

**Basic Discrete Probability**

1. What is the probability that a five-card poker hand contains a royal flush, that is, the 10, jack, queen, king, and ace of one suit?
2. What is the probability that Abby, Barry, and Syliva win the first, second, and third prizes, respectively, in a drawing if 200 people enter a contest and
  - (a) no one can win more than one prize.
  - (b) winning more than one prize is allowed.
3. 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.
4. Assume that the probability a child is a boy is 0.51 and that sexes of children born into a family are independent. What is the probability a family of five children has
  - (a) exactly three boys?
  - (b) at least one boy?
  - (c) at least one girl?
  - (d) exactly two boys, conditional on there being at least two girls?
5. Assume that the probability of a 0 is 0.8 and a 1 is 0.2 for a randomly generated bit string of length six. What is the probability that there are
  - (a) at least 3 zeros?
  - (b) two ones, conditional on the first digit being a zero.
6.
  - (a) What is the probability that two people chosen at random were born during the same month of the year? Assume that it is equally likely that a person is born during any month.
  - (b) What is the probability that in a group of  $n$  people, two are born during the same month of the year?
  - (c) How many people chosen at random are needed such that the probability that two are born during the same month is at least  $1/2$ ?
7. What is the conditional probability that exactly 4 heads appears when a fair coin is flipped five times, given that the first coin comes up heads.
8. For the Monty Hall problem, assume there are  $n$  doors, behind  $k$  of which are prizes. What is the probability of success now if we stick with our initial choice, versus switching to another door?

Source: Rosen's *Discrete Mathematics and its Applications*.