Assignment 1

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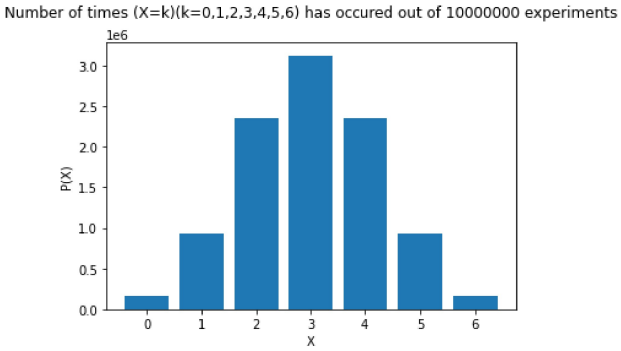
QUESTION:
Suppose X has a binomial distribution . Show that X = 3 is the most likely outcome. (Hint : P(X = 3) is the maximum among all P(x_i), x_i= 0,1,2,3,4,5,6).Assume p=0.5



SOLUTION:
Given number of times event is performed(n)=6
Given probability of event(p)=0.5
Therefore 1-p=0.5
We know that binomial probability[P(X=k)]=$\binom{n}{k}p^k(1-p)^{n-k}$
substituting n=6,p=1-p=$\frac{1}{2}$

$$P(X=k)=\binom{6}{k}(\frac{1}{2})^k(\frac{1}{2})^{6-k}$$
$$(\frac{1}{2})^k(\frac{1}{2})^{6-k}=\frac{1}{2})^{6-k+k}=(\frac{1}{2})^6$$
$$P(X=k)=\binom{6}{k}(\frac{1}{2})^6$$

For P(X=k) to be maximum $\binom{6}{k}$should be maximum ,where k={0,1,2,3,4,5,6}
$\binom{6}{0}=1, \binom{6}{1}=6, \binom{6}{2}=15, \binom{6}{3}=20, \binom{6}{4}=15, \binom{6}{5}=6, \binom{6}{6}=1$

Therefore $\binom{6}{3}$ is maximum ,therefore P(X=3) is most likely outcome.
Hence proved.

Submitted by Student unknown *on* .