## Bin$(n, p)$

- Do $n$ trials $X_i$, each independent with probability $p$ of success.
- The number of successes $S_n$ is the same as Bin$(n, p)$ discussed earlier.
- Let $A_n = S_n/n$ be the **fraction of successes**.
- We have

$$\mathbb{E}[X_i] = p, \qquad \mathrm{Var}(X_i) = p(1-p) = pq$$

- and

$$\mathbb{E}[A_n] = p, \qquad \mathrm{Var}(A_n) = \frac{pq}{n}.$$

- Then

$$\mathbb{P}(|A_n - p| \geq \epsilon) \leq \frac{pq}{n\epsilon^2}.$$