Law of Large Numbers

A.1.4 determine, through investigation using class generated data and technology-based simulation models (e.g., using a random-number generator on a spreadsheet or on a graphing calculator; using dynamic statistical software to simulate repeated trials in an experiment), the tendency of experimental probability to approach theoretical probability as the number of trials in an experiment increases (e.g., “If I simulate tossing two coins 1000 times using technology, the experimental probability that I calculate for getting two tails on the two tosses is likely to be closer to the theoretical probability of than if I simulate tossing the coins only 10 times”)

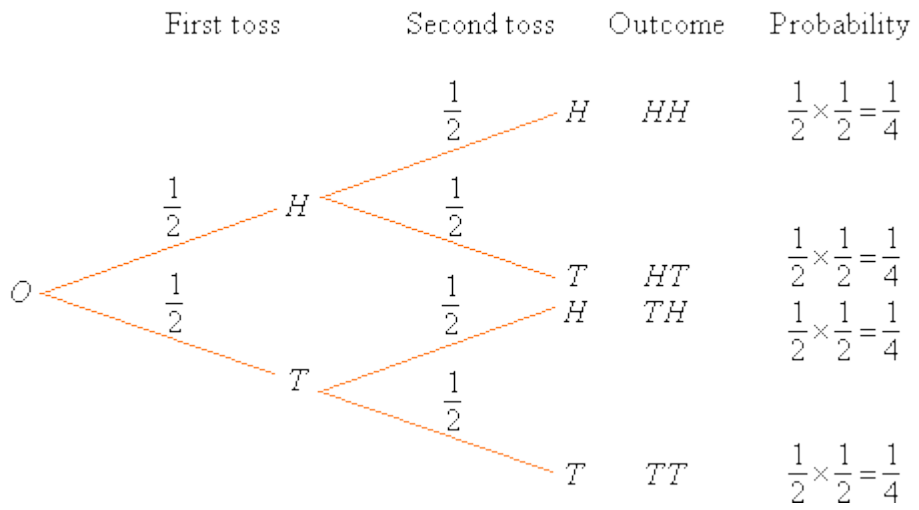
Two ways of getting probability:

1. Run an experiment

Flip a coin

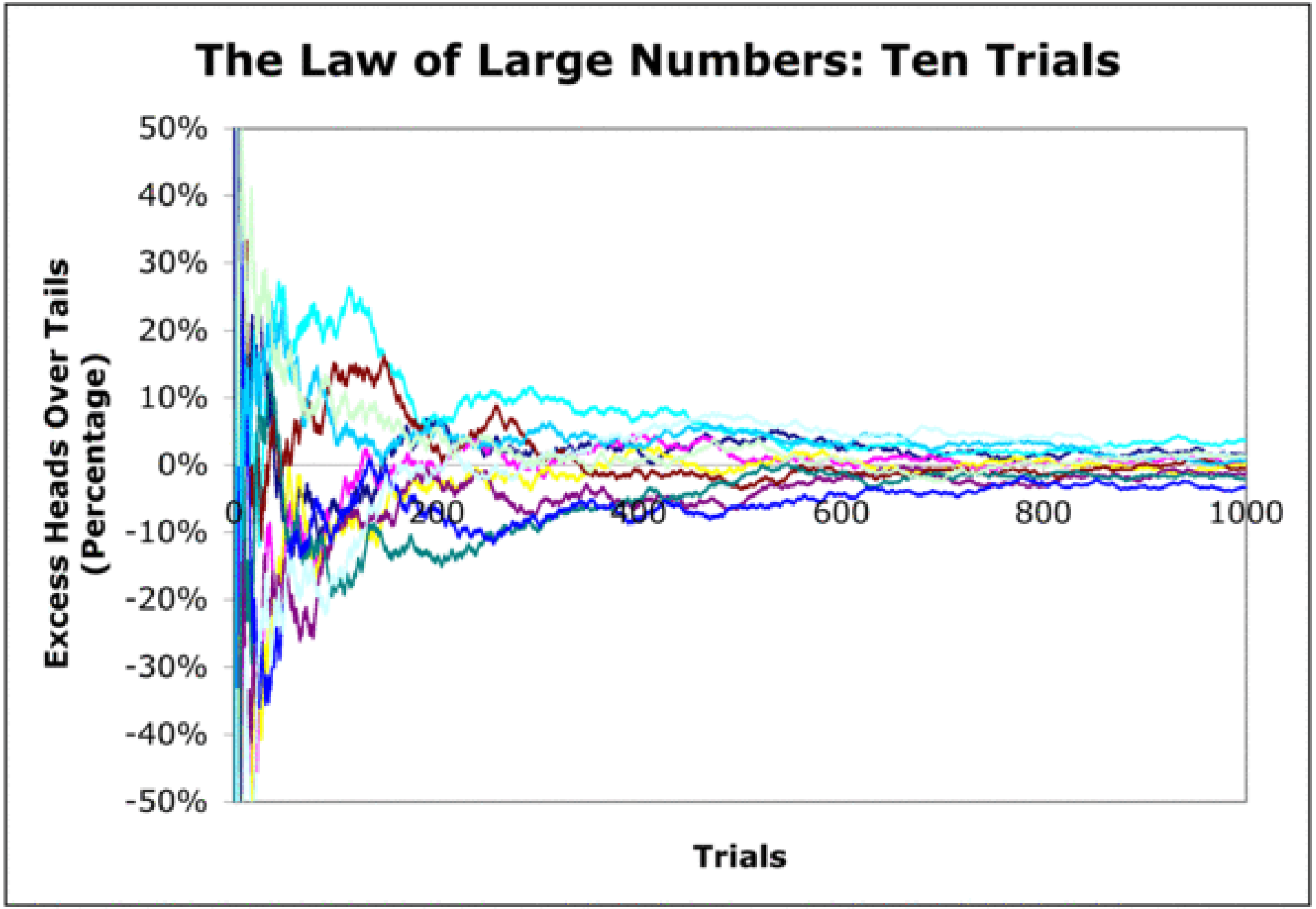
2. Calculate it

Draw the tree



If you run an experiment a really, really, really, large number of times, then your experimental probability will approach your calculated (theoretical) probability.

Number of Tosses	Number of Heads	Probability of Heads
4	1	25%
100	64	64%
1000	582	58.2%
10,000	4989	49.89%


The Law of Large Numbers: Ten Trials
Excess Heads Over Tails (Percentage)
50%
40%
30%
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
0
200
400
600
800
1000
Trials

A Gambler is making a bet at a roulette table.
They are betting on RED or BLACK.
The last few rounds:

RED
RED
BLACK
BLACK
RED
RED
RED

They say: I'm going to bet on BLACK because that's got to come up soon.

Small samples often yield more extreme results that large ones.

Large ones will be close to the theoretical probability.

Small ones might be far off the theoretical probability.

Normally, Toronto has a murder every two weeks.

Last week there were three murders.

It’s time to increase the police force!!

In determining the accuracy of a statistic, the sample size is EXTREMEMLY important.

A common mathematical error is that people sample size.