

**DEPARTMENT OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING**  
**SOEN 6481: SOFTWARE SYSTEMS REQUIREMENTS SPECIFICATION**  
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**DELIVERABLE 2**

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Note: The code repository for the project is maintained at <https://github.com/ndkcha/calculator>

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# 1 User Stories

**Note:** The reference point for the user story estimate is 13 points for 1 day.

## 1.1 Global Constraints

- The system takes the text based inputs from the command line console.
- The system throws error on wrongly formatted input.

## 1.2 User Stories

<b>Identifier</b>	calc-us-001
<b>Description</b>	A user can calculate basic equations related to arithmetic operators.
<b>Constraints</b>	<ol style="list-style-type: none"><li>1. The user will input only two operands at a time.</li><li>2. The user can use symbols to input the special constants.</li><li>3. The operations involve both numbers and symbols.</li></ol>
<b>Acceptance Tests</b>	<ol style="list-style-type: none"><li>1. The user is able to perform arithmetic operations between two numbers.</li><li>2. The user is able to perform arithmetic operations between symbols.</li><li>3. The user is able to perform arithmetic operations among number and symbols.</li></ol>
<b>Priority</b>	High
<b>Estimate</b>	5 points

Table 1: User Story 1

<b>Identifier</b>	calc-us-002
<b>Description</b>	A user can evaluate expressions with scientific operators.
<b>Constraints</b>	<ol style="list-style-type: none"> <li>1. The user can combine two different kind of scientific operators.</li> </ol>
<b>Acceptance Tests</b>	<ol style="list-style-type: none"> <li>1. The user is able to perform logarithmic and trigonometric operations.</li> <li>2. The user is able to use arithmetic operators with scientific operators.</li> </ol>
<b>Priority</b>	Medium
<b>Estimate</b>	8 points

Table 2: User Story 2

<b>Identifier</b>	calc-us-003
<b>Description</b>	A user can evaluate an expression in order to process with variable data for his research.
<b>Constraints</b>	<ol style="list-style-type: none"> <li>1. The expression can be the combination of arithmetic operations and logarithmic operations.</li> <li>2. The expression may contain the Gelfond's constant.</li> </ol>
<b>Acceptance Tests</b>	<ol style="list-style-type: none"> <li>1. The user is able to calculate the roots of an equation.</li> </ol>
<b>Priority</b>	Low
<b>Estimate</b>	13 points

Table 3: User Story 3

<b>Identifier</b>	calc-us-004
<b>Description</b>	A user can calculate the volume of n-ball sphere.
<b>Constraints</b>	<ol style="list-style-type: none"> <li>1. The user will provide only the value of n.</li> <li>2. The sphere will always be unit size.</li> </ol>
<b>Acceptance Tests</b>	<ol style="list-style-type: none"> <li>1. The user can validate the size of the balls to be unit.</li> <li>2. The user can calculate the volume.</li> </ol>
<b>Priority</b>	Medium
<b>Estimate</b>	21 points

Table 4: User Story 4

<b>Identifier</b>	calc-us-005
<b>Description</b>	A user can derive almost integer numbers.
<b>Constraints</b>	<ol style="list-style-type: none"> <li>1. The user can use only transcendental numbers in order to mix it with the Gelfond's constant.</li> </ol>
<b>Acceptance Tests</b>	<ol style="list-style-type: none"> <li>1. The user should be able to generate Ramanujan's constant, <math>e^{\pi\sqrt{163}}</math></li> </ol>
<b>Priority</b>	Medium
<b>Estimate</b>	13 points

Table 5: User Story 5

## 2 Backward Traceability Matrix

### 2.1 Matrix

	Use Cases	Persona	Applications
calc-us-1	calc-uc-1		
calc-us-2	calc-uc-1	1	
calc-us-3	calc-uc-1		
calc-us-4	calc-uc-3		1
calc-us-5	calc-uc-2		1

Table 6: Backward Traceability Matrix

### 2.2 Description

The first column represents the use case identifiers. The use case identifiers are addressed in the User Stories section.

In the use cases column, **calc-uc-1** corresponds to "Evaluate Basic Expressions". **calc-uc-2** corresponds to "Calculate Almost Integer Number". **calc-uc-3** corresponds to "Calculate volume of u-unit balls"

## 3 Implementation

As part of implementation of the project, the following user stories are implemented.

1. **calc-us-1** belongs to the calculator's domain.
2. **calc-us-5** is specific to the Gelfond's constant.
3. **calc-us-4** implements one of the application of Gelfond's constant.

### 3.1 Screen shots of the Implementation

```

Welcome to the calculations services!

Press 1 for basic calculator functionality
Press 2 for extended functionalities
Enter any other value to exit
# 1

Arithmetic Calculator

Hint: To use this part of calculator, you can input the expression in a single line and press return to have it evaluated
The calculator arithmetic operations such as +, -, *, /
The input must have only two operands and one operator.
For example: 4+3 input will give the answer 7.
The calculator also supports symbols "e", "pi" and "g" (where g is Gelfond's constant)
Give "exit" as an input to quit
After the #, start inputting the expression

# 4+5
Result: 9.0
# 5*6
Result: 30.0
# e+1
Result: 3.718281830853743
# g+0
Result: 23.14069269682385
# g*4
Result: 92.5627707872954
#
```

Figure 1: Implementation of calc-us-1

```

Press 1 for basic calculator functionality
Press 2 for extended functionalities
Enter any other value to exit
# 2

The extended functionalities include,

1. List of Other Related Constant
2. The volume of the n-dimensional ball with unit Radius
Enter any other value to exit
After the #, start inputting the expression

# 1
Ramanujan's constant: 2.62537421917415776E17
e^pi - pi: 19.999205331747216
# 2
Result: 23.14069269682385
#
```

Figure 2: Implementation of calc-us-4 and calc-us-5