Probability and Statistics Standard #7

Standard Set 7.0 Probability and Statistics
Students compute the "variance" and the "standard deviation" of a distribution of data.

Deconstructed Standard
1. Students compute the "variance" of a distribution of data.
2. Students compute the "standard deviation" of a distribution of data.

Prior Knowledge Necessary
Students should know how to:
- perform arithmetic computations with rational numbers.
- calculate the mean of a data set.

New Knowledge
Students will need to learn to:
- calculate the variance of a data set.
- calculate the standard deviation of a data set.
- explain the meaning of the standard deviation and the variance of a given data set.

Categorization of Educational Outcomes
Competence Level: Application and Analysis
1. Students will calculate variance for a given set of data.
2. Students will calculate the standard deviation for a given set of data.
3. Students will create examples of data sets.
4. Students will explain relationships between mean, standard deviation, and variance.
5. Students will compare units of standard deviation and data.
6. Students will interpret standard deviation and variance in the context of real world problems.

Necessary New Physical Skills
None

Assessable Result of the Standard
1. Students will be able to calculate the standard deviation and the variance for a given set of data.
2. Students will be able to create examples of data sets and calculate the standard deviation and variance for the data.

Probability and Statistics Standard #7
Model Assessment Items

Computational and Procedural Skills

1. Calculate the standard deviation of the data set: {20, 30, 50, 60}.

2. Calculate the variance of the data set: {12.5, 14.5 19.5, 13.5}.

Conceptual Understanding

1. Create a simple set of numbers between 1 and 10. Calculate the mean and standard deviation of your data set. Explain the meaning of the standard deviation with respect to the mean of your data set.

2. Explain why the sum of the deviations in a data set is always equal to zero.

3. When calculating the variance, explain why you divide by one less (i.e., $n-1$) than the number of values in the data set?

4. Compare the units of the standard deviation with the units of the data. Explain your findings.

5. Explain the connection between the variance, the standard deviation and the mean for any given data set.

Problem Solving/Application

1. You have just entered the real estate market in your area. The first eight homes you sold and their prices are given in the table below. Calculate the average selling price and the standard deviation.

Number of Homes	Selling Price
1	$340,000
2	$260,000
2	$280,000
3	$300,000

2. For the same table above, find the variance.

3. The mean diameter of a Cardinal Best Compact Disc is 12.0 cm, with a standard deviation of 0.012 cm. CDs that are more than one standard deviation from the mean cannot be shipped. How would those statistics be useful to a quality control engineer of Cardinal Best Company?