

# MEASURES OF CENTRAL TENDENCY + VARIATION

Measures of Central Tendency — find the **center** of the data

Mean = "the average"  $\bar{x}$  = mean of sample  
 $\mu$  = mean of population

$$\frac{\sum x}{n}$$

$x$  = data  
 $n$  = # of items  
 $\sum$  = the sum

Median = the "middle"  $\left\{ \begin{array}{l} 75 \text{ pieces of data} \\ 120 \text{ pieces of data} \end{array} \right.$

- 1) Data must be in order
- 2)  $\frac{n}{2}$  + count to median

$$\frac{75}{2} = 37.5 \approx 38^{\text{th}}$$

$$\frac{120}{2} = 60^{\text{th}} + 61^{\text{st}}$$

Mode — the most frequent value — 0 to 3 modes



Median

Mean

Median

## MEASURES OF VARIATION - Show the Spread of the data

$$\text{Range} = \text{Highest Value} - \text{Lowest Value}$$

$$102 - 84 = 18$$

$$102 - 47 = 55$$

$$\text{Interquartile Range (IQR)} =$$

Range of middle of 50%

$$Q_3 - Q_1$$



Standard Deviation - sample st. dev. =  $S$   
population st. dev. =  $\sigma$

the "average" of how much each piece of data varies from the mean.

$$\{7, 13, 16, 17, 19, 24\}$$

$$1) \text{ Find mean} = \frac{96}{6} = 16$$

2) Data-mean

$$7-16 \quad 13-16 \quad 16-16 \quad \dots \dots$$

$$(-9)^2 + (-3)^2 + (0)^2 + (1)^2 + (3)^2 + (8)^2$$

$$81 + 9 + 0 + 1 + 9 + 64 = 164$$

$$\frac{164}{6} = \sqrt{27.33} \approx 5.23$$

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

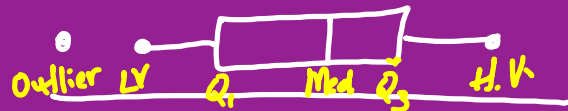
$$S = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}$$

4	2:
5	8:
6	1 4 8 9
7	2 4 5 6 8 9
8	2 2 2 6 8
9	1 4 8 9

$4/2 = 42\%$   
22 students

1) Median:  $\frac{22}{2} = 11 + 12$   
 $\frac{76 + 78}{2} = 77$

2) Quartiles:  $\frac{11}{2} = 5.5 \approx 6^{th}$   
 $Q_1 = 69$   $Q_3 = 86$



### Outliers

- 1)  $IQR * 1.5 = \#$
- 2) upper boundary:  $Q_3 + \#$
- 3) lower boundary:  $Q_1 - \#$

3) Outliers:

$IQR = 86 - 69 = 17$

1)  $17 * 1.5 = 25.5$

2) upper boundary

$86 + 25.5 = 111.5$

3) lower boundary

$69 - 25.5 = 43.5$

