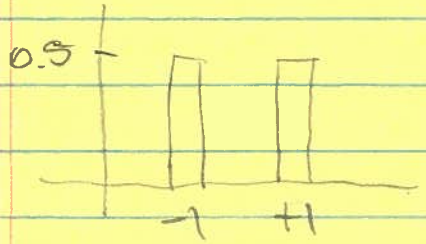
Random Walks

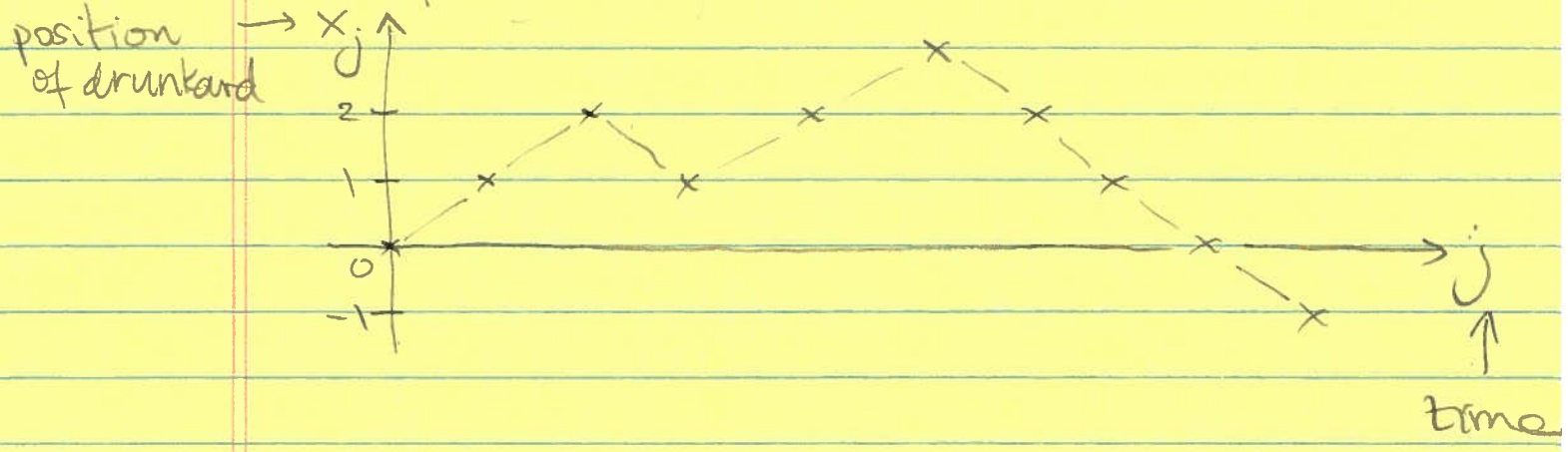
Consider the probability mass function (PMF):



... where the two outcomes are -1 and $+1$, which are equally likely.

For example, a possible sequence of draws from this PMF might be $\{+1, +1, -1, +1, +1, -1, -1, -1, -1\}$

Now suppose that these numbers represent steps that a drunkard takes in 1D; concretely, let the position of the drunkard at time j be x_j. Then the sequence above corresponds to the positions:



We call the sequence of numbers $\{x_j\}$, a "trajectory".

We may simulate a trajectory on the computer by making use of the fact that:

$$x_j = x_{j-1} + \underbrace{\{-1, +1\}}_{\text{choose one randomly w/ equal probability.}}$$

All we have to do is "loop" over time j.

We will also want to loop over trajectories, which we will label by "i".

Finally, we'll want to store the trajectories so we can analyze them later. Let's use a numpy 2d array for that:

x : [ ] — trajectory (↓), time (→)