

1. Let N be the number of times you flip a fair coin until you observe both a head and a tail. For example if the outcome is HHHT then $N = 4$. What is $E[N]$ and $\text{Var}[N]$?
2. You flip a p -biased coin (heads with probability p) 10 times. For which value(s) of p , if any, are the events $A =$ “the first two flips are heads” and $B =$ “there are exactly two heads” independent?
3. Keep rolling a 3-sided die until the sum of the values strictly exceeds 2. For example if the first roll is a 1 then you roll again; if the second roll is then a 2, $1 + 2 = 3 > 2$ and you stop. Find the PMF of the number of times you rolled.
4. On a light rain day, rain falls at an average rate of 1 drop per second. On a heavy rain day, the average rate is 2 drops per second. $2/3$ of the rainy days are light and $1/3$ are heavy. You walk out and 2 drops of rain hit you in the next second. What is the probability it is a light rain day?
5. Let N be the number of distinct values observed when a 6-sided die is rolled 6 times. For example, if the outcome is 521154 then the observed values are $\{1, 2, 4, 5\}$ and $N = 4$. What is $E[N]$?