10. Application problems based on the Binomial distribution.

Ques: Antibiotics occasionally cause nausea as a side effect. A major drug company has developed a new antibiotic called Phe-Mycin. The company claims that, at most, 10 percent of all patients treated with Phe-Mycin would experience nausea as a side effect of taking the drug. Suppose that we randomly select n = 4 patients and treat them with Phe-Mycin. Each patient will either experience nausea (which we arbitrarily call a success) or will not experience nausea (a failure). We will assume that p, the true probability that a patient will experience nausea as a side effect, is .10, the maximum value of p claimed by the drug company. Furthermore, it is reasonable to assume that patients' reactions to the drug would be independent of each other. Let x denote the number of patients among the four who will experience nausea as a side effect. It follows that x is a binomial random variable, which can take on any of the potential values 0, 1, 2, 3, or 4. That is, anywhere between none of the patients and all four of the patients could potentially experience nausea as a side effectSuppose that we wish to investigate whether p, the probability that a patient will experience nausea as a side effect of taking Phe-Mycin, is greater than.10, the maximum value of p claimed by the drug company. This assessment will be made by assuming, for the sake of argument, that p equals .10, and by using sample information to weigh the evidence against this assumption and in favor of the conclusion that p is greater than .10. Suppose that when a sample of n=4 randomly selected patients is treated with Phe-Mycin, three of the four patients experience nausea. Because the fraction of patients in the sample that experience nausea is 3/4 = .75, which is far greater than .10, we have some evidence contradicting the assumption that p equals .10.

| n(Number Of Trials) | 4 |
| p(Probability of Success on given Trails) | 0.1 |

k(Number of success)	Binomial Distribution
0	0.6561
1	0.2916
2	0.0486
3	0.0036
4	0.0001

Binomial Distribution (n=4, p=0.10)