Effect of sample size and variability

6 questions | 13 marks

Equivalent correct methods earn the corresponding marks.

1. Margin is 5 at n = 36. Find it at n = 144. [2 marks]

Four times the sample halves the margin.

Answer: 2.5.

2. A sample of 80 has a given margin. How many observations give one-third that margin? [2 marks]

Multiply by $3^2 = 9$.

Answer: 720.

3. SD changes from 8 to 12 with confidence and n fixed. Compare widths. [2 marks]

12/8 = 1.5.

Answer: The new width is 1.5 times the old width.

4. Compare 99% and 95% widths using critical values 2.576 and 1.96. [2 marks]

2.576/1.96 = 1.314285... .

Answer: Ratio approximately 1.3143.

5. Both n and population SD are multiplied by four. Compare margins. [2 marks]

Spread factor 4 divided by square-root sample factor 2 gives 2.

Answer: The new margin is twice the old.

6. Use the supplied repeated-interval simulation table. Compare interval width when n rises from 25 to 100 at fixed confidence. Does the observed capture fraction have to equal the advertised confidence exactly? [3 marks]

One simulation: 2,000 sample intervals per row; normal population mean 100, SD 20

Sample size	Confidence	Captures	Capture fraction	Mean width
25	95%	1903	0.9515	15.680
25	99%	1978	0.9890	20.608
100	95%	1902	0.9510	7.840
100	99%	1988	0.9940	10.304

Quadrupling sample size halves standard error and width under the known-spread model.

Each row contains a finite number of simulated intervals; capture fraction is an estimate of long-run coverage.

The normal population, fixed sample size and stated independent draws make the simulation method reproducible.

Answer: Width halves; no, empirical coverage varies randomly.