Geometric series: Let r be a real number such that $|r| < 1$, and m a positive integer. Then

$$\sum_{i=0}^{m} r^i = \frac{1 - r^{m+1}}{1 - r} \quad \text{and} \quad \sum_{i=0}^{\infty} r^i = \frac{1}{1 - r}$$

Summation formulas:

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$$

Bernoulli distribution:

$$p(y) = \begin{cases} p & \text{if} \quad y = 1 \\ 1 - p & \text{if} \quad y = 0 \end{cases}$$

Binomial distribution:

$$p(y) = \binom{n}{y} p^y (1-p)^{n-y}, \quad y = 0, 1, \ldots, n$$

Geometric distribution:

$$p(y) = p(1-p)^{y-1}, \quad y = 1, 2, 3, \ldots$$

Negative Binomial distribution:

$$p(y) = \binom{n-1}{r-1} p^r (1-p)^{y-r}, \quad y = r, r+1, r+2, r+3, \ldots$$

Hypergeometric distribution:

$$p(y) = \frac{\binom{r}{y}\binom{N-r}{n-y}}{\binom{N}{n}}, \quad y = \begin{cases} 0, 1, \ldots, n & \text{if} \quad n \le r \\ 0, 1, \ldots, r & \text{if} \quad n > r \end{cases}$$

Poisson distribution:

$$p(y) = \frac{\lambda^y e^{-\lambda}}{y!}, \quad y = 0, 1, 2, \ldots$$

Occupancy: The number of ways of placing r indistinguishable objects in n cells is:

$$\binom{n + r - 1}{r}$$

Permutations:

$$P_r^n = \frac{n!}{(n-r)!}$$

Combinations:

$$C_r^n = \binom{n}{r} = \frac{n!}{r!(n-r)!}, \quad r = 0, 1, 2, \ldots, n$$