Académie de Toulouse – sections européennes mathématiques Anglais– session 2013
Sujet n°29

Please do not write on the exam paper.
Please do not forget to give it back at the end of the examination.

Binomial Distribution

Let us recall the definition of the Binomial Distribution :
Consider a random experiment in which there are just two outcomes, success (S) and failure (F) . These are referred to as **Bernoulli trials**. If X is a discrete random variable that denotes the number of successes in n independent and identical trials of such an experiment then the distribution of X is said to be **binomially distributed.**
It is denoted by $X \sim B(n, p)$ where p is the *probability of a success.* The **probability law** associated with the *Binomial Distribution* is given below :

$$P(X=k)=\binom{n}{k} p^k (1-p)^{n-k}$$

where $\binom{n}{k}$ is the binomial coefficient « n choose k » corresponding to the possibilities of choices of k elements out of n.

A] A teacher in a college noted that each semester the rate of failure at the exam has been 35%. She wondered the probability that on 80 students taking the exam, 55 will pass it.

1. What are the two outcomes S and F?
2. Are the trials independent? Is it a binomial experiment ?
3. Give the parameters of the binomial distribution.
4. How can the problem be stated in the form: "What is the probability of k successes out of n trials?"
5. Compute the probability that 55 students will pass the exam.

we give $\binom{80}{55} \approx 3.07 \times 10^{20}$

B] Is the following a binomial experiment? Why/why not?
A committee of 4 men and 6 women wish to select a chairperson * and recorder **. They do so by placing their names in a hat and drawing two names; the first will be the chairperson and the second the recorder.
(We consider the random variable defined by the number of women that will hold the offices)

Vocabulary
*chaiperson : président de séance.
**recorder : secrétaire.