

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	$np(1-p)$	$x = 0, 1, \dots, n$
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	$k(1-p)/p^2$	$x = k, k+1, \dots; k \geq 1$
Discrete Unif. (k, l)	$1/(l-k+1)$	$(k+l)/2$	$(l-k)(l-k+2)/12$	$x = k, k+1, \dots, l; k < l$
Poisson (α)	$\alpha^x e^{-\alpha} / x!$	α	α	$x = 0, 1, 2, \dots; \alpha > 0$
Continuous Unif. (a, b)	$1/(b-a)$	$(b+a)/2$	$(b-a)^2/12$	$a \leq x < b; a < b$
Exponential (λ)	$\lambda e^{-\lambda x}$	$1/\lambda$	$1/\lambda^2$	$x \geq 0; \lambda > 0$
Erlang (n, λ)	$\lambda^n x^{n-1} e^{-\lambda x} / (n-1)!$	n/λ	n/λ^2	$x \geq 0; n = 1, 2, \dots; \lambda > 0$
Gaussian (μ, σ)	$\frac{1}{\sqrt{2\pi}\sigma^2} e^{-(x-\mu)^2/(2\sigma^2)}$	μ	σ^2	$-\infty < x < \infty; \sigma > 0$
Beta (i, j)	$\frac{(i+j-1)!}{(i-1)!(j-1)!} x^{i-1} (1-x)^{j-1}$	$\frac{i}{i+j}$	$\frac{ij}{(i+j)^2(i+j+1)}$	$0 < x < 1; i, j = 1, 2, \dots$

Standard Gaussian Distribution / Standaard Gaussiese Verdeling

z	0.25	0.50	0.60	0.75	1.00	1.25	1.30	1.50	1.75	2.00	2.25	2.33	2.50	2.75	3.00
$\Phi(z)$	0.599	0.691	0.726	0.773	0.841	0.894	0.903	0.933	0.960	0.977	0.988	0.990	0.994	0.997	0.999

$$z = \frac{x - \mu}{\sigma} \quad \Phi(z) = P(Z \leq z), \quad \mu_Z = 0, \sigma_Z = 1$$

Statistiese formules / Statistical formulas

$P(B) = \sum_{i=1}^n P(B \cap A_i)$	$\phi_X(s) = E[e^{sX}]$	$P(X - \mu_X \geq c) \leq \frac{\text{Var}[X]}{c^2}$
$f_X(x y_a < Y \leq y_b) = \frac{\int_{y_a}^{y_b} f_{X,Y}(x,y) dy}{\int_{y_a}^{y_b} f_Y(y) dy}$	$f_{Y X}(y x) = \frac{f_{X,Y}(x,y)}{f_X(x)}$	$S_X(f) = \int_{-\infty}^{\infty} R_X(\tau) e^{-j2\pi f\tau} d\tau$
$P(A) = \iint_A f_{X,Y}(x,y) dx dy$	$f_Y(y) = \int_{-\infty}^{\infty} f_{X,Y}(x,y) dx$	$R_X(\tau) = \int_{-\infty}^{\infty} S_X(f) e^{j2\pi f\tau} df$
$r_{X,Y} = E[XY]$	$E[X^k] = \left. \frac{d^k \phi_X(s)}{ds^k} \right _{s=0}$	$P(M_n(X) - \mu_X \geq c) \leq \frac{\text{Var}[X]}{nc^2}$
$\text{Cov}[X, Y] = r_{X,Y} - \mu_X \mu_Y$	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	$P(A B) = \frac{P(B A)P(A)}{P(B)}$
$\rho_{X,Y} = \frac{\text{Cov}[X,Y]}{\sigma_X \sigma_Y}$	$\hat{x}_{ML}(y) = \arg \max_x f_{Y X}(y x)$	$\cos \theta = \frac{1}{2}(e^{j\theta} + e^{-j\theta})$
$\text{Var}[X] = E[X^2] - (E[X])^2$	$E[X] = \int_{-\infty}^{\infty} x f_X(x) dx$	$\hat{x}_B = E[X], \quad \hat{x}_M(y) = E[X Y = y]$
$E[X] = \sum_{x \in S_X} x P_X(x)$	$f_W(w) = \left. \frac{f_X(x)}{ g'(x) } \right _{x=g^{-1}(w)}$	$\tilde{\mu}_Y(x) = \mu_Y + \rho_{X,Y} \frac{\sigma_Y}{\sigma_X} (x - \mu_X)$
$\text{Var}[X + Y] = \text{Var}[X] + \text{Var}[Y] + 2\text{Cov}[X, Y]$	$\mathbf{C}_Y = \mathbf{A} \mathbf{C}_X \mathbf{A}'$	$\tilde{\sigma}_Y^2 = \sigma_Y^2 (1 - \rho_{X,Y}^2)$
$\text{Cov}[A, B - C] = \text{Cov}[A, B] - \text{Cov}[A, C]$	$\mathbf{C}_X = \mathbf{R}_X - \mu_X \mu_X'$	$\text{Var}[M_n(X)] = \frac{\text{Var}[X]}{n}$
$\mu_Y = \mathbf{A} \mu_X + \mathbf{b}$		$\hat{x}_{MAP}(y) = \arg \max_x f_{Y X}(y x) f_X(x)$
$P_X = R_X(0) = \int_{-\infty}^{\infty} S_X(f) df$		

Other Formulas / Ander Formules

$$P_k^n = \frac{n!}{(n-k)!} \quad \left| \quad \binom{n}{k} = \frac{P_k^n}{P_k^k} = \frac{n!}{(n-k)! k!} \quad \right| \quad f_X(\mathbf{x}) = \frac{1}{\sqrt{(2\pi)^n \det(\mathbf{C}_X)}} \exp\left[-\frac{1}{2}(\mathbf{x} - \mu_X)' \mathbf{C}_X^{-1} (\mathbf{x} - \mu_X)\right]$$

$$\left| \quad \frac{d}{dx} f(g(x)) = f'(g(x)) g'(x) \quad \right| \quad \frac{d}{dx} [u(x)v(x)] = u(x)v'(x) + v(x)u'(x)$$

Acronyms (English)

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

Akronieme (Afrikaans)

KVF	kumulatiewe verdelingsfunksie
WMF	waarskynlikheidsmassafunksie
WDF	waarskynlikheidsdigtheidsfunksie
oiv	onafhanklik en identies verdeel