1. Let $X_1, \cdots, X_n$ be independent random variables such that $X_i$ is equal to 1 with probability $1 - \delta$ and equal to 0 with probability $\delta$. Let $X = \sum_{i=1}^{n} X_i \pmod 2$. Prove that

$$\Pr[X = 1] = \frac{1}{2} - \frac{(2\delta - 1)^n}{2}.$$