JCE SymMath: Symbolic Mathematics in Chemistry

A Brief Introduction to the Gaussian Distribution, Sample Statistics, and the Student's *t* Statistic

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File Name: StatisticsCollection.zip

Keywords: Upper-Division Undergraduate; Analytical Chemistry; Laboratory Instruction; Physical Chemistry; Chemometrics; Computer Based Learning; Symbolic Mathematics; Mathcad

Requires Mathcad 11 or higher. The zip file contains three working versions of the document, namely: xmcd in mathcad 12 xml file format; *.mcd in mathcad 12 format; and *_mcd11.mcd in Mathcad 11 format.

Statistics is an important part of the chemistry curriculum, and small-sample statistics are critical to interpreting experimental results. Most students, however, have a very poor understanding of how small data sets behave and how statistical tests are used with small data sets. This set of Mathcad documents is designed to develop students' understanding of normal distributions, small sample sets, and Student's t statistic. Gaussian.mcd allows students to explore the area under a Gaussian distribution to understand one- and two-sided distributions. Sample_statistic.mcd allows students to observe how the average and standard deviation depend upon the number of samples taken from a normal population. They also explore how robust these variables are for a small number of samples. Students_t_statistic.mcd then goes on to show the importance of using Student's t with small sample sets. Two additional documents, descriptive_stats.mcd and comparative_stats.mcd, are included for use as calculation templates. They are designed for the user to enter a data set and they calculate a number of statistical parameters for the data. The documents are suitable to use in physical chemistry, analytical chemistry, or instrumental analysis. They require Mathcad 11, Mathcad 12, or later and expect students to have minimal experience using Mathcad. If students are proficient with Mathcad, the instructor may increase the degree of interaction by removing some equations or graphs.
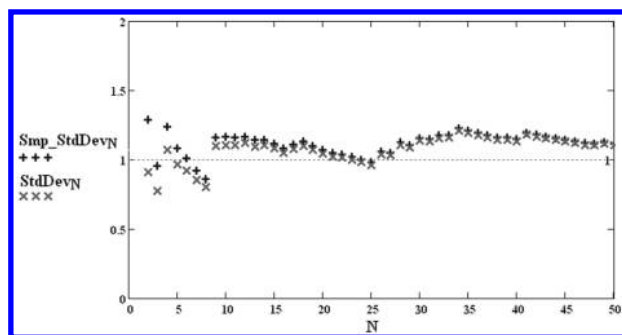
Sample standard deviation (+) and standard deviation (x) as a function of *N*, the number of samples taken from a population and used to calculate an average that represents the total population.