ICMA151 Statistics for Science I

Name: _____ **ID:**_____

Quiz 6 (5%) 40 points (10 points each)

Problem

1. Due to his high blood pressure, Sam watches the sodium content of the foods that he eats. Five samples for each of four brands of canned turkey (97% fat free) were tested for sodium content, measured in milligrams of sodium per 2-ounce serving.

Brand 1	Brand 2	Brand 3	Brand 4
250	175	175	200
251	185	180	210
260	175	180	210
255	180	170	195
245	165	190	205

The following summary table and ANOVA were generated by statistical software as shown below:

SUMMARY TABLE

Groups	Count	Sum	Average	Variance
Brand 1	5	1261	252.2	31.7
Brand 2	5	880	176	55
Brand 3	5	895	179	55
Brand 4	5	1020	204	42.5

ANOVA TABLE

Source of Variation	df	SS	MS	F	P-value	F crit
Brand	3	18632.4	6210.8	134.871	0.000	3.23887
Error	16	736.8	46.05			
Total	19	19369.2				

Use the *p*-value approach to test whether there is a significant difference in mean amount of sodium in the four brands. Let $\alpha = 0.05$.

Can you reject the null hypothesis?

_____

_____ of the brands of canned turkey has a significantly different mean sodium content from the others.

2. Physicians depend on laboratory test results when managing medical problems such as diabetes or epilepsy. In a uniformity test for glucose tolerance, three different laboratories were each sent $nt = 5$ identical blood samples from a person who had drunk 50 milligrams (mg) of glucose dissolved in water. The laboratory results (in mg/dl) are listed here:

Lab 1	Lab 2	Lab 3
121.3	99.5	104.2
111.9	113.2	109.7
110.1	108.9	102.3
105.4	109.1	111.2
101.6	100.4	106.6

Do the data indicate a difference in the average readings for the three laboratories? Use Tukey's method for paired comparisons to rank the three treatment means. Use $\alpha = 0.05$.

What is the F-statistic?

_____

What is the p-value?

_____

Can you reject the null hypothesis?

_____

There _____ sufficient evidence to indicate a difference in the treatment means.

3. A professor of economics wants to study the relationship between income (y in $1000s) and education ($x$ in years). A random sample eight individuals is taken and the results are shown below.

Education	16	11	15	8	12	10	13	14
Income	58	40	55	35	43	41	52	49

Determine the coefficient of determination.

$R^2 =$ _____

Discuss what its value tells you about the two variables.

_____

Calculate the Pearson correlation coefficient.

$r =$ _____

Why does it have the sign it has?

_____

What is the equation of the estimated regression line?

_____

Is there a linear relationship between education and income? Explain?

4. A study was conduced to determine the effect of extra help sessions attended on students ability to avoid mistakes on a 20- multiple choice test. The data shown below represent the number of extra help sessions attended (x) and the average number of mistakes (y) recorded.

x	1	2	3	4	5	6
y	6.1	5.1	5.0	4.2	3.7	3.2

Use the regression formulas to find the least-squares line for the data.

$\hat{y} = $ _____

Plot the six points and graph the line.

Does the line appear to provide a good fit to the data points?

_____

Use the least-Squares line to predict the value of y when $x = 3.5$.

_____

Do the data provide sufficient evidence to indicate that y and x are linearly related at the 1% level of significance?

p-value:

_____

Conclude:

_____

y and *x* _____ linearly related.

Calculate the coefficient of determination.

$r^2 =$ _____

What information does this value give about the usefulness of the linear model?

_____