

### Scenario 1: Delivery Time Analysis for an E-commerce Company

An e-commerce company tracks delivery times (in minutes) for **15 orders**:  
[25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95]

The company wants to analyze the delivery performance using percentiles and detect if there are any unusual delivery times.

**Question 1:** Calculate Q1 and Q3

- Q1 (25th Percentile) → 25% of the data is below this value
- Q3 (75th Percentile) → 75% of the data is below this value
- Q1 = 4th value → 40
- Q3 = 11th value → 75

**2. Find the IQR**

- Interquartile Range (IQR) measures the spread of the middle 50% of data.  
 $IQR = Q3 - Q1 = 75 - 40 = 35$

**3: Detect Outliers**

Formulas: Lower Bound =  $Q1 - 1.5 \times IQR$ , Upper Bound =  $Q3 + 1.5 \times IQR$

- Lower Bound =  $40 - 1.5 \times 35 = -12.5$  → No lower outliers
- Upper Bound =  $75 + 1.5 \times 35 = 127.5$  → No upper outliers.

No outliers in this dataset.

### Scenario 2:

A teacher is analyzing the mathematics scores of students in her class. The scores are:  
[45, 50, 55, 60, 60, 62, 63, 65, 90, 95]

**Question:**

- Calculate the mean, median, and mode of the scores.
- Explain why the median might be a better representation than the mean in this case.

**Answer:**

- **Mean:**  $45 + 50 + 55 + 60 + 60 + 62 + 63 + 65 + 90 + 95 / 10 = 65.5$

- **Median:** Middle value =  $(60+62)/2=61$
- **Mode:** 60 (Occurs twice)

**Explanation:**

- The **median** is a better measure here because the high outliers (90 and 95) skew the mean. The median is not affected by extreme values.

**Scenario 3:**

A grocery store manager tracks how many customers visit the store daily for a month:

[5, 10, 8, 15, 20, 5, 12, 14, 10, 18]

**Question 1:**

- Create a frequency distribution table for this data.

**Answer:**

Number of Customers	Frequency
5	2
10	2
8	1
12	1
14	1
15	1
18	1
20	1

**Scenario 4:**

A real estate model has three variables:

- House Size
- Number of Rooms
- Number of Bathrooms

**Question 1:**

- How can you detect multicollinearity?

**Answer:**

- Logic:
  - Calculate the Variance Inflation Factor (VIF).
  - $VIF > 10$  indicates multicollinearity.
- Answer: High VIF means the variables are correlated, impacting model accuracy.

**Scenario 5:**

A company made a new medicine to lower blood pressure. They gave it to one group and gave a fake pill (placebo) to another group.

**Question 1:**

How can the company check if the new medicine works?

**Solution:**

- Null hypothesis: The medicine doesn't lower blood pressure.
- Alternate Hypothesis: The medicine lowers blood pressure.
- Do a T-Test:
  - Find the p-value (a number that shows how likely the result happened by chance).
  - If p-value  $< 0.05$ , it means the medicine likely works.
- Final Answer:
  - If the p-value is small, the medicine is effective.

**Scenario 6: Identifying Outliers in Sales Data**

A company wants to find any unusual spikes in sales.

**Question 1:**

How can the company detect outliers in their sales data?

**Logic:**

- Step 1: Calculate  $q_1, q_3$
- Step 2: Calculate the Interquartile Range (IQR).

- Step3: Calculate lower bound =  $Q1 - 1.5 \times IQR$  and upper bound =  $Q3 + 1.5 \times IQR$
- Step 4: Identify outliers using the formula:  
Outliers = (Data < lowerbound) or (Data > upper bound)

### **Scenario 7: Understanding Customer Satisfaction**

A restaurant conducted a survey to rate customer satisfaction on a scale of 1 to 5:  
[ 5, 4, 4, 5, 3, 4, 5, 2, 4, 3 ]

**Question 1:** How can the restaurant summarize the overall satisfaction?

**Answer:**

- Find the Mode to see the most common rating.
- Calculate the Mean and Median for further insights.
- If most ratings are 4 or 5, satisfaction is generally high.