Tossing Coins

Tossing_Coins.tns

Name _____

Class _____

Problem 1 – Simulating Tossing Coins

The probability of obtaining a tail with a coin toss is ½. If a coin is tossed twice, what is the probability that both outcomes are tails? Heads? Or one of each? You will investigate this problem using a simulation.

- What do you think will be the probability of tossing no tails? One tail? Two tails?

You predict

Let 0 represent the coin landing 'heads' and 1 represent the coin landing 'tails'. Use the spreadsheet on Page 1.7 to conduct your simulations.

Step 1: To simulate 100 trials of the first coin toss, enter **=randInt(0,1,100)** in the grey cell of Column A (marked by a diamond), and then press enter.

Step 2: To simulate 100 trials of the second coin toss, enter the same formula for Column B.

Step 3: To calculate the number of tails for each trial, enter **=a + b** in the grey cell of Column C, and then press enter.

- The cells in Column C will display the outcomes of the 100 trials of two coin tosses — a 0 means no tails, a 1 means one tail, and a 2 means two tails.
- Scroll down to survey the results. What is the number of tails that occurs most often? Least often?

Most often – 1 tail

Least often – 0 or 2 tails

Step 4: Graph the results of the two tosses. With your cursor in Column C, select **MENU > Data > Quick Graph**. Change the dot plot that appears to a bar graph by selecting **MENU > Plot Properties > Force Categorical X** and then **MENU > Plot Type > Bar Chart**.

Step 5: Calculate the experimental probabilities for your data and enter them into the table below.

Step 6: Combine data with your other group members, and calculate the experimental probabilities. Then, calculate the experimental probabilities for the whole class. Enter all probabilities into the table.

↙ Results vary for individuals & groups...

	No Tails	One Tail	Two Tails
Individual Results			
Group Results			
Class Results	619/2400 ≈ 26%	1199/2400 ≈ 50%	587/2400 ≈ 24%

Period 2

Conclusions:

- Did your results match your predictions? Why or why not?

Answers vary

- Why do you think the probability of getting one tail is higher than getting no tails or two tails?

HH
HT
TH
TT
} 4 possibilities

1 tail occurs twice : $\frac{2}{4} = \frac{1}{2}$

$\therefore$ P(one tail) = $\frac{1}{2}$

- What is the sample space—the set of all possible outcomes—for tossing a coin twice?

{HH, HT, TH, TT} 4 possible outcomes

- Using the sample space, calculate the three theoretical probabilities for tossing a coin twice.

$$\text{Theoretical Probability} = \frac{\text{number of outcomes for event}}{\text{total number of outcomes}}$$

No tails: $\frac{1}{4}$

One tail: $\frac{2}{4} = \frac{1}{2}$

Two tails: $\frac{1}{4}$

{HH, TH, HT, TT}
1 2 1

- As you combined your results with the class, how did the experimental probabilities compare to the theoretical probabilities?

Experimental prob came closer to theoretical probabilities — Law of Large #s

As sample size grows, avg. of results obtained tends to expected value.

- Explain why the computation for the probability of an outcome of one tail is different from the other computations.

Since one tail appears twice in total # of outcomes, we must account for it in our calculations.

$\frac{2}{4} = \frac{1}{2}$ ✓