

A researcher wants to know whether the need for mental health care among prisoners varies according to the different types of prison facilities. The researcher randomly selects prisoners from each of the three main types of prisons in a particular Canadian province and conducts exams to determine their need for mental health care. In the article describing the results, the researcher reported the means for each group and then added: *“The need for mental health care among prisoners in the three types of prison systems appeared to be clearly different,  $F(2,117) = 4.02, p < .05.$ ”*

- a. How many total prisoners participated in this study?
  - b. How would the sentence in quotes change if the researcher had used an alpha level of .01?
- 1** Rewrite the sentence.

Suppose I was conducting a study to see which network can make people laugh more on Thursday nights. I have three groups: One group watches NBC, the second group watches ABC, and the third group watches CBS. All participants watch television from 8:00 to 10:00 while being audio-recorded. The experimenter **listens to the audio and counts laughs.**

 In this experiment, what are some of the reasons for between groups variability? (i.e., What are some of the reasons that people in the NBC group have higher laughter scores than people in the CBS group?)

 In this experiment, what are some of the reasons for within group variability? (Everyone in the NBC group does not have the same laughter score. Why?)

**5**



Adapted from K. Taylor, 2010

Which source of variability is in the denominator of the F ratio? Which source of variability is in the numerator? Why is the F-comp value closer to 0 when the null hypothesis is true? Why is it larger when the null hypothesis is false?

**2**

Complete the ANOVA summary table. You do not need the raw data to complete this table.

**3**

Source	SS	df	MS	F
Between Groups	80	___	40	___
Within Groups	___	___	___	___
Total	100	14	___	___

Use the F table to determine the critical value for F (F-crit) for each of the following situations:

- A.  $\alpha = .01, df_{bet} = 7, df_{within} = 60$
  - B.  $\alpha = .01, df_{bet} = 4, df_{within} = 30$
  - C.  $\alpha = .05, df_{bet} = 5, df_{within} = 120$
  - D.  $\alpha = .05, df_{bet} = 3, df_{within} = 24$
- 4**



Does caffeine help or hinder performance? A researcher administers three varying levels of caffeine (0, 10, or 20 mg) to lab rats and then measures number of food pellets that each rat finds. The more food pellets found, the higher the rat's performance.

FOOD\_FND

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	19.604	2	9.802	13.65	.001
Within Groups	9.333	13	.718		
Total	28.937	15			

- a. What was the computed F value in this study?
  - b. Does caffeine significantly affect performance?
  - c. How many rats were in the study?
  - d. Report the conclusions (a. A one-way ANOVA was conducted... b. There was sufficient evidence to reject...  $F( ) = p...$  c. The number of pellets found by rats administered 0, 10 and 20 mg... d. Further post-hoc testing is needed to determine...)
- 6**



**Statistics... "Is nothing else than torturing the data until it confesses... and if you torture it long enough, you can get it to confess anything" (Fred Menger).**

First born children tend to develop language skills faster than their younger siblings. If this explanation is correct, then it is also reasonable that twins should show slower language development than single children and that triplets should be even slower. Davis (1937) found this result. The following data reproduce Davis's study. 7

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	44.133	2	22.067	9.881	.003
Within Groups	26.800	12	2.233		
Total	70.933	14			

The average scores for the three groups are as follows: single=8, twins=6, triplets=3.8

- a. Write out your ANOVA conclusions, given the information above. Use an alpha level of .05.
- b. Because there is at least one significant difference among the group means, a post-hoc test is necessary to identify which difference(s) among the means is/are significant. Look at the LSD Table below. Focus on the *Mean Difference* and *Sig* columns. Finish your analysis by writing up your post-hoc conclusions based on the values in the LSD Table.

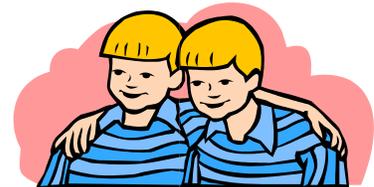
LSD Mean Difference Comparisons

score

LSD

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
single	twin	2.0	.94516	.056	-.0593	4.0593
	triplet	4.2*	.94516	.001	2.1407	6.2593
twin	single	-2.0	.94516	.056	-4.0593	.0593
	triplet	2.2*	.94516	.038	.1407	4.2593
triplet	single	-4.2*	.94516	.001	-6.2593	-2.1407
	twin	-2.2*	.94516	.038	-4.2593	-.1407

\*. The mean difference is significant at the 0.05 level.



Davis, E.A. (1937). The Development of Linguistic Skill in Twins, Singletons with Siblings, and Only Children from Age Five to Ten Years. University of Minnesota Child Welfare Monograph Series. 14, 174.

Adapted from K. Taylor, 2010