

Mean/Expectation for **discrete** r.v.:

$$E(X) = \sum_x xf(x)$$

Mean/Expectation for **continuous** r.v.:

$$E(X) = \int_{-\infty}^{\infty} xf(x)dx$$

Variance for **discrete** r.v.:

$$V(X) = E[(X - \mu)^2] = \sum_x (x - \mu)^2 f(x)$$

Variance for **continuous** r.v.:

$$V(X) = E[(X - \mu)^2] = \int_{-\infty}^{\infty} (x - \mu)^2 f(x)dx$$

Some Properties:

- 1) $V(X) = E(X^2) - [E(X)]^2$
- 2) $E(aX + b) = aE(X) + b$
- 3) $V(aX + b) = a^2V(X)$

k-th moment: $E(X^k)$ is the k-th moment of X.

Chebyshev's inequality: for any positive number k,

$$Pr(|X - \mu| > k\sigma) \leq 1/k^2$$

$$Pr(|X - \mu| \leq k\sigma) \geq 1 - 1/k^2$$