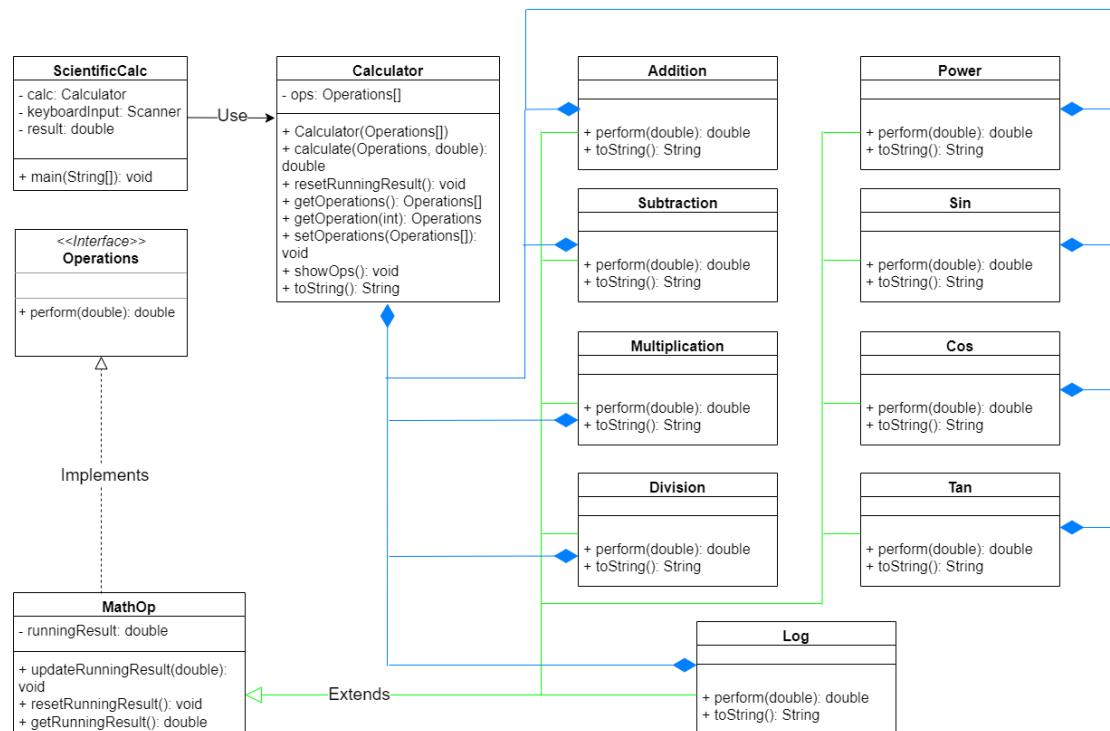


## Scientific Calculator

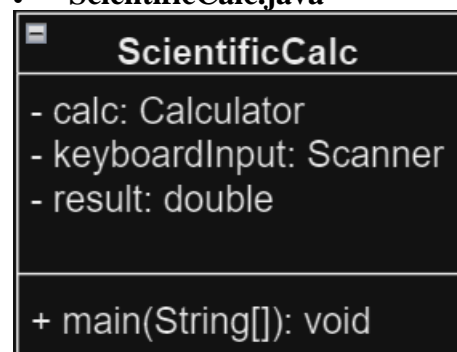
### 1. UML Diagram of the project

- The **green** line indicates the extends relationship.
- The **blue** line indicated the composition relationship.



### 2. UML diagram of each class


- **ScientificCalc.java**




- **Operations.java**

<b>&lt;&lt;Interface&gt;&gt;</b>
<b>Operations</b>
+ perform(double): double


- **MathOp.java**

 <b>MathOp</b>
- runningResult: double
+ updateRunningResult(double): void
+ resetRunningResult(): void
+ getRunningResult(): double


- **Calculator.java**

 <b>Calculator</b>
- ops: Operations[]
+ Calculator(Operations[])
+ calculate(Operations, double): double
+ resetRunningResult(): void
+ getOperations(): Operations[]
+ getOperation(int): Operations
+ setOperations(Operations[]): void
+ showOps(): void
+ toString(): String


- **Addition.java**

 <b>Addition</b>
<div>+ perform(double): double</div> <div>+ toString(): String</div>


- **Subtraction.java**

 <b>Subtraction</b>
<div>+ perform(double): double</div> <div>+ toString(): String</div>


- **Multiplication.java**

 <b>Multiplication</b>
<div>+ perform(double): double</div> <div>+ toString(): String</div>

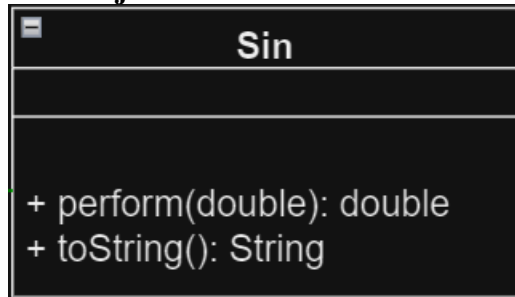
- **Division.java**

 <b>Division</b>
<div>+ perform(double): double</div> <div>+ toString(): String</div>

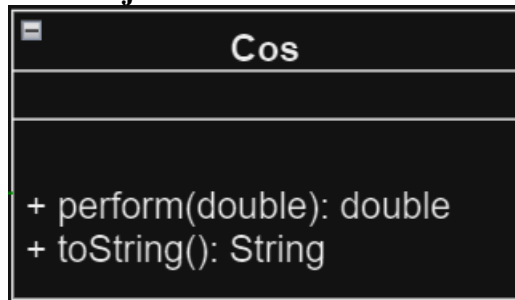
- **Power.java**

 <b>Power</b>
<div>+ perform(double): double</div> <div>+ toString(): String</div>

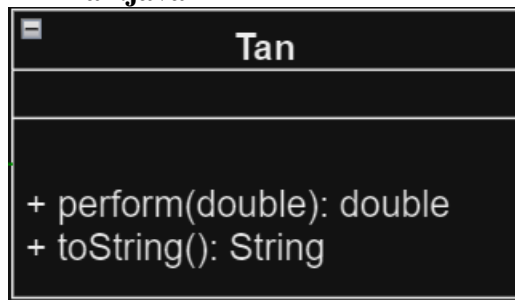
- **Sin.java**



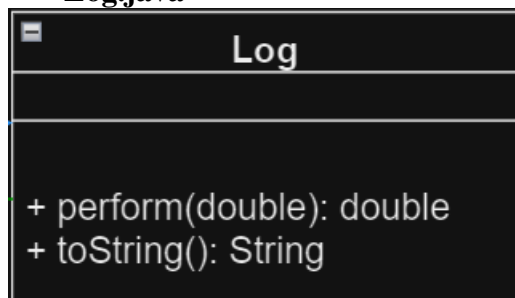
- **Cos.java**



- **Tan.java**



- **Log.java**



### 3. IS-A and HAS-A relationship in this project

#### IS-A relationship (Inheritance)

- The **MathOp** is an abstract class that serves as a common base for specific mathematical operations.
- **MathOp** extends **Operations**, indicating that it **IS-A** type of mathematical operation.
- The subclasses **Addition**, **Subtraction**, **Multiplication**, **Division**, **Power**, **Sin**, **Cos**, **Tan**, and **Log** inherit from **MathOp** and, by extension, implement the **Operations** interface.

- All these sub-classes (**Addition**, **Subtraction**, **Multiplication**, **Division**, **Power**, **Sin**, **Cos**, **Tan**, and **Log**) have an **IS-A** relationship with **MathOp**.
- We can say that **Addition** (**Subtraction**, **Multiplication**, **Division**, **Power**, **Sin**, **Cos**, **Tan**, and **Log**) IS-A **MathOp**.

#### **HAS-A relationship (Composition)**

- The **Calculator** **HAS-A** composition relationship with an array of **Operations**.
- It contains and manages instances of different mathematical operations.
- **Calculator** has methods to get, set, and perform operations on the array of **Operations**.
- **ScientificCalc** **HAS-AN** instance of **Calculator** (calc). It contains and utilizes the functionalities provided by the **Calculator** class.