1. **Rain and Wind**

   The local weather channel just released a statistic for the months of November and December. It said that the probability that it would rain on a windy day is 0.3 and the probability that it would rain on a non-windy day is 0.8. The probability of a day being windy is 0.2. As a student in EECS70, you are curious to play around with these numbers. Find the probability that:

   (a) A given day is both windy and rainy.
   (b) A given day is rainy.
   (c) For a given pair of days, exactly one of the two days is rainy.
   (d) A given day that is non-rainy is also non-windy.

2. **Balls and Bins**

   Throw n balls into n bins.

   (a) What is the probability that the first bin is empty?
   (b) What is the probability that the first k bins are empty?
   (c) What is the probability that the second bin is empty given that the first one is empty?
   (d) Are the events that "the first bin is empty" and "the first two bins are empty" independent?
   (e) Are the events that "the first bin is empty" and "the second bin is empty" independent?

3. **Birthdays**

   Suppose you record the birthdays of a large group of people, one at a time until you have found a match, i.e., a birthday that has already been recorded. (Assume there are 365 days in a year.)

   (a) What is the probability that after the first 3 people's birthdays are recorded, no match has occurred (i.e. each person has a unique birthday)?
   (b) What is the probability that the first 3 people all share the same birthday?
   (c) What is the probability that it takes more than 20 people for a match to occur?
   (d) What is the probability that it takes exactly 20 people for a match to occur?
   (e) Suppose instead that you record the birthdays of a large group of people, one at a time, until you have found a person whose birthday matches your own birthday. What is the probability that it takes exactly 20 people for this to occur?