

1) $\text{Var}(X) = E(X - \mu)^2$, where
 $\mu = E(X)$

2) $\text{Var}(X) = E(X^2) - \{E(X)\}^2$

3) Standard deviation of a random variable X is defined as

$$\text{s.d.}(X) = \sqrt{\text{Var}(X)}$$

4) For Binomial distribution

$$P(X=x) = {}^n C_x p^x \cdot q^{n-x}, \quad x=0, 1, 2, \dots, n$$

, $p+q=1$, p = probability of success

5) $\mu = E(X) = np$

6) $\text{Var}(X) = npq$

7) As $0 < q < 1$, $npq < np$
 \Rightarrow variance $<$ mean

8) $\text{s.d.}(X) = \sqrt{npq}$

9) When, $p = q = \frac{1}{2}$

$$P(X=k) = \binom{n}{k} \cdot \frac{1}{2^n}, \quad k = 0, 1, \dots, n$$

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

$$P_k = P_{n-k}$$

$$E(X) = \frac{n}{2}, \quad \text{Var}(X) = \frac{n}{4}$$

$$\text{s.d.}(X) = \frac{\sqrt{n}}{2}$$