

Basic Rules for Random Variables

	Discrete Random Variables	Continuous Random Variables
PMF/PDF	Probability mass function (PMF) $P(X = k)$ Sum $\sum_{k \in A} P(X = k)$ to get $P(A)$.	Probability density function (PDF) $f(x)$ Integrate $\int_a^b f(x) dx$ to get $P(a \leq X \leq b)$.
CDF	Cumulative distribution function (CDF) $F(k) = P(X \leq k) = \sum_{j \leq k} P(X = j)$	$F(x) = P(X \leq x) = \int_{-\infty}^x f(t) dt$
Expectation	$E(X) = \sum_{k \in \text{support}(X)} k P(X = k)$	$E(X) = \int_{-\infty}^{\infty} x f(x) dx$
LOTUS	$E(g(X)) = \sum_{k \in \text{support}(X)} g(k) P(X = k)$	$E(g(X)) = \int_{-\infty}^{\infty} g(x) f(x) dx$