TOPIC: MULTIPLE COMPARISONS: TUKEY TEST

Tukey Test

◆ ANOVA compares 3+ means. If H_0 is rejected, **Post-hoc** tests can tell you *which* means are different.

  ▶ Post-Hoc Tests, like **Tukey**, test _____ of means against each other.

EXAMPLE

In an ANOVA test on mean weekly study time for different grade levels, you reject H_0: Students in grades 10-12 study for the same amount of time. Determine which pair(s) of means are different with $\alpha = 0.05$.

$N =$ _____　　$k =$ _____

$df =$ _____　Critical Value = _____

$MSE =$ _____

Grade	10	11	12
Study Time	3	4.3	6
Sample Size	10	10	10

10th & 11th Grade	11th & 12th Grade	10th & 12th Grade
$H_0:$	$H_0: \mu_{11} = \mu_{12}$	$H_0: \mu_{10} = \mu_{12}$
$H_a:$	$H_a: \mu_{11} \neq \mu_{12}$	$H_a: \mu_{10} \neq \mu_{12}$
$q_0 =$	$q_0 =$	$q_0 =$
$\dfrac{-}{\sqrt{\left(\dfrac{\quad}{\quad}\right)}}$	$\dfrac{-}{\sqrt{\left(\dfrac{4.448}{10}\right)}}$	$\dfrac{-}{\sqrt{\left(\dfrac{4.448}{10}\right)}}$
q_0 **[>	<]** Crit. Val. **[REJECT	FTR]** H_0.	q_0 **[>	<]** Crit. Val. **[REJECT	FTR]** H_0.	q_0 **[>	<]** Crit. Val. **[REJECT	FTR]** H_0.

HOW TO: Perform Tukey Test

1) Verify: ANOVA H_0 was rejected? ☐

2) Crit. Val.: Studentized Range q-table
$$df = N - k$$
$N = $ # of total obs.　$k = $ # of groups

3) Get MSE from ANOVA readout

`One-way ANOVA`

  Ⓥ `Error`

    `MS=`

For each pair of groups:

4) $H_0: \mu_1 = \mu_2, \quad H_a: \mu_1 \neq \mu_2$

5) Test Statistic: q_0

6) Interpret: Compare q_0 & Crit. Val.

New

$$q_0 = \frac{\bar{x}_2 - \bar{x}_1}{\sqrt{\dfrac{s^2}{n}}}$$

$s^2 = $ MSE from one-way ANOVA

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A nutritionist wants to compare the effectiveness of three different diet plans (Diet A, Diet B, and Diet C) in terms of weight loss over a 6-week period. She randomly assigns 15 participants to one of the three diet groups, with 5 participants per group. After 6 weeks, the amount of weight (in pounds) lost by each participant is recorded. A one-way ANOVA test showed that at least one plan led to a different average weight loss. Perform a Tukey Test using $\alpha = 0.05$ to see which pair(s) of means are different.

Plan	Weight Loss (lbs)				
A	8	9	6	10	7
B	4	5	6	5	4
C	10	12	9	11	13

$$q_0 = \frac{\bar{x}_2 - \bar{x}_1}{\sqrt{\dfrac{s^2}{n}}}$$