2. Find the probability of each outcome when a loaded die is rolled, if a 3 is twice as likely to appear as each of the other five numbers on the die.

8. What is the probability of these events when we randomly select a permutation of \( \{1, 2, \ldots, n\} \) where \( n \geq 4 \)?
   a) 1 precedes 2.
   b) 2 precedes 1.
   c) 1 immediately precedes 2.
   d) \( n \) precedes 1 and \( n - 1 \) precedes 2.
   e) \( n \) precedes 1 and \( n \) precedes 2.

12. Suppose that \( E \) and \( F \) are events such that \( p(E) = 0.8 \) and \( p(F) = 0.6 \). Show that \( p(E \cup F) \geq 0.8 \) and \( p(E \cap F) \geq 0.4 \).

16. Show that if \( E \) and \( F \) are independent events, then \( \bar{E} \) and \( \bar{F} \) are also independent events.

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?

28. Assume that the probability a child is a boy is 0.51 and that the sexes of children born into a family are independent. What is the probability that a family of five children has
   a) exactly three boys?
   b) at least one boy?
   c) at least one girl?
   d) all children of the same sex?