Q1. What are the three measures of central tendency?

The **three measures of central tendency** are:

1. **Mean**
2. **Median**
3. **Mode**

They describe the **central or typical value** of a dataset.

Q2. Difference between mean, median, and mode

Measure	Meaning	Use
Mean	Arithmetic average	Best for symmetric data
Median	Middle value	Best for skewed data
Mode	Most frequent value	Useful for categorical data

Example:
For incomes, **median** is preferred because mean is affected by very high values.

Q3. Measures of central tendency for the given height data

Data:
[178, 177, 176, 177, 178.2, 178, 175, 179, 180, 175, 178.9, 176.2, 177, 172.5, 178, 176.5]

Step 1: Mean

Mean=∑xn=2831.316≈176.96\text{Mean} = \frac{\sum x}{n} = \frac{2831.3}{16} \approx \mathbf{176.96}Mean=n∑x=162831.3≈176.96

Step 2: Median

Sorted data:
[172.5, 175, 175, 176, 176.2, 176.5, 177, 177, **177**, **178**, 178, 178, 178.2, 178.9, 179, 180]

Median=177+1782=177.5\text{Median} = \frac{177 + 178}{2} = \mathbf{177.5}Median=2177+178=177.5

Step 3: Mode

- **177 and 178** occur most frequently
  👉 **Mode = 177 and 178 (bimodal)**

Q4. Find the standard deviation for the given data

Using **sample standard deviation** formula:

s=∑(x−x¯)2n−1s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}s=n−1∑(x−x¯)2

- Mean ≈ 176.96
- Sample Standard Deviation ≈ **2.07**

Q5. How are measures of dispersion used?

Measures of dispersion describe **how spread out** data values are.

Measure	Meaning
Range	Max − Min
Variance	Average squared deviation
Standard Deviation	Spread around mean

Example:
Two classes may have the same mean marks, but the class with **lower standard deviation** is more consistent.

Q6. What is a Venn diagram?

A **Venn diagram** is a visual representation of sets showing:

- Relationships
- Union
- Intersection
- Differences

Q7. Given sets

A = {2,3,4,5,6,7}
B = {0,2,6,8,10}

(i) A ∩ B

A∩B={2,6}A \cap B = \{2,6\}A∩B={2,6}

(ii) A ∪ B

A∪B={0,2,3,4,5,6,7,8,10}A \cup B = \{0,2,3,4,5,6,7,8,10\}A∪B={0,2,3,4,5,6,7,8,10}

Q8. What is skewness in data?

Skewness measures the **asymmetry** of a data distribution.

- **Right skewed** → tail on the right
- **Left skewed** → tail on the left

Q9. Right skewed data: position of median w.r.t. mean

For **right skewed data**:

Mean>Median>Mode\text{Mean} > \text{Median} > \text{Mode}Mean>Median>Mode

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Q10. Difference between covariance and correlation

Feature	Covariance	Correlation
Meaning	Direction of relationship	Strength + direction
Units	Depends on units	Unit-free
Range	Unbounded	−1 to +1

Q11. Formula for sample mean

$\bar{x} = \frac{\sum x}{n}$x¯=n∑x

Example:
For data [2, 4, 6]:

$\bar{x} = \frac{2+4+6}{3} = 4$x¯=32+4+6=4

Q12. Relationship of central tendency in normal distribution

For a **normal distribution**:

$\text{Mean} = \text{Median} = \text{Mode}$Mean=Median=Mode

Q13. How is covariance different from correlation?

- **Covariance** shows **direction only**
- **Correlation** shows **direction and strength**

Correlation is a **standardized form** of covariance.

Q14. Effect of outliers on central tendency and dispersion

- **Mean and standard deviation** are highly affected
- **Median and IQR** are less affected