# **Approach Explanation**

## **Assumptions**

1. Growth Factor (G > 1): This ensures the customer base grows every day.

2. Positive and Increasing Capital Growth: The daily growth in capital (Capital\_EOD - Capital\_SOD) should always be positive and increase day by day.

3. Simplified Spending Values: For simplicity, mi (delivery spend) and Mi (marketing spend) are taken as whole numbers (in millions of rupees).

4. Average weekly order frequency was calculated using that data provided for a sample of customers. We have assumed the same weekly order frequency for all the customers.

## **Finding the Best Combination of mi and Mi**

I wrote a Python function to find the best possible combination of mi and Mi for any given budget that maximizes the growth factor G. The function works by testing different splits of the budget between mi and Mi and selecting the combination that gives the highest G, while making sure G > 1.

## **Initial Observations**

1. Day 1 Spending:

- The initial budget was 15 million. However, I found that spending the full 15 million led to Capital\_EOD < Capital\_SOD, meaning capital growth was negative.

- Using the function, I determined that spending 14 million (with mi = 8 and Mi = 6) was the best option for Day 1. This combination kept G > 1 and ensured Capital\_EOD > Capital\_SOD.

2. Minimum Budget:

- The function showed that at least 8 million must be spent daily to keep G > 1. Spending less than this causes the customer base to shrink.

## **Spending Strategy**

To make the best use of the available capital while maximizing customer growth, I came up with the following strategy:

- Higher Spending in Early Days: Spend 14 million per day for the first 6 days. This helps grow the customer base quickly, which is important for increasing daily profits.

- Gradual Reduction in Budget: After the first 6 days, reduce spending step by step. This ensures that capital growth improves while still maintaining G > 1.

Here’s the daily spending plan:

- Day 1–6: 14 million

- Day 7–10: 13 million

- Day 11–14: 12 million

- Day 15–18: 11 million

- Day 19–22: 10 million

- Day 23–26: 9 million

- Day 27–30: 8 million

## **Why This Strategy Works**

1. Focus on Early Customer Growth:

- Spending more in the early days helps grow the customer base quickly. A larger customer base means higher daily profits in the following days.

2. Improved Capital Growth:

- Gradually reducing the daily budget allows the capital to grow faster while ensuring that customer growth doesn’t stop.

3. Balanced Approach:

- This strategy balances between growing the customer base and increasing capital. It uses higher spending early on and shifts focus to capital growth later.

This plan ensures the problem objectives are met: maintaining positive capital growth, keeping customer growth steady, and optimizing spending over 30 days.

**Suggestions -**

1. Allowing fractional values for mi, and Mi would enable more precise allocation of the daily budget, potentially maximizing the growth factor, G more effectively.
2. Instead of using the same average weekly frequency for all customers, we can look at the distribution of weekly frequencies and plan different strategies for different customer groups. This way, spending and resources can be better matched to how often each group places orders.