MEASURES OF CENTRAL TENDENCY

DESCRIPTIVE STATISTICS

prepared by:

Gyro A. Madrona
Electronics Engineer

TOPIC OUTLINE

Mean

Median

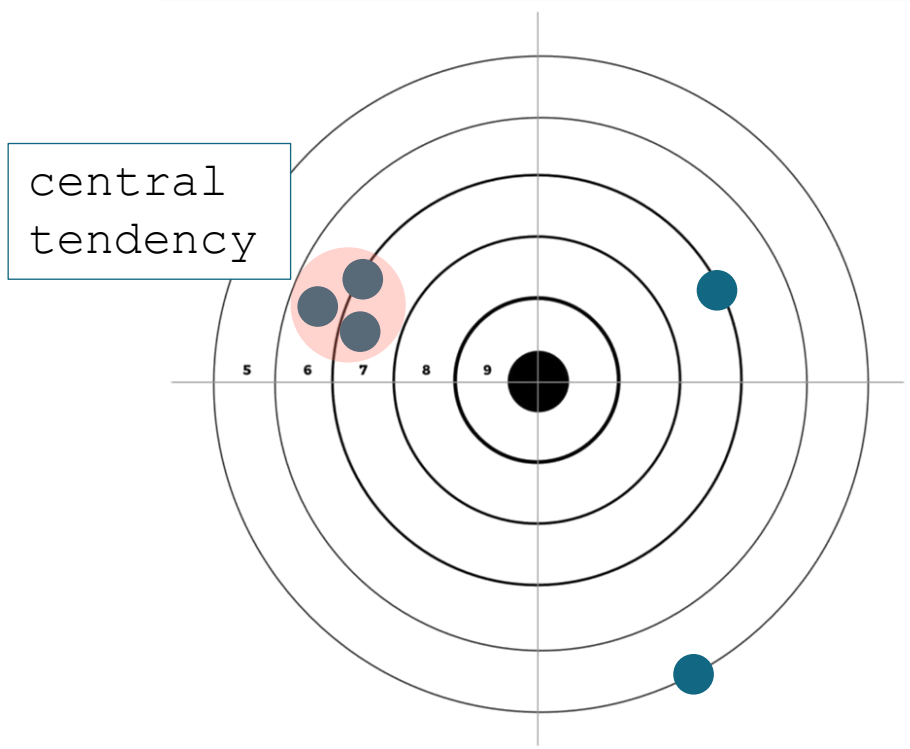
Mode

MEASURES OF CENTRAL TENDENCY

MEASURES OF CENTRAL TENDENCY

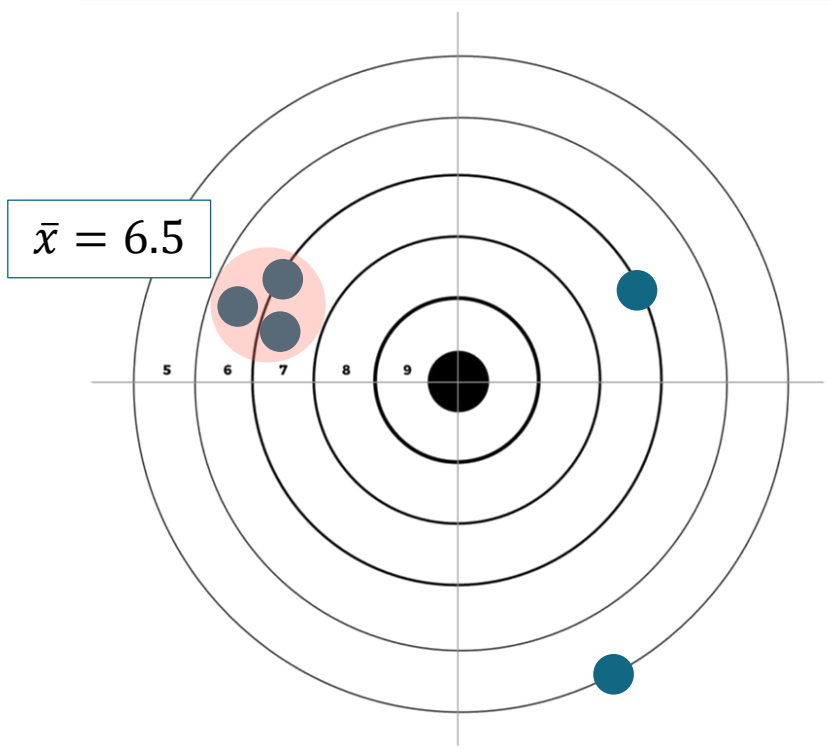
Measures of central tendency are used to describe the center or typical value of a dataset.

Dartboard Analogy



ACCURACY VS PRECISION

Dartboard Analogy



Accuracy refers to how close your measurements are to the **actual target** (in this case, 10).

Precision refers to how **consistent** your measurements are.

If you keep hitting 6.5 repeatedly, you have high precision but low accuracy because your results are consistent but not close to the true value (e.g., 10).

MEAN

MEAN

Mean ($\bar{x}$) is the arithmetic **center** of all data points (*a.k.a* "simple average").

Formula

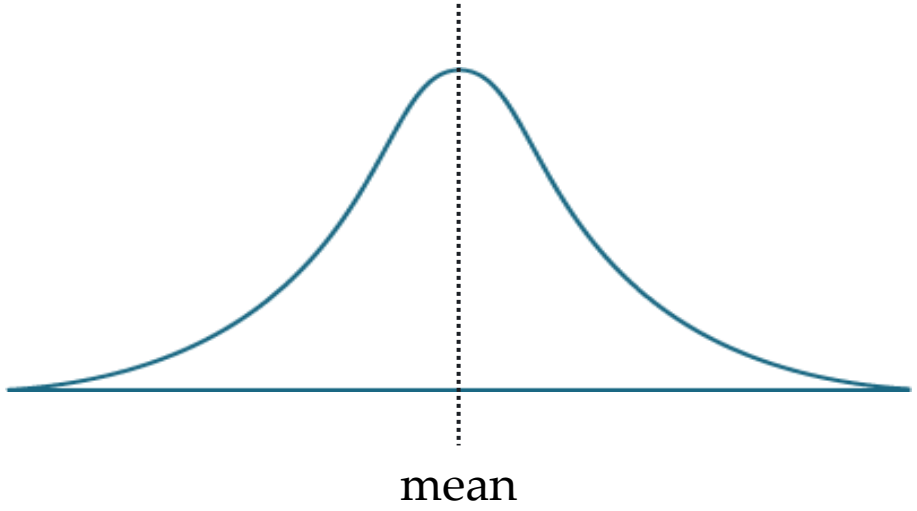
$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

where

x_i = individual data points

n = number of observations

Normal Distribution



MEAN

Mean ($\bar{x}$) is the arithmetic **center** of all data points (*a.k.a* "simple average").

Formula

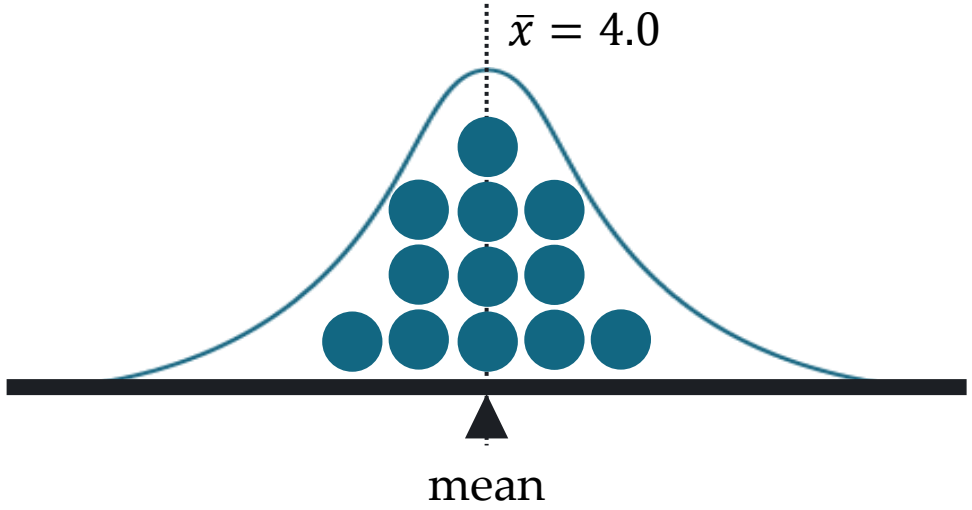
$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

where

x_i = individual data points

n = number of observations

Center of gravity analogy



data

2, 3, 3, 3, **4, 4, 4, 4,** 5 , 5, 5, 6

EXERCISE

The given dataset shows the prices of different fruits per kilogram in pesos. Determine the **mean** price per kilogram.

Fruit Price List

Fruit	Price
Apple	120
Banana	60
Orange	85
Mango	150
Grape	200

Solution

MEDIAN

MEDIAN

Median is the **midpoint** of the **ordered** dataset (i.e., ascending or descending).

median is at position

$$pos_M = \frac{n+1}{2}$$

where

n = number of observations

If the number of observations are even, the median is the average of the two middle numbers.

example

Dataset 1

Data	Ordered
5	1
2	2
1	3
4	4
3	5

Median = 3

Dataset 2

Data	Ordered
5	1
2	2
1	3
4	4
3	5
6	6

Median = 3.5

EXERCISE

The given dataset consists of voltage measurements from two different instruments. Determine the **median** voltage value for each instrument.

Voltage Response

Measurement No.	Instrument A	Instrument B
1	12	2.8
2	5	4.5
3	9.1	6
4	3.3	9
5	24	11.7
6	18.5	14.8
7	15.2	17.3
8		20

Solution

Measurement No.	Instrument A
1	3.3
2	5
3	9.1
4	12
5	15.2
6	18.5
7	24
8	

EXERCISE

The given dataset consists of voltage measurements from two different instruments. Determine the **median** voltage value for each instrument.

Voltage Response

Measurement No.	Instrument A	Instrument B
1	12	2.8
2	5	4.5
3	9.1	6
4	3.3	9
5	24	11.7
6	18.5	14.8
7	15.2	17.3
8		20

Solution

Measurement No.	Instrument B
1	2.8
2	4.5
3	6
4	9
5	11.7
6	14.8
7	17.3
8	20

MODE

MODE

Mode is the value that appears **most frequently** in a data set. A data set may have one mode, more than one mode, or no mode at all.

Frequency Distribution Table

Data	Frequency
1	**2**
2	**1**
3	**1**
4	**3**
5	**1**

dataset

Group A: 1, 1, 2, 3, 4, 4, 4, 5 $\mathbf{mode_A = 4}$

Group B: 1, 2, 3, 4, 5 **no mode**

EXERCISE

The given dataset records the number of points scored by a basketball player over 10 games. Determine the **mode** of the dataset.

Player Performance

Game No.	Points Scored
1	12
2	18
3	15
4	12
5	20
6	15
7	12
8	22
9	18
10	15

Solution

Data	Frequency

EXERCISE

The given dataset consists of test results from two machines, the Jaguar and Panther models, which produce **10 Ω** resistors with ±5% tolerance. Determine which machine performs better based on its **measures of central tendency** for resistance values.

Resistance Test

Test No.	Jaguar	Panther
1	10.6	10.1
2	9.1	11
3	9.3	9.1
4	9.8	20
5	10.5	9.2
6	10.4	10.8
7	9.5	9.9
8	11	9.2
9	10.4	9.1
10	3	9.1
11	9.8	

LABORATORY