

## Functions & All Calculator

### I. Abstract

Functions & All Calculator is a GUI calculator in which a user can perform simple calculations with the operator buttons, area and volumes of a circle, triangle, and rectangle, and find the derivative of a polynomial using power rule.

### II. Introduction

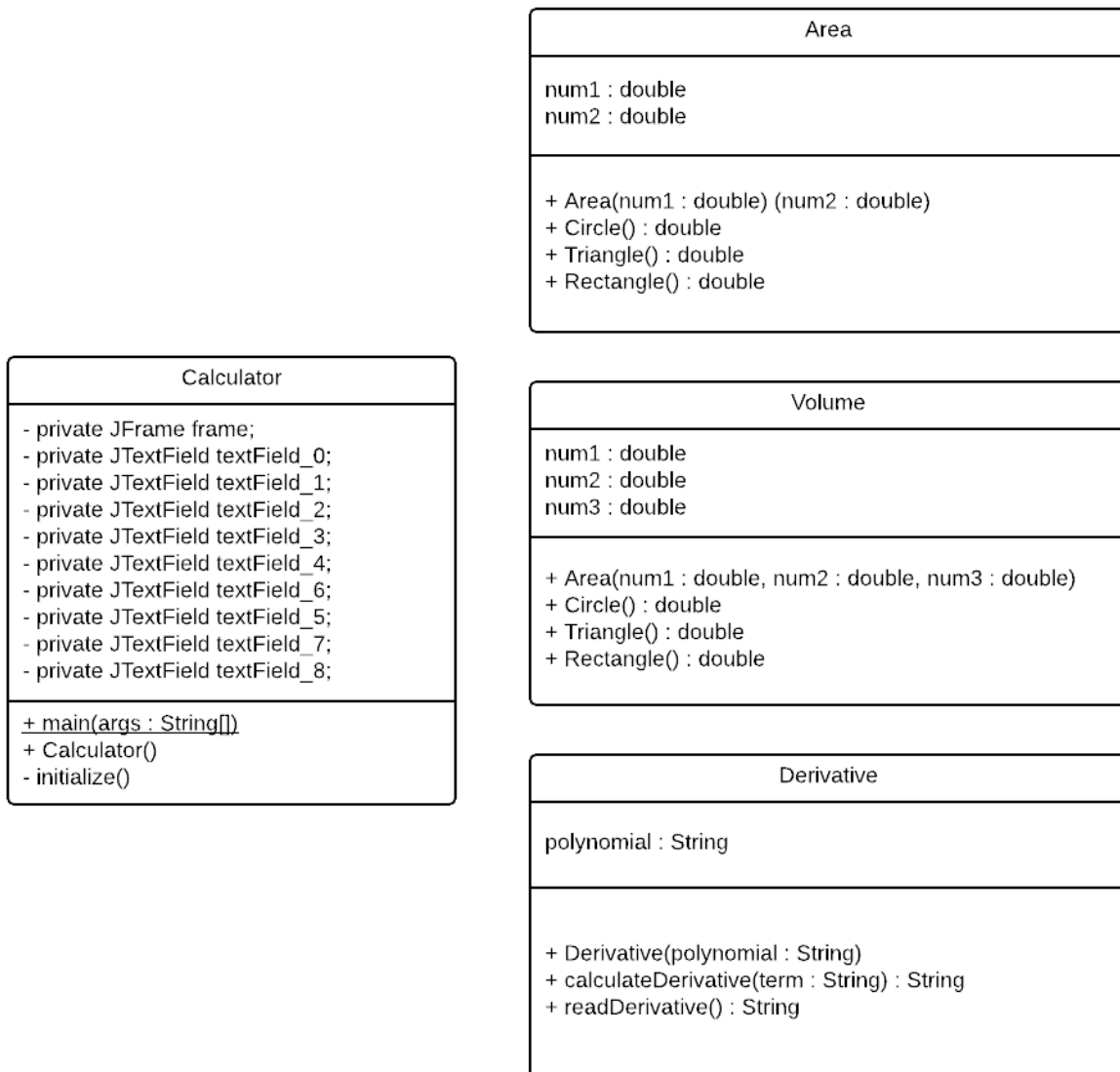
Functions & All Calculator is a calculator made in Java for the Software Development I class. It is a very rudimentary calculator, providing the basics as well as a few functions for easy calculation of area and volume of certain objects.

The application can perform basic operations such as: addition, subtraction, multiplication, division, and exponents. Alongside basic operations, it can also solve the area and volume of circles, triangles, and rectangles. And lastly, it can find the derivative of a polynomial using the power rule.

Within this proposal will describe how Functions & All Calculator works and interacts with itself, as well as how the user can interact with it. The UMLs will give a general overview of what the system looks like and how it interacts with the users. Below that will be the specific details of the problem the application addresses. Similar applications will be discussed that go with the same problem that Functions & All Calculator does. After that, a brief user manual will

describe how a typical interaction between the user and system will occur. Lastly, a summary of the goals accomplished by the application will be described.

### III. Detailed System Analysis



#### **IV. Requirements**

Functions & All Calculator is a calculator that performs basic operations, area and volumes of circles (only spheres), triangles (only prisms for volume), and rectangles, as well as the derivative of a polynomial using power rule.

The problem with writing a calculator program first and foremost is to make sure that the math being done is correct. Because of logic errors that could come up due to something like the misplacement of a number or a set of parentheses missing, the answer could be something completely different and incorrect. This could also be the case for using the wrong data type. For example, even though rectangles can get away with being integers, circles and triangles need to be doubles so that no numbers are affected during the math by rounding errors.

Another problem is that because the application is a GUI, the code can get to be quite hectic. Because of that, anything that didn't deal with the basic operators was sectioned off into their own their own classes, not just to clean up the code, but to make it easier to read and understand. In terms of potential scaling on this application, different classes for different functions allows for different versions of the methods, methods that can analyze can figure out what function to choose based on the input or even basic formatting. The most obvious example in this being the derivatives. Here, it only does power rule; if the application were to be scaled, the derivative class would have all the different methods used for solving differentials as well as an analyzing method to determine which methods to use.

#### **V. Literature Survey**

Functions & All Calculator is not the first calculator program. There are many calculator programs that exist out there, whether they are as simple as only doing basic operation in a command-prompt or as complex as MatLab. Digital calculators are used for their precision in

their calculations as well as the time it takes for them to perform. Take an application such as MatLab, it has a plethora of functions it can perform for just one concept, like Euler's numbers and equations.

What Functions & All Calculator offers is a concise, visual application that can solve basic functions based on user input. Solving areas, volumes, and derivatives are something that not even a factory TI-84 can do (unless someone writes programs for it, of course).

## **VI. User Manual**

A typical interaction of Functions & All Calculator goes like this:

1. User opens up the application
2. User decides what operations they want performed
  - a. For basic operations (addition, subtraction, multiplication, division, exponents)
    - i. User enters the first number in the first text field, then the other in the next text field; the operation is done by the button pressed
    - ii. The answer is outputted in the text field below the operation buttons
  - b. For area and volume
    - i. (For both area and volume of circles) User enters a number in the first text field for the radius
    - ii. (For area of a triangle) User enters a number in the first, second, and (for volume) third textfield to act as the base, height and width
    - iii. (For area of a rectangle) User enters a number in the first, second, and (for volume) third textfield to act as the length, width, and height
    - iv. The same as above, the user clicks on the button for what function they want to solve
  - c. For derivatives
    - i. User enters a polynomial of any size, then hits "Calculate"
    - ii. The answer is outputted in the text field below the operation buttons

## **VII. Why There Was a Change in Programs**

The program originally proposed in both the proposal and milestone, Battle Tendency, had to be scrapped. From that, came the program written about in here, Functions & All Calculator. Battle Tendency's code was rendered unusable after 2 power outages at my house. After the second outage, the code resembled something that's been through encryption. While I did save 2 versions, 1 on IntelliJ and 1 on Eclipse, as IntelliJ didn't have a great Form Builder, the IntelliJ version was very behind, meaning that I'd basically be starting from the beginning. Seeing as I only had a day before my demo and 4 days before we handed it in, I resolved that it would be better if I just wrote a very rudimentary application that, while it didn't have too many bells and whistles, I knew could be completed in time for the demo and for handing in.

## **VIII. Conclusion**

Functions & All Calculator is a GUI calculator program in which a user can perform basic operations, as well as area, volume, and derivatives by power rule. The application was able to complete what it was set out to do without hiccups in its current state. If there was anything that I would change given its current state, it would be to make the area and volume of the circle into terms of Pi.

While it is a very rudimentary idea, it acts as a great introduction to GUI programs, as well as an easy program conceptually to scale upwards. While there were many mistakes and misfortunate events before and during the making of both Battle Tendency and Functions & All Calculator, they both were great stepping stones for what lies ahead for me in learning Java and other programming languages.

## **IX. References/Bibliography**

Java Docs - <https://docs.oracle.com/en/java/javase/11/>

Math check/ruleset for derivatives - <https://www.symbolab.com/>

Where I learned some of the basics of the GUI -

[https://www.tutorialspoint.com/javaexamples/java\\_simple\\_gui.htm](https://www.tutorialspoint.com/javaexamples/java_simple_gui.htm)