

Name _____

Student Number _____

University of Toronto Mississauga
STA442/1008 2012
QUIZ 4 (11 a.m.)

1. (3 Points) Three hundred university student volunteers who wanted to lose weight were weighed in a clinic under controlled conditions. Then they were randomly assigned to one of six treatment groups:

- 1 Free Health Club membership without personal trainer
- 2 Free Health Club membership with personal trainer: Emphasis on aerobic conditioning
- 3 Free Health Club membership with personal trainer: Emphasis on strength training
- 4 Free vegetarian cooking and diet class
- 5 Free Exercise video
- 6 Waiting list control (They were told “Sorry, we’ll call you when there’s an opening.”)

After six months they were weighed again. The dependent variable is weight loss in kilograms: Before minus After.

(a) Is average weight loss in the vegetarian cooking and diet class condition more than average weight loss for the waiting list control condition?

i. State the null hypothesis in terms of μ_j values. ($\mu_4 = \mu_6$)

ii. In the table below, give the weights of the contrast or contrasts you would test to answer the question. There should be one row for each contrast.

1	2	3	4	5	6
0	0	0	1	0	-1

(b) Is average weight loss different for the three treatments that *do not* include a health club membership?

i. State the null hypothesis in terms of μ_j values. ($\mu_4 = \mu_5 = \mu_6$)

ii. In the table below, give the weights of the contrast or contrasts you would test to answer the question. There should be one row for each contrast.

1	2	3	4	5	6
0	0	0	1	-1	0
0	0	0	0	1	-1

- (c) Test for differences among the three treatments that include a health club membership, and *at the same time*, for the three treatments that do not include a health club membership

- i. State the null hypothesis in terms of μ_j values. ($\mu_1 = \mu_2 = \mu_3$ and $\mu_4 = \mu_5 = \mu_6$)
- ii. In the table below, give the weights of the contrast or contrasts you would test to answer the question. There should be one row for each contrast.

1	2	3	4	5	6
1	-1	0	0	0	0
0	1	-1	0	0	0
0	0	0	1	-1	0
0	0	0	0	1	-1

2. (5 Points) For each of the following questions, *on your printout*, circle the number that answers the question, and write the question number (2a, 2b, etc.) beside it. That is, you are writing the answers to this question on your printouts, and *not* on the quiz paper.

- (a) For the Chick Weight data, what proportion of the variation in weight is explained by differences among the 6 treatment means? ($R^2 = 0.541685$)
- (b) For the Chick Weight data, test for differences among mean weights for the five feed types *excluding horsebean*. Give the value of the F statistic. ($F = 9.32$)
- (c) For the Furnace data, we want to know whether average energy consumption is related to chimney shape. Circle the numerical value of the test statistic. ($F = 3.83$)
- (d) For the Furnace data, give the F statistic for the comparison between energy consumption for round vs. rectangular chimneys. ($F = 3.75$)
- (e) For the Furnace data, give the Bonferroni-adjusted p -value for the comparison between round vs. square chimneys. You can either circle a number that's directly on your printout, or do the calculation and write it beside the unadjusted p -value. ($p = 0.0364$ directly from `lsmeans`, or $0.0121 * 3 = 0.0363$)

3. (2 Points) For the Furnace data,

- (a) Do the Bonferroni and Scheffé multiple comparisons lead to the same conclusions? Answer Yes or No. (Yes)
- (b) State the conclusion (or conclusions) in simple, non-technical language. (Houses with square chimneys tend to use more energy than houses with round chimneys.)

Please turn in **both** log files and **both** list files with the quiz. Make sure your name and student number are written on them.