

Q1: Understanding Central Tendency

A bakery tracks the daily sales of muffins (in dozens) over a week: [10, 12, 11, 15, 14, 13, 12]. What is the most representative value of their weekly sales, and why?

Calculations:

$$\text{Mean} = (10 + 12 + 11 + 15 + 14 + 13 + 12) / 7 = 87 / 7 = \mathbf{12.43}$$

Solution/Insight:

The most representative value is the **Mean (≈ 12.43 dozens)**, because there are no outliers. It shows the typical daily sale volume.

Q2: Mean in Real Life

A teacher records the marks of her students in a short quiz: [12, 15, 14, 16, 18, 20, 19]. What is the mean score, and what does it tell us about the class's performance?

Calculations:

$$\text{Mean} = (12 + 15 + 14 + 16 + 18 + 20 + 19) / 7 = 114 / 7 = \mathbf{16.29}$$

Solution/Insight:

The mean score is **16.29**, showing the average performance of the class.

Q3: Mode in Real Life

A store records the shoe sizes sold in one day: [7, 8, 9, 8, 8, 10, 7, 9]. What is the mode, and why is this information useful for the store manager?

Calculations:

Mode = **8** (appears 3 times)

Solution/Insight:

The mode is **8**. This helps the store manager identify the **most popular size** that needs to be stocked more often.

Q4: Median in Real Life

A car dealer notes the prices of used cars: [₹8,000, ₹9,500, ₹10,200, ₹11,000, ₹50,000]. Why is the median a better measure than the mean in this case? Calculate the median.

Calculations:

Ordered Data: [₹8,000, ₹9,500, ₹10,200, ₹11,000, ₹50,000]

Median = 3rd value = **₹10,200**

Solution/Insight:

Median = ₹10,200.

The median is better because the ₹50,000 is an **outlier** that distorts the mean. Median stays stable against extreme values.

Q5: Dispersion Introduction

A student times how long it takes to finish a puzzle each day: [25, 30, 27, 35, 40].
What does the range tell us about the variation in the student's puzzle-solving time?

Calculations:

$$\text{Range} = \text{Max} - \text{Min} = 40 - 25 = \mathbf{15 \text{ minutes}}$$

Solution/Insight:

The range is **15 minutes**. It tells us the **total spread** in timing — the difference between fastest and slowest attempt.

Q6: Range in Action

A farmer records the weekly weight of harvested apples (kg): [100, 105, 98, 110, 120].
Find the range. How can this help the farmer in planning his packaging?

Calculations:

$$\text{Range} = 120 - 98 = \mathbf{22 \text{ kg}}$$

Solution/Insight:

The range is **22 kg**. This variation helps the farmer plan **packaging and storage capacity** according to the maximum weekly yield.

Q7: Mean Deviation (Detailed Working)

The weights (in kg) of 5 students are: [50, 52, 53, 54, 51].
Find the mean deviation about the mean.

Working / Calculations:

| x (Weight) | x - \bar{x} (where $\bar{x} = 52$) | x - \bar{x} |
|------------|---------------------------------------|---------------|
| 50 | -2 | 2 |
| 52 | 0 | 0 |
| 53 | 1 | 1 |
| 54 | 2 | 2 |
| 51 | -1 | 1 |

$$\text{Sum of } |x - \bar{x}| = 6$$

$$\text{Mean Deviation} = 6 / 5 = \mathbf{1.2 \text{ kg}}$$

Solution/Insight:

Mean deviation = **1.2 kg**. The small deviation shows weights are tightly grouped around the mean — consistent and balanced.

Q8: Variance and Standard Deviation (Detailed Working)

Heights (in cm) of 4 players: [160, 165, 170, 175].

Find the variance and standard deviation.

Working / Calculations:

1. Mean (\bar{x}) = $(160 + 165 + 170 + 175) / 4 = 670 / 4 = \mathbf{167.5}$

| x | $x - \bar{x}$ | $(x - \bar{x})^2$ |
|-----|---------------|-------------------|
| 160 | -7.5 | 56.25 |
| 165 | -2.5 | 6.25 |
| 170 | +2.5 | 6.25 |
| 175 | +7.5 | 56.25 |

$$\Sigma(x - \bar{x})^2 = 125$$

$$\text{Variance } (s^2) = 125 / (4 - 1) = 41.67$$

$$\text{Standard Deviation } (s) = \sqrt{41.67} = \mathbf{6.45 \text{ cm}}$$

Solution/Insight:

The SD is **6.45 cm**, meaning players' heights vary moderately — a small, healthy difference within the group.

Q9: Combining Measures (Detailed Working)

A family records their monthly electricity usage (in kWh): [400, 420, 390, 450, 410].

Find the mean and standard deviation.

Data Set: [400, 420, 390, 450, 410], $N = 5$

Step 1 – Mean:

$$\bar{x} = (400 + 420 + 390 + 450 + 410) / 5 = 2070 / 5 = \mathbf{414}$$

Step 2 – Standard Deviation:

| x | $x - \bar{x}$ | $(x - \bar{x})^2$ |
|-----|---------------|-------------------|
| 400 | -14 | 196 |
| 420 | +6 | 36 |
| 390 | -24 | 576 |
| 450 | +36 | 1296 |
| 410 | -4 | 16 |

$$\Sigma(x - \bar{x})^2 = 2120$$

$$\text{Variance } (s^2) = 2120 / 4 = 530$$

$$\text{Standard Deviation } (s) = \sqrt{530} = \mathbf{23.02 \text{ kWh}}$$

Solution/Insight:

Mean = **414 kWh**, SD = **23.02 kWh**.

The small SD shows the family's energy use is **consistent**, varying little month to month.

Q10: Practical Application (Detailed Working)

A basketball player's points in 8 games: [15, 18, 20, 22, 25, 17, 19, 21].

Find the mean, median, mode, range, and standard deviation.

Data Set (Ordered): [15, 17, 18, 19, 20, 21, 22, 25], N = 8

Step 1 – Mean:

$$\bar{x} = (157) / 8 = \mathbf{19.625}$$

Step 2 – Median:

$$(4\text{th} + 5\text{th}) / 2 = (19 + 20) / 2 = \mathbf{19.5}$$

Step 3 – Mode:

No mode (all unique)

Step 4 – Range:

$$25 - 15 = \mathbf{10}$$

Step 5 – Standard Deviation:

| x | x - \bar{x} | (x - \bar{x}) ² |
|-------------------------------------|---------------|-------------------------------|
| 15 | -4.625 | 21.3906 |
| 17 | -2.625 | 6.8906 |
| 18 | -1.625 | 2.6406 |
| 19 | -0.625 | 0.3906 |
| 20 | +0.375 | 0.1406 |
| 21 | +1.375 | 1.8906 |
| 22 | +2.375 | 5.6406 |
| 25 | +5.375 | 28.8906 |
| $\Sigma(x - \bar{x})^2 = 67.875$ | | |
| Variance = 67.875 / 7 = 9.696 | | |
| SD = $\sqrt{9.696} = \mathbf{3.11}$ | | |

Solution/Insight:

Mean = **19.625**, Median = **19.5**, SD = **3.11**.

The player's scores are **consistent**, typically within 3 points of the average. The close mean and median show the data is balanced and symmetrical.