Quick reference for standard discrete distributions

Name	Discrete Uniform	Bernoulli	Binomial
Parameters	$n \in \mathbb{Z}, n \geq 1$	$p \in [0,1]$	$n \in \mathbb{Z}, n \geq 1, p \in [0,1]$
Interpretation	Distribution of n equally likely outcomes with values $1, \ldots, n$.	Distribution of the indicator variable of an event of probability p.	Number of successes in n independent trials, where each trial has probability p of success.
Notation	$\mathrm{Unif}\{1,2,\ldots,n\}$	$\mathrm{Bernoulli}(p)$	$\mathrm{Bin}(n,p)$
pmf $p(x) =$	$\begin{cases} 1/n & \text{if } x = 1,2,\ldots,n \\ 0 & \text{otherwise.} \end{cases}$	$\begin{cases} 1-p & x = 0 \\ p & \text{if } x = 1 \\ 0 & \text{otherwise.} \end{cases}$	$\begin{cases} \binom{n}{x} p^x (1-p)^{n-x} & \text{if } x = 0,1,\ldots,n \\ 0 & \text{otherwise.} \end{cases}$
CDF $F(x) =$	$\begin{cases} 0 & \text{if } x < 1 \\ \lfloor x \rfloor / n & \text{if } 1 \leq x < n \\ 1 & \text{if } n \leq x. \end{cases}$	$\begin{cases} 0 & \text{if } x < 0 \\ 1-p & \text{if } 0 \leq x < 1 \\ 1 & \text{if } 1 \leq x \end{cases}$	No formula
modes	$\{1,2,\ldots,n\}$	$\begin{cases} \{0\} & \text{if } p < 1/2 \\ \{1\} & \text{if } p > 1/2 \\ \{0,1\} & \text{if } p = 1/2. \end{cases}$	$\begin{cases} \{n\} & \text{if } p = 1 \\ \{(n+1)p, (n+1)p+1\} & \text{if } (n+1)p = 1,2,\ldots,n \\ \{\lfloor (n+1)p \rfloor\} & \text{otherwise.} \end{cases}$
medians	$[\lfloor (n+1)/2 \rfloor, \lceil (n+1)/2 \rceil]$	$\begin{cases} \{0\} & \text{if } p < 1/2 \\ \{1\} & \text{if } p > 1/2 \\ [0,1] & \text{if } p = 1/2. \end{cases}$	No formula
mean	$(n+1)/2$	p	np
variance	$(n^2-1)/12$	$p(1-p)$	$np(1-p)$

Name	Negative Binomial	Hypergeometric	Poisson
Parameters	$r \in \mathbb{Z}, r \geq 1, p \in [0,1]$	$N, D, n \in \mathbb{Z}, 1 \leq D \leq N, 1 \leq n \leq N$	$\lambda \in (0, \infty)$
Interpretation	Waiting time up to and including rth success in infinitely many independent trials with probability p of success.	Number of elements in a subset of size D in a sample of size n out of a population of size N.	Limit of binomial distributions as $n \to \infty$, if $np \to \lambda$.
Notation	$\mathrm{NB}(r,p)$	$\mathrm{Hypergeo}(p)$	$\mathrm{Poi}(\lambda)$
pmf $p(x) =$	$\begin{cases} \binom{x-1}{r-1} p^r (1-p)^{x-r} & \text{if } x = r+1, r+2 \ldots \\ 0 & \text{otherwise.} \end{cases}$	$\begin{cases} \frac{\binom{D}{x}\binom{N-D}{n-x}}{\binom{N}{n}} & \text{if } x \in \mathbb{Z}, \max(0, N-D-n) \leq x, x \leq \min(n,D) \\ 0 & \text{otherwise.} \end{cases}$	$\begin{cases} e^{-\lambda} \frac{\lambda^x}{x!} & \text{if } x = 0,1,2,\ldots \\ 0 & \text{otherwise.} \end{cases}$
CDF	No formula	No formula	No formula
modes	$\begin{cases} \{\lfloor r/p \rfloor\} & \text{if } r > 1 \\ \{1\} & \text{if } r = 1. \end{cases}$	$\{\lfloor (n+1)(D+1)/(N+2) \rfloor\}$	$\begin{cases} \{\lambda, \lambda+1\} & \text{if } \lambda \in \mathbb{Z} \\ \{\lfloor \lambda \rfloor\} & \text{else.} \end{cases}$
medians	No formula	No formula	No formula
mean	r/p	nD/N	λ
variance	$r(1-p)/p^2$	$nD(N-D)(N-n)/(N^2(N-1))$	λ

Note: The Geometric distribution (denoted $\mathrm{Geo}(p)$) is the special case $\mathrm{NB}(1,p)$. In addition to satisfying all the formulas for $\mathrm{NB}(1,p)$ above, it has the CDF $F(x) = 1 - (1-p)^{\lfloor x \rfloor}$ for $x \geq 1$, with $F(x) = 0$ for $x < 1$.