AI 1103 assignment 1

cs20btech11005

March 2021

Problem 1.10

Given Question:-
There are 5% defective items in a large bulk of items.What is the probability that a sample of 10 items will not contain more than one defective items.
Given data:-
Given percentage of defective items in a bunch of items= 5
$\Rightarrow$ probability of an item to be defective $= 5\% = 0.05$
$\Rightarrow$ probability of an item to be non-defective = 1-0.05 = 95%
Required to find :- Probability that a sample of 10 items will not contain more than 1 defective items.
Lets assume that we are given 10 items.
probability that all of them are non defective $= (0.95)^{10}$

$\because$ probability of n independent
events happening simultaneously= $p_1 \times p_2 \times .....p_{n-1} \times p_n$

probability that one of them is defective $= {}^{10}C_1 \times (0.95)^9 \times (0.05)$

here ${}^{10}C_1$ indicates choosing one out of 10 items which is defective
0.05 indicates the probability that the choosen item to be defective
$(0.95)^9$ indicates the probability that the rest 9 items are non-defective
$\because$ probability of n independent
events happening simultaneously= $p_1 \times p_2 \times .....p_{n-1} \times p_n$

So the probability that 10 items does not have more than 1 defective item

$$\begin{aligned} &= (0.95)^{10} + {}^{10}C_1 \times (0.95)^9 \times (0.05) \\ &= 0.9139 \\ &= 91.39\% \end{aligned}$$

$\because$ the probability of n mutually exclusive
events such that one of them happens = $p_1 + p_2 + ... + p_{n-1} + p_n$

$\therefore$ **the the probability that 10 items does not have more than 1 defective item is 91.39%**