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Objective:

Verification of mean and variance of random variable X Probability of which is represented with Binomial Distibution Function.

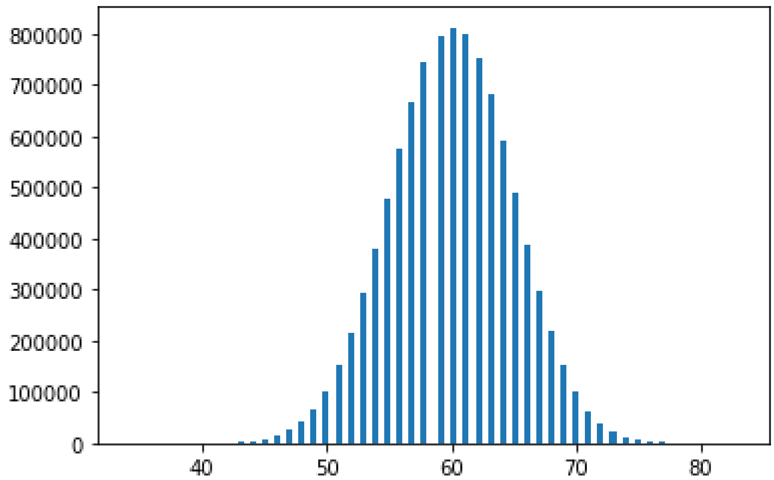
Theory:

The binomial distribution function specifies the number of times (x) that an event occurs in n independent trials where p is the probability of the event occurring in a single trial. It is an exact probability distribution for any number of discrete trials. If n is very large, it may be treated as a continuous function.

Distribution	Functional Form	Mean	Standard Deviation
Binomial	$f_b(x) = \frac{n!p^x(1-p)^{n-x}}{x!(n-x)!}$	np	$\sqrt{np(1-p)}$

```
import numpy as np
import matplotlib .pyplot as plt
```

```
# picks out 10^7 samples from a binomial distribution with n=100 & p=0.6 & q=0.4
binomial_dist= np.random.binomial(100,.6,10**7)
plt.hist(binomial_dist, bins = 100)
plt.savefig('Sample size {}'.format(10**7))
plt.show()
binomial_dist = np.random.binomial(100,.6,10**7)
```



Results:

```
print('The theoretical average is: {},\nThe experimentally calculated average is: {}'
.format(60,np.average(binomial_dist)))

print('The theoretical deviation is: {},\nThe experimentally calculated deviation is: {}'
.format((100*.4*.6)**.5,np.std(binomial_dist)))
```

```
The theoretical average is: 60,
The experimentally calculated average is: 59.9995078
The theoretical deviation is: 4.898979485566356,
The experimentally calculated deviation is: 4.8989495565620125
```

Discussion:

The values calculated theoretically & experimentally for Average & Deviation are equivalent (very close). If large sample size is taken there is no observable difference among them.