

DATA 605 - Discussion 9

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Exercise 12

A balanced coin is flipped 400 times. Determine the number x such that the probability that the number of heads is between $200 - x$ and $200 + x$ is approximately .80.

Solution

$$P(200 - x \leq S_n \leq 200 + x) \approx 0.80.$$

$$\mu = np = 400 \cdot 0.5 = 200.$$

$$\sigma = \sqrt{n \cdot p \cdot q} = \sqrt{400 \cdot 0.5 \cdot 0.5} = 10.$$

$$P\left(\frac{199.5-200-x}{10} \leq Z \leq \frac{200.5+200+x}{10}\right) \approx 0.80.$$

$$P\left(\frac{-x}{10} \leq Z \leq \frac{x}{10}\right) \approx 0.80.$$

$$2 \cdot P\left(0 \leq Z \leq \frac{x}{10}\right) \approx 0.80.$$

$$P\left(Z \leq \frac{x}{10}\right) - P(Z \leq 0) = \frac{0.80}{2}.$$

$$P\left(Z \leq \frac{x}{10}\right) - 0.5 = \frac{0.80}{2}.$$

$$P\left(Z \leq \frac{x}{10}\right) = 0.9.$$

Looking at the Z-table, x is approximately 13.