

# Dispersion Measurements

- The Standard deviation is given by:

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

- **Example:**

The standard deviation for 5, 6, 2, 8, 9 =  $\sqrt{7.5} = 2.73861$

↓  
variance

- **In Excel:**

- =stdev(range of cells)

or = SQRT (VAR(range of cells))

↓  
square Root

## Central Tendency Measurements

- The **median** is the middle value of the data after sorting.

- If  $n$  is odd then Median  $= x_{\left(\frac{n+1}{2}\right)}$

- If  $n$  is even then Median  $= \frac{x_{\left(\frac{n}{2}\right)} + x_{\left(\frac{n}{2} + 1\right)}}{2}$

- **Example :**

The median for 4, ~~8~~, <sup>6</sup>9, 12, 16 = 9

The median for 4, ~~8~~, <sup>6</sup>9, 12, 19, 16 = 10.5

- **In Excel :**

=median(range of cells)

3

Formula  $\rightarrow$  Insert Function  $\rightarrow$  in any blank cell.  
 $\rightarrow$  Select the Category (All)  $\rightarrow$  <sup>Select.</sup> function

## Central Tendency Measurements

- The **mode** is the most frequently occurring

- **Example:**

The mode for 2, 2, 9, 6, 12, 8 = 2

The mode for 2, 2, 4, 6, 7, 8, 4 = 2 and 4

The mode for 2, 6, 9, 16, 12, 8, -2, 0.4 = Not available (no mode)

- **In Excel:**

=mode (range of cells)

4

## Dispersion Measurements

**Dispersion:** Range, variance, and standard deviation

- **Range :** Max – Min

- **Example:**

The range for 2, 6, 8, 9, 12 =  $12 - 2 = 10$

- **In Excel:**

=max(range of cells) - min(range of cells)

5

it can be written directly without inserting a function twice

## Dispersion Measurements

- The variance is given by:  $\text{variance} = \frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2$

- **Example:**

The variance for 5, 6, 2, 8, 9 = 7.5

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i = \frac{2+5+6+8+9}{5} = 6$$

x	2	5	6	8	9	Total sum
$(x_i - \bar{x})$	-4	-1	0	2	3	0 = sum of residuals
$(x_i - \bar{x})^2$	16	1	0	4	9	30

$\frac{30}{4} = 7.5$

- **In Excel:**

=var(range of cells)

6

↑ variance → dispersion ↑  
direct Relationship

agreement  
in decision

positive = abnormal = sick  
= Yes

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حوالاً لطبيب

# True Positive (TP)

- Number of cases where the patient tests positive on a disease when he/she actually has the disease.

i.e.,

- Patient has the disease.
- The test gives positive result for the disease (test says patients have the disease).

True Positive

the positive that the doctor told is for the disease positive

Example :

If the patient "has an allergy" and the test is positive  
→ True positive.

## False Positive (FP)

*→ the positive for the disease that the doctor told is false*

- Number of cases where the patient tests positive on a disease when he/she actually does not have the disease.

i.e.,

- Patient does not have the disease.
- The test gives positive result for the disease (test says patients have the disease).

**Example :**

**If the patient “doesn’t have an allergy “ and the test says “yes”.**

*No = healthy = normal = negative*