

### Section 3.6: Measuring The Spread of a Data Set

#### Part I: ~~Central Tendency Measures~~

- Range : MAXIMUM DATA POINT - MINIMUM DATA POINT
- Sample Variance : THE DISTANCE EACH DATA POINT IS FROM THE MEAN (AVERAGE) OF A DATA SET.

$$s^2 = \frac{\sum_{i=1}^n (x - \bar{x})^2}{n-1}$$

- Sample Standard Deviation : THE AVERAGE DISTANCE OF HOW FAR EACH DATA POINT VARIES FROM THE DATA SET MEAN (AVERAGE).

$$\text{SAMPLE STANDARD DEVIATION} = \sqrt{\text{SAMPLE VARIANCE}}$$

Part II: Example of Measuring The Spread of a Data Set

1. Find the range, the variance, and the standard deviation of the data set of the heights (in inches) of a pre-school class of 3 year olds.

26, 31, 32, 27, 35, 42

RANGE = MAX - MIN = 42 - 26 = 16 INCHES

SAMPLE VARIANCE : AVG ( $\bar{x}$ ) =  $\frac{26 + 31 + 32 + 27 + 35 + 42}{6} = 32.2$  INCHES

$x_i$	$\bar{x}$	$(x_i - \bar{x})$	$(x_i - \bar{x})^2$
26	32.2	-6.2	38.4
31	32.2	-1.2	1.4
32	32.2	-0.2	0.04
27	32.2	-5.2	27
35	32.2	2.8	7.8
42	32.2	9.8	96
			<u>170.64</u>

SAMPLE VARIANCE =  $\frac{170.64}{n-1}$   
↑  
# OF DATA POINTS

=  $\frac{170.64}{6-1}$   
=  $\frac{170.64}{5}$   
= 34.1 INCHES

STANDARD DEVIATION =  $\sqrt{34.1} = 5.8$  INCHES

2. Find the range, the variance, and the standard deviation of the data set given below.

7, 7, 7, 7, 7, 7, 7, 7

RANGE: 0

VARIANCE: 0

STANDARD DEVIATION: 0

3. Three different grocery stores in town sell wine. The average price of the wine sold in each store is \$14.99 per bottle. However, store A has a standard deviation of \$2.23 per bottle, store B has a standard deviation of \$5.00 per bottle, and store C has a standard deviation of \$9.00 per bottle. What does this tell you about the sales at each store?

STORE 1: AVG = \$14.99

STAND. DEVIATION = \$2.33

STORE 2: AVG = \$14.99

STAND. DEVIATION = \$5.00

STORE 3: AVG = \$14.99

STAND DEVIATION = \$9.00

WALMART

KROGER'S

WINE CELLAR

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4. Which of the following data sets has the largest standard deviation? Why?

Data set A: 2, 4, 6, 8, 10, 12

Data set B: 12, 14, 16, 18, 20, 22

Data set C: 102, 104, 106, 108, 110, 112

Data set D: 20, 40, 60, 80, 100, 120 ✓

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5. If the sample variance for a particular data set is 501.76. What is the sample standard deviation?

(a) 251763.0976

(b) 22.4

(c) 501.76

(d) Not enough information

$$\sqrt{501.76} = 22.4$$

6. The two sets of data below represent literacy rates among the top five U.S. states and among the bottom four states and the District of Columbia. (The data was obtained in May 2010 from <http://nces.ed.gov/NAAL/estimates/StateEstimates.aspx>.) Is there more variability in literacy rates among the top five regions or the bottom five?

Top Five States	Literacy Rate	Bottom Four States and DC	Literacy Rate
Minnesota	94	District of Columbia	81
New Hampshire	94	Texas	81
North Dakota	94	Florida	80
Iowa	93	New York	78
Maine	93	California	77