Formula Sheet

- The number of unordered selections of size k from a set of size n: $\binom{n}{k} = \dfrac{n!}{(n-k)!\,k!}$
- The number of ordered selections of size k from a set of size n: $P_k^n = \dfrac{n!}{(n-k)!}$
- The number of ways to partition a set of N items into n unordered groups of sizes $k_1, \ldots, k_n$: $\dfrac{N!}{k_1! \cdots k_n!}$
- Mean μ of n values, $x_1, \ldots, x_n$: $\frac{1}{n}\displaystyle\sum_{i=1}^{n} x_i$
- Variance of n values with mean μ: $\frac{1}{n-1}\displaystyle\sum_{i=1}^{n}(x_i - \mu)^2$
- Binomial distribution with probability of success p: $\binom{n}{k}p^k(1-p)^{n-k}$
- Binomial mean: np
- Binomial variance: $np(1-p)$
- Geometric distribution: $(1-p)^{n-1}p$
- Geometric mean: $\frac{1}{p}$
- Geometric variance: $\frac{1-p}{p^2}$
- Hypergeometric distribution: $\dfrac{\binom{r}{y}\binom{N-r}{n-y}}{\binom{N}{n}}$
- Hypergeometric mean: $\dfrac{nr}{N}$
- Hypergeometric variance: $n\left(\dfrac{r}{N}\right)\left(\dfrac{N-r}{N}\right)\left(\dfrac{N-n}{N-1}\right)$
- Poisson distribution with parameter λ: $\dfrac{\lambda^y e^{-\lambda}}{y!}$
- Poisson mean and variance: λ
- Expected value (mean) with discrete probability function $p(y)$: $\mu = E(Y) = \displaystyle\sum_y y\,p(y)$
- Variance of discrete probability function with mean $E(Y) = \mu$: $E[(Y-\mu)^2] = E(Y^2) - [E(Y)]^2$
- $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- $P(A|B) = \dfrac{P(A \cap B)}{P(B)}$, provided that $P(B) \neq 0$
- $P(A \cap B) = P(A)P(B|A)$
- $P(A) = 1 - P(\overline{A})$
- Tchebysheff: For any constant $k > 0$, $P(|Y - \mu| < k\sigma) \geq 1 - \dfrac{1}{k^2}$
- Given a random variable Y with density function $f(y)$, then $P(a \leq Y \leq b) = \displaystyle\int_a^b f(y)\,\mathrm{d}y$

- Expected value $E(Y)$ for a continuous random variable: $\int_{-\infty}^{\infty} yf(y)\mathrm{d}y$
- Variance of a continuous random variable: $E(Y^2) - [E(Y)]^2$