A few useful mathematical functions for Data Science :

Geometric series:

$$\sum_{j=0}^{n} \rho^j = \frac{1-\rho^{n+1}}{1-\rho}, \quad \text{for } |\rho| < 1 \quad \sum_{j=0}^{\infty} \rho^j = \frac{1}{1-\rho}$$

Gamma function: For an integer α :

$$\Gamma(\alpha) = \int_0^{\infty} x^{\alpha-1} e^{-x} dx = (\alpha-1)!$$

Beta function: For two integers α and β:

$$B(\alpha, \beta) = \int_0^{1} x^{\alpha-1} (1-x)^{\beta-1} dx = \frac{\Gamma(\alpha)\Gamma(\beta)}{\Gamma(\alpha+\beta)}$$

Permutations: The number of arrangements of n distinct objects :

$$n! = n(n-1)\dots(2)(1).$$