Assignment 6

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Download all python codes from

and latex-tikz codes from

1 CSIR UGC NET EXAM (Dec 2015), Q.3

The probability that a ticketless traveler is caught during a trip is 0.1. If the traveler makes 4 trips , the probability that he/she will be caught during at least one of the trips is:

(A) $1 - (0.9)^4$ (B) $(1 - 0.9)^4$
(C) $1 - (1 - 0.9)^4$ (D) $(0.9)^4$

2 Solution

Let $X_i \in \{0, 1\}$ represent in the ith trip ticketless traveller is caught or not.(1 if caught and 0 if he is safe).
Given,

$$\Pr(X_i = 1) = p = 0.1 \qquad (2.0.1)$$

Let,

$$X = \sum_{i=1}^{n} X_i \qquad (2.0.2)$$

where n is the number of trips and X has a binomial distribution.

$$p_X(k) = \Pr(X = k) \qquad (2.0.3)$$

$$p_X(k) = \begin{cases} {}^n C_k \, p^K (1-p)^{n-k}, & 0 \le k \le n \\ 0, & otherwise \end{cases} \qquad (2.0.4)$$
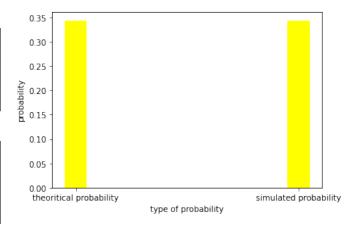

Fig. 1: probability that he/she will be caught during at least one of the trips

Then probability of being caught in atleast one trip is,

$$\Pr(X \ge 1) = 1 - \Pr(X < 1) \qquad (2.0.5)$$
$$= 1 - \Pr(X = 0) \qquad (2.0.6)$$

As he/she makes 4 trips in total, Using (2.0.1) and (2.0.4),

$$\Pr(X = 0) = p_X(0) \qquad (2.0.7)$$
$$= {}^4 C_0 \, p^0 (1-p)^4 \qquad (2.0.8)$$
$$\Pr(X = 0) = (0.9)^4 \qquad (2.0.9)$$

Using (2.0.9) in (2.0.6),

$$\Pr(X \ge 1) = 1 - \Pr(X < 1) \qquad (2.0.10)$$
$$= 1 - \Pr(X = 0) \qquad (2.0.11)$$
$$= 1 - (0.9)^4 \qquad (2.0.12)$$

Therefore the probability that he/she will be caught during at least one of the trips is $1 - (0.9)^4$.
ANSWER : (A)