# **Project Design**

**Project Overview**

The purpose of this project is to design, implement and test a simple java program using the waterfall methodology.

Glasgow Clyde Runners Club manually sorts data captured from various races. They want a program that can read a text file, sort data, print the sorted data to a text file and to the console. They want to develop a trial program using test data as a proof of concept.

They would like a menu interface for their non-technical staff and results to be printed to a text file as well as a suitable message output to the user.The application to be password protected with code from a previous developer and the name of their club to be displayed in the program.

They would also like the Software to run without having to upgrade and for it to run from 03/05/2023 and be completed by 26/05/2023 for £10,000. They would like us to produce a trial program based on their last 2 recorded 400m final races.

The goal of This document is to produce:

* Completed test Plan (How to plan to test your program i.e. black box / white box, types of test e.g. unit, integration, system, acceptance etc.)…**Page 2**
* Debugging Screenshot…**Page 8**

**Test Plan**

Unit tests will be conducted on the login method as well as integration between login and menu methods after the readFile method has been added. Menu will be called from readFile to ensure data is processed before the user can access it.

Remaining methods will be tested during a walkthrough of the program as an entire system. Since some of the methods simply output data we will only test that they output the correct data.

Before the password code can run a few changes need to be made.

* Import Scanner utility and add a global public static scanner to capture user input.
* Wrap the code in its own login() method.
* Change the ‘Int’ to ‘int’ and comment out the call to ‘Menu()’.
* The integration test for login will simply repeat the tests for login once **the readFile method is added after test 4, after the code is integrated into the main program.Tests 1-4 will be completed again and if no differences are found no additional comments will be made. Menu will be called from readFile instead of login.**

Since Integration testing requires the algorithm in the readFile method to be complete the test plan for the algorithm is as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Algorithms and Logic** | | | |
| **Method** | **Input** | **Output** | **Purpose** |
| readFile | runners | Sorts runner array | Sorts from lowest int to highest |
| for (int i = 0; i < runners.length; i++) {  // Sorts runners array from fastest to slowest  for (int j = 1; j < runners.length; j++) {  if (parseInt(runners[j-1][2]) > parseInt(runners[j][2])) {  String[] temp = runners[j-1];  runners[j-1] = runners[j];  runners[j] = temp;  }  }  } | | | |
| 1.loop all values in runners  2.If one value is greater than another  3.Store all values of runner with greatest time in temp[]  3.1Switch all values in runner with lowest time to greatest runner time position  3.2Swap stored runner to greatest value runner position | | | |

* This bubble sort compares each value (j-1; at position i) to the adjacent value (j; i + 1).
* By comparing (j-1) to (j) we can sort a value across the entire array in each pass.
* In the first pass (j-1) = 4 and it is > 1 so the values are swapped. (the position of the runner is actually swapped in our example not just the values)
* Since 4 is not greater than any other value the (j) loop continues to compare values until it finds another (j-1 > j).
* As we can see below 11 is the highest value so it maintains its position as (j-1) because it is being swapped with each adjacent value (j) in the first pass.
* The outer (i) loop continues to iterate for length specified for (i)
* Since all the values have been sorted in the first pass with this data no changes are made as the outer loop (i) continues and *this is why bubble sort is not the best algorithm to use for most cases as it is not as efficient as algorithms such as quicksort*

Test array:[[4], [1], [11], [5], [7], [8]] (We will remove the outer array in the tables to make it easier to read as its only function is to hold data as an index.)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **i** | **j** | **j-1** | **j-1> j?** | **temp** | **Array before** | **Expected after** | **Actual** | **Comment** |
| 4 | 1 | 4 | T | 4 | [ 4, 1, 11, 5, 7, 8 ] | [ 1, 4, 11, 5, 7, 8 ] | [ 1, 4, 11, 5, 7, 8 ] | Expected |
| 1 | 11 | 4 | F | - | [ 1, 4, 11, 5, 7, 8 ] | [ 1, 4, 11, 5, 7, 8 ] | [ 1, 4, 11, 5, 7, 8 ] | Expected |
| 1 | 5 | 11 | T | 11 | [ 1, 4, 11, 5, 7, 8 ] | [ 1, 4, 5, 11, 7, 8 ] | [ 1, 4, 5, 11, 7, 8 ] | Expected |
| 1 | 7 | 11 | T | 11 | [ 1, 4, 5, 11, 7, 8 ] | [ 1, 4, 5, 7, 11, 8 ] | [ 1, 4, 5, 7, 11, 8 ] | Expected |
| 1 | 8 | 11 | T | 11 | [1, 4, 5, 7, 11, 8 ] | [ 1, 4, 5, 7, 8, 11 ] | [ 1, 4, 5, 7, 8, 11 ] | Expected |

We can test the functionality using a trace table (Test data be replaced with actual runner test data after implementation)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Ref | input | Expected output | Actual output | Comment |
| Normal | [ 4, 1, 11, 5, 7, 8 ] | [1, 4, 5, 7, 8, 11 ] | [1, 4, 5, 7, 8, 11 ] | Expected |
| Exceptional | [ 4, 1, 11, 5.5, 7, 8 ] | Error | Error | Expected |
| Extreme | [ 4, 1, 11, 5, @, 8 ] | Error | Error | Expected |
| Normal | [ 4, 1, 11, 5, 7, -8 ] | [ -8, 1, 4, 5, 7, 11 ] | [ -8, 1, 4, 5, 7, 11 ] | Expected |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Testing Plan and Outcome Tables** | | | | | | |
| **Ref.** | **Description** | **Item(s)** | **Input** | **Expected Output** | **Actual Output** | **Comment** |
| **login** | | | | | | |
| Security 1  Extreme | Tests wrong type | Variables password and login | @!£$\ | Incorrect 2 attempts left | Your Password is incorrect  You have: 2 attempts left. | Expected |
| Security 2  Exceptional | Tests combination type | Variables password and login | Runners@ | Incorrect 1 attempts left | Your Password is incorrect  You have: 1 attempt left. | Expected |
| Security 3  Normal | Tests valid value  Checks if password is compared rather than string length | Variables password and login | runnersclyde | Locked out | Your Password is incorrect  You have: 0 attempts left.  Number of attempts exceeded. You are now locked out. | Expected |
| Security 4  Normal | Testing login  Integration | Variables password and login | clyderunneers | Validated, menu shown | PasswordValidated | Expected |

~

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Testing Plan and Outcome Tables** | | | | | | |
| **Ref.** | **Description** | **Item(s)** | **Input** | **Expected Output** | **Actual Output** | **Comment** |
| readFile | | | | | | |
| Error Handling | Test try-catch | FILE\_PATH | Correct path | Display menu | Display menu | Expected |
| Functionality | Test if read files correctly | FILE\_PATH | Incorrect path | Error | Error | Expected |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Testing Plan and Outcome Tables** | | | | | | |
| **Ref.** | **Description** | **Item(s)** | **Input** | **Expected Output** | **Actual Output** | **Comment** |
| **menu** | | | | | | |
| Functionality | Tests output | MenuChoice | 1 | All names displayed | All names displayed | Expected |
| Functionality | Tests output | MenuChoice | 2 | All times displayed | All times displayed | Expected |
| Functionality | Tests output | MenuChoice | 3 | Fastest Time: [Chantelle, Oliver, 68]  Slowest Time: [Al, Capone, 140] | Fastest Time: [Chantelle, Oliver, 68]  Slowest Time: [Al, Capone, 140] | Expected |
| Functionality | Tests output | MenuChoice | 4 | 1: Search Name  2: Search Time  3: Back | 1: Search Name  2: Search Time  3: Back | Expected |
| Functionality | Tests output | MenuChoice | 5 | Produced file and displayed sorted data in console | Produced file and displayed sorted data in console | Expected |
| Functionality | Tests output | MenuChoice | 6 | Process finished with exit code 0 | Process finished with exit code 0 | Expected |
| Input validation | Tests output | MenuChoice | A | Invalid input. Please enter a Number | Invalid input. Please enter a Number | Expected |
| Input validation | Tests output | MenuChoice | 19 | Please choose options 1-6 | Please choose options 1-6 | Correct |
| Input validation | Tests output | MenuChoice | 0 | Please choose options 1-6 | Please choose options 1-6 | Expected |
| Input validation | Tests output | MenuChoice | -1 | Please choose options 1-6 | Invalid input. Please enter a Number | Unexpected |
| Input validation | Tests output | MenuChoice | @ | Invalid input. Please enter a Number | Invalid input. Please enter a Number | Expected |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Testing Plan and Outcome Tables** | | | | | | |
| **Ref.** | **Description** | **Item(s)** | **Input** | **Expected Output** | **Actual Output** | **Comment** |
| Search Menu | | | | | | |
| Input validation | Tests out of range | choice | 0 | Make a selection between 1-3 | Invalid input. Please enter a Number | Unexpected |
| Input validation | Tests out of range | choice | -1 | Make a selection between 1-3 | Invalid input. Please enter a Number | Unexpected |
| Input validation | Tests out of range | choice | 4 | Choose options 1-3 | Make a selection between 1-3 | Unexpected |
| Input validation | Tests wrong type | choice | A | Invalid input. Please enter a Number | Invalid input. Please enter a Number | Expected |
| Input validation | Tests wrong type | choice | 1.1 | Choose options 1-3 | Invalid input. Please enter a Number | Unexpected |
| Input validation | Tests wrong type | choice | @ | Invalid input. Please enter a Number | Invalid input. Please enter a Number | Expected |
| Functionality | Tests valid value | choice | 1 | Enter letters from first OR last name (Not case sensitive): | Enter letters from first OR last name (Not case sensitive): | Expected |
| Functionality | Tests valid value | choice | 2 | Enter time in seconds: | Enter time in seconds: | Expected |
| Functionality | Tests valid value | choice | 3 | Displays main menu | Displays main menu | Expected |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Testing Plan and Outcome Tables** | | | | | | |
| **Ref.** | **Description** | **Item(s)** | **Input** | **Expected Output** | **Actual Output** | **Comment** |
| **Name search (1)** | | | | | | |
| Input validation | Tests wrong type | pattern | 1 | Invalid input. Please enter a string. | Invalid input. Please enter a string. | Expected |
| Input validation | Tests wrong type | pattern | -1 | Invalid input. Please enter a string. | Invalid input. Please enter a string. | Expected |
| Input validation | Tests wrong type | pattern | @ | Invalid input. Please enter a string. | Invalid input. Please enter a string. | Expected |
| Input validation | Tests combination t type | pattern | a1 | Invalid input. Please enter a string. | Invalid input. Please enter a string. | Expected |
| Functionality | Tests valid value | pattern | al | First Name occurrence: 1 Name: Al Capone Times: 140 Total Occurrences: 1 | Occurence 1 : [Callum, Dawson, 72]  Occurence 2 : [Natalie, Wallis, 80]  Occurence 3 : [Al, Capone, 140]  Total Occurrences: 3 | Unexpected  Matched all occurrences of pattern |
| Functionality | Tests valid value | pattern | Al | First Name occurrence: 1 Name: Al Capone Times: 140 Total Occurrences: 1 | Occurence 1 : [Callum, Dawson, 72]  Occurence 2 : [Natalie, Wallis, 80]  Occurence 3 : [Al, Capone, 140]  Total Occurrences: 3 | Unexpected  Matched all occurrences of pattern |
| Functionality | Tests valid value | pattern | Al cap | Occurence 1 : [Al, Capone, 140]  Total Occurrences: 1 | Invalid input. Please enter a string. | Unexpected  Regex only compares one string |
| Functionality | Tests valid value | pattern | cap | Occurence 1 : [Al, Capone, 140]  Total Occurrences: 1 | Occurence 1 : [Al, Capone, 140]  Total Occurrences: 1 | Expected |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Testing Plan and Outcome Tables** | | | | | | |
| **Ref.** | **Description** | **Item(s)** | **Input** | **Expected Output** | **Actual Output** | **Comment** |
| Time Search (2) | | | | | | |
| Input validation | Tests wrong type | NumberPatterm | a | Invalid input. Please enter a Number | Invalid input. Please enter a Number | Expected |
| Input validation | Tests wrong type | NumberPatterm | A | Invalid input. Please enter a Number | Invalid input. Please enter a Number | Expected |
| Input validation | Tests combination type | NumberPatterm | a1 | Invalid input. Please enter a Number | Invalid input. Please enter a Number | Expected |
| Input validation | Tests combination type | NumberPatterm | 1a | Invalid input. Please enter a Number | Invalid input. Please enter a Number | Expected |
| Input validation | Tests wrong type | NumberPatterm | al | Invalid input. Please enter a Number | Invalid input. Please enter a Number | Unexpected |
| Input validation | Tests wrong type | NumberPatterm | @ | Invalid input. Please enter a Number | Invalid input. Please enter a Number | Expected |
| Functionality | Tests valid value | NumberPatterm | -1 | Total Occurrences: 0 | Invalid input. Please enter a Number | Unexpected |
| Functionality | Tests wrong type | NumberPatterm | -1.2 | Total Occurrences: 0 | Invalid input. Please enter a Number | Unexpected |
| Functionality | Tests wrong type | NumberPatterm | 1.2 | Total Occurrences: 0 | Invalid input. Please enter a Number | Unexpected |
| Functionality | Tests wrong type | NumberPatterm | 1.12 | Total Occurrences: 0 | Invalid input. Please enter a Number | Unexpected |
| Functionality | Tests wrong type | NumberPatterm | 12.1 | Total Occurrences: 0 | Invalid input. Please enter a Number | Unexpected |
| Functionality | Tests wrong type | NumberPatterm | 12.12 | Total Occurrences: 0 | Invalid input. Please enter a Number | Unexpected |
| Functionality | Tests valid value | NumberPatterm | 1 | Total Occurrences: 0 | Total Occurrences: 0 | Expected |
| Functionality | Tests valid value | NumberPatterm | 12 | Total Occurrences: 0: | Total Occurrences: 0 | Expected |
| Functionality | Tests valid value  Make sure single digits from double digit times are not compared | NumberPatterm | 9 | Total Occurrences: 0: | Total Occurrences: 0 | Expected |
| Functionality | Tests valid value | NumberPatterm | 90 | occurrence: 1 : [Peter, Black, 90]  occurrence: 2 : [Richard, Smith, 90]  Total Occurrences: 2 | occurrence: 1 : [Peter, Black, 90]  occurrence: 2 : [Richard, Smith, 90]  Total Occurrences: 2 | Expected |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Testing Plan and Outcome Tables** | | | | | | |
| **Ref.** | **Description** | **Item(s)** | **Input** | **Expected Output** | **Actual Output** | **Comment** |
| **getNames** | | | | | | |
| Functionality | Call from menu | runners | Called | Prints full name | Prints full name | Expected |
|  | | | | | | |
| Functionality | Call from menu | runners | Called | Prints slowest and fastest time | Prints slowest and fastest time | Expected |
|  | | | | | | |
| Functionality | Call from menu | Runners, date, | Called | Prints sorted list to console and file | Prints sorted list to console and file | Expected |

**Screenshot**

