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?

The most representative value of the bakery's weekly muffin sales is the mean (average).

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

Why mean is suitable:

- The data is fairly balanced with no extreme outliers.
- Sales values are close to each other.
- The mean reflects the overall average daily sales for the week.
- So, the most representative value is about 12.4 dozens of muffins per day.

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?

Mean score calculation:

Mean = {12 + 15 + 14 + 16 + 18 + 20 + 19}/7 = 114/7 = 16.29

Interpretation:

- The mean score is about 16.3 marks.

- This tells us that, on average, the class performed well, with most students scoring in the mid-to-high range.

- The average reflects a generally strong overall performance on the quiz.

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?

Mode calculation:

Shoe size 8 appears 3 times, more than any other size.

Mode = 8

Why this is useful for the store manager:

- It shows the most popular shoe size sold.

- The manager can stock more of size 8 to meet customer demand.

- It helps reduce out-of-stock issues and improve sales planning.

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.

Step 1: Arrange the prices (already in order):
$8,000; 9,500; 10,200; 11,000; 50,000$

Median calculation:

- There are 5 values (odd number), so the median is the middle value.

- Median = $10,200

Why median is better than mean:

- The price $50,000 is an extreme outlier compared to the other car prices.

- The mean would be pulled upward by this very high value and would not reflect typical used-car prices.

- The median represents the typical car price more accurately in the presence of outliers.

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?

Step 1: Find the range

- Maximum time = 40 minutes

- Minimum time = 25 minutes

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

What the range tells us:

- The student's puzzle-solving time varies by 15 minutes from the fastest to the slowest day.

- This shows there is a moderate amount of variation in how long the student takes each day.

- Some days the student finishes much faster, while on other days it takes considerably longer.

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?

Step 1: Find the range

- Maximum weight = 120 kg

- Minimum weight = 98 kg

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

How it helps the farmer:

- The harvest amount varies by 22 kg from week to week.

- This helps the farmer plan packaging capacity, ensuring boxes and storage can handle both low and high yields.

- It also helps in logistics planning, so there are neither shortages nor excess packaging materials.

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?

Company A is more consistent.

Why:

- Variance measures how spread out the delivery delays are.

- A lower variance means the delays are closer to the average and more predictable.

- Company A's variance (6) is much lower than Company B's (15), indicating less fluctuation in delivery times.

Therefore, Company A has more reliable and consistent delivery performance.

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?

Coin B is riskier to invest in.

Why:

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

- A higher standard deviation means larger and more frequent price swings.

- Coin B's standard deviation ($120) is much higher than Coin A's ($30), indicating greater uncertainty and instability.

Therefore, Coin B carries higher investment risk, while Coin A is relatively more stable.

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?

Step 1: Mean (average)
Mean = {400 + 420 + 390 + 450 + 410}/5 = 2070/5 = 414 kWh

Step 2: Standard Deviation *(treating the 5 months as the full dataset)*

Deviations from mean:
-14, 6, -24, 36, -4

Squares of deviations:
196, 36, 576, 1296, 16

Variance = 2120/5= 424

Standard Deviation=√424 = 20.6 kWh

Interpretation (What both values tell us):

- The mean of 414 kWh shows the family's typical monthly electricity usage.

- The standard deviation of about 21 kWh indicates that usage does not vary widely from month to month.

- Together, these values suggest the family has a fairly stable and consistent energy consumption pattern, with only moderate fluctuations.

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?

Step 1: Mean
  Mean= {15+18+20+22+25+17+19+21}/8
       =157/8 = 19.63

Step 2: Median
Sorted data: 15, 17, 18, 19, 20, 21, 22, 25
  Median = {19+20}/2=19.5

Step 3: Mode

- All values occur once → No mode

Step 4: Range
 Range=25-15=10

Step 5: Standard Deviation *(population)*
 Standard Deviation = 2.9 points

Insights about the player's performance

- The mean (~19.6 points) shows the player typically scores around 20 points per game.

- The median (19.5) is very close to the mean, indicating a balanced and consistent scoring pattern.

- No mode suggests the player doesn't rely on one fixed score; performance varies naturally.

- The range of 10 points shows a reasonable spread between lowest and highest scores.

- The low standard deviation (~2.9) indicates high consistency with only small game-to-game fluctuations.

Overall: The player is a reliable and consistent scorer, regularly contributing around 20 points per game with limited volatility.