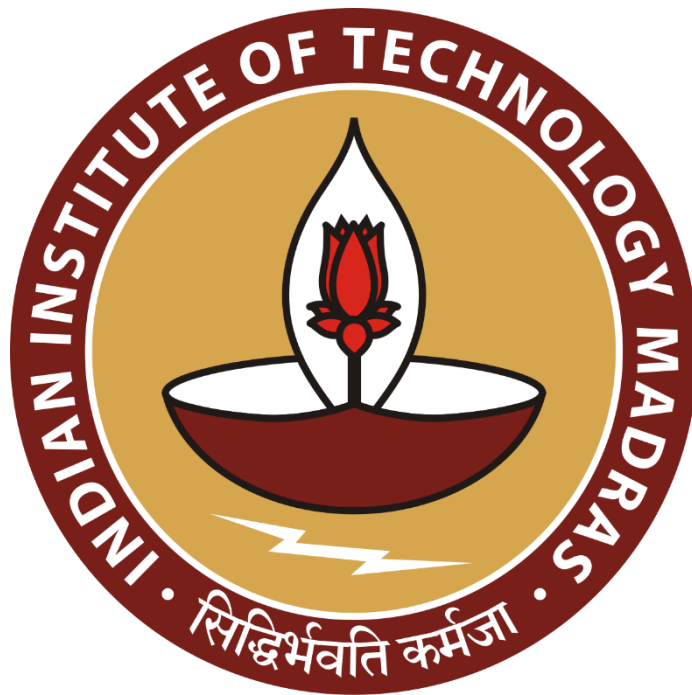# Optimizing Inventory Management for Priya General Store's Enhanced Profitability.

A Proposal report for the BDM capstone Project

Submitted by

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<u>Declaration Statement</u>

I am working on a Project titled "**Optimizing Inventory Management for Priya General Store's Enhanced Profitability**". I extend my appreciation to **Priya General Store**, for providing the necessary resources that enabled me to conduct my project.

I hereby assert that the data presented and assessed in this project report is genuine and precise to the utmost extent of my knowledge and capabilities. The data has been gathered from primary sources and carefully analyzed to assure its reliability.

Additionally, I affirm that all procedures employed for the purpose of data collection and analysis have been duly explained in this report. The outcomes and inferences derived from the data are an accurate depiction of the findings acquired through thorough analytical procedures.

I am dedicated to adhering to the principles of academic honesty and integrity, and I am receptive to any additional examination or validation of the data contained in this project report.

I understand that the execution of this project is intended for individual completion and is not to be undertaken collectively. I thus affirm that I am not engaged in any form of collaboration with other individuals, and that all the work undertaken has been solely conducted by me. In the event that plagiarism is detected in the report at any stage of the project's completion, I am fully aware and prepared to accept disciplinary measures imposed by the relevant authority.

I understand that all recommendations made in this project report are within the context of the academic project taken up towards course fulfillment in the BS Degree Program offered by IIT Madras. The institution does not endorse any of the claims or comments.

Satyam Kumar

Signature of Candidate

Name: **Satyam Kumar**

Date: 05-11-2023

Executive Summary

This project revolves around Priya General Store, a small, decade-old kirana store established in 2003 by Pradeep Kumar. Located in Balupur Lane, Patna, the store caters to B2C customers, offering a wide range of products, including stationary, gift items, general items, Maggi, shampoo, ice cream, cold drinks, and milk.

Priya General Store faces several challenges, including seasonal fluctuations in sales, inventory management issues, and concerns related to storage and product returns. These challenges have a direct impact on the store's profitability.

The project aims to address these challenges by using data analytics and inventory management strategies to optimize stock levels, reduce losses, and improve efficiency.Approaches such as demand forecasting, trend analysis, and efficient storage solutions will be implemented.

The expected outcome of this project is to help Priya General Store reduce capital tied up in slow-moving or perishable inventory, ultimately enhancing its profitability. By leveraging data-driven insights, the store can better adapt to seasonal variations and navigate challenging market conditions, ensuring its long-term sustainability and success.ate challenging market conditions, ensuring its long-term sustainability and success.

Proof of originality
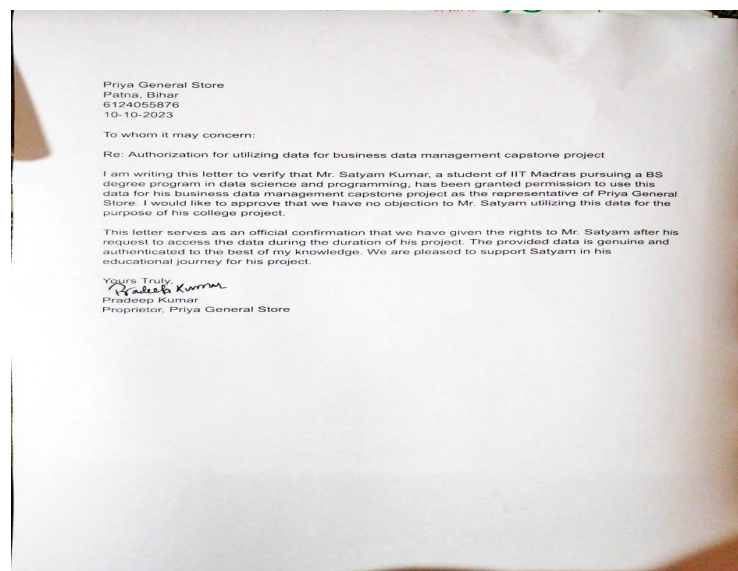
[Video-Proof](#) [Meeting_audio](#)

Metadata

The Priya General Store dataset provides a comprehensive ledger of manually entered sales and inventory information. The dataset spans from December 1 to December 10, 2023, capturing three months data from **September** to **November**. The data is organized into categories, including beverages, dairy products, personal care, snacks, toys and stationary, and condiments. Each category features specific columns detailing company information, types, quantities, costs, selling prices, monthly stock levels, and monthly sales figures. This dataset is stored in an Excel file, named **'BDM.xlsx**,' with each sheet representing a unique category. The metadata succinctly captures the essence of the dataset, aiding in its understanding and effective utilization for analysis and decision-making

```
Description: Priya General Store data
Source: Ledger file from Priya General Store, manually entered
Author: Satyam Kumar
CreationDate: 2023-12-01 to 2023-12-10
Tables: ['Cateogories', 'Toys and stationary', 'Condiments', 'Personal Care', 'Beverages', 'Diary products', 'Snacks', 'Montly_sale'
```

The provided data set below offers insights into the purchase and sales rates across various product categories at Priya General Store. The categories, including **Snacks, Beverages, Personal Care, Diary Products, Toys and Stationary, and Condiments**, each showcase distinct rates of purchase and sales. The purchase rates range from 10.9 to 87.0, while the sales rates vary from 14.8 to 107.2.

Categories	Purchase__Rate	Sales_Rate
Snacks	32.7	43.0
Beverages	52.7	66.6
Personal care	87.0	105.6
Diary Products	86.8	107.2
Toys and Stationary	54.6	76.0
Condiments	10.9	14.8

CategoryRates

The overall monthly sales data contains 4 columns i.e. **Month,Sale_Amount , Gross_Profit,Net_Profit**.The dataset captures essential financial details for Priya General Store, focusing on sales-related metrics for the months of September, October, and November.

Month	Sale_Amount	Gross_Profit	Net_Profit
September	60659	11327	10327
October	65709	12487	11487
November	44608	8177	7177

The dataset consists of five rows and four columns, namely 'Categories,' 'Quantity,' 'Purchase__Rate,' and 'Monthly_Stock_Amount.' Analyzed using **Pandas**, it provides insights into quantities, purchase rates, and monthly stock amounts for various product categories at Priya General Store.This data was cleaned and processed for analysis according to the project objectives.

```
df = pd.read_excel('BDM.xlsx', sheet_name=f'Montly analysis')
df.head()
```

	Categories	Quantity	Purchase__Rate	Monthly_Stock_Amount
0	Snacks	1346	32.68	43987.28
1	Beverages	907	52.71	47807.97
2	Personal care	156	87.04	13578.24
3	Diary Products	200	86.80	17360.00
4	Toys and Stationary	30	54.55	1636.50

Data was cleaned and was segregated into Company, Type, Volume, Cost_per_unit, selling Price, Monthly_stock and each month sales from Sept to Nov.

```
df = pd.read_excel('BDM.xlsx', sheet_name=f'Product_wise_data')
df.head()
```

	Company	Type	Volume(ml)	Cost_per_unit	Selling price	Monthly_Stock	Sept_sale	Oct_Sale	Nov_Sale	Se
0	Mazza	Cold Drink	500	32	42	105.333333	55	61	42	
1	Real(Fruit juice Mixed)	Fruit Juice Drink	1000	102	128	8.000000	6	4	2	
2	Sting	Energy Drink	250	15	20	109.333333	60	74	30	
3	Red Bull	Energy Drink	250	107	125	19.333333	6	19	4	
4	Real(Fruit juice)	Fruit Juice	1000	111	130	7.333333	2	7	2	

Descriptive Statistics

Descriptive statistics of Quantity ,Purchase_rate ,Monthly_Stock_Amount

```
df = pd.read_excel('BDM.xlsx', sheet_name=f'Monthly analysis')
df.describe()
```

	Quantity	Purchase__Rate	Monthly_Stock_Amount
count	6.000000	6.000000	6.000000
mean	514.833333	54.113333	21545.831667
std	512.207152	29.938348	19736.367360
min	30.000000	10.900000	1636.500000
25%	167.000000	37.687500	7073.310000
50%	325.000000	53.630000	15469.120000
75%	792.750000	78.737500	37330.460000
max	1346.000000	87.040000	47807.970000

The data analysis reveals notable variation in product quantity, purchase rates, and monthly stock amounts across six categories. With average quantities around 514.83, purchase rates at approximately 54.11, and monthly stock amounts averaging 21545.83, the data suggests diverse patterns and potential opportunities for optimization in inventory management and pricing strategies. The high standard deviations indicate significant variability within each category.

Descriptive statistics of Beverages

```
df = pd.read_excel('BDM.xlsx', sheet_name=f'Beverages')
df.describe()
```

	Volume(ml)	Cost_per_unit	Selling price	Monthly_Stock	Sept_sale	Oct_Sale	Nov_Sale	Sept_PROFIT	Oct_PROFIT	Nov_PROFIT	Sept_Sale	Oct_Sale.1	Nov_Sale.1
count	14.000000	14.000000	14.000000	14.000000	14.000000	14.000000	14.000000	14.000000	14.000000	14.000000	14.000000	14.000000	14.000000
mean	812.142857	52.714286	66.642857	64.761905	38.142857	38.714286	20.285714	298.857143	303.071429	155.000000	1479.214286	1553.571429	730.571429
std	604.332799	34.803688	43.453967	59.703459	33.544132	33.520209	25.610781	216.985947	192.656116	158.744594	883.878531	795.989439	624.168828
min	120.000000	13.000000	15.000000	7.333333	2.000000	4.000000	2.000000	18.000000	24.000000	4.000000	180.000000	240.000000	40.000000
25%	350.000000	30.500000	40.000000	16.000000	8.250000	12.250000	4.000000	157.000000	166.500000	57.000000	762.000000	1004.250000	365.000000
50%	750.000000	36.000000	41.000000	52.666667	37.000000	29.500000	8.500000	238.000000	266.000000	90.000000	1425.000000	1540.000000	470.000000
75%	1000.000000	73.250000	99.000000	100.833333	61.500000	60.250000	28.250000	485.500000	380.500000	169.500000	2282.500000	2220.000000	888.000000
max	2250.000000	111.000000	130.000000	208.666667	110.000000	115.000000	88.000000	684.000000	700.000000	550.000000	2720.000000	2800.000000	2200.000000

The dataset reveals notable variation in product metrics, with an average volume of 812.14 ml and a wide range from 120 ml to 2250 ml. Cost per unit shows diversity, ranging from Rs. 13 to Rs. 111, while selling prices fluctuate between Rs. 15 and Rs. 130. The data highlights the need for nuanced strategies in pricing and sales, given the observed diversity across product characteristics.

Descriptive statistics of Personal Care

```
df = pd.read_excel('BDM.xlsx', sheet_name=f'Personal Care')
df.describe()
```

	Cost per Unit	Selling Price	Monthly Stock	Sept_Sale	Oct_Sale	Nov_Sale	Sept_PROFIT	Oct_PROFIT	Nov_PROFIT	Sep_Sale	Oct_Sale.1	Nov_Sale.1
count	21.000000	21.000000	21.000000	21.000000	21.000000	21.000000	21.000000	21.000000	21.000000	21.000000	21.000000	21.000000
mean	87.042857	105.619048	7.444444	2.857143	2.523810	1.952381	38.890476	31.780952	20.604762	216.904762	163.523810	119.285714
std	51.463721	61.479652	2.595580	2.535463	3.187774	2.871867	33.671500	34.735337	23.120304	200.920359	174.731113	137.541318
min	7.000000	16.000000	5.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25%	45.000000	55.000000	5.666667	1.000000	1.000000	0.000000	12.000000	8.000000	0.000000	96.000000	44.000000	0.000000
50%	87.000000	100.000000	6.333333	2.000000	1.000000	1.000000	38.000000	24.000000	13.000000	198.000000	130.000000	100.000000
75%	124.000000	145.000000	7.666667	5.000000	3.000000	2.000000	56.000000	39.000000	28.000000	270.000000	245.000000	150.000000
max	193.000000	245.000000	14.333333	9.000000	13.000000	9.000000	126.000000	130.000000	80.000000	870.000000	715.000000	440.000000

Upon examining the descriptive statistics, the dataset reveals considerable variation in product metrics. The average cost per unit is Rs. 87.04, ranging from Rs. 7 to Rs. 193, highlighting a diverse pricing spectrum.

Descriptive statistics of Dairy Products

```
df = pd.read_excel('BDM.xlsx', sheet_name=f'Dairy products')
df.describe()
```

	Cost_per_unit	Selling price	Montly stock	Sept_Sale	Oct_Sale	Nov_Sale	Oct_Profit	Nov_Profit	Sep_Sale	Oct_Sale.1	Nov_Sale.1
count	9.000000	9.000000	9.000000	9.000000	9.000000	9.000000	9.000000	9.000000	9.000000	9.000000	9.000000
mean	86.888889	107.222222	22.222222	24.777778	27.333333	21.111111	345.444444	216.111111	1782.777778	2169.444444	1442.444444
std	58.485991	86.240619	12.275767	18.129932	19.039433	18.100031	313.105059	156.213351	984.006832	1469.784092	928.508900
min	20.000000	26.000000	10.000000	7.000000	10.000000	4.000000	50.000000	35.000000	810.000000	840.000000	462.000000
25%	45.000000	50.000000	15.000000	9.000000	11.000000	7.000000	80.000000	44.000000	1300.000000	1155.000000	630.000000
50%	85.000000	90.000000	20.000000	20.000000	20.000000	11.000000	285.000000	240.000000	1365.000000	1300.000000	1300.000000
75%	99.000000	110.000000	25.000000	35.000000	48.000000	30.000000	528.000000	330.000000	2030.000000	2900.000000	1800.000000
max	200.000000	290.000000	50.000000	55.000000	57.000000	50.000000	900.000000	450.000000	3850.000000	5280.000000	3300.000000

Monthly stock levels have an average of 22.22 units, reflecting diversity in inventory across the observations. Sales in September, October, and November vary, with mean values of 24.78, 27.33, and 21.11 units, respectively. Profits for October and November show an average of Rs. 345.44 and Rs. 216.11. Monthly sales in September, October, and November have average values of 1782.78, 2169.44, and 1442.44, respectively.

Descriptive statistics of Snacks

```
df = pd.read_excel('BDM.xlsx', sheet_name=f'Snacks')
df.describe()
```

	Cost per Unit	Selling Price	Montly_STOCK	Sept_Sale	Oct_Sale	Nov_Sale	Sept_PROFIT	Oct_PROFIT	Nov_PROFIT	Sept_Total_sale	Oct_Total_Sale	Nov_Total_sale
count	31.000000	31.00000	31.000000	31.000000	31.000000	31.000000	31.000000	31.000000	31.000000	31.000000	31.000000	31.000000
mean	32.683871	43.00000	43.419355	26.548387	29.387097	27.838710	117.354839	126.335484	109.212903	582.967742	594.677419	575.548387
std	32.786736	44.65572	39.001516	28.091326	31.931883	34.387107	131.964780	157.639618	134.167377	633.639934	625.404796	732.492769
min	2.000000	5.00000	3.000000	1.000000	1.000000	0.000000	7.000000	7.000000	0.000000	70.000000	65.000000	0.000000
25%	8.000000	10.00000	11.000000	9.000000	9.500000	7.000000	43.500000	42.500000	35.000000	210.000000	160.000000	142.500000
50%	18.000000	20.00000	30.000000	14.000000	16.000000	13.000000	60.000000	62.400000	48.000000	325.000000	400.000000	320.000000
75%	50.000000	57.00000	70.000000	30.000000	36.500000	28.500000	153.000000	172.000000	150.000000	720.000000	690.000000	482.500000
max	103.000000	170.00000	120.000000	90.000000	110.000000	135.000000	658.000000	846.000000	675.000000	2880.000000	2880.000000	2880.000000

The average cost per unit is Rs. 32.68, with a range from Rs. 2 to Rs. 103, indicating diverse pricing. The selling price shows a similar trend, with an average of Rs. 43.00 and a range from Rs. 5 to Rs. 170. Monthly stock levels average 43.42 units, showcasing inventory diversity. Sales in September, October, and November have mean values of 26.55, 29.39, and 27.84 units, respectively.

Descriptive Statistics of Toys And Stationary

```
df = pd.read_excel('BDM.xlsx', sheet_name=f'Toys and stationary')
df.describe()
```

	Quantity	Cost	Selling Price	Cost_Per_unit	Selling_price_per_Unit	Monthly Stock(sets)	Sept_Sale	Oct_sale	Nov_Sale	Sept_Profit	Oct_Profit	Nov_Profit	Sept_Sale_amount	Oct_Sale_amount	Nov_Sale_Amount
count	16.000000	16.000000	16.000000	16.000000	16.000000	16.000000	16.00000	16.000000	16.000000	16.000000	16.000000	16.000000	16.000000	16.000000	16.000000
mean	11.000000	233.250000	322.437500	54.550000	75.961458	1.875000	3.50000	3.812500	2.625000	12.453125	33.742708	12.689583	57.168750	136.563542	54.763542
std	10.500794	257.373529	384.144759	70.244291	101.333993	0.619139	4.09878	3.745553	2.895399	13.939075	39.351550	12.837045	61.184439	129.992662	61.104744
min	1.000000	50.000000	80.000000	3.000000	5.000000	1.000000	0.00000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25%	2.750000	78.750000	117.500000	6.862500	9.562500	1.750000	0.00000	1.750000	0.750000	0.000000	7.925000	1.500000	0.000000	37.462500	3.750000
50%	5.500000	140.000000	199.000000	40.000000	57.500000	2.000000	2.00000	2.500000	1.000000	7.150000	12.250000	10.600000	37.150000	103.183333	44.133333
75%	20.000000	234.000000	262.500000	63.500000	86.250000	2.000000	5.75000	4.000000	4.250000	21.062500	54.000000	18.125000	103.100000	201.750000	70.000000
max	30.000000	1000.000000	1600.000000	250.000000	400.000000	3.000000	12.00000	13.000000	8.000000	40.000000	150.000000	40.000000	180.000000	420.000000	240.000000

The average quantity is 11, with a cost per unit of Rs. 54.55 and a selling price per unit of Rs. 75.96. Monthly stock levels average 1.88 sets, and sales in September, October, and November average 3.50, 3.81, and 2.63 sets, respectively. Corresponding profits for these months average Rs. 12.45, Rs. 33.74, and Rs. 12.69. Sale amounts in September, October, and November show mean values of Rs. 57.17, Rs. 136.56, and Rs. 54.76, emphasizing the variability in product quantities, pricing, sales, and profitability.

Descriptive statistics of Condiments

```
df = pd.read_excel('BDM.xlsx', sheet_name=f'Condiments')
df.describe()
```

	Cost	Selling Price	Monthly_stock	Sept _sale	Oct_Sale	Nov_Sale	Sept_PROFIT	Oct_PROFIT	Nov_PROFIT	Net_PROFIT	Sept_Sale_amount	Oct_Sale_amount	Nov_Sale_Amount
count	8.000000	8.000000	8.000000	8.000000	8.000000	8.000000	8.000000	8.000000	8.000000	8.000000	8.000000	8.00000	8.000000
mean	10.925000	14.750000	56.25000	4.500000	4.25000	2.250000	12.025000	11.750000	5.075000	28.850000	51.000000	47.50000	21.875000
std	8.895545	11.042127	17.67767	4.869732	4.49603	3.011881	8.873999	10.620062	5.888427	22.932385	46.500384	46.59859	30.465144
min	2.000000	5.000000	50.00000	0.000000	0.00000	0.000000	0.000000	0.000000	0.000000	7.800000	0.000000	0.00000	0.000000
25%	7.000000	10.000000	50.00000	1.750000	0.75000	0.750000	5.800000	2.250000	1.950000	8.750000	17.500000	3.75000	3.750000
50%	7.700000	10.000000	50.00000	2.000000	2.50000	1.000000	11.000000	11.000000	3.000000	23.500000	44.000000	47.50000	10.000000
75%	10.500000	13.750000	50.00000	6.500000	8.00000	2.500000	16.750000	21.750000	6.500000	45.250000	65.000000	80.00000	25.000000
max	30.000000	38.000000	100.00000	13.000000	12.00000	9.000000	26.000000	24.000000	18.000000	68.000000	130.000000	120.00000	90.000000

The average cost is Rs. 10.93, selling price is Rs. 14.75, and monthly stock is 56.25 units. September, October, and November sales average 4.5, 4.25, and 2.25 units, respectively. Corresponding profits for these months average Rs. 12.03, Rs. 11.75, and Rs. 5.08.

Detailed explanation for analysis process

The analysis process primarily employed the Pandas library in Python for data manipulation and analysis, complemented by Excel for visualization. The chosen method offers several advantages that make it more appropriate than alternative approaches:

1. **Versatility of Pandas**:

 Justification:Pandas is a robust library that excels in **data manipulation**, **cleaning**, and **analysis**. Its extensive functionalities, including data filtering, grouping, and statistical operations, provided a comprehensive toolkit for processing diverse datasets, as evidenced by the varied data structures and analyses shared. Methods like **df.describe()** are used for descriptive statistics.

2. **Python's Efficiency for Complex Tasks**:

 Justification:Python, with Pandas, offers a more efficient and scalable solution for handling complex data tasks. The language's simplicity and readability, coupled with Pandas' optimized data structures, make it well-suited for diverse analyses, including **aggregations, calculations, and transformations**.

3. **Excel for Visualization and Dynamic Reporting**:

   Justification:While Python and Pandas excel in data manipulation, Excel's strength lies in **visualization** and **dynamic reporting**. The seamless integration of Pandas with Excel allows for the creation of interactive dashboards and visually compelling charts, enhancing the communication of insights to a non-technical audience.

4. **Pivot-table in Excel**:

   Justification: Excel's **pivot tables** and **charts** facilitate the creation of interactive dashboards, allowing decision-makers to explore **trends** and patterns effortlessly. This dynamic presentation is instrumental in deriving actionable insights for strategic decision-making.

Key Analysis and Findings

❖ We can see sales and profit was maximum in October however minimum in November. Festivals in October lead to maximum sales in October.
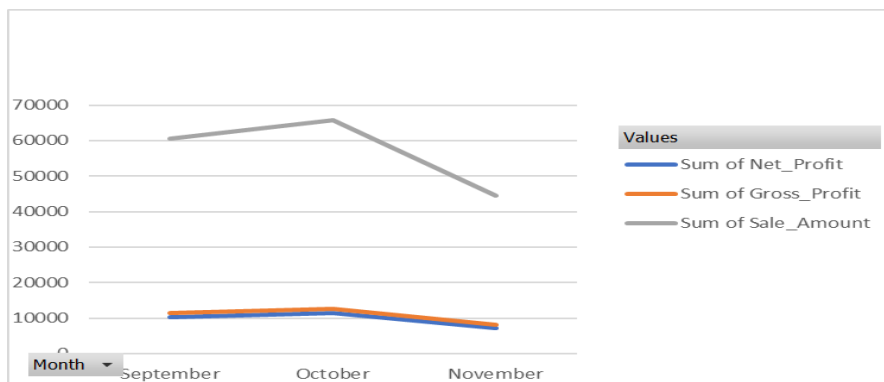
❖ The less sale of beverages in November indicates seasonal factors. In November, since the cold began, people consumed less beverages such as cold drinks and fruit drinks.

❖ Dairy products generate more monthly average profit followed by Beverages and Snacks.

montly_aeverage_profit

TOTAL

Categories ▾
- Beverages
- Condiments
- Diary Products
- Personal care
- Snacks
- Toys and Stationary