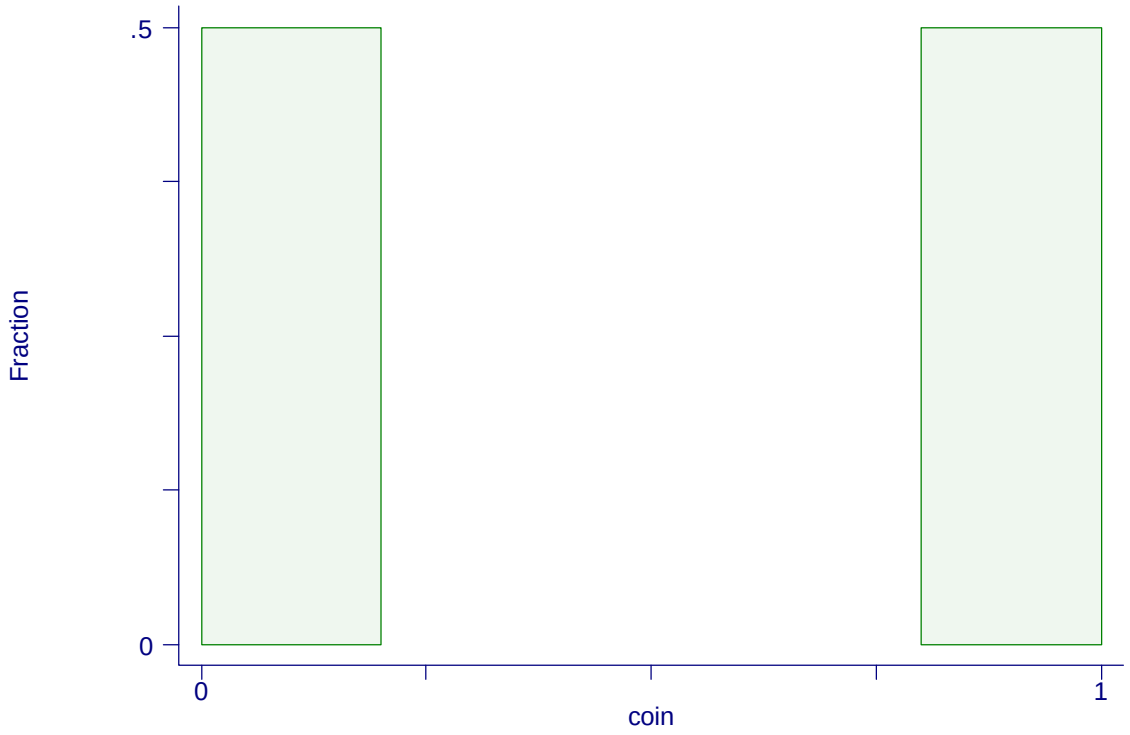


Just above is a histogram of a 1,0 box representing a fair coin where 1=heads and 0=tails. Note, it is not normally distributed.

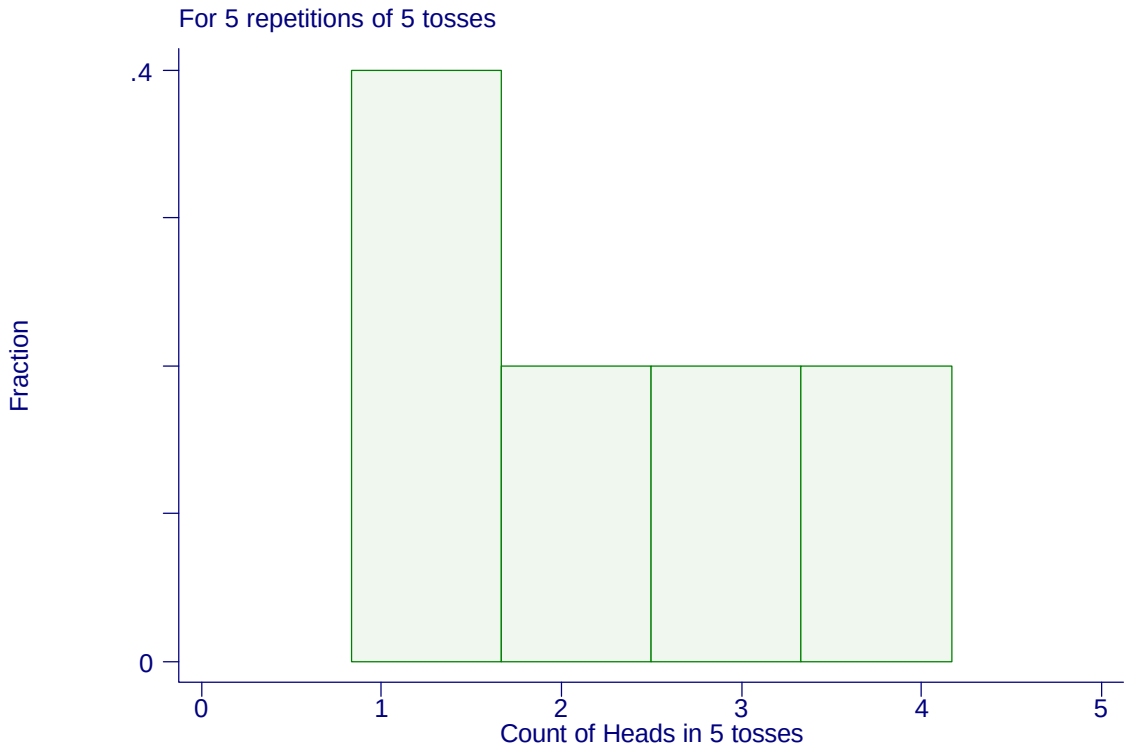
Now, from what you have learned in Chapters 16 and 17, what is the expected value for the number (or total or sum of heads) for this box if you toss a coin 5 times? How about 20 times?

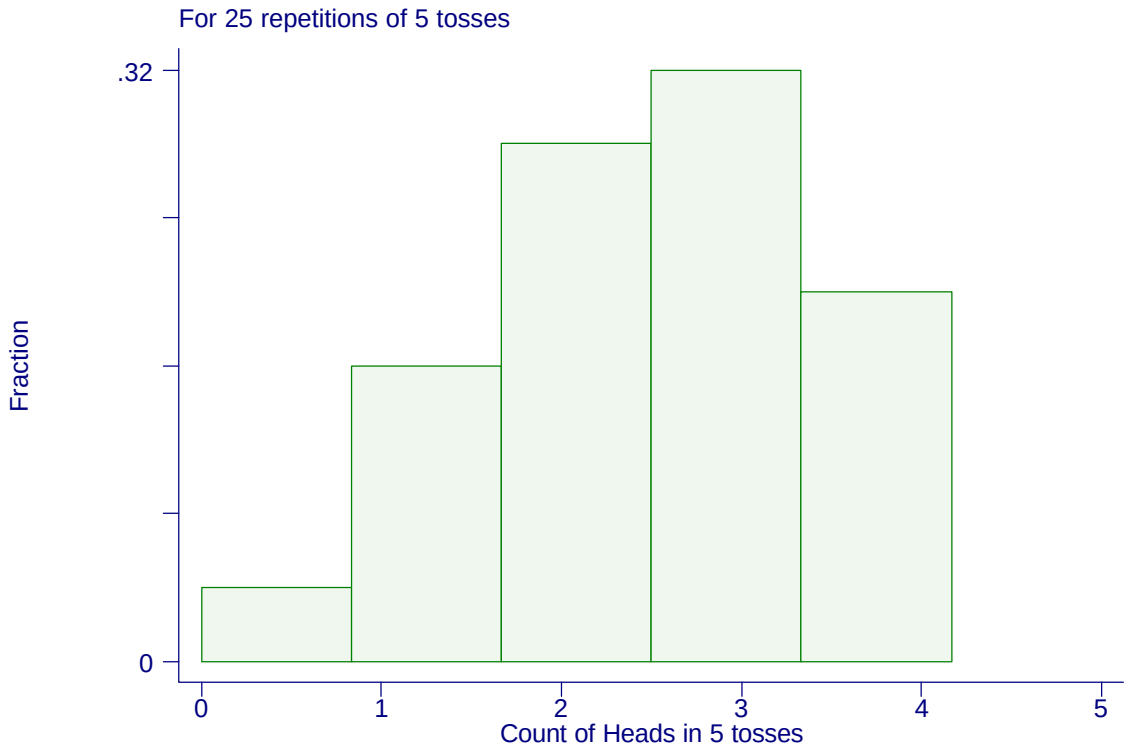
	Expected Value	Standard Error
5 toss situation	2.5	1.12
20 toss situation	10	2.24

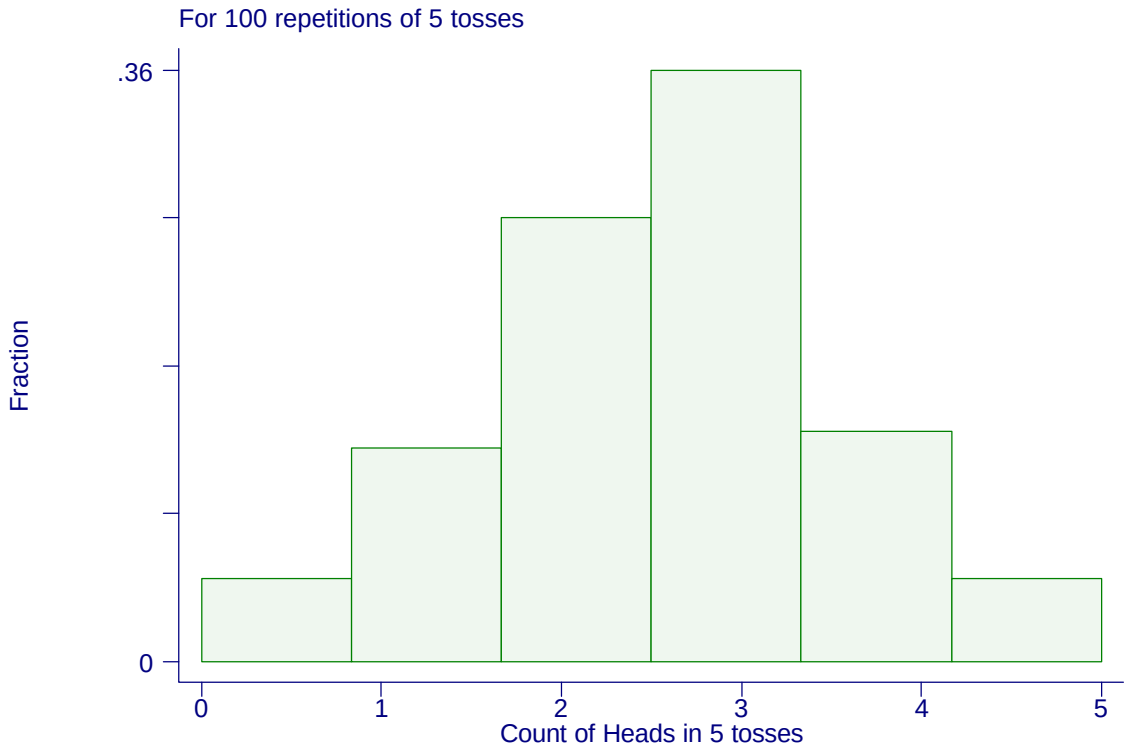
Notice something about the expected value and the standard error in the two situations, the expected value in the 20 toss situation is 4 times larger (where did we get the 4 from) the 5 toss situation.

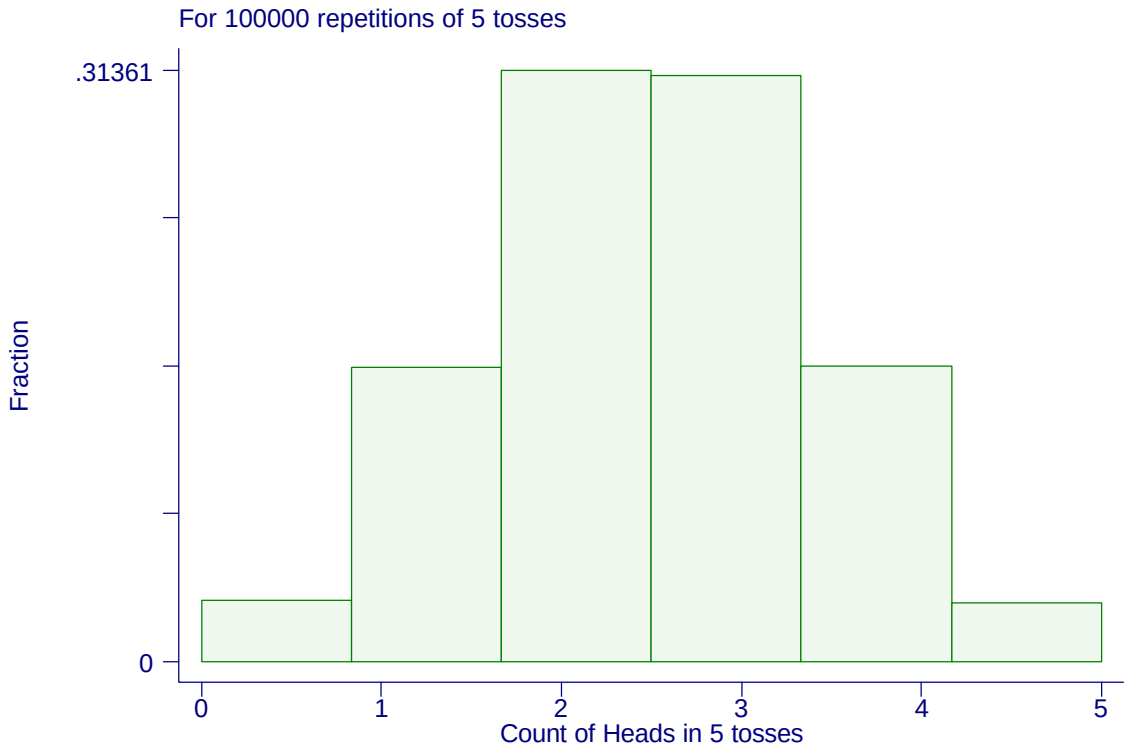
What do you notice about the standard error – well, it's twice as large for the 20 toss situation as for the 5 toss. Two is the square root of 4 (again, where is the 4 coming from?)

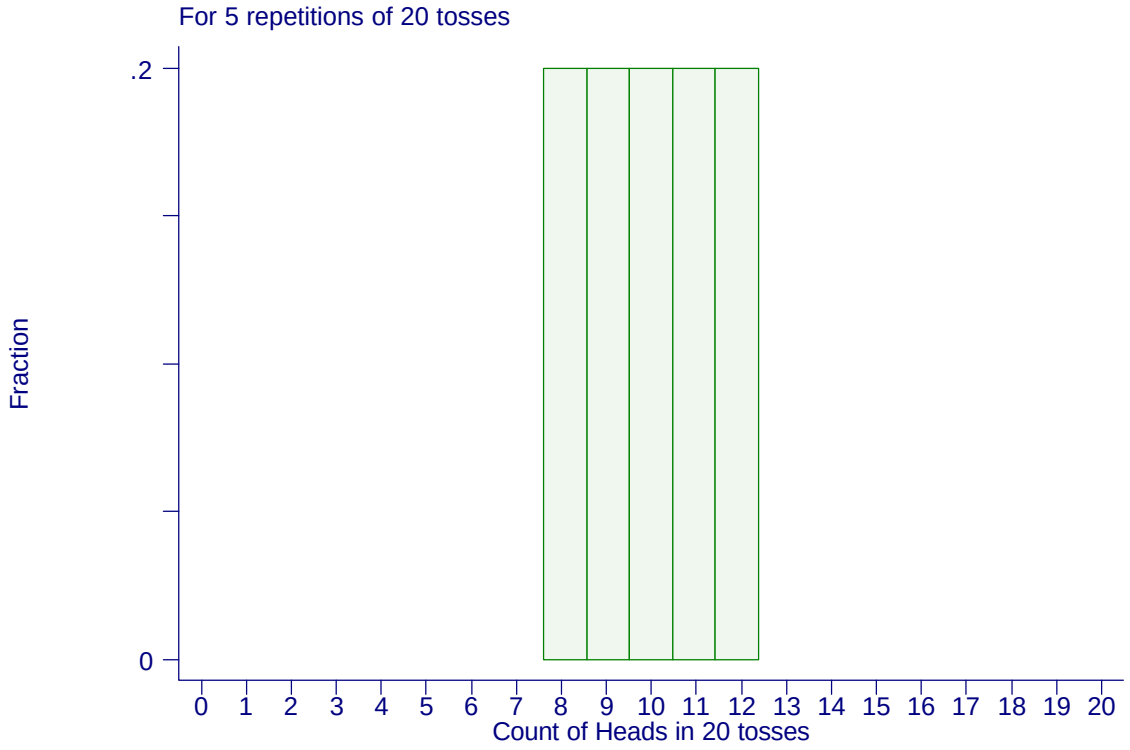
Let's examine some of the similarities and differences between a 5 toss situation (it's like a sample of 5) and a 20 toss situation (like a sample of size 20)

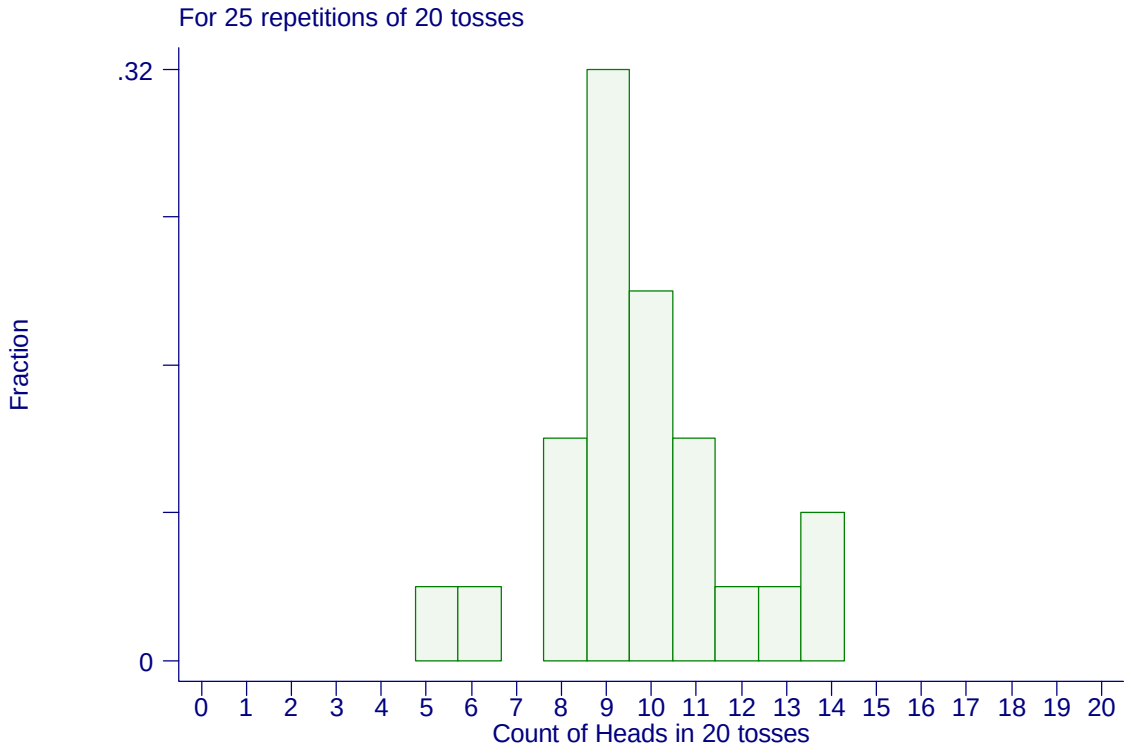

For 5 repetitions of 5 tosses
.4
0
Fraction
0
1
2
3
4
5
Count of Heads in 5 tosses

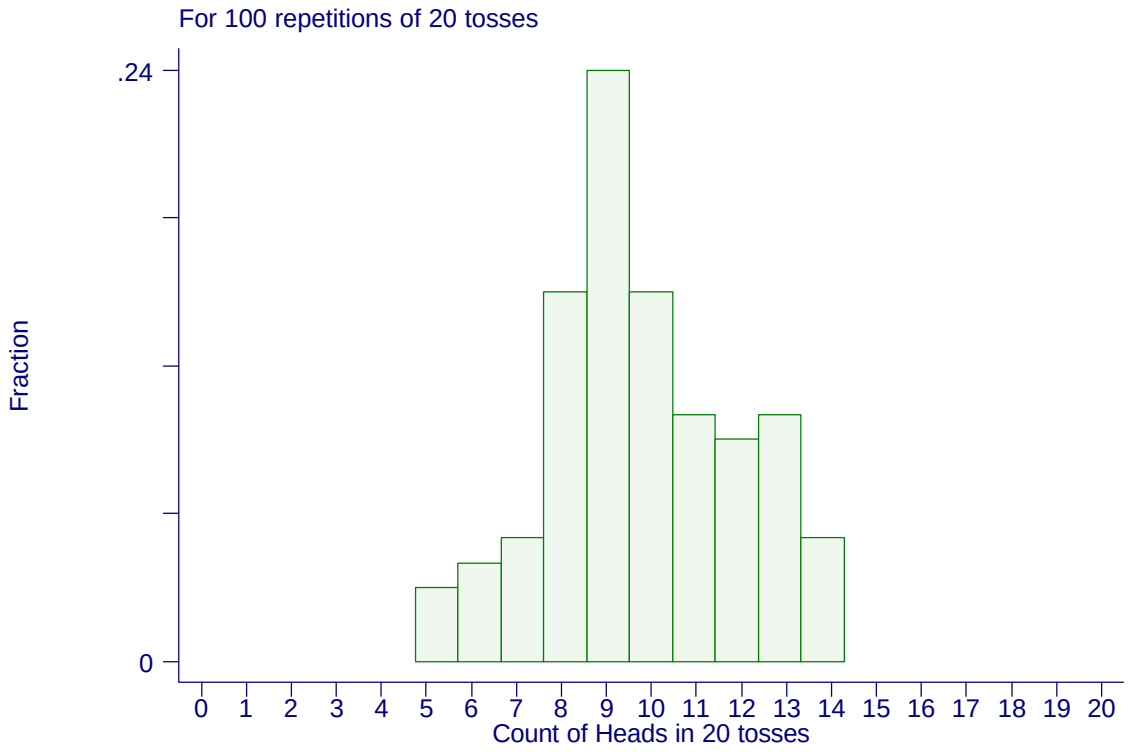

For 25 repetitions of 5 tosses
.32
0
Fraction
0
1
2
3
4
5
Count of Heads in 5 tosses

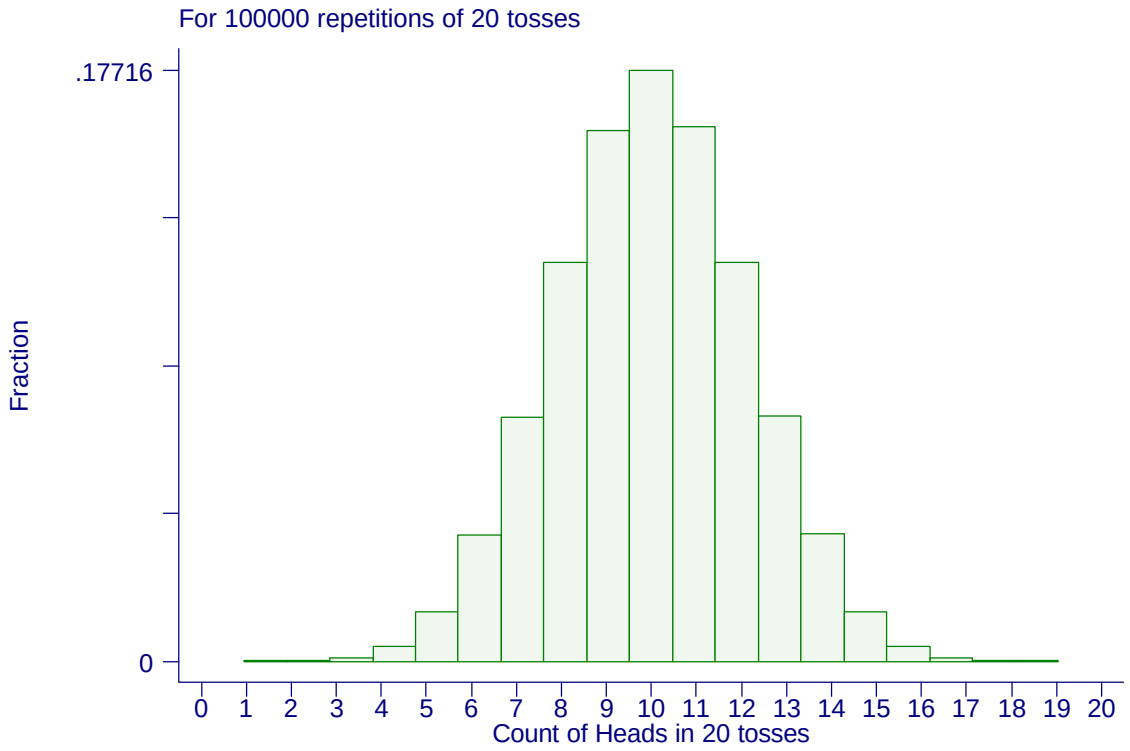

For 100 repetitions of 5 tosses
.36
0
Fraction
0
1
2
3
4
5
Count of Heads in 5 tosses


For 100000 repetitions of 5 tosses
.31361
0
Fraction
0
1
2
3
4
5
Count of Heads in 5 tosses

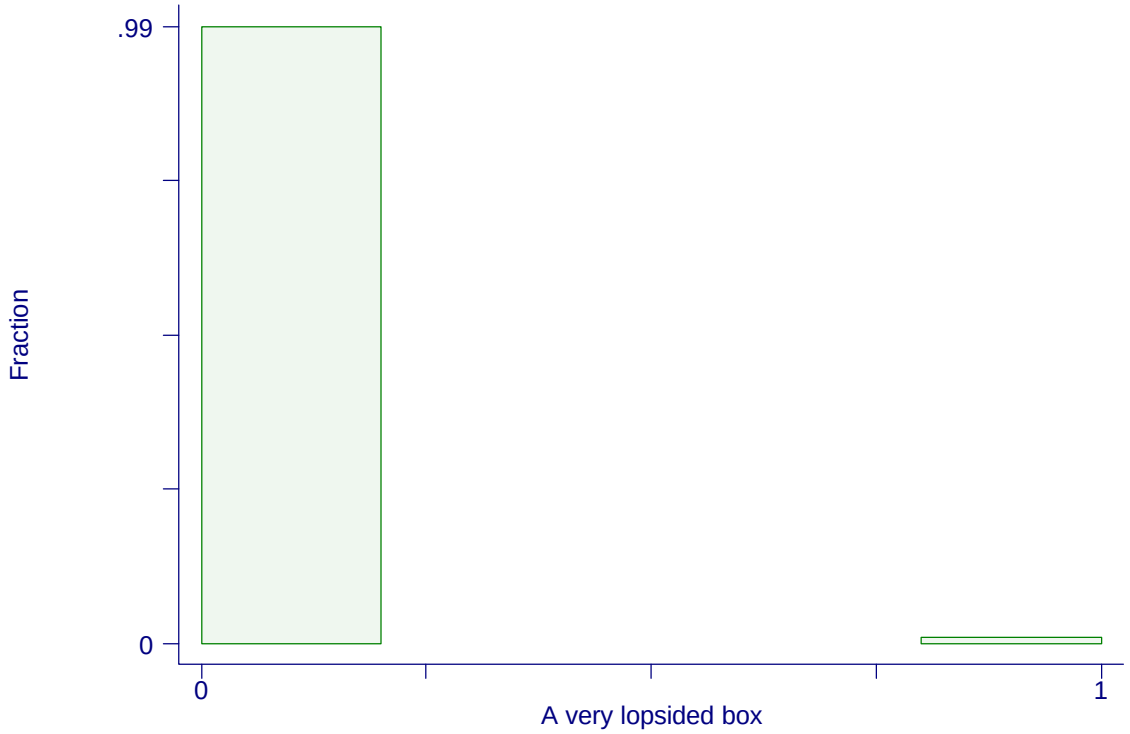

For 5 repetitions of 20 tosses
.2
0
Fraction
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Count of Heads in 20 tosses


For 25 repetitions of 20 tosses
.32
0
Fraction
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Count of Heads in 20 tosses

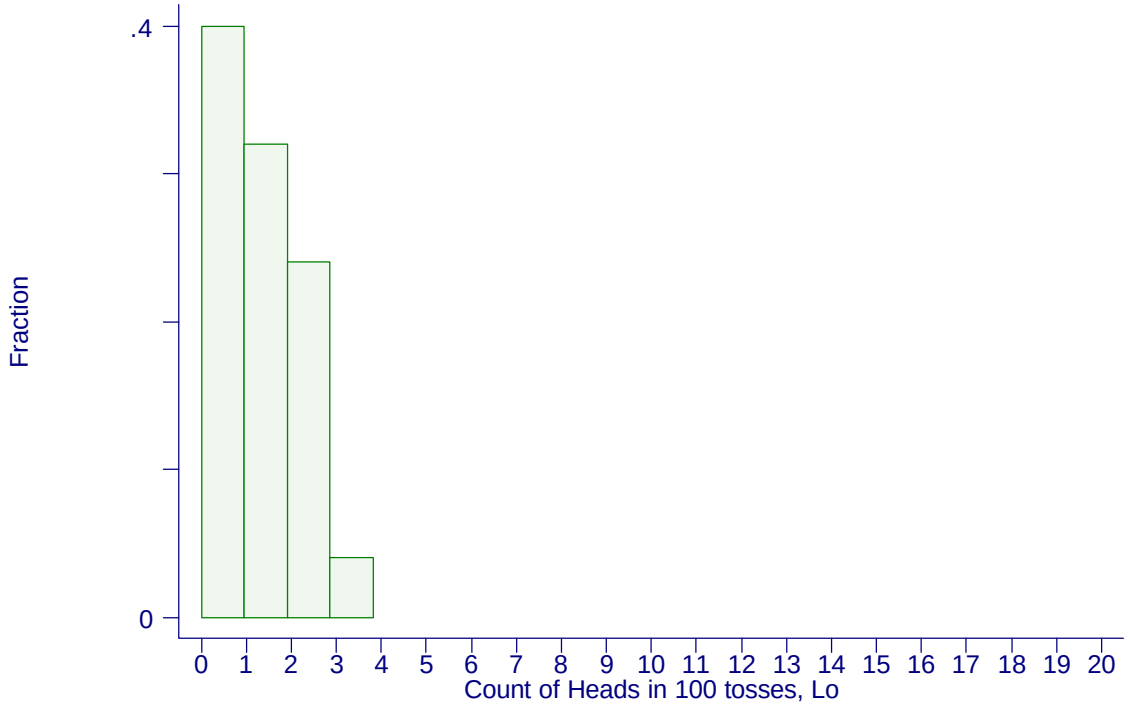


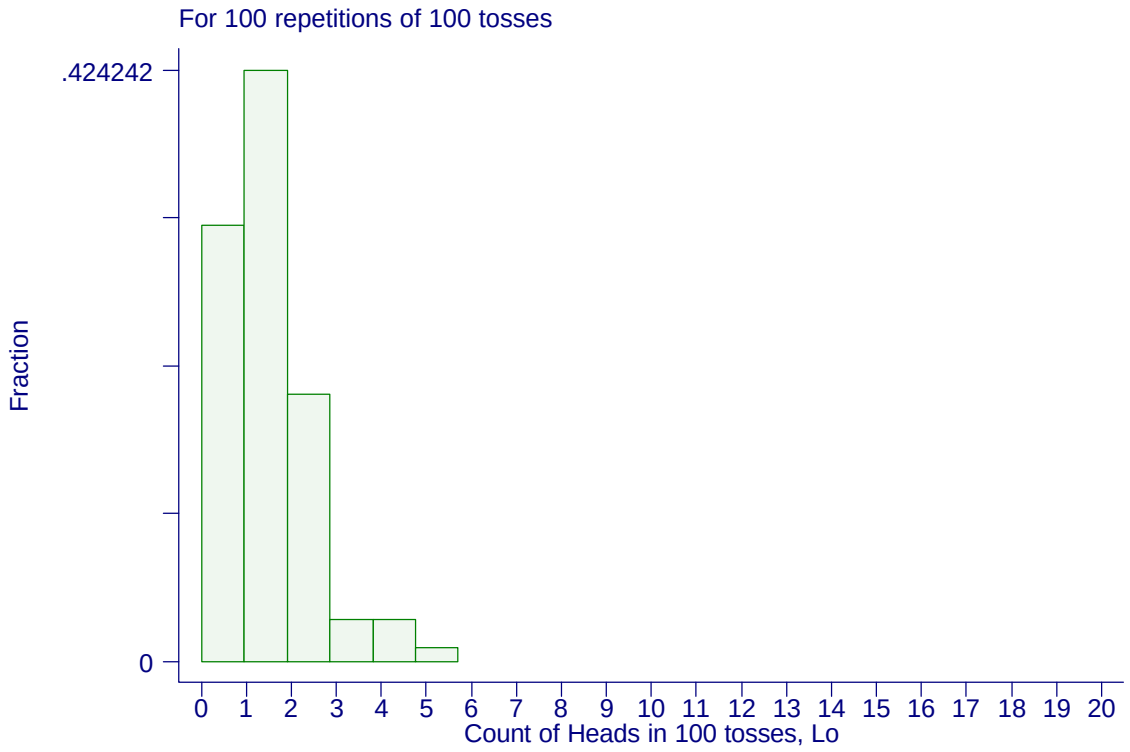


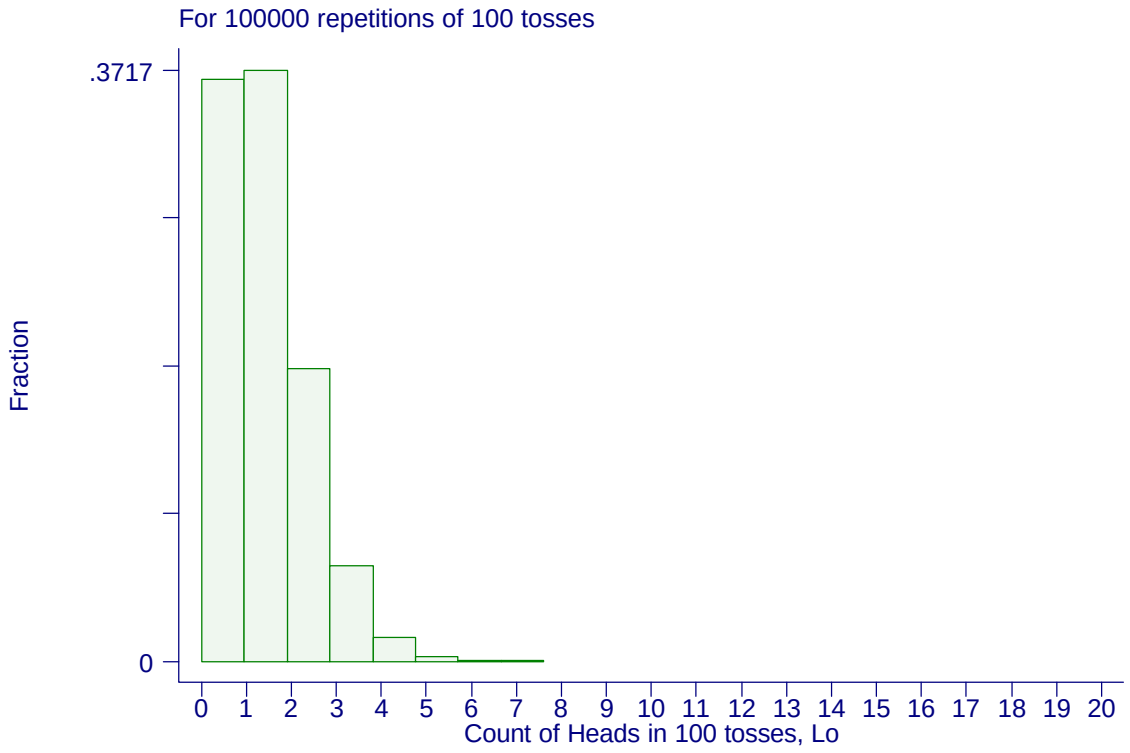
The probability histogram of the 20 toss is more "normal" looking than the 5 toss.
Don't confuse the number of repetitions with the number of "tosses" or "draws". In practice, we generally don't get to do repetitions. The repetitions are being shown to you so that you might understand the theory outlined in Chapters 16-18.



For 25 repetitions of 100 tosses







The point being made here is this: it is possible that some boxes will never generate a normal sampling distribution (or probability histogram) even if the sample size is reasonably large (here it is 100) and even if it done repeatedly. This kind of distribution is beyond the scope of the class – but it's important for you to know that not everything is "normal".