Example 1

A pharmaceutical manufacturer does a chemical analysis to check the potency of products. The standard release potency for cephalothin crystals is 910. An assay of 16 lots gives the following potency data:

897	914	913	906	916	918	905	921
918	906	895	893	908	906	907	901

Assume the population standard deviation is 8 units. Test the hypothesis that the population mean potency is different from the standard release potency.

(1) Define the population quantity of interest in this study. This is called the *population parameter*.

The mean potency across all lots

(2) Carefully state the hypotheses to be tested about the population.

$H_0: \mu = 910$ $H_a: \mu \neq 910$

(3) What is the sample size?

16

(4) What quantity will be used as an estimate of the parameter from (1)?

$\bar{x}$

(5) What is the distribution of the sample estimate? Why? Under the null hypothesis it is

$N(910, 8/\sqrt{16}) = N(910, 2)$

(6) What is the standard deviation of the sample estimate?

2

(7) What is the value of the sample estimate for the sample in this study?

907.75

(8) Find the test statistic. What does this measure?

$$\frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}} = -1.125$$

(9) Give the p-value for the test in (2). What does this measure?

0.2606

(10) Carefully state your conclusions.

There is not enough evidence to conclude that the mean potency is different from 910 (at $\alpha = 0.05$ significance level)

(11) What *assumptions* have we made for this procedure to be valid?

→ Sampling is random

→ $\sigma = 8$