Confidence intervals for a population proportion

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

1. Find a 95% interval for 160 successes from 400 independent randomly sampled people. [2 marks]

Estimate 0.4; margin $1.96\sqrt{\frac{0.24}{400}} = 0.0480100\ldots$.

Answer: Approximately $(0.3520, 0.4480)$.

2. Find a 95% interval for 225 successes from 500 independent observations. [2 marks]

Estimate 0.45; margin $1.96\sqrt{\frac{0.45(0.55)}{500}} = 0.0436072\ldots$.

Answer: Approximately $(0.4064, 0.4936)$.

3. An interval is 0.47 ± 0.035. Give endpoints and margin in percentage points. [2 marks]

Subtract/add 0.035; multiply the margin by 100 for percentage points.

Answer: $(0.435, 0.505)$; 3.5 percentage points.

4. Why is the formula unsuitable for zero successes among 30? [2 marks]

No observed success does not prove zero population probability. Another method is required.

Answer: It gives a misleading zero-width interval and the success-count condition fails.

5. A random sample of app users is used to infer a proportion for all adults. What can its margin omit? [2 marks]

The sampling frame differs from the target population.

Answer: Coverage bias from excluding non-users.

6. Does a proportion interval $(0.51, 0.59)$ contain the binary outcomes of 95% of people? [2 marks]

Individual outcomes are success/failure. Confidence refers to repeated coverage.

Answer: No; it estimates one aggregate population proportion.