4C3/6C3, 2015 **Group number: G _____** **Class 04B, 30 Jan 2015**

Student number 1: _____ Student number 2: _____ Student number 3: _____

Please ensure your student numbers and your group number are consistent.
Both must appear so we can grade your work appropriately.

This class exercise is get comfortable with regular tests for differences (unpaired) and paired tests.

1. Identify if the data analysis will used ***paired*** or ***unpaired*** testing methods. If you say "*paired*" as your answer, also write down what is in common within the pairs. Answer in the gaps.
    a. You use a chemical (either F or T) that it added to a lubricant. You take the lubricant, split it in two parts, adding either F or T to it. Mix. You measure the kinematic viscosity of the mixture.

    b. People participate in a drug trial, some receive the placebo, and others receive the drug being tested for migraine elimination. Participants judge the time taken for the migraine to go away.

    c. You take a piece of wood (e.g. a 2 x 4) and apply your company's new coating that is being tested. Either formulation A or B is randomly applied on the left half, and the other is applied on the right half. The coating is to improve the weatherability (lack of water penetration).

    d. You are testing the durability (hardness) of a new rubber compound for work boots. Apply compound P or compound W. One is randomly selected to go on the left boot, the other on the right boot. Two months later you have the construction workers return the boots and measure the amount of material worn away.

2. You are testing a new analytical method for biological oxygen demand (BOD). The existing method is the dilution method, the new one, is the manometric method. You take a sample of water and split it, measuring the BOD with both methods. The numbers are (also on the course website to copy/paste):

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Dilution    (D):        11, 26, 18, 16, 20, 12,  8, 26, 12, 17, 14
Manometric  (M):        25,  3, 27, 30, 33, 16, 28, 27, 12, 32, 16
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    Enter these data into R (or it is possible to solve this by hand), and **make a recommendation to the lab manager on whether you should use the cheaper manometric system.**
    Here are some results to help you:
    - $\bar{x}_D = 16.4$ and $s_D = 5.9$
    - $\bar{x}_M = 22.6$ and $s_M = 9.5$
    - $\bar{x}_W = 6.27$ and $s_W = 11.8$

3. Why is a paired test appropriate for the BOD case study? [you will need some engineering knowledge about BOD].

4. Interpret the statistical result from your paired test confidence interval. Compare that interpretation to the one you gave your lab manager in question 2.

5. Plot these data in at least these two ways: separate plots of D and M, and a plot of $(M - D)$. What do you notice in these data that will alter your prior conclusions?

6. *From a prior final exam, 2012*:

Eleven males participated in a exercise and diet program designed to stimulate weight loss. Their weight both before and after participation in the program is shown in the following list. Show whether there is evidence, or not, to support the claim that this particular program is effective in reducing weight. Clearly explain all your calculations.

Individual	Before	After
1	195	187
2	213	195
3	247	221
4	201	190
5	162	175
6	210	197
7	215	199
8	246	221
9	294	278
10	310	285
11	152	178

These data are also on the course website. Show rough calculations in the space above, at least describe how you will approach the problem. No need to finish it in the class today.

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Before:     195, 213, 247, 201, 162, 210, 215, 246, 294, 310, 152
After:      187, 195, 221, 190, 175, 197, 199, 221, 278, 285, 178
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