Introduction to Probability Theory I

Exercise 6, Autumn 2008

1* A coin is tossed repeatedly. Find the probability that the first tail occurs on 12th toss.

2. Determine the distribution of random variable X, when
   a) X is the number of faulty devices in a box of 48. Assume that each device is faulty with probability 0.05 independent of other devices.
   b) X is number of aces in a hand of 13 cards drawn from a shuffled deck without replacement.
   c) X is the number of white balls in certain box, when placing n balls randomly in k boxes.
   d) X is number of tosses before first pair of sixes when tossin two dice.
   e) X is the number of colour blind people in a sample, consisting of 10 people, from a population of 100 people with 3 colour blind persons.

3* Find the probability that X is even, if
   a) X has geometric distribution with parameter p,
   b) X has binomial distribution with parameters n and p,
   c) X has Poisson distribution with parameter λ.

4. A coin is tossed repeatedly until both heads and tails have appeared at least twice. Let X be the number of the final round. Determine frequency and distribution functions of X. After that, find the smallest number n such that $P(\{X \leq n\}) > 0.9$.

5. Message consists of 100 bits (either 0 or 1). Each bit can be flipped with probability $p = 0.001$ in each transmission phase. The message is transmitted through ten phases. Find the probability that message is received in its original form after these ten phases.