Coin Toss

CoinToss.tns

Name ________________________

Class ________________________

Problem 1 – Coin Toss Simulation: Exponential Decay

On page 1.4, run the **coinremove** program to simulate pouring coins out of a bag. Each time the coins are poured out, the ones that land heads up are removed and the remaining ones are shaken and poured out again until they are gone.

Select the number of coins that you want to use in the simulation. Pick a number between 180 and 200. Write your number here. Later, you will need to store this value as *a* on page 1.8.

a = ______

The data generated by the program is on page 1.7. In cell C1, enter the formula **=b2/b1**. Use the **Fill Down** command to calculate the remaining ratios. In cell D1, use the **Mean** command to find the average of the ratios and store this value as *b* on page 1.8. Write this value below.

b = ______

Next, create an equation to model the data. This equation should be in the form $y = a \cdot b^x$. Store this equation using the Math Box on page 1.8.

y =

On page 1.9, you will see a scatter plot of your data (**trialr**, **clistr**). Arrow up to your equation in **f1** on page 1.9 and press [enter] to graph the function. If the graph of your equation does not fit well, modify your *b*-value.

- Is this a growth or decay model?

- At what percent are the coins being removed?

- Explain the significance of the *b*-value with this experiment.

On page 1.12, find the regression equation to fit the data by selecting **Exponential Regression** from the Statistics menu. Store this equation in **f2**. Go back to page 1.9 and view this equation along with the data.

- How does the exponential regression equation compare to your equation? How well does it fit the data?

Now find the inverse of $y = a \cdot b^x$. On page 1.14, you will see a scatter plot of the data (**clistr**, **trialr**).

- Graph your inverse equation on this page. How well does this function model the inverse data?

On page 1.16, you will see both the data and the inverse data graphed together.

- What do you notice about the two sets of data?
- What line could you draw between the two data sets where they would reflect upon each other? Graph this line on page 1.16.

Add the graphs of the exponential regression model (**f2**) and the inverse logarithmic function to this graph.

- What are all of the aspects of the relationship between an exponential function and its inverse?

Problem 2 – Coin Toss Simulation: Exponential Growth

On page 2.2, run the **coinadd** program. This program also simulates pouring coins out of a bag. Each time the coins are poured out, the ones that land heads up are counted and that number of coins is added to the bag, shaken, and poured out repeatedly until about 200 coins are in the bag.

On page 2.4, use the **Fill Down** command to calculate all of the ratios in Column C. Then calculate the mean ratio in cell D1. On page 2.5, store your values for *a* and *b*.

- Create an equation to model your data in the form $y = a \cdot b^x$ as in Problem 1.

Enter your equation in **f1** on page 2.5 and graph it on page 2.6.

- Is this a growth or decay model?
- At what percent are the coins being added?
- Explain the significance of the *b*-value for this experiment.

On page 2.9, find the regression equation to fit the data by selecting **Exponential Regression** from the Statistics menu. Store this equation in **f2**. Go back to page 2.6 and view this equation along with the data.

- How does the exponential regression compare to your equation? How well does it fit the data?

- Graph your inverse equation from Problem 1 on page 2.11. How well does this function model the inverse data?

On page 2.13, you will see both the data and the inverse data graphed together. Add the exponential regression model (**f2**) and the inverse logarithmic function to this graph.

- How was the difference between the two experiments represented in their exponential and logarithmic model equations?