Business Data Management Capstone Project

Final Submission

Term: September 2022

Date: 19th January 2023

Name: Prateeksha Tripathi

Roll no: 22ds3000116

TITLE:

Predicting stock-out conditions with changing demands of consumers for a stationery shop.
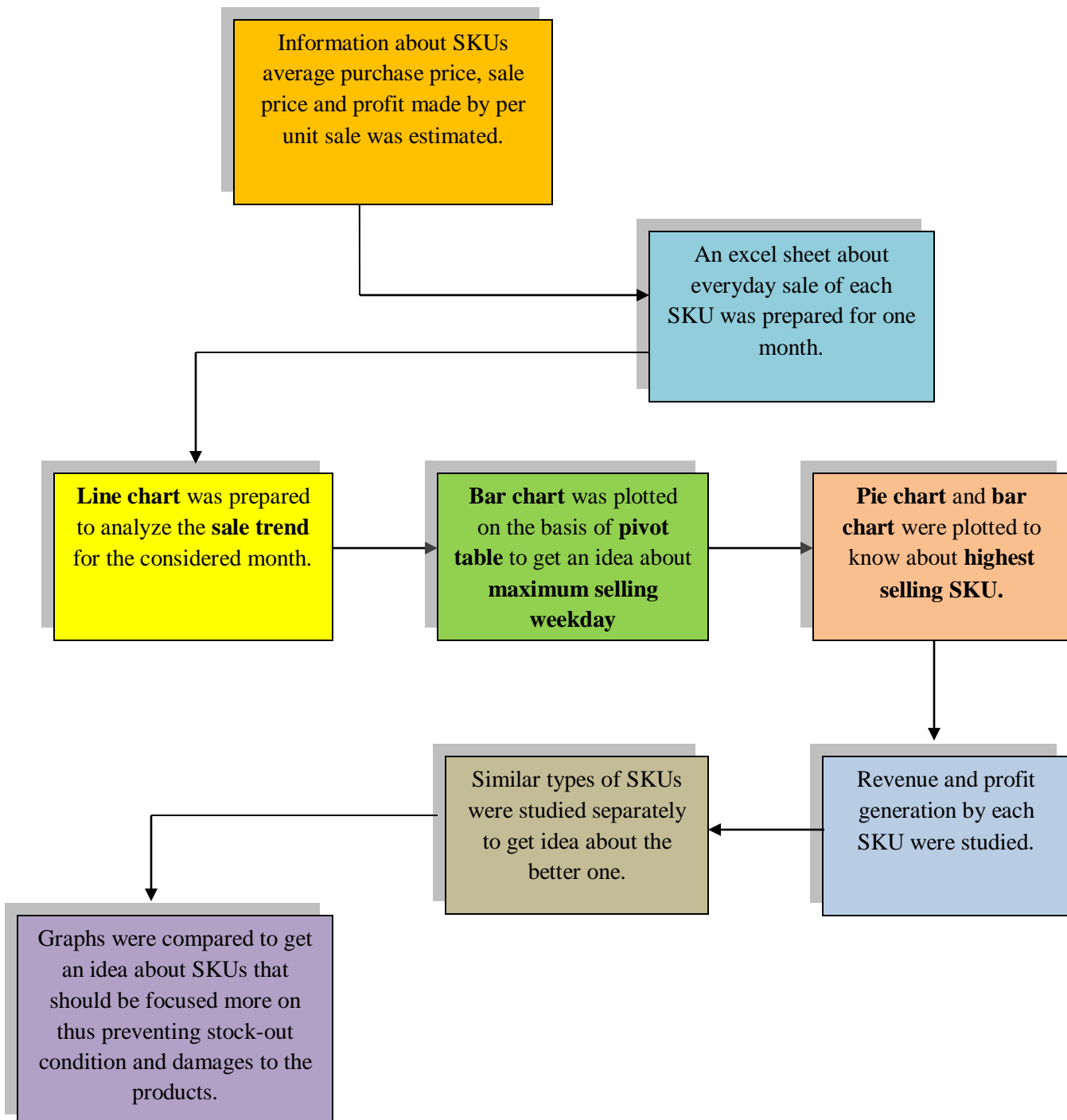
EXECUTIVE SUMMARY

In this project, we have analyzed the problems regarding stockouts and damages to inventories faced by **Mr. Shukla** owner of **Vidya Book House** which is a small stationery shop located in a highly populated area of **Teliarganj, Prayagraj**, about 500m from MNNIT Allahabad.

One month of **data from 12/15/2022 - 01/15/2023** is used. To study different trends, **20 SKUs**, namely Linc Pentonic ballpoint pen, Apsara platinum pencil, Doms X-tra dark pencil, Fevicol, Fevigum, Promise adhesive tape, Cellopapersoft pen, Apsara non-dust eraser, Doms eraser, Doms marker, Luxor CD/DVD marker, Classmate notebook, Student notebook, Luxor highlighter pen, Nishu file sheets, Orient A4 size paper, Doms majestic basket crayons, Pidilite watercolors, Casio calculator and miscellaneous items including decorative, gift items, toys, etc. were taken.

Different types of charts were plotted to know the sale trend of the items, the day of the week having high sale value, which SKU is sold more, which generates more revenue and profit, etc.,

thus concluding which product the owner should focus more on and try to keep in stock which would help him maintain his inventories preventing stock-out condition and helping him maximize his profit.

ANALYSIS PROCESS/ METHODS USED

Information about SKUs average purchase price, sale price and profit made by per unit sale was estimated.

An excel sheet about everyday sale of each SKU was prepared for one month.

Line chart was prepared to analyze the **sale trend** for the considered month.

Bar chart was plotted on the basis of **pivot table** to get an idea about **maximum selling weekday**

Pie chart and **bar chart** were plotted to know about **highest selling SKU.**

Similar types of SKUs were studied separately to get idea about the better one.

Revenue and profit generation by each SKU were studied.

Graphs were compared to get an idea about SKUs that should be focused more on thus preventing stock-out condition and damages to the products.

RESULTS AND FINDINGS

The link given directs to the excel sheet maintained for the data collection [data sheet](#)

- **CHARTS SHOWING SALES TREND**
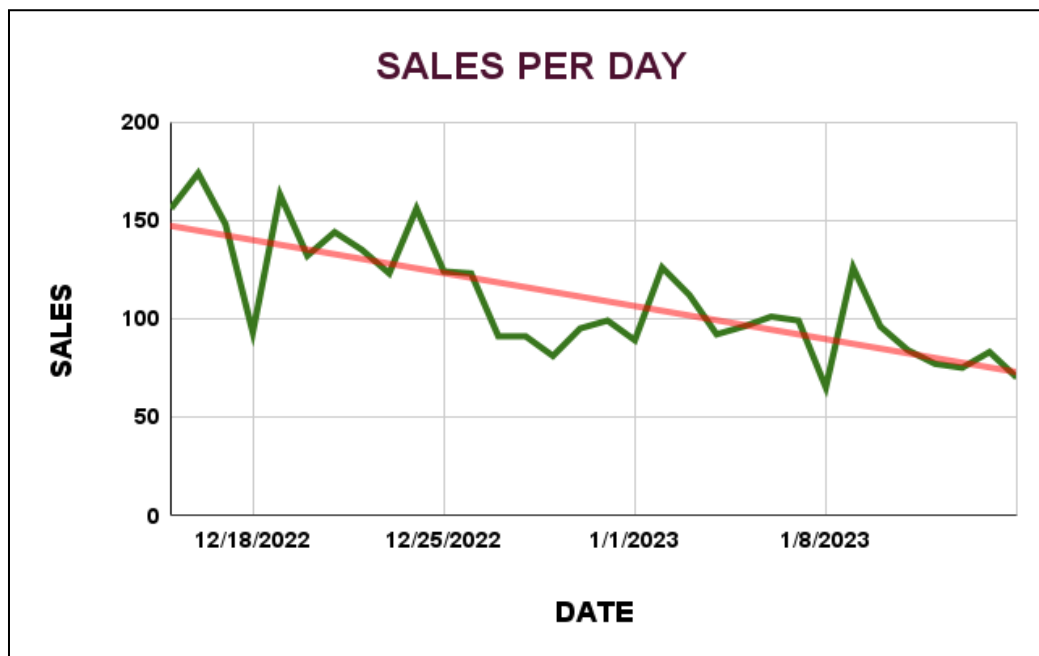
A line chart of sales per day was plotted for one month time period i.e from **12/15/2022 to 01/15/2023**. As depicted in the graph above, we see a **negative trend** in sales for the considered month.

Also as can be seen above, the dates mentioned in the graph are the **Sundays** of the month and they show a bottom peak position indicating that the sales on Sundays are the lowest.
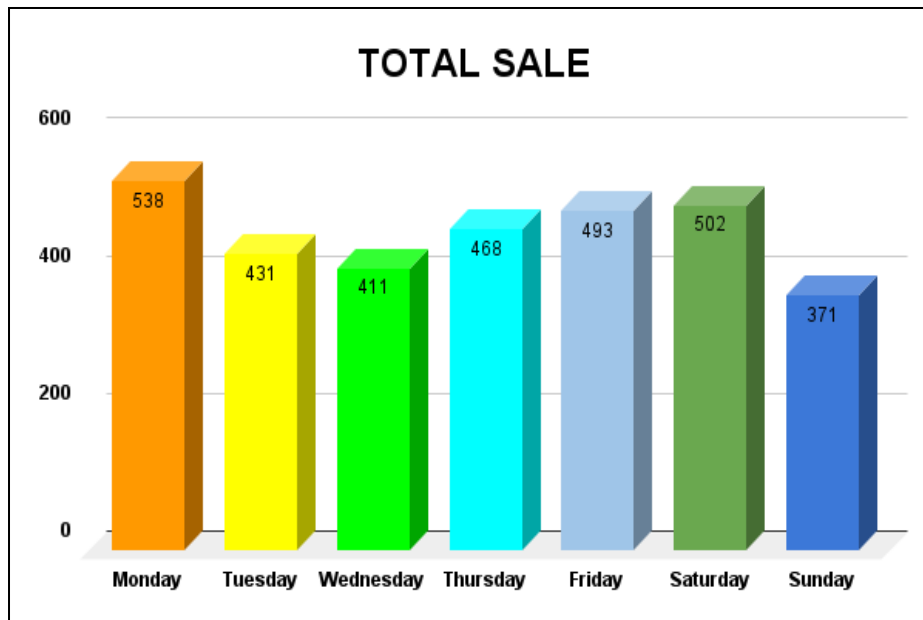
TOTAL SALE

The bar graph depicts the total sales on weekdays. Since data taken from **15ᵗʰ December 2022** to **15ᵗʰ January 2023** has **4 Mondays, Tuesdays, and Wednesdays** and **5 Thursdays, Fridays, Saturdays, and Sundays** therefore the graph shown above has been **normalized** by taking an **equal number of weekdays** to study the actual course of sales.

As can be inferred from the plot above, there is a distinct difference in the sale on Sundays and Mondays with **Sundays** having a **total sale of 371** and **Mondays** with **538**, the highest sale day of the week. Saturdays have the **second highest** sale value of **502.**

.

- **CHARTS SHOWING RELATION BETWEEN SKUs AND TOTAL SALE**

TOTAL SALE vs. SKU
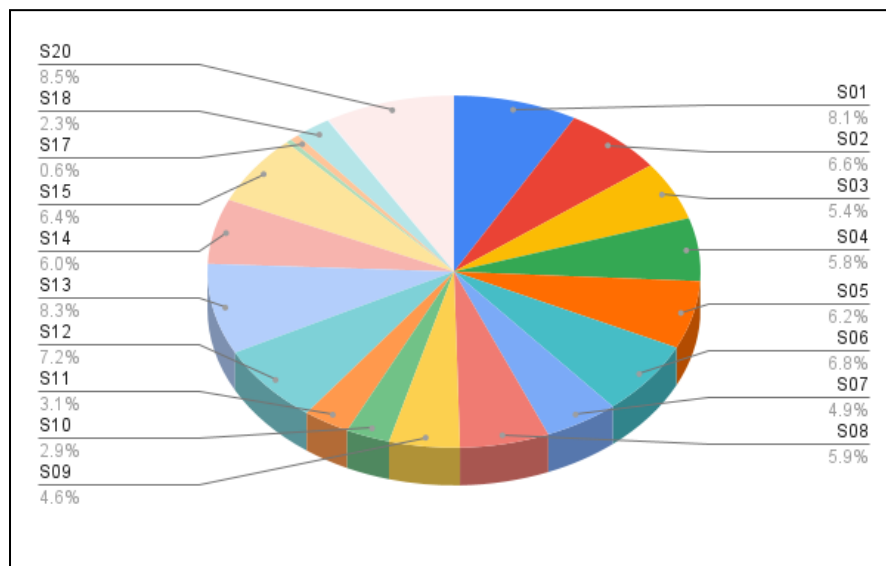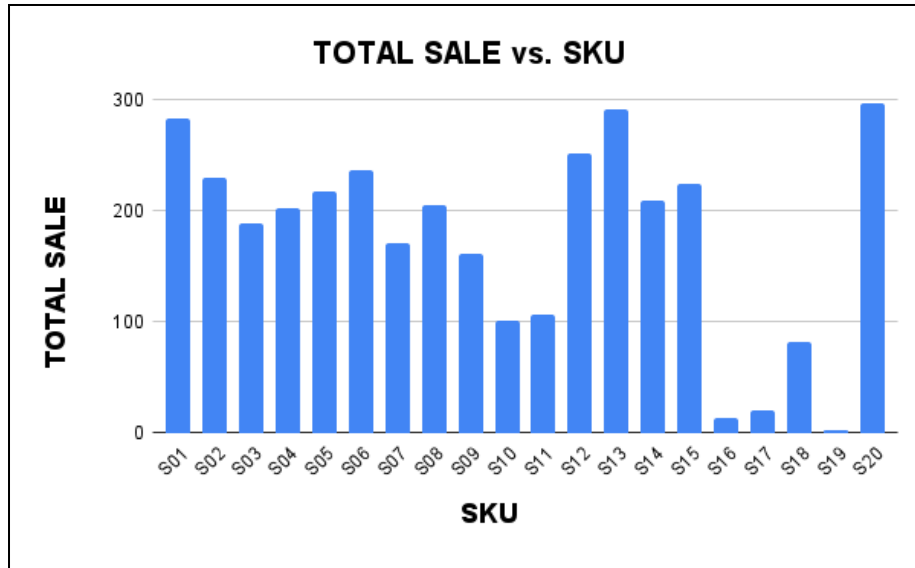
Graphs show the demand for each SKU by total sales data and the percentage share of each SKU in total sales.

As can be concluded through these two plots, **S20** (miscellaneous) has the **maximum** share of **8.5**% by selling **297** units throughout the month.

S13 (**student notebook)** accounts for the **second highest** SKU sold comprising **8.3%** of total sale volume with **291** units being sold.

S19 (Casio calculator) has the **lowest** demand with only **3** units being sold in the whole month. The second lowest item being sold in a month is **S16** (A4 size sheets bundle).

- **CHARTS SHOWING REVENUE AND PROFIT GENERATED BY SKUS**

SKU Vs. PROFIT
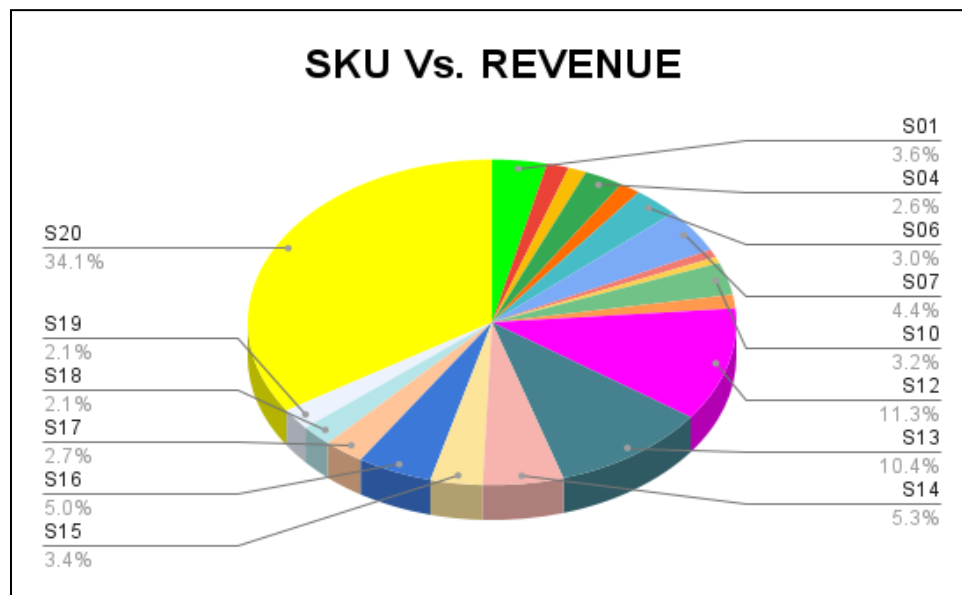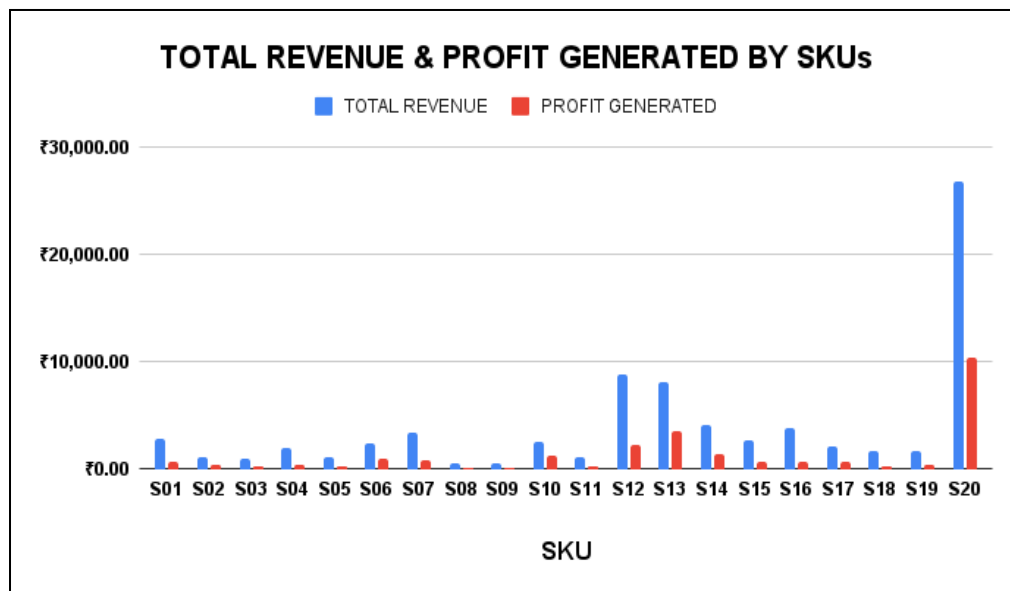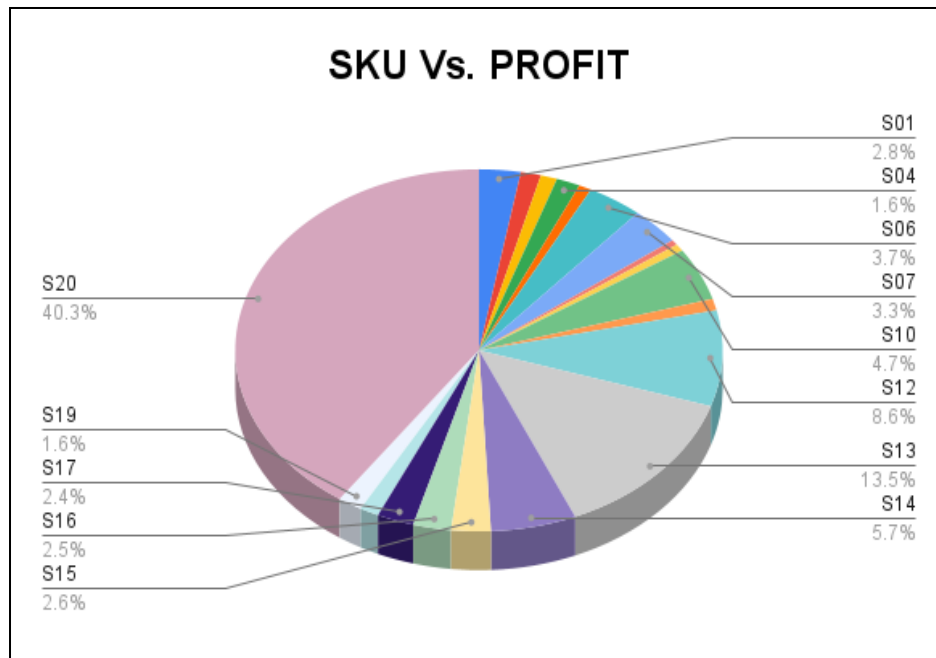
The plots show the SKUs generating the highest and lowest revenue and profit.

Revenue of **Rs.26,730** is generated by **S20** which comprises **34.1%** of the total since **297 units** were sold with an average **selling price of Rs.90**. Profit of Rs.10395 was also generated by S20 having a profit margin of Rs. 35, being highest among all the items.

Other SKUs, except for S12 and S13, have an average sale price in the range **of Rs.3-Rs.20** comprising **44.2%** (Rs.61,431) **of total revenue**. **37.6%** (Rs.20,083) of **total profit** is generated by these products.

S12 and **S13** which are **notebooks** of different brands comprise **21.7%** of total revenue with **S12** selling **252 units** and **S13** selling **291** units in the range of **Rs.28-Rs35**, generating a profit of **Rs.5,697**.

- **PLOT OF SALE VERSUS PROFIT GENERATED PER UNIT**
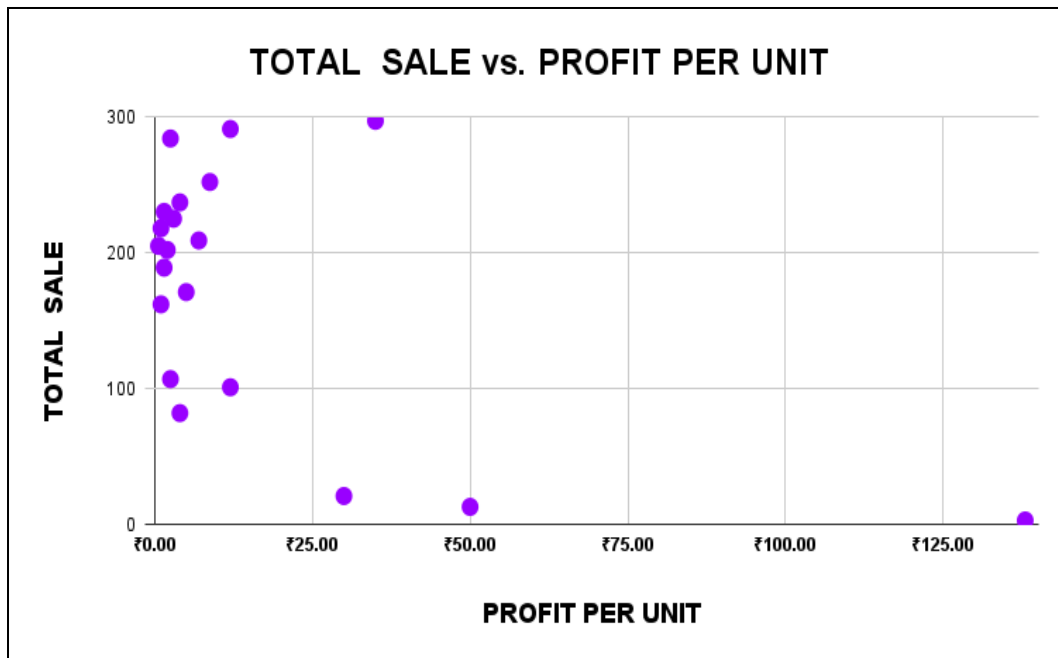
The scatter chart shows a trend of total sales with profit per unit.

As is clear from the plot, the **high-in-demand** products, selling **82-297** units per month, generated **profit** in the range **of Rs.1-Rs.50 with most** of them generating **profit** in the range **of Rs1 - Rs.12**.

The **lowest demanded** product selling 21, 13 and 3 units only generate comparatively higher profit with the one selling only **3 units** generating **Rs.125 as profit**.

The reason for this anomaly is that the highly valued products are sold less thereby decreasing their sale and since the value at which they are purchased and sold have a considerable margin therefore even if one unit is sold, they compensate for their low volume of sale if purchased in small quantity by the seller.

- **GRAPHS COMPARING DIFFERENT TRENDS OF SIMILAR TYPE OF SKUs**

  A) S01 and S07

PER DAY SALES - S01 & S07
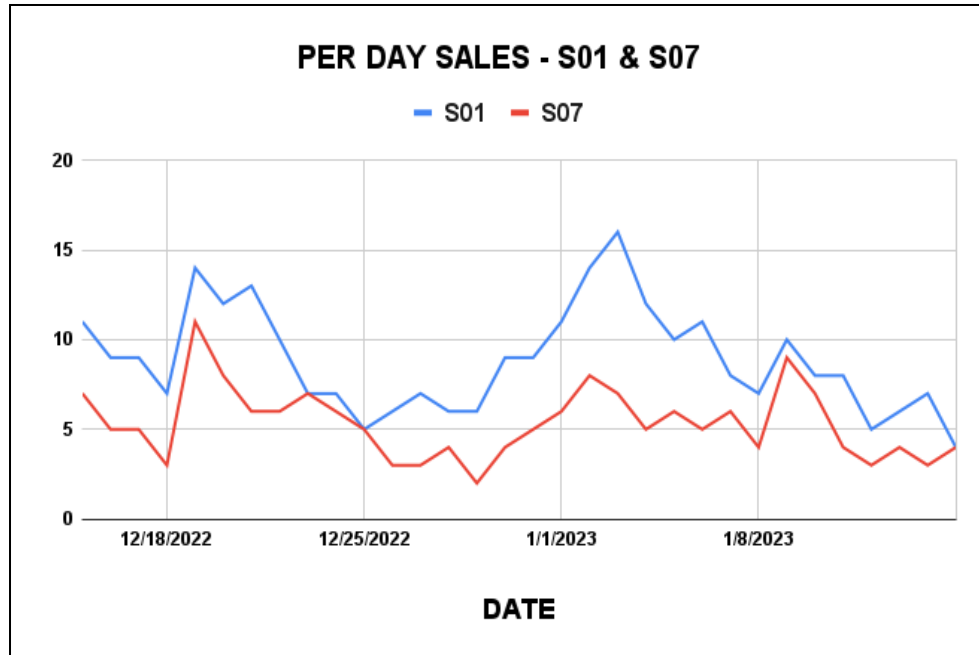
The sales trend for **S01 (Linc pentonic ballpoint pen)** and **S07 (Cello paper soft ballpoint pen)** is shown above. **S01** shows a **greater** sale trend compared to S07 for the considered time.

As can also be seen in the pie chart below, S01 consists of about **62.4%** of the total sale of both products combined making it a more salable item.

TOTAL SALE
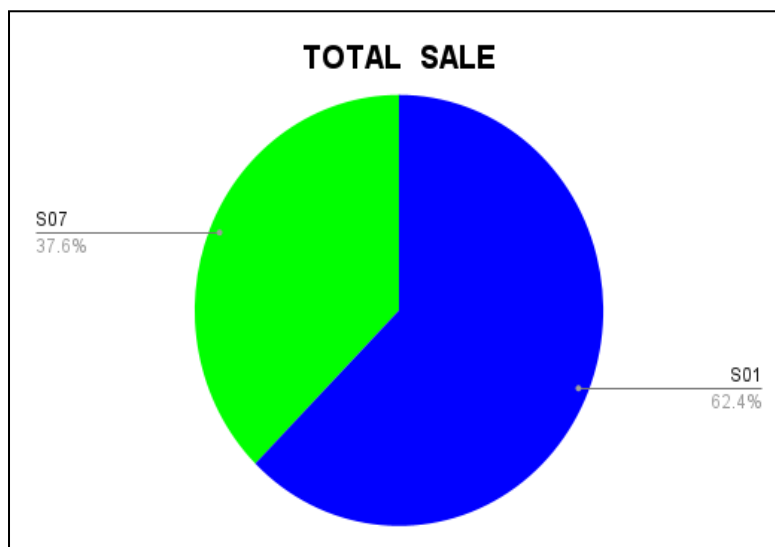
The average purchase and sale price along with profit per unit made by S01 and S07 has been plotted below. S01 is purchased at an average price of Rs.7.50 and sold at Rs.10 making a profit margin of about Rs.2.50. On the other hand S07 is purchased at Rs.15 and sold at Rs.20 making a profit of about Rs.5.
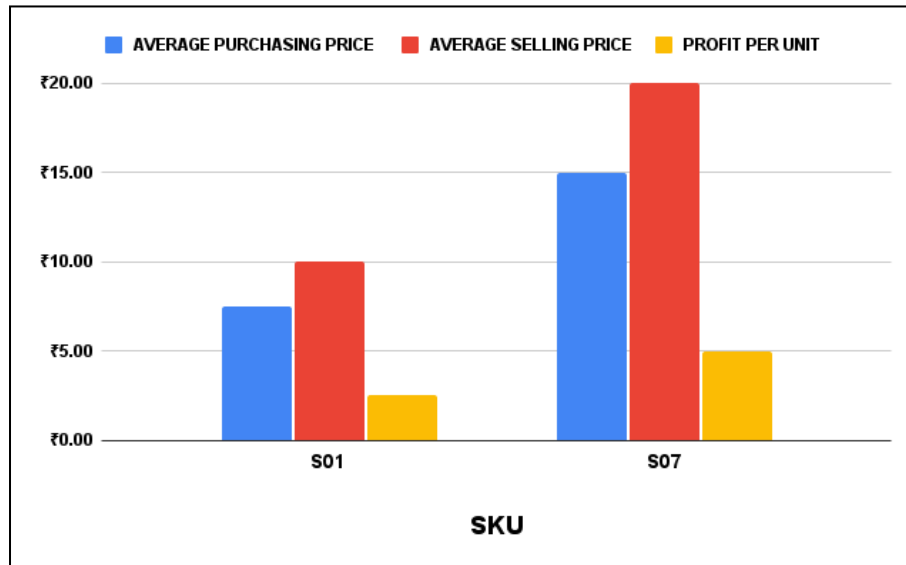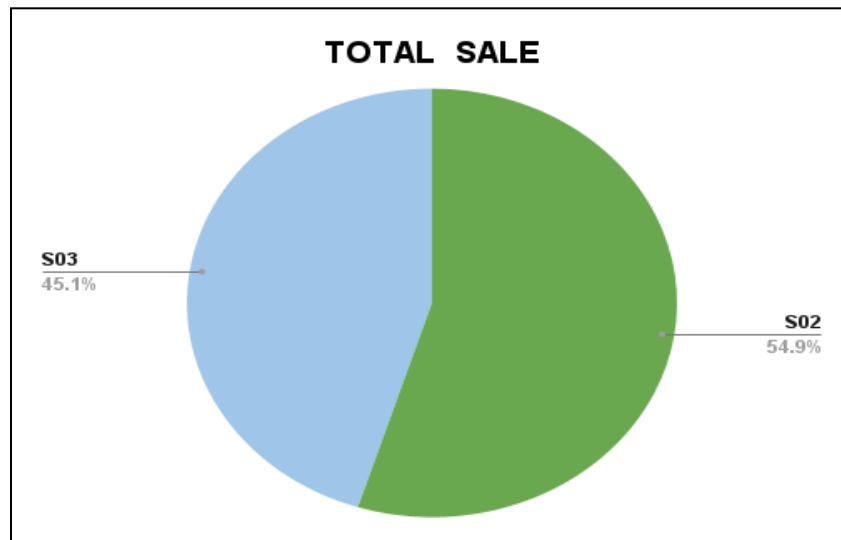

B) S02 and S03
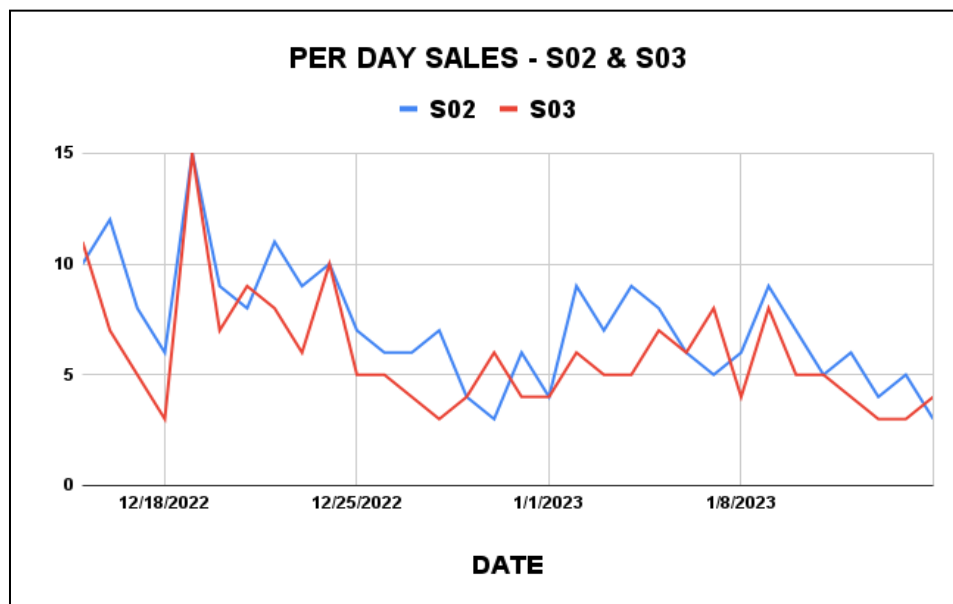
The chart above shows the sales trend of **S02 (Apsara platinum dark pencil)** and **S03 (Doms x-tra dark pencil).** These two SKUs shows a similar kind of sale trend with **S02** having **more sale** most days.
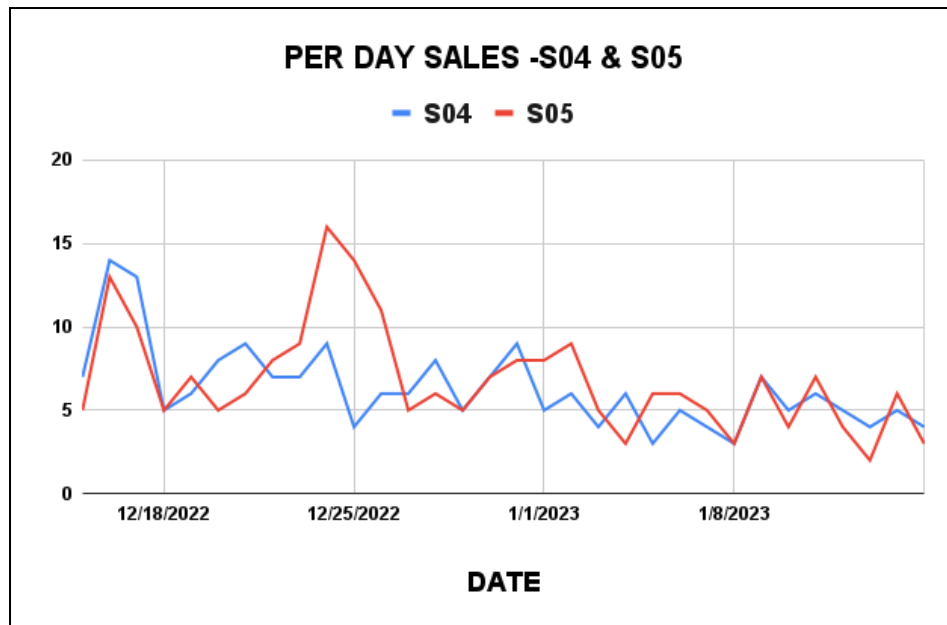
The pie chart shows the percentage share in the total sale of S02 and S03, with **S02** having a **54.9%** contribution.

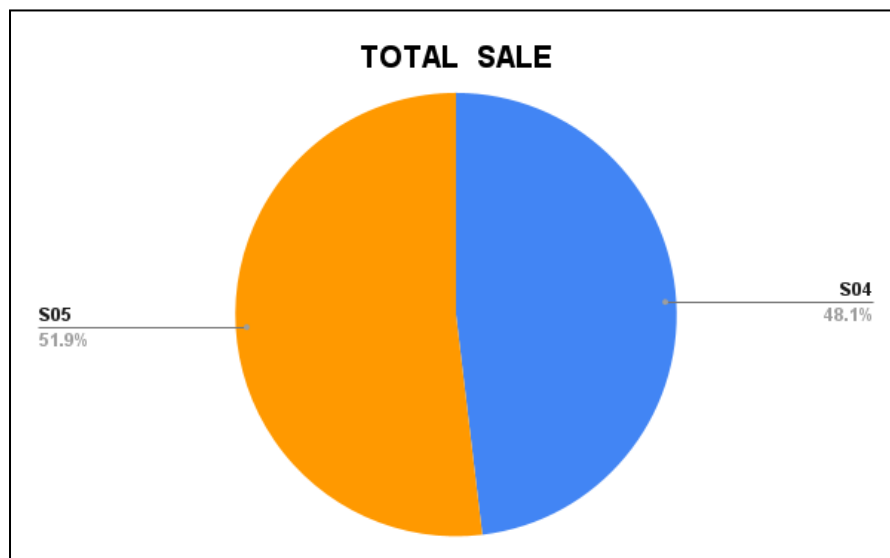**TOTAL SALE**

S03
45.1%

S02
54.9%

The average purchase and sale price along with profit per unit made by S02 and S03 has been plotted below. Both S02 and S03 are purchased at an average price of Rs.3.50 and sold at Rs.5 making a profit margin of about Rs.1.50.

AVERAGE PURCHASING PRICE   AVERAGE SELLING PRICE   PROFIT PER UNIT
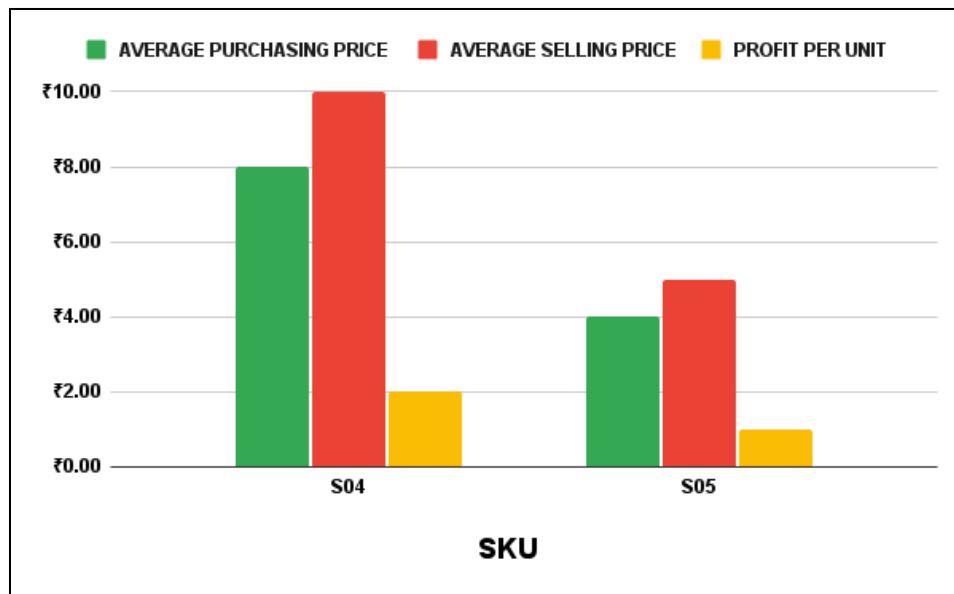
SKU
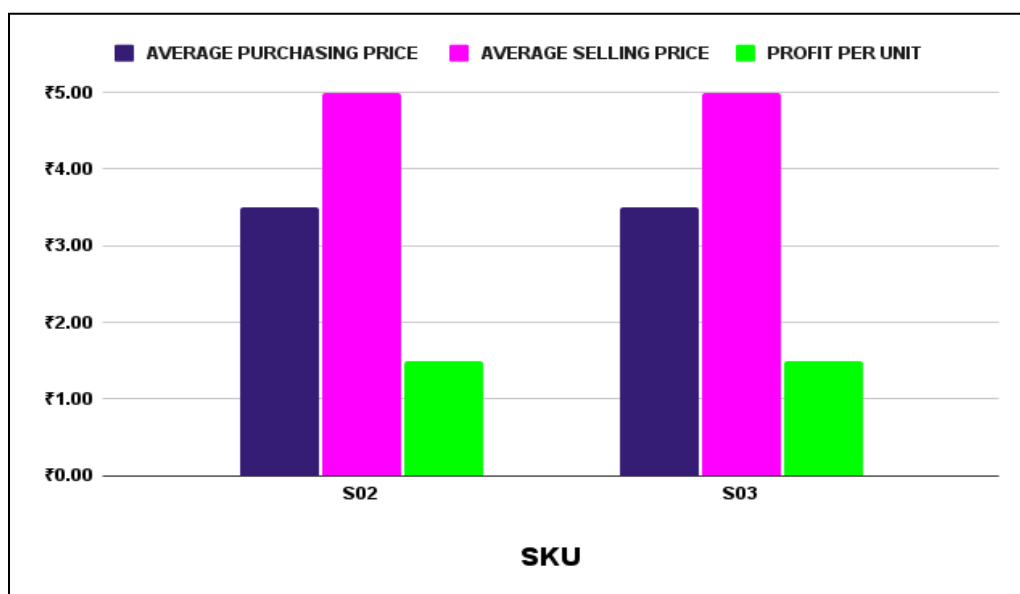
C) S04 and S05

The chart above shows the sales trend of **S04 (Fevicol adhesive glue)** and **S05 (Fevigum adhesive glue).** These two SKUs have almost similar sale trends with both products being sold almost equally.

The Pie chart above shows the total sale percentage of S04 and S05; with S05 contributing about 51.9% and S04 contributing 48.1%.

The average purchase and sale price along with profit per unit made by S04 and S05 has been plotted. S04 is purchased at an average price of Rs.8 and sold at Rs.10 making a profit margin of about Rs.2, while on the other hand, S05 is purchased at Rs.4 and sold at Rs.5 making a profit of Rs.1

D) S08 and S09
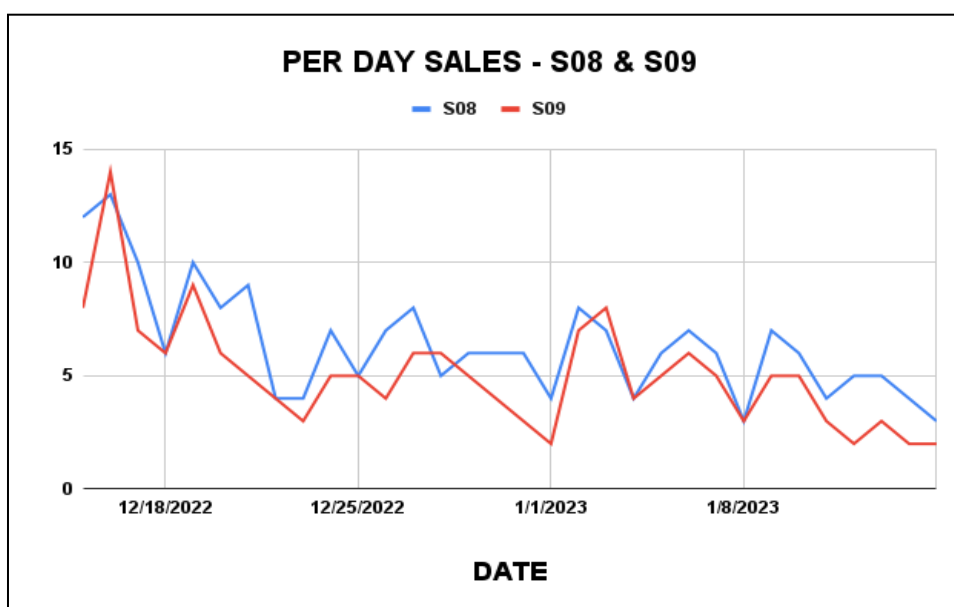
The chart above shows the sales trend of **S08 (Apsara non-dust eraser)** and **S09 (Doms eraser).**

The graph clearly shows that sale for **S08** is **more** than S09, with S09 showing greater value than S08 on just three days of the considered month.

SKUs' contribution to total sale volume could be seen in the pie chart plotted below, with **S08's** contribution being **55.9%** and that of S09 being 44.1%
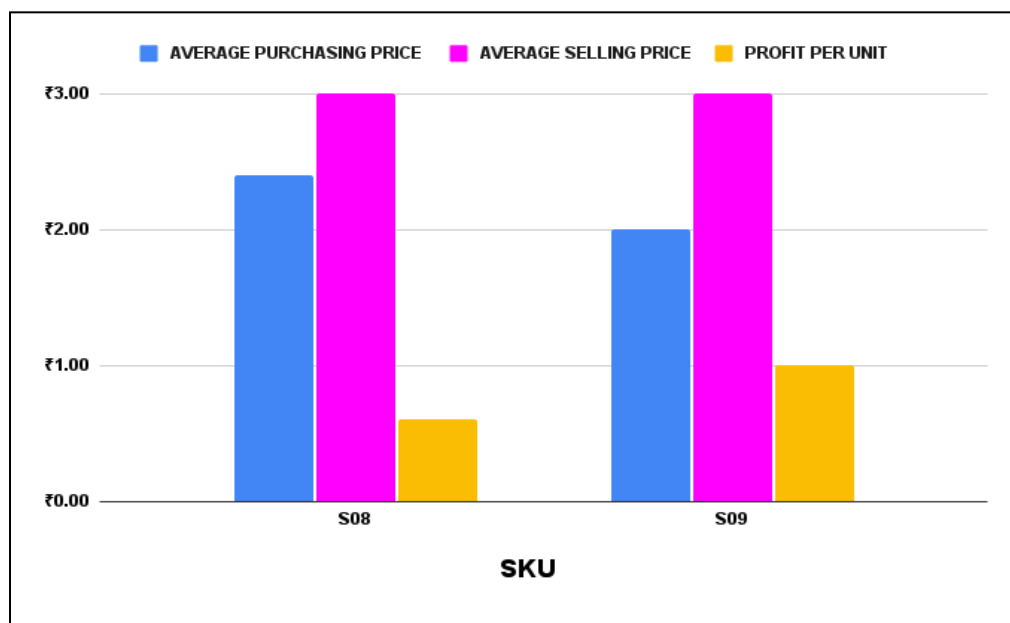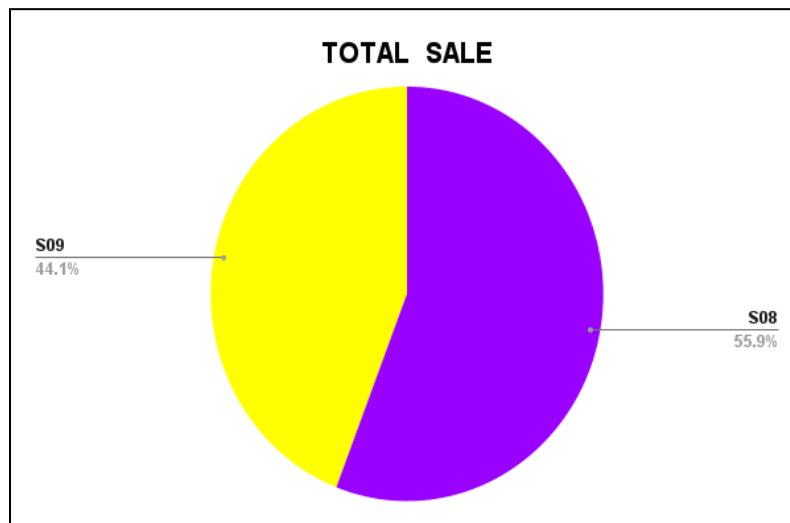
The average purchase and sale price along with profit per unit made by S08 and S09 has been plotted. S08 is purchased at an average price of Rs.2.40 and sold at Rs.3 making a profit margin of about Rs.0.60, while S09 is purchased at Rs.2 and sold at Rs.3 making a profit of Rs.1

E) S12 and S13
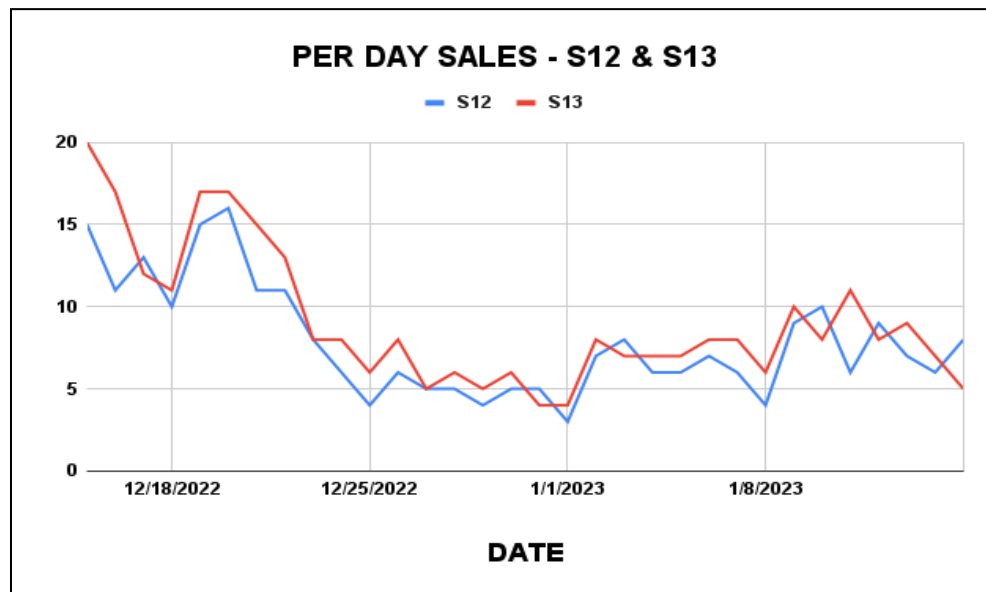
The sales trend of **S12 (classmate notebook)** and **S13 (student notebook)** is plotted above, with **S13** showing a **greater sale** trend thus indicating its greater demand compared to S12.

The percentage contribution of **S12** and **S13** is indicated in the Pie chart with **S12** having a **46.4%** contribution while **S13** has a **53.6%** share in the total sale volume.
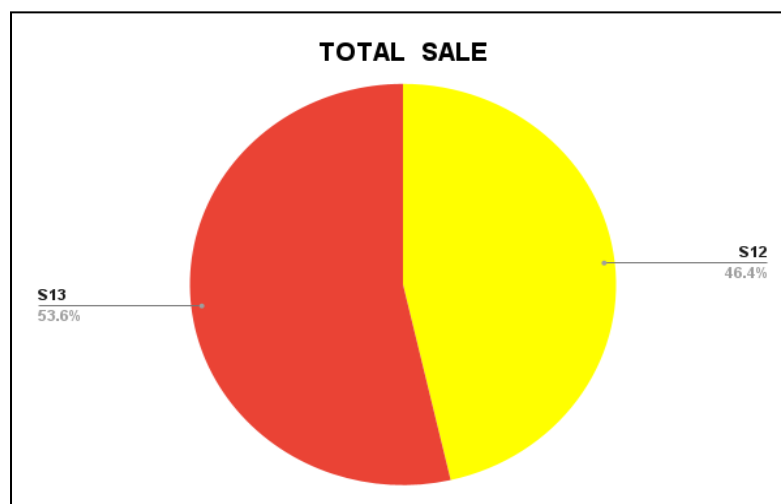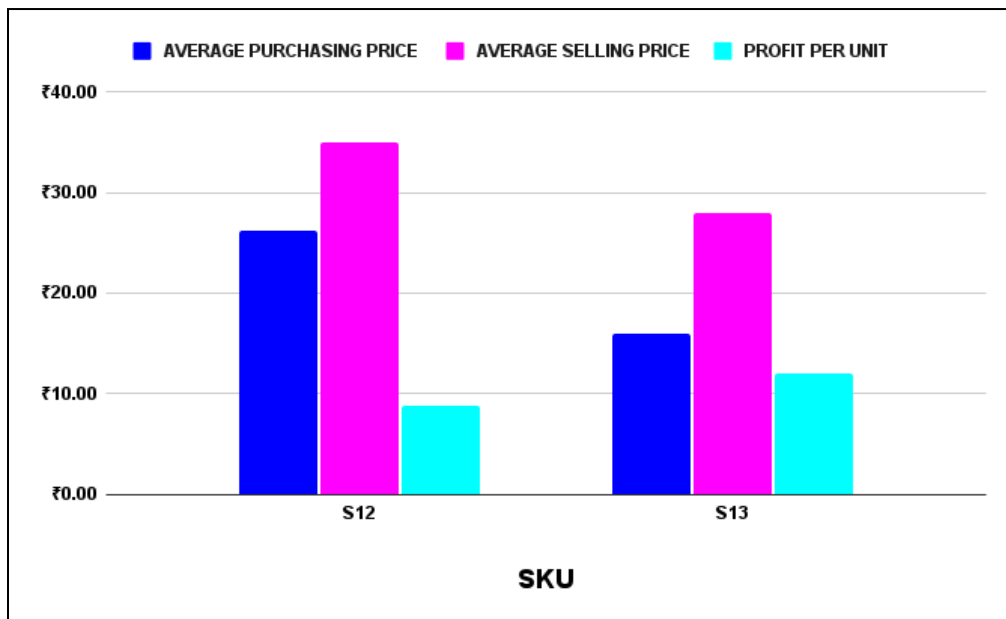

The average purchase and sale price along with profit per unit made by S12 and S13 has been plotted above. S12 is purchased at an average price of Rs.26.25 and sold at Rs.35 making a profit of about Rs.8.75, while S13 is purchased at Rs.16 and sold at Rs.28 making a profit of Rs.12.

INTERPRETATION OF RESULTS AND RECOMMENDATION:

- The **line chart of per day sales** shows a **negative behavior**, which could be attributed to the fact that **data** was **collected** from the **15th of December to the 15th of January** which was a holiday period with Christmas, New Year, and Winter Vacations falling in this period during which schools and colleges remain closed hence the sale of stationery gets affected.
- The **dates** in the graph are the **Sundays** of the month showing a **bottom peak** indicating the **sales** on Sundays are **lowest** on the fact that all academic and working places remain inactive thus lowering the sales of products.

- The **bar graph** depicts the total sale on weekdays, with **Mondays** having a **high sale** value because it is the beginning of the week with schools, colleges, offices, coaching institutes, etc. gearing up for a fresh start after a day off thus increasing the sales.
- **Saturdays** have the **second highest** sale value but this is not the normal trend since most of the institutions have 5 working days with Saturday being off, but for the considered month we saw this unfamiliar trend because the festivals of the season (Christmas and New Year) fell on Sundays thus increasing the sales of S20 (gift items, decorative, toys, etc.) drastically.

Recommendation: As is inferred from the graphs showing the sales trend of SKUs, we could conclude that Mondays have high sale value compared to other days of the week hence it would be beneficial for Mr. Shukla to keep his stock full of demanded items, especially on Mondays to get the most profit.

- From the charts showing the relation between SKUs and total sales, it can be concluded that **S20** (miscellaneous) had the maximum sale comprising about **8.5%** of total sale volume, the possible reason being that the S20 is an aggregate item consisting of toys, decorative, and gift items which because of the festivals falling have accounted for its high demand.
- **S13** (student notebook) and **S12** (classmate notebook) comprise **8.3%** and **7.2%** of the total volume respectively. The notebooks have a high sales complementing to the fact that they are needed in every academic field by every age group of the student and since the store normally sells them in a quantity of more than one unit hence they have a high sale volume. Similar reasoning can be implemented to the sale of **S01** (Linc pentonic pen) comprising **8.1%** of the total sale.
- **S19** (Casio scientific calculator), being the most expensive with each unit being sold at Rs.550 has the **lowest** sale with only **3** units being sold in the whole month. S19's low sale is due to its low demand because it's a product that is needed only by a certain section.
- **S16** (A4 size papers) has the second lowest sale according to plots. The low sale of this product is not because its sale is low but because for simplification of data collection, a

whole **bundle** being sold is considered but in reality, they are sold as **loose sheets** thus making **13** bundles being sold in a month.

Recommendation: Visualizing the data for SKUs being sold, it is quite obvious that **S20** which is an aggregate SKU of products like gifts, toys decorative items, etc. has a high sale volume hence is highly recommended to **Mr. Shukla** to keep stocks of such items in his store and also the sales of S20 increased drastically near the festival days, hence, he should try keeping and renewing his stock for S20, especially during festivals. He should also keep stock full of S01, S12, and S13 since these are highly demanded products contributing heavily to total sale volume.

- Interpreting the graphs further it is clear that **S20** has contributed largely to both revenue and profit made. S20 is purchased at an average price of Rs.55 and sold at Rs. 90 giving a profit margin of Rs.35 since in total **297** units were sold making its contribution **the highest** in **total revenue** and **profit** made. **S19** is purchased at Rs.412 and sold at Rs.550 generating a profit margin of Rs.138; the highest for any SKU, selling **3 units** has **a 2.1%** contribution to total revenue and **1.6%** to profit generated.
- **S08** and **S09** have **high sale** value selling **205** and **162 units** respectively but since the average purchase price (Rs. 2.40 for S08 and Rs. 2 for S09), and sale price (Rs. 3 for both) is very low therefore the contribution to total revenue and total profit generation is very less.

Recommendation: S20 has high sales along with creating high revenue and profit hence keeping **S20 in stock** is beneficial for the owner. Also, **S19**, despite only 3 units being sold, has created a considerable amount of profit hence it will be favorable for Mr. Shukla to keep **S19 in stock** but **in less quantity** which will prevent him from investing a lot of money in the SKU and also will save the product from damages.

- Charts for **S01 (Linc pentonic ballpoint pen)** and **S07 (Cello paper soft ballpoint pen)**, show S01 selling more units compared to S07 indicating its higher demand. S01 is sold at Rs. 10 whereas S07 at Rs.20 which could be a reason for S01s higher sale value, but when we consider the profit made by these two SKUs, S07 creates a higher profit margin

of Rs.5 compared to S01 which has a profit margin of Rs.2.50 given the fact that S07 is purchased at Rs.15 and S01 at Rs.7.50.

Recommendation: S01 sale is more therefore it would be good for the owner to have its stock always ready while keeping a considerable stock for S07 too since the demand for S07 is also not bad and the profit margin is also good which will help the owner to create more profit.

- Graph for **S02 (Apsara platinum dark pencil)** and **S03 (Doms x-tra dark pencil)** shows a trend that **S02** is sold more with **230** units being sold as compared to **S03** which sells **189 units**. The purchase price, sale price, and profit made per unit are the same for both the SKUs but **S02** selling more clearly indicates its high demand.

Recommendation: S02 and **S03** both create the **same profit** therefore it would help Mr. Shukla to invest more in S02 since its demand is high**.**

- For **S04 (Fevicol adhesive glue)** and **S05 (Fevigum adhesive glue),** the graphs indicate that S05 is sold more with an average selling price of Rs.5 compared to S04 selling at Rs.10. The profit made by S04 is Rs.2 per unit while that for S05 is Rs.1 per unit. The reason for S05 having more demand could be because it has the same function as S04 but is cheaper thus increasing its sale.

Recommendation: S05 should be kept in stock considering its high sale while also promoting more sales of S04 which generates higher profit.

- For **S08 (Apsara non-dust eraser)** and **S09 (Dom's eraser),** S08 has higher sales selling at Rs.3 which is the same for S09 but in terms of profit generation S09 has a higher value creating a profit of Rs.1 compared to S08 which creates a profit of Rs.0.60 per unit sold.

Recommendation: For the owner to increase his profit he should push sales for S09 more while keeping stock of S08 in the inventories since is a more demanded product.

- The trend for **S12 (classmate notebook)** and **S13 (student notebook)** shows S13 selling more units with each unit being sold at Rs.28 while that for S12 selling each unit at Rs.35. Also the profit generated per unit for S13 is Rs. 12, for S12 it is Rs.8.75.

Recommendation: S13 has a higher sale volume along with generating higher profit hence the owner should maintain the stock for this SKU preventing it from getting into the stock-out phase.

CONCLUSION

For Mr. Shukla to prevent stock-out conditions he should keep track of the products sold thus keeping note of the most demanded product, especially the products mentioned above, which will help him organize his inventories more efficiently thus generating more profit.