ONE SAMPLE Z-TEST

This test is used to compare a sample mean (\(\bar{x}\)) to a population mean (\(\mu\)) or to determine a confidence interval for a population mean when \(\sigma\) is known.

The cellulose content of a variety of alfalfa hay is normally distributed with \(\sigma = 8\text{mg/g}\). An agronomist believes the cellulose content is higher than 140 mg.

Test this claim at the \(\alpha = .05\) significance level.

To test the claim, an SRS of 15 cuttings is taken with an average cellulose content is 145 mg/g.

P) STATE POPULATION PARAMETER:

\[\mu = \text{mean cellulose content of a variety of alfalfa hay}\]

H) STATE HYPOTHESES:

\(H_0 : \mu = 140\) \hspace{1cm} \(H_a : \mu > 140\)

A) VERIFY CONDITIONS REQUIRED FOR TEST:

a) SRS

*The problem states an SRS was used...*

b) Sampling distribution normal- normal population or large sample size (\(n > 40\)) or justification for normality (\(n < 40\)) after omitting outliers

*Since the population distribution is normal, the sampling distribution is normal*

c) \(N > 10n\)

\[N > 10n > 10(15) > 150?\]
T) PUT DATA INTO LIST (IF NECESSARY) AND

   a) USE TABLE C:

      i) Determine mean ($\overline{x}$)

         $\overline{x} = 145$

      ii) Calculate $z$ statistic

         $z = \frac{\overline{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = 2.42$

      iii) Determine critical $z^*$ and compare to $z$ statistic

         From Table C ($\alpha = .05$), the critical $z^*$ value is 1.645. Since $2.42 > 1.645$, the P-value < .05.

   b) USE CALCULATOR

      STATS ---> TESTS ---> 1: Z-Test ---> P-value = .0077

      DISTR ---> 1: normalcdf (min, max) = (2.42, 10) = .0078

S) STATE CONCLUSION:

At $\alpha = .05$ significance level, we reject the null hypothesis and conclude that the mean cellulose content of this variety of alfalfa hay is greater than 140 mg/g.

CONFIDENCE INTERVAL (Use PAIS):

A 90% confidence interval for the mean cellulose content of this variety of alfalfa hay is:

STAT ---> TESTS ---> 7: Z Interval = (141.6, 148.4)

We are 90% confident that the average cellulose content of this type of alfalfa hay is between 141.6 mg/g and 148.4 mg/g.