Software Requirements Specification

for

Polynomial Arithmetic Calculator

Version 1.0

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30-09-2021

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1. Introduction

1.1 Purpose of Document

All of the prerequisites for the project Polynomial arithmetic will be provided in this document. Throughout the development of the final version of the system, it will act as a reference for developers and users.

This project is simulating the basic arithmetic calculations on polynomials. The basic algebraic functions will include addition, subtraction, division, and multiplication.

1.2 Project Scope

Polynomial arithmetic is a branch of algebra dealing with some properties of polynomials which share strong analogies with properties of number theory relative to integers. It includes basic mathematical operations such as addition, subtraction, and multiplication, as well as more elaborate operations like Euclidean division, and properties related to roots of polynomials.

The main aim of this project is to take the coefficient and degree of the polynomial function and perform the basic operations such as addition, subtraction, multiplication and division.

This application is a console base application where activity can perform based on the switch case model.

The goal of this project is to provide users an application that can compute addition , subtraction, multiplication and division on polynomials, as well as other developers can use and extend this in their projects.

1.3 Overview of Document

This is the base version of arithmetic polynomial calculator created on 29th september 2021.

This document specifies the functional requirements for a polynomial arithmetic calculator program. This program is designed to act like a handheld calculator with the usual standard functions (add, subtract, multiply, divide) for polynomial expression.

This document can be used by the developer as a base document for the entire Project Development Life Cycle (PDLC). The rest of this document will give further details on the overall product description, including the hardware, software, and communications interfaces, product functions, user characteristics, and any assumptions that will be made. The document will also include the specific requirements needed. These will include the functions, performance, design, and software attributes. This document is organized in a logical manner and is easy to follow.

Readers should refer to the table of contents if looking for something in specific.

2. Overall Description

2.1 Product Perspective

The proposed polynomial arithmetic calculator must be written in C++. The console-based application can run on a Unix-based operating system. This application contains all of the features of basic arithmetic operations.

A console-based interface is provided for users, which is a menu-driven application in which users can enter their choice from a menu list and perform specific arithmetic operations on polynomials.

2.2 Application Features

The major features for Polynomial arithmetic will be the following:

● **Menu driven console application** : Based on the functionality that needs to be performed on the polynomial expression, an application will be provided with a menu-driven console application.

● **Addition of polynomials:** The application will accept an array of paired coefficients and exponent values, and polynomial is a list of nodes, with each node containing a polynomial term. After performing an addition operation on two polynomials, the addition function returns one polynomial.

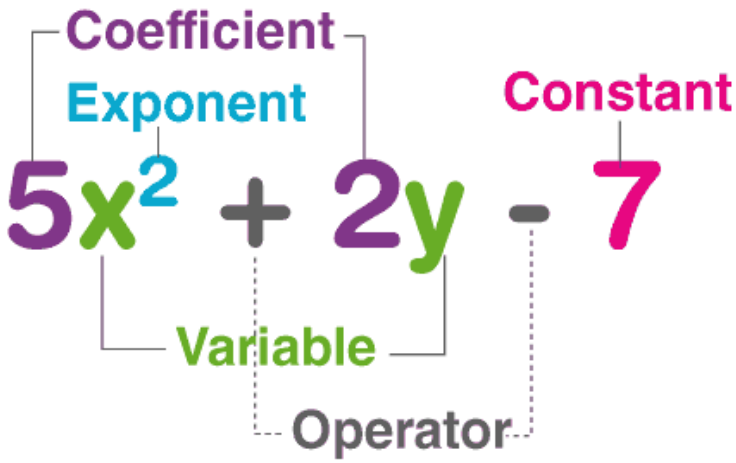
● **Subtraction of polynomials:** The application will accept an array of paired coefficients and exponent values, and polynomial is a list of nodes, with each node containing a polynomial term. After performing a subtraction operation on two polynomials, the subtraction function returns one polynomial.

● **Multiplication of polynomials:** The application will accept an array of paired coefficients and exponent values, and polynomial is a list of nodes, with each node containing a polynomial term. After performing a multiplication operation on two polynomials, the multiplication function returns one polynomial.

● **division of polynomials:** The application will accept an array of paired coefficients and exponent values, and polynomial is a list of nodes, with each node containing a polynomial term. After performing a division operation on two polynomials, the division function returns one polynomial.

2.3 User Classes and Characteristics

Representation of Polynomials :



The three classes for this system are described below:

● **Polynomials**

A Polynomial class consists of the polynomial's start node and each node is an enclosing term, whereas a term has a coefficient and an exponent value.
To perform algebraic operations on polynomials, a user can create an object of the polynomial class.

The Polynomial class includes functions for performing arithmetic operations on polynomial expressions.

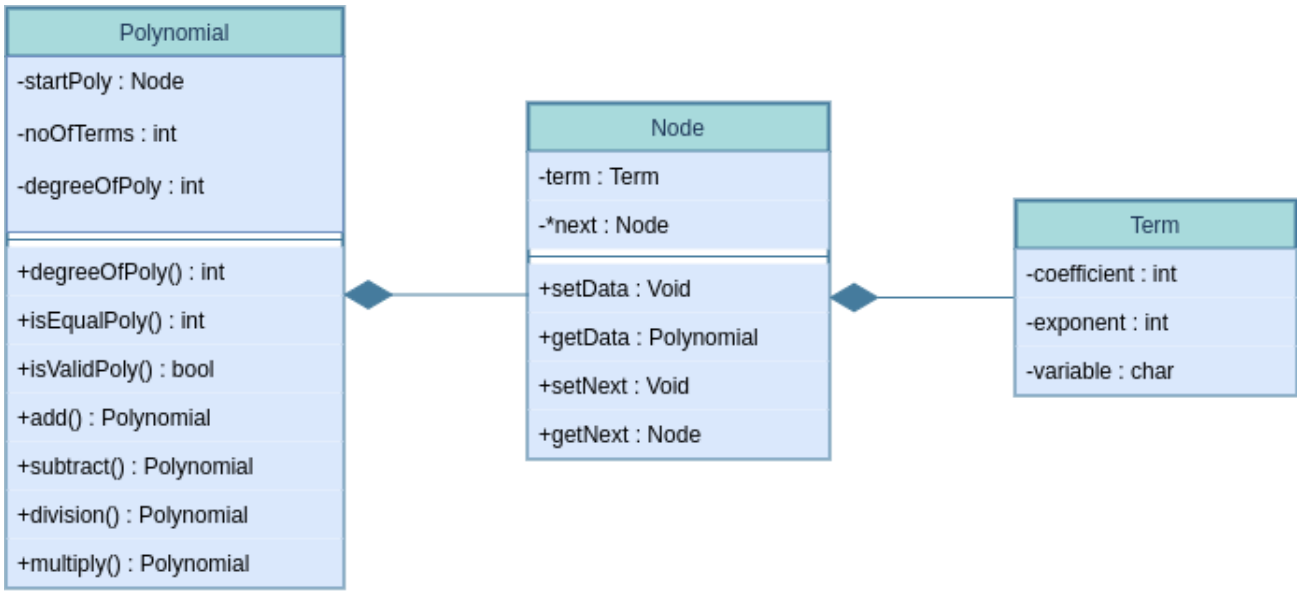
.● **Node**

This class has a term and the address for the next term. A Node stores information about each term as an individual, such as the coefficient and exponent value.

.● **Terms**

There are two parameters in this class, Exponent and coefficient.

Class Diagram is shown below :



2.4 Constraints

2.4.1 Limited Operation Scope

This application has a limited scope of operations; it can only perform arithmetic operations on single variable polynomials. Additionally, other than arithmetic operations, users cannot perform any other operations on polynomials with the current version of the application.

2.4.2 Input

This application will only accept certain types of input values, such as an array of paired coefficients and exponent values.

i.e **Input : For a polynomial expression** $5X^2$+ 3x + 7, **input can be given as shown below:**

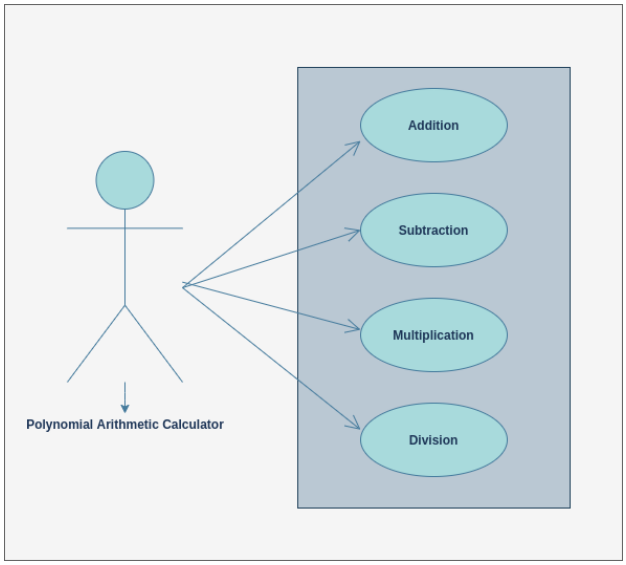
{{5 , 2},{3 , 1},{7 , 0}}

2.5 Assumption and Dependencies

The project is intended for the advancement of programming and PDLC software engineering aspects. Not intended for commercial or business purposes. Polynomial arithmetic calculator is the basic version of a console-based application that can only perform basic arithmetic operations. Because the goal of the project is to develop and improve programming skills. We designed and planned to implement basic arithmetic operations on polynomials on a Unix-based operating system.

3. System Features

3.1 Use Case for Polynomial Arithmetic calculator



- Menu driven console application
- Addition of polynomials
- Subtraction of polynomials
- Multiplication of polynomials
- division of polynomials

Polynomial Arithmetic calculations: As a calculator, it seems obvious that this machine will be able to perform basic arithmetic calculations. Addition, subtraction, multiplication etc. will be done with this machine. But a polynomial class will handle the arithmetic operations for polynomial expression.

Input: This application will only accept certain types of input values, such as an array of paired coefficients and exponent values.

i.e **Input : For a polynomial expression** $5X^2$+ 3x + 7, **input can be given as shown below:**

{{5 , 2},{3 , 1},{7 , 0}}

Output: These functions will display the result of the calculation as per the user request.

4. External Interface Requirements

4.1 User Interfaces

A console-based interface is provided for users, which is a menu-driven application in which users can enter their choice from a menu list and perform specific arithmetic operations on polynomials.

4.2 Hardware Interfaces

N/A

4.3 Software Interfaces

The current version of the application is compatible with Unix-based operating systems.

4.4 Communications Interfaces

N/A

5. Other Nonfunctional Requirements

5.2 Web interface/Mobile application

N/A

Appendix A: Glossary

N/A