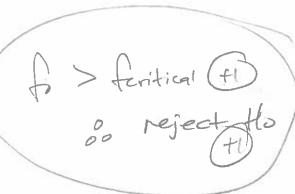
It is hypothesized that there is a connection between relative humidity in the atmosphere and the hardness of an automotive finish. Five test samples were finished in each of four different relative humidity environments in random order and subjected to a Vickers hardness test:

RH (%)	Vickers Hardness (VH)					Totals	Averages
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	1000	7,150,10803
20	31.1	31.7	32.0	30.9	33.8	159.5	31.9
40	30.1	30.4	29.9	28.0	31.6	150.0	30.0
60	28.2	30.1	29.4	27.3	26.8	141.8	28.36
80	26.2	28.2	25.7	23.9	26.6	130.6	26.12
00	20.2	2012			1	581.9	29.095

Use Analysis of Variance (ANOVA) to test the null hypothesis that the treatment means are equal at the  $\alpha$  = 0.01 level of significance. Fill in the ANOVA table.

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	fo
Treatments	90,39	3	30,13	16,31
Error	29.41	16	1.838	-
Total	119.8	19		-

$$\int_{0}^{\infty} = \frac{30.13}{1.839} = 16.39 \text{ }$$



treatment means

Write a 99% confidence interval on Vickers hardness at the 80% relative humidity level.

$$J_{4} = 26.12 + 0$$

$$+ 12,9(14) = + .005,16 = 2.921 + 0$$

$$M_{4} : 26.12 + 2.921 \sqrt{\frac{1.838}{5}}$$

$$24.35 < M_{4} < 27.89$$

$$+ 12$$

Use Fisher's Least Significant Difference to determine which, if any, pairs of relative humidities show significant difference at  $\alpha = 0.01$ .

$$LSD = \frac{1}{40}, \frac{1}{40} = \frac{1.9}{2.505}$$

$$= \frac{1.921}{2.1.838}$$

$$= \frac{1.9}{5}$$

$$= \frac{1.9}{40}$$

$$= \frac{1.9}{1.9}$$

Duly 20% to 60%, 40% vs. 80%, and 20% vs. 80% humidity pairs show significant differences in Vickers hardness @ X=0.01. (+1)

Formulae:

$$SS_T = \sum_{i=1}^a \sum_{j=1}^n y_{ij}^2 - \frac{y_{ij}^2}{N}$$
 with an  $-1$  degrees of freedom

$$SS_{Treatments} = \sum_{i=1}^{a} \frac{y_{i}^{2}}{n} - \frac{y_{i}^{2}}{N}$$
 with  $a - 1$  degrees of freedom

$$SS_E = SS_T - SS_{Treatments}$$
 with  $a(n-1)$  degrees of freedom

$$MS_{Treatments} = \frac{SS_{Treatments}}{a-1}$$

$$MS_E = \frac{SS_E}{a(n-1)}$$

$$f_0 = \frac{MS_{Treatments}}{MS_E}$$

$$f_{critical} = f_{\alpha,\alpha-1,\alpha(n-1)}$$

CI on 
$$\mu_i$$
:  $\bar{y}_{i} \pm t_{\alpha/2,\alpha(n-1)} \sqrt{\frac{MS_E}{n}}$ 

Cl on 
$$\mu_i - \mu_j$$
:  $\bar{y}_{i+} - \bar{y}_{j+} \pm t_{\alpha/2, \alpha(n-1)} \sqrt{\frac{2MS_E}{n}}$ 

$$LSD = t_{\alpha/2, \alpha(n-1)} \sqrt{\frac{2MS_E}{n}}$$