1. A bucket contains 30 red balls and 50 white balls. Sam and Jane take turns drawing balls until all the balls are drawn. Sam goes first. Let N be the number of times that Jane draws a ball that matches the color of the ball that Sam drew on the turn before. Calculate $E[N]$.

2. The sequence of coin flips HHTHHHTTTHTHHHT contains two "runs" of heads of length three, one run of length two and one run of length one. If a coin is flipped 100 times, what is the expected value of the number of runs of length 3? What is the expected value of the number of runs of length 5?

3. Each night for 30 nights an ecologist sets a trap for a rabbit. The trap is very attractive so there is always a rabbit in the trap the next morning. (Only one because the trap isn't large enough for two.) The rabbits that are trapped are marked and released. If there are 100 rabbits in the area and each night the 100 are equally likely to be trapped, what is the expected value of the number of distinct rabbits that are trapped during the 30 night period?