

This program is a collection of methods that we have used in probability and applied statistics class. The methods that are used include findMean, findMedian, findMode. For the findVariance and findStandardDeviation methods, they take a parameter to specify if it is of a sample or population. I implemented two factorial methods utilizing both long and BigInteger. For the sake of the findPermutations and findCombinations method, I used the BigInteger implementation because long does not support as big of numbers for the examples I used from class. I have two methods that return a boolean value of isDependent and isIndependent that is basically the same method just reversed. The conditionalProbability is another method that is included in the program. For binomial probability distribution, geometric probability distribution, hypergeometric probability distribution, and negative binomial probability distribution, I included the methods as well as expected values and variance for each respectively.

```
The Mean is 5.0  
The Median with even input is 5.5  
The Median with odd input is 5.0  
The Mode is 4.0  
The Mode is 3.0
```

For the mean median and mode, they take a set as a parameter and displayed the information as show.

```
Mean: 5.5  
Squares: 82.5  
Variance: 8.25  
The standard deviation of the Population is 2.8722813232690143  
Mean: 5.5  
Squares: 82.5  
Variance: 9.166666666666666  
The standard deviation of the Sample is 3.0276503540974917
```

For the standard deviation type, I have the method output each step of the way to have more transparency and more information in case you are looking for a specific value. Depending on which type of standard deviation you wish to use, you can input that specific type(samp or pop)

```
double standardDeviationPop = findStandardDeviation(sampleNumbersEven, type:"population");
System.out.println("The standard deviation of the Population is " + standardDeviationPop);

//double standardDeviationSamp = findStandardDeviationSample(sampleNumbersEven);
double standardDeviationSamp = findStandardDeviation(sampleNumbersEven, type:"sample");
System.out.println("The standard deviation of the Sample is " + standardDeviationSamp);
```

For each of the implementations of the factorial method, I include that in the output. Each of the values match as they should.

```
the Long factorial is: 362880
the BigInt factorial is: 362880
```

The output of the permutations and combinations show for each. The boolean check for isIndependent and isDependent are opposite as they should be.

```
The number of permutations is 720
The number of combinations is 120
Is the problem independent? true
Is the problem dependent? false
```

The conditional probability is output as shown

```
The conditional probability is 0.5
```

For each of the types of probability distribution, the information is clearly labeled and includes the name of each

```
The binomial probability distribution is 0.2013265920000001
The expected value of binomial probability distribution is 1.5
The variance of binomial probability distribution is 1.0
```

The geometric probability distribution is 0.08192000000000002  
The expected value of geometric probability distribution is 5.0  
The variance of geometric probability distribution is 19.999999999999996

The hypergeometric probability distribution is 0.13039642705767354  
The expected value of hypergeometric probability distribution is 5.153061224489796  
The variance of hypergeometric probability distribution is 2.382380738794733

The negative binomial probability distribution is 0.06449725440000001  
The expected value of the negative binomial probability distribution is 15.0  
The variance of the negative binomial probability distribution is 60.0