Common Discrete Probability Distributions

Distribution of $rv\ Y$	**Probability Mass Function**	**Mean** $E(Y)$	**Variance** $V(Y)$	*mgf* $m_Y(t)$
Binomial	$p_Y(y) = \binom{n}{y} p^y (1-p)^{n-y},\ y = 0, 1, \ldots, n$ $0 < p < 1$	np	$np(1-p)$	$(pe^t + (1-p))^n$
Geometric	$p_Y(y) = p(1-p)^{y-1},\ \ y = 1, 2, \ldots$ $0 < p < 1$	$\frac{1}{p}$	$\frac{1-p}{p^2}$	$\frac{pe^t}{1-(1-p)e^t}$
Hypergeometric	$p_Y(y) = \frac{\binom{r}{y}\binom{N-r}{n-y}}{\binom{N}{n}},$ $\max(0, n+r\text{ - }N) \le y \le \min(r, n)$ N, r, n positive integers, $N \ge r,$ and $N \ge n$	$n\frac{r}{N}$	$n\left(\frac{r}{N}\right)\left(1-\frac{r}{N}\right)\left(\frac{N-n}{N-1}\right)$	Closed form for m_Y(t) does not exist.
Poisson	$p_Y(y) = \frac{e^{-\lambda}\lambda^y}{y!},\ y = 0, 1, \ldots$ $\lambda > 0$	λ	λ	$e^{[\lambda(e^t - 1)]}$
Negative Binomial	$p_Y(y) = \binom{y-1}{r-1} p^r (1-p)^{y-r},\ \ y = r, r+1, \ldots$ $0 < p < 1,\ \ r = 1, 2, \ldots$	$\frac{r}{p}$	$\frac{r(1-p)}{p^2}$	$\left(\frac{pe^t}{1-(1-p)e^t}\right)^r$