

LARSON—MATH 255—CLASSROOM WORKSHEET 14

Dictionaries and Problems

1. (a) Start the Chrome browser.
(b) Go to `http://cocalc.com`
(c) You should see an existing Project for our class. Click on that.
(d) Click “New”, then “Sage Worksheet”, then call it **c15**.
(e) For each problem number, label it in the SAGE cell where the work is. So for Problem 1, the first line of the cell should be **#Problem 1**.

Dictionaries Revisited

A dictionary is a collection of key-value pairs (*keys* and *values*). Each pair is connected with a colon, and different pairs are separated by commas.

2. Use *dictionary comprehension* to make a dictionary D with keys from 1 to 100 and initial values of 0.

Now run `randint(1,100)` many times. If a is the output integer increment the value $D[a]$ by 1. See if you get roughly 1% of each of the integers from 1 to 100.

Streaks of Heads and Tails

3. We would now like to investigate longest streak of heads or tails in a sequence of coin flips. We will first need to generate data. Write a function `coin_flips(n)` that *returns* a list of n “heads” or tails”. Test your function.
4. Let `flip_data = coin_flips(100)`.
5. One way to investigate our data is to first find the length of the streak that starts at any specified index in your `flip_data` list. Define a function `streak_at_i(flip_data,i)` that inputs a list of ‘H’ and ‘T’ strings, an index i , and returns the length of the streak whose first term is `flip_data[i]`. Test it on some data to see if it's working.
6. Now we have a tool we can use to find the longest streak of heads or tails in our data. Use `streak_at_i(flip_data,i)` for $i \in [0..99]$ and keep track of the largest value you get.
7. This is a single *experiment*. Now repeat this experiment many times and see what the average length of a longest string is.
8. Now investigate the average length of a longest streak of heads or tails when you flip a coin **200** times.

A Formula for Primes?

9. When $n = 0$, $n^2 - 79n + 1601$ is 1601—which is prime. When $n = 1$, $n^2 - 79n + 1601$ is 1523—which is prime. Find the smallest value of n where $n^2 - 79n + 1601$ is *not* prime.

Getting your classwork recorded

When you are done, before you leave class...

- (a) Click the “Make pdf” (Adobe symbol) icon and make a pdf of this worksheet. (If CoCalc hangs, click the printer icon, then “Open”, then print or make a pdf using your browser).
- (b) Send me an email with an informative header like “Math 255 - c15 worksheet attached” (so that it will be properly recorded).
- (c) Remember to attach today’s classroom worksheet!