The project my group chose was the Random Walk and Gambler's Ruin, with the goal of that being to model a gambler's fortune as a random walk. A random walk is a series of random steps forwards or backwards, and in the context of the gambler this would be the randomness of his fortune.

How we decided to solve this problem was to create a function ranWalk, which when called simulates the amount of iterations we had set for and does that many random steps forward or backwards. If it is the first time the function is being called for a specific weight, a list will record the results, which would then be used to plot later. Each of the different walks have different weights, being 0.5/0.5, 0.501/0.499, 0.6/0.4, 0.54/0.46. This down the road leads to drastically different results. After all simulations of ranWalk have been finished for each weight then we will calculate the win odds and the loss odds for each of the weights. In this scenario, a win would be the gambler at the end of ranWalk having positive money, while a loss would be having negative money.

Results wise, the win and loss rates for each distribution were interesting. The mostly even weights still had a lot of variation both ways. Weights which had a heavy bias ended up being fill wins or full loses.

These results show essential concepts within statistics and probability, in that they show minor changes in starting conditions or distributions can cause much greater effects when compounded. For example, we saw how a Bernoulli (0.5) shift to Bernoulli (0.4) caused major changes. With 1000 steps, the probability of winning went from around 0.5 down to 0. Small changes in variation and movement can cause so many different scenarios, and when scaled out to a population would cause extreme changes also. These effects only get exacerbated when the

amount of iterations increases, because then the slight change is compounded into some wildly different results from expectations.

Thank you for reading! I had a lot of fun and it's a bit odd submitting my last assignment, but here we go.