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 borin 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) exactly two ones, conditional on the first digit being a zero?
   (c) exactly three zeros in a row? (hint: counting)

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