AI-C 205 Probability and Statistics

Homework 2
(Deadline: 13^{st} Oct, 2026)

1. If we draw two cards at random from a deck without replacement, what is the probability that the second card is an ace?

2. Show that if X is independent of Y, Y should also be independent of X.

3. Let us say I have three bags, B_1, B_2, and B_3, where B_1 contains two red balls and one white ball, B_2 contains one red ball and two white balls, and B_3 contains two red balls and three white balls. I toss a fair coin twice; if they are both heads I draw a ball from B_1, if they are both tails I draw from B_2, and if they are different I draw from B_3. Let us say that the ball I draw following this scenario turns out to be red; what is the probability that I have drawn it from B_3?

4. In some applications, the dependency may be in time. For example, we know that weather on consecutive days are dependent—nice weather or bad weather may last more than a day. The figure below reflects that the weather being cloudy or not at day t has an influence on whether or not it rains on day t and also the weather at day $t+1$. How can we infer $P(R^{t+1}|R^t)$?

