Biology 4605 / 7220 Name _____
Quiz #6b 21 October 2015

Cobb (2015 *Design and Analysis of Experiments* p 150) reported the age (in months) at which babies first walked. The goal of the study was to find if special (structured) exercise lowered the age, compared to 3 control groups: 12 minute/day of unstructured exercise, no exercise and a weekly parental report, no exercise and a single parental report at the end of the study. Six baby boys were assigned randomly to each level, only 5 values were obtained for single report babies.

Age	Group
9	Special
9.5	Special
9.75	Special
10	Special
13	Special
9.5	Special
11	Exercise
10	Exercise
10	Exercise
11.8	Exercise
10.5	Exercise
15	Exercise
11	Weekly Report
12	Weekly Report
9	Weekly Report
11.5	Weekly Report
13.3	Weekly Report
13	Weekly Report
13.3	Single Report
11.5	Single Report
12	Single Report
13.5	Single Report
11.5	Single Report

1. Write a GLM, using A for age, and Gr for Group. [5]

2. Complete the ANOVA table

3 groups compared,single report group not included

	Df	Sum of Sq	Mean Sq	F Value	Pr(F)
Group		7.75			0.268
Residuals					
Total	17	48.156			

[6]

3. Given the 'non-significant' decision, it is of interest to calculate the sample size needed to detect a difference among the three groups. To do this we recompute the ANOVA table with more degrees of freedom (df = more babies - 1). The formula is

new F-ratio = initial F-ratio * multiplier,
where multiplier = $(df_{additional} + df_{initial}) / df_{initial}$
$df_{initial}$ = Residual df in the table above.

additional df	multiplier	New F-ratio	p(F<0.05)
0	1		
10			0.1227
15			0.0830
20			0.0561
25			0.0380
30	2.76	3.98	0.0257

3a. Fill in the two boxes in the table [2]

3b. Use the p-values to estimate the additional df needed in a future study. Circle your estimated additional df [1]

3c Calculate the multiplier and the F-ratio for your estimate. [2]

Calculations like this are required in clinical trials and with animal studies. In other research areas, calculations like this can prevent waste of time and effort on experimental programs that are 'doomed to failure' because of inadequate replication and high variability due to poor experimental controls.