MTD367
iOS App Development
July 2024
ECA

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Question 1

Question 1(a) (10 marks)

ANS:

Correct and Functional Code:

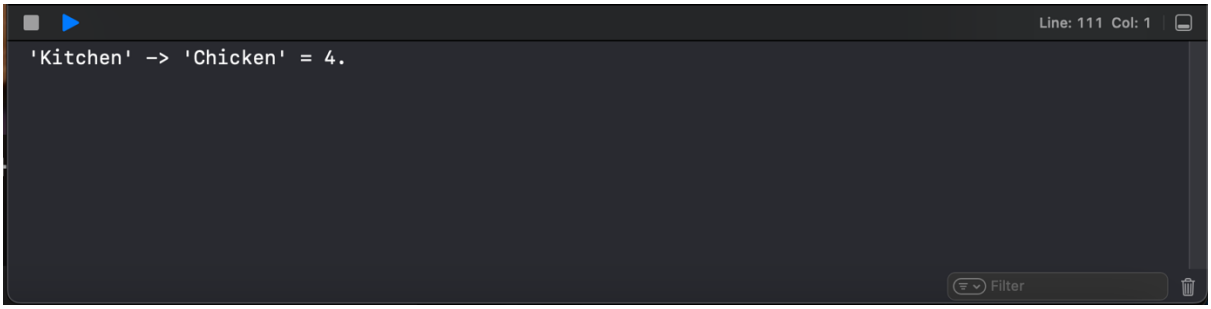
```
import UIKit

// This function calculates the Levenshtein distance between two strings.

// The Levenshtein distance is the minimum number of single-character edits required to change one string into the other.


/*

 This statement was replaced:

 func LDist(_ s1: string, s2.count)


 Corrected function declaration

*/

func LDist(_ s1: String, _ s2: String) -> Int

{

    // Get the lengths of the input strings.

    let (lenS1, lenS2) = (s1.count, s2.count)


    /*

     This statement was replaced:

     let dp = Array(repeating: Array(repeating: 0, count: lenS2 + 1), count: lenS1 + 1)


     Change 'let' to 'var' to make the variable mutable


     Initialize a 2D array to store the minimum edit distances.

    */

    var dp = Array(repeating: Array(repeating: 0, count: lenS2 + 1), count: lenS1 + 1)


    // Iterate over the characters of s1 (including an empty substring at the beginning).

    for i in 0...lenS1

    {
```

```
    // Iterate over the characters of s2 (including an empty substring at the beginning).
    for j in 0...lenS2
    {


        // dp[i][j] represents the Levenshtein distance between the first i characters of s1 and the first j characters of s2.


        if i == 0
        {
            // Initialize first row
            dp[i][j] = j
        }


        else if j == 0
        {
            // Initialize first column
            dp[i][j] = i
        }
        else {
            dp[i][j] = min(
                /*
                 Del
                 Deletion: Delete the last character of s1.
                */
                dp[i - 1][j] + 1,


                /*
                 Ins
                 Insertion: Insert the last character of s2.
                */
                dp[i][j - 1] + 1,


                /*
                 ????
```

```
                    Substitution: If the last characters of s1 and s2 are different, substitute one for the other.
                    */
                    dp[i - 1][j - 1] + (s1[s1.index(
                        s1.startIndex,
                        offsetBy: i - 1
                    )] == s2[s2.index(
                        s2.startIndex,
                        offsetBy: j - 1)] ? 0 : 1)
                )
            }
        }
    }

    /*
     This Statement was replaced:
     --> dp[lenS1][lenS2]

     Added return statement

     Return the Levenshtein distance between the two strings.
    */
    return dp[lenS1][lenS2]
}

// Example Usage
let input1 = "Kitchen"
let input2 = "Chicken"
let output  = LDist(input1, input2)

/*
 This Statement was replaced:

 print('\(input1)' -> '\(input2)' = \(output).")
```

```
 Print the result.
*/
print(" '\(input1)' -> '\(input2)' = \(output).")


// 'Kitchen' -> 'Chicken' = 4
```

Output:



Explanation of Code Corrections:

1. The original function declaration "**func** LDist(_ s1: string, s2.count)" had errors.

   The new function declaration is "**func** LDist(_ s1: String, _ s2: String) -> Int {"

   The parameter "_ s1: string" should instead have been renamed to "(_ s1: String" where the capitalized String is an acceptable Swift data type. The s1 variable represents string variable

   The parameter "s2.count" is incorrect and instead it should be changed to "_ s2: String" where an underscore was added in place of a explicit argument label and String data type was also used so that the s2 variable would become a second string variable.

   An explicit return type "-> Int" was added to the function declaration to indicate that the function must return an integer value which represents the Levenshtein distance.

2. The original array "**let** dp = Array(repeating: Array(repeating: 0, count: lenS2 + 1), count: lenS1 + 1)" was immutable.

   The new array "**var** dp = Array(repeating: Array(repeating: 0, count: lenS2 + 1), count: lenS1 + 1)" is mutable.

The array “dp” was declared with a type “let” which made it a constant that has immutable values assigned to it..

Since the values within the array “dp” needs to be modified in the function, the array should instead be declared with a type of “var” to make it a variable so that mutable values would be assigned to it.

3. The original function did not explicitly provide a return statement and instead returned this statement “--> dp[lenS1][lenS2]” which is incorrect. Since we explicitly require the function to provide a return statement that returns an integer value, I have added this statement “**return** dp[lenS1][lenS2]” to replace the original statement.

4. This is the original print statement “print('\(input1)' -> '\(input2)' = \(output).")”

   This is the updated print statement “print(" '\(input1)' -> '\(input2)' = \(output).")”

   The original print statement is incorrect because the first quotation mark ‘ is incorrectly used and instead it should be replaced with a double quotation mark as seen in the updated print statement.

Clarification of Code Comments:

1. The code comment “Del” for the line “dp[i - 1][j] + 1,” has been corrected to “Deletion: Delete the last character of s1.” which represents the code operation to delete the last element from the first string “s1”.

2. The code comment “Ins” for the line “dp[i][j - 1] + 1,” has been corrected to “Insertion: Insert the last character of s2.” which represents the code operation to insert the last element from the second string “s2” into the first string which is ”s1”

3. The code comment “????” for the line “dp[i - 1][j - 1] + (s1[s1.index(s1.startIndex, offsetBy: i - 1)] == s2[s2.index(s2.startIndex, offsetBy: j - 1)] ? 0 : 1)” has been corrected to “Substitution: If the last characters of s1 and s2 are different, substitute one for the other.”

Question 1(b) (10 marks)

ANS:

Explanation of how the Code works:

The function “LDist” is used to systematically consider single-character edits or code operations such as the insertion, deletion and substitution operations as well as apply dynamic programming to obtain and use results to compute the Levenshtein distance between two strings.

The Levenshtein distance represents the minimum number of single-character edits which refers to the various code operations such as the insertion, deletion and substitution operations that were previously mentioned above.

The Levenshtein distance function has 4 key stages, initialization, base cases, dynamic programming and result.

1st Stage: Initialization

In the initialization stage, the function “LDist” takes 2 strings “s1” and “s2” as parameters and within the function, the tuple “(s1.count, s2.count)” contains the length of both of the string values and stores them into a constant tuple “let (lenS1, lenS2)”.

A 2D array called “dp” is defined as a dynamic programming table that will store the minimum edit distances.

The “dp[i][j]” is the substring that would store the Levenshtein distance between the first element at position “[i]” of the first string “s1” and the first element at position “[j]” of the second string “s2”.

2nd Stage: Base Cases

In the base cases stage, the first two for loops are used to manage the base cases by iterating through the elements of strings “s1” and “s2” to check whether anyone of them are empty.

The statement “**if** i == 0” checks if the string “s1” is empty and if this is true, then the Levenshtein distance would be the length of string “s2” which is referring to “”lenS2”.

The statement “**else if j == 0**” checks if the string ”s2” is empty and if this is true, then the Levenshtein distance would be the length of string “s1” which is referring to “”lenS1”.

3rd Stage: Dynamic Programming

In the dynamic programming stage, for each pair of elements at positions “[i]” and “[j]”, if the elements at the current positions from the 2 string values “s1” and “s2” match, no single-character edits would be required because the Levenshtein distance matches the distance between the substrings that do not have those elements at the positions “[i]” and “[j]”.

If the elements at the positions “[i]” and “[j]’ do not match the 3 minimum number of single-character edits or code operations need to be considered which are the Deletion, Insertion and Substitution operations.

The deletion operation which is represented by the code “dp[i - 1][j] + 1” involves removing the last element from the first substring “s1” and calculating the distance between “s1” and the second substring “s2”.

For the deletion operation, the “dp” array would be increased by 1.

The insertion operation which is represented by the code “dp[i][j - 1] + 1” involves inserting the last element from the second substring “s2” into the substring “s1” and calculating the distance between “s1” and the second substring “s2”.

For the insertion operation, the “dp” array would also be increased by 1.

The substitution operation which is represented by the code “dp[i - 1][j - 1] + (s1[s1.index(s1.startIndex, offsetBy: i - 1)] == s2[s2.index(s2.startIndex, offsetBy: j - 1)] ? 0 : 1)” involves substituting the last element of the first substring “s1” with the last element of the second substring “s2” and calculating the distance the substrings “s1” and “s2”.

For the substitution operation, the “dp” array would also be increased by 1 if the elements are not the same but if they are the same, increase by 0.

The minimum distance from exploring these 3 code operations would be used as the Levenshtein distance for the substring “dp[i][j]”.

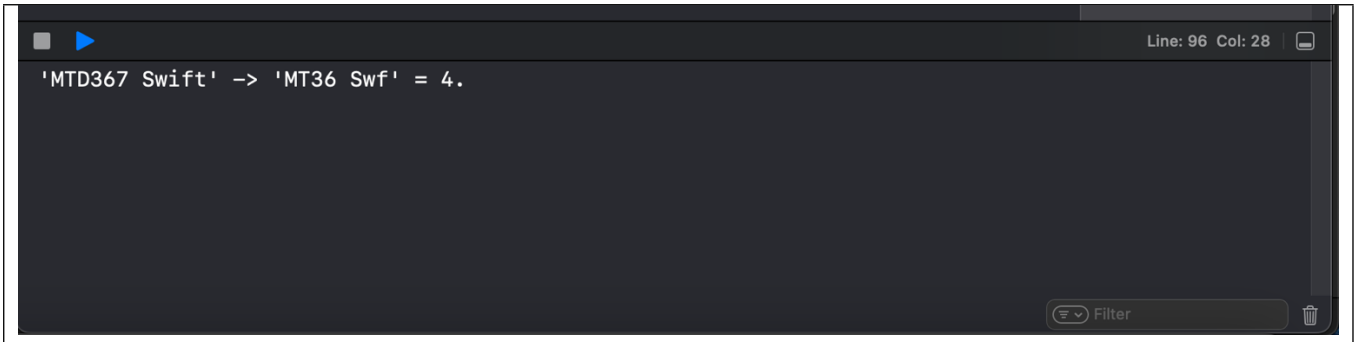
4th Stage: Result

In the result stage, after the for loops have been computed, the function would return the value “dp[lenS1][lenS2]” that would store into the bottom-right corner of the “dp” array the Levenshtein distance between the strings “s1” and “s2”.

Example that gives an output = 4 when one of the two inputs is “MTD367 Swift”:

```
// Example Usage
let input1 = "MTD367 Swift"
let input2 = "MT36 Swf"
let output = LDist(input1, input2)
/*
 This Statement was replaced:
 print('\(input1)' -> '\(input2)' = \(output).")
 Print the result.
*/
print(" '\(input1)' -> '\(input2)' = \(output).")
```

Output:

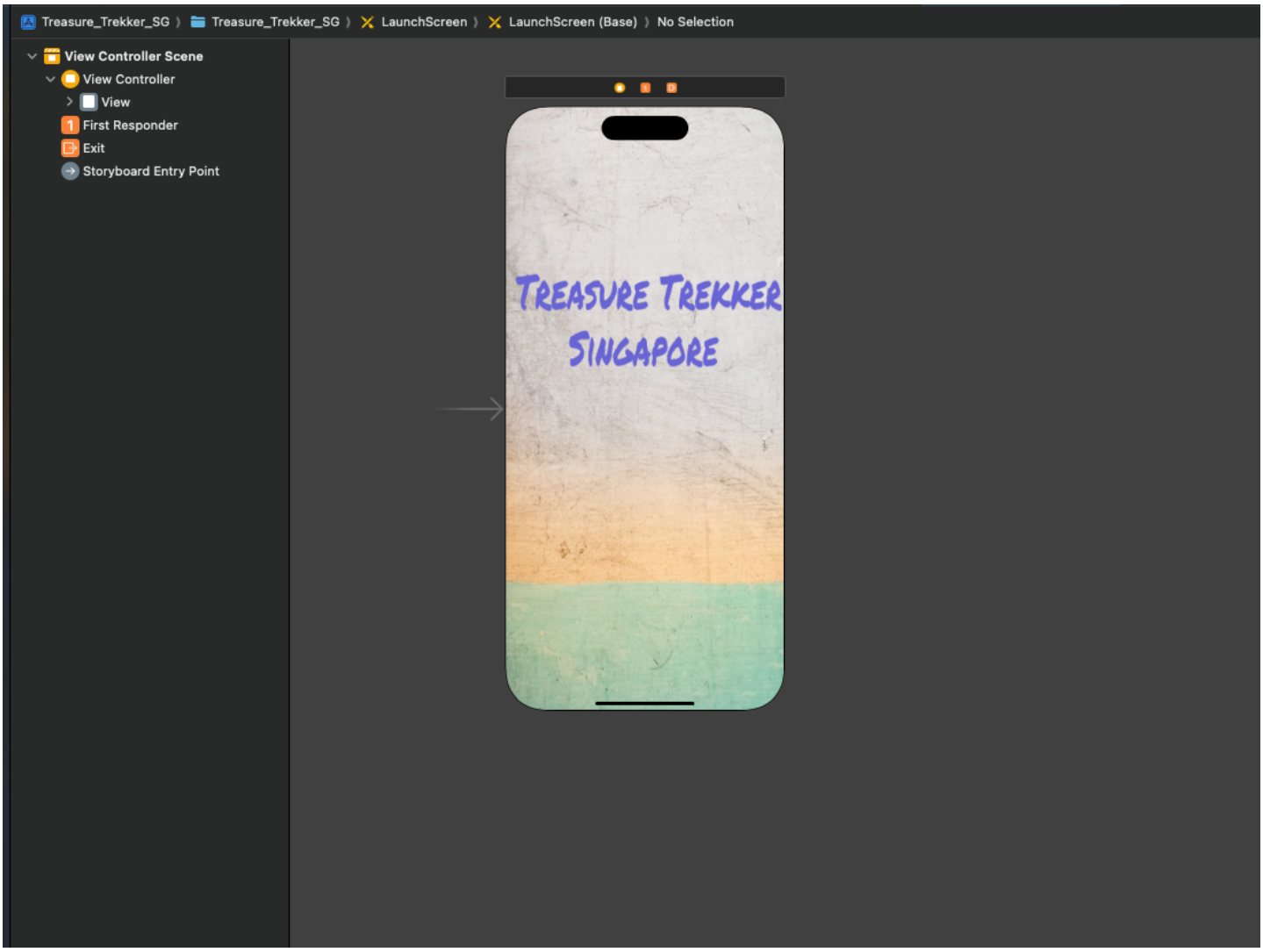

Line: 96 Col: 28
'MTD367 Swift' -> 'MT36 Swf' = 4.
Filter

Question 2

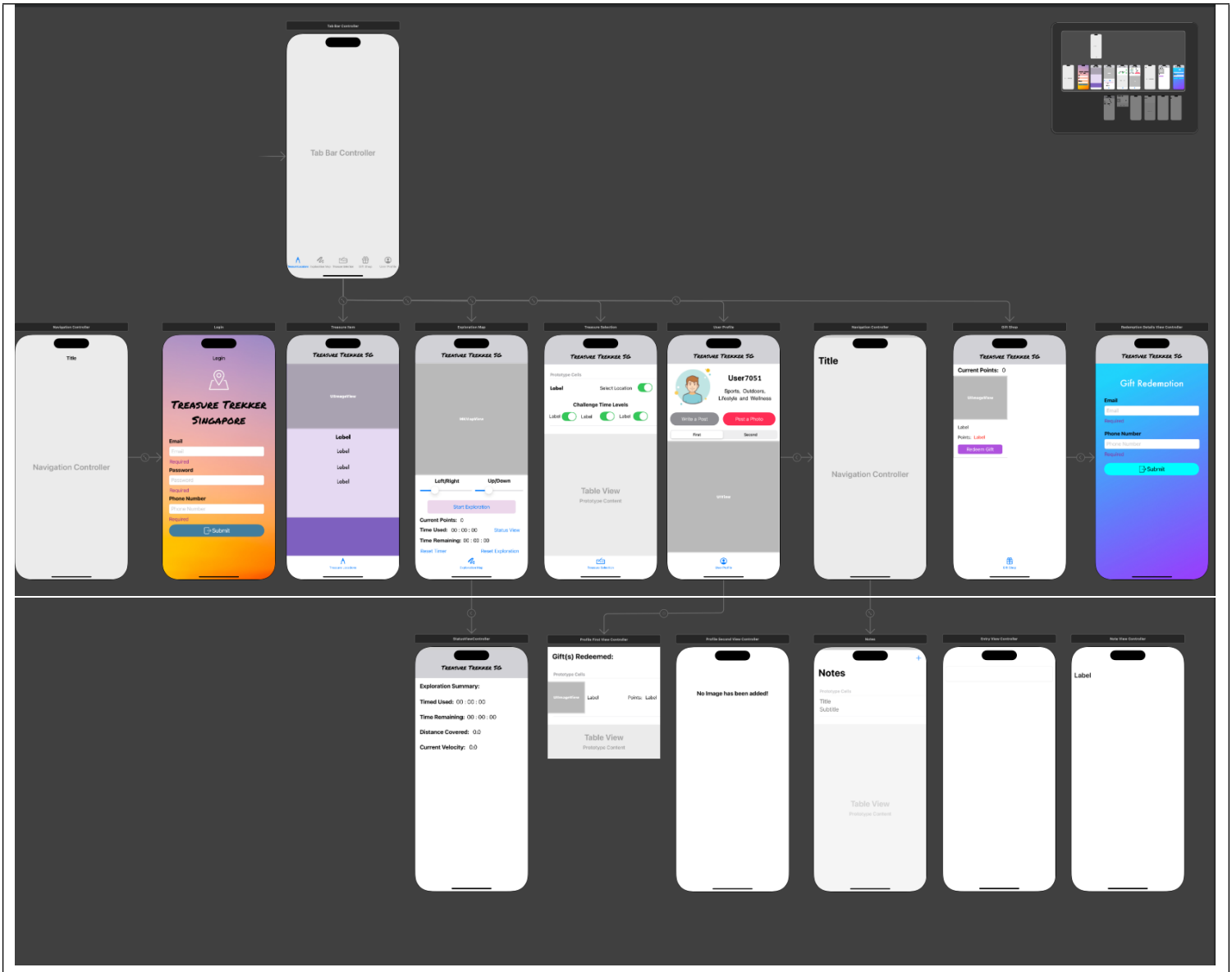
Question 2(a) (15 marks)

ANS:

LaunchScreen:

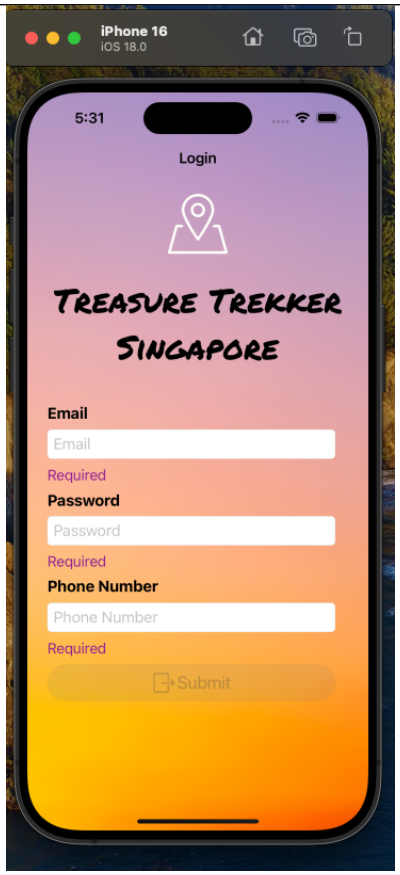


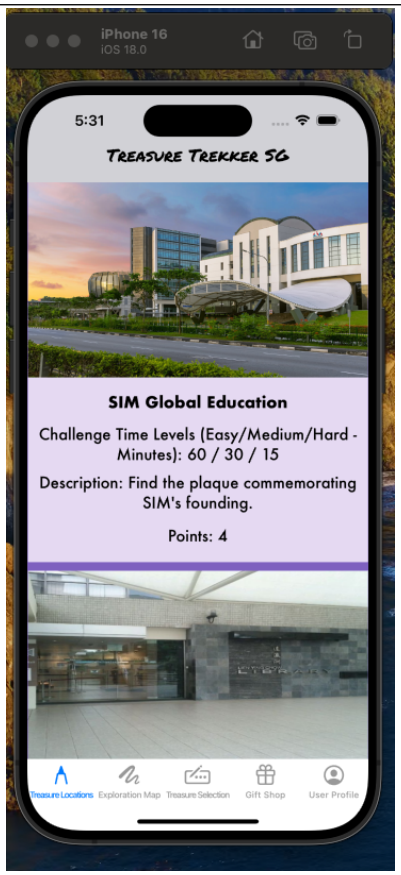
Treasure Trekker Singapore App Workflow in Xcode:

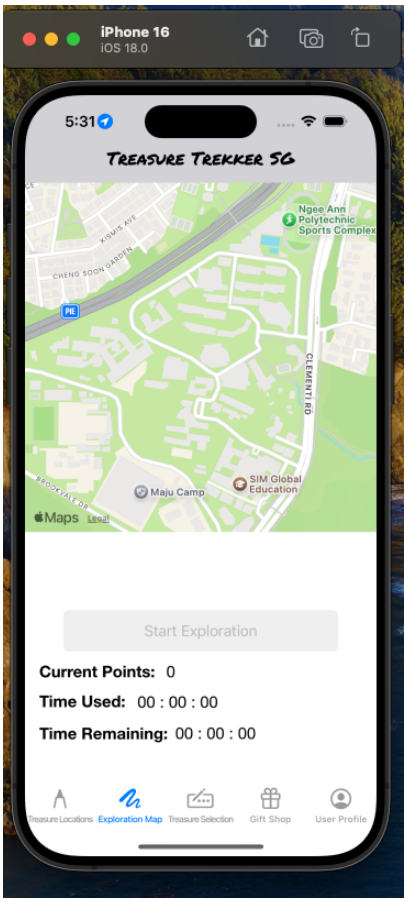


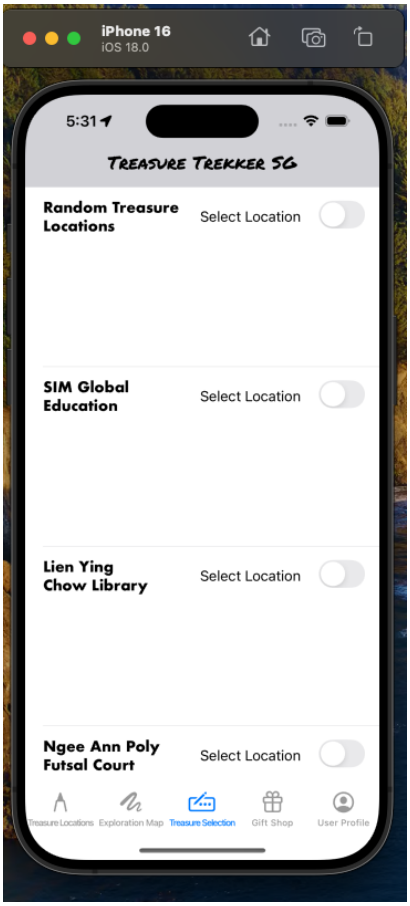
Simulator Flow:

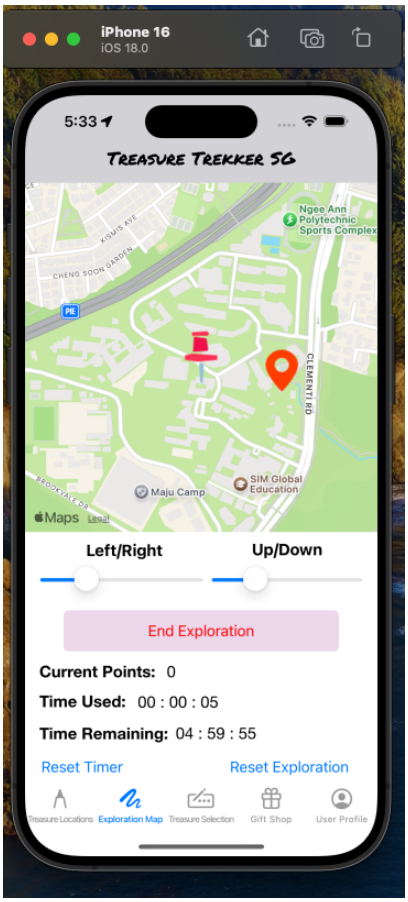

iPhone 16
iOS 18.0
5:30
Treasure Trekker Singapore

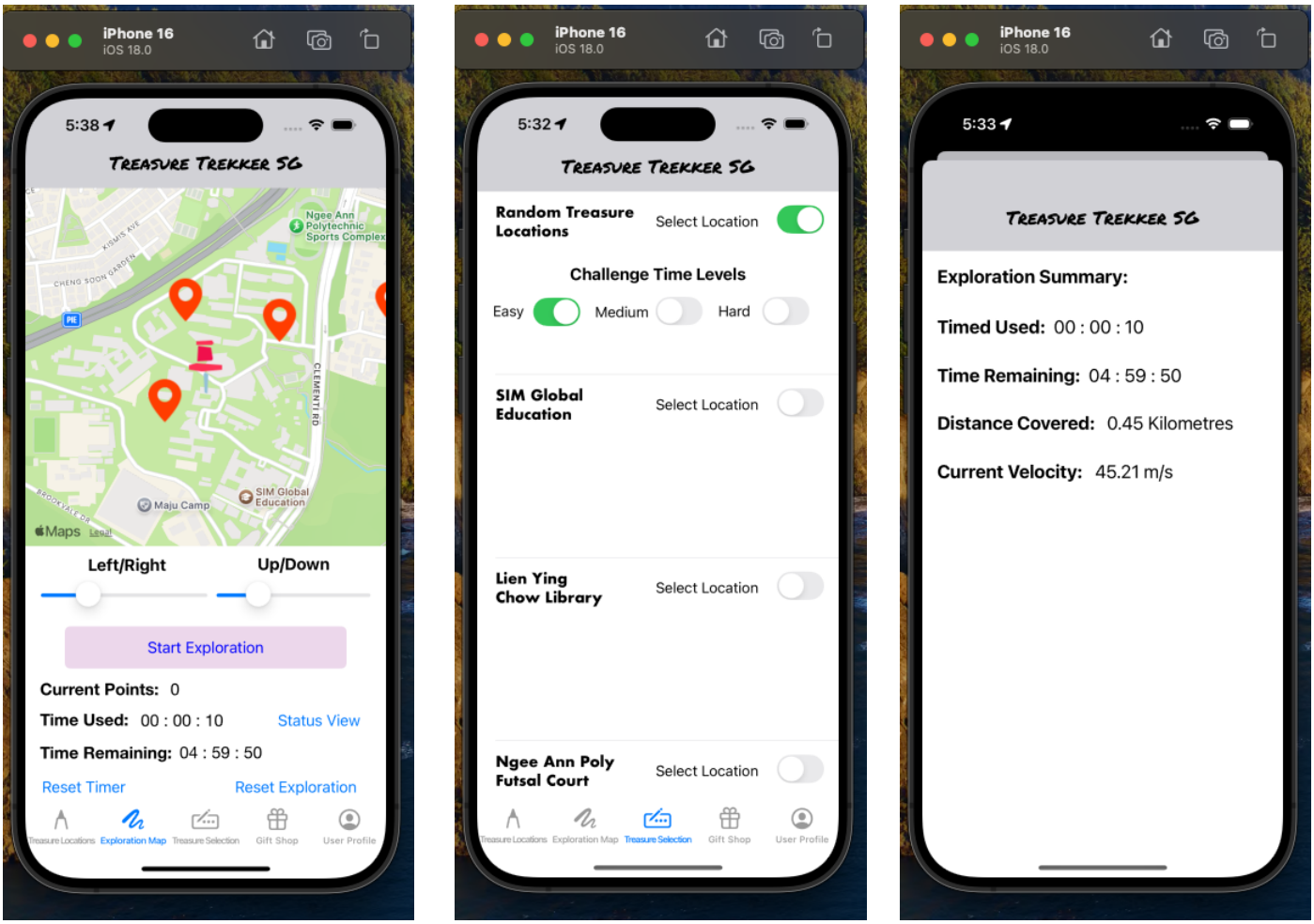

iPhone 16
iOS 18.0
5:31
Login
Treasure Trekker Singapore
Email
Email
Required
Password
Password
Required
Phone Number
Phone Number
Required
Submit

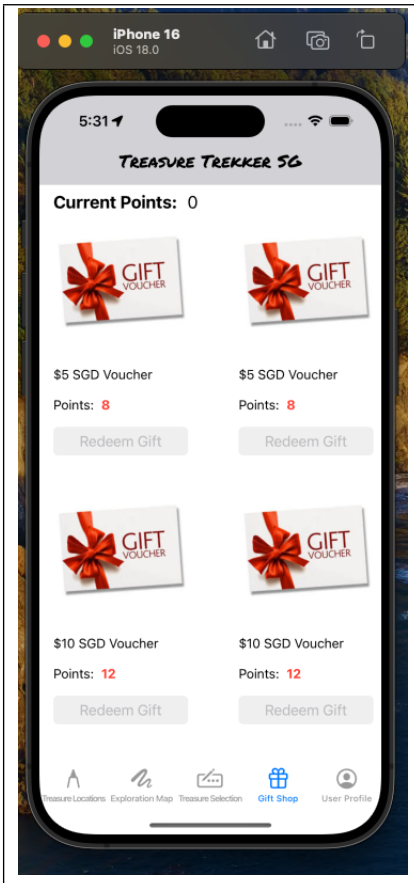

iPhone 16
iOS 18.0
5:31
Treasure Trekker SG
SIM Global Education
Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15
Description: Find the plaque commemorating SIM's founding.
Points: 4
Treasure Locations
Exploration Map
Treasure Selection
Gift Shop
User Profile

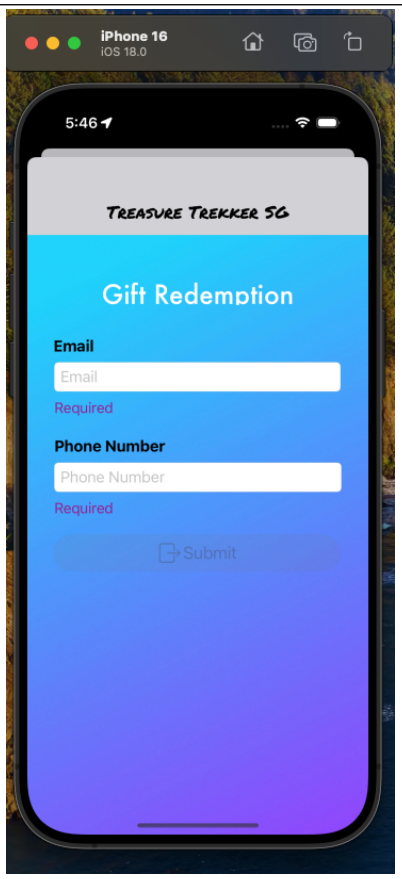

iPhone 16
iOS 18.0
5:31
Treasure Trekker SG
Ngee Ann Polytechnic Sports Complex
Maju Camp
SIM Global Education
Maps
Start Exploration
Current Points: 0
Time Used: 00 : 00 : 00
Time Remaining: 00 : 00 : 00
Treasure Locations
Exploration Map
Treasure Selection
Gift Shop
User Profile

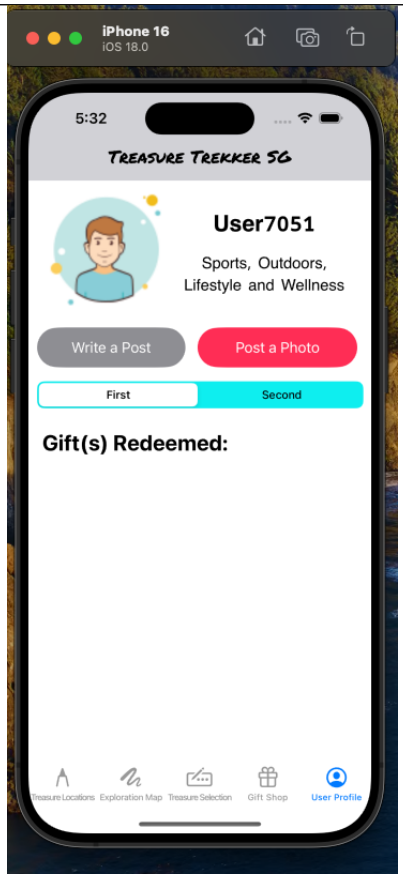

iPhone 16
iOS 18.0
5:31
Treasure Trekker SG
Random Treasure Locations
Select Location
SIM Global Education
Select Location
Lien Ying Chow Library
Select Location
Ngee Ann Poly Futsal Court
Select Location
Treasure Locations
Exploration Map
Treasure Selection
Gift Shop
User Profile

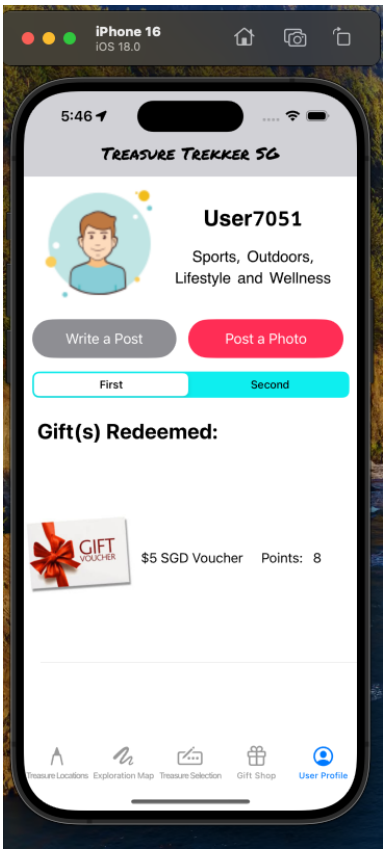

iPhone 16
iOS 18.0
5:33
Treasure Trekker SG
Ngee Ann Polytechnic Sports Complex
Maju Camp
SIM Global Education
Maps
Left/Right
Up/Down
End Exploration
Current Points: 0
Time Used: 00 : 00 : 05
Time Remaining: 04 : 59 : 55
Reset Timer
Reset Exploration
Treasure Locations
Exploration Map
Treasure Selection
Gift Shop
User Profile

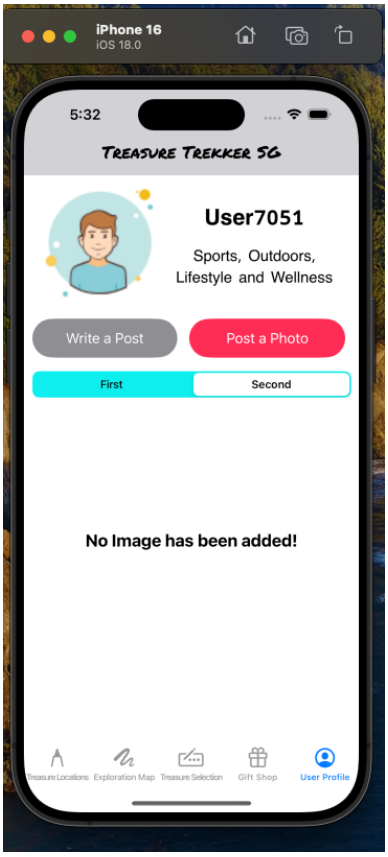

iPhone 16
iOS 18.0
5:38
Treasure Trekker SG
Ngee Ann Polytechnic Sports Complex
Maju Camp
SIM Global Education
Left/Right
Up/Down
Start Exploration
Current Points: 0
Time Used: 00 : 00 : 10
Status View
Time Remaining: 04 : 59 : 50
Reset Timer
Reset Exploration
Treasure Locations
Exploration Map
Treasure Selection
Gift Shop
User Profile
iPhone 16
iOS 18.0
5:32
Treasure Trekker SG
Random Treasure Locations
Select Location
Challenge Time Levels
Easy
Medium
Hard
SIM Global Education
Select Location
Lien Ying Chow Library
Select Location
Ngee Ann Poly Futsal Court
Select Location
Treasure Locations
Exploration Map
Treasure Selection
Gift Shop
User Profile
iPhone 16
iOS 18.0
5:33
Treasure Trekker SG
Exploration Summary:
Timed Used: 00 : 00 : 10
Time Remaining: 04 : 59 : 50
Distance Covered: 0.45 Kilometres
Current Velocity: 45.21 m/s

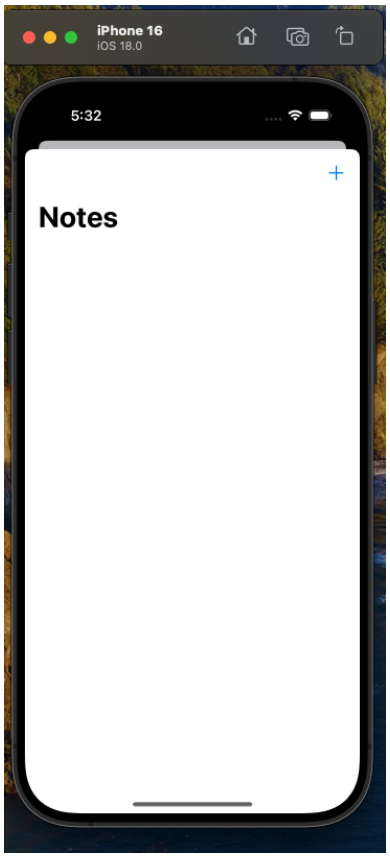

iPhone 16
iOS 18.0
5:31
Treasure Trekker SG
Current Points: 0
$5 SGD Voucher
Points: 8
Redeem Gift
$5 SGD Voucher
Points: 8
Redeem Gift
$10 SGD Voucher
Points: 12
Redeem Gift
$10 SGD Voucher
Points: 12
Redeem Gift
Treasure Locations
Exploration Map
Treasure Selection
Gift Shop
User Profile

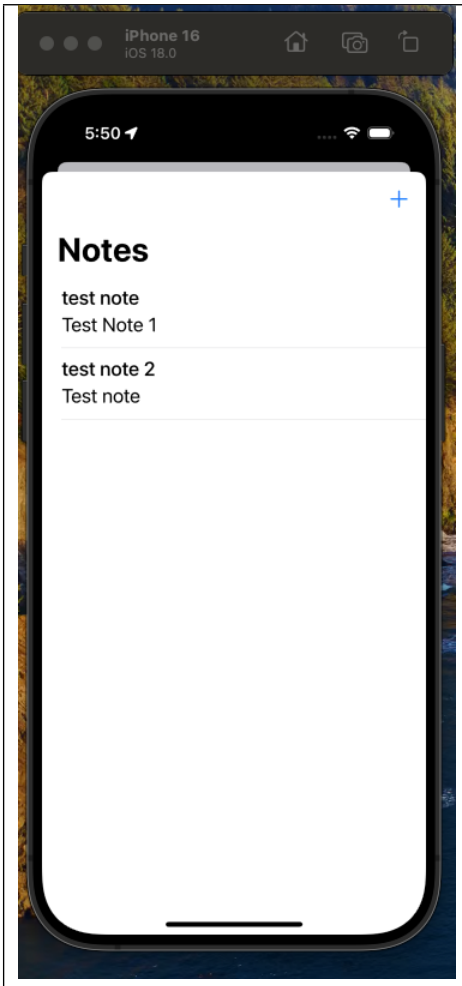

iPhone 16
iOS 18.0
5:46
Treasure Trekker SG
Gift Redemption
Email
Email
Required
Phone Number
Phone Number
Required
Submit

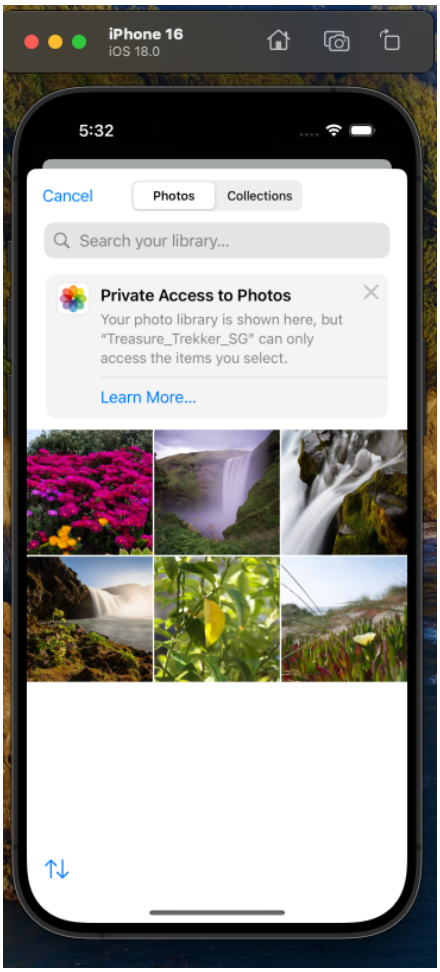

iPhone 16
iOS 18.0
5:32
Treasure Trekker SG
User7051
Sports, Outdoors,
Lifestyle and Wellness
Write a Post
Post a Photo
First
Second
Gift(s) Redeemed:
Treasure Locations
Exploration Map
Treasure Selection
Gift Shop
User Profile

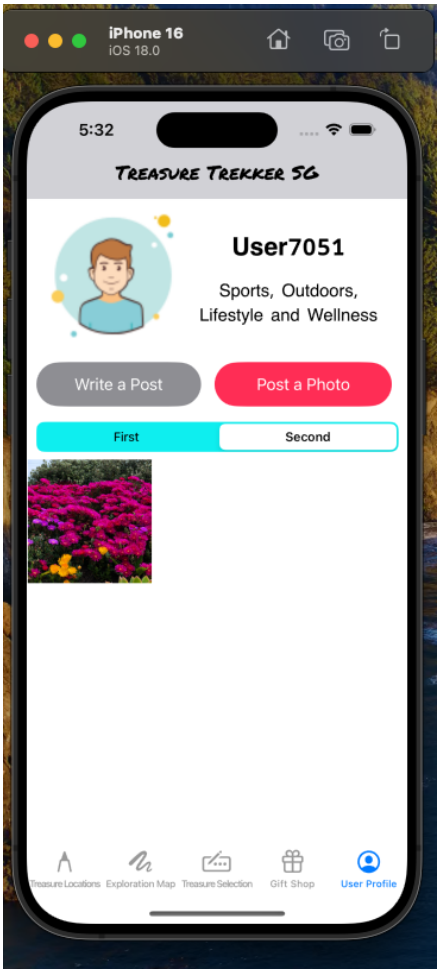

iPhone 16
iOS 18.0
5:46
Treasure Trekker SG
User7051
Sports, Outdoors,
Lifestyle and Wellness
Write a Post
Post a Photo
First
Second
Gift(s) Redeemed:
$5 SGD Voucher
Points: 8
Treasure Locations
Exploration Map
Treasure Selection
Gift Shop
User Profile


iPhone 16
iOS 18.0
5:32
Treasure Trekker SG
User7051
Sports, Outdoors,
Lifestyle and Wellness
Write a Post
Post a Photo
First
Second
No Image has been added!
Treasure Locations
Exploration Map
Treasure Selection
Gift Shop
User Profile


iPhone 16
iOS 18.0
5:32
Notes







Treasure Trekker Singapore App Workflow in Xcode:

1. Overview

The app I designed called Treasure Trekkers Singapore is an app that encourages users explore specific parts of Singapore by using 2 longitudinal and latitude sliders user interface widgets to simulate the effect of walking or running on the map to various locations that identified by pins and when users reach the specified pin locations, users would be granted points that they can use to win attractive prizes.

Users would also have their own profile page where they use the notes feature to write about their experiences about exploring various locations on the map and users would also be able to share photos in the profile view by displaying photos that are taken from the simulator photo gallery.

2. Workflow and Features

- Login Page:
  When users first access the app, they will be greeted by a login page where they can input their email address, password and phone number into several UITextFields. Each input field has text validation for example for the email address, you can only input a valid email address, for the password field it requires 1 uppercase letter, 1 lowercase letter and 1 number, for the phone number field, it requires 8 numbers to be considered a valid phone number. When users have input the correct information, the submit button would be enabled then they would need to swipe right the button.

- Treasure Locations Tab
  After the login page, users would see a Treasure Locations tab which is one of several tabs as of part of a tab bar view controller and in this tab which uses a UICollectionView and UICollectionViewCell, users can view information about the various treasure locations in our app using UIImageView and UILabels such as their image, name, challenge time levels, description and points granted for reaching each of them.

- Treasure Selection Tab
  In the Treasure Selection tab, a UITableView, UITableViewCell and UISwitch is used to allow users to choose either to generate 5 random pins or select specified pins that they can generate can on the map. After a user have selected the pin locations, they would also have to select the corresponding challenge time levels for each pin which are easy, medium and hard which will allocate users with different amounts of time depending on the level of difficulty.

- Exploration Map Tab
  When users select on the Exploration Map tab, they will see the map view that uses the MKMapView that would automatically zoom into an area around SUSS in Singapore and users would notice that the Start Exploration button which uses a UIButton is disabled.

  After users have chosen the treasure locations, in the exploration map tab, they would notice that the button for exploration has been enabled and they would need to double tap the button to start an exploration. When the button is double tap the following actions would be triggered using MKPointAnnotation:

    - If users selected the Random Treasure Locations option, 5 random pins would be displayed on the map view.

    - If users instead selected other specific pins such as SIM Global Education and Lien Ying Chow Library, those pins would be displayed on the map view instead of 5 random pins.

    - When users have chosen either 1 of the 2 options and have double tapped the Start Exploration button, they would notice that another pin called aAnnotation would also appear in the map view and they can use the 2 UISlider widgets just below the map view in the interface to move the aAnnotation pin in longitude and latitude directions to the treasure locations.

    - When users have chosen either 1 of the 2 options and have double tapped the Start Exploration button, they would notice that there would be 2 timers that would immediately start counting, the 1st timer counts the amount of time used and the 2nd timer counts the amount of time remaining for the duration of the exploration.

    - When the aAnnotation pin hits one of the other pins such as SIM Global Education or SIM Lien Ying Chow Library, users would be displayed with an alert message stating that they have reached a treasure location.

- Users would notice that their points would increase by 4 whenever the aAnnotation pin hits a treasure location and users would also notice they can only be granted the points once for each treasure location hit during the duration of the exploration.

- When an exploration has started users would notice that the exploration button text has changed to End Exploration and when the users double tap the button, the exploration would be ended and the 2 timers would stop counting. When the exploration has ended, the exploration button text would also revert to Start Exploration which would allow the user to begin a new exploration.

- During an exploration, if the user does not move the 2 sliders for 1 minute, the user would receive an alert message stating that they have stopped for too long, and they should continue moving.

- During an exploration, if the time remaining reaches the last 10 minutes mark, the user would receive an alert message stating that they only have 10 minutes left to complete the exploration.

- During an exploration, if the time remaining reaches 0, the user would receive an alert message stating that their time is up and the 2 timers would stop counting.

- Status View Page
  When an exploration has ended, the user would notice a button called Status View would appear and when they select the button, the user would be direct to a Status View page where UILabels are used to show statistical data about their exploration such as time used, time remaining, distance covered and current velocity.

- Gift Shop Tab
  When users select on the Gift Shop tab, they will see a catalogue of gifts that uses a UICollectionView and UICollectionViewCell to display information using UIImageView, UILabels and UIButton about gifts such as SGD vouchers, watches, movie tickets and electronic devices and each gift also has a button with the text Redeem Gifts. Each gift contains information such as a gift image, name and points required to redeem the gift.

  When users attain a certain amount of points that matches the points required for a gift in the gift shop, for example if the user has 8 points, the user would be eligible to redeem a $5 SGD Voucher and the button with the text Redeem Gift would be enabled within the UICollectionViewCell.

  After user has returned from the gift redemption details page, the user would notice that their points has been reduced by the amount of points they used to redeem a gift for example if the user had 8 points, after redeeming a gift, their points value would drop to 0 points.

- Gift Redemption Details Page
  When a user selects the Redeem Gift button when it is enabled, the user would be directed to a Gift Redemption page that uses UILabels, UITextFields and a UIButton where the user would have to input their email address and phone number followed by selecting the Submit button. After the user have selected the Submit button, the user would receive a message stating that they have successfully redeemed a gift. The user can now return to the gift shop page.

- User Profile Tab
  When the user selects the User Profile tab, they would notice that the gift that they had redeemed is displayed in the first segment of a UISegmentControl and in a UITableView and UITableViewCell that uses a UIImageView and UILabels to display information such as gift image, name and points required to redeem the gift.

  When the user selects the second segment, they would be greeted by the text that uses a UILabel stating that no image has been added yet, instead users can users can select on the Post a Photo button that uses a UIButton which will trigger a request for access to the simulator photo gallery. In the simulator photo gallery, the user can select on a photo and upload the photo to the 2nd segment within a UICollectionView and UICollectionViewCell. Users may also display multiple images to the 2nd segment UICollectionView.

  When users select on the Write a Post button that uses a UIButton, they would be directed to a notes page.

- Notes Page
  In the notes page that uses a UITableView, UITableViewCell and UILabels, users can select the + button that uses a UIButton and will be directed to another page that uses a UITextField and UITextView where they can input a post title and description followed by selecting the Save button that uses a UIButton to save their post. The user would then be returned to the initial notes page where they can see the record of their post. The notes page can be used by users to publish their experiences about the explorations that they were involved in.

Question 2(b) (65 marks)

ANS:

New functional feature created in our app: A gift redemption summary in our user profile view.

Rationale for Gift Redemption Summary:

Why this feature should be created:

I created this feature because at first when the user selects a gift in the gift shop view and then keys in their email address and phone number in the gift redemption details view, they will then receive an alert message stating that they have successfully redeemed a gift and when they return to the gift shop view their accumulated points would be reduced based on the number of points the user used to redeem their gift.

However subsequently, if users were to forget about their gift redemptions, there would be no way for users to check their gift redemptions and users would not be able to track gift redemptions.

A gift redemption summary in the user profile page would provide users with a record of gifts that users have redeemed with information such as the gift image, name and points used which.

The gift redemption summary can also be used by users to showcase the gifts that they have redeemed to their peers and provide users with further motivation to continue using the app to redeem more gifts reaching more pins on the map and accumulate more points. Therefore, such gift redemption summary would further provide people with greater motivation to participate in outdoor activities such as running or walking to the pins on the map to attain points and redeem attractive prizes.

How this feature can be created:

The gift redemption summary feature applies a struct data structure named “RedeemedGift” to store important data relating to each redeemed gift such as the gift name, image and points required. This data for each redeemed gift is further stored in an array called “ExplorationData” to manage a record of each user gift redemptions.

The gift redemption summary feature makes use of a table view to display its information and in each table cell, a redeemed gift is displayed with relevant information such as their respective gift name, image and points required.

The gift redemption summary feature also makes use of a Swift UI @ObservedObject variable called “explorationData” that is used to program the gift redemption summary table view to automatically update whenever a user redeems a gift from the gift shop view.

The gift redemption summary feature also involves creating an instance called “RedeemedGift” and adding it to an array called “redeemedGifts” in our class called “ExplorationData” each time a user successfully redeems a gift by inputting their email

address and phone number in my gift redemption controller called “RedemptionDetailsViewController”.

1. **EntryViewController Source Code:**

```
import UIKit

class EntryViewController: UIViewController {


    // Outlets for the title input field and the note text view
    @IBOutlet var titleField: UITextField!   // Reference to a UITextField for entering the note's title
    @IBOutlet var noteField: UITextView!     // Reference to a UITextView for entering the note's content


    // Optional closure to be called when the note is saved
    // This will be set by the presenting view controller to handle the saved note data
    public var completion: ((String, String) -> Void)?
//
//    // Called when the view controller's view is loaded into memory
    override func viewDidLoad() {
        super.viewDidLoad()


//        // Make the titleField the first responder, so the keyboard appears automatically
        titleField.becomeFirstResponder()
//
//        // Create a "Save" button on the right side of the navigation bar
//        // When tapped, it will trigger the didTapSave function
        navigationItem.rightBarButtonItem = UIBarButtonItem(title: "Save", style: .done, target: self, action: #selector(didTapSave))
    }


    // Function called when the "Save" button is tapped
    @objc func didTapSave() {
        // Check if there's text in both the titleField and noteField
        if let text = titleField.text, !text.isEmpty, !noteField.text.isEmpty {
            // If so, call the completion handler with the title and note text
            completion?(text, noteField.text)
        }
```

```
        // If either field is empty, do nothing (no saving)
    }
}
```

2. **ExplorationData Class Source Code:**

```
/*
    We'll use a singleton pattern to hold the data that needs to be shared between the two view controllers.

    This singleton will be accessible from anywhere in your app.
*/
import Foundation

// This class uses the singleton pattern to store and manage data shared across the application during an exploration.
class ExplorationData: ObservableObject
{
    // MARK: - Published Properties

    // These properties, when changed, will automatically update any parts of your UI that observe them.

    // The user's current score
    @Published var score: Int = 0

    // An array to store redeemed gifts (assuming you have a RedeemedGift type)
    @Published var redeemedGifts: [RedeemedGift] = []

    // MARK: - Shared Instance

    // This creates a single, shared instance of the ExplorationData class that can be accessed from anywhere in your app.
    static let shared = ExplorationData()

    // MARK: - Properties

    var timeUsed: String = ""
```

```
    var timeRemaining: String = ""

    var distanceCovered: Double = 0

    var currentVelocity: Double = 0

    // MARK: - Private Initializer

    // This private initializer ensures that only one instance of ExplorationData can be created.
    private init() {}
}
```

3. **ExplorationViewController Source Code:**

```
import UIKit

import MapKit

import CoreLocation

// used to create audio video players and play
import AVFoundation

// used for create AV Player View -- acceleration audio, forward...
import AVKit

// If you are using SwiftUI elements
import SwiftUI

class ExplorationViewController: UIViewController, MKMapViewDelegate, TreasureSelectionDelegate {

    // MARK: - Outlets
```

```
@IBOutlet weak var explorationMap: MKMapView!

@IBOutlet weak var explorationBtn: UIButton!

@IBOutlet weak var timeUsedLabel: UILabel!

@IBOutlet weak var resetTimerBtn: UIButton!

@IBOutlet weak var timeRemainingLabel: UILabel!

@IBOutlet weak var resetExplorationBtn: UIButton!

@IBOutlet weak var longSlider: UISlider!

@IBOutlet weak var latSlider: UISlider!

@IBOutlet weak var leftRightLabel: UILabel!

@IBOutlet weak var upDownLabel: UILabel!

@IBOutlet weak var statusViewBtn: UIButton!

@IBOutlet weak var pointsLabel: UILabel!

// MARK: - Properties

// Timer for tracking time used
var timer_one:Timer = Timer()

// Timer for tracking time remaining
var timer_two:Timer = Timer()

// Time used for random treasures (in seconds)
var randomTreasures_timeUsedCount : Int = 0
```

```
// Changed variable name
var randomTreasures_timeRemainingCount : Int = 0

var timerCounting : Bool = false

// Declare the flag
var hasPresentedAlert = false

var treasure_timeUsedCount : Int = 0

var treasure_timeRemainingCount: Int = 0

// Flag for initial start
var initialStart = true

// Location manager and annotations

// Manages location services
let location_man = CLLocationManager()

// An annotation that will be moved
let aAnnotation = MKPointAnnotation()

// An annotation created on long press
var Annotation1 = MKPointAnnotation()

// Used for timing annotation movement
var Timestamp = 0.0

// Add a set to keep track of collided annotations
var collidedAnnotations: Set<MKPointAnnotation> = []

// Inactivity tracking
```

```
var inactivityTimer: Timer?

var inactivityDuration: TimeInterval = 0

// Declare variables to hold URLs for audio and video files
let file_src = Bundle.main.url(forResource: "bensound-rebelsofourownkind", withExtension: "mp3")

// Audio player object
var playerAudio: AVAudioPlayer!

// Distance and score tracking
var previousLocation: CLLocationCoordinate2D?

var totalDistance: Double = 0

var score: Int = 0

override func viewDidLoad() {
    super.viewDidLoad()

    // Map view setup

    view.addSubview(explorationMap)

    explorationMap.frame = view.bounds

    explorationMap.delegate = self

    // Configure location manager for best accuracy and request authorization
    location_man.desiredAccuracy = kCLLocationAccuracyBest

    location_man.requestAlwaysAuthorization()

    // Show the user's location on the map
```

```
        explorationMap.showsUserLocation = true

        // Initially hide all pins
        explorationMap.removeAnnotations(explorationMap.annotations)

        // UI setup

        // Lock the button
        explorationBtn.isEnabled = false

        // Access the Tab Bar Controller and then the TreasureSelectionViewController
        if let tabBarController = self.tabBarController,
           let viewControllers = tabBarController.viewControllers {
            for viewController in viewControllers {
                if let treasureSelectionVC = viewController as? TreasureSelectionViewController {
                    // Set the delegate
                    treasureSelectionVC.delegate = self
                    break
                }
            }

            // Create the double-tap gesture recognizer for the exploration button
            let doubleTap = UITapGestureRecognizer(target: self, action: #selector(explorationBtnDoubleTapped(_:)))

            doubleTap.numberOfTapsRequired = 2

            explorationBtn.addGestureRecognizer(doubleTap)
        }

        // Hide the button initially
        resetExplorationBtn.isHidden = true

        longSlider.isHidden = true
```

```
    latSlider.isHidden = true

    leftRightLabel.isHidden = true
    upDownLabel.isHidden = true

    // Start the inactivity timer
    resetInactivityTimer()

    resetTimerBtn.isHidden = true

    statusViewBtn.isHidden = true

    // Initialize the audio player
    if let path = file_src
    {
        // Try to create an audio player with the provided URL
        playerAudio = try! AVAudioPlayer(contentsOf: path)
    }
    else
    {
        // Print an error message if the audio file is not found
        print("Audio file not found")
    }

    // Prepare the audio player for playback
    playerAudio.prepareToPlay()

    // Print the audio duration to the console (for debugging purposes)
    print(playerAudio.duration)
}

override func viewDidAppear(_ animated: Bool)
{
    // Set up the initial annotation when the view appears
```

```
        aAnnotation.title = "Some where interesting"

        aAnnotation.coordinate = CLLocationCoordinate2D(latitude: 1.3324, longitude: 103.775)

        // Center the map on the annotation
        let regionATMyloc = MKCoordinateRegion(
            center: aAnnotation.coordinate,
            latitudinalMeters: 1000,
            longitudinalMeters: 1000
        )

        explorationMap.setRegion(regionATMyloc, animated: true)
    }

    // MARK: - Slider Actions

    // IBActions for slider value changes
    @IBAction func longChangedS(_ sender: UISlider)
    {
        let newLocation = CLLocationCoordinate2D(latitude: aAnnotation.coordinate.latitude, longitude: 103.775 + Double(sender.value - 0.5) * 0.01)

        totalDistance += calculateDistance(from: aAnnotation.coordinate, to: newLocation)

        aAnnotation.coordinate = newLocation

        previousLocation = newLocation

        // Adjust the annotation's longitude based on the slider value
        aAnnotation.coordinate.longitude = 103.775 + Double(sender.value - 0.5) * 0.01

        // Check for collision after updating longitude
        checkCollision()
```

```
        // Reset the inactivity timer
        resetInactivityTimer()
    }

    @IBAction func latChangedS(_ sender: UISlider)
    {
        let newLocation = CLLocationCoordinate2D(latitude: 1.3324 + Double(sender.value - 0.5) * 0.01, longitude: aAnnotation.coordinate.longitude)

        // Calculate distance
        totalDistance += calculateDistance(from: aAnnotation.coordinate, to: newLocation)

        // Update annotation location
        aAnnotation.coordinate = newLocation

        previousLocation = newLocation

        // Adjust the annotation's latitude based on the slider value
        aAnnotation.coordinate.latitude = 1.3324 + Double(sender.value - 0.5) * 0.01

        // Check for collision after updating latitude
        checkCollision()

        // Reset the inactivity timer
        resetInactivityTimer()
    }

    // MARK: - Inactivity Timer

    func resetInactivityTimer() {
        inactivityTimer?.invalidate()
        inactivityDuration = 0
        inactivityTimer = Timer.scheduledTimer(timeInterval: 1, target: self, selector: #selector(updateInactivityTimer), userInfo: nil, repeats: true)
```

```
}

@objc func updateInactivityTimer() {
    inactivityDuration += 1

    // 60 seconds of inactivity
    if inactivityDuration >= 60 {
        showInactivityAlert()

        // Reset inactivityDuration after showing the alert
        inactivityDuration = 0
    }
}

func showInactivityAlert() {
    // Check if the ExplorationViewController is currently visible
    if self.tabBarController?.selectedViewController == self {
        // Show an alert to the user about inactivity
        let alertStoppedTooLong = UIAlertController(
            title: "Stopped Too Long",
            message: "You have stopped too long, please resume walking.",
            preferredStyle: .alert
        )

        alertStoppedTooLong.addAction(UIAlertAction(title: "Cancel", style: .cancel, handler: { (_) in
            // Do nothing
        }))

        alertStoppedTooLong.addAction(UIAlertAction(title: "Okay", style: .destructive))
        present(alertStoppedTooLong, animated: true)
    }
}

// MARK: - Annotation Movement (Currently Not Used)
```

```
func checkCollision() {
    for annotation in explorationMap.annotations {
        // Skip the aAnnotation itself
        if annotation === aAnnotation { continue }

        // Check if the distance between the two annotations is less than a threshold (e.g., 5 meters)
        let distance = calculateDistance(from: aAnnotation.coordinate, to: annotation.coordinate)

        if distance < 10 {

            // Check if this annotation has already collided
            guard !collidedAnnotations.contains(annotation as! MKPointAnnotation) else { continue }

            // Increment the score
            score += 4

            pointsLabel.text = "\(score)" // Update the pointsLabel

            ExplorationData.shared.score = score // Update the shared score

            // Collision detected! Show the alert
            let alertLocationReached = UIAlertController(
                title: "Reached Treasure Location",
                message: "You have arrived at a Treasure Location",
                preferredStyle: .alert
            )

            alertLocationReached.addAction(UIAlertAction(title: "Cancel", style: .cancel, handler: { (_) in
                //do nothing
            }))

            alertLocationReached.addAction(UIAlertAction(title: "Okay", style: .destructive))
```

```
            present(alertLocationReached, animated: true)

            // Optionally, you can remove the collided annotation or perform other actions here

            // Add the collided annotation to the set
            collidedAnnotations.insert(annotation as! MKPointAnnotation)

            // Exit the loop after finding a collision
            break
        }
    }
}

func calculateDistance(from coordinate1: CLLocationCoordinate2D, to coordinate2: CLLocationCoordinate2D) -> Double
{
    let location1 = CLLocation(latitude: coordinate1.latitude, longitude: coordinate1.longitude)

    let location2 = CLLocation(latitude: coordinate2.latitude, longitude: coordinate2.longitude)

    return location1.distance(from: location2)

    // Distance in meters
}

// 2. Implement the delegate methods
func didUnlockExploration() {
    // Unlock the button
    explorationBtn.isEnabled = true
}

func didLockExploration() {
    // Lock the button
    explorationBtn.isEnabled = false
```

```
    }

    @IBAction func resetTimerTapped(_ sender: UIButton)
    {
        // Reset the initialStart flag when exploration is reset
        initialStart = true

        let alert = UIAlertController(title: "Reset Timer?", message: "Are you sure you would like to reset the Timer?", preferredStyle: .alert)
        alert.addAction(UIAlertAction(title: "Cancel", style: .cancel, handler: { (_) in
            // do nothing
        }))

        alert.addAction(UIAlertAction(title: "Yes", style: .default, handler: { (_) in
            self.randomTreasures_timeUsedCount = 0
            self.timer_one.invalidate()
            self.timeUsedLabel.text = self.makeTimeString(hours: 0, minutes: 0, seconds: 0)
            self.explorationBtn.setTitle("Start Exploration", for: .normal)
            self.explorationBtn.setTitleColor(UIColor.blue, for: .normal)
        }))

        self.present(alert, animated: true, completion: nil)
    }

    @IBAction func resetExplorationTapped(_ sender: Any)
    {
        longSlider.isHidden = true
        latSlider.isHidden = true

        leftRightLabel.isHidden = true
        upDownLabel.isHidden = true


        score = 0 // Reset the score
```

```
        pointsLabel.text = "0" // Update the pointsLabel


        let alert = UIAlertController(title: "Start Exploration?", message: "Are you sure you would like to reset the Exploration?", preferredStyle: .alert)


        alert.addAction(UIAlertAction(title: "Cancel", style: .cancel, handler: { (_) in
            // do nothing
        }))


        alert.addAction(UIAlertAction(title: "Yes", style: .default, handler: { (_) in


            // 1. Reset the map view
            self.explorationMap.removeAnnotations(self.explorationMap.annotations)


            // 2. Reset the explorationBtn
            self.explorationBtn.isEnabled = false
            self.explorationBtn.setTitle("Start Exploration", for: .normal)
            self.explorationBtn.setTitleColor(UIColor.blue, for: .normal)


            // 3. Reset the TimerLabel
            self.randomTreasures_timeUsedCount = 0
            self.timer_one.invalidate()
            self.timeUsedLabel.text = self.makeTimeString(hours: 0, minutes: 0, seconds: 0)


            // 4. Reset the treasure selection switches
            if let tabBarController = self.tabBarController,
               let viewControllers = tabBarController.viewControllers {
                for viewController in viewControllers {
                    if let treasureSelectionVC = viewController as? TreasureSelectionViewController {
                        treasureSelectionVC.resetSwitches() // Call a function to reset switches in TreasureSelectionViewController
                    }
                }
            }
```

```
        // 5. Reset the timeRemainingLabel
        self.timeRemainingLabel.text = self.makeTimeString(hours: 0, minutes: 0, seconds: 0)

        self.resetTimerBtn.isHidden = true

        // Hide the resetExplorationBtn after reset
        self.resetExplorationBtn.isHidden = true
    }))
    self.present(alert, animated: true, completion: nil)

    // Clear the collidedAnnotations set when resetting the exploration
    collidedAnnotations.removeAll()
}

@IBAction func explorationBtnDoubleTapped(_ sender: UIButton)
    {

        totalDistance = 0 // Reset distance when a new exploration starts

        // Add the annotation to the map
        explorationMap.addAnnotation(aAnnotation)

        // Show the resetExplorationBtn when the exploration starts
        longSlider.isHidden = false
        latSlider.isHidden = false

        leftRightLabel.isHidden = false
        upDownLabel.isHidden = false

        resetTimerBtn.isHidden = false

        resetExplorationBtn.isHidden = false
```

```
        // Access the Tab Bar Controller and then the TreasureSelectionViewController
        guard let tabBarController = self.tabBarController,
            let viewControllers = tabBarController.viewControllers else { return }

        for viewController in viewControllers {
           if let treasureSelectionVC = viewController as? TreasureSelectionViewController {

              // Get the selected locations and their difficulty from TreasureSelectionViewController
              let selectedLocations = treasureSelectionVC.selectedLocations

              if selectedLocations.isEmpty {
                 // No location selected, handle this case (e.g., show an alert)
                 return
              }

              // Clear existing pins on the map
              explorationMap.removeAnnotations(explorationMap.annotations)

              if selectedLocations.count == 1 && selectedLocations.keys.contains(0) {

                 // Random location selected
                 _ = treasurelocations[0] // Get the Random Treasure Locations object

                 let difficulty = selectedLocations[0]! // Get the selected difficulty

                 // Set timeRemainingCount only on initial start
                 if initialStart {
                    switch difficulty {
                    case .easy:
//                       randomTreasures_timeRemainingCount = 11 * 60 // 11 minute in seconds

//                       randomTreasures_timeRemainingCount = 1 * 60 // 1 minute in seconds

                      randomTreasures_timeRemainingCount = 5 * 60 * 60 // 5 hours in seconds
```

```
            case .medium:
                randomTreasures_timeRemainingCount = 2 * 60 * 60 + 30 * 60 // 2.5 hours in seconds
            case .hard:
                randomTreasures_timeRemainingCount = 1 * 60 * 60 + 15 * 60 // 1.25 hours in seconds
            }
            initialStart = false // Set the flag to false after initial start
        }

        // Shuffle the treasurelocations array to randomize
        let shuffledLocations = treasurelocations.shuffled()

        // Add only the first 5 pins from the shuffled array
        for i in 0..<5 {
            let location = shuffledLocations[i]
            let pin = MKPointAnnotation()
            pin.coordinate = location.coordinate
            pin.title = location.location
            pin.subtitle = location.description
            explorationMap.addAnnotation(pin)
            explorationMap.addAnnotation(aAnnotation)

        }
    }

    else {
        for (row, difficulty) in selectedLocations
        {
            let location = treasurelocations[row] // Get the TreasureLocation object

            // Add the pin to the map
            let pin = MKPointAnnotation()
            pin.coordinate = location.coordinate
            pin.title = location.location
```

```
                    pin.subtitle = location.description
                    explorationMap.addAnnotation(pin)
                    explorationMap.addAnnotation(aAnnotation)

                    // Set timeRemainingCount only on initial start
                    if initialStart {
                        switch difficulty {
                        case .easy:

//                          randomTreasures_timeRemainingCount = 1 * 60 // 1 minute
//                          randomTreasures_timeRemainingCount = 11 * 60 // 11 minute

                            randomTreasures_timeRemainingCount = 1 * 60 * 60 // 5 hours in seconds

                        case .medium:
                            randomTreasures_timeRemainingCount = 30 * 60 // 30 minutes in seconds
                        case .hard:
                            randomTreasures_timeRemainingCount = 15 * 60 // 15 minutes in seconds
                        }

                        // Set the flag to false after initial start
                        initialStart = false
                    }
                }
            }

            break
        }
    }

    if(timerCounting)
    {
        timerCounting = false
```

```
            timer_one.invalidate()
            timer_two.invalidate()

            explorationBtn.setTitle("Start Exploration", for: .normal)
            explorationBtn.setTitleColor(UIColor.blue, for: .normal)

            // Stop playing the audio
            playerAudio.stop()

            statusViewBtn.isHidden = false
        }
        else
        {
            timerCounting = true
            explorationBtn.setTitle("End Exploration", for: .normal)
            explorationBtn.setTitleColor(UIColor.red, for: .normal)

            // Initialize timers here
            timer_one = Timer.scheduledTimer(timeInterval: 1, target: self, selector: #selector(timerCounter), userInfo: nil, repeats: true)
            timer_two = Timer.scheduledTimer(timeInterval: 1, target: self, selector: #selector(timeRemainingCounter), userInfo: nil, repeats: true)

            // Start playing the audio from the beginning
            playerAudio.currentTime = 0
            playerAudio.play()
        }
    }

    // Map
    func mapView(_ mapView: MKMapView, viewFor annotation: MKAnnotation) -> MKAnnotationView?
    {
        guard annotation is MKPointAnnotation else { return nil }
```

```
    var annotationView = explorationMap.dequeueReusableAnnotationView(withIdentifier: "custom")

    if annotationView == nil {
        // Create the view
        annotationView = MKAnnotationView(
            annotation: annotation,
            reuseIdentifier: "custom"
        )
        annotationView!.rightCalloutAccessoryView = UIButton(type: .infoDark)
        annotationView?.canShowCallout = true

        annotationView?.calloutOffset = CGPoint(x: -10, y: -10)
    }
    else {
        // Reuse the annotation view
        annotationView?.annotation = annotation
    }

    // Set the hand-drawn pin image for aAnnotation
    if annotation === aAnnotation {
        annotationView?.image = UIImage(named: "icons8-pin-80")

    } else {
        annotationView?.image = UIImage(named: "icons8-pin-48") // For other annotations

    }

    return annotationView
}

// Handle annotation selection
func mapView(_ mapView: MKMapView, didSelect view: MKAnnotationView)
{
    if let annoteTitle = view.annotation?.title
```

```
        {
            print("tapped on:", annoteTitle!)
        }
    }

    // Handle taps on the callout accessory
    func mapView(_ mapView: MKMapView, annotationView view: MKAnnotationView, calloutAccessoryControlTapped control: UIControl)
    {
        let alertWin = UIAlertController(
            title: "Treasure Location",
            message: "There is hidden treasure here.",
            preferredStyle: .alert
        )

        alertWin.addAction(UIAlertAction(title: "Cancel", style: .cancel, handler: { (_) in
            //do nothing
        }))

        alertWin.addAction(UIAlertAction(
            title: "Okay",
            style: .destructive
        )
        )
        present(alertWin, animated: true)
    }

    @objc func timerCounter() -> Void
    {
        randomTreasures_timeUsedCount = randomTreasures_timeUsedCount + 1
        let time = secondsToHoursMinutesSeconds(seconds: randomTreasures_timeUsedCount)
        let timeString = makeTimeString(hours: time.0, minutes: time.1, seconds: time.2)
        timeUsedLabel.text = timeString
```

```
        // Update the shared data
        ExplorationData.shared.timeUsed = timeString

        ExplorationData.shared.distanceCovered = totalDistance




        // Calculate velocity in meters per second
        let velocity = randomTreasures_timeUsedCount > 0 ? totalDistance / Double(randomTreasures_timeUsedCount) : 0

        ExplorationData.shared.currentVelocity = velocity

    }

    func secondsToHoursMinutesSeconds(seconds: Int) -> (Int, Int, Int)
    {
        return ((seconds / 3600), ((seconds % 3600) / 60),((seconds % 3600) % 60))
    }

    func makeTimeString(hours: Int, minutes: Int, seconds : Int) -> String
    {
        var timeString = ""
        timeString += String(format: "%02d", hours)
        timeString += " : "
        timeString += String(format: "%02d", minutes)
        timeString += " : "
        timeString += String(format: "%02d", seconds)
        return timeString
    }

    @objc func timeRemainingCounter() -> Void
    {
```

```
    if randomTreasures_timeRemainingCount > 0 {
        randomTreasures_timeRemainingCount -= 1
        let time = secondsToHoursMinutesSeconds(seconds: randomTreasures_timeRemainingCount)
        let timeString = makeTimeString(hours: time.0, minutes: time.1, seconds: time.2)
        timeRemainingLabel.text = timeString

        // Update the shared data
        ExplorationData.shared.timeRemaining = timeString
    }

    if treasure_timeRemainingCount > 0 {
        treasure_timeRemainingCount -= 1
        let time = secondsToHoursMinutesSeconds(seconds: treasure_timeRemainingCount)
        let timeString = makeTimeString(hours: time.0, minutes: time.1, seconds: time.2)
        timeRemainingLabel.text = timeString

        // Update the shared data
        ExplorationData.shared.timeRemaining = timeString
    }



    // Check for 10 minutes remaining
    if randomTreasures_timeRemainingCount == 10 * 60 && !hasPresentedAlert {
        hasPresentedAlert = true
        let alertExplorationEnd = UIAlertController(
            title: "10 minutes left",
            message: "You have 10 minutes left, please complete your exploration.",
            preferredStyle: .alert
        )
        alertExplorationEnd.addAction(UIAlertAction(title: "Cancel", style: .cancel, handler: { (_) in
            // Do nothing
        }))
        alertExplorationEnd.addAction(UIAlertAction(title: "Okay", style: .destructive))
        present(alertExplorationEnd, animated: true)
```

```
        }

        if randomTreasures_timeRemainingCount == 0 {
            timer_two.invalidate()
            // Use a boolean flag to track if the alert has been presented
            if !hasPresentedAlert { // Check the flag
                hasPresentedAlert = true // Set the flag to true
                // Show the alert when timeRemainingLabel reaches 0
                let alertExplorationEnd = UIAlertController(
                    title: "Times Up",
                    message: "Your allotted time has ended.",
                    preferredStyle: .alert
                )

                alertExplorationEnd.addAction(UIAlertAction(title: "Cancel", style: .cancel, handler: { (_) in
                    // Do nothing
                }))

                alertExplorationEnd.addAction(UIAlertAction(title: "Okay", style: .destructive))
                present(alertExplorationEnd, animated: true)
            }
        }
    }
}
```

4. **GiftRedeemedTableViewCell Class Source Code:**

```
import UIKit

// This class defines a custom table view cell to display information about redeemed gifts.
class GiftRedeemdTableViewCell: UITableViewCell {

    // MARK: - Outlets
```

```
    @IBOutlet weak var iconImageView: UIImageView!

    @IBOutlet weak var gift_redeemed: UILabel!

    @IBOutlet weak var points_required: UILabel!
}
```

5. **Gifts Swift File Source Code:**

```
import UIKit

// Defines a structure to hold information about each gift
struct Gift {
    let title: String
    let points_needed: Int
    let image: UIImage
    // Add imageName property
    let imageName: String
}

// Creates an array of Gift objects, each representing a different gift in the gift shop
let gifts: [Gift] = [
    Gift(title: "$5 SGD Voucher", points_needed: 8, image:  imageLiteral(resourceName: "gift voucher"), imageName: "gift voucher"),

    Gift(title: "$5 SGD Voucher", points_needed: 8, image:  imageLiteral(resourceName: "gift voucher"), imageName: "gift voucher"),

    Gift(title: "$10 SGD Voucher", points_needed: 12, image:  imageLiteral(resourceName: "gift voucher"), imageName: "gift voucher"),

    Gift(title: "$10 SGD Voucher", points_needed: 12, image:  imageLiteral(resourceName: "gift voucher"), imageName: "gift voucher"),

    Gift(title: "$20 SGD Voucher", points_needed: 16, image:  imageLiteral(resourceName: "gift voucher"), imageName: "gift voucher"),
```

Gift(title: "$20 SGD Voucher", points_needed: 16, image: imageLiteral(resourceName: "gift voucher"), imageName: "gift voucher"),

Gift(title: "Creative Zen Air DOT", points_needed: 20, image: imageLiteral(resourceName: "Creative Zen Air DOT"), imageName: "Creative Zen Air DOT"),

Gift(title: "Cyxus Aviator Polarized Sunglasses", points_needed: 24, image: imageLiteral(resourceName: "Cyxus Aviator Polarized Sunglasses"), imageName: "Creative Live Cam Sync 1080p V2"),

Gift(title: "2 GV Tickets for Transformers One", points_needed: 20, image: imageLiteral(resourceName: "2 GV Tickets for Transformers One"), imageName: "2 GV Tickets for Transformers One"),

Gift(title: "Creative Live Cam Sync 1080p V2", points_needed: 24, image: imageLiteral(resourceName: "Creative Live Cam Sync 1080p V2"), imageName: "Creative Live Cam Sync 1080p V2"),

Gift(title: "Casio Sports Watch F91W-1D", points_needed: 16, image: imageLiteral(resourceName: "Casio Digital Watch F91W-1D"), imageName: "Casio Digital Watch F91W-1D")

]

6. **GiftsCollectionViewCell Class Source Code:**

```
import UIKit

class GiftsCollectionViewCell: UICollectionViewCell {

    // MARK: - Outlets

    @IBOutlet weak var giftImageView: UIImageView!

    @IBOutlet weak var giftTitleLabel: UILabel!

    @IBOutlet weak var giftPriceLabel: UILabel!

    @IBOutlet weak var giftBtn: UIButton!
```

```
// MARK: - Properties

var currentPoints: Int = 0

// Reference to the RedemptionDetailsViewController
var redemptionVC: RedemptionDetailsViewController!

// Stores the index path of the cell
var indexPath: IndexPath!

// MARK: - Setup Function

func setup(with gift: Gift) {
    giftImageView.image = gift.image

    giftTitleLabel.text = gift.title

    giftPriceLabel.text = "\(gift.points_needed)"

    // Enable/disable the redeem button based on whether the user has enough points
    giftBtn.isEnabled = currentPoints >= gift.points_needed
}

// MARK: - Actions

@IBAction func giftBtnTapped(_ sender: UIButton)
{
    print("Redeem Gift Button Tapped")

    // Set the selected gift in the redemptionVC
    redemptionVC.selectedGift = gifts[indexPath.row]

    // In GiftsCollectionViewCell, in the giftBtnTapped method, set the delegate of redemptionVC to the GiftShopViewController instance:
```

```
        redemptionVC.delegate = self.window?.rootViewController as? GiftShopViewController

        // Present the redemptionVC modally
        self.window?.rootViewController?.present(redemptionVC, animated: true, completion: nil)
    }
}
```

7. GiftShopViewController Source Code:

```
import UIKit

// This view controller manages the gift shop where users can redeem gifts using their points.
class GiftShopViewController: UIViewController {

    // MARK: - Outlets

    @IBOutlet weak var currentPointsLabel: UILabel!

    @IBOutlet weak var giftCollectionView: UICollectionView!

    // MARK: - View Lifecycle

    override func viewDidLoad() {
        super.viewDidLoad()

        // Display the initial score from ExplorationData
        currentPointsLabel.text = "\(ExplorationData.shared.score)"

        // Set up the collection view
        giftCollectionView.dataSource = self
        giftCollectionView.delegate = self
        giftCollectionView.collectionViewLayout = UICollectionViewFlowLayout()
    }
```

```
    override func viewWillAppear(_ animated: Bool) {
        super.viewWillAppear(animated)

        // Update the score label with the latest value from ExplorationData
        currentPointsLabel.text = "\(ExplorationData.shared.score)"

        // Refresh the collection view to update button states (enable/disable based on points)
        giftCollectionView.reloadData()
    }
}

// MARK: - UICollectionViewDataSource

extension GiftShopViewController: UICollectionViewDataSource {

    // Returns the number of gifts to display in the collection view
    func collectionView(_ collectionView: UICollectionView, numberOfItemsInSection section: Int) -> Int {
        return gifts.count
    }

    // Configures and returns a cell to display in the collection view
    func collectionView(_ collectionView: UICollectionView, cellForItemAt indexPath: IndexPath) -> UICollectionViewCell {

        let cell = collectionView.dequeueReusableCell(withReuseIdentifier: "GiftsCollectionViewCell", for: indexPath) as! GiftsCollectionViewCell

        // Configure the cell with gift data
        cell.setup(with: gifts[indexPath.row])

        // Provide the current points to the cell
        cell.currentPoints = ExplorationData.shared.score

        // Instantiate RedemptionDetailsViewController
```

```
        let redemptionVC = self.storyboard!.instantiateViewController(withIdentifier: "RedemptionDetailsViewController") as! RedemptionDetailsViewController

        // Set the redemptionVC property of the cell
        cell.redemptionVC = redemptionVC

        // Set the indexPath property of the cell
        cell.indexPath = indexPath

        return cell
    }
}

// MARK: - UICollectionViewDelegateFlowLayout

extension GiftShopViewController: UICollectionViewDelegateFlowLayout {

    // Defines the size of each item (gift cell) in the collection view
    func collectionView(_ collectionView: UICollectionView, layout collectionViewLayout: UICollectionViewLayout, sizeForItemAt indexPath: IndexPath) -> CGSize {
        return CGSize(width: 180, height: 300)
    }
}

// MARK: - UICollectionViewDelegate

extension GiftShopViewController: UICollectionViewDelegate {

    // Called when an item (gift cell) in the collection view is selected
    func collectionView(_ collectionView: UICollectionView, didSelectItemAt indexPath: IndexPath) {
        print(gifts[indexPath.row].title)
    }
}
```

```
// MARK: - RedemptionDelegate

// Make GiftShopViewController conform to the RedemptionDelegate protocol:
extension GiftShopViewController: RedemptionDelegate {

    func didRedeemGift() {
        // Update the points label and refresh the collection view after a gift is redeemed
        currentPointsLabel.text = "\(ExplorationData.shared.score)"
        giftCollectionView.reloadData()
    }
}
```

8. LoginViewController Source Code:

```
import UIKit

class LoginViewController: UIViewController
{
    // MARK: - Outlets
    // These connect to UI elements in your Storyboard

    @IBOutlet weak var emailTF: UITextField!

    @IBOutlet weak var passwordTF: UITextField!

    @IBOutlet weak var phoneTF: UITextField!

    @IBOutlet weak var emailError: UILabel!

    @IBOutlet weak var passwordError: UILabel!

    @IBOutlet weak var phoneError: UILabel!

    @IBOutlet weak var submitButton: UIButton!
```

```
// MARK: - View Lifecycle

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

    // Create the swipe gesture recognizer
    let swipeRight = UISwipeGestureRecognizer(target: self, action: #selector(submitButtonSwiped(_:)))
    swipeRight.direction = .right // Set the desired swipe direction
    submitButton.addGestureRecognizer(swipeRight)

    // Reset the form to its initial state
    resetForm()
}

// MARK: - Actions
// These functions are called when the corresponding UI elements are interacted with

@IBAction func emailChanged(_ sender: UITextField)
{
    if let email = emailTF.text
    {
        // Validate the email address
        if let errorMessage = invalidEmail(email)
        {
            emailError.text = errorMessage
            emailError.isHidden = false
        }
        else
        {
            emailError.isHidden = true
        }
    }
```

```
    // Check if the form is valid
    checkForValidForm()
}


@IBAction func passwordChanged(_ sender: UITextField)
{
    if let password = passwordTF.text
    {
        if let errorMessage = invalidPassword(password)
        {
            passwordError.text = errorMessage
            passwordError.isHidden = false
        }
        else
        {
            passwordError.isHidden = true
        }
    }

    // Check if the form is valid
    checkForValidForm()
}


@IBAction func phoneChanged(_ sender: UITextField)
{
    if let phoneNumber = phoneTF.text
    {
        // Validate the phone number
        if let errorMessage = invalidPhoneNumber(phoneNumber)
        {
            phoneError.text = errorMessage
```

```
            phoneError.isHidden = false
        }
        else
        {
            phoneError.isHidden = true
        }
    }

    // Check if the form is valid
    checkForValidForm()
}

// This function is called when the submit button is swiped right
@IBAction func submitButtonSwiped(_ sender: Any)
{
    // MARK - Using Story board

    // Instantiate the TabBarController from the storyboard
    let storyboard = self.storyboard?.instantiateViewController(withIdentifier: "TabBarController") as! UITabBarController

    // Push the TabBarController onto the navigation stack
    self.navigationController?.pushViewController(storyboard, animated: true)

    // Reset the form to its initial state
    resetForm()
}

// MARK: - Helper Functions
// These functions perform specific tasks within the view controller

// Resets the form to its initial state
func resetForm()
{
```

```
    submitButton.isEnabled = false

    emailError.isHidden = false
    phoneError.isHidden = false
    passwordError.isHidden = false

    emailError.text = "Required"
    phoneError.text = "Required"
    passwordError.text = "Required"

    emailTF.text = ""
    passwordTF.text = ""
    phoneTF.text = ""
}

// Validates the email address
func invalidEmail(_ value: String) -> String?
{
    let requlrExpression = "[A-Z0-9a-z._%+-]+@[A-Za-z0-9.-]+\\.[A-Za-z]{2,64}"
    let predicate = NSPredicate(format: "SELF MATCHES %@", requlrExpression)
    if !predicate.evaluate(with: value)
    {
        return "Invalid Email Address"
    }

    return nil
}

// Validates the password
func invalidPassword(_ value: String) -> String?
{
    if value.count < 8
    {
        return "Password must be at least 8 characters"
```

```
    }
    if containsDigit(value)
    {
        return "Password must contain at least 1 digit"
    }
    if containsLowerCase(value)
    {
        return "Must contain 1 lowercase character"
    }
    if containsUpperCase(value)
    {
        return "Must contain 1 uppercase character"
    }
    return nil
}

// Checks if the string contains a digit
func containsDigit(_ value: String) -> Bool
{
    let regularExpression = ".*[0-9]+.*"
    let predicate = NSPredicate(format: "SELF MATCHES %@", regularExpression)
    return !predicate.evaluate(with: value)
}

// Checks if the string contains a lowercase character
func containsLowerCase(_ value: String) -> Bool
{
    let regularExpression = ".*[a-z]+.*"
    let predicate = NSPredicate(format: "SELF MATCHES %@", regularExpression)
    return !predicate.evaluate(with: value)
}

// Checks if the string contains an uppercase character
func containsUpperCase(_ value: String) -> Bool
```

```
{
    let requlatExpression = ".*[A-Z]+.*"
    let predicate = NSPredicate(format: "SELF MATCHES %@", requlatExpression)
    return !predicate.evaluate(with: value)
}

// Validates the phone number
func invalidPhoneNumber(_ value: String) -> String?
{
    let set = CharacterSet(charactersIn: value)
    if !CharacterSet.decimalDigits.isSuperset(of: set)
    {
        return "Phone Number must contain only digits"
    }

    if value.count != 8
    {
        return "Phone Number must have 8 Digits"
    }
    return nil
}

// Checks if the form is valid and enables/disables the submit button accordingly
func checkForValidForm()
{
    if emailError.isHidden && passwordError.isHidden && phoneError.isHidden
    {
        submitButton.isEnabled = true
    }
    else
    {
        submitButton.isEnabled = false
    }
}
```

```
}
```

9. **NotesViewController Source Code:**

```
import UIKit

class NoteViewController: UIViewController {

    // Outlets for displaying the note's title and content
    @IBOutlet var titleLabel: UILabel!     // Reference to a UILabel for displaying the note's title
    @IBOutlet var noteLabel: UITextView!   // Reference to a UITextView for displaying the note's content

    // Public variables to hold the note's title and content.
    // These will be set by the previous view controller when navigating to this one
    public var noteTitle: String = ""
    public var note: String = ""

    // Called when the view controller's view is loaded into memory
    override func viewDidLoad() {
        super.viewDidLoad()

        // Set the text of the titleLabel and noteLabel with the passed-in values
        titleLabel.text = noteTitle
        noteLabel.text = note
    }
}
```

10. **PhotoCollectionViewCell Class Source Code:**

```
import UIKit

// This class defines a custom collection view cell to display photos.
class PhotoCollectionViewCell: UICollectionViewCell {

    // A static identifier for reusing cells
```

```
    static let identifier = "PhotoCollectionViewCell"

    // A private UIImageView to display the photo within the cell
    private let imageView: UIImageView = {
        let imageView = UIImageView()

        // Set content mode to fill the entire image view
        imageView.contentMode = .scaleAspectFill

        // Clip any content that goes beyond the bounds
        imageView.clipsToBounds = true

        return imageView
    }()

    // MARK: - Initializers

    // This initializer is called when creating the cell programmatically
    override init(frame: CGRect) {
        super.init(frame: frame)

        // Add the imageView to the cell's content view
        contentView.addSubview(imageView)

        // Create an array of UIImages (using optional chaining to handle potential nil images)
        let images = [
            UIImage(named: "1. Dover MRT Station"),

            UIImage(named: "2. Blk 21 Dover Crescent Playground"),

            UIImage(named: "3. One-north Park"),

            UIImage(named: "4. National University Hospital (NUH)"),
```

```
        UIImage(named: "5. Singapore Polytechnic (SP)"),

        UIImage(named: "6. The Japanese Cemetery Park")
    ].compactMap({ $0 })

    // Set a random image from the array to the imageView
    imageView.image = images.randomElement()
}

// This initializer is required when using the cell from a Storyboard/XIB
required init?(coder: NSCoder) {
    // This should not be called, as we're creating the cell programmatically
    fatalError()
}

// MARK: - Layout

// This function is called when the cell's layout needs to be updated
override func layoutSubviews() {
    super.layoutSubviews()

    // Make the imageView fill the entire cell
    imageView.frame = contentView.bounds
}

// MARK: - Reuse

// This function is called when the cell is about to be reused
override func prepareForReuse() {
    super.prepareForReuse()
    // You can add any cleanup code here if needed (e.g., resetting the image)
}

// MARK: - Public Function
```

```
    // Sets the image of the cell's imageView
    public func setImage(_ image: UIImage) {
        imageView.image = image
    }
}
```

11. **ProfileFirstViewController Source Code:**

```
import UIKit

import Foundation

// If you are using SwiftUI elements
import SwiftUI

// This view controller manages the first view in the user's profile, likely displaying a list of redeemed gifts.
class ProfileFirstViewController: UIViewController {

    // MARK: - Outlets

    // Outlet for the table view
    @IBOutlet weak var redeemedGiftsTableView: UITableView!

    // MARK: - Properties

    // An observed object to access shared data
    @ObservedObject var explorationData = ExplorationData.shared

    // MARK: - View Lifecycle

    override func viewDidLoad() {
        super.viewDidLoad()
```

```
        // Set the table view's data source
        redeemedGiftsTableView.dataSource = self
    }

    override func viewWillAppear(_ animated: Bool) {
        super.viewWillAppear(animated)

        // Reload the table view data when the view appears
        redeemedGiftsTableView.reloadData()
    }
}

// MARK: - UITableViewDataSource

// This extension provides data to the table view
extension ProfileFirstViewController: UITableViewDataSource
{
    // Returns the number of redeemed gifts to display in the table view
    func tableView(_ tableView: UITableView, numberOfRowsInSection section: Int) -> Int {
        return explorationData.redeemedGifts.count
    }

    // Configures and returns a cell to display in the table view
    func tableView(_ tableView: UITableView, cellForRowAt indexPath: IndexPath) -> UITableViewCell {

        let cell = redeemedGiftsTableView.dequeueReusableCell(withIdentifier: "cell", for: indexPath) as!
GiftRedeemdTableViewCell

        let redeemedGift = explorationData.redeemedGifts[indexPath.row]

        // Configure the cell with redeemedGift data
        cell.gift_redeemed.text = redeemedGift.title

        cell.points_required.text = "\(redeemedGift.points)"
```

```
        // Assuming you store image names
        cell.iconImageView.image = UIImage(named: redeemedGift.imageName)

        return cell
    }

    // This function currently returns 0, which means the cells will not be visible.
    // You likely want to return an appropriate height for your cells here.
    func tableView(_ tableView: UITableView, heightForRowAt indexPath: IndexPath) -> CGFloat {
        return 0
    }
}
```

12. **ProfileNotesViewController Source Code:**

```
import UIKit

class ProfileNotesViewController: UIViewController, UITableViewDelegate, UITableViewDataSource {

    @IBOutlet weak var testLabel: UILabel!

    // Outlets for the table view and label in the UI
    @IBOutlet var table: UITableView!  // Reference to the UITableView in the storyboard
    @IBOutlet var label: UILabel!     // Reference to a UILabel (likely for placeholder text when no notes exist)

    // Array to store the notes. Each note is a tuple with a title and the actual note content
    var models: [(title: String, note: String)] = []

    override func viewDidLoad() {
        super.viewDidLoad()

        // Set the title of the navigation bar
        title = "Notes"
```

```
        // Set this view controller as the delegate and data source for the table view
        // This means this class will handle providing data to the table and responding to user interactions
        table.delegate = self
        table.dataSource = self



    }


    // Action triggered when the "New Note" button is tapped
    @IBAction func didTapNewnote() {
        // Attempt to instantiate the "EntryViewController" from the storyboard
        guard let vc = storyboard?.instantiateViewController(withIdentifier: "new") as? EntryViewController else {
            return // If instantiation fails, do nothing and exit the function
        }

        // Set the title of the new note view controller
        vc.title = "New Note"

        // Disable large titles for this view controller
        vc.navigationItem.largeTitleDisplayMode = .never

        // Set a completion handler to be called when the new note is saved
        vc.completion = { noteTitle, note in
            // Navigate back to the root view controller (this view controller)
            self.navigationController?.popToRootViewController(animated: true)

            // Append the new note to the models array
            self.models.append((title: noteTitle, note: note))

            // Hide the label (likely a placeholder) and show the table
            self.label.isHidden = true
            self.table.isHidden = false
```

```
        // Reload the table view to display the new note
        self.table.reloadData()
    }

    // Push the new note view controller onto the navigation stack
    navigationController?.pushViewController(vc, animated: true)
}

// MARK: - Table View Data Source Methods

// Return the number of rows (notes) to display in the table
func tableView(_ tableView: UITableView, numberOfRowsInSection section: Int) -> Int {
    return models.count
}

// Configure and return a cell to display at the specified index path
func tableView(_ tableView: UITableView, cellForRowAt indexPath: IndexPath) -> UITableViewCell {
    // Dequeue a reusable cell with the identifier "cell"

    let cell = tableView.dequeueReusableCell(withIdentifier: "cell", for: indexPath)

    // Set the title and note text for the cell
    cell.textLabel?.text = models[indexPath.row].title
    cell.detailTextLabel?.text = models[indexPath.row].note

    return cell
}

// MARK: - Table View Delegate Methods

// Called when a row (note) is selected
func tableView(_ tableView: UITableView, didSelectRowAt indexPath: IndexPath)
{
```

```
        // Deselect the row with animation
        tableView.deselectRow(at: indexPath, animated: true)

        // Get the selected note model
        let model = models[indexPath.row]

        // Attempt to instantiate the "NoteViewController" from the storyboard
        guard let vc = storyboard?.instantiateViewController(identifier: "note") as? NoteViewController else {
            return
        }

        // Disable large titles for this view controller
        vc.navigationItem.largeTitleDisplayMode = .never

        // Set the title of the note view controller
        vc.title = "Note"

//        Pass the note title and content to the note view controller
        vc.noteTitle = model.title
        vc.note = model.note

        // Push the note view controller onto the navigation stack
        navigationController?.pushViewController(vc, animated: true)
    }

}
```

13. **ProfileSecondViewController Source Code:**

```
import UIKit

// This view controller manages a collection view to display photos.
class ProfileSecondViewController: UIViewController, UICollectionViewDelegate, UICollectionViewDataSource, UICollectionViewDelegateFlowLayout {
```

```
    // MARK: - Outlets

    @IBOutlet weak var noImageLabel: UILabel!

    // MARK: - Properties

    // The collection view to display photos
    private let collectionView = UICollectionView(
        frame: .zero,
        collectionViewLayout: UICollectionViewFlowLayout()
    )

    // An array to store the images to be displayed
    private var images: [UIImage] = []

    // MARK: - View Lifecycle

    override func viewDidLoad() {
        super.viewDidLoad()

        // Initially hide the "no images" label
        noImageLabel.isHidden = true

        // Register the PhotoCollectionViewCell for use in the collection view
        collectionView.register(PhotoCollectionViewCell.self, forCellWithReuseIdentifier:
PhotoCollectionViewCell.identifier)

        // Set the collection view's delegate
        collectionView.delegate = self

        // Set the collection view's data source
        collectionView.dataSource = self

        // Add the collection view to the view controller's view
```

```
        view.addSubview(collectionView)

        // This line of code tells the view to rearrange its subviews so that noImageLabel is placed at the top of the stack, ensuring it's visible above other elements like the collectionView and the UIView container.
        view.bringSubviewToFront(noImageLabel)
    }

    // Called when the view's layout has been calculated and subviews are about to be positioned
    override func viewDidLayoutSubviews() {
        super.viewDidLayoutSubviews()

        // Make the collection view fill the entire view
        collectionView.frame = view.bounds
    }

    // MARK: - Public Function

    // Adds an image to the images array and reloads the collection view
    func addImage(_ image: UIImage) {
        images.append(image)
        collectionView.reloadData()

        // Hide the label after adding an image
        noImageLabel.isHidden = true
    }

    // MARK: - UICollectionViewDataSource
    // These functions provide data to the collection view

    // Returns the number of photos to display
    func collectionView(_ collectionView: UICollectionView, numberOfItemsInSection section: Int) -> Int {

        if images.count == 0 {
            // Show the label if no images
```

```
            noImageLabel.isHidden = false
        } else {
            // Hide the label if images are present
            noImageLabel.isHidden = true
        }

        return images.count
    }

    // Returns a configured cell for the collection view
    func collectionView(_ collectionView: UICollectionView, cellForItemAt indexPath: IndexPath) -> UICollectionViewCell
    {
        let cell = collectionView.dequeueReusableCell(withReuseIdentifier: PhotoCollectionViewCell.identifier, for: indexPath) as! PhotoCollectionViewCell

        // Set the image for the cell
        cell.setImage(images[indexPath.item])

        return cell
    }

    // MARK: - UICollectionViewDelegateFlowLayout
    // These functions control the layout of the collection view

    // Sets the size of each photo item in the collection view
    func collectionView(_ collectionView: UICollectionView, layout collectionViewLayout: UICollectionViewLayout, sizeForItemAt indexPath: IndexPath) -> CGSize
    {
        return CGSize(
            width: (view.frame.size.width/3)-3,
            height: (view.frame.size.width/3)-3
        )
    }
```

```
    // Sets the spacing between items in the same row
    func collectionView(_ collectionView: UICollectionView, layout collectionViewLayout: UICollectionViewLayout, minimumInteritemSpacingForSectionAt section: Int) -> CGFloat {
        return 1
    }

    // Sets the spacing between rows
    func collectionView(_ collectionView: UICollectionView, layout collectionViewLayout: UICollectionViewLayout, minimumLineSpacingForSectionAt section: Int) -> CGFloat {
        return 1
    }

    // Sets the insets for the collection view section
    func collectionView(_ collectionView: UICollectionView, layout collectionViewLayout: UICollectionViewLayout, insetForSectionAt section: Int) -> UIEdgeInsets
    {
        return UIEdgeInsets(top: 1, left: 1, bottom: 1, right: 1)
    }

    // Called when an item in the collection view is selected
    func collectionView(_ collectionView: UICollectionView, didSelectItemAt indexPath: IndexPath) {
        // Deselect the item with animation
        collectionView.deselectItem(at: indexPath, animated: true)

        print("Selected section \(indexPath.section) and row \(indexPath.row)")
    }
}
```

14. **RedeemedGifts Swift File Source Code:**

```
import UIKit

// We need a way to store the redeemed gifts. Let's create a new structure to hold the redemption details:
struct RedeemedGift: Codable { // Make it Codable for storage
    let title: String
    let points: Int
```

```
    let redemptionDate: Date
    let imageName: String // Store the image name or identifier
}
```

15. RedemptionDetailsViewController Source Code:

```
import UIKit

// Protocol that allows this view controller to communicate with the GiftShopViewController
protocol RedemptionDelegate: AnyObject {
    // Called when a gift is successfully redeemed
    func didRedeemGift()
}

class RedemptionDetailsViewController: UIViewController {

    // MARK: - Outlets

    @IBOutlet weak var giftRedemptionEmailTF: UITextField!

    @IBOutlet weak var giftRedemptionPhoneTF: UITextField!

    @IBOutlet weak var giftRedemptionEmailError: UILabel!

    @IBOutlet weak var giftRedemptionPhoneError: UILabel!

    @IBOutlet weak var giftRedemptionSubmitBtn: UIButton!

    // MARK: - Properties

    // Pass gift data to RedemptionDetailsViewController
    var selectedGift: Gift?

    // In RedemptionDetailsViewController, add a delegate property:
```

```
    weak var delegate: RedemptionDelegate?

    // MARK: - View Lifecycle

    override func viewDidLoad() {
        super.viewDidLoad()

        // Reset the form to its initial state
        resetForm()
    }

    // MARK: - Actions

    // These functions are called when the corresponding UI elements are interacted with
    @IBAction func emailChanged(_ sender: UITextField)
    {
        if let email = giftRedemptionEmailTF.text
        {
            // Validate the email address
            if let errorMessage = invalidEmail(email)
            {
                giftRedemptionEmailError.text = errorMessage
                giftRedemptionEmailError.isHidden = false
            }
            else
            {
                giftRedemptionEmailError.isHidden = true
            }
        }

        // Check if the form is valid
        checkForValidForm()
    }
```

```
    @IBAction func phoneChanged(_ sender: UITextField)
    {
        if let phoneNumber = giftRedemptionPhoneTF.text
        {
            // Validate the phone number
            if let errorMessage = invalidPhoneNumber(phoneNumber)
            {
                giftRedemptionPhoneError.text = errorMessage
                giftRedemptionPhoneError.isHidden = false
            }
            else
            {
                giftRedemptionPhoneError.isHidden = true
            }
        }

        // Check if the form is valid
        checkForValidForm()
    }

    @IBAction func submitButtonTapped(_ sender: Any)
    {
        if let gift = selectedGift {
            // Deduct points for the redeemed gift
            ExplorationData.shared.score -= gift.points_needed

            // Create a RedeemedGift object and add it to the redeemedGifts array in ExplorationData
            let redeemedGift = RedeemedGift(title: gift.title, points: gift.points_needed, redemptionDate: Date(),
imageName: gift.imageName)

            ExplorationData.shared.redeemedGifts.append(redeemedGift)
        }

        // Notify the delegate (GiftShopViewController) that a gift has been redeemed
```

```
    delegate?.didRedeemGift()

    // Show an alert to confirm gift redemption
    let alertGiftRedemption = UIAlertController(
        title: "Gift Redeemed",
        message: "Congratulations, you have redeemed a gift.",
        preferredStyle: .alert
    )

    alertGiftRedemption.addAction(UIAlertAction(title: "Cancel", style: .cancel, handler: { (_) in
        // Do nothing
    }))

    alertGiftRedemption.addAction(UIAlertAction(title: "Okay", style: .destructive))

    present(alertGiftRedemption, animated: true)

    // Reset the form after submission
    resetForm()
}

// MARK: - Helper Functions
// These functions perform specific tasks within the view controller

// Resets the form to its initial state
func resetForm()
{
    giftRedemptionSubmitBtn.isEnabled = false

    giftRedemptionEmailError.isHidden = false
    giftRedemptionPhoneError.isHidden = false

    giftRedemptionEmailError.text = "Required"
    giftRedemptionPhoneError.text = "Required"
```

```
    giftRedemptionEmailTF.text = ""
    giftRedemptionPhoneTF.text = ""
}

// Validates the email address
func invalidEmail(_ value: String) -> String?
{
    let regularExpression = "[A-Z0-9a-z._%+-]+@[A-Za-z0-9.-]+\\.[A-Za-z]{2,64}"
    let predicate = NSPredicate(format: "SELF MATCHES %@", regularExpression)
    if !predicate.evaluate(with: value)
    {
        return "Invalid Email Address"
    }

    return nil
}

func containsDigit(_ value: String) -> Bool
{
    let regularExpression = ".*[0-9]+.*"
    let predicate = NSPredicate(format: "SELF MATCHES %@", regularExpression)
    return !predicate.evaluate(with: value)
}

func containsLowerCase(_ value: String) -> Bool
{
    let regularExpression = ".*[a-z]+.*"
    let predicate = NSPredicate(format: "SELF MATCHES %@", regularExpression)
    return !predicate.evaluate(with: value)
}

func containsUpperCase(_ value: String) -> Bool
{
```

```
        let requlrExpression = ".*[A-Z]+.*"
        let predicate = NSPredicate(format: "SELF MATCHES %@", requlrExpression)
        return !predicate.evaluate(with: value)
    }

    func invalidPhoneNumber(_ value: String) -> String?
    {
        let set = CharacterSet(charactersIn: value)
        if !CharacterSet.decimalDigits.isSuperset(of: set)
        {
            return "Phone Number must contain only digits"
        }

        if value.count != 8
        {
            return "Phone Number must have 8 Digits"
        }
        return nil
    }

    // Checks if the form is valid and enables/disables the submit button accordingly
    func checkForValidForm()
    {
        if giftRedemptionEmailError.isHidden && giftRedemptionPhoneError.isHidden
        {
            giftRedemptionSubmitBtn.isEnabled = true
        }
        else
        {
            giftRedemptionSubmitBtn.isEnabled = false
        }
    }
}
```

16. **StatusViewController Source Code:**

```
import UIKit

class StatusViewController: UIViewController {

    // MARK: - Outlets

    @IBOutlet weak var StatusTimedUsedLabel: UILabel!

    @IBOutlet weak var StatusTimeRemainingLabel: UILabel!

    @IBOutlet weak var StatusDistanceCoveredLabel: UILabel!

    @IBOutlet weak var StatusCurrentVelocityLabel: UILabel!

    // MARK: - View Lifecycle

    override func viewDidLoad() {
        super.viewDidLoad()

        // Retrieve and display the initial data from the shared ExplorationData singleton
        StatusTimedUsedLabel.text = ExplorationData.shared.timeUsed

        StatusTimeRemainingLabel.text = ExplorationData.shared.timeRemaining

        let distanceMeters = ExplorationData.shared.distanceCovered

        let distanceKm = distanceMeters / 1000

        StatusDistanceCoveredLabel.text = String(format: "%.2f Kilometres", distanceKm)

        StatusCurrentVelocityLabel.text = String(format: "%.2f m/s", ExplorationData.shared.currentVelocity)
    }
```

```
    override func viewWillAppear(_ animated: Bool) {
        super.viewWillAppear(animated)

        // Refresh the labels with the latest data from ExplorationData whenever the view appears
        StatusTimedUsedLabel.text = ExplorationData.shared.timeUsed

        StatusTimeRemainingLabel.text = ExplorationData.shared.timeRemaining

        let distanceMeters = ExplorationData.shared.distanceCovered

        let distanceKm = distanceMeters / 1000

        StatusDistanceCoveredLabel.text = String(format: "%.2f Kilometres", distanceKm)

        StatusCurrentVelocityLabel.text = String(format: "%.2f m/s", ExplorationData.shared.currentVelocity)
    }
}
```

17. **Treasure Swift File Source Code:**

```
import UIKit

// Defines a Treasure struct to hold information about each treasure location
struct Treasure
{
    // Name of the location
    let location: String

    // Image of the location
    let image: UIImage

    // Time limit for finding the treasure
    let timeLimit: String
```

```
    // Reward for finding the treasure
    let reward: String

    // Description of the treasure or task
    let description: String
}

// Creates an array of Treasure objects, each representing a different treasure location
let treasures: [Treasure] = [

    //  Treasure Location 1
    Treasure(
        location: "SIM Global Education",
        image:  imageLiteral(resourceName: "1. SIM Global Education"),
        timeLimit: "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15",
        reward: "Points: 4",
        description: "Description: Find the plaque commemorating SIM's founding."
    ),

    //  Treasure Location 2
    Treasure(
        location: "Lien Ying Chow Library",
        image:  imageLiteral(resourceName: "2. Lien Ying Chow Library"),
        timeLimit: "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15",
        reward: "Points: 4",
        description: "Description: How many floors does the library have?"
    ),

    //  Treasure Location 3
    Treasure(
        location: "Ngee Ann Poly Futsal Court",
        image:  imageLiteral(resourceName: "3. Ngee Ann Poly Futsal Court"),
        timeLimit: "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15",
        reward: "Points: 4",
```

```
    description: "Description: Take a panoramic photo of the entire court."
),

// Treasure Location 4
Treasure(
    location: "King Albert Park",
    image:  imageLiteral(resourceName: "4. King Albert Park"),
    timeLimit: "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15",
    reward: "Points: 4",
    description: "Description: Locate the playground within the park."
),



// Treasure Location 5
Treasure(
    location: "Ngee Ann Poly Block 50",
    image:  imageLiteral(resourceName: "5. Ngee Ann Poly Block 50"),
    timeLimit: "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15",
    reward: "Points: 4",
    description: "Description: Find the directory board in the building."
),

// Treasure Location 6
Treasure(
    location: "Old Jurong Railway",
    image:  imageLiteral(resourceName: "6. Old Jurong Railway"),
    timeLimit: "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15",
    reward: "Points: 4",
    description: "Description: Take a selfie with the railway station."
),

// Treasure Location 7
Treasure(
    location: "King Albert Lodge",
```

```
        image:  imageLiteral(resourceName: "7. King Albert Lodge"),
        timeLimit: "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15",
        reward: "Points: 4",
        description: "Description: How many windows on the front facade?"
    ),

    //  Treasure Location 8
    Treasure(
        location: "Methodist Girls' School",
        image:  imageLiteral(resourceName: "8. Methodist Girls' School"),
        timeLimit: "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15",
        reward: "Points: 4",
        description: "Description: Locate the main entrance to MGS."
    ),

    //  Treasure Location 9
    Treasure(
        location: "Rail Corridor (Bukit Timah)",
        image:  imageLiteral(resourceName: "9. Rail Corridor (Bukit Timah)"),
        timeLimit: "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15",
        reward: "Points: 4",
        description: "Description: Find a marker post along the Rail Corridor."
    ),

    //  Treasure Location 10
    Treasure(
        location: "Singapore Institute of Technology (SIT@NP)",
        image:  imageLiteral(resourceName: "10. Singapore Institute of Technology (SIT@NP)"),
        timeLimit: "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15",
        reward: "Points: 4",
        description: "Description: Find the SIT logo."
    )

]
```

18. **TreasureCollectionViewCell Class Source Code:**

```
import UIKit

// This class defines the layout and behavior of a single cell within your Treasure Collection View
class TreasureCollectionViewCell: UICollectionViewCell
{
    // MARK: - Outlets
    // Connect to the UI elements within your cell's design in the Storyboard

    // Displays the treasure image
    @IBOutlet weak var treasureImageView: UIImageView!

    // Shows the treasure location name
    @IBOutlet weak var treasureLocationLabel: UILabel!

    // Shows the time limit for the treasure
    @IBOutlet weak var treasureTimeLimitLabel: UILabel!

    // Provides a description of the treasure or task
    @IBOutlet weak var treasureDescriptionLabel: UILabel!

    // Displays the reward for finding the treasure
    @IBOutlet weak var treasureRewardLabel: UILabel!

    // MARK: - Setup Function
    // This function configures the cell with data from a Treasure object

    func setup(with treasure: Treasure) {
        treasureImageView.image = treasure.image

        treasureLocationLabel.text = treasure.location
```

```
        treasureTimeLimitLabel.text = treasure.timeLimit

        treasureRewardLabel.text = treasure.reward

        treasureDescriptionLabel.text = treasure.description
    }
}
```

19. **TreasureCustomTableViewCell Class Source Code:**

```
import UIKit

// This class defines a custom table view cell for selecting treasure locations and their difficulty levels
class TreasureCustomTableViewCell: UITableViewCell
{
    // MARK: - Outlets

    // Connect to UI elements in the cell's design in the Storyboard
    @IBOutlet weak var treasureLocationLabel: UILabel!

    @IBOutlet weak var selectLocationLabel: UILabel!

    @IBOutlet weak var selectLocationSwitch: UISwitch!

    @IBOutlet weak var challengeTimeLevelsLabel: UILabel!

    @IBOutlet weak var easyLabel: UILabel!

    @IBOutlet weak var easySwitch: UISwitch!

    @IBOutlet weak var mediumLabel: UILabel!

    @IBOutlet weak var mediumSwitch: UISwitch!
```

```
@IBOutlet weak var hardLabel: UILabel!

@IBOutlet weak var hardSwitch: UISwitch!

// MARK: - Cell Lifecycle

override func awakeFromNib()
{
    super.awakeFromNib()

    // Set labels with proper text

    // Rename labels
    selectLocationLabel.text = "Select Location"
    challengeTimeLevelsLabel.text = "Challenge Time Levels"
    easyLabel.text = "Easy"
    mediumLabel.text = "Medium"
    hardLabel.text = "Hard"

    // Set all switches to off initially
    selectLocationSwitch.isOn = false
    easySwitch.isOn = false
    mediumSwitch.isOn = false
    hardSwitch.isOn = false

    // Hide challenge options initially
    hideChallengeOptions()
}

// MARK: - Actions
// These functions are called when UI elements are interacted with

// Called when the "Select Location" switch is toggled
@IBAction func selectLocationSwitchToggled(_ sender: UISwitch)
```

```
{
    if sender.isOn
    {
        // Show difficulty options when location is selected
        showChallengeOptions()
    } else {
        // Hide difficulty options when location is deselected
        hideChallengeOptions()
    }
}

// Called when the "Easy" switch is toggled
@IBAction func easySwitchToggled(_ sender: UISwitch)
{
    if sender.isOn
    {
        // Ensure only one difficulty is selected at a time
        mediumSwitch.isOn = false
        hardSwitch.isOn = false
    }
}

// Called when the "Medium" switch is toggled
@IBAction func mediumSwitchToggled(_ sender: UISwitch)
{
    if sender.isOn
    {
        // Ensure only one difficulty is selected at a time
        easySwitch.isOn = false
        hardSwitch.isOn = false
    }
}

// Called when the "Hard" switch is toggled
```

```
@IBAction func hardSwitchToggled(_ sender: UISwitch)
{
    if sender.isOn
    {
        // Ensure only one difficulty is selected at a time
        mediumSwitch.isOn = false
        easySwitch.isOn = false
        mediumSwitch.isOn = false
    }
}

// MARK: - Helper Functions
// These functions perform specific tasks within the cell

// Shows the difficulty level options
func showChallengeOptions() {
    challengeTimeLevelsLabel.isHidden = false
    easyLabel.isHidden = false
    easySwitch.isHidden = false
    mediumLabel.isHidden = false
    mediumSwitch.isHidden = false
    hardLabel.isHidden = false
    hardSwitch.isHidden = false
}

// Hides the difficulty level options
func hideChallengeOptions() {
    challengeTimeLevelsLabel.isHidden = true
    easyLabel.isHidden = true
    easySwitch.isHidden = true
    mediumLabel.isHidden = true
    mediumSwitch.isHidden = true
    hardLabel.isHidden = true
    hardSwitch.isHidden = true
```

```
    }

}
```

20. **TreasureSelection Swift File Source Code:**

```
import UIKit

import MapKit

import CoreLocation

// Defines a structure to hold information about each treasure location
struct TreasureLocation
{
    // Name of the location
    let location: String

    // Coordinates of the location
    let coordinate: CLLocationCoordinate2D

    // Description of the task or challenge
    let description: String

    // Difficulty level (easy, medium, hard)
    var difficulty: Difficulty

    // Time limit to find the treasure (in seconds)
    var timeLimit: Int

    // Reward points for finding the treasure
    var reward: Int
}
```

```
// Creates an array of TreasureLocation objects, each representing a different treasure location
var treasurelocations: [TreasureLocation] = [

  //  Treasure Location 1
  TreasureLocation(
    location: "Random Treasure Locations",
    coordinate: CLLocationCoordinate2D(latitude: 1.2867,longitude: 103.7910),
    description: "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15",
    // "Challenge Time Levels (Easy/Medium/Hard - Minutes): 300 / 150 / 75"
    difficulty: Difficulty.easy,
    timeLimit: 1,
    reward: 1
  ),

  // 1. SIM Global Education Coordinates
  TreasureLocation(
    location: "SIM Global Education",
    coordinate: CLLocationCoordinate2D(
          latitude: 1.3294,
          longitude: 103.7762
       ),
    description: "Find the plaque commemorating SIM's founding.",
    // "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15"
    difficulty: .easy,
    timeLimit: 1,
    reward: 1
  ),

  // 2. Lien Ying Chow Library Coordinates
  TreasureLocation(
    location: "Lien Ying Chow Library",
    coordinate: CLLocationCoordinate2D(
          latitude: 1.333586,
          longitude: 103.776868
```

```
        ),
    description: "How many floors does the library have?",
    // "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15"
    difficulty: .easy,
    timeLimit: 1,
    reward: 1
),

// 3. Ngee Ann Poly Futsal Court Coordinates
TreasureLocation(
    location: "Ngee Ann Poly Futsal Court",
    coordinate: CLLocationCoordinate2D(
            latitude: 1.332060,
            longitude: 103.777084
        ),
    description: "Take a panoramic photo of the entire court.",
    // "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15"
    difficulty: .easy,
    timeLimit: 1,
    reward: 1
),

// 4. King Albert Park Coordinates
TreasureLocation(
    location: "King Albert Park",
    coordinate: CLLocationCoordinate2D(
            latitude: 1.334044,
            longitude: 103.779700
        ),
    description: "Locate the playground within the park.",
    // "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15"
    difficulty: .easy,
    timeLimit: 1,
    reward: 1
```

```
),

// 5. Ngee Ann Poly Block 50 Coordinates
TreasureLocation(
    location: "Ngee Ann Poly Block 50",
    coordinate: CLLocationCoordinate2D(
        latitude: 1.331557,
        longitude: 103.773971
    ),
    description: "Find the directory board in the building.",
    // "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15"
    difficulty: .easy,
    timeLimit: 1,
    reward: 1
),

// 6. Old Jurong Railway
TreasureLocation(
    location: "Old Jurong Railway",
    coordinate: CLLocationCoordinate2D(
        latitude: 1.328323,
        longitude: 103.780313
    ),
    description: "Take a selfie with the railway station.",
    // "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15"
    difficulty: .easy,
    timeLimit: 1,
    reward: 1
),

// 7. King Albert Lodge Coordinates
TreasureLocation(
    location: "King Albert Lodge",
    coordinate: CLLocationCoordinate2D(
```

```
            latitude: 1.336467,
            longitude: 103.780312
        ),
    description: "How many windows on the front facade?",
    // "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15"
    difficulty: .easy,
    timeLimit: 1,
    reward: 1
),

// 8. Maju Camp Coordinates
TreasureLocation(
    location: "Methodist Girls' School",
    coordinate: CLLocationCoordinate2D(
            latitude: 1.332852,
            longitude: 103.783459
        ),
    description: "Locate the main entrance to MGS.",
    // "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15"
    difficulty: .easy,
    timeLimit: 1,
    reward: 1
),

// 9. Rail Corridor (Bukit Timah) Coordinates
TreasureLocation(
    location: "Rail Corridor (Bukit Timah)",
    coordinate: CLLocationCoordinate2D(
            latitude: 1.331612,
            longitude: 103.781242
        ),
    description: "Find a marker post along the Rail Corridor.",
    // "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15"
    difficulty: .easy,
```

```
        timeLimit: 1,
        reward: 1
    ),

    // 10. Singapore Institute of Technology (SIT@NP) Coordinates
    TreasureLocation(
        location: "Singapore Institute of Technology (SIT@NP)",
        coordinate: CLLocationCoordinate2D(
            latitude: 1.334106,
            longitude: 103.774496
        ),
        description: "Find the SIT logo.",
        // "Challenge Time Levels (Easy/Medium/Hard - Minutes): 60 / 30 / 15"
        difficulty: .easy,
        timeLimit: 1,
        reward: 1
    )

]

// Defines an enumeration for the difficulty levels of treasure locations
enum Difficulty
{
    case easy, medium, hard
}
```

21. **TreasureSelectionViewController Source Code:**

```
import UIKit
// 1. Define the delegate protocol
// This protocol allows this view controller to communicate with other parts of your app
protocol TreasureSelectionDelegate: AnyObject
{
    // Called when an exploration becomes available
```

```
    func didUnlockExploration()

    // Called when an exploration is no longer available
    func didLockExploration()
}

class TreasureSelectionViewController: UIViewController, UITableViewDataSource, UITableViewDelegate
{

    // MARK: - Outlets

    @IBOutlet weak var table: UITableView!

    // MARK: - Properties

    // Dictionary to store selected locations and their difficulties
    var selectedLocations: [Int: Difficulty] = [:]

    // Flag to indicate if the "Random" location is selected
    var isRandomLocationSelected = false

    // Delegate to communicate with other view controllers
    weak var delegate: TreasureSelectionDelegate?

    // MARK: - View Lifecycle

    override func viewDidLoad() {
        super.viewDidLoad()

        // Set the data source for the table view
        table.dataSource = self

        // Set the delegate for the table view
        table.delegate = self
```

```
    }

    // MARK: - UITableViewDataSource
    // These functions provide data to the table view

    // Returns the number of treasure locations to display in the table view
    func tableView(_ tableView: UITableView, numberOfRowsInSection section: Int) -> Int
    {
        return treasurelocations.count
    }

    // Configures and returns a cell to display in the table view
    func tableView(_ tableView: UITableView, cellForRowAt indexPath: IndexPath) -> UITableViewCell
    {
        // Get the TreasureLocation for this row
        let sunset = treasurelocations[indexPath.row]

        // Set the location label text

        let cell = table.dequeueReusableCell(withIdentifier: "cell", for: indexPath) as!
TreasureCustomTableViewCell

        // Set the location label text
        cell.treasureLocationLabel.text = sunset.location

        // Add targets for switches to call the switchToggled function when their value changes
        cell.selectLocationSwitch.addTarget(self, action: #selector(switchToggled(_:)), for: .valueChanged)

        cell.easySwitch.addTarget(self, action: #selector(switchToggled(_:)), for: .valueChanged)

        cell.mediumSwitch.addTarget(self, action: #selector(switchToggled(_:)), for: .valueChanged)

        cell.hardSwitch.addTarget(self, action: #selector(switchToggled(_:)), for: .valueChanged)
```

```
        // Set the switch state based on the selectedLocations dictionary
        if let difficulty = selectedLocations[indexPath.row] {
            cell.selectLocationSwitch.isOn = true
            cell.showChallengeOptions()
            switch difficulty {
            case .easy:
                cell.easySwitch.isOn = true
                cell.mediumSwitch.isOn = false
                cell.hardSwitch.isOn = false
            case .medium:
                cell.easySwitch.isOn = false
                cell.mediumSwitch.isOn = true
                cell.hardSwitch.isOn = false
            case .hard:
                cell.easySwitch.isOn = false
                cell.mediumSwitch.isOn = false
                cell.hardSwitch.isOn = true
            }
        } else {
            cell.selectLocationSwitch.isOn = false
            cell.hideChallengeOptions()
        }

        // Disable/enable cells based on isRandomLocationSelected
        if isRandomLocationSelected && indexPath.row > 0
        {
            // Disable other locations if "Random" is selected
            cell.selectLocationSwitch.isEnabled = false
        } else if !isRandomLocationSelected && indexPath.row > 0 {
            // Only disable other locations if Random is selected
            cell.selectLocationSwitch.isEnabled = true
        } else {
            // Always enable the "Random" location cell
            cell.selectLocationSwitch.isEnabled = true
```

```
    }

    return cell
}

// Sets the height of each row in the table view
func tableView(_ tableView: UITableView, heightForRowAt indexPath: IndexPath) -> CGFloat {
    return 200
}

// MARK: - Actions

// Called when a switch is toggled
@objc func switchToggled(_ sender: UISwitch) {

    // Get the cell that contains the switch that was toggled
    let cell = sender.superview?.superview as! TreasureCustomTableViewCell // Access the custom cell

    // Check which difficulty switch was toggled
    if sender == cell.easySwitch {
        print("easy switch toggled")
    } else if sender == cell.mediumSwitch {
        print("medium switch toggled")
    } else if sender == cell.hardSwitch {
        print("hard switch toggled")
    }

    // Get the index path of the cell
    guard let indexPath = table.indexPath(for: cell) else { return }

    // "Random Treasure Locations" cell
    if indexPath.row == 0 {
        isRandomLocationSelected = cell.selectLocationSwitch.isOn
```

```
            // Disable/enable other cells
            for i in 1..<treasurelocations.count {
                table.cellForRow(at: IndexPath(row: i, section: 0))?.isUserInteractionEnabled = !isRandomLocationSelected
            }

        } else {
            // Other treasure location cells
            if cell.selectLocationSwitch.isOn {
                // Disable the "Random Treasure Locations" cell
                isRandomLocationSelected = false

                table.cellForRow(at: IndexPath(row: 0, section: 0))?.isUserInteractionEnabled = false

                var difficulty: Difficulty

                if cell.easySwitch.isOn { difficulty = .easy }

                else if cell.mediumSwitch.isOn { difficulty = .medium }

                else { difficulty = .hard }

                selectedLocations[indexPath.row] = difficulty

                // Update the difficulty in the treasurelocations array
                treasurelocations[indexPath.row].difficulty = difficulty
            } else {
                // Check if any other location is selected before enabling "Random Treasure Locations"
                var anyOtherLocationSelected = false

                for i in 1..<treasurelocations.count where i != indexPath.row {
                    if let otherCell = table.cellForRow(at: IndexPath(row: i, section: 0)) as? TreasureCustomTableViewCell,
                        otherCell.selectLocationSwitch.isOn {
```

```
                    anyOtherLocationSelected = true
                    break
                }
            }

            table.cellForRow(at: IndexPath(row: 0, section: 0))?.isUserInteractionEnabled = !anyOtherLocationSelected

            // Remove the location from selectedLocations
            selectedLocations.removeValue(forKey: indexPath.row)

        }
    }

    // Check if the selectLocationSwitch and at least one difficulty switch is on
    if cell.selectLocationSwitch.isOn &&
       (cell.easySwitch.isOn || cell.mediumSwitch.isOn || cell.hardSwitch.isOn) {
        delegate?.didUnlockExploration()
    } else {
        delegate?.didLockExploration()
    }

    // Update the selectedLocations dictionary
    if cell.selectLocationSwitch.isOn {
        let difficulty: Difficulty
        if cell.easySwitch.isOn { difficulty = .easy }
        else if cell.mediumSwitch.isOn { difficulty = .medium }
        else { difficulty = .hard }
        selectedLocations[indexPath.row] = difficulty
    } else {
        selectedLocations.removeValue(forKey: indexPath.row)
    }

}
```

```
    // MARK: - Helper Functions

    // Resets all switches to their initial state
    func resetSwitches() {
        selectedLocations = [:] // Clear the selectedLocations dictionary
        isRandomLocationSelected = false

        // Reload the table view to reflect the changes
        table.reloadData()
    }
}
```

22. TreasureViewController Source Code:

```
import UIKit

class TreasureViewController: UIViewController
{
    // MARK: - Outlets

    // Outlet for the collection view that displays treasures
    @IBOutlet weak var collectionView: UICollectionView!

    // MARK: - View Lifecycle

    override func viewDidLoad() {
        super.viewDidLoad()

        // Do any additional setup after loading the view.

        // Set the data source and delegate for the collection view
        collectionView.dataSource = self
        collectionView.delegate = self
```

```
        // Set the collection view layout to a flow layout
        collectionView.collectionViewLayout = UICollectionViewFlowLayout()
    }
}

// MARK: - UICollectionViewDataSource

// This extension provides data to the collection view
extension TreasureViewController: UICollectionViewDataSource
{
    // Returns the number of treasures to display in the collection view
    func collectionView(_ collectionView: UICollectionView, numberOfItemsInSection section: Int) -> Int {
        return treasures.count
    }

    // Configures and returns a cell to display in the collection view
    func collectionView(_ collectionView: UICollectionView, cellForItemAt indexPath: IndexPath) -> UICollectionViewCell
    {
        // Dequeue a reusable cell with the specified identifier
        let cell = collectionView.dequeueReusableCell(withReuseIdentifier: "TreasureCollectionViewCell", for: indexPath) as! TreasureCollectionViewCell

        // Configure the cell with data from the corresponding Treasure object
        cell.setup(with: treasures[indexPath.row])

        return cell
    }
}

// MARK: - UICollectionViewDelegateFlowLayout

// This extension allows you to customize the layout of items in the collection view
```

```
extension TreasureViewController: UICollectionViewDelegateFlowLayout {
    func collectionView(_ collectionView: UICollectionView, layout collectionViewLayout: UICollectionViewLayout, sizeForItemAt indexPath: IndexPath) -> CGSize {
        return CGSize(width: 392, height: 440)
    }
}

// MARK: - UICollectionViewDelegate

// This extension handles user interaction with the collection view
extension TreasureViewController: UICollectionViewDelegate {
    func collectionView(_ collectionView: UICollectionView, didSelectItemAt indexPath: IndexPath) {
        print(treasures[indexPath.row].location)
    }
}
```

23. **UserProfileViewController Source Code:**

```
import UIKit

// This view controller manages the user's profile, which has two segments controlled by a UISegmentedControl.
class UserProfileViewController: UIViewController {

    // MARK: - Outlets

    // Segmented control to switch between profile views
    @IBOutlet weak var control: UISegmentedControl!

    // Container view to hold the currently active profile view
    @IBOutlet weak var containerView: UIView!

    @IBOutlet weak var postPhotoBtn: UIButton!

    // MARK: - Properties
```

```
    // Stores the image selected by the user
    var selectedImage: UIImage?

    // MARK: - Child View Controllers

    // These are the two view controllers that will be displayed in the container view
    private lazy var firstViewController: ProfileFirstViewController = {
        let storyboard = UIStoryboard(name: "Main", bundle: Bundle.main)
        var viewController = storyboard.instantiateViewController(identifier: "ProfileFirstViewController") as! ProfileFirstViewController
        // Add the first view controller as a child
        self.add(asChildViewController: viewController)
        return viewController
    }()


    private lazy var secondViewController: ProfileSecondViewController = {
        let storyboard = UIStoryboard(name: "Main", bundle: Bundle.main)
        var viewController = storyboard.instantiateViewController(identifier: "ProfileSecondViewController") as! ProfileSecondViewController
        // Add the second view controller as a child
        self.add(asChildViewController: viewController)
        return viewController
    }()

    // MARK: - View Lifecycle

    override func viewDidLoad() {
        super.viewDidLoad()

        // Set the background color of the segmented control
        control.backgroundColor = .cyan
```

```
    // Initially display the first view controller
    updateView()
}

// MARK: - Actions

@IBAction func didChangeSegment(_ sender: UISegmentedControl) {
    // Update the displayed view controller when the segment changes
    updateView()
}

@IBAction func postPhotoBtnDidTap(_ sender: UIButton)
{
    // Allow the user to select a photo from their library
    let vc = UIImagePickerController()
    vc.sourceType = .photoLibrary
    vc.delegate = self
    vc.allowsEditing = true
    present(vc, animated: true)
}

// MARK: - Helper Functions

// These functions manage adding and removing child view controllers

// Updates the displayed view controller based on the selected segment
private func updateView() {
    if control.selectedSegmentIndex == 0 {
        // Remove the second view controller
        remove(asChildViewController: secondViewController)

        // Add the first view controller
        add(asChildViewController: firstViewController)
    } else if control.selectedSegmentIndex == 1 {
```

```
            // Remove the first view controller
            remove(asChildViewController: firstViewController)

            // Add the second view controller
            add(asChildViewController: secondViewController)
        }
    }

    // Adds a view controller as a child to this view controller
    private func add(asChildViewController viewController: UIViewController) {
        addChild(viewController)
        containerView.addSubview(viewController.view)
        viewController.view.frame = containerView.bounds
        viewController.view.autoresizingMask = [.flexibleWidth, .flexibleHeight]
        viewController.didMove(toParent: self)
    }

    // Removes a child view controller from this view controller
    private func remove(asChildViewController viewController: UIViewController) {
        viewController.willMove(toParent: nil)
        viewController.view.removeFromSuperview()
        viewController.removeFromParent()
    }
}

// MARK: - UIImagePickerControllerDelegate, UINavigationControllerDelegate

// This extension handles the image picker delegate methods
extension UserProfileViewController: UIImagePickerControllerDelegate, UINavigationControllerDelegate {

    func imagePickerControllerDidCancel(_ picker: UIImagePickerController)
    {
        // Dismiss the image picker if canceled
        picker.dismiss(animated: true, completion: nil)
```

```
    }


    func imagePickerController(_ picker: UIImagePickerController, didFinishPickingMediaWithInfo info: [UIImagePickerController.InfoKey : Any])
    {
        // Dismiss the image picker
        picker.dismiss(animated: true, completion: nil)


        guard let image = info[UIImagePickerController.InfoKey.editedImage] as? UIImage else
        {
            // Return if no edited image is found
            return
        }


        self.selectedImage = image


        // Pass the selected image to the ProfileSecondViewController if it's the active view
        if control.selectedSegmentIndex == 1
        {
            if let secondVC = self.children.first(where: { $0 is ProfileSecondViewController }) as? ProfileSecondViewController {
                secondVC.addImage(image)
            }
        }
    }
}
```