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SWE 4304 - Software Project Lab

Project Proposal

Team Voyager

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Abstract

Math libraries are essential tools for developers, simplifying complex calculations. Introducing 'mathVoyage,' a Java toolkit offering versatile math functions. In this paper, we propose the idea of implementing coordinate geometry, trigonometry, matrix operations, combinatorix, vector, number system modules and more. It streamlines mathematical tasks using several wellknown algorithms, saving developers time and ensuring precision in Java applications.

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Chapter 1

Project Introduction and Motivation

1.1 Introduction

In software development, having strong math tools is really important. They're like the foundation for lots of apps and solutions. That's why we will make mathVoyage, a big Java library with lots of math tools for developers to use.

In today's software ecosystem, precision and efficiency are paramount. Whether you are crafting scientific simulations, engineering solutions, or applications that require mathematical rigor, mathVoyage will be poised to be your trusted companion. This project will seek to address the intricate demands of mathematics and geometry by providing a versatile collection of functions, thereby simplifying complex calculations and enhancing the precision and versatility of Java applications

The mathVoyage project will be organized into modules, each catering to specific mathematical domains. It will encompass coordinate geometry, trigonometry, matrix algebra, vector operations, and number conversions, offering developers the flexibility to choose the tools they will require for their unique projects.

Our coordinate geometry module will equip developers with the ability to effortlessly handle points, lines, and shapes in 2D space. Whether you will need to calculate distances, classify triangles, or identify various quadrilaterals, mathVoyage will have you covered.

For trigonometric calculations, the library will provide a rich set of functions for converting between degrees and radians and for computing sine, cosine, tangent, cotangent, secant, cosecant, and their inverse counterparts. These functions will be crucial for projects that will involve precise mathematical calculations involving angles.

In the realm of matrix algebra, mathVoyage will facilitate matrix creation, manipulation, and operations, including determinant calculations, matrix addition and subtraction, multiplication (both with other matrices and scalars), transposition, inversion, and powering matrices to integer exponents.

Vector operations will be another critical component of mathematical computations, and mathVoyage will include essential vector arithmetic functions like addition, subtraction, scalar multiplication, and cross-product calculations.

Moreover, the library will cover practical number conversion requirements, including decimal to binary, octal, hexadecimal, and n-base conversions, as well as reverse conversions from these bases to decimal.

In summary, the mathVoyage project will be a testament to our commitment to providing developers with a powerful toolbox of mathematical functionalities that can simplify their work, elevate precision, and enhance the efficiency of their Java applications. We will invite you to explore this project further and embark on your mathematical voyage with confidence.

1.2 Motivation

In the world of software development, mathematics serves as the universal language that underpins the creation of applications, simulations, and solutions across diverse domains. From engineering and physics simulations to financial modeling, data analysis, and game development, mathematical operations are an integral part of the software development process.

However, despite the commonality of mathematics in software, developers often face significant challenges when it comes to implementing and managing complex mathematical computations. These challenges include the need for precision, the efficient handling of mathematical entities, and the availability of versatile tools that cater to a wide range of mathematical domains.

The mathVoyage project will be born out of the recognition of these challenges and the conviction that every developer, regardless of their mathematical background, should have access to a comprehensive and user-friendly mathematical library that simplifies intricate calculations and enhances the precision of their applications.

Here are some key motivating factors behind the mathVoyage project:

Empowering Developers

We aim to empower developers, from students to professionals, with a powerful set of mathematical tools. By providing an extensive library that covers various mathematical and geometric domains, we seek to democratize access to advanced mathematical functionalities.

Precision Matters

In fields such as scientific research, engineering, and finance, even the smallest margin of error can have profound consequences. mathVoyage will be designed to assist developers in achieving the highest levels of accuracy in their mathematical computations.

Time and Resource Efficiency

By offering efficient algorithms and data structures, mathVoyage will help the developers save valuable development time and computational resources. This efficiency will be particularly important in real-time systems and applications that require rapid mathematical computations.

Cross-Disciplinary Applications

The mathVoyage library will be versatile, making it suitable for a wide range of applications across different domains. Whether you're working on a physics simulation, game development, data analysis, or engineering project, mathVoyage will serve as a valuable asset.

Education and Learning

mathVoyage also will have educational value. It will aid students and educators in understanding and visualizing mathematical concepts through practical implementation, making learning more engaging and tangible.

Community and Collaboration

We envision mathVoyage as a community-driven project where developers will contribute to the growth and enhancement of the library. This collaborative spirit fosters innovation and ensures that mathVoyage remains a dynamic and evolving resource.

Chapter 2

Key Features

The mathVoyage software project will be organized into distinct modules, each tailored to address specific mathematical and geometric domains. These modules will be meticulously designed to provide a comprehensive suite of mathematical functionalities, making mathVoyage a versatile and valuable resource for developers across various disciplines. Below, we will provide an overview of each module, highlighting its key features and objectives.

2.1 Coordinate Geometry Module

This module will be dedicated to handling geometric entities in 2D space. It will offer functionalities for point creation, distance calculations, area computations for shapes, triangle classification, line creation, line relationships, intersection points, slope calculations, and more. The Coordinate Geometry module will serve as the foundation for many geometric operations within ”mathVoyage.” We are going to implement these functions under this module:

- Creation of Points
- distance between 2 points
- cosine distance between 2 points
- chebyshev distance between 2 points
- Area of a triangle given 3 points
- Area of a quadrilateral given 4 points
- Area of a circle given radius
- Triangle : is equilateral ?

- Triangle : is isoscales ?
- Triangle : is Scalane ?
- Triangle : is Acute ?
- Triangle : is Obtuse ?
- Triangle : is Right ?
- Quadrilateral : is rectangle ?
- Quadrilateral : is square ?
- Quadrilateral : is rhombus ?
- Quadrilateral : is Parallelogram ?
- Calculate Slope given point
- Creation of Line
- Check if same line ?
- Check if parallel line ?
- if perpendicular
- Intersection Point
- Calculate Slope given line
- Distance of two parallel line
- Area of triangle given 3 line
- point in polygon
- Area for convex hull polygon
- Area of quadrilateral given 4 line

2.2 Trigonometry Module

Precise trigonometric calculations will be essential in numerous scientific and engineering applications. The Trigonometry module will provide functions for degree-to-radian and radian-to-degree conversions, as well as the computation of sine, cosine, tangent, cotangent, secant, cosecant, and their inverses in both degree and radian units. These functions will empower users with accurate trigonometric operations for various tasks.

- Sin Calculation
- Cos Calculation
- Tan Calculation
- Cot Calculation
- Sec Calculation
- Cosec Calculation
- Arc-Sin Calculation
- Arc-Cos Calculation
- Arc-Tan Calculattion
- Arc-Sec Calculation
- Arc-Cosec Calcultaion
- Arc-Cot Calculation
- Degree to Radian Conversion and Vice Versa

2.3 Matrix Module

Matrices will be fundamental in mathematical modeling and data manipulation. The Matrix module will facilitate matrix creation, determinant calculations, addition, subtraction, multiplication (with matrices and scalars), transposition, inversion, and matrix exponentiation. This module will be indispensable for applications involving linear algebra and matrix transformations. We are going to implement these functions under this module:

- Creation of Matrix
- Creation of Matrix

- Identity Matrix Creation
- Zero matrix creation
- Zero matrix creation
- One matrix creation
- One matrix creation
- Determinant
- Matrix Addition
- Matrix Subtraction
- Matrix Multiply
- Matrix Multiply with Number
- Matrix Transpose
- Inverse Matrix
- Power Matric

2.4 Vector Module

Vectors will play a crucial role in physics, engineering, and computer graphics. The Vector module will allow users to work with vectors by providing operations for vector creation, addition, subtraction, scalar multiplication, and cross-multiplication. These functions will simplify vector calculations, making them accessible to developers. We are going to implement these functions under this module:

- Creation of Vector
- Vector Addition
- Vector Subtraction
- Vector Scelar Multiplication
- Vector cross Multiplication

2.5 Number Conversion Module

Number conversions will often be required when working with different numeral systems. The Number Conversion module will offer a range of functions for converting between decimal, binary, octal, hexadecimal, and n-base numeral systems. These conversions will be vital for various applications, including digital systems and data encoding. We are going to implement these functions under this module:

- Decimal to Binary
- Decimal to Octal
- Decimal to Hexadecimal
- Decimal to n-Base
- Binary to Decimal
- Binary to Octal
- Binary to Hexadecimal
- Binary to n-Base
- Octal to Binary
- Octal to Decimal
- Octal to Hexadecimal
- Octal to n-Base
- Hexadecimal to Decimal
- Hexadecimal to Binary
- Hexadecimal to Octal
- Hexadecimal to n-Base
- n-Base to k-Base

2.6 Basic Module

The Basic module will include fundamental mathematical operations like square root and cube root calculations. These functions will cater to basic mathematical needs and will serve as building blocks for more complex computations in other modules. We are going to implement these functions under this module:

- nth root calculation
- maximum of two numbers
- maximum value of an array
- index of maximum value of an array
- minimum of two numbers
- minimum value of an array
- index of minimum value of an array

2.7 Combinatorics

The Combinatorics module in mathVoyage will provide functions for calculating permutations, combinations, and the number of subsets. These tools are essential for solving a variety of mathematical problems, particularly in areas like probability and discrete mathematics. With this module, developers can expect accurate and efficient solutions to combinatorial challenges, enhancing the versatility of the mathVoyage library. We are going to implement these functions under this module:

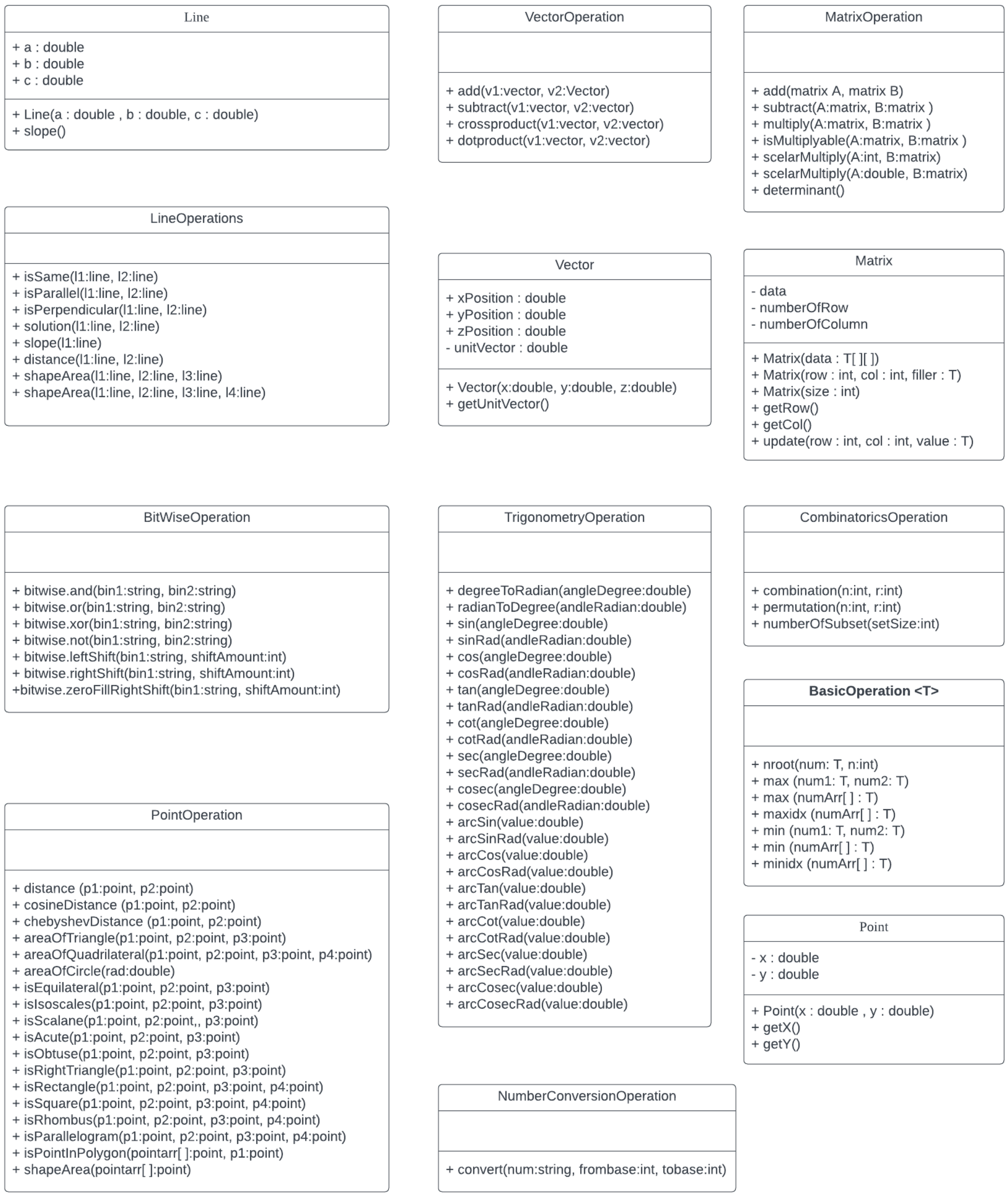
- nCr
- nPr
- number of subset of a set

2.8 Bit-wise Operation

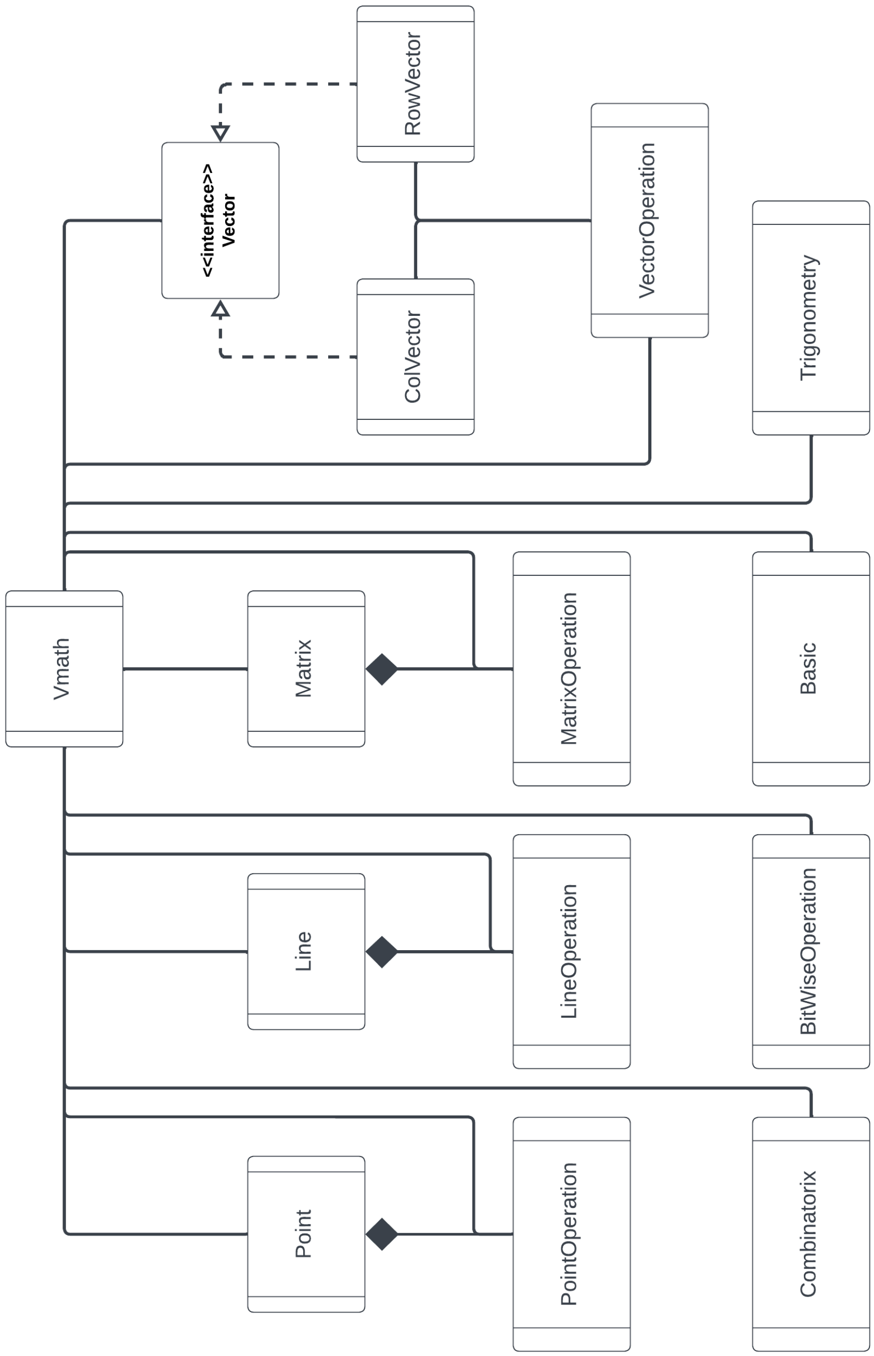
The Bit-wise Operation module in mathVoyage will offer key functions like AND, OR, NOT, XOR, Left Shift, Right Shift, and Zero Fill Right operations. These operations are fundamental for low-level programming tasks, providing precise control over individual bits in binary data. This module will be a valuable resource for developers working on tasks that demand detailed bit-level computations and optimizations. We are going to implement these functions under this module:

- Bit wise And
- Bit wise OR
- Bit Wise XOR
- Bit Wise NOT
- Left Shift
- Right Shift
- Zero Fill Right Shift
- Square root
- Cube root

2.9 Class Diagram



2.10 Relational Class Diagram



Chapter 3

Use cases of this project

The versatility and power of the mathVoyage mathematical library will come to life in this chapter as we explore practical applications and real-world scenarios where our project shines. In the following use cases, we will delve into how mathVoyage can empower professionals, researchers, educators, and developers to harness the full potential of mathematics within their respective domains. By presenting these scenarios, we will illustrate the practicality and relevance of our mathematical toolkit, demonstrating its value in solving complex problems, making informed decisions, and driving innovation across diverse fields. Join us on this journey as we will uncover the countless possibilities unlocked by ”mathVoyage.”

3.1 Geometry Module Use Cases

Calculate distance Between 2 points

Knowing distance between 2 points is one of the most important thing for rendering, modeling, architecture and printing.

Classification of Shape

Making applications for designing and modeling requires a set of validation for the classification of several shapes. Architectural designs need to check these perfect shapes.

Line operations

Intersection point of lines, check for are given lines parallel or are given lines perpendicular are very important for mechanical and civil engineering applications. These functions also play great role for statistics and machine learning path calculation for auto-driving objects.

Area of Polygon

Applications build for civil drawing, printing, designing and mapping needs the area calculations for several points.

3.2 Matrix Module Use Cases

Matrix Creation

In mathVoyage, users will have the essential ability to create matrices of different sizes and initialize them with provided data. This feature will be crucial for a wide range of applications, including data analysis, simulations, and engineering calculations.

Additionally, mathVoyage will make it easy to generate identity matrices, which are important in operations like matrix multiplication and solving linear equations.

The platform will also allow users to create zero matrices (with all elements set to zero) and matrices filled with ones, which are commonly used in various mathematical computations, simplifying tasks like summation and scaling.

Determinant Calculation

Calculating the determinant of a matrix is a fundamental operation in linear algebra. mathVoyage will provide an efficient method to compute determinants, enabling users to assess the solvability of systems of linear equations and perform various transformations.

Matrix Arithmetic

mathVoyage will support essential matrix operations: addition, subtraction, and multiplication. These operations are vital in various fields, including physics, graphics, and statistics. They enable tasks like vector transformations and solving complex equations with ease.

Matrix Transposition

Matrix transposition involves flipping a matrix over its diagonal. This operation is useful in tasks such as solving linear systems and performing coordinate transformations. mathVoyage will offer a straightforward method to transpose matrices of varying dimensions.

Matrix Inversion

Matrix inversion is crucial in solving systems of linear equations and many scientific applications. mathVoyage will provide a reliable method to find the inverse of a matrix, facilitating a wide range of mathematical and engineering calculations.

Matrix Exponentiation

Raising a matrix to power is essential in fields like physics, computer graphics, and cryptography. mathVoyage will empower users to perform matrix exponentiation efficiently, enabling complex simulations and transformations.

3.3 Vector Module Use Cases

Vector Creation

Creating vectors with specific components is a fundamental feature of ”mathVoyage.” Users can define vectors of varying dimensions and populate them with numerical data, facilitating tasks in physics, engineering, and data analysis.

Vector Arithmetic

mathVoyage will cover a variety of essential vector operations. It enables users to add vectors, simplifying the calculation of combined forces, velocities, and displacements across diverse applications.

Additionally, vector subtraction, crucial in physics and engineering for tasks like determining net forces and relative positions, will be supported.

The platform also will facilitate scalar multiplication, a common operation in linear transformations and physics, allowing users to scale vectors by specific values for tasks like stretching or compressing.

Furthermore, mathVoyage will provide an efficient method for computing the cross-product of vectors with varying dimensions. This operation is widely used in physics, engineering, and computer graphics for tasks like calculating torque and determining perpendicular vectors.

Vector Magnitude

Calculating the magnitude (length) of vectors is a common operation in physics and engineering. mathVoyage will provide a straightforward way to compute vector magnitudes, enabling users to determine distances, velocities, and forces.

Vector Normalization

Normalizing vectors involves scaling them to have a magnitude of 1, making them useful for direction calculations. mathVoyage will offer a simple method to normalize vectors, supporting applications in computer graphics, simulations, and physics.

Vector Angle Calculation

Determining the angle between vectors is crucial in numerous applications, including robotics, physics, and computer graphics. mathVoyage will provide tools to calculate angles between vectors, simplifying tasks like robotic arm motion planning and object tracking.

3.4 Number Conversion Module Use Cases

Converting Decimal Number

Being able to switch between decimal and other custom bases is a fundamental skill in computer science and digital electronics. mathVoyage will provide a reliable and user-friendly method for converting decimal numbers to binary, octal, hexadecimal, and even custom bases. This versatility is crucial for tasks ranging from data encoding and bitwise operations to configuring file permissions and working with memory addresses. Whether you're a programmer, web developer, or involved in computational mathematics, mathVoyage will be a valuable tool for seamless base conversions.

Converting Binary Number

Converting binary numbers to different bases is a crucial skill in software and hardware systems. mathVoyage will provide a user-friendly method to seamlessly switch between binary, decimal, octal, and hexadecimal representations. This versatility is invaluable for professionals in various fields, from digital systems to low-level programming, ensuring smooth operations and accurate data interpretation.

Converting Octal Number

In computer science and engineering, transitioning between octal and other bases is vital. mathVoyage will simplify this process, effortlessly converting octal numbers to binary, decimal, hexadecimal, and even custom bases. This adaptability is crucial for tasks like data analysis, configuration, and specialized computations. Whether you're a programmer, system administrator, or an engineer, mathVoyage will be your dependable tool for smooth base conversions.

Converting to Hexadecimal

Effortlessly switch between different numerical bases with mathVoyage. This versatile tool supports conversions from binary, decimal, octal, and hexadecimal, even accommodating custom bases. Ideal for programmers, engineers, and those tackling specialized computations.

n-Base to k-Base Conversion

The ability to convert numbers between custom bases is essential for specialized calculations. mathVoyage will empower users to perform n-base-to-k-base conversions, supporting diverse numerical system needs.

3.5 Trigonometry Module Use Cases

Degree and Radian Conversions

Converting angles between degrees and radians is fundamental in trigonometry and calculus. mathVoyage will provide tools for precise angle conversions, supporting mathematical and scientific calculations.

Sine Calculation

Calculating the sine of an angle, whether in degrees or radians, is a common operation in trigonometry. mathVoyage will offer a reliable method for computing sine values, facilitating applications in physics, engineering, and mathematics.

Cosine Calculation

Determining the cosine of an angle, whether in degrees or radians, is vital in geometry, physics, and engineering. mathVoyage will simplify cosine computations, enabling users to solve problems related to angles and rotations.

Tangent Calculation

Calculating the tangent of an angle, whether in degrees or radians, is important in trigonometry and physics. mathVoyage will provide reliable tangent computations, aiding users in tasks involving slopes, inclinations, and angles of elevation.

Cotangent Calculation

Determining the cotangent of an angle, whether in degrees or radians, is fundamental in trigonometry. mathVoyage will offer accurate cotangent computations, aiding users in tasks such as inverse trigonometric transformations.

Secant Calculation

Calculating the secant of an angle, whether in degrees or radians, is valuable for solving trigonometric equations. mathVoyage will simplify secant computations, facilitating tasks like solving for side lengths in triangles.

Cosecant Calculation

Determining the cosecant of an angle, whether in degrees or radians, is essential for mathematical and engineering calculations. mathVoyage will provide precise cosecant calculations, supporting applications in robotics and control systems.

Arc-Sin Calculation

Calculating the arcsine of an angle, whether in degrees or radians, is crucial for solving inverse trigonometric equations. mathVoyage will offer tools to compute arcsine values, aiding users in tasks like navigation and physics.

Arc-Cos Calculation

Determining the arccosine of an angle, whether in degrees or radians, is important for solving inverse trigonometric equations. mathVoyage will simplify arccosine computations, supporting applications in geometry and engineering.

Arc-Tan Calculation

Calculating the arctangent of an angle, whether in degrees or radians, is fundamental in trigonometry. mathVoyage will provide reliable arctangent calculations, aiding users in tasks like angle measurements and vector analysis.

Arc-Sec Calculation

Determining the arcsecant of an angle, whether in degrees or radians, is valuable for solving inverse trigonometric equations. mathVoyage will simplify arcsecant computations, facilitating tasks like solving for side lengths in triangles.

Arc-Cosec Calculation

Calculating the arccosecant of an angle, whether in degrees or radians, is essential for mathematical and engineering calculations. mathVoyage will offer precise arccosecant calculations, supporting applications in robotics and control systems.

Arc-Cot Calculation

Determining the arccotangent of an angle, whether in degrees or radians, is crucial for solving inverse trigonometric equations. mathVoyage will provide accurate arccotangent computations, aiding users in tasks like angle measurements and vector analysis.

3.6 Basic Module Use Cases

Square Root Calculation

Calculating the square root of a number is a fundamental mathematical operation. mathVoyage will provide a reliable method for computing square roots, supporting various applications in mathematics, physics, and engineering.

Cube Root Calculation

Determining the cube root of a number is important in mathematical and scientific contexts. mathVoyage will simplify cube root computations, aiding users in solving equations and performing complex calculations.

Maximum number between two numbers

Finding the maximum between two numbers is a common task in programming and mathematics. mathVoyage will offer a straightforward and efficient method for identifying the larger of two given numbers.

Maximum number from an Array

Determining the maximum value from an array is a critical operation in data analysis and algorithm design. mathVoyage will provide a convenient function for efficiently extracting the highest value from an array.

Index of Maximum number from an Array

Locating the index of the maximum number in an array is essential for various applications, including sorting and data manipulation. mathVoyage will offer a specialized function for precisely identifying the position of the highest value within an array.

Minimum number between two numbers

Similarly, finding the minimum between two numbers is a common computational task. mathVoyage will equip developers with a reliable method for determining the smaller of two given numbers.

Minimum number from an Array

Identifying the minimum value from an array is crucial in data analysis and algorithmic problem-solving. mathVoyage will feature a convenient function for efficiently extracting the lowest value from an array.

Index of Minimum number from an Array

Locating the index of the minimum number in an array is a fundamental operation for tasks like sorting and data processing. mathVoyage will provide a specialized function for accurately determining the position of the lowest value within an array.

3.7 Combinatorics

Permutation

Permutation is a fundamental concept in combinatorial mathematics. mathVoyage will offer a dedicated function for efficiently determining the arrangements of a set of elements. This operation is vital in various fields, including probability theory and discrete mathematics.

Combination

Combinations represent a crucial aspect of combinatorial analysis, particularly in scenarios where the order of elements doesn't matter. mathVoyage will provide a specialized function for accurately calculating combinations. This operation finds applications in probability, statistics, and combinatorics.

Number of Subset

Determining the number of subsets of a given set is a fundamental combinatorial task. mathVoyage will offer a convenient function for efficiently computing the total number of possible subsets. This operation is essential in a wide range of mathematical and computational contexts.

3.8 Bit-wise Operation

AND Operation

The AND operation is a fundamental bitwise operation used in low-level programming. mathVoyage will provide a dedicated function for efficiently performing bitwise AND operations between binary numbers. This operation is essential for various applications, such as masking and data manipulation.

OR Operation

Bitwise OR operations are crucial for combining binary values in low-level programming. mathVoyage will include a specialized function for efficiently performing bitwise OR operations between binary numbers. This operation is essential for tasks involving flags, permissions, and data merging.

XOR Operation

The XOR (Exclusive OR) operation plays a vital role in bitwise calculations. mathVoyage will feature a specific function for accurately executing bitwise XOR operations between binary numbers. This operation is used in cryptography, error detection, and data comparison.

NOT Operation

Bitwise NOT operations are essential for inverting binary values. mathVoyage will provide a dedicated function for efficiently performing bitwise NOT operations on binary numbers. This operation is critical for tasks like flipping bits and creating complements.

Left Shift Operation

Left shifting is a fundamental bitwise operation that involves shifting binary digits to the left. mathVoyage will offer a specialized function for precisely executing left shift operations on binary numbers. This operation is used for multiplying or dividing by powers of two and optimizing code.

Right Shift Operation

Right shifting is another key bitwise operation, involving the movement of binary digits to the right. mathVoyage will include a specific function for accurately performing right shift operations on binary numbers. This operation is used for division and efficient data manipulation.

Zero Fill Right Shift Operation

Zero fill right shifting is a bitwise operation that shifts binary digits to the right while filling the vacant positions with zeros. mathVoyage will provide a dedicated function for efficiently performing zero-fill right shift operations on binary numbers. This operation is vital for logical shifts and data processing.

Chapter 4

Tools and Technologies

The development of the mathVoyage software project will rely on a carefully chosen set of tools and technologies to ensure its robustness, efficiency, and versatility. Leveraging industry-standard and well-established resources, we are committed to creating a reliable mathematical library that will be accessible to developers across diverse domains. In this section, we will provide a comprehensive overview of the software development tools, programming languages, libraries, and technologies that will underpin the mathVoyage project. These tools have been thoughtfully selected to facilitate efficient development and seamless integration of mathematical functionalities, empowering users to harness the power of mathematics in their applications with ease and precision.

4.1 Programming Language

As we want to build this library for **JAVA** based applications we are going to choose **JAVA** for this library.

4.2 Development Environment

The mathVoyage software project will be developed using Java within the IntelliJ IDEA integrated development environment for coding, debugging and documenting.

4.3 Version Control

The project's source code will be managed using a Git repository hosted on GitHub, with individual branches dedicated to each contributor to maintain the chronological order of contributions.

4.4 Documentation Tools

Project documentation, including code comments, user manuals, and will be generated and maintained using Javadoc within the IntelliJ IDEA integrated development environment.

4.5 Collaboration Tools

Communication and collaboration among team members will be facilitated through a Discord server, while online meetings and discussions will be conducted using Google Meet.

4.6 Progress Tracking Tools

In our project, Google Sheets will serve as a dynamic platform for seamlessly tracking and managing our progress.

4.7 Performance Optimization

Matrix Multiplication

For matrix multiplication, we will implement the Strassen algorithm to optimize performance. Additionally, based on the diverse features provided earlier, we are considering the implementation of other matrix-related algorithms to enhance the module's capabilities.

Trigonometric Functions

Trigonometric calculations will be performed using the Maclaurin and Taylor series methods to ensure accuracy, providing up to four digits of precision after the decimal point for precise results.

In the realm of performance optimization, our commitment to efficiency and precision shines through. By implementing the Strassen algorithm for matrix multiplication, we are poised to significantly enhance computational speed, especially when dealing with large matrices. Furthermore, our dedication to accuracy in trigonometric function calculations, achieved through the Maclaurin and Taylor series methods, will enable mathVoyage to deliver results with up to four digits of precision after the decimal point. These performance optimization strategies reflect our unwavering commitment to providing users with a robust mathematical toolkit that excels in both speed and precision, catering to a wide range of mathematical and scientific applications.

In this chapter, we've outlined the foundational tools and technologies driving the development of the mathVoyage software project. With Java as our core programming language and IntelliJ IDEA as our development environment, we're poised to create a versatile mathematical library. Git and GitHub will manage our source code, ensuring organized contributions. Javadoc within IntelliJ IDEA will maintain clear documentation, while Discord and Google Meet will foster team collaboration.

Our commitment to performance optimization includes the Strassen algorithm for matrix multiplication, enhancing speed for large matrices. Trigonometric accuracy, with up to four decimal places, will be achieved through the Maclaurin and Taylor series methods. These choices reflect our dedication to providing a powerful, precise, and accessible mathematical toolkit for developers across various domains.

Chapter 5

Proposed Project Timeline

The following Gantt chart shows our projected timeline. We took about 3 weeks to brainstorm ideas for our project. In the third and fourth weeks, we determined the modules of our MathVoyage. It took the third, fourth, and fifth weeks to write the proposal. From the fourth week, we started designing the project according to OOP concepts. We are targeting to finish this within the sixth week.

From the sixth week, we will start building the necessary utility functions, hoping to finish them by the seventh week. We will start implementing the Matrix module in the sixth week and aim to finish by the eighth week. In the seventh week, we will begin implementing the Number System module, and Bit-wise operation module simultaneously, and aim to finish by the ninth week.

We aim to complete the implementation of the Trigonometric module by the eighth, ninth, and tenth weeks. We aim to start the implementation of the Vector module and Combinatorics module in the ninth week and hope to finish this implementation by the twelfth week. We aim to finish the Coordinate Geometry module by the twelfth week, starting it in the tenth week. From the twelfth week, we will focus on fixing bugs and covering up any delayed work,.

Progress	WEEKS													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
BrainStorming														
Determining the modules														
Writing the proposal														
Designing the project according to OOP concepts														
Building the necessary utility functions														
Implementing Matrix module														
Implementing Number System & Bitwise module														
Implementing Trigonometric module														
Implementing Vector & combinatorix module														
Implementing Coordinate Geometry module														
Bug fixing and cover up for delayed work														