LARSON—MATH 255–CLASSROOM WORKSHEET 23
Coin Flip Experiments; Files.

1. (a) Start the Chrome browser.
   (b) Go to `http://cocalc.com`
   (c) Login using **your VCU email address** .
   (d) Click on our class Project.
   (e) Click "New", then "Worksheets", then call it **c23**.
   (f) For each problem number, label it in the Sage cell where the work is. So for Problem 2, the first line of the cell should be `#Problem 2`.

Streaks of Heads and Tails

2. Use our previously defined functions to generate a list of 100 coin flips called `flip_data`.

3. Now we need to find a longest streak of heads or tails in our data. One way to do it it to first find the length of the streak that starts at any specified index in your `flip_data`. 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 its working.

4. Now we have a tool we can to a 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.

5. Write a function `longest_streak(flip_data)` that *inputs* a list of heads and tails ('H' and 'T' strings) and *outputs* the length of a longest streak (of either heads or tails).

6. Now repeat this experiment (of flipping a coin one hundred times) 1000 times, record the longest streak each time, and finally *estimate* the average length of a longest streak of heads or tails when you flip a coin 100 times.

7. Now estimate the the average length of a longest streak of heads or tails when you flip a coin 200 times.

Files

8. Now it is the case on any larger program that you will want to use functions you have previously defined. These are called *tools*. Instead of copying and pasting from your old code. You can save them as *files* and load them as needed.

   (a) Click "New". Type `heads_from_n_flips.sage` and then click "file". (You are making a **.sage** file *not* our usual Sage Worksheet file. These are regular text files that are loaded as Python files plus some *preprocessing*).

   (b) Define the function:

```
def heads_from_n_flips(n):
    heads=0
    for i in [1..n]:
        if random() < 0.5:
            heads=heads+1
    return heads
```

   (c) Click "Save" and then go back to your **c23** worksheet.

   (d) Type `load("heads_from_n_flips.sage")` and evaluate.

   (e) Now try `heads_from_n_flips(100)` a few times. You never need to write this function again. You have a tool!

9. Add a print statement to `heads_from_n_flips.sage` that indicates that the file has in fact been loaded. Test it.

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 - c23 worksheet attached" (so that it will be properly recorded).

(c) Remember to attach today's classroom worksheet!