Functions

Let's define and explain each of these functions—DATEADD(), TIMESTAMPDIFF(), POWER(), SQRT(), VARIANCE(), and STDDEV()—and explore how they are used in real-world industry applications:

1. DATEADD()

- Definition: Adds a specified time interval (e.g., days, months, years) to a given date.

- Syntax: `DATE_ADD(date, INTERVAL value unit)`

Use Cases in Real-Life Industries:

Retail: Used to calculate delivery or shipping dates based on the order date.

- Example: Determine the expected delivery date by adding 5 days to the order date.

```
SELECT order_id, order_date, DATE_ADD(order_date, INTERVAL 5 DAY) AS
delivery_date

FROM orders;
```

Healthcare: Calculate follow-up appointment dates.

- Example: Add 3 months to a patient's last appointment date to determine the next follow-up appointment.

```
SELECT patient_id, last_appointment, DATE_ADD(last_appointment, INTERVAL 3
MONTH) AS next_appointment

FROM appointments;
```

Finance: Determine the maturity date of a loan or investment.

- Example: Add 10 years to the start date of a loan.

```
SELECT loan_id, start_date, DATE_ADD(start_date, INTERVAL 10 YEAR) AS
maturity_date

FROM loans;
```

2. TIMESTAMPDIFF()

- Definition: Calculates the difference between two `TIMESTAMP` or `DATE` values in terms of the specified unit (seconds, minutes, hours, days, etc.).

- Syntax: `TIMESTAMPDIFF(unit, start_datetime, end_datetime)`

Use Cases in Real-Life Industries:

Logistics: Calculate the time taken to deliver an order.

- Example: Calculate the number of hours between the dispatch time and delivery time.

```
SELECT order_id, TIMESTAMPDIFF(HOUR, dispatch_time, delivery_time) AS
delivery_hours

FROM deliveries;
```

Human Resources: Calculate the duration of employment.

- Example: Determine how many months an employee has been with the company.

```sql
SELECT  employee_id,  TIMESTAMPDIFF(MONTH,  hire_date,  CURDATE())  AS
months_worked

FROM employees;
```

Telecommunications: Calculate call duration for billing purposes.

- Example: Find out how long each customer call lasted in minutes.

```sql
SELECT  call_id,  TIMESTAMPDIFF(MINUTE,  call_start,  call_end)  AS
call_duration

FROM call_logs;
```

3. POWER()

- Definition: Returns the value of a number raised to the power of another number.

- Syntax: `POWER(base, exponent)`

Use Cases in Real-Life Industries:

Finance: Calculate compound interest or growth rate over time.

- Example: Calculate the future value of an investment using compound interest.

```sql
SELECT investment_id, principal_amount, POWER(1 + interest_rate, years) *
principal_amount AS future_value

FROM investments;
```

Manufacturing: Predict future demand growth or production capacity.

- Example: Estimate future production output based on a consistent growth rate.

```sql
SELECT  factory_id,  current_output,  POWER(1  +  growth_rate,  years)  *
current_output AS estimated_output

FROM production;
```

4. SQRT()

- Definition: Returns the square root of a number.

- Syntax: `SQRT(number)`

Use Cases in Real-Life Industries:

Finance: Calculate the volatility of an asset (related to variance).

- Example: Determine the standard deviation of returns for a stock.

```sql
SELECT stock_id, SQRT(variance) AS volatility

FROM stock_returns;
```

Engineering: Calculate the square root of load or pressure measurements.

- Example: Used in stress analysis to calculate forces and displacements.

```
SELECT measurement_id, SQRT(load) AS load_root

FROM stress_measurements;
```

5. VARIANCE()

- Definition: Calculates the variance of a set of values (a measure of how far data points deviate from the mean).

- Syntax: `VARIANCE(expression)`

Use Cases in Real-Life Industries:

Finance: Measure the risk (volatility) of an investment or stock portfolio.

- Example: Calculate the variance of daily returns for a stock.

```
SELECT stock_id, VARIANCE(daily_return) AS return_variance

FROM stock_returns;
```

Retail: Analyze sales variance across stores or regions to identify inconsistencies.

- Example: Calculate variance in sales between different stores in a region.

```
SELECT region, VARIANCE(sales) AS sales_variance

FROM store_sales

GROUP BY region;
```

6. STDDEV()

- Definition: Calculates the standard deviation of a set of values (a measure of the amount of variation or dispersion in a set of data).

- Syntax: `STDDEV(expression)`

Use Cases in Real-Life Industries:

Manufacturing: Monitor product quality by calculating the standard deviation of production measurements (e.g., length, weight).

- Example: Calculate the standard deviation of product weights to check for consistency.

```
SELECT product_id, STDDEV(weight) AS weight_stddev

FROM product_batches;
```

Finance: Measure risk by calculating the standard deviation of asset returns.

- Example: Determine the volatility of a stock by calculating the standard deviation of daily price changes.

```
SELECT stock_id, STDDEV(daily_return) AS volatility

FROM stock_prices;
```