**Algebra II**

## Section 12.4 - Standard Deviation

**Obj:** To find the standard of deviation for a set of data

The **standard deviation**, $\sigma$, of a set of n values, $x_1, x_2, x_3, ...., x_n$ with the mean of $\bar{x}$ is

$$\sigma = \sqrt{\frac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + (x_3 - \bar{x})^2 + ... + (x_n - \bar{x})^2}{n}}$$

**Def:** - The **variance** is $\sigma^2$.

- The **range** of a set of data is the difference between the highest and lowest values.

- Each value $x_i - \bar{x}$ is the **deviation from the mean.**

1. Find the range, the variance, and the standard deviation of the following set of data:
   20, 22, 21, 23, 25, 27, 20, 22, 27, 23

**Range:**

**Mean** $\bar{x}$:

| $x_i$ | $x_i - \bar{x}$ | $(x_i - \bar{x})^2$ |
|---|---|---|
| 20 | 20 - = | |
| 20 | 20 - = | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Sum of all the $(x_i - \bar{x})^2$ =

Using the formula

$$\sigma = \sqrt{\frac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + (x_3 - \bar{x})^2 + \ldots + (x_n - \bar{x})^2}{n}}$$

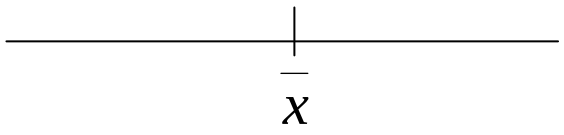
$$\sigma = \sqrt{\frac{\quad}{\quad}}$$

$\sigma =$ ← **Standard deviation**

**Variance** $\sigma^2$ =

2. Using the data from problem 1, within how many standard deviations of the mean do the following scores fall?

   a) 22, 21, 23, 25




   b) 20, 22, 21, 23, 25, 27, 20, 22, 27, 23

The z-score is the number of standard deviation a value is from the mean:

$$\text{z-score} = \frac{\text{value mean}}{\text{standard deviation}} \quad \text{or} \quad \frac{x - \bar{x}}{\sigma}$$

3. A set of values has a mean of 85 and a standard deviation of 6. Find the z-score of the value 76.

   76 is ___ standard deviations from the mean of 85.

4. Using the same mean and standard deviation from problem 3, find the value that has a z-score of 2.5 (a value that is 2.5 standard deviations from the mean)