Confidence intervals

Chapter 16

Selected z^* values from table C:

C	90%	95%	99%
z^*	1.645	1.960	2.576

A **level C confidence interval for the mean** μ of a Normal population with known standard deviation σ, based on SRS of size n, is given by

$$(\bar{x} - z^*\frac{\sigma}{\sqrt{n}}, \bar{x} + z^*\frac{\sigma}{\sqrt{n}})$$

you should take z^* for appropriate level of the confidence interval. The critical value z^* is choosen so that the standard Normal curve (N(0,1)) has area C between -z^* and z^*.

The **margin of error** (ME) for the confidence interval is

$$ME = z^*\frac{\sigma}{\sqrt{n}}$$

The margin of error **gets smaller** (and confidence interval would be narrower) when z^* (also level C) gets smaller, or σ is smaller, or n gets larger.

To find the **sample size n**:

$$n = \left(\frac{z^*\sigma}{ME}\right)^2$$

Problem 1

For a certain kind of scientific instrument, the population distribution is approximately normal with the standard deviation for measurements of weight 0.2 grams. Suppose you weight an object 100 times and observe a mean weight of 31.35 grams.

a) Construct a 90% confidence interval for the average weight of this object, rounded to two decimals.

b) Interpret the interval in part (a) above (i.e. say in words what it means).

Problem 2

In estimating the mean monthly fuel expenditure, , per household vehicle, the Energy Information Administration takes a sample of size 6841. Assuming that = \$20.65, determine the margin of error in estimating at the 95% level of confidence.