Variance of the Sum of R.V.'s

$\mathrm{Var}(X_1 + X_2) = \mathrm{Var}(X_1) + \mathrm{Var}(X_2) + 2\mathrm{Cov}(X_1, X_2)$

where $\mathrm{Cov}(X_1, X_2) = \rho_{12}\sigma_1\sigma_2$ $\sigma_1^2 = \mathrm{Var}(X_1)$, $\sigma_2^2 = \mathrm{Var}(X_2)$, and ρ_{12} is corr. coeff.

Also,

$$\mathrm{Cov}(X_1, X_2) = E\left[(X_1 - \mu_1)(X_2 - \mu_2)\right] = E\left[X_1 X_2\right] - \mu_1\mu_2$$

$$= \iint x_1 x_2 f(x_1, x_2)\,dA - \mu_1\mu_2 \quad \left(f(x_1, x_2) \text{ is joint probability density function}\right)$$

In general,

$$\mathrm{Var}(X_1 + X_2 + \cdots + X_n) = \sum_{i=1}^{n} \mathrm{Var}(X_i) + 2\sum_{i=1}^{n-1}\sum_{j=i+1}^{n} \mathrm{Cov}(X_i, X_j)$$