

Problem 1

a)

```
> GPA = c(1.8, 0.9, 1.5, 2.4, 2.4, 3.3, 3.9, 3.6, 2.1, 2.4, 3.0, 3.9); GPA
[1] 1.8 0.9 1.5 2.4 2.4 3.3 3.9 3.6 2.1 2.4 3.0 3.9
> Club = c(rep(1, 4), rep(2, 4), rep(3, 4)); Club
[1] 1 1 1 1 2 2 2 2 3 3 3 3
> College = c(rep(1:4, 3)); College
[1] 1 2 3 4 1 2 3 4 1 2 3 4
> results = glm(GPA ~ factor(Club) + factor(College))
> summary(aov(results))
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
factor(Club)	2	5.82	2.91	11.64	0.0086 **
factor(College)	3	2.82	0.94	3.76	0.0787 .
Residuals	6	1.50	0.25		

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

b) For factor "Club":

F test statistic = 11.64, and p-value = 0.0086 < $\alpha = 0.05$.

Thus Reject H_0 at $\alpha = 5\%$ significance level. The critical value is shown below:

```
> qf(0.95, 2, 6)
[1] 5.143253
```

c) For factor "College":

F test statistic = 3.76, and p-value = 0.0787 > $\alpha = 0.05$.

Thus DO NOT Reject H_0 at $\alpha = 5\%$ significance level. The critical value is shown below:

```
> qf(0.95, 3, 6)
[1] 4.757063
```

Problem 2

a)

```
> GPA = c(4.0, 3.4, 3.2, 2.5, 3.2, 2.3, 2.5, 3.3, 1.5, 2.4, 2.8, 3.7,
+         3.2, 3.7, 2.2, 3.0, 3.2, 2.7, 1.9, 2.8, 1.5, 2.1, 3.3, 2.8); GPA
[1] 4.0 3.4 3.2 2.5 3.2 2.3 2.5 3.3 1.5 2.4 2.8 3.7 3.2 3.7 2.2 3.0 3.2 2.7
1.9 2.8 1.5 2.1 3.3 2.8
> College = c(rep(1, 6), rep(2, 6), rep(3, 6), rep(4, 6)); College
[1] 1 1 1 1 1 1 2 2 2 2 2 2 3 3 3 3 3 3 4 4 4 4 4 4
> Club = c(rep(c(1, 1, 2, 2, 3, 3), 4)); Club
[1] 1 1 2 2 3 3 1 1 2 2 3 3 1 1 2 2 3 3 1 1 2 2 3 3
> results = glm(GPA ~ factor(Club) * factor(College))
> summary(aov(results))
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
factor(Club)	2	3.04	1.52	5.630	0.0189 *
factor(College)	3	1.80	0.60	2.222	0.1382
factor(Club): factor(College)	6	2.16	0.36	1.333	0.3154
Residuals	12	3.24	0.27		

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

b) For the interaction between factor “Club” and factor “College”:

F test statistic = 1.333, and p-value = 0.3154 > $\alpha = 0.05$.

Thus DO NOT Reject H_0 at $\alpha = 5\%$ significance level. The critical value is shown below:

```
> qf(0.95, 6, 12)
[1] 2.99612
```

c) For factor “Club”:

F test statistic = 5.630, and p-value = 0.0189 < $\alpha = 0.05$.

Thus Reject H_0 at $\alpha = 5\%$ significance level. The critical value is shown below:

```
> qf(0.95, 2, 12)
[1] 3.885294
```

d) For factor “College”:

F test statistic = 2.222, and p-value = 0.1382 > $\alpha = 0.05$.

Thus DO NOT Reject H_0 at $\alpha = 5\%$ significance level. The critical value is shown below:

```
> qf(0.95, 3, 12)
[1] 3.490295
```

Problem 3

a)

Beta0 is the average amount of weight loss of a participant after 8 weeks who was not on any diet and did not exercise at all during the past 8 weeks.

b)

Beta1 is the average amount of CHANGE (or INCREASE) in the weight loss of a participant after 8 weeks who changed the diet from one without the Low Calorie diet to one with the Low Calorie diet, while his/her other diet manners and weekly average time spent exercising both did not change.

c)

Beta4 is the CHANGE (or INCREASE) in the average amount of weight loss of a participant after 8 weeks with each ADDITIONAL hour of weekly average time spent exercising, while his/her diet manners did not change.