

MTH 217 – Prof. Richard B. Goldstein – ANOVA HW Problems

Page web address: <http://www.providence.edu/mcs/rbg/mat/math217anovahw.pdf>

[1] **One Way ANOVA:** Understandable Statistics - Brase & Brase – 8<sup>th</sup> Ed. – Houghton Mifflin

How productive are U.S. workers? One way to answer this question is to study annual profits per employee. A random sample of companies in computers (I), aerospace (II), heavy equipment (III), and broadcasting (IV) gave the following data regarding annual profits per employee (units in thousands of dollars). (Source: *Forbes Top Companies*, edited by J.T. Davis, John Wiley and Sons.)

I	II	III	IV		I	II	III	IV
27.8	13.3	22.3	17.1	sums	86.4	69.4	70.2	82.6
23.8	9.9	20.9	16.9	sumsq	1757.14	901.80	1198.78	1196.56
14.1	11.7	7.2	14.3					
8.8	8.6	12.8	15.2					
11.9	6.6	7.0	10.1					
	19.3		9.0					

What are each of the group means. Are they equal? Test at the  $\alpha = 5\%$  level using a one way ANOVA. What is the F statistic and its p-value? Repeat hypothesis test using **Kruskal-Wallis**.

[2] **Two Way ANOVA with replication** (fictitious data)

Comparing the drop in cholesterol with various medications mixed with exercise. Note that a negative was the result of an increase in cholesterol after one year.

		Medication:			
		A	B	C	D
No exercise		12	20	9	6
		15	18	-2	15
		18	12	14	8
		25	14	20	6
		8	12	15	5
Exercise		20	25	10	15
		30	40	15	20
		-5	20	30	10
		20	30	15	18
		22	35	19	-6

Are all the medications equal in their effect? Does exercise matter? Does the interaction of exercise and medication matter? Test each at the  $\alpha = 5\%$  level.

→ **Both spreadsheets are available on the web at the following file:**

<http://www.providence.edu/mcs/rbg/mat/anova.xls>