Practice questions

1. Bob tosses three fair coins. Given that at least one is a head, what is the probability that there are more heads than tails in the final outcome?

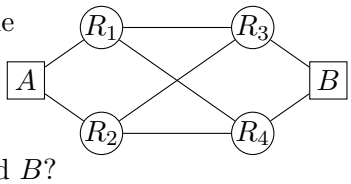
2. Alice tosses a six-sided dice, then she tosses R fair coins, where R is roll of the die. Given that all the coin tosses came out tails, find the probabilities of each outcome for the die.

3. There are 5 red balls and 2 blue balls. Each ball is randomly placed in one of two bins.

   (a) Find the probabilities of each outcome for the number of balls in the bin that has the smaller number of balls.

   (b) What is the probabilities that the bin with the smaller number of balls contains balls with different colours? (Use Bayes' rule)

4. Computers A and B are linked through routers R_1 to R_4 as in the picture. Each router fails independently with probability 10%.



   (a) What is the probability there is a connection between A and B?

   (b) Are the events "there is a connection between A and B" and "exactly two routers fail" independent? Justify your answer.

Additional ESTR 2018 questions

5. If Alice flips 10 coins and Bob flips 9 coins, what is the probability that Alice gets more heads than Bob? (*Hint:* Use conditioning.)

6. Benford's law is a probability model over the sample space $\{1, 2, \ldots, 9\}$ with $\mathrm{P}(\{d\}) = \log_{10}(d+1) - \log_{10} d$. It describes the probability of the leading (most significant) digit in real-life numerical data like accounting records. Benford's law predicts, for example, that the leading digit is a 1 about 30% of the time. Test this hypothesis on some data sets of your choice.