MEASURES OF DISPERSION

Complete the following problems to reinforce your understanding of the concept covered in this module.

Problem 1:

The grades (percentage) of exams for a sample of students in a certain class are:

79.9 84.9 81.0 82.2
78.4 79.9

Determine the sample variance.

Problem 2:

Determine the Mean, Variance, and Standard Deviation of the following data:

x_i	$x_i - \mu$	$(x_i - \mu)^2$
6	-1	1
10	3	9
5	-2	4
4	-3	9
9	2	4
8	1	1
$\sum x_i = 42$		$\sum (x_i - \mu)^2 = 28$

Problem 3:

For a 5 day period, an athlete measured their resting heart rate prior to going to the gym. The readings were:

64 68 74 76
78

Determine the Mean, Variance, and Standard Deviation of the data.

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Solution 1:

Recall that the sample variance, s^2, is found using the general formula:

$$s^2 = \frac{1}{n-1}\sum(x_i - \overline{x})^2$$

Placing the data in to a table and determining the:

The sample mean is:

$$\overline{x} = \frac{79.9 + 84.9 + 81.0 + 82.2 + 78.4 + 79.9}{6} = 81.05$$

Now us a table to get the remaining values:

x_i	$x_i - \overline{x}$	$(x_i - \overline{x})^2$
79.9	-1.15	1.32
84.9	3.85	14.82
81.0	-.05	.0025
82.2	1.15	1.32
78.4	-2.65	7.02
79.9	-1.15	1.32
$\sum x_i = 486.3$		$\sum x_i^2 = 25.81$

Now plugging in the values we get:

$$s^2 = \frac{25.81}{6-1} = 5.16$$

Solution 2:

All the information that we need to determine each of the variables is given.

The Mean is given by the general equation:

$$\mu = \frac{\sum x_i}{n} = \frac{42}{6} = 7$$

The Variance is given by the general equation:

$$\sigma^2 = \frac{\sum (x_i - \mu)^2}{n} = \frac{28}{6} = 4.67$$

The Standard deviation is given by the general equation:

$$\sigma = \sqrt{\frac{\sum (x_i - \mu)^2}{n}} = \sqrt{4.67} = 2.16$$

Solution 3:

We are dealing with a sample of data, therefore:

The Mean is given by the general equation:

$$\bar{x} = \frac{\sum x_i}{n} = \frac{64 + 68 + 74 + 76 + 78}{5} = 72$$

The Variance is given by the general equation:

$$s^2 = \frac{\sum (x_i - \bar{x})^2}{n-1} = \frac{(64-72)^2 + (68-72)^2 + (74-72)^2 + (76-72)^2 + (78-72)^2}{5-1} = 34$$

The Standard deviation is given by the general equation:

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}} = \sqrt{34} = 5.83$$