PROBABILITY AND STATISTICS, Homework Exercises 2.

1. Three fair dice are rolled. Let X denote the sum of the numbers they landed on. What is the probability that X is greater than 10? Hint: describe the distribution of X.

2. On a multiple choice exam with 5 possible answers for each of the 10 questions, what is the probability that a student would get 8 or more correct answers just by guessing?

3. A purchaser of transistors buys them in lots of 20. It is his policy to inspect 4 components from a lot randomly and to accept the lot only if at least 3 are nondefective. If a lot has 2 defective components, what is the probability that the purchaser rejects it?

4. In a book of 600 pages there are 1500 typographical errors (typos). Suppose that the number of typos on a page has Poisson distribution. Calculate the probability that opening the book at random, there are at least two typos on that page. Give the mode of the typos on a single page. Then calculate the probability that opening the book randomly and reading 3 consecutive pages, we find at most 5 typos.

5. Prove that the hypergeometric probabilities approach the binomial ones for large samples in the following sense:

$$\lim_{M,N\to\infty,\,\frac{M}{N}\to p} \frac{\binom{M}{k}\binom{N-M}{n-k}}{\binom{N}{n}} = \binom{n}{k} p^k (1-p)^{n-k}, \qquad k = 0, 1, \ldots, n \quad (n \text{ is fixed})$$