

Summation Algebra Proofs

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Sum of Deviation Scores

- ▣ Prove that, in any list of numbers, the sum of the deviation scores is zero, that is,

$$\sum_{i=1}^N dx_i = \sum_{i=1}^N (X_i - \bar{X}_{\bullet}) = 0$$

Linear Transformation Rule for Means

- ▣ If, a group of X 's with mean \bar{X}_{\bullet} is transformed into a group of Y 's via the rule

$$Y_i = aX_i + b$$

then the new mean must follow the rule

$$\bar{Y}_{\bullet} = a\bar{X}_{\bullet} + b$$

Linear Transformation Rule for Deviation Scores

- ▣ If, a group of X 's with mean \bar{X}_{\bullet} is transformed into a group of Y 's via the rule

$$Y_i = aX_i + b$$

then the deviation scores must follow the rule

$$dy_i = a dx_i$$

Definition – Sample Variance

The sample variance of a set of numbers is

$$S_x^2 = \frac{1}{N-1} \sum_{i=1}^N dx_i^2$$

Linear Transformation Rule for Variances

If, a group of X 's with variance S_x^2 is transformed into a group of Y 's via the rule

$$Y_i = aX_i + b$$

then the new variance must follow the rule

$$S_y^2 = a^2 S_x^2$$