Section 8 HO

A. An experiment was conducted to compare the effectiveness of 4 techniques for teaching spelling to 1st graders using a 'spelling pattern' approach. The students in a classroom are randomly assigned to the 4 techniques, and then a spelling test was administered to all students at the end of the experiment. In the first 2 techniques, students are praised for their **ability**; in one technique, the words are presented by a **teacher** or teacher's aide, and in the other the words are presented by a **computer**. In the other 2 techniques, students are praised for their **effort**; again, in one technique, the words are presented by a **teacher** or teacher's aide, and in the other the words are presented by a **computer**.

   1. Using the reported scores below, **test the null hypothesis** that the techniques are equally effective.

Technique 1 (Ability/Teacher):	2, 0, 5, 7
Technique 2 (Ability/Computer):	0, 1, 3 ,6, 5
Technique 3 (Effort/Teacher):	9, 6, 5, 2, 4, 5
Technique 4 (Effort/Computer):	1, 4, 6, 7, 8

[Ans. See QHW-7, p. 3, for the detailed solution to this type of problem.

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Analysis of Variance Table

Response: Score
                Df  Sum Sq  Mean Sq F value Pr(>F)
technique        3  19.567  6.5222  0.9265 0.4505
Residuals       16 112.633  7.0396
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We **retain the null** because p = .45 > .05.]

   2. **Without doing any more formal statistical tests**, discuss the impact on spelling score of (a) the method of reinforcement (praising **effort** rather than **ability**), and (b) the method of delivery (**teacher** versus **computer**). [Ans. Compute the **group means** and compare them. Which means are larger? The **effort** groups seem to do better …]

B. Five different treatments were tried, one treatment on each of 5 different groups of patients who have the same symptoms. The improvement of each patient was measured. Here are the sample size, mean and s.d., i.e., n_j, $\bar{x}_j$, and s_j for the 5 groups: (10, 2, .6), (15, 3, .7), (14, 4, .8), (8, 3, .6), and (12, 3, .8). Use a 1-way ANOVA and $\alpha = 0.05$ to **test** the null hypothesis that there are no differences in μ_j among the 5 treatments.

1. The 5 treatments differ in the *dosage* of a certain medicine given to patients. The levels are 0, 1, 2, 3 and 4 units, respectively. **Without doing any other formal test**, describe the effect of *dosage* on patient health. [**Ans**. The **control** group (*dosage* = 0) does **worst** (mean = 2.0); a ***dosage* of 2 units** seems to be **best** (mean = 4.0), etc.]

C. Professor Marvel has just perfected a new pruning technique designed to increase the yield of apple trees. She designs an experiment to compare yield from her new technique (x_1) with that of no pruning (x_2) and 2 standard pruning techniques (x_3 & x_4). She samples 10 trees in each condition and records their yield. A summary of her data is provided below. (From Quiz8 '01)

$\sum x_1 = 1895$, $\sum x_2 = 901$, $\sum x_3 = 1322$, $\sum x_4 = 1375$

$\sum x_1^2 = 361359$, $\sum x_2^2 = 86115$, $\sum x_3^2 = 179372$, $\sum x_4^2 = 194679$

1. Assuming ANOVA is appropriate, complete the ANOVA summary table below for this dataset. **Fill in values for a, b, c, d, e, f, & g**. (35)

Source	SS	df	MS	F
Between	49787	b	e	g
Within	a	c	f	
Total	67199	d		

2. Use the information presented in the table to **test Ho:** $\mu_1 = \mu_2 = \mu_3 = \mu_4$**.** (15)

3. **Without doing any other formal test**, describe the effect of pruning *technique* on *yield*. [**Ans**. The **control** group (*group 2*) does **worst** (mean = 90.1); the **new** group (*group 1*) seems to be **best** (mean = 189.5), etc.]