

Commonly encountered pmfs and pdfs along with their mgfs, expected values, and variances:

pmf/pdf	\mathcal{X}	$M_X(t)$	$\mathbb{E}X$	$\text{Var } X$
$p_X(x; p) = p^x(1-p)^{1-x}$,	$x = 0, 1$	$pe^t + (1-p)$	p	$p(1-p)$
$p_X(x; n, p) = \binom{n}{x} p^x(1-p)^{n-x}$,	$x = 0, 1, \dots, n$	$[pe^t + (1-p)]^n$	np	$np(1-p)$
$p_X(x; p) = (1-p)^{x-1}p$,	$x = 1, 2, \dots$	$\frac{pe^t}{1-(1-p)e^t}$	p^{-1}	$(1-p)p^{-2}$
$p_X(x; p, r) = \binom{x-1}{r-1}(1-p)^{x-r}p^r$,	$x = r, r+1, \dots$	$\left[\frac{pe^t}{1-(1-p)e^t}\right]^r$	rp^{-1}	$r(1-p)p^{-2}$
$p_X(x; \lambda) = e^{-\lambda}\lambda^x/x!$	$x = 0, 1, \dots$	$e^{\lambda(e^t-1)}$	λ	λ
$p_X(x; N, M, K) = \binom{M}{x} \binom{N-M}{K-x} / \binom{N}{K}$	$x = 0, 1, \dots, K$	¡complicadísimo!	$\frac{KM}{N}$	$\frac{KM}{N} \frac{(N-K)(N-M)}{N(N-1)}$
$p_X(x; K) = \frac{1}{K}$	$x = 1, \dots, K$	$\frac{1}{K} \sum_{x=1}^K e^{tx}$	$\frac{K+1}{2}$	$\frac{(K+1)(K-1)}{12}$
$p_X(x; x_1, \dots, x_n) = \frac{1}{n}$	$x = x_1, \dots, x_n$	$\frac{1}{n} \sum_{i=1}^n e^{tx_i}$	$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$	$\frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2$
$f_X(x; \mu, \sigma^2) = \frac{1}{\sqrt{2\pi}\sigma} \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right)$	$-\infty < x < \infty$	$e^{\mu t + \sigma^2 t^2/2}$	μ	σ^2
$f_X(x; \alpha, \beta) = \frac{1}{\Gamma(\alpha)\beta^\alpha} x^{\alpha-1} \exp\left(-\frac{x}{\beta}\right)$	$0 < x < \infty$	$(1-\beta t)^{-\alpha}$	$\alpha\beta$	$\alpha\beta^2$
$f_X(x; \alpha, \beta) = \frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\Gamma(\beta)} x^{\alpha-1}(1-x)^{\beta-1}$	$0 < x < 1$	$1 + \sum_{k=1}^{\infty} \frac{t^k}{k!} \left(\prod_{r=0}^{k-1} \frac{\alpha+r}{\alpha+\beta+r}\right)$	$\frac{\alpha}{\alpha+\beta}$	$\frac{\alpha\beta}{(\alpha+\beta)^2(\alpha+\beta+1)}$

The “multinoulli” and multinomial pmfs and the bivariate Normal pdf:

$$p_{(X_1, \dots, X_K)}(x_1, \dots, x_K; p_1, \dots, p_K) = p_1^{x_1} \cdots p_K^{x_K} \cdot \mathbf{1} \left\{ (x_1, \dots, x_K) \in \{0, 1\}^K : \sum_{k=1}^K x_k = 1 \right\}$$

$$p_{(Y_1, \dots, Y_K)}(y_1, \dots, y_K; n, p_1, \dots, p_K) = \left(\frac{n!}{y_1! \cdots y_K!}\right) p_1^{y_1} \cdots p_K^{y_K} \cdot \mathbf{1} \left\{ (y_1, \dots, y_K) \in \{0, 1, \dots, n\}^K : \sum_{k=1}^K y_k = n \right\}$$

$$f_{(X,Y)}(x, y; \mu_X, \mu_Y, \sigma_X^2, \sigma_Y^2, \rho) = \frac{1}{2\pi \sigma_X \sigma_Y \sqrt{1-\rho^2}} \exp\left(-\frac{1}{2} \left[\left(\frac{x-\mu_X}{\sigma_X}\right)^2 - 2\rho \left(\frac{x-\mu_X}{\sigma_X}\right) \left(\frac{y-\mu_Y}{\sigma_Y}\right) + \left(\frac{y-\mu_Y}{\sigma_Y}\right)^2 \right]\right)$$