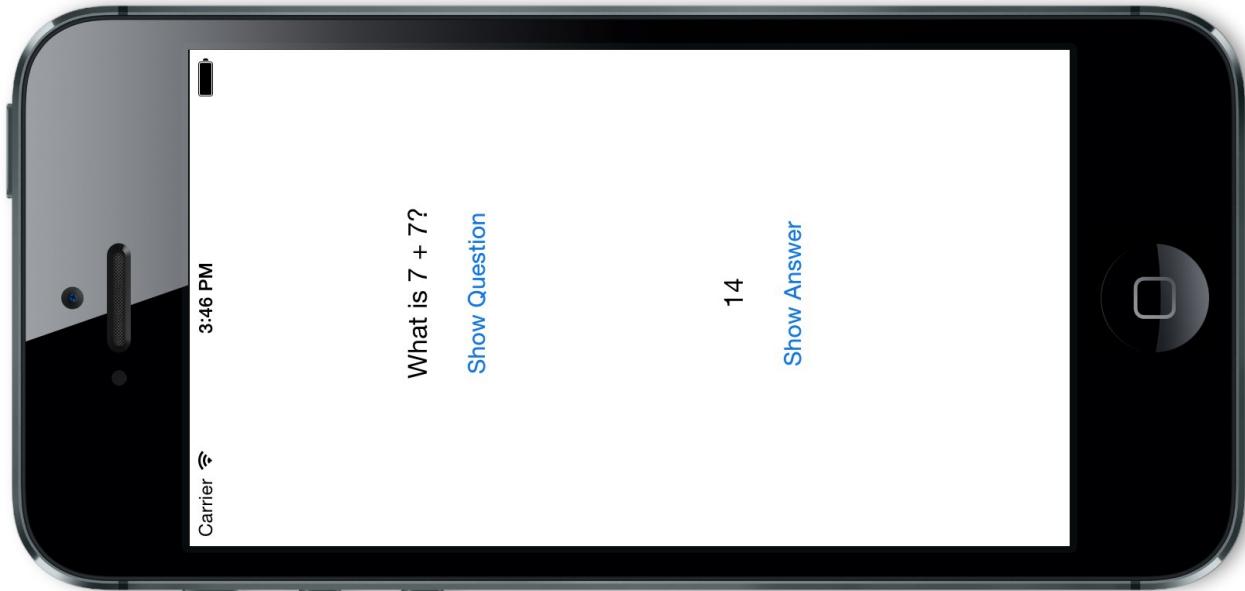
```
37 }  
38 return self;  
39 }  
40 - (IBAction)showQuestion: (id)sender  
41 {  
42 // Step to the next question  
43 self. currentQuestionIndex++;  
44 // Am I past the last question?  
45 if ( self. currentQuestionIndex == [ self. questions count ] )  
46 {  
47 // Go back to the first question  
48 self. currentQuestionIndex = 0; }  
49 // Get the string at that index in the questions array  
50 NSString * question = self. questions[ self. currentQuestionIndex ];  
51 // Display the string in the question label  
52 self. questionLabel. text = question;  
53 // Reset the answer label  
54 self.answerLabel.text = @"????";  
55 }  
56 - (IBAction)showAnswer:(id)sender  
57 {  
58 // What is the answer to the current question?  
59 NSString * answer = self. answers[ self. currentQuestionIndex ];  
60 // Display it in the answer label  
61 self.answerLabel.text = answer;  
62 }  
63 - (IBAction)showAnswer:(id)sender  
64 {  
65 // What is the answer to the current question?  
66 NSString * answer = self. answers[ self. currentQuestionIndex ];  
67 // Display it in the answer label  
68 self.answerLabel.text = answer;  
69 }  
70 @end  
71 }  
72 }  
73 }
```

Getting the view on the screen

```
1 // INIAppDelegate.m
2 // Quiz > Quiz > INIAppDelegate.m > No Selection
3 // Quick Help
4 // Created by Ibrahim Imam on 5/4/14.
5 // Copyright (c) 2014 CECS. All rights reserved.
6 //
7 //
8 #import "INIAppDelegate.h"
9
10 @implementation INIAppDelegate
11
12 - (BOOL)application:(UIApplication *)application didFinishLaunchingWithOptions:(NSDictionary *)launchOptions
13 {
14     self.window = [[UIWindow alloc] initWithFrame:[UIScreen mainScreen] bounds]];
15     // Override point for customization after application launch.
16     self.window.backgroundColor = [UIColor whiteColor];
17     self.window.makeKeyAndVisible;
18
19     return YES;
20 }
21
22 - (void)applicationWillResignActive:(UIApplication *)application
23 {
24     // Sent when the application is about to enter a background state.
25     // This method is called before the application quits the foreground and it begins the transition to the background state.
26     // Use this method to pause ongoing tasks, disable timers, and throttle free background execution. It also prevents the application from休眠.
27 }
28
29 - (void)applicationDidEnterBackground:(UIApplication *)application
30 {
31     // Use this method to release shared application-specific resources, save user data, invalidate timers, and throttle free background execution. It also prevents the application from休眠.
32     // If your application supports background termination, call this method when the system needs to terminate it.
33 }
34
35 - (void)applicationWillResignActive:(UIApplication *)application
36 {
37     // Sent when the application is about to move from active to inactive state because another application is taking over. This method is called before the application quits the foreground and it begins the transition to the background state.
38     // Use this method to pause ongoing tasks, disable timers, and throttle free background execution. It also prevents the application from休眠.
39 }
40
41 - (void)applicationDidEnterBackground:(UIApplication *)application
42 {
43     // Use this method to release shared resources, save user data, invalidate timers, and throttle free background execution. It also prevents the application from休眠.
44 }
45
46 - (void)applicationDidReceiveMemoryWarning:(UIApplication *)application
47 {
48     // Sent when the application is low on memory. This method is called before the application quits the foreground and it begins the transition to the background state.
49     // Use this method to release shared resources, save user data, invalidate timers, and throttle free background execution. It also prevents the application from休眠.
50 }
51
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134 }
```

Override the code to create an instance the quiz window and make it the root

Building and Running on Simulator



- Build and run your application by pressing the “Run” arrow on the top left hand corner.
- The iOS Simulator will open with your application running on the iPhone simulator.

Application Icons and Launch Images

- Navigate Xcode to the “Images.xcassets” as show below,
- Locate the desired application icons and launch images in your file system that drag and drop them in the appropriate place-holder, Xcode will copy them to the application folder/bundle.
- We will discuss deploying your application to your own device later in the semester

