1. Show that Var(x) is the same as E(X^2) -(E(x))^2

Var(x) = E [(x - µ) ^2]

= E [(x - E(x)) ^2]

= E [(x - E(x)) (x - E(x))]

= E [x^2- 2E(x) + (E(x)) ^2]

= E [x^2] – 2E [x E(x)] + E[(E(x)) ^2]

= E [x^2] – 2E[E(x) E(x)] + E[(E(x)) ^2]

= E [x^2] – 2(E(x)) ^2 + (E(x)) ^2

= E [x^2] – 2(E(x)) ^2 + (E(x)) ^2

= E[x^2] – (E(x)) ^2

1. Show that E(x+y)= E(x)+ E(y)

**Solution:**

For discrete random variable X and Y, it’s given by:

E (X + Y) = (Xi + Yj) Fx,y(Xi + Yj)

= Xi Fx,y(Xi, Yj) + Yj Fx,y(Xi, Yj)

= E(X) + E(Y).

1. Show that Covar(x+y)=0 if x and y are independent

Cov(x , y) = (X - Ux) (Y - Uy) P(X, Y)

= (X - Ux) (Y - Uy) P(X) P(Y) …………… (P (x and y) = P(X) \* P(Y) since both X & Y are independant)

= (X - Ux) P(X) (Y -Uy) P(Y)

= (X P(X) - Ux) (Y P(Y)) – Uy

= (0 – 0) (0 - 0)

= 0

1. Show that Var(x+y) =Var(x)+Var(y) if x and y are independent.

Solution:

We know that Var(x) = E[X^2] – E[X]^2

Var (x + y) = E [(X + Y) ^2] – E[(X + Y)]^2

= E (X^2 + 2XY + Y^2) – Ux^2 -Uy^2 – 2UxUy

= E(X^2) – Ux^2 + E(Y)^2 – Uy^2 + 2E(XY) – 2Ux Uy

= E(X^2) – Ux^2 + E(Y)^2 – Uy^2 + 2 Ux Uy – 2Ux Uys

= Var (X) + Var (Y) -2 E [XY] – 2E[X]E[Y]

Since X and Y are independent

E[XY]= E[X] + E[Y]

Therefore, Var(x+y) =Var(x)+Var(y)