



Mobile CSP POGIL Handouts

Lesson 4.6: Coin Flip Experiment

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Break into POGIL teams of 4 and assign each team member one of the following roles.

Student Name	Role	Responsibility
	Facilitator	Records the team's data -- i.e., the number of flips and the heads for each run of the app. Tallies the results and calculates the percentage of heads and tails.
	Spokesperson	Reports the team's results.
	Quality Control	Validates the Facilitator's data -- Are the results of each run recorded correctly? Are the tallies and calculations correct?
Jaden Lee	Process Analyst	Keeps track of the team's progress and assess its performance.

Experimental Procedure

Our hypothesis for this experiment: App Inventor's PRNG provides a good model of randomness.

Perform the following steps:

- 1.) Repeatedly run the app on each device and record the number of heads and tails received in each trial. Do at least 20 runs (**trials**) among the team. The maximum number of "flips" per trial is 100. Your team should have at least 2000 "flips".
- 2.) Tally your results and calculate the percentage of heads for each trial. In addition, calculate the cumulative number and percentage of heads after each trial. For example, after the 5th trial of 100 flips, your table will show the number and percentage of heads for 500 flips.
- 3.) (**Portfolio**) Record your team's results for each trial in a neatly organized table. That is, if you did 20 trials of 100 coin flips each, your table should have 20 rows of results, with the percentage for each trial along with the cumulative numbers. Here's an example:

Trial	Flips	Heads	% Heads	Total Flips	Total Heads	Total % Heads
1	100	54	54%	100	54	54%
2	100	43	43%	200	97	48.5%
3	100	57	57%	300	154	51.3%
4	100	50	50%	400	204	51%



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5	100	54	54%	500	258	51.6%
6	100	47	47%	600	305	50.8%
7	100	44	44%	700	349	49.9%
8	100	48	48%	800	397	49.6%
9	100	52	52%	900	449	49.9%
10	100	46	46%	1000	495	49.5%
11	100	49	49%	1100	544	49.5%
12	100	53	53%	1200	597	49.8%
13	100	50	50%	1300	647	49.8%
14	100	45	45%	1400	692	49.4%
15	100	44	44%	1500	736	49.1%
16	100	44	44%	1600	780	48.8%
17	100	48	48%	1700	828	48.7%
18	100	51	51%	1800	879	48.8%
19	100	51	51%	1900	930	48.9%
20	100	53	53%	2000	983	49.2%

Template table available online. Linked in Lesson 4.6.

4.) (**Portfolio**) According to your results, does App Inventor's PRNG provide a good model of randomness?

According to the results, yes. Though it is not completely random, the percentages all hover roughly around 50% and do not deviate in one specific direction often enough to disregard its use as a suitable PRNG.

5.) (**Portfolio**) A friend claims that flipping a coin 100 times and finding that it comes up heads only 45% of the time shows that the coin is biased. How should you reply?



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Flipping a coin 100 times is not a good test of whether or not a coin flip is biased. It cannot be definitively stated that because out of 100, 45 were heads but variance is expected when flipping a completely random event.