Name _____

Psychology 516
Applied Multivariate Analysis
Homework 1
Due 9/11/2018

Assume the following table of means for four groups. Call this matrix **X**.

	Variable 1	**Variable 2**	**Variable 3**	**Variable 4**
Group 1	4	9	3	8
Group 2	6	7	2	1
Group 3	1	6	6	2
Group 4	3	8	7	4

The general matrix equation, **LXM**, describes how to create linear combinations of the groups (the **L** matrix) and variables (the **M** matrix) to test different hypotheses.

In words, describe what each of the following **L** vectors is trying to accomplish:

1. $\begin{bmatrix}1 & 1 & 1 & 1\end{bmatrix}$ = $\mathbf{L_1}$

2. $\begin{bmatrix}1 & 0 & 0 & -1\end{bmatrix}$ = $\mathbf{L_2}$

3. $\begin{bmatrix}1 & 0 & 0 & 0\end{bmatrix}$ = $\mathbf{L_3}$

4. $\begin{bmatrix}1 & 1 & -2 & 0\end{bmatrix}$ = $\mathbf{L_4}$

5. $\begin{bmatrix}1 & 1 & -1 & -1\end{bmatrix}$ = $\mathbf{L_5}$

Assume that you want to answer the following “variable” questions. Give the appropriate **M** vector or matrix.

6. The linear combination given by **L** should be performed separately on each of the variables (= $\mathbf{M_1}$).

7. Variable 3 is the only variable of interest (= $\mathbf{M_2}$).

8. The difference between Variables 1 and 4 is of interest (= $\mathbf{M_3}$).

9. The sum of all variables is of interest (= $\mathbf{M_4}$).

10. The difference between the first two variables and the difference between the second two variables is to be compared (= $\mathbf{M_5}$**)**.

Carry out the following matrix multiplications, in R.

11. $\mathbf{L_1XM_2}$

12. $\mathbf{L_2XM_5}$

13. $\mathbf{L_3XM_3}$

14. $\mathbf{L_4XM_4}$

15. $\mathbf{L_5XM_1}$