

LARSON—MATH 353—HOMEWORK WORKSHEET h08
Digital Dice.

1. Log in to your Sage Cloud account.
 - (a) Start the Chrome browser.
 - (b) Go to `http://cloud.sagemath.com` and sign in.
 - (c) You should see an existing Project for our class. Click on that.
 - (d) Click “New”, call it **h08**, then click “Sage Worksheet”.

The Curious Coin-Tossing Game. There are three players each with a stack of coins. They each flip one. If they all get Heads or all get Tails they play again. Otherwise the “odd man out” (the one who got say Heads while the other two get Tails) get the other’s two coins (so her pile goes up two, while their piles of coins each go down one). If they start with k , l and m coins, how many iterations of this game does it take on average for (at least) one player to lose all of her coins?

We showed mathematically that the number of iterations in the case $k = l = m = 1$ is at least $\frac{85}{64} \sim 1.328$. We then confirmed this by repeating a million experiments.

We calculated the average number of iterations when $k = l = m = 2$, $k = l = m = 3$ and $k = l = m = 10$?

2. Now make a `scatter_plot` to visualize the average number of iterations for $k = l = m = 1$ to $k = l = m = 100$.
3. We’ve assumed that this was a *fair* coin. In class we modified our code in order to have our players play with coins where the probability of heads is p .

Now make a `scatter_plot` to visualize the average number of iterations for fixed $k = l = m = 2$ but varied “heads probability” p (maybe $p = 0.1$ to $p = 0.9$).

Getting your homework recorded

When you are done...

- (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 353—h08 worksheet attached” (so that it will be properly recorded).
- (c) Remember to attach your homework worksheet!