

## Math 1700: Elementary Statistics

### 7<sup>th</sup> and 8<sup>th</sup> Weeks Summary (10/17/23)

- Inference about the value of the population mean,  $\mu$ .
- Estimating the value of a population parameter ( $\mu$ ).  
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  $\mu$ : 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 ( $\alpha$ ):

Falsely Rejecting  $H_0$

Type II Error ( $\beta$ ):

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

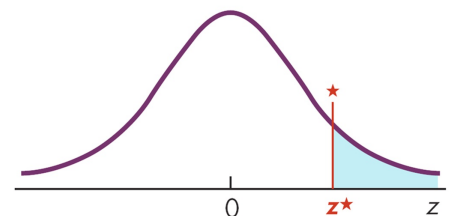
Step 4 The Probability Distribution

Step 5 The Results

Case 1  
 $H_a$  contains ">"  
"Right tail"

p-Value in Right Tail

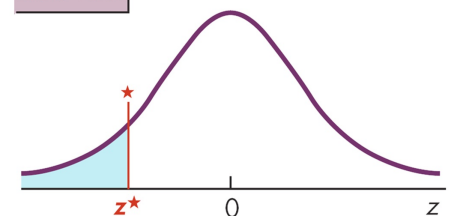
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Case 2  
 $H_a$  contains "<" "Left tail"

p-Value in Left Tail

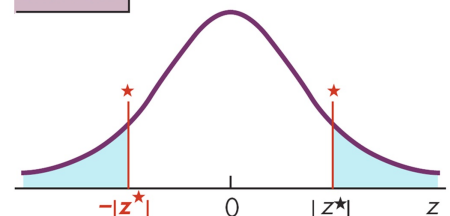
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Case 3  
 $H_a$  contains " $\neq$ " "Two-tailed"

p-Value in Two Tails

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



- Classical approach of Hypothesis Testing .....

### Sign in the Alternative Hypothesis

