Facts about standard distributions

**Binomial distribution**
Parameters are \( n \) and \( p \). Range is the integers from 0 to \( n \).
Written \( X \sim \text{binomial}(n,p) \).
Probability mass function: \( f_X(x) = \binom{n}{x} p^x (1-p)^{n-x} \), where \( \binom{n}{x} = \frac{n!}{x!(n-x)!} \)
Mean: \( E(X) = np \)
Variance: \( \text{Var}(X) = np(1-p) \)

**Geometric distribution**
Parameter is \( p \). Range is the integers from 0 up.
Written \( X \sim \text{geometric}(p) \).
Probability mass function: \( f_X(x) = p(1-p)^x \)
Mean: \( E(X) = (1-p)/p \)
Variance: \( \text{Var}(X) = (1-p)/p^2 \)

**Poisson distribution**
Parameter is \( \lambda \). Range is the integers from 0 on up.
Written \( X \sim \text{Poisson}(\lambda) \).
Probability mass function: \( f_X(x) = e^{-\lambda} \lambda^x / x! \)
Mean: \( E(X) = \lambda \)
Variance: \( \text{Var}(X) = \lambda \)

**Exponential distribution**
Parameter is \( \beta \). Range is the positive real numbers.
Written \( X \sim \exp(\beta) \).
Probability density function: \( f_X(x) = \beta \exp(-\beta x) \)
Mean: \( E(X) = 1/\beta \)
Variance: \( \text{Var}(X) = 1/\beta^2 \)

**Normal distribution**
Parameters are \( \mu \) and \( \sigma \). Range is the real numbers.
Written \( X \sim N(\mu, \sigma^2) \).
Probability density function: \( f_X(x) = \frac{1}{\sqrt{2\pi}\sigma} \exp \left( -\frac{1}{2} \left( \frac{x-\mu}{\sigma} \right)^2 \right) \)
Mean: \( E(X) = \mu \)
Variance: \( \text{Var}(X) = \sigma^2 \)
Table of the CDF for the \( N(0,1) \) distribution:

<table>
<thead>
<tr>
<th>( x )</th>
<th>(-3.0)</th>
<th>(-2.5)</th>
<th>(-2.0)</th>
<th>(-1.5)</th>
<th>(-1.0)</th>
<th>(-0.5)</th>
<th>( 0.0 )</th>
<th>( 0.5 )</th>
<th>( 1.0 )</th>
<th>( 1.5 )</th>
<th>( 2.0 )</th>
<th>( 2.5 )</th>
<th>( 3.0 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P(X \leq x) )</td>
<td>0.001</td>
<td>0.006</td>
<td>0.023</td>
<td>0.067</td>
<td>0.159</td>
<td>0.309</td>
<td>0.500</td>
<td>0.691</td>
<td>0.841</td>
<td>0.933</td>
<td>0.977</td>
<td>0.994</td>
<td>0.999</td>
</tr>
</tbody>
</table>