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?

Ans:-

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

So, the bakery sells about 12–13 dozens of muffins per day on average.

Why the mean is most representative:

- The data has no extreme outliers.
- Sales increase and decrease smoothly across the week.
- The mean uses all values, giving a balanced picture of typical daily sales.

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?

Ans:-

The mean score is calculated as:

Mean = (12+15+14+16+18+20+19)/7

=114/7≈16.29

The mean score of about 16 marks indicates that, on average, the class performed well in the quiz, with most students scoring around this value.

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?

Ans:-

the mode is the value that appears most often in a set of data. To find it, we count the frequency of each shoe size:

- Size 7: appears 2 times
- Size 8: appears 3 times
- Size 9: appears 2 times
- Size 10: appears 1 time

Since size 8 appears more than any other size, it is the mode.

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.

Ans:-

Order the Data

The given data set is already ordered from lowest to highest:

$8,000, $9,500, $10,200, $11,000, $50,000

Identify the Middle Value

There are N=5 data points. Since the number of observations is odd, the median is the middle value in the ordered list, which corresponds to the position (N+1)/2 or (5+1)/2 = 3^{rd} Value.

Arranging the prices in ascending order:

8,000, 9,500, 10,200, 11,000, 50,0008

The third value in the ordered list is $10,200.

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?

Ans:-

The range is a simple measure of dispersion calculated as the difference between the maximum and minimum values in a dataset.

Calculation:

- Maximum time: 40 minutes.
- Minimum time: 25 minutes.
- Range calculation: 40-25 = 15 minutes.

The range of 15 minutes shows that the student's puzzle-solving time varies by 15 minutes from the fastest to the slowest day, indicating a moderate level of variation in daily performance

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?

Ans:-

Calculate the Range :-

The range of a dataset is the difference between the maximum and minimum values.

Range = Maximum Value − Minimum Value

Given data:- [100, 105, 98, 110, 120] kg.

Calculation:

- Maximum weight = 120 kg
- Minimum weight = 98 kg
- Range =120 kg−98 kg = 22 kg

The range of 22 kg shows the variation in weekly apple harvests. This helps the farmer plan packaging by preparing for both low and high harvest quantities, ensuring sufficient packaging materials without excessive waste.

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?**

Ans:-

Company A is more consistent.

This is because a lower variance (6) indicates that delivery delays are less spread out and more uniform, whereas Company B's higher variance (15) shows greater variability in delays.

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?**

Ans:-

Coin B is riskier to invest in.

Standard deviation measures the extent to which prices fluctuate around their average value. A higher standard deviation indicates greater volatility, meaning prices change more widely and unpredictably.

Coin A has a standard deviation of $30, showing relatively stable price movements. In contrast, Coin B has a much higher standard deviation of $120, which means its prices experience large daily fluctuations.

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?

Ans:-

Calculate the Mean

The mean (x̄) is calculated by summing the usage values and dividing by the number of months (n=5).

$\bar{x}$ = Sum of total values/n

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

$\bar{x}$ = 2072/5 = 414 kWh

Calculate the Standard Deviation

The sample standard deviation (s) is calculated using the formula:

$$S = \sqrt{\frac{\sum(x_i - \bar{x})2}{n-1}}$$

Calculate the deviations from the mean:

400−414=−14

420−414=6

390−414=−24

450−414=36

410−414=−4

Square the deviations:

$(-14)^2=196$

$6^2=36$

$(-24)^2=576$

$36^2=1296$

$(-4)^2=16$

Sum the squared deviations:

$\sum(x_i - \bar{x})^2$
=196+36+576+1296+16

=2120

Divide by n-1 (sample variance) and take the square root :

S^2 = 2120\5-1

= 2120/4 = 530

S = √530 ≈ 23.02 kWh

The mean electricity usage of 414 kWh represents the family's average monthly consumption. The standard deviation of approximately 23 kWh indicates that the monthly usage does not very greatly from the average.

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?

Ans:-

Given data: [15, 18, 20, 22, 25, 17, 19, 21]

1. **Mean:-**

$$\text{Mean} = \frac{15+18+20+22+25+17+19+21}{8}$$

$$= \frac{157}{8} \approx 19.63$$

2. **Median:-**

there are 8 values, median = average of 4th and 5th:

$$\text{Median} = \frac{19+20}{2}$$

$$= 19.5$$

The middle score is 19.5, showing typical performance per game.

3. **Mode:-**

Mode=None (no repeating value)

4. **Range:-**

Range = 25 - 15 = 10

The scores vary by 10 points

Calculate the Standard Deviation

$$S = \sqrt{\frac{\sum(x_i - \bar{x})2}{n-1}}$$

Deviations from mean (≈19.63):

15-19.63 = -4.63, 17-19.36 = -2.63, 18-19.63 = -1.63, 19-19.63 = -0.63, 20-19.36 = 0.37, 21-19.63 = 1.37, 25-19.63 = 5.37

Square the deviations:

X	$(x - \bar{x})^2$
15	21.39
18	2.64
20	0.14
22	5.64
25	28.89
17	6.89
19	0.39
21	1.89

$\sum(x - \bar{x})^2 = 67.87$

$$\text{Variance} = \frac{67.87}{7} = 9.69$$

$S = \sqrt{9.69} = 3.11$

The mean is 19.625 points, the median is 19.5 points, there is no mode, the range is 10 points, and the sample standard deviation is approximately 3.11 points. And around the average of approximately 19-20 points per game.