

Confidence intervals for proportions; polls

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Practice problems

1. A survey of $n = 500$ people finds that 340 support a new law. Calculate the 95% confidence interval for the population proportion of support.
2. A quality control manager wants to estimate the proportion of defective parts in a batch. To be 90% confident that the estimate is within 3% of the true proportion, what is the minimum sample size needed? (Use the conservative estimate for $\hat{p}$).
3. A poll of 1200 people shows that 45% prefer Brand A. If the margin of error is 2.8% at a 95% confidence level, would the interval for the proportion of people who prefer Brand A include 50%?

Solutions

1. A survey of $n = 500$ people finds that 340 support a new law. Calculate the 95% confidence interval for the population proportion of support.

- Calculate the sample proportion: $\hat{p} = 340/500 = 0.68$.
- Find the standard error: $SE = \sqrt{(0.68 \times 0.32)/500} \approx 0.0209$.
- Use $z^* = 1.96$ for 95% confidence: $MOE = 1.96 \times 0.0209 \approx 0.041$.
- Construct the interval: 0.68 ± 0.041 .

Answer: [0.639, 0.721]

2. A quality control manager wants to estimate the proportion of defective parts in a batch. To be 90% confident that the estimate is within 3% of the true proportion, what is the minimum sample size needed? (Use the conservative estimate for $\hat{p}$).

- Identify values: $z^* = 1.645$ for 90% confidence, $MOE = 0.03$, and $\hat{p} = 0.5$.
- Apply the formula: $n = (1.645/0.03)^2 \times 0.25$.
- Calculate: $n = (54.833)^2 \times 0.25 \approx 3006.7$.
- Round up to the nearest whole number.

Answer: 3007

3. A poll of 1200 people shows that 45% prefer Brand A. If the margin of error is 2.8% at a 95% confidence level, would the interval for the proportion of people who prefer Brand A include 50%?

- The sample proportion is $\hat{p} = 0.45$.
- The margin of error is $MOE = 0.028$.
- The confidence interval is 0.45 ± 0.028 , which is $[0.422, 0.478]$.
- Check if 0.50 is within the range $[0.422, 0.478]$.

Answer: No