Analysis Report: MRA PART(B)

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Introduction

► In the competitive landscape of retail, maximizing revenue and enhancing customer satisfaction are paramount objectives for any business. One of the most valuable assets at the disposal of a grocery store is its transactional data, often captured through Point of Sale (POS) systems. This data holds a wealth of insights waiting to be unearthed, offering the potential to drive revenue growth through informed decision-making and strategic planning.

► Our grocery store has provided us with transactional data, prompting us to delve deep into its intricacies to identify patterns, trends, and associations that can inform our strategies for revenue optimization. Specifically, we aim to uncover the most commonly occurring sets of items in customer orders and devise recommendations for enticing combo offers and discounts.

Importance of Analysing POS Data

► Analysing POS data goes beyond mere transactional records; it provides a window into consumer behaviour, preferences, and purchasing patterns. By harnessing the power of data analytics, businesses can gain actionable insights to:

Exploratory Analysis

▶ The dataset comprises transactional data from a grocery store, including the date of the transaction, order ID, and the products purchased. Here's a snapshot of the dataset

Trends Across Months, Years, Quarters, and Days

▶ To analyse trends across different time periods, we'll aggregate the data accordingly:

Months: We'll examine the total number of transactions and popular products sold each month to identify any seasonal trends.

Month of Date
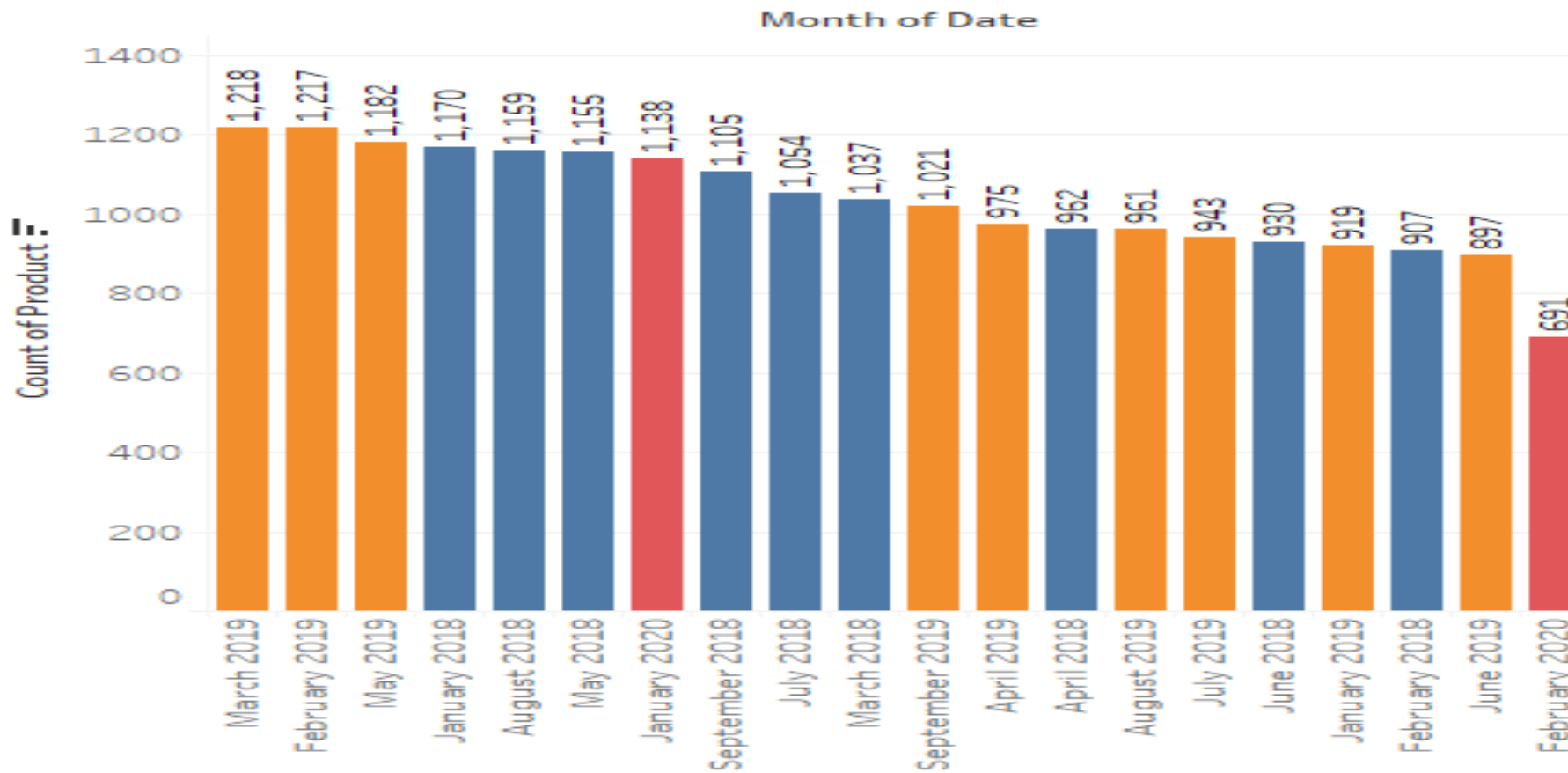
Years: Analysing the yearly sales growth or decline can provide insights into long-term performance and market trends.
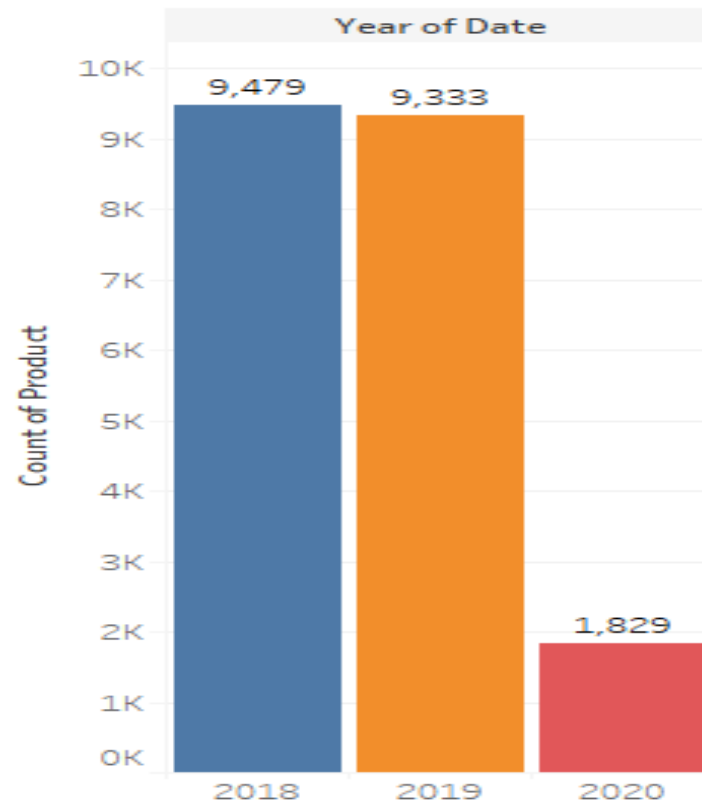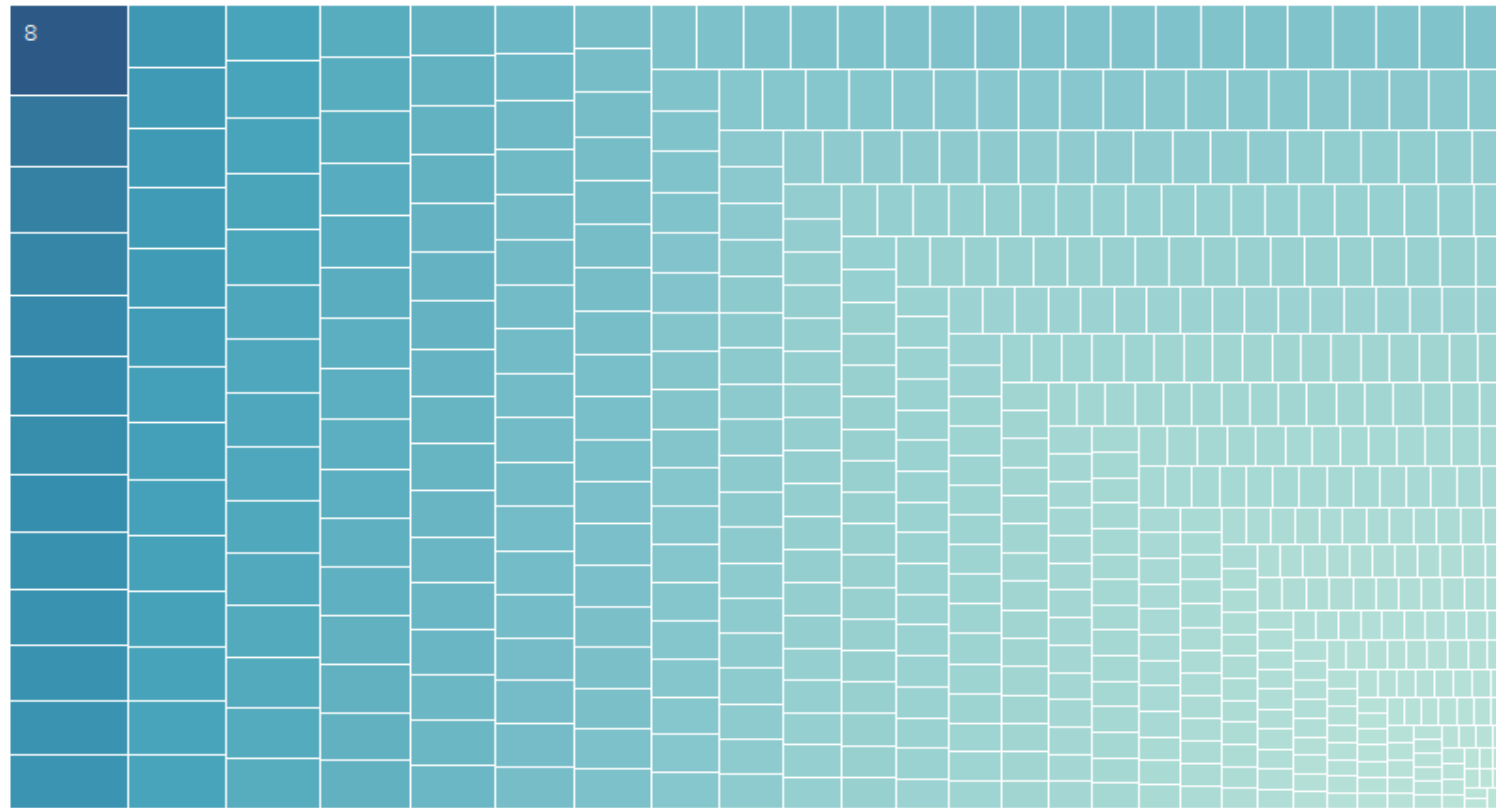
Quarters: Aggregating data by quarters allows us to assess sales performance within each quarter and identify any quarterly fluctuations.
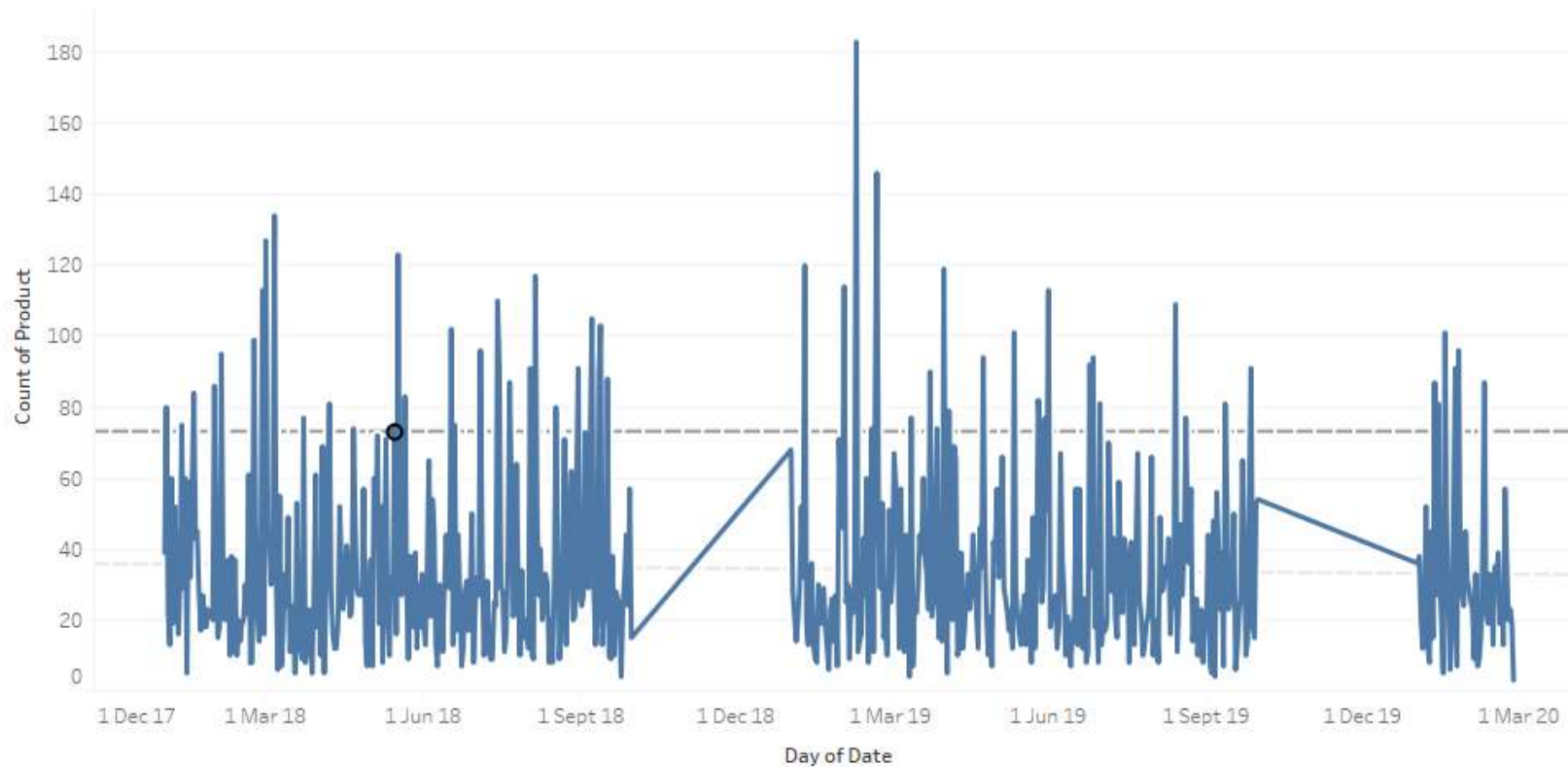

Quarter of Date
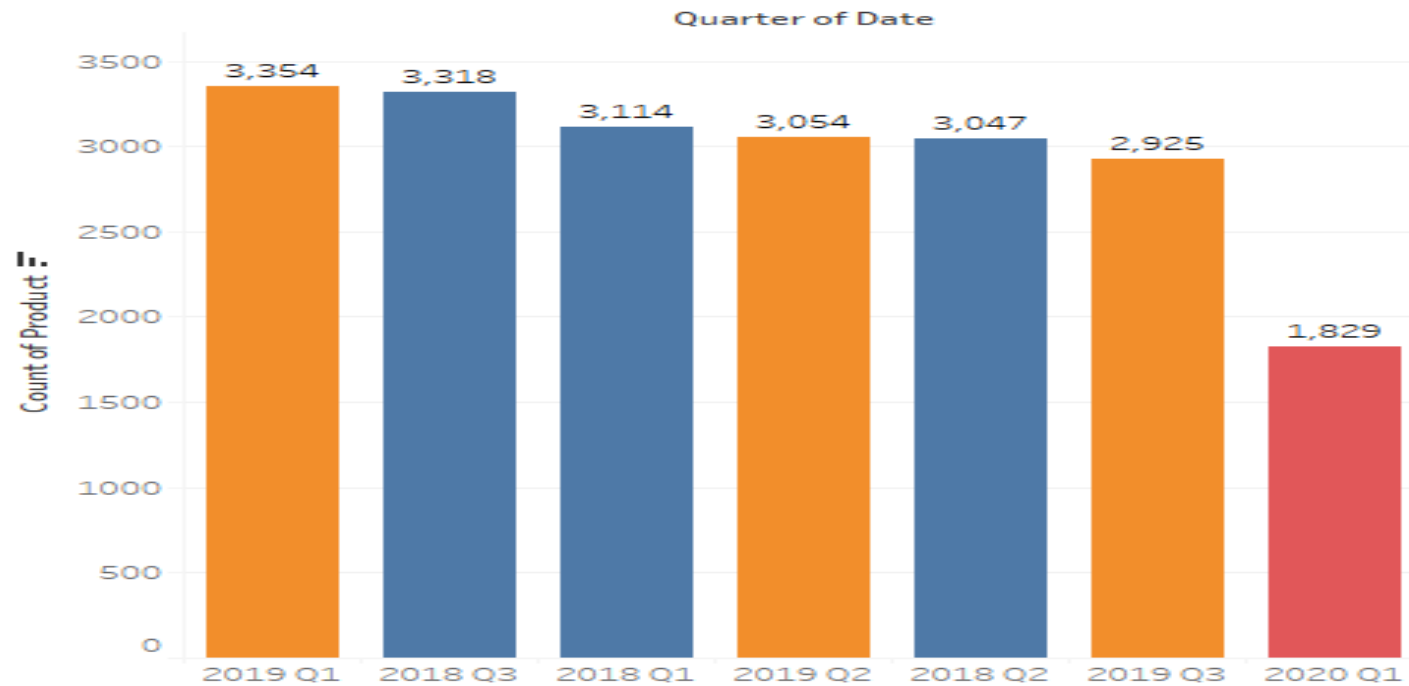
Days: We'll explore daily transaction volumes and popular products to understand daily shopping patterns.

DAY WISE SELL

Graphical Representation of Trends

Market Basket Analysis (Association Rules)

Explanation of Association Rules and Their Relevance

▶ Association rules in Market Basket Analysis reveal relationships between items frequently purchased together in transactions. These rules are essential for understanding customer behaviour and preferences, which in turn helps businesses optimize product placement, create targeted promotions, and improve overall customer satisfaction

▶ For example, the association rule "Juice ---> [Yogurt, Toilet Paper, and Aluminium Foil]" with a confidence of 0.64 indicates that there's a 64% likelihood of customers purchasing yogurt, toilet paper, and aluminium foil alongside juice. This insight can be leveraged by the grocery store to strategically place these items together on shelves or create bundled promotions to encourage additional purchases.

Introduction to KNIME Workflow
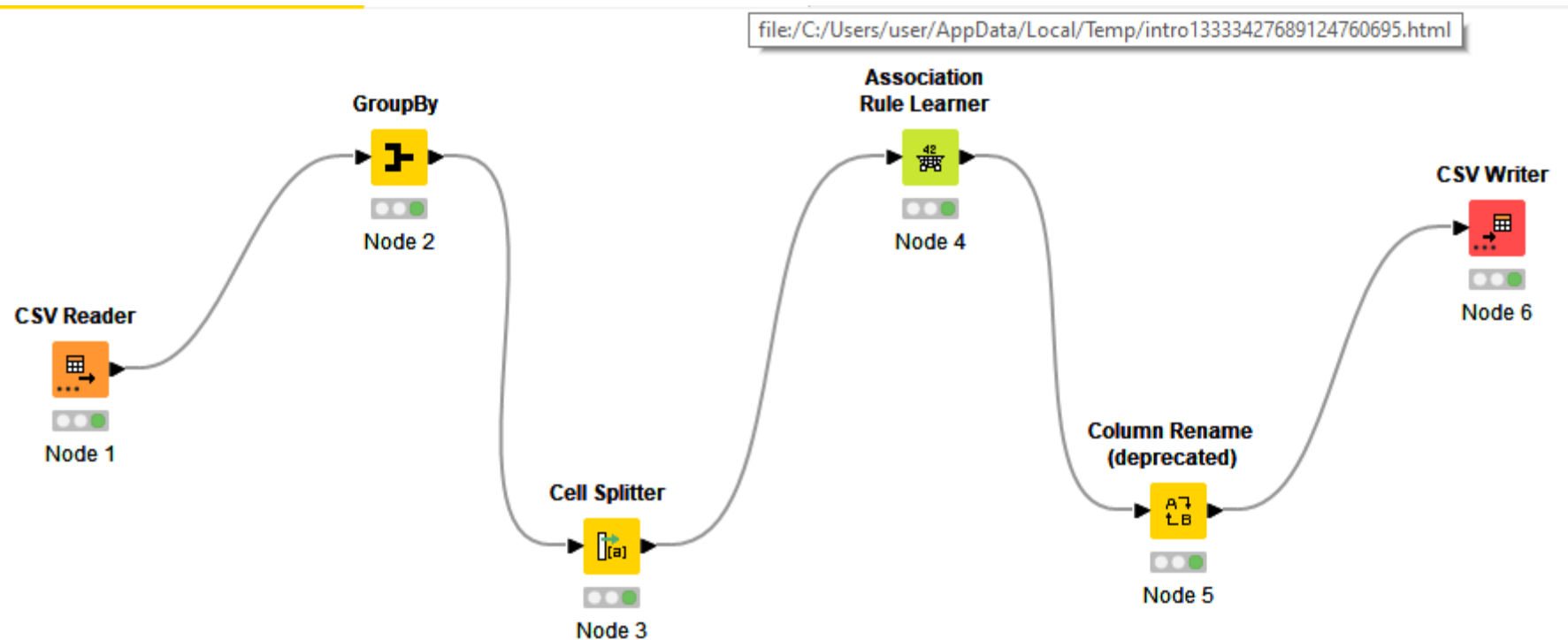
Explanation of Support and Confidence Thresholds

▶ Support and confidence thresholds are important parameters in association rule mining that determine the significance of discovered rules:

▶ **Support:** Represents the proportion of transactions containing a particular item set. A higher support threshold yields fewer but more reliable association rules.

▶ **Confidence:** Measures the reliability of the association rule. It's the conditional probability of finding the consequent item(s) in a transaction given the antecedent item(s) are present. A higher confidence

Tabular presentation of associations

Here's a tabular presentation of the associations derived from the Market Basket Analysis

Support	Confidence	Lift	Recommended_item	Recommended_with	Items_list
0.050043898	0.640449438	1.700400723	juice	<---	[yogurt, toilet paper, aluminum foil]
0.050043898	0.619565217	1.644952873	juice	<---	[yogurt, poultry, aluminum foil]
0.050043898	0.612903226	1.615964755	coffee/tea	<---	[yogurt, cheeses, cereals]
0.050043898	0.6	1.42375	poultry	<---	[dishwashing liquid/detergent, laundry detergent, mixes]
0.050921861	0.630434783	1.677722471	mixes	<---	[yogurt, poultry, aluminum foil]
0.050921861	0.610526316	1.659640749	sandwich bags	<---	[cheeses, bagels, cereals]
0.050921861	0.674418605	1.726208518	cheeses	<---	[bagels, cereals, sandwich bags]
0.050921861	0.617021277	1.55828655	cereals	<---	[cheeses, bagels, sandwich bags]
0.050921861	0.630434783	1.620914712	dinner rolls	<---	[spaghetti sauce, poultry, cereals]
0.050921861	0.637362637	1.512408425	poultry	<---	[dinner rolls, spaghetti sauce, cereals]
0.050921861	0.604166667	1.589251347	milk	<---	[poultry, laundry detergent, cereals]
0.051799824	0.627659574	1.610144719	eggs	<---	[dinner rolls, poultry, soda]
0.051799824	0.641304348	1.648861517	dinner rolls	<---	[spaghetti sauce, poultry, ice cream]
0.051799824	0.686046512	1.627931202	poultry	<---	[dinner rolls, spaghetti sauce, ice cream]
0.051799824	0.627659574	1.613779357	dinner rolls	<---	[spaghetti sauce, poultry, juice]
0.051799824	0.602040816	1.428592687	poultry	<---	[dinner rolls, spaghetti sauce, juice]
0.051799824	0.634408602	1.627458103	eggs	<---	[paper towels, dinner rolls, pasta]
0.051799824	0.602040816	1.621098085	pasta	<---	[paper towels, eggs, dinner rolls]
0.053555751	0.642105263	1.650920756	dinner rolls	<---	[spaghetti sauce, poultry, laundry detergent]
0.053555751	0.655913978	1.556429211	poultry	<---	[dinner rolls, spaghetti sauce, laundry detergent]
0.055311677	0.623762376	1.564901644	ice cream	<---	[paper towels, eggs, pasta]
0.055311677	0.63	1.616148649	eggs	<---	[paper towels, ice cream, pasta]

Explanation of Support, Confidence, and Lift Values

▶ **Support:** Represents the proportion of transactions containing a specific itemset. In the context of the association rule "Juice ---> [Yogurt, Toilet Paper, Aluminum Foil]" with a support of 0.050, it means that 5% of transactions include both juice, yogurt, toilet paper, and aluminum foil.

▶ **Confidence**: Indicates the likelihood of the consequent item(s) being purchased given the antecedent item(s) are purchased. For instance, in the association rule "Juice ---> [Yogurt, Toilet Paper, Aluminum Foil]" with a confidence of 0.640, it means that there's a 64% chance that customers who purchase yogurt, toilet paper, and aluminum foil also purchase juice.

▶ **Lift:** Measures the strength of association between antecedent and consequent items, considering the support of both items individually. A lift value greater than 1 indicates a positive association. In the same example, the lift value of 1.700 suggests that the likelihood of purchasing juice and the recommended items together is 1.700 times higher than would be expected if their occurrence were independent

Recommendations for Combos with Lucrative Offers

- To capitalize on the associations identified through Market Basket Analysis and drive increased sales and customer satisfaction, the grocery store can implement the following strategies for discount offers and combos:

Strategies for discount offers and combos

- **Bundled Offers**: Create bundled offers that package associated items together at a discounted price. For example:

- Buy Yogurt, Toilet Paper, and Aluminum Foil together and get a discount on Juice.

- Purchase Bagels, Cereals, and Sandwich Bags as a bundle and receive a discount on Cheeses.

- **Cross-Promotions:** Promote complementary items together to encourage additional purchases. For instance:

- Display Poultry and Spaghetti Sauce alongside Dinner Rolls to encourage customers to buy all three items together.

- Place Eggs and Ice Cream near Paper Towels and Pasta to prompt customers to purchase these items as a meal solution.

- **Volume Discounts**: Offer discounts for purchasing multiple units of associated items. For example:

- Buy two packs of Mixes and get a discount.

- Purchase multiple units of Juice and receive a discount on each additional unit.

- Special Promotions: Introduce limited-time promotions or seasonal offers based on popular associations. For instance:

- **Seasonal promotion:** Buy Juice and Yogurt together and receive a free pack of Aluminum Foil during summer months.

- **Weekend special:** Get a discount on Dinner Rolls when you purchase Spaghetti Sauce and Poultry on weekends.

- **Customized Offers:** Personalize offers based on customer purchase history and preferences. Utilize loyalty programs or customer segmentation to tailor promotions to individual shoppers' needs.

Examples of Potential Offers Based on Association Rules

- Morning Breakfast Combo: Offer a breakfast combo consisting of Yogurt, Cereals, and Juice at a discounted price during morning hours.

- Family Dinner Deal: Create a family dinner deal including Poultry, Spaghetti Sauce, and Dinner Rolls with a discount on Ice Cream for dessert.

- Weekend BBQ Bundle: Promote a weekend BBQ bundle with Beef, Pork, and Charcoal at a special price, paired with a discount on Soda.

- Healthy Snack Pack: Introduce a healthy snack pack containing Cheese, Bagels, and Sandwich Bags with a discounted offer on Yogurt.

- Pasta Night Promotion: Encourage pasta night with a promotion offering Pasta, Eggs, and Paper Towels together with a discount on Pasta Sauce.

- By implementing these recommendations, the grocery store can effectively leverage association rules to drive sales, enhance customer satisfaction, and increase overall profitability. Additionally, monitoring the effectiveness of these offers and continuously refining strategies based on customer feedback and market trends is essential for long-term success.