let c is a constant :

* $\boxed{E[c] = c}$

* $\boxed{E[cx] = c\mu_x}$

* $\boxed{V[c] = 0}$

* $V[x] = E[(x-\mu_x)^2] =$

$E[x^2 - 2x\mu_x + \mu_x^2] =$

$E[x^2] - 2\mu_x \underbrace{\cancel{E[x]}}_{\mu_x} + \underbrace{\cancel{E[\mu_x^2]}}_{\mu_x^2}$

$\boxed{V[x] = E[x^2] - \mu_x^2}$

* $V[\underbrace{cx}_{y}] = E[(y-\mu_y)^2] =$

$E[y^2] - \mu_y^2$

$E[(cx)^2] - (E[cx])^2$

$c^2E[x^2] - c^2(E[x])^2$

$c^2(E[x^2] - \mu^2)$

$\boxed{V[cx] = c^2 V[x]}$

if we have two random variables $x \begin{cases} E[x] = \mu_x \\ V[x] = \sigma_x^2 \end{cases}$ $y = \begin{cases} E[y] = \mu_y \\ V[y] = \sigma_y^2 \end{cases}$

* $E[x+y] = E[x] + E[y] = \mu_x + \mu_y$

* $Cov(x,y) = E[(x-\mu_x)(y-\mu_y)]$

* $V[\underbrace{x+y}_{z}] = E[z^2] - z^2 = E[(x+y)^2] - (E[(x+y)])^2$

$= E[(x^2 + 2xy + y^2)] - (\mu_x^2 + 2\mu_x\mu_y + \mu_y^2)$

$= E[x^2] + 2E[xy] + E[y^2] - \mu_x^2 - 2\mu_x\mu_y - \mu_y^2$

$= V[x] + V[y] + 2Cov(x,y)$

* If x and y are independent, $Cov(x,y) = 0$