Homework 7

Section 7.1

22. What is the probability that a positive integer not exceeding 100 selected at random is divisible by 3?

24. Find the probability of winning a lottery by selecting the correct six integers, where the order in which these integers are selected does not matter, from the positive integers not exceeding
   a) 30.

32. Suppose that 100 people enter a contest and that different winners are selected at random for first, second, and third prizes. What is the probability that Kumar, Janice, and Pedro each win a prize if each has entered the contest?

Section 7.2

6. What is the probability of these events when we randomly select a permutation of \{1, 2, 3\}?
   a) 1 precedes 3.
   b) 3 precedes 1.
   c) 3 precedes 1 and 3 precedes 2.

24. What is the conditional probability that exactly four heads appear when a fair coin is flipped five times, given that the first flip came up tails?

26. Let \(E\) be the event that a randomly generated bit string of length three contains an odd number of 1s, and let \(F\) be the event that the string starts with 1. Are \(E\) and \(F\) independent?
Section 7.3

8. Suppose that one person in 10,000 people has a rare genetic disease. There is an excellent test for the disease; 99.9% of people with the disease test positive and only 0.02% who do not have the disease test positive.

a) What is the probability that someone who tests positive has the genetic disease?

b) What is the probability that someone who tests negative does not have the disease?

Section 7.4

8. What is the expected sum of the numbers that appear when three fair dice are rolled?

10. Suppose that we flip a fair coin until either it comes up tails twice or we have flipped it six times. What is the expected number of times we flip the coin?

28. What is the variance of the number of times a 6 appears when a fair die is rolled 10 times?