**PROBABILITY PROJECT #1 – COINS**

**NAME:**

**CLASS:**

**DATE**: June 8, 2019

**PART A – EMPIRICAL PROBABILITY**

A1 Research the web using key word “probability”.

Define probability in your own words.

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What does a probability of 0 mean?

>

What does a probability of 1 mean?

>

What is probability useful for?

>

Website URL(s):

A2 Research the web using key words “empirical probability”.

What is the definition?

>

What is the formula to calculate empirical probability?

>

Website URL(s):

A3 Go to <https://www.probabilitycourse.com/chapter1/1_3_1_random_experiments.php> and review. Define the following terms.

Random experiment:

>

Outcome:

>

Sample space:

>

Event:

>

A4 Go to <https://www.mathsisfun.com/data/probability.html> and write the formula in the yellow box to calculate probability of event happening.

>



A5 Consider rolling a fair, six-sided die with faces 1, 2, 3, 4, 5 and 6. Use the formula from A4 to calculate the probability of rolling a 3.

Total number of outcomes?

>

Number of ways it can happen?

>

Probability of rolling a 3?

>

A6 Consider the following morbid example. Suppose you are going to school and there are two outcomes: the first is that you get to school safely and the second is that you die in an accident. Calculate the probability of dying using the formula from A4.

Total number of outcomes?

>

Number of ways it can happen?

>

Probability of dying?

>

What is wrong with this formula?

>

A7 Research the web using key words “equally likely outcomes”. Define that term and modify the formula from A4.

Equally likely outcomes?

>

Modified probability formula?

>

Website URL(s):

A8 What is meant by “fair” or “balanced” in terms of flipping a coin or rolling a die?

>

What would be an example of an unfair or unbalanced coin or die?

>

A9 What is the probability of a coin landing on its side? Research <https://journals.aps.org/pre/abstract/10.1103/PhysRevE.48.2547>

Probability?

>

What type of coin are they referring to?

>

Do you think this is correct?

>



**PART B – FLIP A FAIR COIN**

B1 Open the Excel file “Coins Spreadsheet” and enter your name, class and date in cells A2, B2 and C2. Only change cells in blue.

B2 Flip a fair coin 21 times. Record the results in column 2. Enter 1 for Head and 0 for Tail.

B3 What was the highest the probability reached (Column C)?

>

B4 What was the lowest the probability reached (Column C)?

>

B5 Did the probability ever equal 50% (i.e. 0.50)? If so, at what trial(s)?

>

B6 Based on your experiment of 21 trials, what is the probability if you flip the coin again, it will be a Head?

>

B7 Go to the second sheet named “1 Coin Chart”. Look at your data. What do you observe? If you conducted 21,000 trials, what do you think the probability would be?

>

B8 Make the graph your own. Enter an appropriate title for the graph and labels for the axes. Change the color as you wish. The more creative the better.

**PART C – FLIP A FAIR COIN 4 TIMES OR 4 FAIR COINS ONCE**

C1 Explain why the experiments “Flipping a Fair Coin 4 Times” and “Flipping 4 Fair Coins Once” can be considered the same?

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Which would be easier for you to carry out?

>

C2 Open the Excel file “Coins Spreadsheet” and flip a fair coin 4 times or flip 4 fair coins once. Record the results on sheet 3 named “4 Coins”. In Column 2, enter the number of Heads. Enter 1 if there were 2 Heads and 0 otherwise.

C3 Repeat the experiment 20 more times. What was the highest the probability reached (Column D)?

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C4 What was the lowest the probability reached (Column D)?

>

C5 Did the probability ever equal 50% (i.e. 0.50)? If so, at what trial(s)?

>

C6 Based on your experiment of 21 trials, what is the probability that if you conduct the experiment again, there will be exactly 2 Heads

>

C7 Go to the fourth sheet named “4 Coin Chart”. Look at your data. What do you observe? If you conducted 21,000 trials, what do you think the probability would be?

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C8 What is the theoretical probability that if you flip a coin 4 times you would get exactly 2 Heads? Show your work.

>

C9 Make the graph your own. Enter an appropriate title for the graph and labels for the axes. Change the color as you wish. The more creative the better.

C10 Save this Word document and the Excel spreadsheet as firstname.lastname.coins (different extensions) and email both to me.