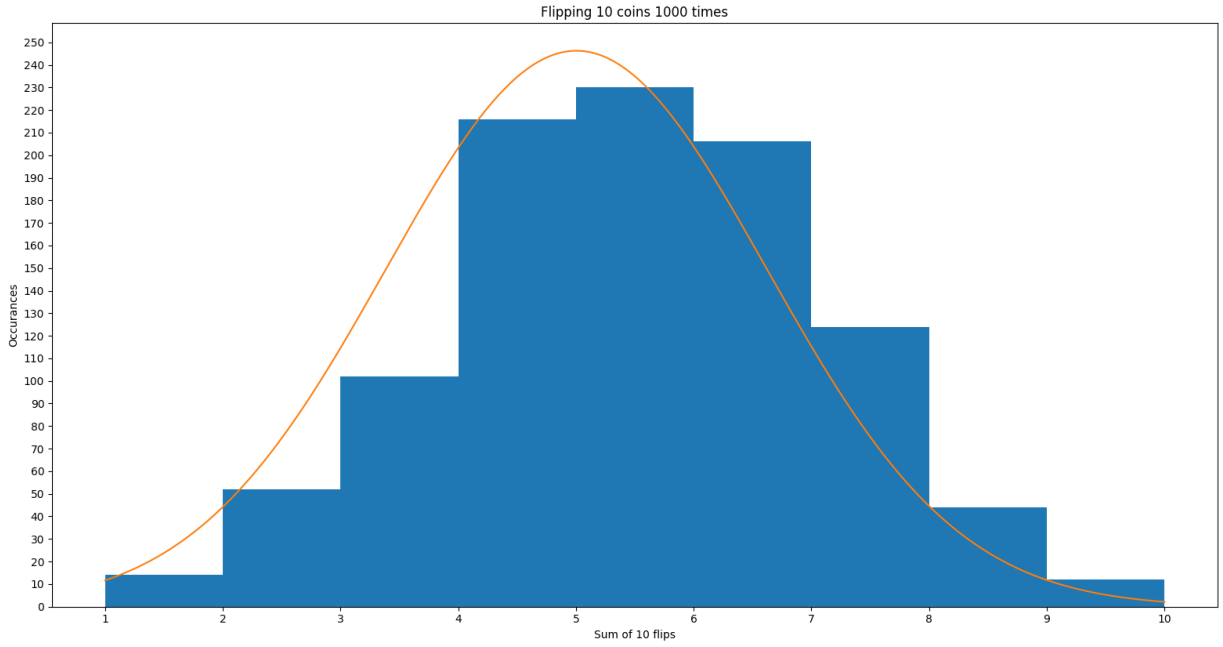
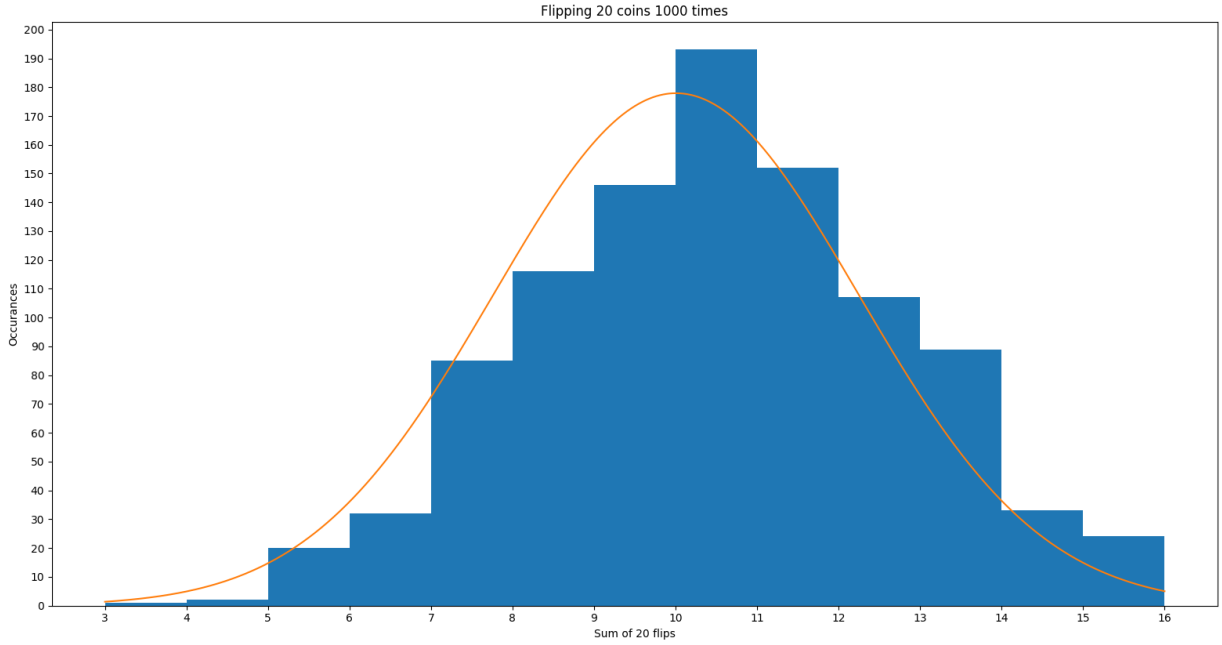
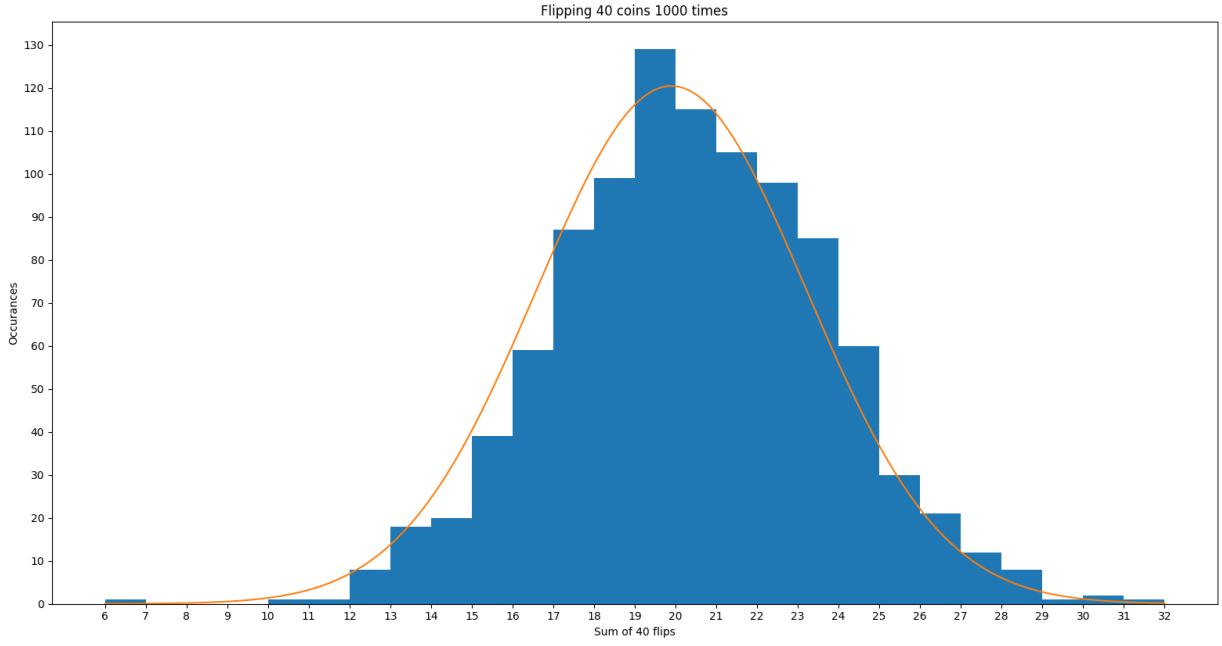
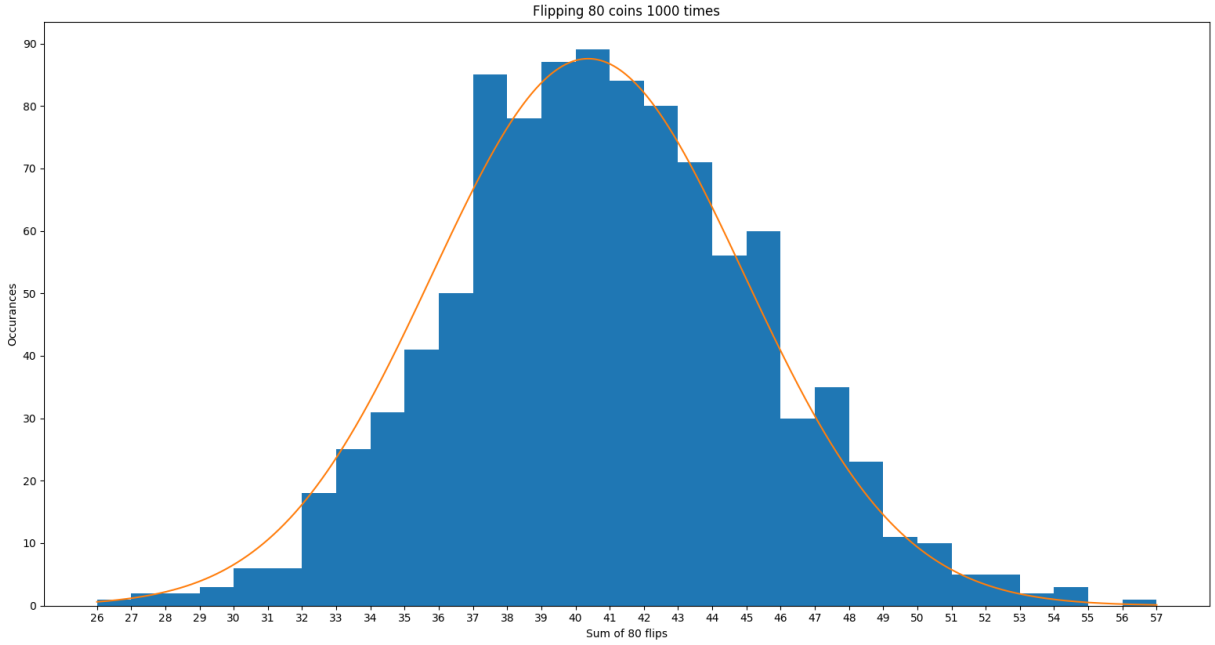
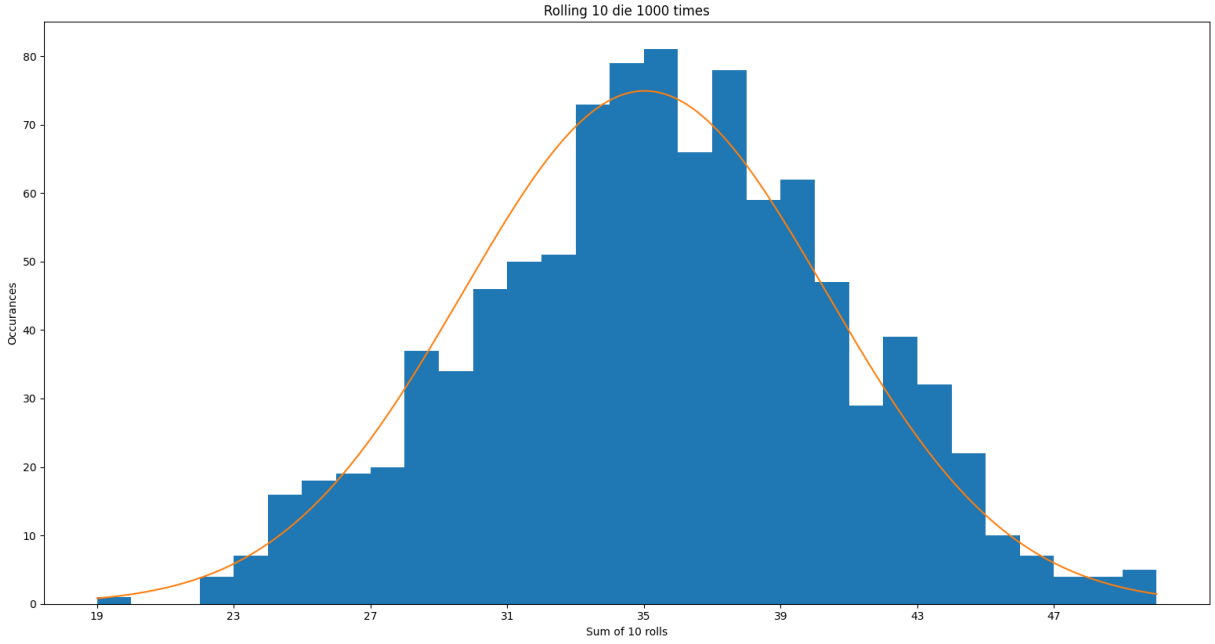
The central limit theorem states that if we take the sum of N random variables, as $N \to \infty$ the distribution of the sums will be approximately a normal distribution. We can see this through the experiments that we conducted. The first experiment was to simulate flipping a fair coin n times. We sum up all of the coin flips, associating 1 with heads and 0 with tails to get our data. We run this experiment 1000 times and then graph the data. All of these are graphed and compared to a normal curve for the data as well. We noticed as we increase n, the histogram begins to resemble a bell curve shape. This is what central limit theorem states and we can see it. Looking at the histograms, we can see that when $n = 10$ the resulting graph is similar to a bell curve but still has a lot of data that is outside it. As we increase n to eventually 80, it can be seen that the graph is almost perfectly inline with a bell curve. The second experiment we ran was simulating rolling a dice. We took the sum of n dice rolls, associating the value on the die with the value being summed. We also ran this experiment 1000 times. Similar to the coin experiment, we noticed that as n increased in value, the resulting graph was more similar to a bell curve shape. We ran each of these experiments 4 times with $n = 10$, $n = 20$, $n = 40$ and $n = 80$. If we allowed for n to growth without bound, then we would see an even better graph that holds tighter to the normal distribution.

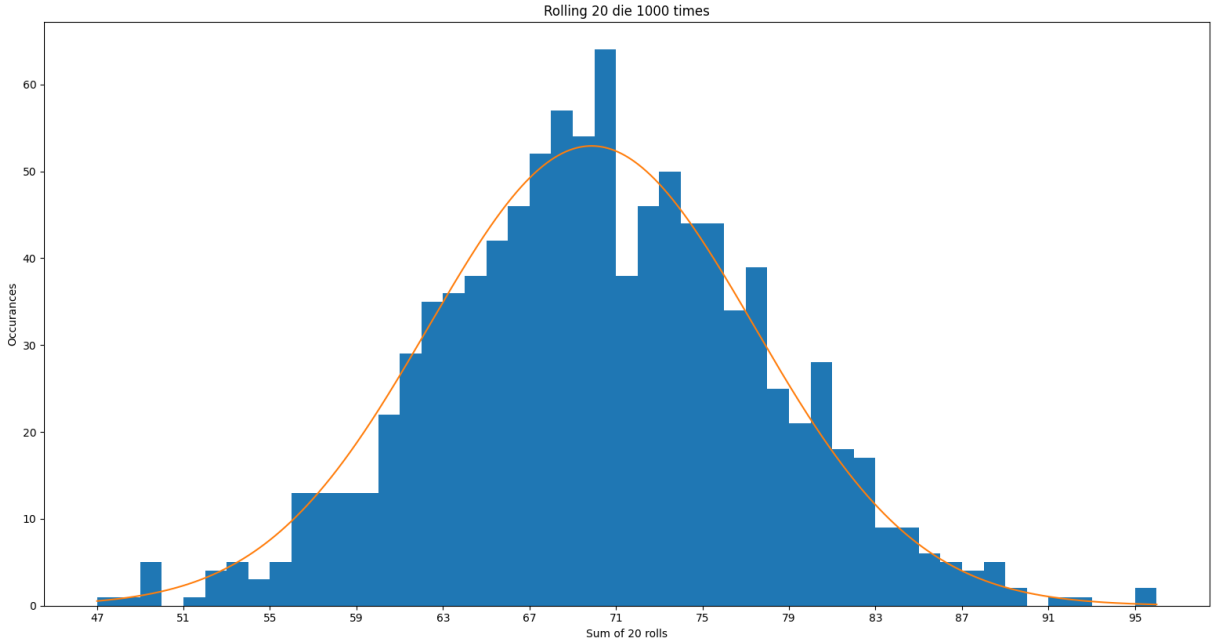


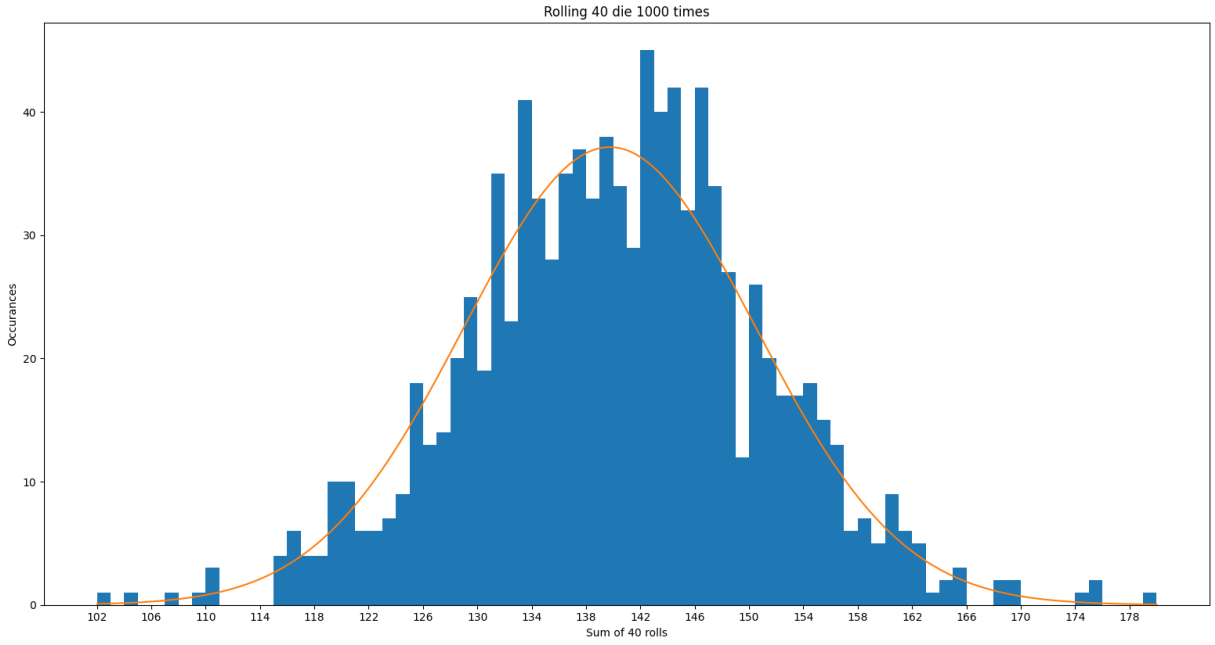

Flipping 20 coins 1000 times
Occurances
Sum of 20 flips

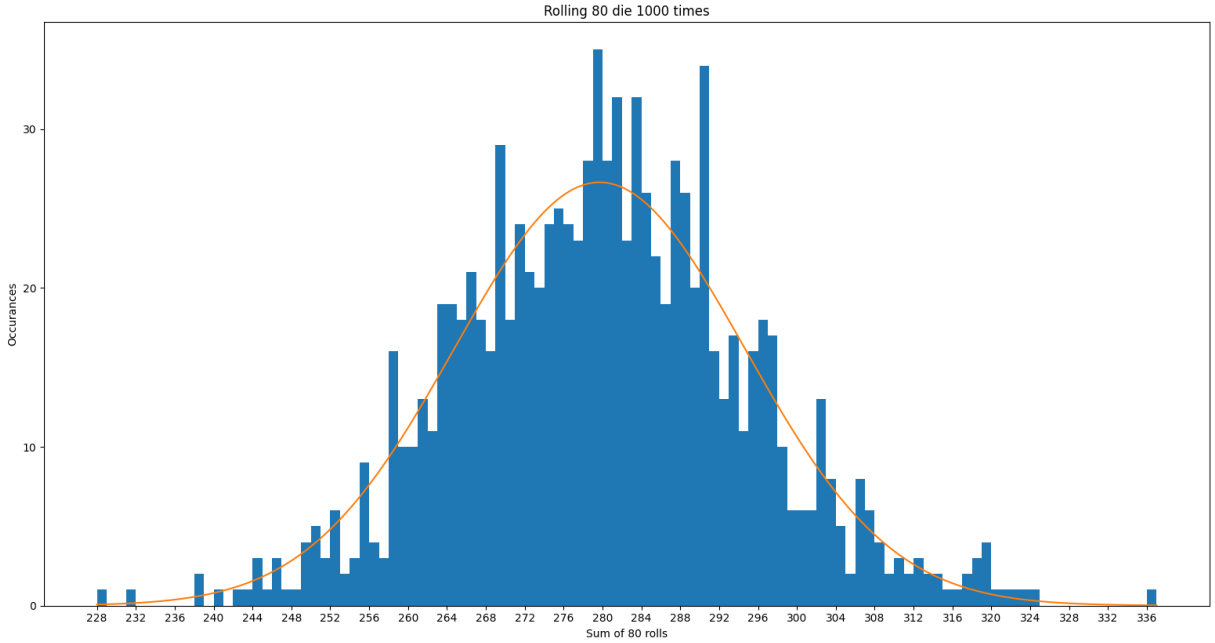

Flipping 40 coins 1000 times
Occurances
Sum of 40 flips


Flipping 80 coins 1000 times
Occurances
Sum of 80 flips
0
10
20
30
40
50
60
70
80
90
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57


Rolling 10 die 1000 times
Occurances
Sum of 10 rolls
0
10
20
30
40
50
60
70
80
19 23 27 31 35 39 43 47


Rolling 20 die 1000 times
Occurances
0
10
20
30
40
50
60
47
51
55
59
63
67
71
75
79
83
87
91
95
Sum of 20 rolls


Rolling 40 die 1000 times
Occurances
0
10
20
30
40
102
106
110
114
118
122
126
130
134
138
142
146
150
154
158
162
166
170
174
178
Sum of 40 rolls


Rolling 80 die 1000 times
Occurances
0
10
20
30
228
232
236
240
244
248
252
256
260
264
268
272
276
280
284
288
292
296
300
304
308
312
316
320
324
328
332
336
Sum of 80 rolls