

## ***Solution***      **Section 4.3 – Measures of Variation / Dispersion**

### ***Exercise***

Find the range and standard deviation for: {3, 7, 4, 12, 15, 18, 19, 27, 24, 11}

### **Solution**

$$\text{Range} = 27 - 3 = 24$$

$$s = \sqrt{\frac{2554 - 10(14)^2}{9}} \approx 8.1$$

$$\approx 8.1$$

### ***Exercise***

Find the range and standard deviation for: S = {1.2, 1.4, 1.7, 1.3, 1.5}

### **Solution**

$$\text{Mean: } \bar{X} = \frac{1.2 + 1.3 + 1.4 + 1.5 + 1.7}{5} = 1.42$$

Standard Variance:

$$s = \sqrt{\frac{(1.2 - 1.42)^2 + (1.3 - 1.42)^2 + (1.4 - 1.42)^2 + (1.5 - 1.42)^2 + (1.7 - 1.42)^2}{5 - 1}}$$

$$\approx .19$$

### ***Exercise***

Find the range and standard deviation for: 72, 61, 57, 83, 52, 66, 85

### **Solution**

$$\text{Range: } 85 - 52 = 33$$

$$\text{Standard deviation } \approx 12.6$$

### ***Exercise***

Find the range and standard deviation for: 241, 248, 251, 257, 252, 287

### **Solution**

$$\text{Range: } 287 - 241 = 46$$

$$\text{Standard deviation } \approx 16.1$$

### Exercise

Find the range and standard deviation for: 122, 132, 141, 158, 162, 169, 180

### Solution

**Range:**  $180 - 122 = 58$

**Standard deviation**  $\approx 20.9$

### Exercise

Find the standard deviation for the following data

<i>Interval</i>	<i>Frequency</i>
30 – 39	1
40 – 49	6
50 – 59	13
60 – 69	22
70 – 79	17
80 – 89	13
90 - 99	8

### Solution

Interval	$f$	$x$	$xf$	$x^2$	$fx^2$
30-39	1	34.5	34.5	1190.25	1190.25
40-49	6	44.5	267.0	1980.25	11,881.50
50-59	13	54.5	708.5	2970.25	38,613.25
60-69	22	64.5	1419.0	4160.25	91,525.50
70-79	17	74.5	1266.5	5550.25	94,354.25
80-89	13	84.5	1098.5	7140.25	92,823.25
90-99	8	94.5	756.0	8930.25	71,442.00
Totals:	80		5550.0		401,830.00

$$\begin{aligned}\bar{x} &= \frac{\sum xf}{n} \\ &= \frac{5550}{80} \\ &= 69.375\end{aligned}$$

$$\begin{aligned}s &= \sqrt{\frac{401830 - 80(69.375)^2}{79}} \\ &\approx 14.6\end{aligned}$$

### Exercise

Find the standard deviation for the following data

<i>Interval</i>	<i>Frequency</i>
0 – 24	4
25 – 49	8
50 – 74	5
75 – 99	10
100 – 124	4
125 – 149	5

### Solution

<i>Interval</i>	<i>x</i>	<i>f</i>
0 – 24	12	4
25 – 49	37	8
50 – 74	62	5
75 – 99	87	10
100 – 124	112	4
125 – 149	137	5

*Standard deviation*  $\approx 39.4$

### Exercise

Forever Power Company analysis conducted tests on the life of its batteries and those of a competitor (Brand X). They found that their batteries has a mean life (in hours) of 26.2, with a standard deviation of 4.1. Their results for a sample of 10 Brand X were as follows: 15, 18, 19, 23, 25, 25, 28, 30, 34, 38.

- Find the mean and standard deviation for the sample of Brand X batteries.
- Which batteries have a more uniform life in hours?
- Which batteries have the highest average life in hours?

### Solution

a)  $\text{Mean} = \frac{255}{10} = 25.5$       *Standard deviation*  $\approx 7.2$

- Power Company has a smaller standard deviation of 4.1 hrs. as opposed to 7.2 hr. which indicates a more uniform life
- Power Company has a higher mean of 26.2 hr. as opposed to 25.5 hr. which indicates a longer average life