Margin of error and sample-size calculations

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

1. Known SD is 15. Plan a 95% mean interval with margin at most 3. [2 marks]

$\left(\frac{1.96\times 15}{3}\right)^2 = 96.04$; round up.

Answer: 97.

2. Without prior p, plan a 95% proportion interval with margin at most 0.04. [2 marks]

$\frac{1.96^2(0.25)}{0.04^2} = 600.25$; round up.

Answer: 601.

3. For planning $p_0 = 0.3$, 95% confidence and margin 0.05, find n. [2 marks]

$\frac{1.96^2(0.3)(0.7)}{0.05^2} = 322.6944$; round up.

Answer: 323.

4. A study needs 385 completions and expects a 70% response rate. Give a contact-budget estimate and limitation. [2 marks]

$\frac{385}{0.70} = 550$.

Monitor actual response and non-response bias.

Answer: 550 contacts; no guarantee of count or representativeness.

5. Why is $p_0 = 0.5$ conservative? [2 marks]

The squared term is non-negative, so the maximum occurs at 0.5.

Answer: $p(1-p) = 0.25 - (p-0.5)^2 \leq 0.25$.

6. Why does rounding a bound of 120.02 down to 120 fail? [2 marks]

The target margin inequality is not met below that bound.

Answer: 120 is below the required lower bound; use 121.