REVIEW OF SUMMATION ALGEBRA

In deriving the correlational statistics used throughout this course, we will have many occasions in which we will sum scores across cases. That is, we will add up scores on, say x, across all n cases (i.e., from 1 through n). In more formal terms,*

$$\Sigma\, x_i = x_1 + x_2 + x_3 + \ldots + x_n$$

Likewise, the sum of squared scores is indicated as

$$\Sigma\, x_i^2 = x_1^2 + x_2^2 + x_3^2 + \ldots + x_n^2 \quad \text{(the “sum of squares”)}$$

while the sum of two scores multiplied by each other is given by

$$\Sigma\, x_{1i}x_{2i} = x_{11}x_{21} + x_{12}x_{22} + x_{13}x_{23} + \ldots + x_{1n}x_{2n} \quad \text{(the “sum of cross-products”)}$$

In addition, there are three basic rules of summation that are very useful.

(1) $\Sigma\, k = kn$

(i.e., summing a constant across n cases multiplies that constant by n)

(2) $\Sigma\, kx_i = k\, \Sigma\, x_i$

(i.e., a constant can always be removed to the left of the summation sign)

(3) $\Sigma\, (x_{1i} \pm x_{2i}) = \Sigma\, x_{1i} \pm \Sigma\, x_{2i}$

(i.e., summing the sum of two variables x_1 and x_2 across all cases is the same as first calculating the sums of the two variables separately across all cases and then summing those two sums together)

The last two rules will be used extremely often in the first and third parts of this course, so you should have them at your fingertips.

*Although the summation is more precisely represented as

$$\sum_{i=1}^{n} x_i$$

this nicety can be ignored, since we will always be summing across cases 1 through n.