

Math 1700: Elementary Statistics

7th Week Summary (10/9/25)

- Inference about the value of the population mean, μ .
- Estimating the value of a population parameter (μ).
 - Point estimate for a parameter (\bar{x})
 - Interval estimate ($\bar{x} - E, \bar{x} + E$)
- Level of confidence ($1 - \alpha$): The portion of all interval estimates that include the parameter being estimated.

- Confidence interval for μ : An interval estimate with a specified level ($1 - \alpha$) of confidence:

$$(\bar{x} - z(\alpha/2) \frac{\sigma}{\sqrt{n}}, \bar{x} + z(\alpha/2) \frac{\sigma}{\sqrt{n}})$$

$$\text{Maximum error of Estimate: } E = z(\alpha/2) \left(\frac{\sigma}{\sqrt{n}} \right)$$

Confidence Interval Applet

- Required Sample size for a specific level of confidence, ($1 - \alpha$):

$$n = \left(\frac{z(\alpha/2)\sigma}{E} \right)^2$$

- Testing a hypothesis.....

Null Hypothesis:

$$H_0 : \mu = \mu_0$$

Alternative (Research) Hypotheses:

$$H_a : \mu < \mu_0, \text{ or}$$

$$H_a : \mu > \mu_0, \text{ or}$$

$$H_a : \mu \neq \mu_0$$

- Type of Errors:

Type I Error or Level of Significance (α):

Falsely Rejecting H_0

Type II Error (β):

Falsely Fail to Reject H_0

- Test Statistic:

$$z^* = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}}$$

- Hypothesis Test Approaches

Classical Approach

P-value Approach

- P-value Approach HT: A 5-step Procedure

Step 1 The Set-Up

Step 2 The Hypothesis Test Criteria

Step 3 The Sample Evidence

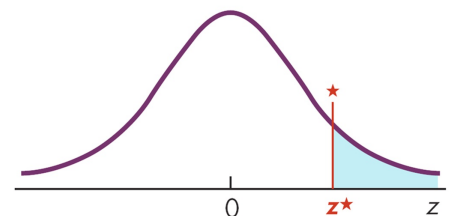
Step 4 The Probability Distribution

Step 5 The Results

Case 1
 H_a contains ">"
"Right tail"

p-Value in Right Tail

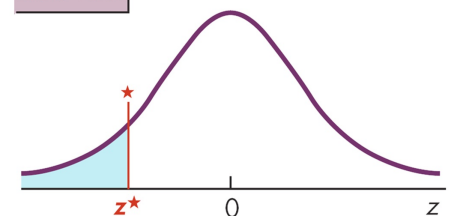
table value	p-value
-------------	---------



Case 2
 H_a contains "<" "Left tail"

p-Value in Left Tail

p-value	table value
---------	-------------



Case 3
 H_a contains " \neq " "Two-tailed"

p-Value in Two Tails

$1/2$ p-value	$1/2$ p-value
table value	

