Written Documentation for Project 1 Programs
Alexis Petito

Birthday Checker:

To modify output user can specify number of people and the number of iterations to test the birthday problem.

```
The probability of 2 people sharing a birthday in a class is: 40.739999999999995%

Process finished with exit code 0
```

Car Factory:

You must run CarCsvWriter.java before CarCsvReader.java. When CarCsvWriter.java is ran it will populate a csv file with random car objects with the attribute CarType, Year, Color, and Miles.

```
CarType,Year,Color,Miles
Sedan,1979,Cream,101920
Sedan,2000,White,42894
SUV,2016,Black,45775
SUV,2019,Red,132550
Truck,1981,Red,216271
Hatchback,1990,Yellow,151373
Truck,1992,Cream,139620
Truck,1990,Red,45851
Truck,2006,Red,173508
Convertible,2023,White,15345
Convertible,2012,Red,59730
Coupe,2013,Blue,183620
Sedan,1974,Red,57175
Truck,2016,Cream,173626
Hatchback,1994,Yellow,199778
Sedan,1991,Blue,237924
Sedan,2019,Blue,244381
Hatchback,2000,Cream,44485
Convertible,2000,Red,238428
Hatchback,1980,Black,125451
SUV,1994,Yellow,132567
Convertible,2006,Yellow,164555
Coupe,2005,Cream,26225
Hatchback,1980,Yellow,83061
Truck,2014,Yellow,52600
Convertible,1988,Cream,174983
Hatchback,2007,Black,121613
Truck,1984,Cream,72778
Sedan,2010,Blue,205167
Sedan,2019,Red,41869
Truck,2003,Black,210591
Truck,1975,Cream,155146
SUV,2004,Red,51811
Sedan,1985,Blue,238547
Sedan,1997,Black,187879
```

After the car.csv file is created CarCsvReader.java can be ran and will give similar but randomized output as the output seen below.

```
CarType,Year,Color,Miles
Sedan,1979,Cream,101920
Sedan,2000,White,42894
SUV,2016,Black,45775
SUV,2019,Red,132550
Truck,1981,Red,216271
Hatchback,1990,Yellow,151373
Truck,1992,Cream,139620
Truck,1990,Red,45851
Truck,2006,Red,173508
Convertible,2023,White,15345
Convertible,2012,Red,59730
Coupe,2013,Blue,183620
Sedan,1974,Red,57175
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Hatchback,1994,Yellow,199778
```

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Monty Hall Problem:

When TestMontyHall.java is ran the output reflects the cumulative probability of 10,000 iterations of the Monty Hall problem. Showing the probability of when the door is switched and when it is not.

```
The percentage of wins when you don't switch doors : 32.53%
The percentage of wins when you switch doors : 67.2%
```

Poker:

In TestHandEvaluator.java input for the functions can be modified to change the number of cards in the hand and the number of hands that will be tested in total.

```
This is a test hand: [5 of Spades, 7 of Spades, 7 of Diamonds, 4 of Spades, 6 of Hearts]
This is the result of 200000 hands with 5 cards in hand:
Percentage of Pair: 42.363500%
Percentage of Three of a Kind: 2.267000%
Percentage of Four of a Kind: 0.019500%
Percentage of Straight: 0.366000%
Percentage of Flush: 0.202500%
Percentage of Full House: 0.135000%
Percentage of Straight Flush: 0.001500%
Percentage of Royal Flush: 0.001500%
Percentage of High Card: 54.802500%
```

Stats Library:

Set Operations

The output can be modified by changing the elements in the array list of the sets in the file TestSetOperations.java.

```
Set Days of Week: [Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday]
Subset A: [Tuesday, Thursday, Saturday]

Set Operations:
The union of both arrays: [Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday]
The intersection of both arrays: [Tuesday, Thursday, Saturday]
The complement of subset A: [Monday, Wednesday, Friday, Sunday]
```

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Stats Library

The TestStatsLibrary.java file can be modified with the appropriate input to see the results for any of the formulas listed below. More extensive documentation for each function can be found in the generated Javadoc.

```
Chapter 1
The mean of the test numbers: 3.675
The median of the test numbers: 4.1
The standard deviation of the test numbers: 2.2237355957937086
The mode for the test numbers: 1.1

Chapter 2
The factorial of the test number: 120
The number of the combination n objects r times: 1287
The number of permutations in n objects with r objects selected: 30240
The independent intersection of the test numbers: 0.2
The dependent intersection of the test numbers: 0.2
The exclusive union of the test numbers: 0.2700000000000001
The not exclusive union of the test numbers: 0.20000000000000007
Are the test numbers independent or dependent? They are independent.
The conditional probability of P(A and B) & P(B)? 0.6
The Bayes Theorem result is? 0.05

Chapter 3
Binomial Distribution
The Binomial Distribution is: 0.20132659199999994
The Binomial Distribution Expected Value is: 2.0
The Binomial Distribution Variance is: 1.6

Geometric Distribution
The Geometric Distribution: 0.041943040000000015
The Geometric Distribution Expected Value is: 5.0
The Geometric Distribution Variance is: 19.999999999999996

Hypergeometric Distribution
This is the Hypergeometric Distribution: 0.02380952380952381
This is the Hypergeometric Distribution Expected Value: 2.0
This is the Hypergeometric Distribution Variance: 0.6666666666666666

Negative Binomial Distribution
The Negative Binomial Distribution is: 0.09000000000000001
The Negative Binomial Expected Value is: 10.0
The Negative Binomial Variance is: 89.99999999999999

Poisson Distribution
The Poisson Distribution is: 0.09022352215774179
The Poisson Distribution Expected Value is: 2.0
The Poisson Distribution Variance is: 2.0

Chebyshev's Theorem
The Chebyshev's result is: 0.75
```