

2. J. Neter, W. Wasserman, and M.H. Kutner 1985 *Applied Linear Statistical Models* reported muscle mass in 8 women, in the 43-58 year age range.

Does muscle mass M (kg) decrease with age A in this range? (H_0 testing)

The question can also be phrased as:

How good is the evidence for a decrease in muscle mass with age in this range ?

Using the symbols above write a GLM to address this question.

_____ = _____ [2]

Show units below each symbol in your GLM. [5]

Write the null hypothesis.

H_0 [1]

Complete the ANOVA table [6]

age	Source	df	SS	MS	F	p
43-58	regr		70.64			0.02
	residual		41.44			
	total	7				

Calculate the explained variance $R^2 =$ _____ [1]

Calculate the likelihood ratio. $LR =$ _____ [1]

Declare a decision about H_0 against a 5% tolerance for statistical significance. [1]

Choose one of the following methods of reporting statistical conclusions. (circle it). [1]

Report the likelihood ratio as relative evidence:

“change with age was (___) times more likely than no change”

Report Type I error with a decision.

“the null hypothesis was (or was not) rejected at $\alpha = 5\%$.”

Give a reason for your choice. [2]

3. Cochran and Cox (1957 *Experimental Designs* Table 4.4) reported the breaking strength of cotton fibers from 5 blocks, each with 5 plots treated with a different level of potash (36, 54, 72, 108, or 144 lbs K₂O / acre). Does cotton property (breaking strength) depend on level of potash, controlled for soil pH ?

Define variables in a tabular format, as in the box. [3]

scale = nominal, ordinal, or cardinal
 cardinal = interval or ratio scale.

A.	<u>name</u>	<u>symbol</u>	<u>scale</u>

Using the symbols, write a general linear model relating the response variable to explanatory variables and interaction term.

$$\text{_____} = \text{_____} + \epsilon \quad [4]$$

Assume 2 measures of breaking strength and one measure of pH per plot. Show how to calculate the total degrees of freedom. [1]

Complete the source column. [1]
 Complete the df column [5]
 of the ANOVA table.

C.	<u>source</u>	<u>df</u>

State the name of the analysis, from the following list.
 t-test, one-way ANOVA, two-way ANOVA, three-way ANOVA
 paired comparisons, randomized blocks, hierarchical (nested) ANOVA
 regression, multiple regression, ANCOVA (at least one nominal and at least 1 cardinal scale explanatory variable)
 none of the above. [1]