Homework 04:

A1. Use some program like MATHEMATICA, Maple, or MATLAB to make a plot like Fig. 4.3(c) in your text. Repeat your plot several times. (You have 36 coins, so use 36 bins in your histogram.)

- What should this plot look like in principle?
- If you use 570 trials instead of 57, is there a qualitative change in the plots? How about 5700? Explain.
- How many trials are necessary to make the plot look like what you expected? (If you didn’t expect anything in particular, think harder.) Explain.
- Include a couple of plots that demonstrate your findings. Include a printout of your code as well.

A2. Write a one-dimensional random walker program. (If this sounds too hard for you—you’re not a programmer—come see me and I’ll help you. If you’ve had Physics 230 [or equivalent experience], you should be able to do this.)

- Plot $x_i$ as a function of $i$ for a single walker ($i$ is the step number). Do this several times. What do you observe? Any take home messages? Attach a plot that includes, in a single graph, the trajectory of many walkers. (optional: What kind of a “shape” do all the trajectories together make?)
- Plot $x_i^2$ as a function of $i$ for a single walker (like Fig. 4.5(a) in the text). Do this several times. What do you observe? Any take home messages?
- Average $x_i^2$ over many walkers (that is, plot $\langle x_i^2 \rangle$ where the average is taken using lots of walkers). Plot the diffusion law on the same graph. Attach the graph. What do you observe? Any take home messages?
Do problem 4.1, part a only, in the text

Do problem 4.2 in the text