

Formula sheet / Formuleblad

PMFs / WMF's and PDFs / WDF's

Type/Tipe	$P_X(x) / f_X(x)$	μ_X	σ_X^2	Limit/Beperk.
Binomial (n, p)	$\binom{n}{x} p^x (1-p)^{n-x}$	np	$np(1-p)$	$0 \leq x \leq n$
Geometric (p)	$p(1-p)^{x-1}$	$1/p$	$(1-p)/p^2$	$x = 1, 2, 3, \dots$
Pascal (k, p)	$\binom{x-1}{k-1} p^k (1-p)^{x-k}$	k/p	$k(1-p)/p^2$	$x = k, k+1, \dots$ and $k \geq 1$
Discrete Unif. (k, l)	$1/(l-k+1)$	$(k+l)/2$	$(l-k)(l-k+2)/12$	$x = k, k+1, \dots, l$ and $k < l$
Poisson (α)	$\alpha^x e^{-\alpha} / x!$	α	α	$x = 0, 1, 2, \dots$ and $\alpha > 0$
Continuous Unif. (a, b)	$1/(b-a)$	$(b+a)/2$	$(b-a)^2/12$	$a \leq x < b$
Exponential (λ)	$\lambda e^{-\lambda x}$	$1/\lambda$	$1/\lambda^2$	$x \geq 0$ and $\lambda > 0$
Erlang (n, λ)	$\lambda^n x^{n-1} e^{-\lambda x} / (n-1)!$	n/λ	n/λ^2	$n = 1, 2, \dots$ and $\lambda > 0$
Gaussian (μ, σ)	$\frac{1}{\sqrt{2\pi}\sigma^2} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$	μ	σ^2	$\sigma > 0$
Beta(i, j)	$\frac{(i+j-1)!}{(i-1)!(j-1)!} x^{i-1} (1-x)^{j-1}$	$\frac{i}{i+j}$	$\frac{ij}{(i+j)^2(i+j+1)}$	$0 < x < 1$

Standard Gaussian Distribution / Standaard Gaussiese Verdeling

z	0.25	0.5	0.6	0.75	1.0	1.25	1.5	1.75	2.0	2.25	2.4	2.5	2.6	2.75	3.0
$\Phi(z)$	0.599	0.692	0.726	0.773	0.841	0.894	0.933	0.96	0.977	0.988	0.992	0.994	0.995	0.997	0.999

Statistiese formules / Statistical formulas

$$P(B) = \sum_{i=1}^n P(B \cap A_i)$$

$$f_X(x|y_a < Y \leq y_b) = \frac{\int_{y_a}^{y_b} f_{X,Y}(x,y) dy}{\int_{y_a}^{y_b} f_Y(y) dy}$$

$$f_{X,Y|B}(x,y) = \frac{f_{X,Y}(x,y)}{P(B)}$$

$$\text{Cov}[X, Y] = r_{X,Y} - \mu_X \mu_Y$$

$$\rho_{X,Y} = \frac{\text{Cov}[X,Y]}{\sigma_X \sigma_Y}$$

$$\mu_2 = m_2 - m_1^2$$

$$E[X] = \sum_{x \in S_X} x P_X(x)$$

$$\text{Var}[X+Y] = \text{Var}[X] + \text{Var}[Y] + 2\text{Cov}[X, Y]$$

$$\boldsymbol{\mu}_Y = \mathbf{A}\boldsymbol{\mu}_X + \mathbf{b}$$

$$\mathbf{R}_Y = \mathbf{A}\mathbf{R}_X\mathbf{A}' + (\mathbf{A}\boldsymbol{\mu}_X)\mathbf{b}' + \mathbf{b}(\mathbf{A}\boldsymbol{\mu}_X)' + \mathbf{b}\mathbf{b}'$$

$$\phi_X(s) = E[e^{sX}]$$

$$f_{Y|X}(y|X=x) = \frac{f_{X,Y}(x,y)}{f_X(x)}$$

$$f_Y(y) = \int_{-\infty}^{\infty} f_{X,Y}(x,y) dx$$

$$E[X^k] = \frac{d^k \phi_X(s)}{ds^k} \Big|_{s=0}$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$\mu_3 = m_3 - 3m_1\mu_2 - m_1^3$$

$$E[X] = \int_{-\infty}^{\infty} x f_X(x) dx$$

$$f_W(w) = f_X(x) \left(\left| \frac{\partial g(X)}{\partial x} \right| \right)^{-1}$$

$$\mathbf{C}_Y = \mathbf{A}\mathbf{C}_X\mathbf{A}'$$

$$\mathbf{C}_X = \mathbf{R}_X - \boldsymbol{\mu}_X \boldsymbol{\mu}_X'$$

$$P(|X - \mu_X| \geq c) \leq \frac{\text{Var}[X]}{c^2}$$

$$P(X \geq c) \leq \frac{E[X]}{c}$$

$$P(X \geq c) \leq \min_{s \geq 0} e^{-sc} \phi_X(s)$$

$$P(|M_n(X) - \mu_X| \geq c) \leq \frac{\text{Var}[X]}{nc^2}$$

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

$$P(B) = P(B|A).P(A) + P(B|\bar{A})P(\bar{A})$$

$$\hat{x}_B = E[X]$$

$$\hat{x}_A = E[X|A]$$

$$\text{Var}[M_n(X)] = \frac{\text{Var}[X]}{n}$$

$$\mathbf{C}_{XY} = \mathbf{R}_{XY} - E[X]E[Y]^T$$

Other Formulas / Ander Formules

$$P_k^n = \frac{n!}{(n-k)!} \quad \left| \quad \binom{n}{k} = \frac{P_k^n}{P_k^k} = \frac{n!}{(n-k)!k!} \right|$$

$$\frac{d}{dx}[f(g(x))] = f'(g(x)) \cdot g'(x)$$

$$f_X(\mathbf{x}) = \frac{1}{\sqrt{(2\pi)^n \det(\mathbf{C}_X)}} \exp\left(-\frac{1}{2}(\mathbf{x} - \boldsymbol{\mu}_X)' \mathbf{C}_X^{-1}(\mathbf{x} - \boldsymbol{\mu}_X)\right)$$

$$\frac{d}{dx}[u(x) \cdot v(x)] = u(x) \cdot \frac{d}{dx}[v(x)] + v(x) \cdot \frac{d}{dx}[u(x)]$$

Acronyms:

- CDF: cumulative distribution function
- PMF: probability mass function;
- PDF: probability density function;
- iid: independent and identically distributed

Akronieme:

- KVF: kumulatiewe verdelings funksie
- WMF: waarskynlikheidsmassfunksie
- WDF: waarskynlikheidsdigtheidfunksie
- oiv: onafhanklik en identies verdeel