6.4 Confidence Level, Precision, Sample Size

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Goals

1. Use a desired maximum margin of error to calculate a sample size.
2. Use a desired maximum interval width to calculate a sample size.

Sample Size

Other than level of confidence, there is one other thing we can control in the confidence interval: the sample size n.

- We can specify the confidence level and the maximum acceptable interval width and use these to determine sample size.
- We know that

$$\text{interval width} \geq 2z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$$

- Letting interval width equal w, we can solve for n:

$$n \geq \left(2z_{\alpha/2}\frac{\sigma}{w}\right)^2$$

Sample Size

Alternately, we may specify a maximum margin of error m instead:

$$n \geq \left(z_{\alpha/2} \frac{\sigma}{m} \right)^2$$

- Once we've done a sample size calculation, we need a whole number for n.
- Since $n \geq$ something, we will *always round up*.

Checkpoint

Suppose we want a 95% confidence interval for the mean of a normally distributed population with standard deviation $\sigma = 10$. It is important for our margin of error to be no more than 2. What sample size do we need?

Some comments

- As desired width/margin of error decreases, n will increase.
- As σ increases, n will also increase. (More population variability will necessitate a larger sample size.)
- As confidence level increases, n will also increase.

Checkpoint

Prior experience with SAT scores in the CSU system suggests that SAT scores are well-approximated by a normal distribution with standard deviation known to be 50.

Find the sample size required for a 98% confidence interval with maximum margin of error 10.

Homework Problems