**Easy Level**

Q1: Understanding Central Tendency (Easy)

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

**Answer:** For **central tendency**, the *most representative value* is usually the **mean (average)** when the data has no extreme outliers.

**Given data (in dozens):**

[10, 12, 11, 15, 14, 13, 12]

**Step 1: Calculate the mean**

[

Mean= {10 + 12 + 11 + 15 + 14 + 13 + 12}/{7} = {87}/{7} = 12.43

]

**Answer:**

The most representative value of their weekly muffin sales is **approximately 12.4 dozens per day**.

**Why?**

- The data is fairly balanced with no extreme values.
- Sales cluster around 12–13 dozens.
- Hence, the **mean** gives a good overall picture of typical daily sales.

So, the bakery sells **about 12 dozen muffins per day on average**.

**Q2:** Mean in Real Life (Easy)

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?

**Given marks:**
[12, 15, 14, 16, 18, 20, 19]

**Step 1: Calculate the mean**
[
Mean = {12 + 15 + 14 + 16 + 18 + 20 + 19}/{7} = {114}/{7} = 16.29
]

**Answer:**
The **mean score is approximately 16.3 marks**.

**What it tells us about the class performance:**

- On average, students scored around **16 marks** in the quiz.
- This indicates a **good overall performance**, as most students scored in the mid-to-high range.
- The class, as a whole, performed **fairly well**, with no extremely low scores pulling the average down.

**Q3**: Mode in Real Life (Easy)

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

**Given shoe sizes:**
[7, 8, 9, 8, 8, 10, 7, 9]

**Step 1: Count frequencies**

- Size 7 → 2 times
- Size 8 → 3 times
- Size 9 → 2 times
- Size 10 → 1 time

**Answer:**
The **mode is shoe size 8**, because it occurs most frequently.

**Why this is useful for the store manager:**

- It shows the **most popular shoe size** among customers.
- The manager can **stock more size 8 shoes** to meet demand.
- It helps in **inventory planning**, reducing shortages and unsold stock.

Medium Level

**Q4:** Median in Real Life (Medium)

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.

**Given car prices:**
[$8,000, $9,500, $10,200, $11,000, $50,000]

**Step 1: Arrange the data**
The prices are already in ascending order.

**Step 2: Calculate the median**
There are **5 values** (odd number), so the median is the **middle value**:

**Median = $10,200**

**Why the median is a better measure than the mean:**

- One car costs **$50,000**, which is **much higher** than the rest.
- This extreme value (outlier) would **pull the mean upward**, making the average price seem higher than what most cars actually cost.
- The **median is not affected by outliers**, so it better represents the *typical* used car price.

**Conclusion:**
The **median price is $10,200**, and it gives a more realistic picture of the usual car price than the mean in this case.

**Q5:** Dispersion Introduction (Medium)

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?

**Given times (in minutes):**
[25, 30, 27, 35, 40]

**Step 1: Find the range**

- Minimum time = **25 minutes**
- Maximum time = **40 minutes**

[
Range = 40 - 25 = 15
]

**Answer:**
The **range is 15 minutes**.

**What this tells us about variation:**

- The student's puzzle-solving time **varies by up to 15 minutes** from fastest to slowest day.
- This shows there is a **moderate level of variation** in performance.
- Some days the student finishes quickly, while on other days it takes much longer.

**Conclusion:**
The range gives a **simple idea of spread**, showing how consistent (or inconsistent) the student's puzzle-solving time is over different days.

**Q6:** Range in Action (Medium)

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?

**Given weekly weights (kg):**
[100, 105, 98, 110, 120]

**Step 1: Find the range**

- Minimum weight = **98 kg**
- Maximum weight = **120 kg**

[
Range = 120 - 98 = 22 ]

**Answer:**
The **range is 22 kg**.

**How this helps the farmer in planning packaging:**

- It shows that weekly harvest quantities can **vary by up to 22 kg**.
- The farmer can **prepare flexible packaging options** (different box sizes or extra crates).
- Helps avoid **shortages or excess packaging**, improving efficiency and reducing waste.

**Conclusion:**
The range helps the farmer understand the **variability in harvest**, making packaging and logistics planning more accurate.

**Q7:** Variance for Decision-Making (Medium)

Two delivery companies track delivery delays (in minutes).

Company A: variance = 6

Company B: variance = 15

Which company is more consistent, and why?

**Answer:**
**Company A is more consistent.**

**Why:**

- **Variance measures how spread out the data is** from the mean.
- A **lower variance** means the delivery times are **closer to the average**, showing more consistency.
- Company A has a variance of **6**, which is much lower than Company B's **15**.

**Conclusion:**
Company A's delivery delays are **more predictable and stable**, while Company B shows **greater fluctuation** in delivery times.

**Hard Level**

Q8: Standard Deviation in Context (Hard)

A finance student compares the daily price fluctuations of two cryptocurrencies.

Coin A: standard deviation = $30

Coin B: standard deviation = $120

Which coin is riskier to invest in, and why

**Answer:**
**Coin B is riskier to invest in.**

**Why:**

- **Standard deviation measures volatility**, i.e., how much prices fluctuate around the average price.

- A **higher standard deviation** means **larger and more frequent price swings**.
- Coin B's standard deviation is **$120**, which is much higher than Coin A's **$30**.

**Conclusion:**
Coin B has **greater price volatility**, making it **riskier but potentially higher-return**, while Coin A is **more stable and lower risk**.

**Q9:** Combining Measures (Hard)

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

Find the mean and standard deviation. What do these values together tell you about the family's energy use pattern

**Given monthly usage (kWh):**
[400, 420, 390, 450, 410]

1. **Mean (average usage)**

[
Mean ={400 + 420 + 390 + 450 + 410}/{5} ={2070}/{5} = 414
]

2️⃣ **Standard Deviation**

(Considering this as the full dataset → population standard deviation)

- Deviations from mean (414):
  [-14, 6, -24, 36, -4]
- Squared deviations:
  [196, 36, 576, 1296, 16]
- Sum of squares = **2120**

[
Variance ={2120}/{5} = 424
]

[
\text{Standard Deviation} \approx \sqrt{424} \approx 20.6 \text{ kWh}
]

---

**Final Answer**

- **Mean electricity usage: 414 kWh**
- **Standard deviation: ≈ 20.6 kWh**

**What this tells us about the family's energy use:**

- The family typically uses **around 414 kWh per month**.
- The **relatively small standard deviation** shows that their usage is **fairly consistent** from month to month.
- There are some fluctuations (like 450 kWh), but overall the energy consumption pattern is **stable and predictable**.

In short: **steady average usage with moderate variation.**

Q10: Practical Application (Hard)

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

Find the mean, median, mode, range, and standard deviation. What insights can these measures provide

about the player's scoring performance?

**Given points (8 games):**
[15, 18, 20, 22, 25, 17, 19, 21]

## Calculations

**Mean (average):**

[

{157}/{8} = 19.63

]

**Median:**

Sorted data → [15, 17, 18, 19, 20, 21, 22, 25]

[

Median={19 + 20}/{2} = 19.5

]

**Mode:**

- **No mode** (all values occur once)

**Range:**

[

25 - 15 = 10 ]

**Standard Deviation (population):**

[

\text{SD} \approx 2.9 \text{ points}

]

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## 📊 Summary of Measures

- **Mean:** 19.6
- **Median:** 19.5
- **Mode:** None
- **Range:** 10
- **Standard Deviation:** ≈ 2.9

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### Insights about the player's performance

- The player **averages about 20 points per game**, showing solid scoring ability.
- Mean and median are very close → performance is **well-balanced**, not skewed by extreme games.
- No mode suggests **varied scoring**, not the same score repeated.
- A **small standard deviation (≈ 3 points)** indicates **consistent performance** across games.
- The range shows the difference between best and worst games is reasonable, not extreme.
- **Overall:** The player is a **reliable and consistent scorer** with steady performance game to game.