Lab 4-

The implementation I chose was to set a pre-check condition in my Loaded Die roll function. I generated a random number mod 10, and if that value was greater than or equal to 5 the function just returned the number of sides of the dice object. If the pre-check random number is less than 5 it will return a random roll (excluding the max roll). The results I expected for 2 dice being rolled would be around 25% of the time would return the maximum roll. This comes from the original stats of 50% of each die throw will land on the max value. Combining these stats .5\*.5 = .25 or 25% of the time.

I chose to set a counter in my main program to run 100,000 throws and an array to track the results. The main function outputs the percentage of each throw at the end. I tried with 4 different scenarios:

Scenario 1:

This involved a basic illustration of concept. I set my first die to 1 sided, and the second die to 2 sided. In this way, the first die will always return 1, and the stats would be roughly 50-50 based on the second die. The results are as follows:

Mean: 2.50232 Mode: 3 Std. Dev: 0.353546

This chart shows about what we’d expect. ~50% of the time we see 2 returned (1+1), and ~50% of the time we see 3 returned (1 + 2). This shows what we’d expect with no heavy weight placed on the “loadedness” of the die.

Scenario 2:

This involved 2 2 sided dice. This should illustrate a similar concept, but with more outcomes. We should expect 25% of the time we get the minimum roll, 25% of the time the maximum roll, and 50% of the time we should get 3. This comes from our 50% chance of each die for each value. .5\*.5 = .25 or 25% of the time we see (1+1) rolled. .5\*.5 = .25 or 25% of the time we see (2+2) rolled. And there is two outcomes (2+1) or (1+2) that each have a 25% outcome, so 3 has a 50% chance of being rolled.

Mean: 3.00147 Mode: 3 Std. Dev: 0.353334

This outcome illustrates that our dice are working appropriately. We see that ~50% of the time we get 3 as our roll and ~25% for each outcome of 2 and 4.

Scenario 3:

This scenario involved two 6 sided dice being rolled. This will illustrate our loaded dice are working properly. There should be a fairly bell shaped curve amounting to ~75% of the outcomes, with the center around 8. Further, we should expect ~25% of the time our maximum roll of 12 should come up.

Mean: 8.99099 Mode: 12 Std. Dev.: 0.892412

These outcomes are about what I expected. I made a poor guess at the bell curve shape. I neglected to take into account the extra percentage of throws that would come up greater than 6 (the max value that comes up 50% of the time). But, it does still reflect roughly what I expected. There is a bell curve, with an extra 25% of value after 6, and the max outcome is almost 12 exactly.

Scenario 4:

This was an expansion of the 6 sided dice being thrown. I chose 2 20 sided dice to be thrown. I expected a similar, but expanded across more values, result to the 2 6 sided dice. The results are as follows:

Mean: 30.05494 Mode: 40 Std. Dev.: 2.690272

Our outcome is exactly what we expected. ~25% are the maximum throw of 40, and the rest is a smoothed out version of the 6 sided dice outcome.