

4a. X_i - i-th point inside circle

$$X = \sum_i X_i \quad X \sim \text{Binom}(N, p)$$

$$p = \frac{\pi}{A}$$

$$E[X] = Np \quad \text{Var}[X] = Np(1-p)$$

$$E\left[\frac{AX}{N}\right] = Ap = \pi \quad \text{Var}\left[\frac{AX}{N}\right] = A^2 \frac{p(1-p)}{N}$$

$$A = 4$$

$$A = 400$$

$$\text{sd}\left[\frac{AX}{N}\right] = A \sqrt{\frac{p(1-p)}{N}}$$

$$\frac{\text{sd}\left[\frac{AX}{N}\right]}{E\left[\frac{AX}{N}\right]} = \sqrt{\frac{(1-p)}{pN}}$$

prob. / density of v.v. X

4b. X - v.v.

$$E[f(X)] = \int_{\mathbb{R}} f(x) p(x) dx$$

