# Probability : Approximating Binomial Probabilities

**Key words:**

1. Random Variables
2. Bernoulli Distribution
3. Binomial Distribution

Solve the following Questions:

1. Prove the following Theorem:

   **Theorem 1** *Let $0 < p < 1$ and $X_1, X_2, \ldots X_n$ be independent Bernoulli random variables. Define $S_n = \sum_{i=1}^{n} X_i$ Then*

   $$\lim_{n\to\infty} P\left(\frac{S_n - np}{\sqrt{np(1-p)}} \leq a\right) \to \int_{-\infty}^{a} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} dx$$

**Mathematician in Focus** Bernoulli