

# Walmart sales Optimization Project

## Using Mysql

## Objective of The Project

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To Optimize Sales Performance Through Data-Driven Insights on Returns, Customer Segments, and Regional Performance



## **Project Overview: Sales Optimization Project**

The Sales Optimization Project aims to analyze sales, profit, customer behavior, and return patterns using SQL.

By leveraging the "Orders" and "Returns" datasets, the project identifies high-performing customer segments, shipping modes, and product categories. It evaluates year-over-year sales trends, profit margins, and financial losses due to returns.

The project helps uncover insights to reduce return rates, enhance profitability, and improve strategic decision-making. Visualizations are created using PowerPoint, and data queries are executed and optimized using MySQL. The goal is to support data-driven sales and operational strategies.

## Information on Orders Table

### Key Columns:

Column Name	Description
Row_ID	Unique identifier for each row (index-like)
Order_ID	Identifier for each order
Order_Date	Date the order was placed
Ship_Date	Date the order was shipped
Ship_Mode	Shipping method (e.g., Standard, Second Class)
Customer_ID	Unique customer identifier
Customer_Name	Name of the customer
Segment	Customer segment (Consumer, Corporate, Home Office)
Country	Country (All entries: United States)
City & State	Location of customers
Postal_Code	ZIP/postal code
Region	Region (e.g., West, East, South, Central)
Product_ID	Unique product identifier
Category	Main product category (Furniture, Technology, Office Supplies)
Sub_Category	More specific product type (e.g., Binders, Phones)
Product_Name	Name/description of the product
Sales	Sales amount for the line item
Quantity	Number of units ordered
Discount	Discount applied to the product
Profit	Profit made on the sale

### Insights:

- Segment Distribution: 3 segments: Consumer, Corporate, Home Office.
- Sales ranges from ₹0.44 to ₹22,638.48.
- Profit ranges from –₹6,599.98 to ₹8,399.98, indicating possible losses.
- Discounts range from 0% to 80%.
- Top Category: Office Supplies appears most frequently.
- Most Common Ship Mode: Standard Class.



## Information on People Table

### Columns Overview:

Column	Description
Person	Name of the sales representative
Region	Region assigned to the person (West, East, Central, South)

### Insights:

- Each person is uniquely associated with a specific region.
- This dataset is likely used for mapping sales performance or order responsibility to regional sales representatives.

## Information on Return Table

### Columns Overview:

Column	Description
Returned	Indicates whether the order was returned (all are "Yes")
Order_ID	ID of the returned order

### Insights:

- All entries are marked as "Yes", indicating that all listed orders were returned.
- Each Order\_ID is unique — no order appears more than once.
- This dataset can be joined with orders.csv using Order\_ID to analyze return rates, losses, or patterns in returns.



## Use Cases of the Sales Optimization Project

### 1. Marketing & Customer Strategy

Use Case: Identify the most profitable customer segments and regions.

Impact: Helps target high-value customers with tailored promotions, improving ROI on marketing efforts.

### 2. Sales Management

Use Case: Analyze year-over-year growth and order value trends by segment.

Impact: Supports strategic planning and forecasting by identifying sales momentum and seasonality.

### 3. Product & Category Managers

Use Case: Detect low-margin products and high return-rate items.

Impact: Drives product refinement, pricing adjustments, or discontinuation decisions to enhance margins.

### 4. Logistics & Operations

Use Case: Assess shipping modes preferred by profitable segments.

Impact: Optimizes shipping strategies, balancing delivery speed, customer satisfaction, and cost-efficiency.

## Question : 1

What is the average profit per customer segment across different regions?

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**Purpose:** Helps determine which customer segments are the most profitable in each region.

## Query :

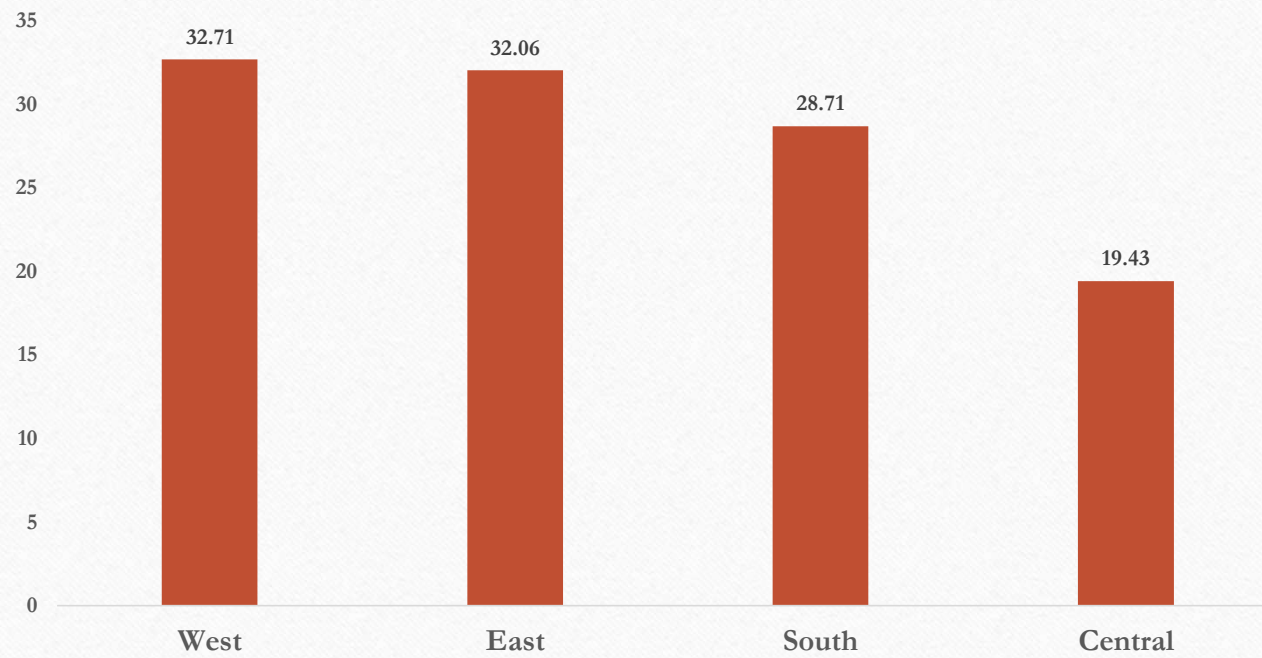
```
select o.region,round(avg(o.profit),2)
as average_profit
from `return` as r right join orders as o on
o.order_id=r.order_id
where r.order_id is null
group by o.region
order by average_profit desc;
```



## Output of the query

region	average_profit
West	32.71
East	32.06
South	28.71
Central	19.43

## Region by average profit





# Insights

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West leads in average profit (₹32.71), followed by East and South.

Central lags significantly (₹19.43), indicating a need for strategic improvement in that region

## Question : 2

Which shipping modes are preferred by the most profitable customer segments, and how does this impact overall sales and profit?

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**Purpose:** Identify the most profitable customer segments' preferred shipping modes and assess their impact on sales and profit

### Query :

```
select o.ship_mode, o.segment,  
       round(sum(o.sales),0) as total_sales,  
       round(sum(o.profit),0)  
       as total_profit  
from `return` as r right join orders  
as o  
on o.order_id = r.order_id  
where r.order_id is null  
group by o.ship_mode, o.segment  
order by o.segment desc,      total_sales desc,  
total_profit;
```



## Output of the query

ship_mode	segment	total_sales	total_profit
Standard Class	Home Office	230458	28064
First Class	Home Office	80152	14066
Second Class	Home Office	73713	13334
Same Day	Home Office	22123	4057
Standard Class	Corporate	377538	55162
Second Class	Corporate	134597	16654
First Class	Corporate	99707	13375
Same Day	Corporate	42392	1336
Standard Class	Consumer	656886	73473
Second Class	Consumer	219859	22628
First Class	Consumer	132275	13490
Same Day	Consumer	46997	7526

# Ship mode wise total sales and profit

Chart Title





# Insights

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- Standard Class is the most profitable shipping method across all segments, especially for:
  - Consumer: ₹73,473 profit
  - Corporate: ₹55,162 profit
  - Home Office: ₹28,064 profit
- Same Day delivery, while fast, yields the lowest profits, especially for:
  - Corporate: Only ₹1,336 profit
  - Home Office: ₹4,057 profit
- Consumer segment consistently delivers the highest total profit, led by Standard Class shipping.

### **Question : 3**

What are the top-performing customer segments by frequency of purchase and average order value?

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**Purpose:** Purpose: Segments customers to target those with high lifetime value.

#### **Query :**

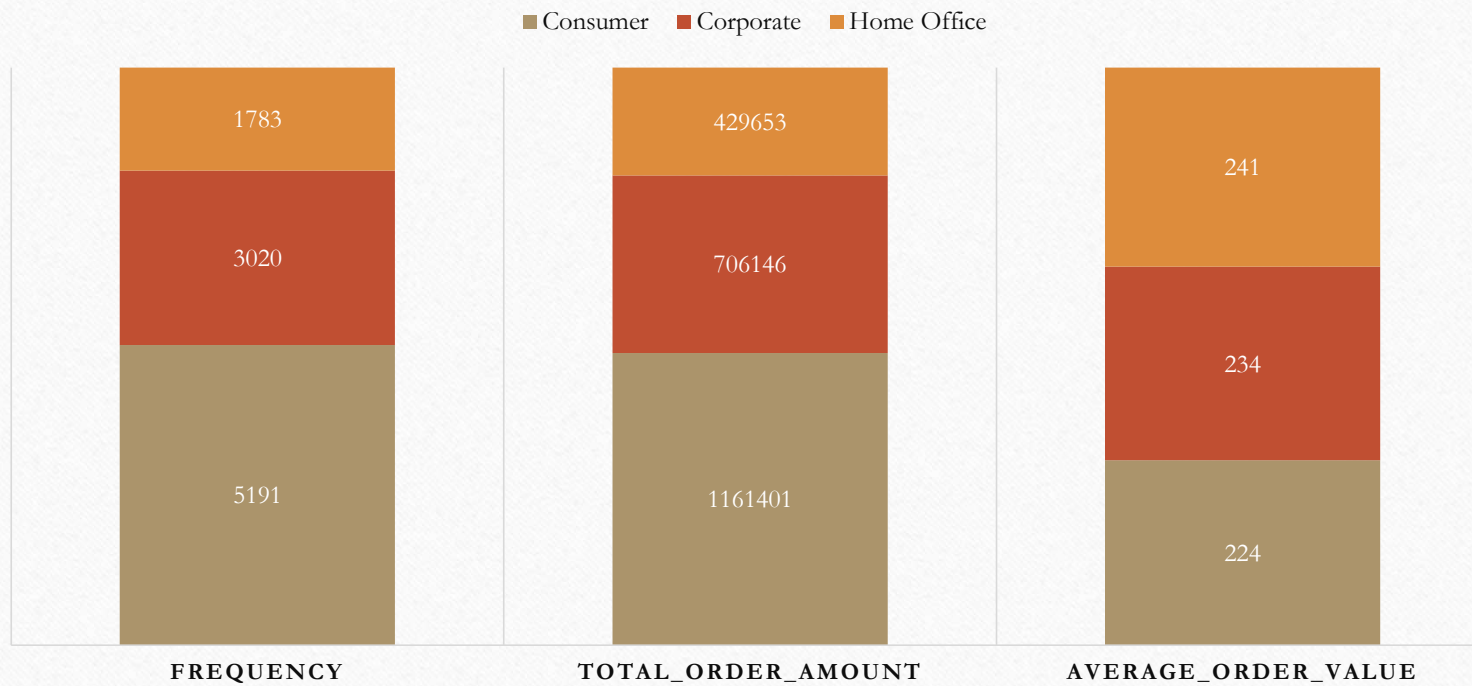
```
select segment,  
count(order_id) as frequency,  
round(sum(sales)) as  
    total_order_amount,  
round(sum(sales)/count(order_id)) as  
average_order_value  
from orders  
  
group by segment  
  
order by total_order_amount desc,  
average_order_value desc;
```



## Output of the query

segment	frequency	total_order_amount	average_order_value
Consumer	5191	1161401	224
Corporate	3020	706146	234
Home Office	1783	429653	241

## Customer Segment Analysis: Frequency, Revenue & AOV





# Insights

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- Home Office has the highest average order value (₹241), indicating higher-value purchases per transaction.
- Consumer segment makes the most frequent purchases (5191 orders) and contributes the highest total order amount (₹11.6 lakh+).
- Corporate lies in the middle for both frequency and order value.

## **Question : 4**

Which regions contribute the most to total sales but yield low profits?

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**Purpose:** Detects geographical areas with high sales but poor margins, signaling the need for cost or pricing review.

### **Query :**

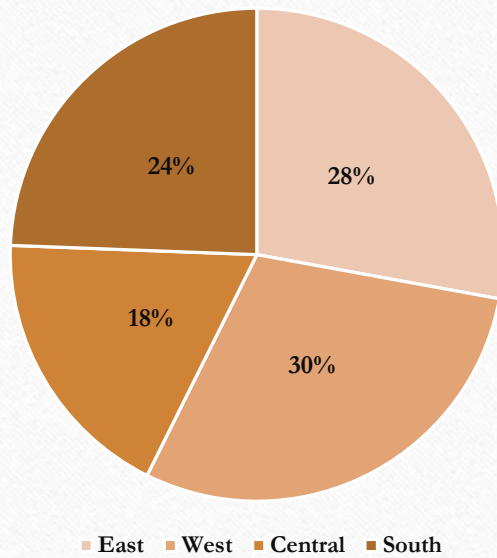
```
select o.region ,  
round(sum(o.sales),0) as total_sales,  
round(((sum(o.profit)/sum(o.sales))*100),2)  
as profit_yield_percentage  
from orders as o left join `return` as r  
on o.order_id = r.order_id  
where r.order_id is null  
group by o.region  
order by total_sales  
desc,profit_yield_percentage asc;
```



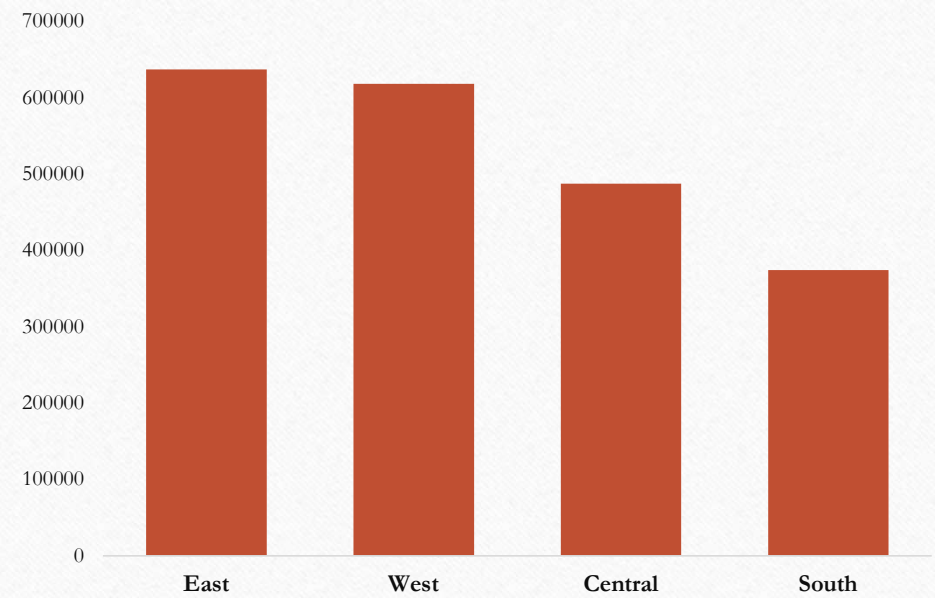
## Output of the query

region	total_sales	profit_yield_percentage
East	637076	13.58
West	617975	14.36
Central	487233	8.9
South	374413	11.89

**Region Wise Profit Yield Percentage**



**Region Wise Total Sales**





# Insights

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- West region has the highest profit yield at 14.36%, making it the most efficient in converting sales into profit.
- East generates the highest total sales but slightly lower profit yield (13.58%).
- Central performs poorly with the lowest profit yield (8.9%), indicating inefficiencies or high costs.
- South has the lowest sales and moderate profit efficiency (11.89%).

## **Question : 5**

What is the moving average of profit over the last 3 orders for each region?

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**Purpose:** Smooths out fluctuations in profits to observe short-term trends region-wise.

### **Query :**

```
select o.region,round(o.profit)
as profit,
round(avg(profit) over (partition by o.region
order by o.profit desc
rows between 2 preceding and current
row),0)
as moving_average_profit
from orders as o left join `return` as r
on o.order_id = r.order_id
where r.order_id is null;
```



# Insights

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- West leads with the highest profit yield (33.72%) and strong average profit, making it the most efficient region.
- East follows closely with a 32.89% yield, but shows higher volatility, indicating inconsistent performance.
- South contributes the least in total profit, but has a moderate yield (16.91%), suggesting some efficiency despite lower volume.
- Central performs worst with the lowest yield (16.48%) and average profit, highlighting possible inefficiencies or higher costs.

## **Question : 6**

Rank the sub-categories within each category by profit.

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**Purpose:** Assesses sub-category performance in the context of its parent category.

### **Query :**

```
select category,sub_category ,  
round(sum(profit),0) as total_profit,  
rank() over (partition by category  
order by sum(profit) desc) as rnk  
from orders  
  
group by sub_category, category  
order by category desc, rnk asc;
```



## Output of the query

category	sub_category	total_profit	rnk
Technology	Copiers	55618	1
Technology	Phones	44516	2
Technology	Accessories	41937	3
Technology	Machines	3385	4
Office Supplies	Paper	34054	1
Office Supplies	Binders	30222	2
Office Supplies	Storage	21279	3
Office Supplies	Appliances	18138	4
Office Supplies	Envelopes	6964	5
Office Supplies	Art	6528	6
Office Supplies	Labels	5546	7
Office Supplies	Fasteners	950	8
Office Supplies	Supplies	-1189	9
Furniture	Chairs	26590	1
Furniture	Furnishings	13059	2
Furniture	Bookcases	-3473	3
Furniture	Tables	-17725	4

# Insights

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- Top Profitable Sub-Categories:
  - Copiers (₹55,618) and Phones (₹44,516) from Technology lead in total profit.
  - Paper and Binders from Office Supplies also perform strongly.
- Least Profitable Sub-Categories:
  - Tables (–₹17,725) and Bookcases (–₹3,473) from Furniture are loss-making.
  - Supplies under Office Supplies also shows a negative profit.



## **Question : 7**

Calculate the year-over-year sales growth for each region using LAG().

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**Purpose:** Measures regional growth rates for performance benchmarking.

### **Query :**

with cte as

(select year(o.new\_order\_date) as year,

sum(sales) as year\_wise\_total\_sales

from orders as o left join `return` as r

on o.order\_id = r.order\_id

where r.order\_id is null

group by year(o.new\_order\_date)

)

select \*,

( (year\_wise\_total\_sales - LAG(year\_wise\_total\_sales) OVER

(ORDER BY year))

/ NULLIF(LAG(year\_wise\_total\_sales) OVER

(ORDER BY year), 0))\*100 as percentage\_change

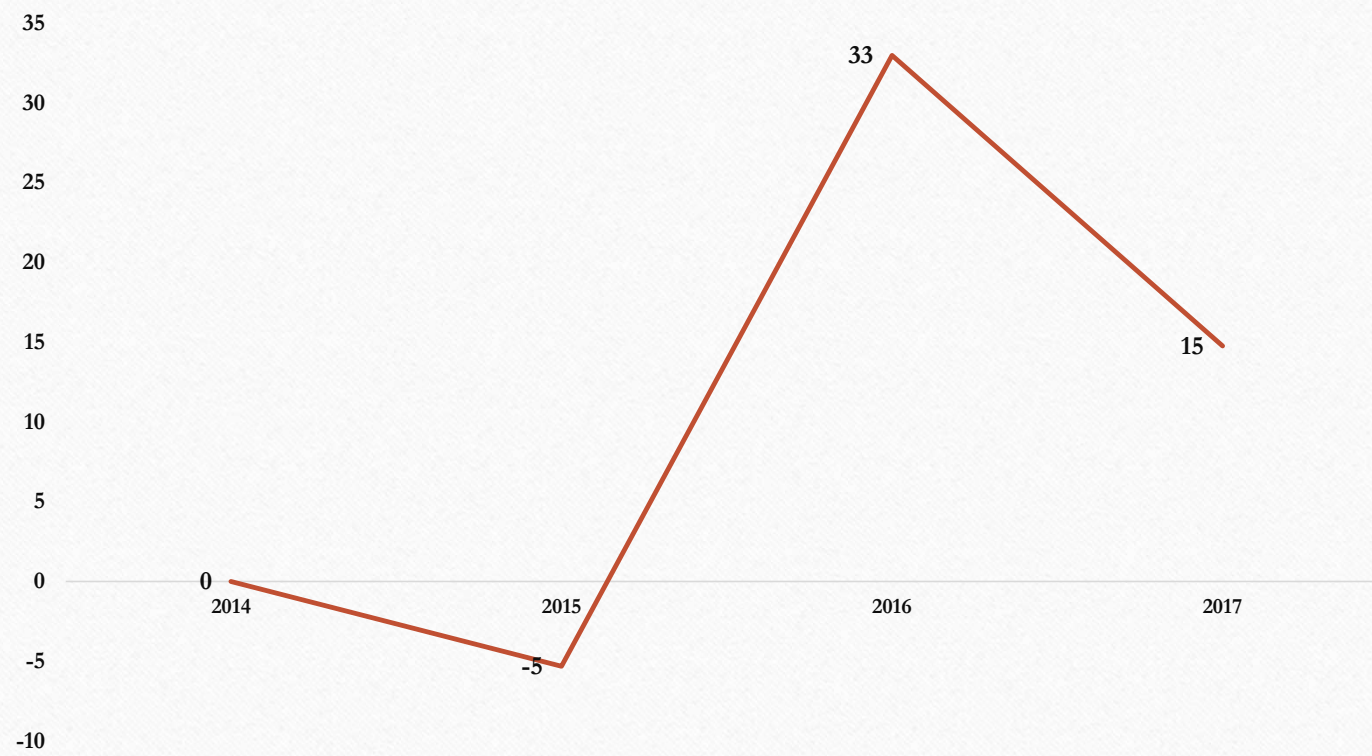
from cte;

### Output of the query

year	year_wise_total_sales	percentage_change
2014	455028	NULL
2015	430871.6	-5.30877
2016	573084.1	33.00576
2017	657713.1	14.76731



**Year Wise Growth of Profit  
(In Percentage)**



# Insights

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- 2014: Baseline year with total sales of \$455K.
- 2015: Sales declined by 5.31%, indicating a dip in business performance.
- 2016: Strong recovery with 33% growth, showing a major turnaround.
- 2017: Continued positive momentum with a 14.77% increase, reflecting sustained growth.



## Question : 8

What is the profit-to-sales ratio by product to identify low-margin items despite high sales?

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**Purpose:** Highlights products that need margin improvement despite high revenue.

### Query :

```
with
cte as ( select o.product_name,
round(sum(o.sales)) as total_sales ,
round(sum(o.profit)) as total_profit
from orders as o left join `return` as r
on o.order_id = r.order_id
where r.order_id is null
group by o.product_name )
select*, total_profit/ nullif(total_sales,0)
as profit_to_sales_ratio
from cte
order by total_sales desc ,
profit_to_sales_ratio asc;
```

## Output of the query

product_name	total_sales	total_profit	profit_to_sales_ratio
Canon imageCLASS 2200 Advanced Copier	47600	18480	0.3882
Fellowes PB500 Electric Punch Plastic Comb Binding Machine with Manual Bind	27453	7753	0.2824
Cisco TelePresence System EX90 Videoconferencing Unit	22638	-1811	-0.08
GBC DocuBind TL300 Electric Binding System	19823	2234	0.1127
HON 5400 Series Task Chairs for Big and Tall	19417	350	0.018
GBC Ibimaster 500 Manual ProClick Binding System	19025	761	0.04
Hewlett Packard LaserJet 3310 Copier	18840	6984	0.3707
HP Designjet T520 Inkjet Large Format Printer - 24 Color"	18375	4095	0.2229
High Speed Automatic Electric Letter Opener	17030	-262	-0.0154
Lexmark MX611dhe Monochrome Laser Printer	16830	-4590	-0.2727
Ibico EPK-21 Electric Binding System	15876	3345	0.2107
GBC DocuBind P400 Electric Binding System	15787	1824	0.1155
Riverside Palais Royal Lawyers Bookcase, Royale Cherry Finish	15611	-670	-0.0429
Martin Yale Chadless Opener Electric Letter Opener	14991	-1332	-0.0889
3D Systems Cube Printer, 2nd Generation, Magenta	14300	3718	0.26
Bretford Rectangular Conference Table Tops	12995	-327	-0.0252
Samsung Galaxy Mega 6.3	12684	1495	0.1179
Canon PC1060 Personal Laser Copier	11620	4571	0.3934
SAFCO Arco Folding Chair	11573	1179	0.1019
Cubify CubeX 3D Printer Double Head Print	11100	-8880	-0.8
Apple iPhone 5	10917	1430	0.131
Plantronics CS510 - Over-the-Head monaural Wireless Headset System	10822	3085	0.2851



# Insights

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- Baseline (Overall Average): The average profit-to-sales ratio across all products is 19.13%.

## Low-End Performance:

- About 25% of products have a margin below 7.84%, indicating low profitability or pricing issues.
- A small subset has negative margins up to -245%, pointing to significant losses per sale.

## High-End Performance:

- The top 25% of products enjoy margins above 36.93%, indicating highly efficient or premium products.
- A few standout items achieve over 50% margin, showcasing excellent cost control and value pricing.

## **Recommendations**

### **1. Eliminate Low-Margin Products**

- Remove or reprice products with low or negative profit-to-sales ratios.
- Focus on high-margin winners like Canon Copiers and HP Printers.

### **2. Fix Central Region Performance**

- Central region has lowest profit yield (8.9%).
- Audit pricing, returns, and logistics for inefficiencies.

### **3. Standardize Shipping Strategy**

- Standard Class is most profitable.
- Limit Same Day shipping to premium cases.

### **4. Target High-Value Segments**

- Consumers = highest frequency & revenue.
- Home Office = highest order value.
- Tailor campaigns by segment behavior.

### **5. Optimize Product Categories**

- Push profitable sub-categories: Copiers, Phones, Paper.
- Reevaluate loss-makers: Furniture Tables, Supplies.

### **6. Monitor Profit Trends**

- Use 3-order moving averages for early margin warnings.
- Track YoY trends for strategic planning.

### **7. Control Returns**

- Identify and address high-return products.
- Set return rate limits and improve packaging/warranty.