UTAustinX: UT.7.20x Foundations of Data Analysis - Part 2

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One-Way ANOVA

0:00 / 0:00 1.0x

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Lab due May 03, 2016 at 17:00 UTC

Problem Set
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1. ANOVA is an appropriate statistical measure when we want to:

(1/1 point)

- determine whether the hypothesized mean in one population is the same for two or more other populations.
- compare the means of three or more populations at once. ✔
- estimate the size of the difference between two or more group means.
- compare the distributions of two or more categorical variables.

2. In ANOVA, we calculate an F statistic. The F statistic is the ratio of:

(1/1 point)

- the difference in group means compared to the expected group difference in means.
- the variation in one group compared to the variation in the other.
- the variation within groups to the total variation.
- the variation between groups to the variation within groups. ✔

3. If the null hypothesis for an ANOVA test is $\mu_A = \mu_B = \mu_C$, what is the appropriate alternative hypothesis?

(1/1 point)

- $\mu_A \neq \mu_B \neq \mu_C$
- At least one of the means is different. ✔

○ $\mu_A \neq \mu_B \ or \ \mu_A \neq \mu_C$

4. The source table below presents the results from an ANOVA comparing four treatment conditions with n=25 participants in each condition. Compare all the missing values. *Hint: Start with degrees of freedom*. (Round to 3 decimal places where needed.)

Source	SS	df	MS	F-statistic	F-critical
Between	[SS_B]	[df_B]	19	F-stat	2.699
Within	[SS_W]	[df_W]	[MS_W]		
Total	117	[df_T]			

(7/7 points)
4a. SS_B=

57

Answer: 57

57

4b. SS_W =

60

Answer: 60

60

4c. df_B =

3

Answer: 3

3

4d. df_W =

96

Answer: 96

96

4e. df_T =

99

Answer: 99

99

4f. MS_W =

0.625

Answer: .625

0.625

4g. F-stat=

30.4

Answer: 30.400

30.4

(1/1 point)

4h. We should _________ the null hypothesis.

Reject ▼ **Answer:** Reject

(1/1 point)

4i. Assume your F-statistic is significant, suggesting that at least one treatment condition is different from the others. How many post-hoc group comparisons will you need to run?

Remember the formula for group comparisons: $\frac{k(k-1)}{2}$

- (selected) 6 ✔
- 15
- 10
- 12

(1/1 point)

4j. Using the Bonferroni correction, what significance level should you use for each post-hoc hypothesis test if you want an overall significance level of 0.05?

- .050

- .100
- .008 ✔
- .003

(1/1 point)

4k. What was the overall risk of making a Type I error in this ANOVA? *(Round to 2 decimal places.)*

0.05 ✔

Answer: .05

0.05

(1/1 point)

4l. What would the risk of a Type I error have been if you had run multiple t-tests instead? Assume $\alpha = 0.05$ for each test. *(Round to 2 decimal places)*

Hint: $1 - (1 - \alpha)^C$

0.26

Answer: .26

0.26

(1/1 point)

4m. How would you interpret this difference in overall Type I error rate?

- ○ The risk of missing a significant difference between means, when one really exists, is 5 times lower when you run an ANOVA.
- ◉ The risk of finding a difference between group means, when one does not really exist, is 5 times lower when you run an ANOVA.
- ○ The risk of falsely rejecting the null hypothesis is higher when you run an ANOVA.
- ○ The risk of falsely failing to reject the null hypothesis is higher when you run multiple t-

tests.