Simple Mathematical Facts for Lecture 1 (Part II)

Strong Law of Large Numbers

- Let $X_1, X_2, \ldots$ be a sequence of independent random variables having a common distribution, and $\mu = E[X_i]$. Then, with probability 1,

$$\frac{X_1 + X_2 + \ldots + X_n}{n} \to \mu$$

as $n \to +\infty$.

Geometric Distribution

- Suppose that independent trials, each having a probability p of being a success, are performed until a success occurs. If we let X be the number of trials required until the first success, then X follows a **geometric distribution with parameter** p. In particular,

$$P\left[X = n\right] = \left(1 - p\right)^{n-1} p$$

for $n \geq 1$.