Probability lesson plan 4

Binomial Distribution

1. A and B play a game in which their chances of winning are in the ratio 3:2. Find A's chance of winning at least three games out of the five games played.
2. A multiple choice test consists of 8 questions with 3 answers to each question (of which only one is correct). A student answers each questions by rolling a die and checking the first answer if he gets 1 or 2, the second answer if he gets 3 or 4 and the third answer if he gets 5 or 6. To get a distinction, the student must secure at least 75% correct answer. If there is no negative marking, what is the probability that the student secures a distinction?
3. A coffee connoisseur claims that he can distinguish between a cup of instant coffee and a cup of percolator coffee 75% of the time. It is agreed that his claim will be accepted if he correctly identifies at least 5 of the 6 cups. Find his chance of having the claim (i) accepted, (ii) rejected, when he does have the ability he claims.
4. A department in a works has 10 machines which may need adjustment from time to time during the day. Three of these machines are old; each having a probability of 1/11 of needing adjustment during the day, and 7 are new, having corresponding probabilities of 1/21. Assuming that no machine needs adjustment twice on the same day, determine the probabilities that on a particular day,
   (i) Just 2 old and no new machines need adjustment.
   (ii) If just 2 machines need adjustment, they are of the same type.

Poisson distribution

1. A manufacturer of cotter pins knows that 5% of his product is defective. If he sells cotter pins in boxes of 100 and guarantees that not more than 10 pins will be defective, what is the approximate probability that a box will fail to meet the guaranteed quality?   P-8.5
2. An insurance company insures 4,000 people against loss of both eyes in a car accident. Based on the previous data, the rates were computed on the assumption that on the average 10 persons in 1,00,000 will have car accident each year that results in this type of injury. What is the probability that more than 3 of the insured will collect on their policy in a given year?
3. A manufacturer, who produces medicine bottles, finds that 0.1% of the bottles are defective. The bottles are packed in boxes containing 500 bottles. A drug manufacturer buys 100 boxes from the produce of bottles. Using Poisson distribution, find how many boxes will contain:
   (i)   No defectives
   (ii)   At least two defectives [Given, $e^{-0.5} = 0.6065$]
4. A manager accepts the work submitted by his typist only when there is no mistake in the work. The typist has to type on an average 20 letters per day of about 200 words each. Find the chance of her making a mistake:
   (i)   If less than 1% of the letters submitted by her are rejected.
   (ii)   If on 90% days all the letters submitted by her are accepted. [Given, e=2.72]