Data Analysis Report on Restaurant Data using SQL

1) INTRODUCTION:

This project aims to analyse restaurant data contained in 'tips.csv' dataset using SQL queries to extract valuable insights about customer behaviour, revenue trends, operational efficiency, and profitability. The goal is to help restaurant owners make data-driven decisions to enhance customer experience and financial performance.

2) DATASET OVERVIEW:

2.1) Dataset Name: 'tips.csv'

The dataset contains records of restaurant transactions, where each row represents a customer's dining experience, including their bill amount, tip, group size, gender, smoking preference, day of visit, and meal time.

2.2) Attributes:

COLUMN NAME	DESCRIPTION
total_bill	The total bill amount paid by the customer.
tip	The tip amount given by the customer.
gender	Gender of the customer
smoker	Indicates whether the customer is a smoker.
day	The day of the week when the customer dined.
time	Indicates whether the dining took place during Lunch or Dinner.
size	The number of people in the customer's group.

2.3) Sample Data:

Here's a preview of the dataset:

total_bill	tip	gender	smoker	day	time	size
16.99	1.01	Female	No	Sun	Dinner	2
10.34	1.66	Male	No	Sun	Dinner	3
21.01	3.50	Male	No	Sat	Lunch	3
23.68	3.31	Male	Yes	Fri	Dinner	4
24.59	3.61	Female	No	Thu	Lunch	2

2.4) Dataset Summary:

METRIC	VALUE
Total rows	244
Total columns	7
Unique days	Thu, Fri, Sat, Sun
Unique time	Lunch, Dinner
Smoking preference	Yes, No
Gender distribution	Male, Female

3) SQL OBJECTIVES:

The following objectives were achieved during this SQL project:

a) Mastering the use of SQL clauses such as WHERE, GROUP BY, HAVING, and ORDER BY.

b) Utilizing aggregation functions to summarize numerical data.

c) Analysing patterns in customer dining behaviour based on different attributes.

d) Gaining insights into financial performance indicators such as revenue and tip percentages.

4) METHODOLOGY USED:

CONCEPT	SQL COMMAND/FUNCTION
Filtering	WHERE, IN, NOT IN, BETWEEN, LIKE
Aggregation	SUM, AVG, MAX, MIN, COUNT
Logical Operators	AND, OR, NOT
Sorting	ORDER BY
Grouping	GROUP BY, HAVING

5) DATA ANALYSIS AND KPIs:

1. Financial Performance KPIs

1.1 Average Total Bill Per Customer

Query:

```
select round(avg(total_bill)) as Avg_Bill from tips;
```

Insight:

The average total bill per customer is 20.

1.2 Total Revenue Per Day

Query:

```
select day as Day,round(sum(total_bill)) as Revenue from tips
group by day order by field(day, 'Thu', 'Fri', 'Sat', 'Sun');
```

Insight:

The total revenue on Thursday is 1096, Friday is 326, Saturday is 1778 and Sunday is 1627.

1.3 Average Tip Percentage

Query:

```
select avg(tip/total_bill) as 'Average tip given by customer' from tips;
```

Insight:

Average tip given by customer is 0.1608.

1.4 Highest Revenue-Generating Day

Query:

```
select day as Day,round(sum(total_bill)) as 'Revenue Generated' from tips group by Day order by sum(total_bill) desc limit 1 ;
```

Insight:

Highest Revenue-Generating Day is Saturday with 1778 total revenue generated.

2. Customer Behaviour KPIs

2.1 Average Group Size

Query:

```
select avg(size) as "Average group size"from tips;
```

Insight:

The average group size is 2.5697.

2.2 Peak Dining Time (Lunch vs. Dinner)

Query:

```
select time as Time,count(*) as "Number of customers" from tips group by time ;
```

Insight:
Number of customers during lunch is 68 and during dinner is 176.

2.3 Percentage of Customers Who Dine Alone

Query:
select (select count(*) from tips where size=1)/(select count(*) from tips)*100 as "Percentage of customers who dine alone" from tips limit 1;

Insight:
Percentage of customers who dine alone is 1.6393.

2.4 Smoking vs. Non-Smoking Customers

Query:
select smoker,count(*) as "Number of customers" from tips group by smoker order by field(smoker,'yes','no');

Insight:
Smokers make up 38.14% (93 out of 244 customers), while non-smokers account for 61.86% (151 customers).

3. Marketing & Customer Segmentation KPIs

3.1 Most Frequent Customer Gender

Query:
select gender,count(*) as "Number of customers" from tips group by gender order by count(*) desc limit 1;

Insight:
The most frequent customer is Male with 157 strength.

3.2 Highest Spending Customer Segment (Gender & Smoking Status)

Query:
select gender,smoker,avg(total_bill) as "Money spent" from tips group by gender,smoker order by avg(total_bill) desc limit 1;

Insight:
The highest spending customer segment is male smokers, with an average bill of 22.28

3.3 Best Day for High Tips

Query:
select day, round(avg(tip/total_bill)) as "Tip received" from tips group by day order by avg(tip/total_bill) desc limit 1;

Insight:
Best day for high tips is Friday.

3.4 Most Popular Group Size

Query:
select size,count(*) as "Group size" from tips group by size order by count(*) desc limit 1;

Insight:
Most popular group is of size 2.

4. Operational Efficiency KPIs

4.1 Total Number of Customers Per day

Query:

```
select day,sum(size) as customers from tips group by day order by field(day,"thur","fri","sat","sun");
```

Insight:

The customers on Thursday is 152, Friday is 40, Saturday is 219 and on Sunday is 216.

4.2 Average Spending Per Table

Query:

```
select size,round(avg(total_bill)) as "Average spending per table" from tips group by size;
```

Insight:

The average spending per table for sizes are 1:7, 2:16, 3:23, 4:29, 5:30, 6:35.

4.3 Total Revenue During Lunch vs. Dinner

Query:

```
select time,round(sum(total_bill)) as "Total revenue" from tips group by time;
```

Insight:

Total revenue during lunch is 1167 and during dinner is 3660.

4.4 Best Day for Promotions

Query:

```
select day,count(*) from tips group by day order by count(*) desc ;
```

Insight:

The best day for promotions is Saturday, as it has the highest customer count (87). This is followed by Sunday (76 customers), Thursday (62 customers), and Friday (19 customers)

5. Customer Experience & Loyalty KPIs

5.1 Customer Satisfaction Score (Based on Tips)

Query:

```
select avg(tip/total_bill)*100 from tips;
```

Insight:

The average tip per total bill is 16.080

5.2 Repeat Customer Analysis

Query:

```
select gender,size,count(*) as "customers" from tips group by gender,size order by gender desc,count(*) desc  ;
```

Insight:

The most frequent customer group is male pairs (size 2), with 98 visits. Among females, the most common group size is also 2, with 58 visits. The least frequent group is a single male diner (size 1) and a group of five female diners (size 5), each with only one visit.

6. Advanced Insights & Predictive Analysis KPIs

6.1 Seasonal Trends in Revenue

Query:

```
select day,round(sum(total_bill)) as "Total bill"from tips group by day order by sum(total_bill) desc;
```

Insight:

Day	Total Bill
Sat	1778
Sun	1627
Thur	1096
Fri	326

6.2 Impact of Group Size on Tip Percentage

Query:

```
select size,avg(tip/total_bill)*100 as "Average tip" from tips group by size order by size;
```

Insight:

Size	Average Tip
1	21.72
2	16.57
3	15.21
4	14.59
5	14.14
6	15.62

6.3 Time-Based Spending Pattern (Hourly Analysis)

Query:

```
select time,avg(total_bill) from tips group by time;
```

Insight:

The average total bill spend by customers during lunch time is 17.16 and during dinner is around 20.79.

6.4 Tip Amount Based on Day of the Week

Query:

```
select day,avg(tip) from tips group by day ;
```

Insight:

Day	Average Tip
Sun	3.25
Sat	2.99
Thur	2.77
Fri	2.73

7. Profitability & Cost Optimization KPIs

7.1 Average Revenue Per Seat

Query:

```
select round(sum(total_bill)/sum(size))as "Avg revenue per seat"
from tips;
```

Insight:

The average revenue per seat is 8.

7.2 Most Profitable Customer Type

Query:

```
select gender,smoker,round(avg(total_bill),2) as "Average bill"
from tips group by gender,smoker order by avg(total_bill) desc;
```

Insight:		
Gender	**Smoker**	**Average Bill**
Male	Yes	22.28
Male	No	19.79
Female	No	18.11
Female	Yes	17.98

6) AREAS FOR IMPROVEMENT & GROWTH STRATEGIES:

1. Increase Revenue & Profitability

- Menu Engineering: Optimize pricing and placement of high-margin dishes to drive profitability.
- Weekend Promotions: Since Saturdays and Sundays are the busiest, introduce weekend special menus or discounts to maximize revenue.

2. Enhance Customer Experience & Loyalty

- Loyalty Programs: Offer discounts or reward points to repeat customers (especially 2-person male groups).
- Personalized Discounts: Give special offers to high spenders (male smokers) to encourage repeat visits.
- Reduce Waiting Time: More staff and better table management to handle peak dinner rush efficiently.

3. Optimize Operational Efficiency

- Adjust Staff Allocation: Since dinner has the highest customer volume, allocate more staff during peak dinner hours.
- Reduce Low Revenue Days: Introduce weekday promotions (e.g., “Thursday Special” or “Happy Hours”) to attract more customers.
- Increase Table Turnover: Encourage faster service for small groups (most common size: 2-person tables).

4. Marketing & Customer Targeting

- Social Media Ads: Target male smokers and weekend diners since they are the highest spenders.
- Customer Feedback: Gather feedback on food quality, ambiance, and service to identify areas for improvement.
- Theme Nights: Host live music, sports screenings, or themed dinners to attract diverse customer groups.

7) CONCLUSION:

By leveraging SQL-driven insights, the restaurant can enhance operational efficiency, increase revenue, and improve customer satisfaction. Data-backed decisions in pricing, promotions, and customer engagement will drive sustainable growth. Strategic improvements in staffing, menu optimization, and targeted marketing will strengthen the restaurant's competitive edge, ensuring long-term profitability and customer loyalty.