# Lab 05.2: Creating Calculator Classes

## Objective

This lab will introduce the first of the larger systems that you will be programming. This system is a set of classes that perform basic math-oriented calculations. You will utilize the existing Java and **Math** class functionality to implement these classes and it will provide practice in creating classes, methods and attributes.

## Overview

In this lab you will:

* Create the necessary packages
* Create the necessary calculator classes
* Add the appropriate attributes
* Provide the appropriate method definitions (minus the actual code to make them work at this point)

## Step by Step Instructions

**Create a Java Project and Package**

1. Create a new Java Project within the same workspace named **Calculators**.
2. Create a package named **com.javaoo.calculators**.

**Exercise 1: Creating the Calculator classes**

1. Create each of the following classes in the **com.javaoo.calculators** package:
   1. **BasicCalculator**
   2. **ScientificCalculator**
   3. **TrigonometricCalculator**

**Exercise 2: Adding Attributes and Methods**

1. For each of the calculator classes, add the necessary attributes and methods as specified below.
2. **BasicCalculator**:
   1. Declare the following **public** methods
      1. add()
      2. subtract()
      3. multiply()
      4. divide()
   2. Each method must accept two parameters, both of type double
   3. Each method must return a double. Add code to the return statement that calculates and returns the correct value. Example:

**public** **final** **double** multiply(**double** x, **double** y) {

**return** x \* y;

}

1. **ScientificCalculator**:
   1. Must declare the following attributes:
      1. A double named PI to hold the value of **PI (3.14159).** This attribute will be shared by all instances of the class and will be constant so it should be declared as static and final. Since it is a final, it can have public visibility so that anyone can use it.
      2. A double named holdValue to hold a value in memory. Since it will be managed within the **ScientificCalculator** class, it should have private visibility.
   2. Declare the following **public** methods
      1. exp() which has one parameter of type double and returns a double [This method will be used to calculate ex]
      2. log() which has one parameter of type double and returns a double [This method will be used to calculate ln x]
      3. putValueInMemory() which has one parameter of type double and returns a void. Implement this method.
      4. getValueFromMemory() which has no parameters and returns a double Implement this method
   3. We will not provide the details of each method in this lab. In order for your code to compile, add the following single statement to **each method block** **that returns a double**:

return(0);

1. **TrigonometricCalculator**:
   1. Declare the following **public** methods
      1. sine()
      2. cosine()
      3. tangent()
      4. arcsine()
      5. arccosine()
      6. arctangent()
   2. Each method must accept one parameter of type double
   3. Each method must return a double
   4. We will not provide the details of each method in this lab. For your code to compile, add the following single statement to each method block:

return(0);

1. **BRAIN TEASER: Could and should any of these classes or methods be made *static*?**