

**Example 2**  
**Range, sum of squares, variance, and standard deviation**

The number of aphids on tomato plants was counted. (Same data as example 1)

3	4	5	5
3	4	5	6
4	4	5	6
4	4	5	6
4	4	5	6
4	4	5	6
4	4	5	6
4	4	5	6
4	4	5	6
4	5	5	6
4	5	5	7

**Range**

$$\text{Range} = (X_n - X_1)$$

$$\text{Range} = (X_{40} - X_1)$$

$$\text{Range} = (7 - 3) = 4$$

Range = 4 aphids

**Sum of squares**

$$SS = \sum (X_i - \bar{X})^2$$

Mean = 4.75 (from Example 1)

Xi	Xi-X	(Xi-X)^2	Xi	Xi-X	(Xi-X)^2	Xi	Xi-X	(Xi-X)^2	Xi	Xi-X	(Xi-X)^2
3	-1.75	3.06	4	-0.75	0.56	5	0.25	0.06	5	0.25	0.06
3	-1.75	3.06	4	-0.75	0.56	5	0.25	0.06	6	1.25	1.56
4	-0.75	0.56	4	-0.75	0.56	5	0.25	0.06	6	1.25	1.56
4	-0.75	0.56	4	-0.75	0.56	5	0.25	0.06	6	1.25	1.56
4	-0.75	0.56	4	-0.75	0.56	5	0.25	0.06	6	1.25	1.56
4	-0.75	0.56	4	-0.75	0.56	5	0.25	0.06	6	1.25	1.56
4	-0.75	0.56	4	-0.75	0.56	5	0.25	0.06	6	1.25	1.56
4	-0.75	0.56	4	-0.75	0.56	5	0.25	0.06	6	1.25	1.56
4	-0.75	0.56	5	0.25	0.06	5	0.25	0.06	6	1.25	1.56
4	-0.75	0.56	5	0.25	0.06	5	0.25	0.06	7	2.25	5.06

$$SS = \sum (X_i - \bar{X})^2 = 33.5$$

$$SS = 33.5 \text{ aphids}^2$$

**Variance**

$$s^2 = \frac{\sum (X_i - \bar{X})^2}{n-1} = \frac{33.5}{40-1} = \frac{33.5}{39} = 0.86$$

$$s^2 = 0.86 \text{ aphids}^2$$

**Standard deviation**

$$s = \sqrt{\frac{\sum (X_i - \bar{X})^2}{n-1}} = \sqrt{0.86} = 0.927$$

$$s = 0.927 \text{ aphids}$$

**Coefficient of variation**

$$CV = \frac{s}{\bar{X}} = \frac{0.927}{4.75} = 0.195$$

$$CV = 0.195$$