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**Project II**

**Stats Library – Distributions**

The Stats Library Program has been updated with a new option to access the Distribution Calculator. This calculator outputs the expected mean, variance, and probabilities for each distribution. The distributions calculated are Binomial, Geometric, Hypergeometric, and Poisson. The calculator also calculates the cumulative probabilities as well. Each Distribution states the purpose of the variables being inputted and allows for user input of those variables. Almost every distribution utilizes the getCombo() method to reduce the repetition of code when a factorial or combination needs to be calculated in the formula. Each distribution contains the methods: EqualTo(), LessThan(), LessThanEqual(), GreaterThan(), and GreaterThanEqual(). For some distributions it was easier to use the formula 1-P(X) to determine the probability then to loop through and keep a running sum of every probability. The program heavily relies on the Math utility to do calculations such as: to the power of a variable, the use of *e* in the Poisson distribution, etc. The program was fairly simple as the main goal is to perform calculations using the given formulas with the user inputted variables.

**When to Use What Distribution**

**Binomial**

1. The experiment has n trials
2. There are two possible outcomes: success or failure
3. The trials are independent but identical
4. The probability of successes is the same between trials where 1-p is the probability of a failure

**Geometric**

1. The experiment has independent trials
2. There are two possible outcomes: success or failure
3. The probability of success is defined as p
4. The random variable is the trial where the first success occurs
5. There could be 1 to ∞ number of trials

**Hypergeometric**

1. Contains a sample size of n, the sample is randomly selected without replacement from the population of N.
2. The random variable is the number of successes
3. Not independent trials
4. The probability of success changes with each trial

**Poisson**

1. The experiment is based on the occurrence of an event during a specific interval
2. The probability that the event occurs is the same
3. The events of the experiment are independent

**Distributions Screenshots**

**Binomial Distribution**

**Graphical user interface, application

Description automatically generated**

**Geometric Distribution**

**Graphical user interface, text, application

Description automatically generated**

**Hypergeometric Distribution**

**Graphical user interface, text, application

Description automatically generated**

**Poisson Distribution**

**Graphical user interface, text, application

Description automatically generated**

**Function Plotter, Salter, and Smoother**

The function plotter uses three main classes, the Plotter, the Salter, and the Smoother. The equation I chose to implement is the equation of a line in the form y = mx + b. The class LinearEquation is set with the initial variables of m = .5 and b = 2 for the values of the slope and the x-intercept. The method accepts the value for x and solves the equation for y. There are also two methods to get the slope and x-intercept variables, for later use to display the value of the variables. The Plotter class is used to create a csv file that outputs the x and y values associated with the give equation. This class creates a csv file called “plotter.csv” that loops through the x values from 0 to 20 and records the resulting y value. The values are written to the file with comma separation. The Salter class creates a csv file called “salter.csv” that adds a random integer to all the y values. The random value is determined by the Random() method. The x and resulting y values are written to the file. Lastly, the Smoother class creates a csv called “smoother.csv” that changes the y values based on the average of the sum of the surrounding y values. Two variables are used in the loop as placeholders for the previous and next y value. The values are then average together and added to the specified y value. The values are then written to the csv file.

**Plotting Program Screenshots and Resulting Graphs**

**Plotter Graph**

**Chart, line chart, scatter chart

Description automatically generated**

**Salter Graph**

**Chart, line chart

Description automatically generated**

**Smoother Graph**

**Chart, line chart, scatter chart

Description automatically generated**

**Poker Hand Tester**

The poker

**Poker Hand Test for Correctness**

**A picture containing logo

Description automatically generated**

**A picture containing text

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**A picture containing graphical user interface

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**A picture containing chart

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**Poker Tester Output**

**Text

Description automatically generated**

Probabilities from <https://www.vcalc.com/wiki/MichaelBartmess/Poker+Calculator+%28five+card%29>