

INFO370 Lab: Collect and describe data

April 15, 2022

Instructions

Your task is to toss two coins and analyze the results. Very little coding needed here.

- Format your results well: readability is a part of your task!
- Your task is not just to get a correct answer but to convince us that you understand the task!

1 Toss two coins

Your task here is to conduct an experiment: toss two coins at least 20 times (at least 40 coin-tosses in total). Each time you record the number of heads you got.

If you only have a single coin, you can toss it twice for two coins.

If you have no coins (such a loser!), you can flip something else—a bottle cap, your credit card, your cellphone, your laptop, your roommate... just use your imagination! It does not have to be a fair object giving you 50/50 chances. You can also use many-sided objects, such as dice to get two outcomes. A die will always give you either a “six” or a “non-six”, for instance.

NB! We ask you to actually **flip a coin or another physical object**, not to cheat with computers, random numbers, online simulators and such.

1. Explain which object(s) are you flipping, and if you had two of these or just a single object.
2. Toss the coins.

For each toss, add a row in the table about the number of heads in each trial. The table might look something like this:

Trial	# of Heads
1	0
2	2
⋮	⋮
20	1

You can create such table with the following markdown:

```
| Trial | # of heads |
| :----: | :-----: |
| 1 | 0 |
| 2 | 2 |
| ... | ... |
```

This will be rendered in html as the table above.

Note: if you flip something that is not a coin then you either have to decide which side you call “heads”, or you can also record not “heads” but e.g. “magnetic stripes” in case of credit card.

3. Show a summary table of your results: how many times did you get 0 heads, how many times 1 heads, how many times 2 heads.

Do this as markdown table!

4. Compute the mean, median and mode of the number of heads per trial in your experiment.

Do not use the existing functions for median and mode, use your summary table and explain how do you get median and mode from there.

5. Which one is larger: mean or median?

6. Compute the variance in number of heads in your experiment.

Use one of the sample variance formulas and show your calculations. Do not use variance function on computer! You may consult [lecture notes](#) Ch 1.2.2, page 10 for now.

You can show your calculations along these lines:

$$\text{variance is } \text{var } H = \text{mean}(H^2) - \text{mean}(H)^2 = 2.1 - 1.21 = 0.89$$

(note: it does not have to be valid computer code, just understandable enough).

7. Compute standard deviation.

8. Compute 0.25th quantile (25th *percentile* or *lower quartile*) of your results. Do not use the quantile/percentile function but do it manually (you may want to print the results in an ordered way). Explain how do you get the result!

Hint: consult [lecture notes](#), section 1.2.2 “Describing data”, in particular subsection “Quantiles” a few pages down there.

9. Plot (or manually sketch) a histogram of your results. Does the result look symmetric or left/right skewed?

Hint: you can use `plt.hist` to do a histogram.
