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=$\frac{1}{2}$

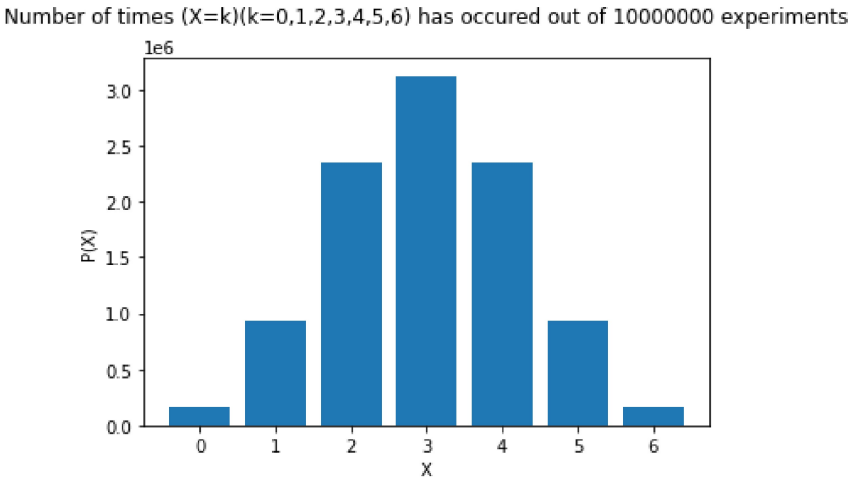
$$P(X=k)=\binom{6}{k}(\frac{1}{2})^k(\frac{1}{2})^{6-k} \tag{0-1}$$

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

$$P(X=k)=\binom{6}{k}(\frac{1}{2})^6 \tag{0-2}$$

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* .


Number of times (X=k)(k=0,1,2,3,4,5,6) has occured out of 10000000 experiments
1e6
3.0
2.5
2.0
1.5
1.0
0.5
0.0
P(X)
0
1
2
3
4
5
6
X