Project- Enternity:Numbers **Simran Sidhu**
SOEN6481 **40011611**
GitHub Repository : https://github.com/SimSid2312/SOEN6481.git

Contents

1 Change Made From D1 to D2

1. For the reasons of adding more use cases i have created a user- Marc Anthony that is a prototype.Additional as Nileesha Fernando didnt share any goals related to the Enternity:Numbers so i am changing her profile to be a surogate user for the same reasons mentioned above.Therefore in this project i will be having 2 real users and 2 surrogate users of Enternity:Numbers.Hence for this reason I am re-submitting User:Nileesha and Marc Interview and Personna.

2. After Discussion with Ta in the Lab Session (26 July 2019) and as TA suggestion I have added User Stories that provides the capability of performing basic arithematic operations on two number such addition,substraction,division,multiplication.

3. I am assigning identifiers to my use case :

Identifier	Use Cases
UC1	Calculate natural logarithm of 2
UC2	Calculate compound interest using ln_e2 - compounded annually
UC3	Calculate compute interest using ln_e2 - compounded continuously.
UC4	Compute Half-Life of a Substance
UC5	Compute Inverse Function of ln_e2
UC6	Compute Basic Arithmetic Operation of a number with ln_e2
UC7	Save history session
UC8	Computing the result upto a precision of 2 or 3 decimal places.
UC9	Validating User Input.
UC10	Display Math Error.
UC11	Fetching Session History
UC12	Perform Operation
UC13	Compute Natural Logarithm Properties on ln_e2 and natural logarithm of a number

2 Problem2 : Interview

2.1 Interview 3

Q1. Your Name - Nileesha Fernando
Q2. What do you do in your daily life?
Student and working part time as Full Stack PHP intern at PlanetRate,Montreal

Q3. What is your highest Qualification?
Pursuing Master of Software Engineering at Concordia University,Montreal

Q4. Generic question about the scientific calculator, can you share your past experience of using a scientific calculator?
I have used the calculator for educational purposes. In my mathematics and physics classes, it was vital to use the scientific calculator during lab ex-experiments to perform data analysis. I used the Casio S-V P.A.M calculator and sometimes I used online scientific calculators to perform more complex scientific equations. The main drawback with my current scientific calculator is that it cannot perform complex functionality in a simple manner. Also i don't see any options to view my previous history of a particular session on my calculator.

Q5. Have you ever dealt with irrational numbers may be in your school, university or work? If yes, can you share any particular concept or project where you used them?
Yes, in my undergraduate courses - physics and math.

Q6. Have you used natural logarithms in any of your previous work or as a school project? If yes, can you share any particular concept or project where you used them?
I have used natural logarithms in my undergraduate course like - Physics,Math,Machine Learning , Artificial intelligence,Statistics.Also i took Algorithm Design Techniques in my masters. Since all these course involve computing complex equation hence i have used natural logarithm many times. Not only this , in some hard to solve problems the use of natural logarithm made it easier for me to compute them.

Q7. How will you describe the frequency of your usage of natural logarithm?

- ○ Rarely used

○ Frequently used

◉ Somewhat in between Rare and Frequent Usage

Q8. Can you illustrate an example which can demonstrate the fact that using a natural logarithm is helpful- Any real-world application?
I remember solving problems that involved exponential term ,in my math and algorithm design courses, using natural logarithm manually. In the real world application i can say they can be useful in computing complexity of an algorithm.

Q9. How do you prefer solving an equation involving a natural logarithm?

◉ Using a Scientific Calculator

○ Manually

○ Both

Q10. Any challenges you faced while using this number i.e. Natural logarithm with or without a calculator?
None but for your school project you can add a feature of computing natural logarithm properties such as Quotient Rule,Power Rule,Product Rule on $ln_e(2)$ and Inverse Function of $ln_e(2)$. Additionally you can add the facility of Basic Arithmetic Operation on $ln_e(2)$. A calculator that can directly apply the formulas will be beneficial for us student during the examination as we can save time.

Q11. Have you used the natural logarithm of 2 in any of your previous work or as a school project? If yes, can you share any particular concept or project where you used them?
Not used

Q12. How will you describe the frequency of your usage of the natural logarithm of 2- rarely used or frequently used?

◉ Rarely used

○ Frequently used

○ Somewhat in between Rare and Frequent Usage

Q13. Can you illustrate an example for me which can demonstrate the fact that using a natural logarithm of 2 is helpful- Any real-world application?
Never really used this number in particular but it was a part of complex equation i will compute its value using a scientific calculator.

Q14. When you use the natural logarithm of a number do you round off the digits and if so how many decimal places do you prefer rounding off the result?
3

Q15. Any feature, one or more, you feel that should be there in the scientific calculator to make it easier for the user to perform complex mathematical equation easily using a natural logarithm of 2?
None related to natural logarithm

Q16.Any challenges you faced while using this number i.e. Natural logarithm of 2 with or without a

calculator?
None

2.2 Interview 4

Q1. Your Name - Marc Anthony

Q2. What do you do in your daily life?
Chemist at Analytical Chemist

Q3. What is your highest Qualification?
Master in philosophy.

Q4. Generic question about the scientific calculator, can you share your past experience of using a scientific calculator?
Well, i use it on a daily basis to generate various report after analysis of a new drug.

Q5. Have you ever dealt with irrational numbers may be in your school, university or work? If yes, can you share any particular concept or project where you used them?
Yes, but nothing in particular i can remember at the moment.

Q6. Have you used natural logarithms in any of your previous work or as a school project? If yes, can you share any particular concept or project where you used them?
Yes, i used it often to analyze the result of a research.
Q7. How will you describe the frequency of your usage of natural logarithm?

- ○ Rarely used
- ◉ Frequently used
- ○ Somewhat in between Rare and Frequent Usage

Q8. Can you illustrate an example which can demonstrate the fact that using a natural logarithm is helpful- Any real-world application?
A special case where i find the natural logarithm concept useful is finding the time by which a substance will complete its half life using natural logarithm of 2.

Q9. How do you prefer solving an equation involving a natural logarithm?

- ◉ Using a Scientific Calculator
- ○ Manually
- ○ Both

Q10. Any challenges you faced while using this number i.e. Natural logarithm with or without a calculator?
None.

Q11. Have you used the natural logarithm of 2 in any of your previous work or as a school project? If yes, can you share any particular concept or project where you used them?

Yes, an example that i mentioned previously that it is useful in finding Half Life of a substance.

Q12. How will you describe the frequency of your usage of the natural logarithm of 2- rarely used or frequently used?

- ○ Rarely used
- ○ Frequently used
- ◉ Somewhat in between Rare and Frequent Usage

Q13. Can you illustrate an example for me which can demonstrate the fact that using a natural logarithm of 2 is helpful- Any real-world application?
In comuting Half Life of substance. Here the substance can be a carbon atom.

Q14. When you use the natural logarithm of a number do you round off the digits and if so how many decimal places do you prefer rounding off the result?
3 decimal places

Q15. Any feature, one or more, you feel that should be there in the scientific calculator to make it easier for the user to perform complex mathematical equation easily using a natural logarithm of 2?
Finding Half Life of a substance can be added to your calculator - so that i quickly perform my computation put entering two values i.e. initial amount and rate of decay annually.This will really help when i am finding the half life of large number of substances.

Q16.Any challenges you faced while using this number i.e. Natural logarithm of 2 with or without a calculator?
None.

2.3 Rationale for selecting the three interviewees

2.3.1 Reason for choosing Ms. Nileesha Fernando as interview:

She is a currently per suing her masters degree(Master of Software Engineering) at Concordia University and has successfully completed course - Software Requirement Specification in fall 2018 under professor - Abdelwahab Elnaka with a grade : A+. Additionally, as a side project she created a calculator application using : JavaScript,HTML,CSS. She was able to provide me with the information about the relevance of natural logarithm of 2 in student community of Computer Science/Software Engineering.

2.3.2 Reason for choosing Mr. Marc Anthony as interviewee:

He is a surogate user i.e. a prototype that is being created after introspection about the benefits this calculator can prove in real life problem.

2.4 Analysis of interview :

Please note: For the reasons of adding more use cases i have created a user- Marc Anthony that is a prototype. Additional as Nileesha Fernando didnt share any goals related to the Enternity:Numbers so i am changing her profile to be a surogate user for the same reasons mentioned above.Therefore in this project i will be having 2 real users and 2 surrogate users of Enternity:Numbers.All interviewees have used the scientific calculator a lot in computing complex mathematical equations. For the use of irrational

number s it is interesting to note that irrational number are not being used by data-scientist professionals in their day to day work.Regarding the use of natural logarithm all of them have used it extensively i.e. they pointed out its usage in plotting a large data after computing the natural log of the value, in computing complexity of algorithm and any physical model that has an exponential term in it and computing half life of a substance. All the three of them prefer using a scientific calculator to calculate the value of natural logarithm. None them have dealt with natural logarithm of 2 related problems in particular however Mr. Manjit,mathematician, mentioned about the real world application of this number that it can used to compute compound interest and Marc mentioned about its use in finding Half Life. They usually prefer rounding off the natural logarithm value to 2 to 3 decimal places when using it in an mathematical equation.It was also noted that none of them feel a need of a change that is required in the scientific calculator for computing natural logarithm of number.However suggested a few features that can be used in Enternity:Numbers.

3 Problem3 : Persona

Photo

Personal Information

- Name : Nileesha Fernando
- Job Title : Student
- Age :25
- University: Concordia University
- Email: nfernado@gmail.com
- Location: Montreal, QC, Canada
- Highest Level of Education: Pursuing Master of Software Engineering

Skills

Full Stack PHP intern at Planet Rate, Montreal. Her part-time internship requires her to design efficient algorithm for company's new feature using technologies such as

- PHP
- HTML
- CSS
- Node JS
- MySQL

Experience

- Student – Completed course Algorithm Design Technics and Aritificial intelligence
- Full Stack Php intern (Web Developer)

User requirements

Regarding Eternity:Numbers she mentioned a few features i.e. save history of a session,calculating the natural logartithm properties on ln_2, computing the inverse function of ln_e2 and perfoming basic arithematic operation on the ln_e2 . Despite the suggested feature she feels that using the scientific calculator to compute natural logarithm of any number is easy.

Goals

Although user seems very satisfied with scientific calculator she is using to solving complex mathematical equation involving natural logarithm of 2. However still feel that the suggested features, if are made available it will really help students solve equations faster which can be beneficial during examinations.

Photo	**Personal Information**
	• Name : Marc Anthony • Job Title : Chemist • Age : 30 • University : McGill University,Montreal,Canada • Email :marc@gmail.com • Location : Montreal,Canada • Highest Level of Education: Master in philosophy
Skills • Good Team player. • Analytical Thinking • Good knowledge of Probability and Statistics	
Experience • Chemist at Analytical Chemist	
User requirements Add a feature to compute Half Life a substance to Enternity:Numbers.	
Goals Have a scientific calculator that can compute the half-life of a substance by providing the initial amount (in grams) and rate of decay annually.	

4 Problem6 : User Stories

User Stories are written from the perspective of the users.
Priority : MOSCOW , where
M : Must have
S : Should have
C : Could have
W : Wont have(this time) (1)
Please Note : Since i am considered that Deliverable -D2 is a time box. i.e as a date of first delivery of Enternity:Number hence the Priority of User Stories was categorized considering this factor.

Estimate : For estimating I am using Fibonacci Sequence and the unit of estimate is Story Point.A story point describes the effort needed to complete a user story. These story points does not necessarily have direct relationship with the time in hours or minute or seconds. Its just a relative measure of scale between different user stories.The format of Acceptance criteria was learnt form website (4).

4.1 User Stories by users- Generic (asked by all the users)

Identifier:
G-US1

User Story Statement
A customer can view the result on a User Interface so that they can see the result of the computed value after execution of an operation.

Constraints
None

Acceptance Criteria

Identifier	Given	When	Then
T_G-US1_1	Constraint is met – if any.	User Performs operation : Ln2 + 2	Display Result upto 2 decimal places = 2.69 AND Display Result upto 3 decimal places=2.693 AND Save the result and user operation locally.
T_G-US1_2	Constraint is met – if any.	User Performs operation : Ln(-3/2)	Display Math Error AND Save the result locally.

Priority
Must-have.

Estimate :
0.5

Identifier:
G-US2

User Story Statement
A customer can get the result upto a certain precision i.e either 2 decimal places or 3 decimal places so that they dont have to perform rounding off of a result manually(mentally).

Constraints
Results should not be a math Error

Acceptance Criteria

Identifier	Given	When	Then
T_G-US2_1	Constraint is met – if any.	User Performs operation : Ln$(2 * 6)$	Display Result upto 2 decimal places = 2.48 AND Display Result upto 3 decimal places=2.485 AND Save the result and user operation locally.
T_G-US2_2	Constraint is met – if any.	User Performs operation : InverseFunction$(ln_e 2)$	Display Result upto 2 decimal places = 7.39 AND Display Result upto 3 decimal places=7.389 AND Save the result and user operation locally.

Priority
Must-have

Estimate :
1

Identifier:
G-US3

User Story Statement:
A customer can get the value of $ln_e 2$ so that they can use this result in their work.

Constraints
None

Acceptance Criteria

Identifier	Given	When	Then
T_G-US3_1	Constraint is met – if any.	User Performs operation : Ln(2)	Display Result upto 2 decimal places = 0.69 AND Display Result upto 3 decimal places=0.693 AND Save the result and user operation locally.

Priority
Must have

Estimate :
2

Identifier:
G-US4

User Story Statement:
A customer can perform basic arithmetic operation - addition of two numbers so that they can use this result in their work.

Constraints
None

Acceptance Criteria

Identifier	Given	When	Then
T_G-US4_1	Constraint is met – if any.	User Performs operation : 2+.2	Display Result upto 2 decimal places = 2.20 AND Display Result upto 3 decimal places=2.200 AND Save the result and user operation locally.
T_G-US4_2	Constraint is met – if any.	User Performs Operation : 0.01+0.0008	Display Result upto 2 decimal places = 0.01 AND Display Result upto 3 decimal places=0.011 AND Save the result and user operation locally.

Priority
Must have

Estimate :
2

Identifier:
G-US5

User Story Statement:
A customer can perform basic arithmetic operation- subtraction of two numbers so that they can use this result in their work.

Constraints
None

Acceptance Criteria

Identifier	Given	When	Then
T_G-US5_1	Constraint is met – if any.	User Performs operation : -0.2-0.31	Display Result upto 2 decimal places = - 0.51 AND Display Result upto 3 decimal places= - 0.510 AND Save the result and user operation locally.
T_G-US5_2	Constraint is met – if any.	User Performs Operation : 5-0.69	Display Result upto 2 decimal places = 4.31 AND Display Result upto 3 decimal places=4.310 AND Save the result and user operation locally.

Priority
Must have

Estimate :
2

Identifier:
G-US6

User Story Statement:
A customer can perform basic arithmetic operation - division of two numbers so that they can use this result in their work.

Constraints
None

Acceptance Criteria

Identifier	Given	When	Then
T_G-US6_1	Constraint is met – if any.	User Performs operation : 0.31/2	Display Result upto 2 decimal places = 0.15 AND Display Result upto 3 decimal places=0.155 AND Save the result and user operation locally.
T_G-US6_2	Constraint is met – if any.	User Performs Operation : 91.2/9	Display Result upto 2 decimal places = 10.13 AND Display Result upto 3 decimal places=10.133 AND Save the result and user operation locally.
T_G-US6_3	Constraint is met – if any.	User Performs Operation : 5/0	Display Math Error AND Save the result locally.

Priority
Must have

Estimate :
2

Identifier:
G-US7

User Story Statement:
A customer can perform Basic arithmetic operation - multiplication of two numbers so that they can use this result in their work.

Constraints
None.

Acceptance Criteria

Identifier	Given	When	Then
T_G-US7_1	Constraint is met – if any.	User Performs operation : 2 * 4	Display Result upto 2 decimal places = 8.00 AND Display Result upto 3 decimal places=8.000 AND Save the result and user operation locally.
T_G-US7_2	Constraint is met – if any.	User Performs Operation : 16.999 * 3.31	Display Result upto 2 decimal places = 56.27 AND Display Result upto 3 decimal places=56.267 AND Save the result and user operation locally.

Priority
Must have

Estimate :
2

4.2 User Stories by user - Nileesha Fernando

Identifier:
L-US1

User Story Statement
As a user I want to see the history of calculation saved so that I can access a result I computed previously.

Constraints
User Session History must be displayed under 30 seconds.

Acceptance Criteria

Identifier	Given	When	Then
T_L-US1_1	Constraint is met – if any.	User Performs operations in a session : 2+.2 10*2 ln(2) ln(-10)+ln(2)	2+.2=2.20;2.200 10*2=20.00,20.000 ln(2) = 0.69;0.693 ln(-10)+ln(2)=Math Error

Priority
Must have

Estimate :
3

Identifier:
L-US2

User Story Statement
As a user (student) I want to get the result of the application of Natural log property - Quotient Rule on a natural log of a number with $ln_e 2$ so that I can quickly get the result of this computation and hence save time during examination.

Constraints
None.

Acceptance Criteria

Identifier	Given	When	Then
T_L-US2_1	Constraint is met – if any.	User Performs operation : Ln(4/2)	Display Result upto 2 decimal places = 0.69 AND Display Result upto 3 decimal places=0.693 AND Save the result and user operation locally.
T_L-US2_2	Constraint is met – if any.	User Performs operation : Ln(-16/2)	Display Math Error AND Save the result locally.

Priority
Must have

Estimate :
2

Identifier:
L-US3

User Story Statement
As a user (student) I want to get the result of the application of Natural log property - Product Rule on a natural log of a number with $ln_e 2$ so that I can quickly get the result of this computation and hence save time during examination.

Constraints
None.

Acceptance Criteria

Identifier	Given	When	Then
T_L-US3_1	Constraint is met – if any.	User Performs operation : Ln(4 * 2)	Display Result upto 2 decimal places = 2.08 AND Display Result upto 3 decimal places= 2.079 AND Save the result and user operation locally.
T_L-US3_2	Constraint is met – if any.	User Performs operation : Ln(-16 * 2)	Display Math Error AND Save the result locally.

Priority
Must have

Estimate :
2

Identifier:
L-US4

User Story Statement
As a user (a student) I want to get the result of the application of Natural log property- Power Rule on a natural log of a number with $ln_e 2$ so that I can quickly get the result of this computation and hence save time during examination.

Constraints
None.

Acceptance Criteria

Identifier	Given	When	Then
T_L-US4_1	Constraint is met – if any.	User Performs operation : $ln(2^8)$	Display Result upto 2 decimal places = 5.55 AND Display Result upto 3 decimal places= 5.545 AND Save the result and user operation locally.
T_L-US4_2	Constraint is met – if any.	User Performs operation : $ln(2^{-10})$	Display Result upto 2 decimal places = −6.93 AND Display Result upto 3 decimal places = −6.931 AND Save the result and user operation locally.

Priority
Must have

Estimate :
2

Identifier:
L-US5

User Story Statement
As a user (a student) I want to get the result of the Inverse Function of $ln_e 2$ so that I can quickly get the result of this computation and hence save time during examination.

Constraints
None.

Acceptance Criteria

Identifier	Given	When	Then
T_L-US5_1	Constraint is met – if any.	User Performs operation : InverseFunction(ln(2))	Display Result upto 2 decimal places = 7.39 AND Display Result upto 3 decimal places= 7.389 AND Save the result and user operation locally.

Priority
Must have

Estimate :
0.5

Identifier:
L-US6

User Story Statement
As a user I want to get the result of adding a number to $ln_e 2$ so that she can quickly get the result of this computation and hence save time during examination.

Constraints
None.

Acceptance Criteria

Identifier	Given	When	Then
T_L-US6_1	Constraint is met – if any.	User Performs operation : $10.5 + ln(2)$	Display Result upto 2 decimal places = 11.19 AND Display Result upto 3 decimal places= 11.193 AND Save the result and user operation locally.
T_L-US6_2	Constraint is met – if any.	User Performs operation : $ln(2) + 89.9$	Display Result upto 2 decimal places = 90.59 AND Display Result upto 3 decimal places = 90.593 AND Save the result and user operation locally.

Priority
Wont have (this time)

Estimate :
1

Identifier:
L-US7

User Story Statement
As a user I want to get the result of subtraction of $ln_e 2$ and a number so that I can quickly get the result of this computation and hence save time during examination.

Constraints
None.

Acceptance Criteria

Identifier	Given	When	Then
T_L-US7_1	Constraint is met – if any.	User Performs operation : $10.5 - ln(2)$	Display Result upto 2 decimal places = 9.81 AND Display Result upto 3 decimal places= 9.807 AND Save the result and user operation locally.
T_L-US7_2	Constraint is met – if any.	User Performs operation : $ln(2) - 89.9$	Display Result upto 2 decimal places = -89.21 AND Display Result upto 3 decimal places = -89.207 AND Save the result and user operation locally.

Priority
Wont have (this time)

Estimate :
1

Identifier:
L-US8

User Story Statement
As a user I want to get the result of multiplying a number and $ln_e 2$ so that I can quickly get the result of this computation and hence save time during examination.

Constraints
None.

Acceptance Criteria

Identifier	Given	When	Then
T_L-US8_1	Constraint is met – if any.	User Performs operation : $10.5 * ln(2)$	Display Result upto 2 decimal places = 7.28 AND Display Result upto 3 decimal places= 7.278 AND Save the result and user operation locally.
T_L-US8_2	Constraint is met – if any.	User Performs operation : $ln(2) * 89.9$	Display Result upto 2 decimal places = 62.31 AND Display Result upto 3 decimal places = 62.314 AND Save the result and user operation locally.

Priority
Wont have (this time)

Estimate :
1

Identifier:
L-US9

User Story Statement
As a user I want to get the result of dividing a number and $ln_e 2$ so that she I quickly get the result of this computation and hence save time during examination.

Constraints
None.

Acceptance Criteria

Identifier	Given	When	Then
T_L-US9_1	Constraint is met – if any.	User Performs operation : $10.5/ln(2)$	Display Result upto 2 decimal places = 15.15 AND Display Result upto 3 decimal places= 15.148 AND Save the result and user operation locally.
T_L-US9_2	Constraint is met – if any.	User Performs operation : $ln(2)/89.9$	Display Result upto 2 decimal places = 0.00 AND Display Result upto 3 decimal places = 0.008 AND Save the result and user operation locally.
T_L-US9_2	Constraint is met – if any.	User Performs operation : $ln(2)/0$	Display Math Error AND Save the result locally.

Priority
Wont have (this time)

Estimate :
1

4.3 User Stories by user - Manjit

Identifier:
L-US10

User Story Statement
As a user I want to compute the time required for the Initial Principal to be doubled when the Interest rate is compounded annually by using the value of $ln_e 2$ so that I can get the results of this computation quickly while I am teaching in lecture and would like to share this feature with my students so that they can solve such complex math problem faster during exam time.

Constraints
None.

Acceptance Criteria

Identifier	Given	When	Then
T_L-US10_1	Constraint is met – if any.	User Performs operation : $NumOfYear(8)$ Note: Here 8 is the rate of interest compounded annually NumOfYear is function name that applies the Rule72	Display Result upto 2 decimal places = 9.00 years AND Display Result upto 3 decimal places= 9.000 years AND Save the result and user operation locally.
T_L-US10_2	Constraint is met – if any.	User Performs operation : $NumOfYear(0)$ Note: Here 0 is the rate of interest compounded annually NumOfYear is function name that applies the Rule72	Display Math Error AND Save the result locally.

Priority
Must have

Estimate :
3

Identifier:
L-US11

User Story Statement
As a user I want to compute the time required for the Initial Principal to be doubled when the Interest rate is compounded continuously by using the value of $ln_e 2$ so that I can get the results of this computation quickly while I am teaching in lecture and would like to share this feature with my students so that they can solve such complex math problem faster during exam time.

Constraints
None.

Acceptance Criteria

Identifier	Given	When	Then
T_L-US11_1	Constraint is met – if any.	User Performs operation : $NumOfYear(8)$ Note: Here 8 is the rate of interest compounded continuously NumOfYear is function name that applies the Rule69	Display Result upto 2 decimal places = 8.63 years AND Display Result upto 3 decimal places= 9.000 years AND Save the result and user operation locally.
T_L-US11_2	Constraint is met – if any.	User Performs operation : $NumOfYear(0)$ Note: Here 0 is the rate of interest compounded continuously NumOfYear is function name that applies the Rule69	Display Math Error AND Save the result locally.

Priority
Must have

Estimate :
3

4.4 User Stories by user - Marc Anthony

Identifier:
L-US12

User Story Statement
As a customer I want to compute half life of a substance by supplying only two parameters i.e. initial amount and rate of decay annually so that I quickly perform the computations for large number of substances.

Constraints
None.

Acceptance Criteria

Identifier	Given	When	Then
T_L-US12_1	Constraint is met – if any.	User Performs operation : $computeHalfLife(100, 4)$ Note: computeHalfLife is method that accepts two values, the first value denotes the initial amount(grams) and second values(percentage) and is the rate of decay of the substance annually	Display Result upto 2 decimal places = 16.00 AND Display Result upto 3 decimal places= 16.000 AND Save the result and user operation locally.
T_L-US12_2	Constraint is met – if any.	User Performs operation : $computeHalfLife(100, 8)$ Note: computeHalfLife is method that accepts two values, the first value denotes the initial amount(grams) and second values(percentage) and is the rate of decay of the substance annually	Display Result upto 2 decimal places = 8.31 AND Display Result upto 3 decimal places = 8.313 AND Save the result and user operation locally.

Priority
Could have

Estimate :
5

5 Problem7 : Backward traceability matrix

User Story Identifier	User Story Statement	User Story Source - Use Case	User Story Source – Use Story	User Story Source - Interview	User Story Source- Online resources(blogs,Other),TextBook
G-US1	A customer can view the result on a User Interface so that they can see the result of the computed value after execution of an operation.			From User Interview	
G-US2	A customer can get the result upto a certain precision i.e either 2 decimal places or 3 decimal places so that they dont have to perform rounding off of a result manually(mentally).	UC8		From User Interview	
G-US3	As customer can get the value of lne2 so that they can use this result in their work.	UC1			Scientific Calculator
G-US4	A customer can perform basic arithmetic operation - addition of two numbers so that they can use this result in their work.				Scientific Calculator

G-US5	A customer can perform basic arithmetic operation- subtraction of two numbers.				Scientific Calculator
G-US6	A customer can perform basic arithmetic operation - division of two numbers so that they can use this result in their work.				Scientific Calculator
G-US7	A customer can perform Basic arithmetic operation - multiplication of two numbers so that they can use this result in their work.				Scientific Calculator
L-US1	As a user I want to have the history of calculation saved so that I can see a result she computed previously.	UC11			
L-US2	As a user I want to get the result of the application of Natural log property - Quotient Rule on a natural log of a number with lne2 so that I can quickly get the result of this computation and hence save time during examination.	UC13			

L-US3	As a student I want to get the result of the application of Natural log property - Product Rule on a natural log of a number with lne2 so that I can quickly get the result of this computation and hence save time during examination.	UC13			
L-US4	As a user I want to get the result of the application of Natural log property- Power Rule on a natural log of a number with lne2 so that I can quickly get the result of this computation and hence save time during examination.	UC13			
L-US5	As a user I want to get the result of the Inverse Function of lne2 so that I can quickly get the result of this computation and hence save time during examination.	UC5			

L-US6	As a user I want to get the result of adding a number to lne2 so that I can quickly get the result of this computation and hence save time during examination.	UC6			
L-US7	As a user I want to get the result of subtraction of lne2 and a number so that I can quickly get the result of this computation and hence save time during examination.	UC6			
L-US8	As a user I want to get the result of multiplying a number and lne2 so that I can quickly get the result of this computation and hence save time during examination.	UC6			
L-US9	As a user I want to get the result of dividing a number and lne2 so that I can quickly get the result of this computation and hence save time during examination.	UC6			

L-US10	As a user I want to compute the time required for the Initial Principal to be doubled when the Interest rate is compounded annually by using the value of lne2 so that I can get the results of this computation quickly while I am teaching in lecture and would like to share this feature with my students so that they can solve such complex math problem faster during exam time.	UC2			

L-US11	As a user I wants to compute the time required for the Initial Principal to be doubled when the Interest rate is compounded continuously by using the value of lne2 so that I can get the results of this computation quickly while I am teaching in lecture and would like to share this feature with my students so that they can solve such complex math problem faster during exam time.	UC2			
L-US12	As a user I want to compute half-life of a substance by supplying only two parameters i.e. initial amount and rate of decay annually so that I quickly perform the computations for large number of substances.	UC4			Website (2)

6 Problem 8 : Java Code - Brief Explanation

Two Classes (Calculator.java) and (SessionHistory.java) submitted. The code driver is : Calculator.java
The computation of the ln(2) is computed using trapezoidal rules(summation).(3)
The calculator prforms below task : 1. View history of computations.
2. Perform Basic Arithematic operations (ADD,MULTIPLICATION,DIVISION,SUBSTRACTION) on

two numbers
3. Calculate Natural Logarithm Properties (QUOTIENT RULE,POWER RULE,PRODUCT RULE) of a number with ln(2)
4. Get Result of natural logarithm of 2
5. Get Result of natural logarithm of a number
6. Compute the Inverse Function of natural logarithm of 2
7. Compute the time required to double the initial principle with interest compunded annually
8. Compute the time required to double the initial principle with interest compunded continously

7 Reference

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