**SOEN 6481**

**Software Systems Requirements Specification**

**Summer 2019**

**Deliverable 2**

**Eternity: Numbers**

## Declaration

**I have read and understood the Fairness Protocol and Communal Work Protocol, and agree to abide by the policies therein, without any exception under any circumstances, whatsoever.**

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**Problem 6 [70 marks]**

**USER STORIES**

### 6.1 Display input

| | |
|---|---|
| Identifier | EN_01 |
| Statement | As a user, I should be able to see the operators/operations on the display screen that I am entering so that I can modify the expression if needed. |
| Constraint | The display screen will show a total of 16 inputs of the expression at a time. |
| Acceptance Criteria | Given I want to get the sum of 2 & 3, I should be able to see the expression as 2+3, on the display screen before I click "=" for the result. |
| Priority | Must have |
| Estimate | 1 |

### 6.2 Modify input

| | |
|---|---|
| Identifier | EN_02 |
| Statement | As a user, I should be able to delete wrongly entered operators/operations so that I can correct the expression I want to calculate. |
| Constraint | The user must have to enter atleast one operator/operation to delete it.<br>The user can only delete the last entered input one at a time. |
| Acceptance Criteria | 1. Given I have entered 1, 2, 3 (123). On pressing the backspace key, I should see 12 on the display screen.<br>2. Given I entered 5. On pressing the backspace key, I should see 0 on the display screen. |
| Priority | Must have |
| Estimate | 1 |

### 6.3 Accuracy

| | |
|---|---|
| Identifier | EN_03 |
| Statement | As a user I want my calculator to calculate the value of "Pi" upto 15 decimal places (enough for any measurable experiment), so that I can use it to bring accuracy in my results |
| Constraint | None |
| Acceptance Criteria | 1. Given I have clicked "$\pi$ " key and then "=" , I should see 3.141592653589793 on the display screen |
| Priority | Must have |
| Estimate | 2 |

### 6.4 Precision

| | |
|---|---|
| Identifier | EN_04 |
| Statement | As a user, I should be able to choose the value of "pi" upto desired number of decimal points depending on my calculation, to get the precise result. |
| Constraint | The minimum decimal places user can choose is 2 and maximum is 15. |
| Acceptance Criteria | 1. Given I have clicked "pi" , on clicking "D" key if I enter 2 , the pi in my calculation will have value upto 2 decimal places i.e. 3.14 , which will be enough for me to calculate the circumference of a circle.<br>2. Minimum decimal value to be chosen must be 2 and maximum is 15.<br>3. Even If I click an integer less than 2 or greater than 15, after pressing the "D" key, "INVALID INPUT" will be displayed on the screen. |
| Priority | Should have |
| Estimate | 2 |

### 6.5 Area Shortcut

| | |
|---|---|
| Identifier | EN_05 |
| Statement | As a user, I should be able to directly calculate the area of a circle by just providing the value of radius as this is the most needed calculation in my field of work thus it will save me a lot of time. |
| Constraint | The value of Radius should be greater than zero. (r >0)<br>The default value of "pi" in this function would be upto 2 decimal places. |
| Acceptance Criteria | 1. Given I have clicked/typed "Area" key. I will now click 5 (radius) to get the result 78.5 ($3.14 * 5 * 5$) displayed on the screen.<br>2. Given I have clicked "Area" key. Now on giving the value of radius as -5, the display screen will show "INVALID RADIUS" . |
| Priority | Should have |
| Estimate | 2 |

### 6.6 Store Result

| | |
|---|---|
| Identifier | EN_06 |
| Statement | As a user, I should be able to save the results of my calculation so that I can use it later. |
| Constraint | There must be atleast one entered value or computation done, after starting the calculator.<br>All these saved result will be erased after the user turns off the calculator. |
| Acceptance Criteria | 1. Given I have calculated area of a circle with radius "5" , if I click "S" key, the result will be stored in calculator's memory for later use and a message "Result saved" and the memory [5] will be displayed..<br>2. Given that I have just turned on the calculator and the display screen shows "0" , on clicking "S" nothing is stored in the memory. |
| Priority | Should have |
| Estimate | 2 |

### 6.7 Clear Memory

| | |
|---|---|
| Identifier | EN_07 |
| Statement | As a user, I should be able to delete all the saved results to have a fresh memory and delete the results that will not be needed anymore. |
| Constraint | There must be atleast one saved calculation in the memory. |
| Acceptance Criteria | 1. Given I have saved 5 (3+2), 6 (9-3) in my calculator memory. On clicking "MC" key, both the saved values will be deleted. |
| Priority | Should have |
| Estimate | 1 |

### 6.8 See Stored Results

| | |
|---|---|
| Identifier | EN_08 |
| Statement | As a user, I should be able to see all my saved calculations so that I can decide which one to use. |
| Constraint | The user must have to save at least one computation in the saving list. |
| Acceptance Criteria | 1. Given I have saved 2+2=4 and then 4-3=1 by clicking "S" key after each computation. On clicking "H" key I should see 4, 1.<br>2. Given I have just started the calculator and no value is saved. On clicking "H" , "No value" will be displayed on the screen |
| Priority | Should have |
| Estimate | 1 |

### 6.9 Last Calculation

| | |
|---|---|
| Identifier | EN_09 |
| Statement | As a user, I should be able to operate on the last calculated answer directly. |
| Constraint | The user must have calculated one expression |
| Acceptance Criteria | 1. Given I calculated 2+2=4, if I click "Ans" key and then + 2 , the result displayed should be 6 (4 + 2)<br>2. Given I have not done any calculation, clicking "Ans" will do nothing. |
| Priority | Should have |
| Estimate | 1 |

### 6.10 iCloud

| | |
|---|---|
| Identifier | EN_10 |
| Statement | As a user, I should be able to upload my saved calculations in icloud, so that I can access them from anywhere, anytime. |
| Constraint | The user should have an icloud account. |
| Acceptance Criteria | Given I have done a calculation and saved it in the memory, on clicking "iC" , the saved result(s) is permanently stored in my icloud account. |
| Priority | Could have |
| Estimate | 3 |

**Problem 7 [10 marks]**

**Traceability Matrix**

| Index | User Story Identifier | User Story Name | User Story Source |
|---|---|---|---|
| 1 | EN_01 | Display input | Problem 5 UML Use Case Diagram [ Use Case: Display Result] |
| 2 | EN_02 | Modify input | Problem 5 UML Use Case Diagram [ Use Case: Edit Displayed Result] |
| 3 | EN_03 | Accuracy | Interview (Problem 2) |
| 4 | EN_04 | Precision | User Story EN_03 |
| 5 | EN_05 | Area Shortcut | Problem 1 |
| 6 | EN_06 | Store Result | Persona (Problem 3) |
| 7 | EN_07 | Clear Memory | User Story EN_06 |
| 8 | EN_08 | See Stored Results | Interview (Problem 2) |
| 9 | EN_09 | Last Calculation | https://www.online-calculator.com/ |
| 10 | EN_10 | iCloud | Interview (Problem 2) |

**Problem 8 [40 marks]**

I have implemented **four user stories** using **three classes**, whose description is as follow:

All the inputs while running these programs are **NOT CASE SENSITIVE**

**1. EN_03_04:** This class shows the implementation of **User Story 3 (EN_03)** & **User Story 4 (EN_04)**. The goal of this implementation is to calculate or use the value of pi by letting the user decide till how many decimal places he wants to use the value of pi. If the user chooses/types "pi" as the first operand, he is asked if he want to decide the precision of the value of pi. The user can type "D" continued with an integer 'i' (1<i<16) to choose the number of decimal places he wants the value of pi to be upto or "c" to continue with default 15 decimal places. After choosing he can just type "=" to calculate the value of pi or choose any arithmetic operator "+,-, /,* " to operate on first operand "pi" . In this program, after end of one operation, user can type "c" to continue with another operation or type "q" to terminate the program.

**2 EN_05:** This class shows the implementation of **User Story 5 (EN_05)** and shows the application of number "pi" in real life. According to the description of number pi in Problem 1 and the interview it is quite clear that pi's most common use is in finding area or circumference and area of a circle. So in this implementation, user has the option to quickly calculate the area. User will just press "Area" button (type "Area" while running this program) and then give the value of radius to calculate the area of the circle. After completing one operation, user can press "c" to continue or "q" to terminate the program.

**3. EN_06:** This class implements **User Story 6 (EN_06)** which focuses on the application of the calculator. User can store the results he wants and use them later. In the program, user enters first operand as a rational number or pi, in this implementation choosing the precision of pi is not implemented as the focus is only to implement "saving the result" , followed by one of the four primary arithmetic operators and then the second operator. On getting the result, all user has to do is press/type "S" to save the result in calculator's memory. If he doesn't want to store this result all he can type "c" to continue or "q" to quit.

**Glossary:**

1. User Story: In software development and product management, a user story is an informal, natural language description of one or more features of a software system, often written from the perspective of an end user or user of a system.

2. Traceability Matrix: In software development, a traceability matrix is a document, usually in the form of a table, used to assist in determining the completeness of a relationship by correlating any two baselined documents using a many-to-many relationship comparison.

**Repository Link:**

https://github.com/Bikram1907/SOEN-6481

**References:**

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2. P. Kamthan, summer 2019, "User Stories in Context" , Department of Csc. & SE, Concordia University.

3. P. Kamthan, summer 2019, "Traceability in Software Requirements" , Department of Csc. & SE, Concordia University.

4. "Four Function Calculator Requirement Specification"
http://www.mathcs.richmond.edu/∼ barnett/cs322/assignments/1999_fall/calculator_requirements.pdf

5. "Software Requirements Document: A Multi-Function Calculator" http://www2.cs.uidaho.edu/∼ rinker/cs113/calculator.pdf