PSYC 5143
Spring 2024
Problem Set #9

This is due at 2:00 p.m. on Monday, April 15 on Blackboard, preferably in an R file.

Use the data at right for #1, #2, & #3 (these are also stored here in a .csv file):

A1	A2	A3
28	32	36
31	35	39
36	37	44
26	30	37
29	31	33

1) Treat the data above as if they were from a between-subjects design (with n = 5 per cell) and perform an ANOVA, however you see fit. (*Make sure A is a factor*! Use R's default dummy-coding. Or create your own. Or create contrast codes. Whatever works for you.) Report the values of $SS_{between}$, SS_{within}, and SS_{total}, which you might know better as *SSR* and *SSE* for the augmented model and *SSE* an intercept-only model, respectively; the first two values should sum to the third.

2) Now treat the data above as if they were from a repeated-measures design, such that the first row represents Subject 1, the second row Subject 2, and so on. There is an *id* variable in the data file, so you don't need to add it yourself. *Make sure id is a factor*. If you don't do this, R will treat it as if the numbers are meaningful; the numbers have no numeric meaning!
   a. Perform an ANOVA and report/figure out the values of *SS* for factor A and *SS* for subjects/persons. If you use `ezANOVA` – which I recommend here! – *SSn* for the intercept is *SS* for subjects/persons. (*SSn* stands for *SS* for the numerator. *SSd* stands for *SS* for the denominator.)
   b. How are the various *SS*s from #1 related to those from #2? (What's the same? What's different? Do any two things add up to another thing? Et cetera.)
   c. Notice that the *F*-ratio is quite a bit larger in #2 than in #1. Say why, being sure to say something about the relationship between $SS_{residual}$ (also known as SS_{error} and SS_{within}) from #1 and the *SSd* values that `ezANOVA` produces.

3) Now model the data once more using `lmer` in the `lme4` package. Verify that the *F*-ratio that `lmer` reports is the same that you found for the analysis in #2. (This equivalence breaks down once designs get more complicated.)