Computation with Variances:

Random variable X (continuous)

$$E[X] = \int x f(x) dx \quad \text{with } f(x) \text{ density of } X$$

$$Var[X] = \int (x - E(x))^2 f(x) dx$$

$$var[a \cdot x] = \int a^2 (x - E(x))^2 f(x) dx$$

$$= a^2 \int (x - E(x))^2 f(x) dx$$

$$= a^2 \cdot var(x)$$

$$var(X+Y) = var(X) + var(Y) + 2 cov(X,Y)$$

$$cov(X, Y+Z) = cov(X,Y) + cov(X,Z)$$