## Distribution Sheet

<table>
<thead>
<tr>
<th>Name</th>
<th>pdf</th>
<th>$\mu$</th>
<th>$\sigma^2$</th>
<th>MGF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Discrete Uniform</strong></td>
<td>$\frac{1}{k}$</td>
<td>$\sum x_i \cdot \frac{1}{k}$</td>
<td>$\sum (x_i - \mu)^2 \cdot \frac{1}{k}$</td>
<td>**</td>
</tr>
<tr>
<td><strong>Bernoulli</strong></td>
<td>$\theta^x (1 - \theta)^{1-x}$</td>
<td>$\theta$</td>
<td>$\theta (1 - \theta)$</td>
<td>$1 - \theta + \theta e^t$</td>
</tr>
<tr>
<td><strong>Binomial</strong></td>
<td>(\binom{n}{x} \theta^x (1-\theta)^{n-x})</td>
<td>$n\theta$</td>
<td>$n\theta (1 - \theta)$</td>
<td>$[1 + \theta (e^t - 1)]^n$</td>
</tr>
<tr>
<td><strong>Negative Binomial</strong></td>
<td>(\binom{x-1}{k-1} \theta^k (1-\theta)^{x-k})</td>
<td>$\frac{k}{\theta}$</td>
<td>$\frac{k}{\theta} \left(1 - \frac{1}{\theta} - 1\right)$</td>
<td>$\left(\frac{\theta e^t}{1 - (1-\theta)e^t}\right)^k$</td>
</tr>
<tr>
<td><strong>Geometric</strong></td>
<td>$\theta (1-\theta)^{x-1}$</td>
<td>$\frac{1}{\theta}$</td>
<td>$\frac{1-\theta}{\theta^2}$</td>
<td>$\frac{\theta e^t}{1 - (1-\theta)e^t}$</td>
</tr>
<tr>
<td><strong>Hypergeometric</strong></td>
<td>(\frac{\binom{M}{x} \binom{N-M}{n-x}}{\binom{N}{n}})</td>
<td>$\frac{nM}{N}$</td>
<td>$\frac{nM(N-M)(N-n)}{N^2(N-1)}$</td>
<td>**</td>
</tr>
<tr>
<td><strong>Poisson</strong></td>
<td>$\frac{\lambda^x e^{-\lambda}}{x!}$</td>
<td>$\lambda$</td>
<td>$\lambda$</td>
<td>$e^{\lambda(e^t-1)}$</td>
</tr>
<tr>
<td><strong>Uniform</strong></td>
<td>$1/(\beta - \alpha)$</td>
<td>$(\alpha + \beta)/2$</td>
<td>$\frac{1}{12}(\beta - \alpha)^2$</td>
<td>$\frac{e^{t\beta} - e^{t\alpha}}{t(\beta - \alpha)}$</td>
</tr>
<tr>
<td><strong>Gamma</strong></td>
<td>$\frac{1}{\beta^\alpha \Gamma(\alpha)} x^{\alpha-1} e^{-x/\beta}$</td>
<td>$\alpha/\beta$</td>
<td>$\alpha^2/\beta^2$</td>
<td>$(1-\beta t)^{-\alpha}$</td>
</tr>
<tr>
<td><strong>$\chi^2$</strong></td>
<td>$\frac{1}{2^{\nu/2} \Gamma(\frac{\nu}{2})} x^{\frac{\nu}{2} - 1} e^{-x/2}$</td>
<td>$\nu$</td>
<td>$2\nu$</td>
<td>$(1 - 2t)^{-\nu/2}$</td>
</tr>
<tr>
<td><strong>Exponential</strong></td>
<td>$\frac{1}{\theta} e^{-x/\theta}$</td>
<td>$\theta$</td>
<td>$\theta^2$</td>
<td>$\frac{1}{1 - \theta t}$</td>
</tr>
<tr>
<td><strong>Normal</strong></td>
<td>$\frac{1}{\sigma \sqrt{2\pi}} e^{-\frac{1}{2} (\frac{x-\mu}{\sigma})^2}$</td>
<td>$\mu$</td>
<td>$\sigma^2$</td>
<td>$e^{\mu t + \frac{1}{2} \sigma^2 t^2}$</td>
</tr>
</tbody>
</table>

**:** Formulas exist but aren’t terribly useful for us.

\[1\] With $\chi^2$ added Dec 5 2008