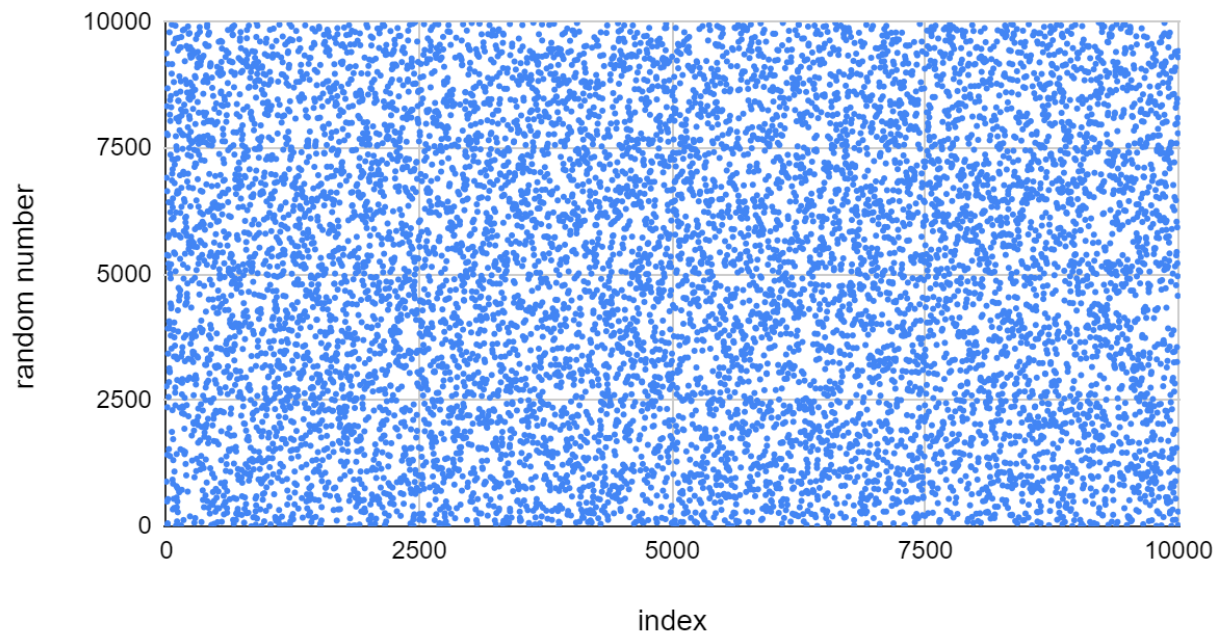Darren Lee
CSE 107
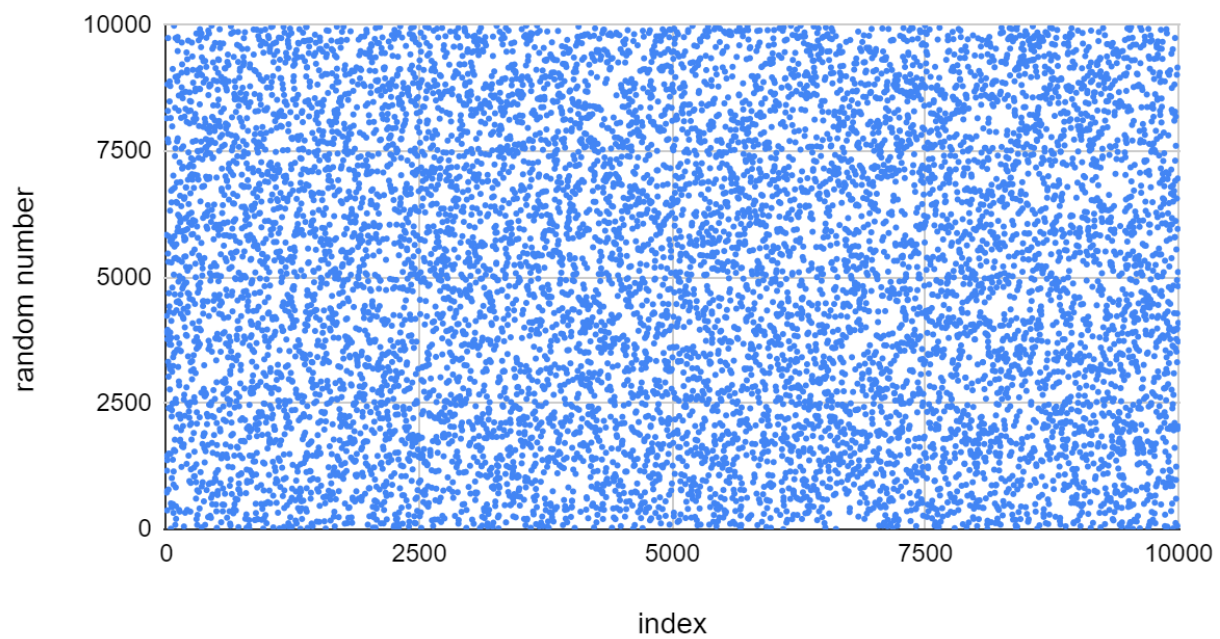
Project I: Probability via Simulation Program Report
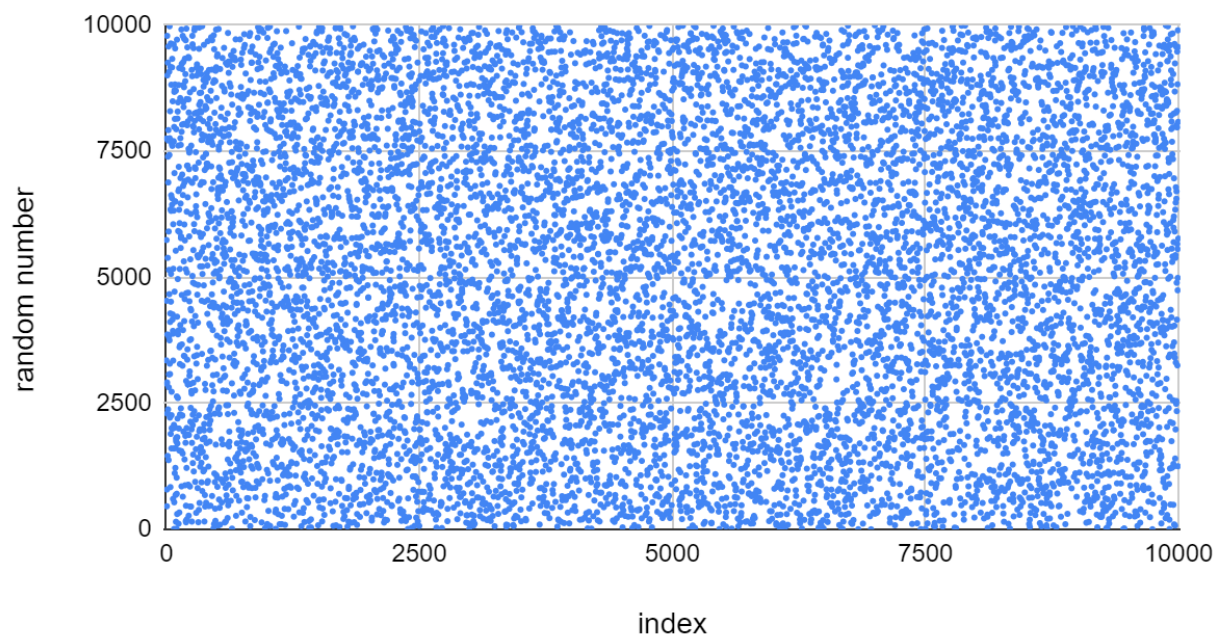
Part (a)

rand
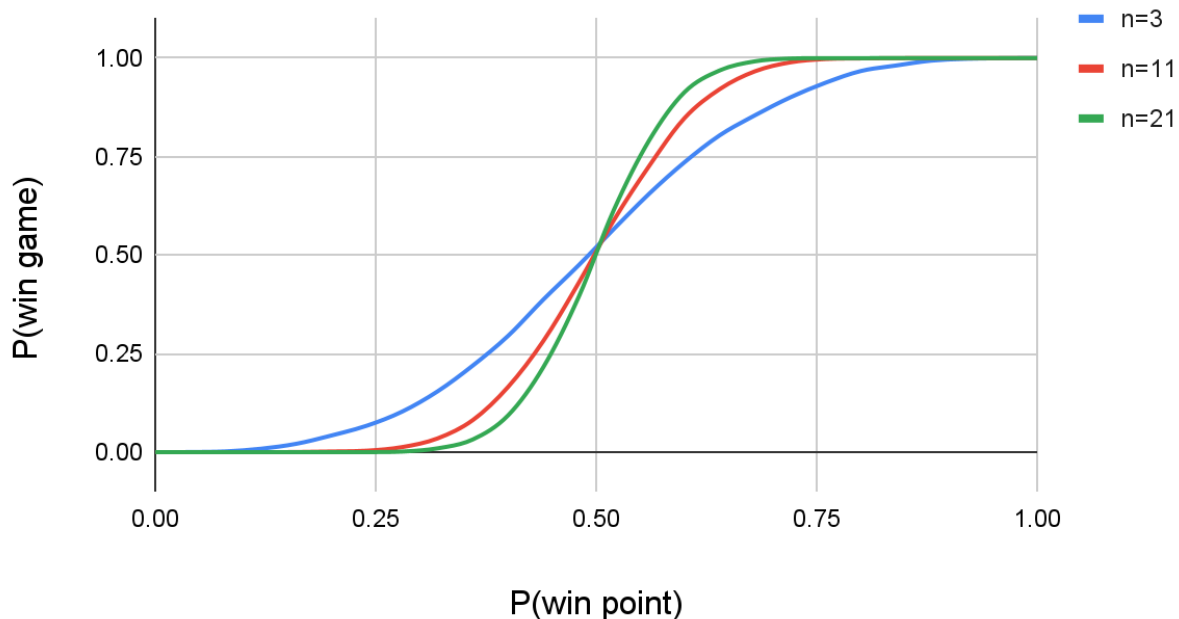
KISS

SHR3

Part (b)

Relating P(win point) to P(win game)

Steepness
As n gets larger, the curve gets steeper since when there aren't many points in the game, each player can more easily win despite a low probability of winning an individual point. This makes sense because if you only play to a few points before someone wins, then there are not enough rounds or points for the probability of winning the game to be very precise or reliable. In contrast, if you play up to many points, the probability of winning a point starts to matter more for winning the overall game because using more simulations increases precision, and the likelihood of winning a single point will be reflected more in the probability of winning the game.

3 points (0,0), (0.5, 0.5), and (1,1)
The curves always pass through (0,0) because if you never win a single point, you can never win a game, and the expectation of the binomial random variable representing the number of points won when playing up to n points per game is np so if p=0 the expected value is 0 points meaning you never win. The curves approximately pass through (0.5, 0.5) because if you win half of the points with n*(1/2)=n/2 points per game when playing up to n points, the scores will likely be approximately tied until someone wins and you should win the game half of the time. The curves also pass through (1, 1) because if you win a point every time, the expectation would be n*1=n meaning you win n points out of n and win the game every time.

Part (c)

In part_d of Pokemon, my code generates a random number and attempts to catch the Pokemon every encounter even if it has already been caught before.

```
part_a:
proportion legendary: 0.2
average height: 53.1246
average weight: 11.3671
average encounter probability: 0.04
average catch probability: 0.678576

part_b:
proportion legendary: 0.25
average height: 58.8748
average weight: 19.6615
average encounter probability: 0.041725
average catch probability: 0.606833

part_c: 103.792

part_d: 182.968
```