**Interview Questions**

# Problem 1:

# Find the distance travelled by each car per day.

Suppose you have a car travelling certain distance and the data is presented as follows:

Day 1 - 50 Kms

Day 2 - 100 Kms

Day 3 - 200 Kms

Now the distance is a cumulative sum as in:

Row 2 = (Kms travelled by car on that day + Row 1 kms)

How should we create a table in the form of Kms travelled by the car on a given day and not the sum of the total distance?

**select \*,**

**(cumulative\_distance - lag(cumulative\_distance, 1, 0)**

**over (partition by cars order by cars))**

**as distance\_travelled**

**from car\_travels;**

## Query Explanation:

The query calculates the distance traveled by each car on a specific day using cumulative distance data from the car\_travels table.

## Query Breakdown:

**select \*: Selects all columns from the car\_travels table.**

(cumulative\_distance - lag(cumulative\_distance, 1, 0) over (partition by cars order by cars)):

**lag(cumulative\_distance, 1, 0):**

Retrieves the cumulative distance of the previous row for the same car (partition by cars).

If no previous row exists (e.g., Day 1), it defaults to 0 (third parameter).

**cumulative\_distance - lag(...):**

Subtracts the previous day's cumulative distance from the current day's cumulative distance to calculate the distance travelled on that specific day.

**as distance\_travelled:**

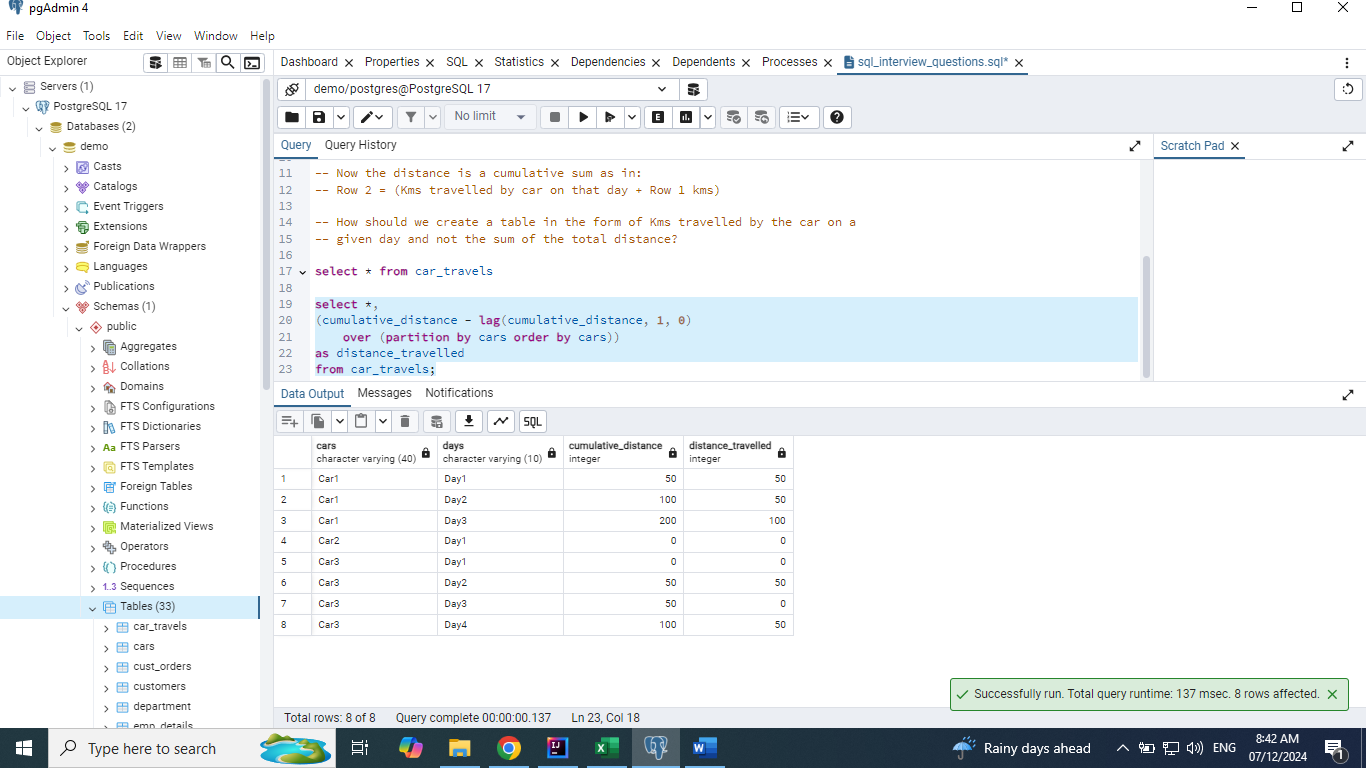
Renames the result of the calculation to distance\_travelled.

**Window Function:**

**over (partition by cars order by cars):**

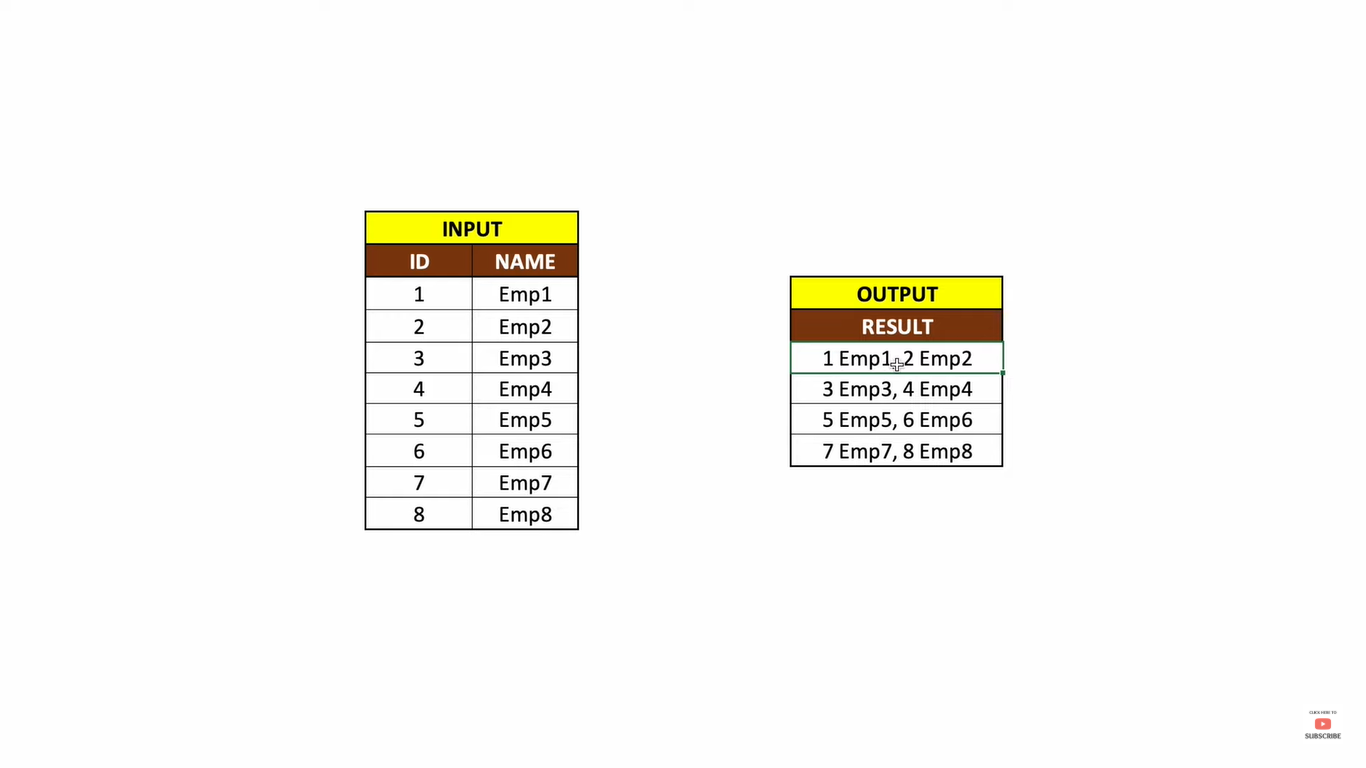
Divides the data by each car (partition by cars), ensuring calculations are performed within the scope of a single car.

Orders the rows for each car to process the cumulative distances in sequence.



# Problem 2:

# Convert the Row level data to Column level data. Also, Combine the data of pair of rows using comma.



**select \*,**

**ntile(4) over(order by id) as buckets**

**from emp\_input;**

**select concat(id,' ', name) as name,**

**ntile(4) over(order by id) as buckets**

**from emp\_input;**

**with cte as**

**(select concat(id,' ', name) as name,**

**ntile(4) over(order by id) as buckets**

**from emp\_input)**

**select string\_agg(name, ', ') as final\_result**

**from cte**

**group by buckets**

**order by 1;**

## Query Explanation:

The query divides employees into 4 equal-sized groups (buckets) based on their id and then concatenates their id and name into a comma-separated string for each bucket.

## Query Breakdown:

**Step 1: Common Table Expression (CTE)**

with cte as (

select

concat(id, ' ', name) as name,

ntile(4) over (order by id) as buckets

from emp\_input

)

**concat(id, ' ', name) as name:**

Combines the id and name of each employee into a single string, formatted as "id name".

For example: 1 Emp1, 2 Emp2, etc.

**ntile(4) over (order by id):**

Divides the employees into 4 groups (buckets).

The ntile function evenly distributes rows across the specified number of groups.

Groups are formed based on the id in ascending order.

**Step 2: Aggregating and Grouping**

select

string\_agg(name, ', ') as final\_result

from cte

group by buckets

order by 1;

string\_agg(name, ', '):

Aggregates all name values in each bucket into a single comma-separated string.

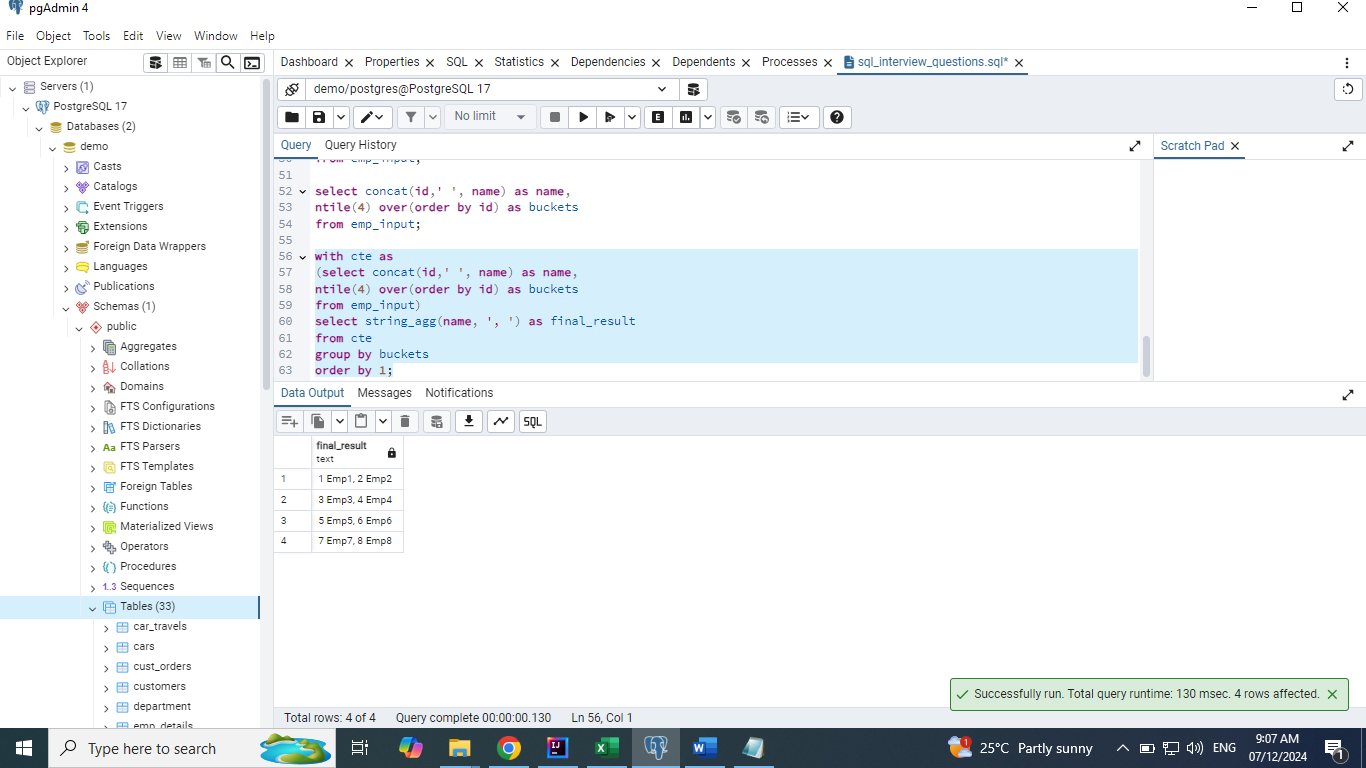
For example: "1 Emp1, 2 Emp2" for the first bucket.

group by buckets:

Groups rows by their assigned bucket, ensuring that string\_agg works within each bucket.

order by 1:

Orders the final results by the aggregated string.



# Problem 3:

# Write a solution to report the type of each node in the tree. Return the result table in any order.

Table: Tree

+-------------+------+

| Column Name | Type |

+-------------+------+

| id | int |

| p\_id | int |

+-------------+------+

id is the column with unique values for this table.

Each row of this table contains information about the id of a node and the id of its parent node in a tree.

The given structure is always a valid tree.

Each node in the tree can be one of three types:

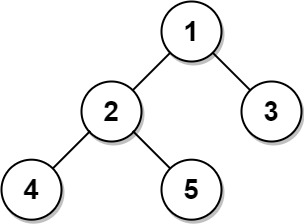
* **"Leaf"**: if the node is a leaf node.
* **"Root"**: if the node is the root of the tree.
* **"Inner"**: If the node is neither a leaf node nor a root node.

Write a solution to report the type of each node in the tree.

Return the result table in **any order**.

The result format is in the following example.

**Example 1:**



**Input:**

Tree table:

+----+------+

| id | p\_id |

+----+------+

| 1 | null |

| 2 | 1 |

| 3 | 1 |

| 4 | 2 |

| 5 | 2 |

+----+------+

**Output:**

+----+-------+

| id | type |

+----+-------+

| 1 | Root |

| 2 | Inner |

| 3 | Leaf |

| 4 | Leaf |

| 5 | Leaf |

+----+-------+

**Explanation:**

Node 1 is the root node because its parent node is null and it has child nodes 2 and 3.

Node 2 is an inner node because it has parent node 1 and child node 4 and 5.

Nodes 3, 4, and 5 are leaf nodes because they have parent nodes and they do not have child nodes.

**Example 2:**



**Input:**

Tree table:

+----+------+

| id | p\_id |

+----+------+

| 1 | null |

+----+------+

**Output:**

+----+-------+

| id | type |

+----+-------+

| 1 | Root |

+----+-------+

**Explanation:** If there is only one node on the tree, you only need to output its root attributes.

## Query Explanation:

This query determines the type of each node in a tree structure based on its relationships with parent and child nodes. The type of each node is classified as Root, Inner, or Leaf.

## Query Breakdown:

**Basic Selection:**

select \*

from tree;

Selects all columns (id, p\_id) from the tree table.

**Type Classification with CASE:**

case

when p\_id is null then 'Root'

when p\_id is not null and id in (select distinct p\_id from tree) then 'Inner'

else 'Leaf'

end as type

**Condition 1:**

**when p\_id is null then 'Root'**

A node is classified as Root if its p\_id (parent ID) is null. This indicates the node has no parent and is the top-most node in the tree.

**Condition 2:**

**when p\_id is not null and id in (select distinct p\_id from tree) then 'Inner'**

A node is classified as Inner if:

It has a parent (p\_id is not null).

It is a parent of other nodes (id in (select distinct p\_id from tree)). This checks whether the id appears in the p\_id column of any row in the tree table.

**Condition 3:**

else 'Leaf'

A node is classified as Leaf if:

It has a parent (p\_id is not null).

It is not a parent of any other node. In this case, the id does not appear in the p\_id column of the tree table.

**select \*,**

**case**

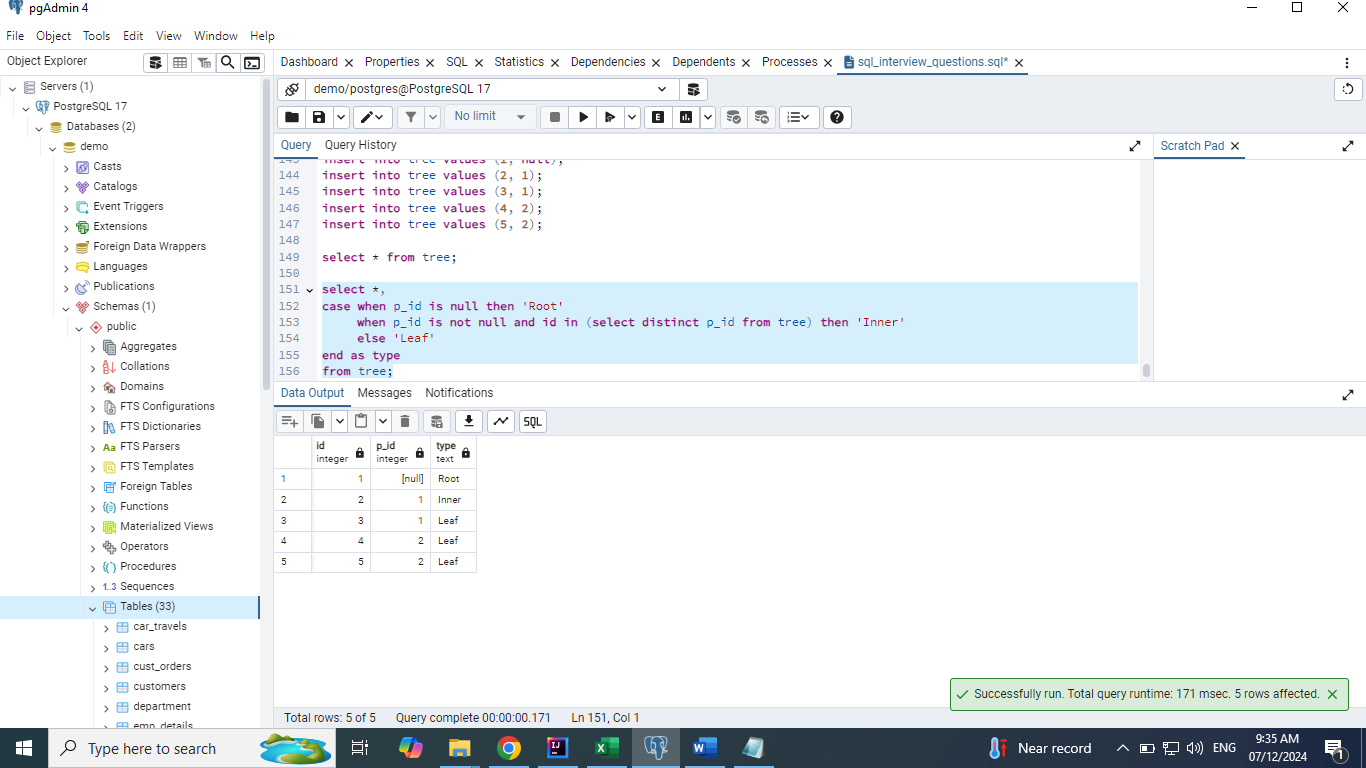
**when p\_id is null then 'Root'**

**when p\_id is not null and id in (select distinct p\_id from tree) then 'Inner'**

**else 'Leaf'**

**end as type**

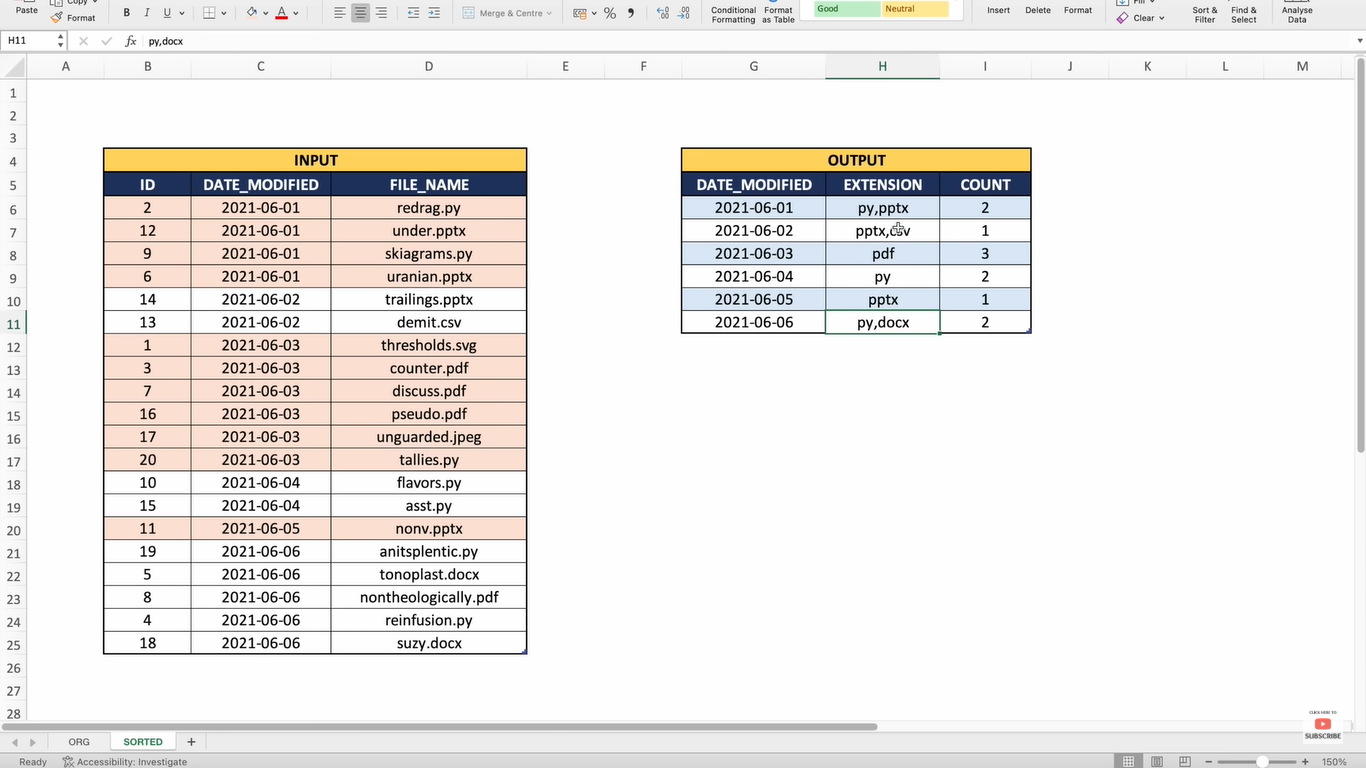
**from tree;**



# Problem 4:

# Find the most modified file extension for the day

A DB contains a list of filenames including their extensions and the dates they were last modified. For each date that a modification was made, return the date, the extension(s) of the files that were modified the most, and the number of files modified that date. If more than one file extension ties for the most modifications, return them as a comma delimited list in reverse order.



Problem Breakdown

Fetch the file extension

select \* , position('.' in file\_name)

from files;

select date\_modified, substring(file\_name, (position('.' in file\_name)+1)) as file\_ext

from files;

For each day, how many times each file extension was modified

select date\_modified, substring(file\_name, (position('.' in file\_name)+1)) as file\_ext, count(1) as cnt

from files

group by date\_modified, file\_ext

order by 1;

For each day, fetch the most modified file extension from #2

with cte as

(select date\_modified, substring(file\_name, (position('.' in file\_name)+1)) as file\_ext, count(1) as cnt

from files

group by date\_modified, file\_ext

order by 1)

select \*

from cte c1

where cnt = (select max(cnt) from cte c2

where c2.date\_modified = c1.date\_modified);

If there is tie, then concatenate the multiple file extension

## Query Explanation:

The given query identifies the file extensions that were most frequently modified on each date from a database of files. It returns the following for each modification date:

1. The **modification date**.
2. The **file extension(s)** with the highest count of modifications for that date (comma-separated in reverse alphabetical order if there's a tie).
3. The **number of files modified** for the most frequent file extension(s) on that date.

## Query Breakdown:

**Extract File Extension and Count by Date:**

A Common Table Expression (cte) is created.

For each date\_modified, the query extracts the file extension using substring(file\_name, (position('.' in file\_name) + 1)).

It counts the number of files modified for each date\_modified and file\_ext combination.

The result is grouped by date\_modified and file\_ext, and ordered by the modification date

**Find Extensions with Maximum Modifications Per Date:**

The main query iterates through each row of the cte.

It compares the cnt of each file extension with the maximum cnt for that date\_modified using a subquery.

If the cnt equals the maximum, the extension is considered one of the most modified for that date.

**Aggregate Extensions in Reverse Alphabetical Order:**

For each date\_modified, extensions meeting the maximum count criteria are concatenated into a single string using string\_agg with ORDER BY file\_ext DESC.

**Final Output:**

The query groups the results by date\_modified.

**It selects:**

date\_modified.

A comma-separated list of extensions in reverse alphabetical order (extension).

The maximum count of modified files for that date (count).

**with cte as**

**(select date\_modified, substring(file\_name, (position('.' in file\_name)+1)) as file\_ext, count(1) as cnt**

**from files**

**group by date\_modified, file\_ext**

**order by 1)**

**select date\_modified,**

**string\_agg(file\_ext, ', ' order by file\_ext desc) as extension,**

**max(cnt) as count**

**from cte c1**

**where cnt = (select max(cnt) from cte c2**

**where c2.date\_modified = c1.date\_modified)**

**group by date\_modified;**



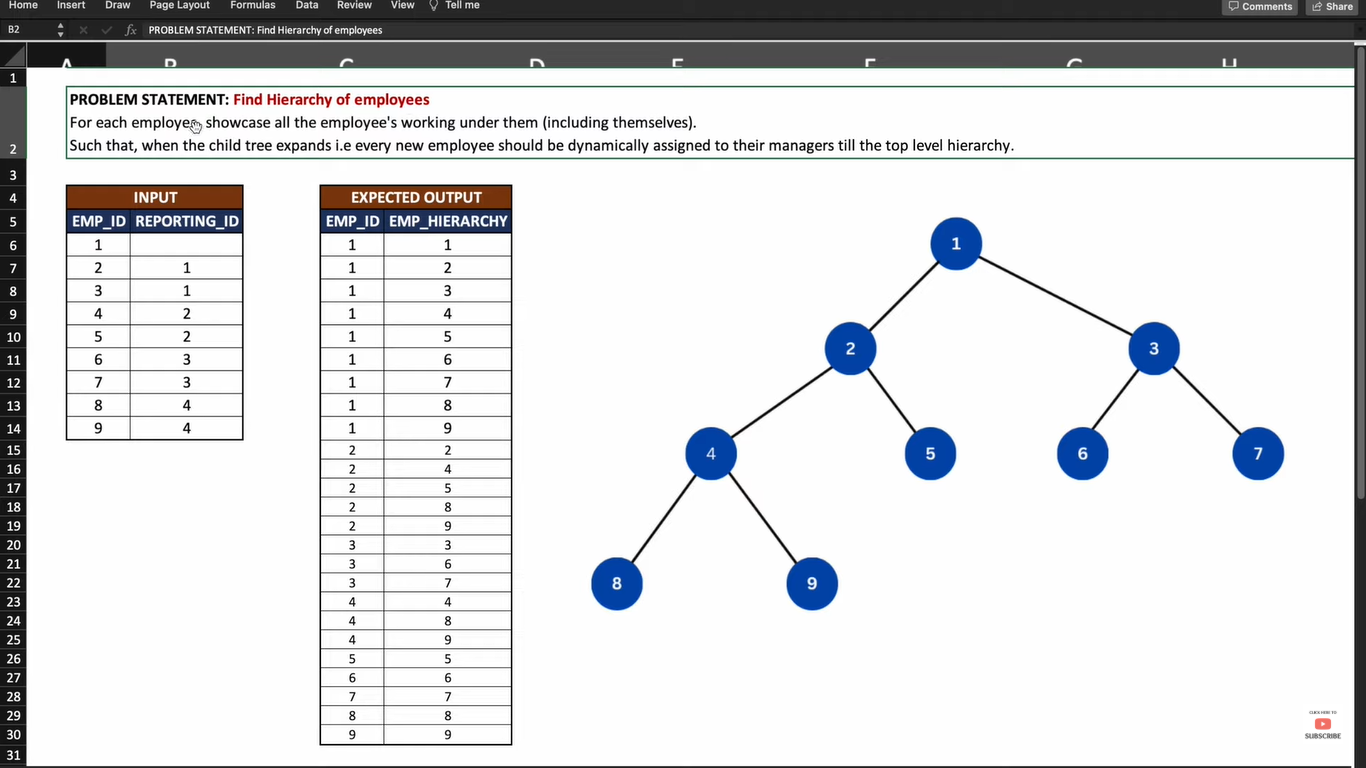
# Problem 5:

Find the hierarchy of employees

For each employee, showcase all the employee's working under them (including themselves)

Such that, when the child tree expands i.e., every new employee should be dynamically

assigned to their managers till the top-level hierarchy.



## Recursive SQL syntax

**with recursive cte as**

**(base query**

**union all**

**recursive part of the query**

**termination / exit condition)**

**select \***

**from cte;**

## Query Explanation:

The query generates the **hierarchy of employees** from a table, emp\_hierarchy, where each row defines an employee and their manager (or reporting\_id). For each employee, it lists:

* The employee themselves.
* All employees working under them, either directly or indirectly, forming a tree-like structure.

## Query Breakdown:

**1. Recursive Common Table Expression (CTE):**

The query uses a WITH RECURSIVE clause to define a CTE, called cte, to compute the hierarchy dynamically.

with recursive cte as

(

select emp\_id, emp\_id as employee\_hierarchy

from emp\_hierarchy

union all

select cte.emp\_id, eh.emp\_id as employee\_hierarchy

from cte

join emp\_hierarchy eh on cte.employee\_hierarchy = eh.reporting\_id

)

**Base Case:**

select emp\_id, emp\_id as employee\_hierarchy

from emp\_hierarchy

Starts with the base row for each emp\_id.

Here, employee\_hierarchy is initialized to the emp\_id itself, meaning each employee is their own manager.

**Recursive Step:**

select cte.emp\_id, eh.emp\_id as employee\_hierarchy

from cte

join emp\_hierarchy eh on cte.employee\_hierarchy = eh.reporting\_id

The recursive step finds all employees who report to someone already in the hierarchy.

It iterates through the hierarchy to add employees working under the emp\_id in the CTE.

**2. Final Output:**

The select statement retrieves the hierarchy:

select \*

from cte

order by emp\_id, employee\_hierarchy;

For each emp\_id, it lists their entire hierarchy, including themselves, sorted by emp\_id and employee\_hierarchy.

**with recursive cte as**

**(select emp\_id, emp\_id as employee\_hierarchy**

**from emp\_hierarchy**

**union all**

**select cte.emp\_id, eh.emp\_id as employee\_hierarchy**

**from cte**

**join emp\_hierarchy eh on cte.employee\_hierarchy = eh.reporting\_id)**

**select \***

**from cte**

**order by emp\_id, employee\_hierarchy;**

**1st Iteration**

**select emp\_id, emp\_id as employee\_hierarchy**

**from emp\_hierarchy where emp\_id = 1;**

**2nd Iteration**

**select cte.emp\_id, eh.emp\_id as employee\_hierarchy**

**from (select emp\_id, emp\_id as employee\_hierarchy**

**from emp\_hierarchy where emp\_id = 1) cte**

**join emp\_hierarchy eh on cte.employee\_hierarchy = eh.reporting\_id;**

**3rd Iteration**

**select cte.emp\_id, eh.emp\_id as employee\_hierarchy**

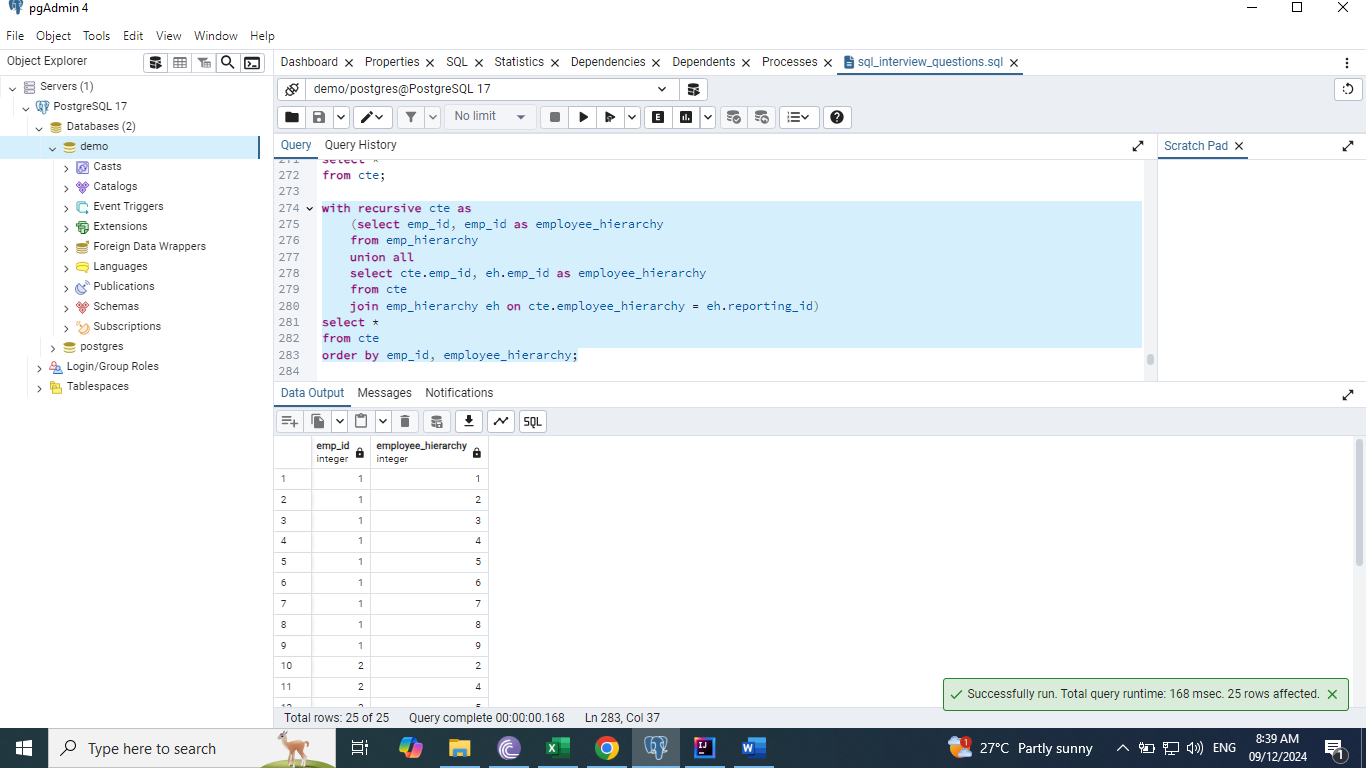
**from (select cte.emp\_id, eh.emp\_id as employee\_hierarchy**

**from (select emp\_id, emp\_id as employee\_hierarchy**

**from emp\_hierarchy where emp\_id = 1) cte**

**join emp\_hierarchy eh on cte.emp\_id = eh.reporting\_id)cte**

**join emp\_hierarchy eh on cte.employee\_hierarchy = eh.reporting\_id;**



# Problem 6:

# Given is a list of arbitrary values. They can either be comma separated values in a single row column or they could be values spread across multiple rows. Write an SQL Query to group these arbitrary values as per the expected output.

**Step by Step approach**

**Convert the column level data to row level data**

select unnest(val) from arbitrary\_values;

**Adding unique identifier with ordinality**

select x.\*

from arbitrary\_values

cross join unnest(val) with ordinality x(val, index);

## Query Explanation:

This SQL query transforms a single-column array of values into grouped rows where each group size grows incrementally. Here's a step-by-step explanation:

## Query Breakdown:

**Step 1: Explode the Array Column**

The array val is expanded into rows using the unnest function:

**SELECT unnest(val) FROM arbitrary\_values;**

This converts an array like "{a1,a2,a3,...}" into a single column of values (a1, a2, etc.) in individual rows.

**Step 2: Add Ordinality**

To maintain the original order and allow indexing, unnest is combined with the WITH ORDINALITY option:

**SELECT x.\***

**FROM arbitrary\_values**

**CROSS JOIN UNNEST(val) WITH ORDINALITY x(val, index);**

val: The individual values from the array.

index: The position of the value in the original array.

This gives rows like:

val index

a1 1

a2 2

a3 3

... ...

This result is stored in the cte\_values Common Table Expression (CTE).

**Step 3: Create Recursive Groups**

Using a Recursive CTE, the query builds groups with sizes that increase incrementally. Here's the breakdown:

**3.1. Base Case**

The first row (index = 1) initializes the recursion:

**SELECT \*, 1 AS iterator, MAX(index) OVER() AS max\_index**

**FROM cte\_values**

**WHERE index = 1;**

iterator = 1: Group number starts at 1.

max\_index: Stores the highest index value to track group boundaries.

**3.2. Recursive Case**

Each recursive step processes the next set of rows by expanding the group size by one:

**SELECT cv.\*, (iterator + 1), MAX(cv.index) OVER() AS max\_index**

**FROM cte**

**JOIN cte\_values cv**

**ON cv.index BETWEEN max\_index + 1 AND max\_index + 1 + iterator;**

**cv: Refers to rows in cte\_values.**

iterator + 1: Advances to the next group.

index BETWEEN max\_index + 1 AND max\_index + 1 + iterator: Picks the next set of rows for the current group.

**Step 4: Aggregate Values into Groups**

Once grouped, the query aggregates the values in each group into a comma-separated string using string\_agg:

**SELECT iterator AS grp, STRING\_AGG(val, ' , ') AS values**

**FROM cte**

**GROUP BY iterator**

**ORDER BY iterator;**

grp: The group number (from iterator).

values: The aggregated string of values in each group.

**Final Query**

**with recursive cte as**

**(select \*, 1 as iterator, max(index) over() as max\_index**

**from cte\_values where index = 1**

**union**

**select cv.\*, (iterator+1), max(cv.index) over() as max\_index**

**from cte**

**join cte\_values cv on cv.index between max\_index+1 and max\_index+1+iterator**

**),**

**cte\_values as**

**(select x.\***

**from arbitrary\_values**

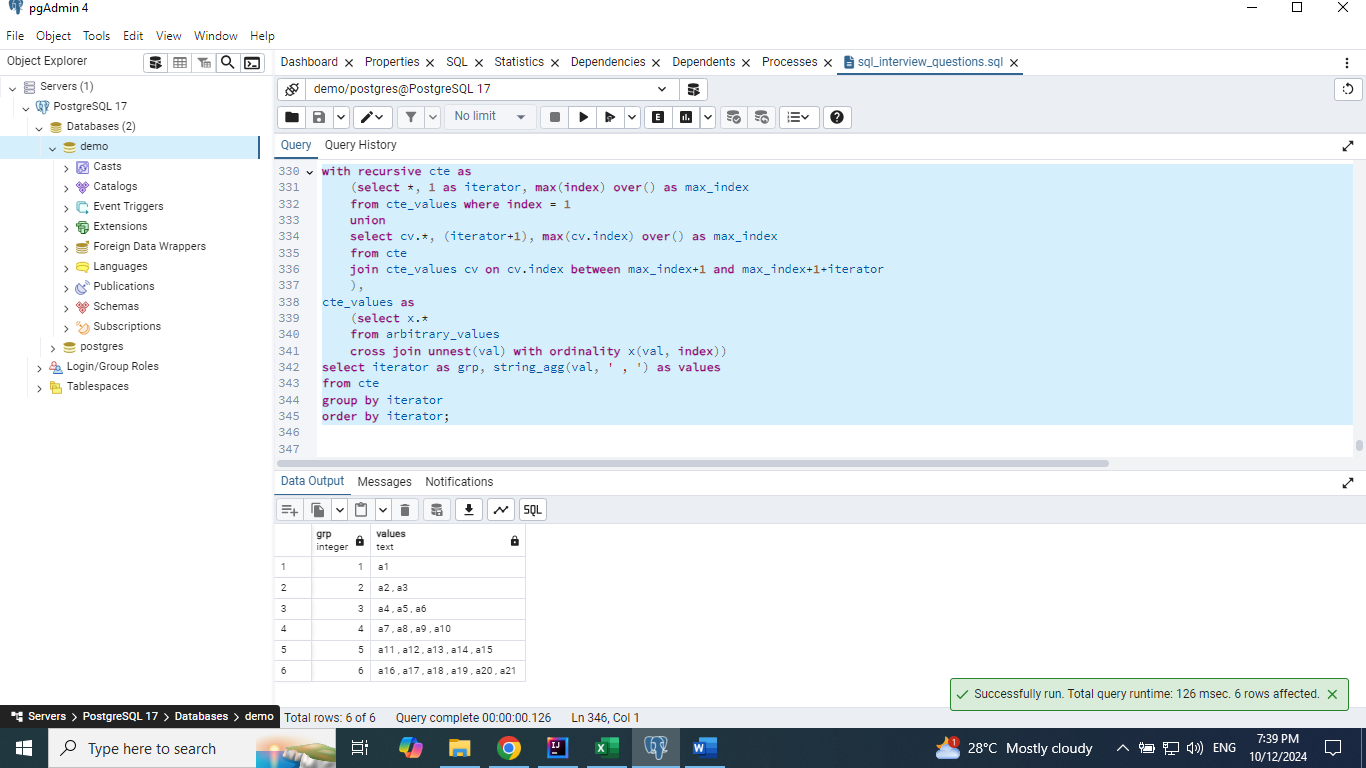
**cross join unnest(val) with ordinality x(val, index))**

**select iterator as grp, string\_agg(val, ' , ') as values**

**from cte**

**group by iterator**

**order by iterator;**



# Problem 7:

## Type1: SQL Query to fetch "N" consecutive records when temperature is below 0.

**Fetch the temperature below 0.**

select \* from weather where temperature < 0;

**Add a unique row number to the data**

select \*, row\_number() over(order by id) as rn

from weather

where temperature < 0;

**Logic to group the data**

select \*, row\_number() over(order by id) as rn,

(id - row\_number() over(order by id)) as difference

from weather

where temperature < 0;

## Query Breakdown:

**The WITH clause, also known as a Common Table Expression (CTE), is used in SQL to create temporary, named result sets that can be referenced within the main query. It helps make SQL queries more readable and modular, especially when dealing with complex logic or when a subquery is used multiple times.**

**CTE t1:**

Purpose: Add additional columns to analyze the consecutive records.

Columns added:

rn: Row number of the record ordered by id.

difference: A computed value (id - row\_number() over(order by id)) that groups records with consecutive id values. This is because consecutive rows in a sequence will have the same difference.

**CTE t2:**

Purpose: Count the number of records in each group (grouped by difference).

Columns added:

no\_of\_records: Total number of records in the group with the same difference.

This is achieved by using a count(\*) over(partition by difference).

**Final Query:**

Filters the rows to include only those groups where no\_of\_records = 3.

Selects the id, city, temperature, and day columns for these rows.

**Final query using with clause**

**with t1 as**

**(select \*, row\_number() over(order by id) as rn,**

**id - (row\_number() over(order by id)) as difference**

**from weather**

**where temperature < 0),**

**t2 as**

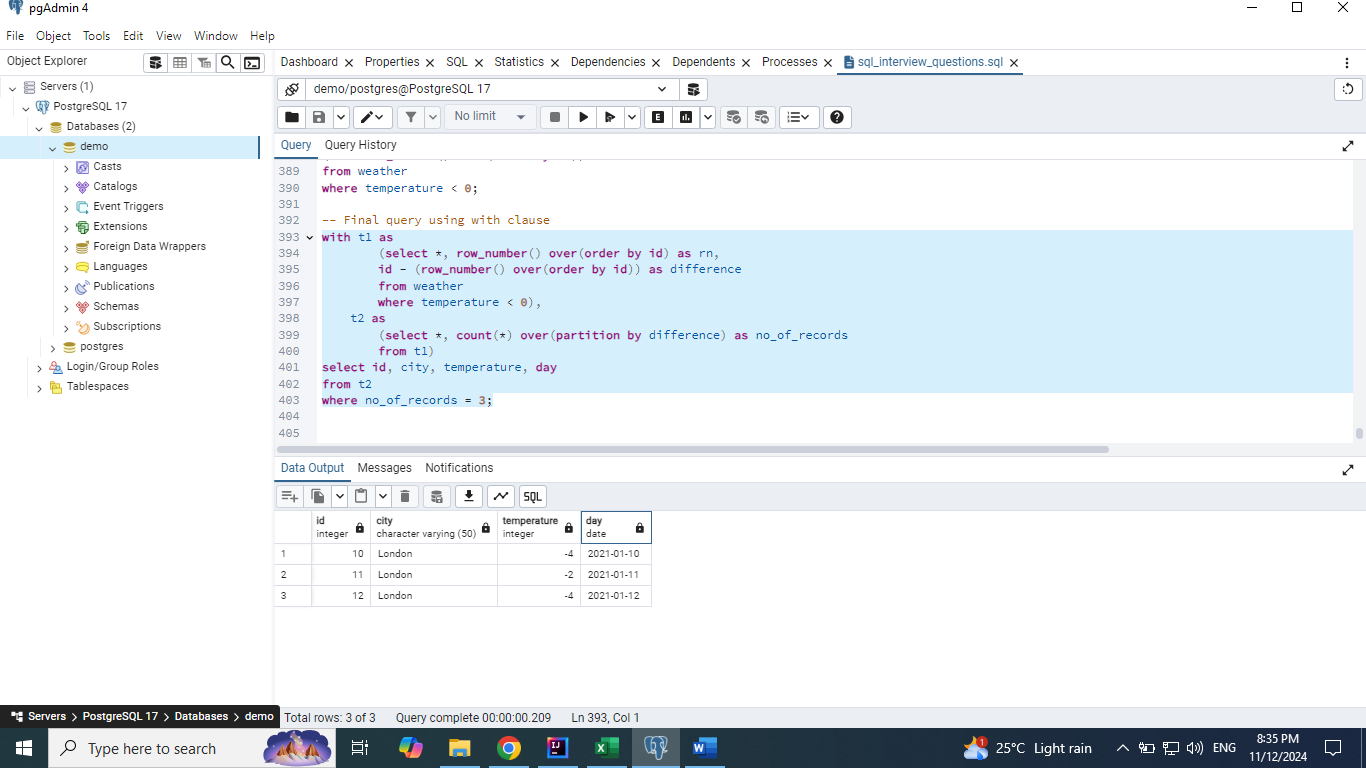
**(select \*, count(\*) over(partition by difference) as no\_of\_records**

**from t1)**

**select id, city, temperature, day**

**from t2**

**where no\_of\_records = 3;**



## Type 2: SQL Query to fetch "N" consecutive records when temperature is below 0 and also table doesn't have id column.

**with w as**

**(select \*, row\_number() over() as id**

**from vw\_weather),**

**t1 as**

**(select \*, row\_number() over(order by id) as rn,**

**id - (row\_number() over(order by id)) as difference**

**from w**

**where temperature < 0),**

**t2 as**

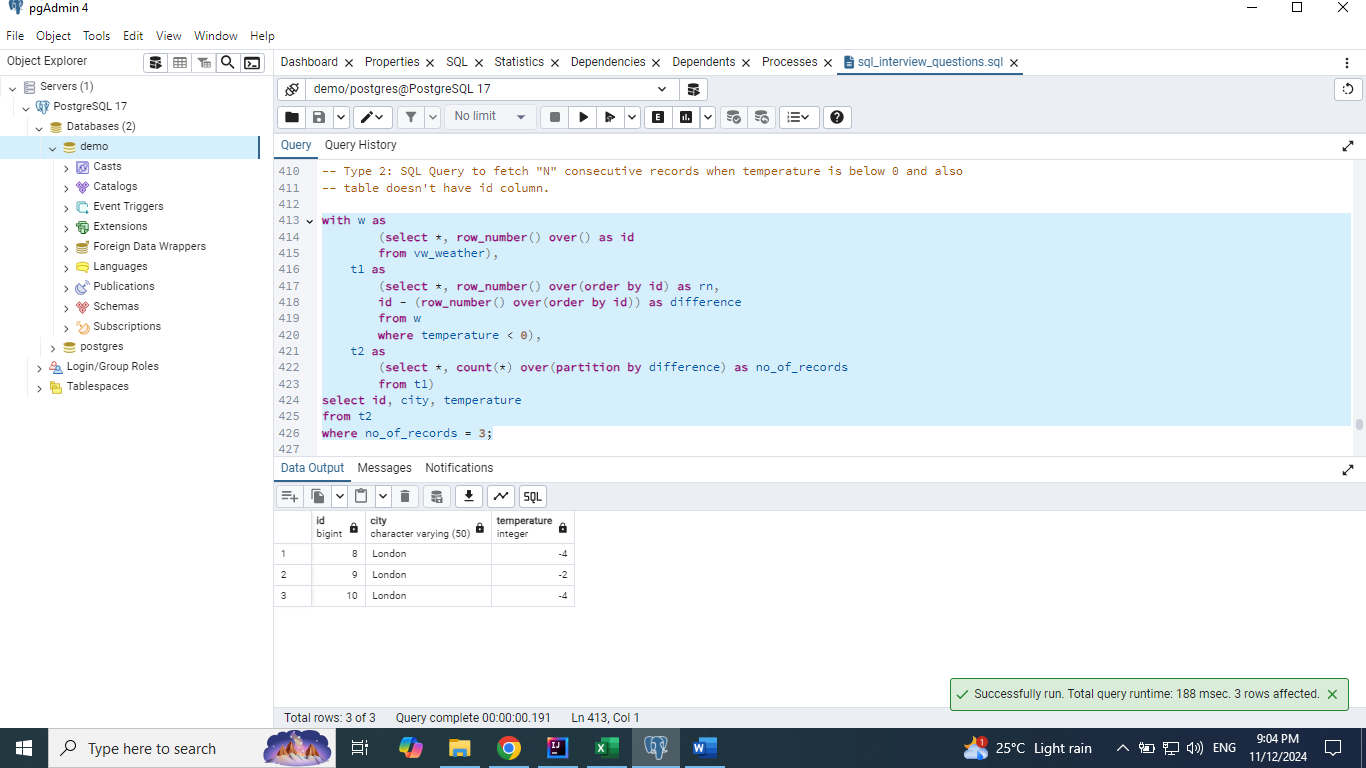
**(select \*, count(\*) over(partition by difference) as no\_of\_records**

**from t1)**

**select id, city, temperature**

**from t2**

**where no\_of\_records = 3;**



## Query Explanation:

The query identifies consecutive groups of records from the weather table where the temperature is less than 0 and extracts groups of exactly 3 records.

## Type 3: Fetch the records from table where there are orders for 3 consecutive days

**select \*, row\_number() over(order by order\_id) as rn**

**from orders;**

**with t1 as**

**(select \*, row\_number() over(order by order\_id) as rn ,**

**order\_date - cast (row\_number() over(order by order\_id)as int) as difference**

**from orders),**

**t2 as**

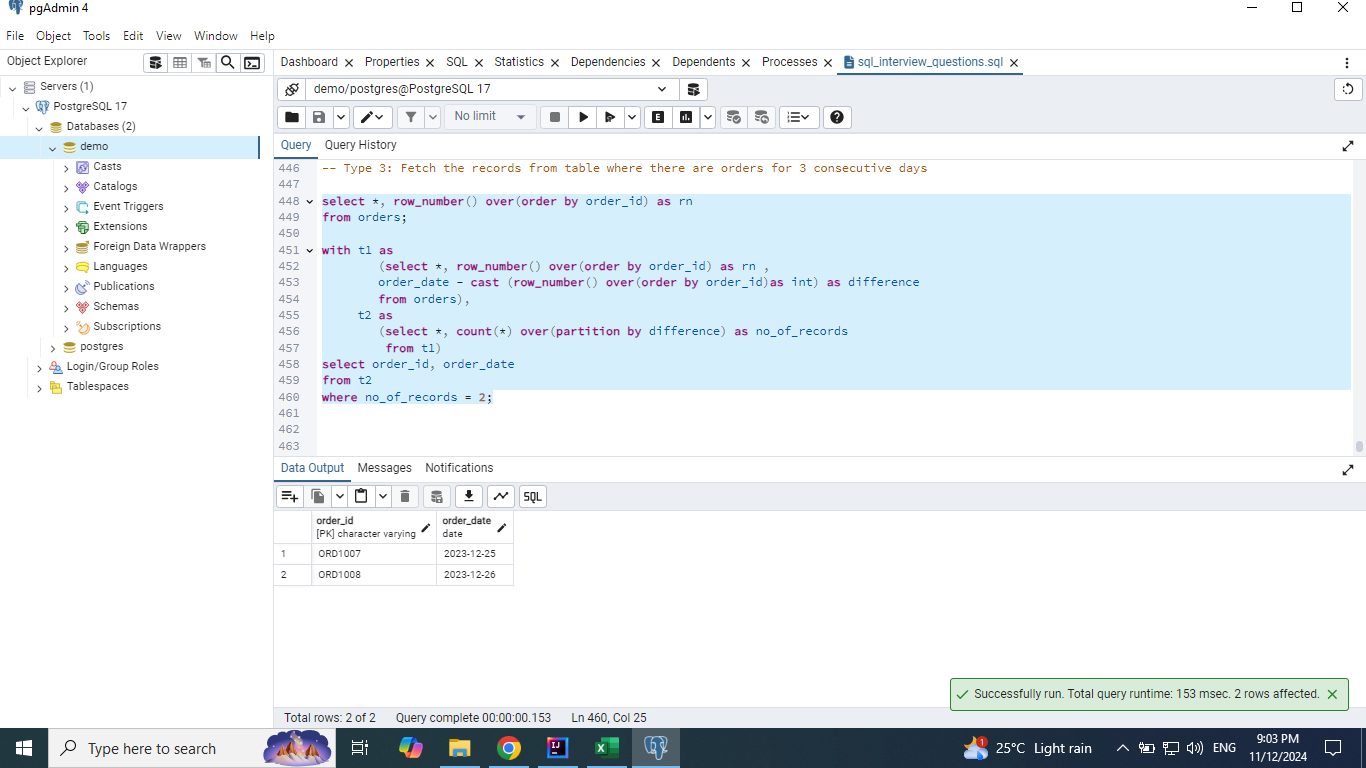
**(select \*, count(\*) over(partition by difference) as no\_of\_records**

**from t1)**

**select order\_id, order\_date**

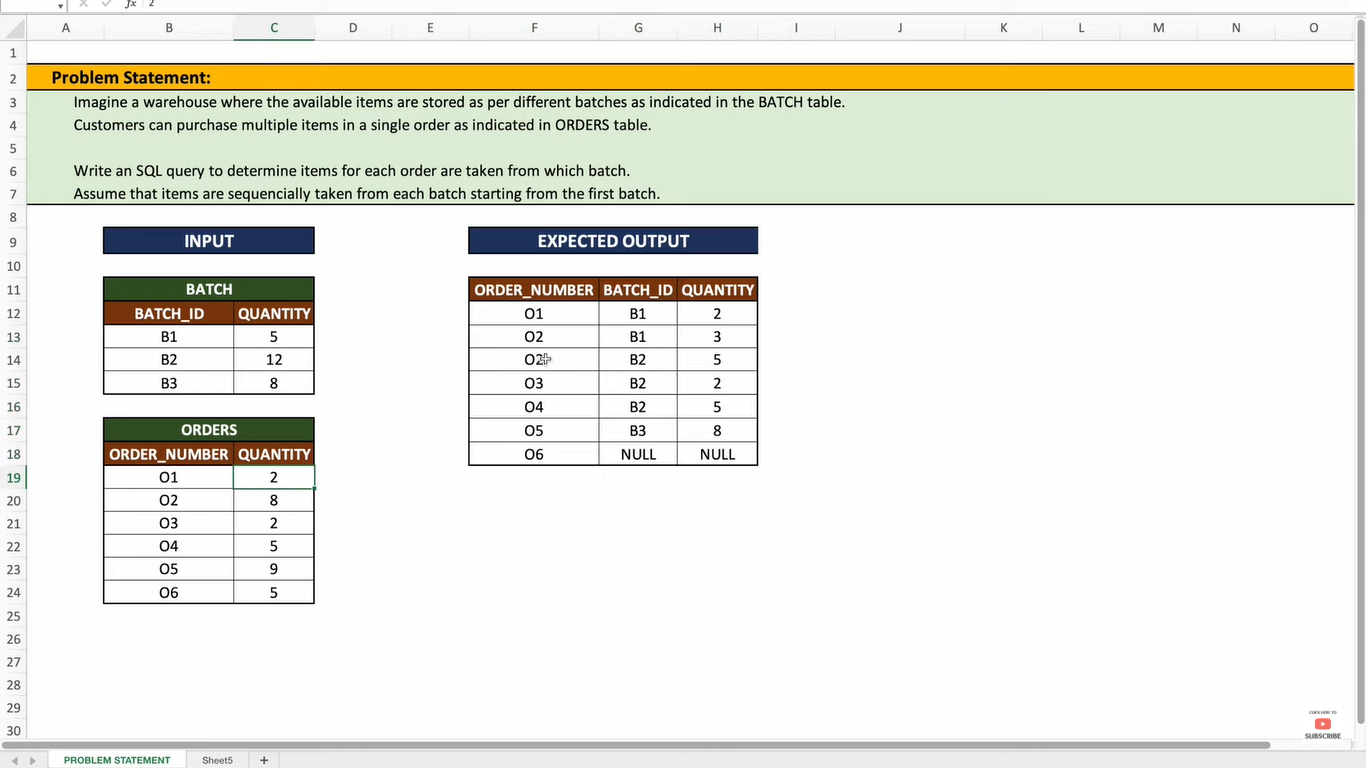
**from t2**

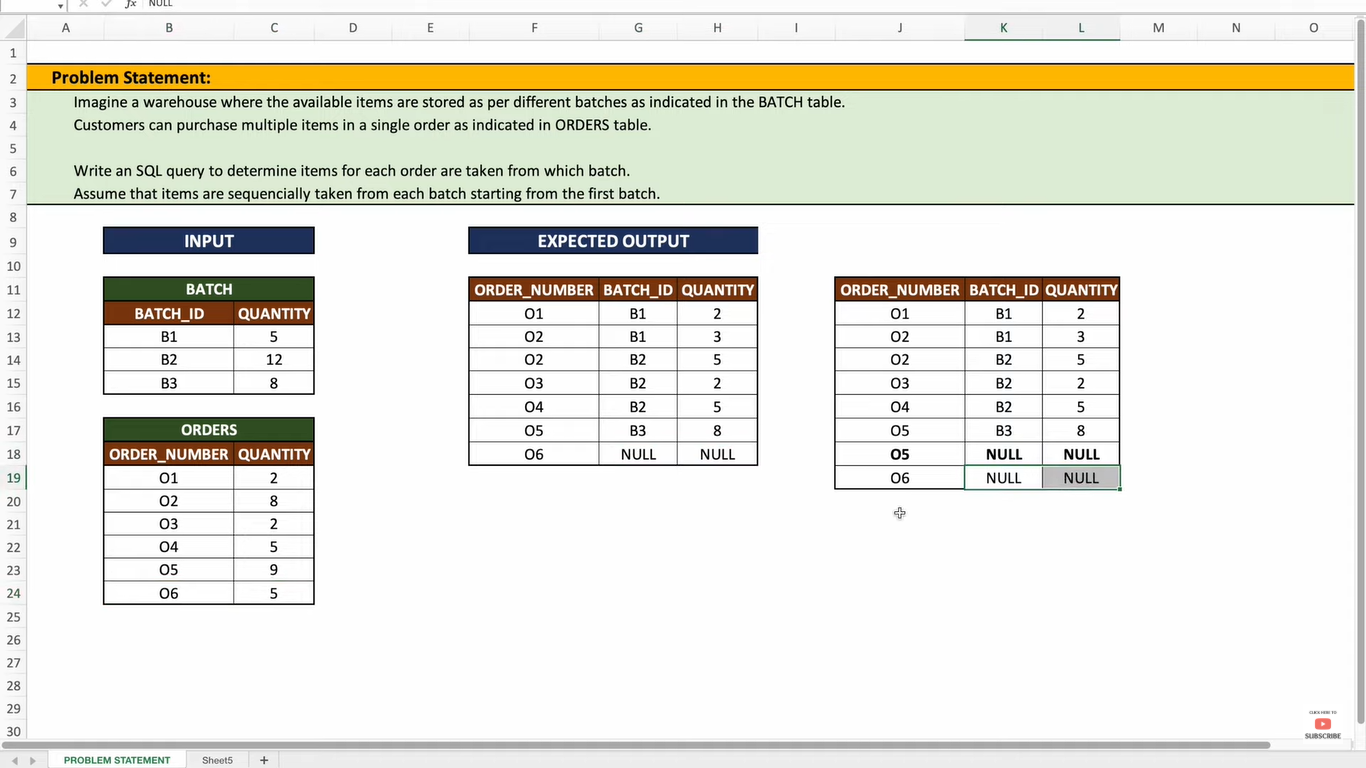
**where no\_of\_records = 2;**



# Problem 8:

# Imagine a Warehouse where items are stored in different batches as indicated in the Batch table. Customers can purchase multiple items in a single order as indicated in Orders table. Write an SQL query to determine items for each order are taken from which Batch. Assume that items are sequentially taken from each Batch starting from the first batch.





## Query Explanation:

This query aims to allocate items from **batches** to **orders**, ensuring that items are taken sequentially from batches starting with the first batch. Here’s a step-by-step explanation of how the query works

**Understanding the Data**

batch Table: Contains batch\_id and quantity (number of items available in each batch).

orders Table: Contains order\_number and quantity (number of items ordered in each order).

The goal is to match the required quantity for each order by sequentially drawing from the batches until the order is fulfilled.

## Query Breakdown:

**a. batch\_split Recursive CTE**

Purpose: Expands the batch table into rows where each row represents a single item from the batch.

**Logic:**

The first query selects the first item for each batch (quantity = 1).

The recursive part generates additional rows for each item in the batch until the total batch quantity is covered.

**Output: A row for every item in the batches.**

**b. batch\_cte**

Purpose: Adds a sequential numbering (row\_number) to the expanded rows of the batch\_split CTE.

Logic: Orders batches by batch\_id and assigns a unique row\_number to each item across all batches.

**c. orders\_split Recursive CTE**

Purpose: Similar to batch\_split, this expands the orders table into rows representing individual items ordered.

**Logic:**

The first query selects the first item for each order (quantity = 1).

The recursive part generates additional rows for each item in the order until the total order quantity is covered.

**Output: A row for every item in the orders.**

**d. order\_cte**

Purpose: Adds a sequential numbering (row\_number) to the expanded rows of the orders\_split CTE.

**Logic: Orders by order\_number and assigns a unique row\_number to each item across all orders.**

**e. Joining batch\_cte and order\_cte**

Purpose: Matches items in batch\_cte (items in batches) with items in order\_cte (items ordered) using the row\_number (rn).

**Logic:**

Join on rn to allocate items sequentially from batches to orders.

Use LEFT JOIN to ensure all orders are included, even if they cannot be fully fulfilled.

**f. Aggregating and Formatting the Result**

**Purpose: Aggregate the allocated items for each (order\_number, batch\_id) pair.**

**Logic:**

Group by order\_number and batch\_id.

Sum up the quantities for each group.

Order: Orders results by order\_number and batch\_id.

O1, O2, O3, O4: Fully fulfilled using available batches.

O5: Partially fulfilled using batch B3 but ran out of items for complete fulfillment.

O6: Could not be fulfilled due to lack of items in all batches.

**Expanding the table values**

with recursive batch\_split as

(select batch\_id, 1 as quantity from batch

union all

select b.batch\_id, (cte.quantity+1) as quantity

from batch\_split cte

join batch b

on b.batch\_id = cte.batch\_id

and b.quantity > cte.quantity)

select batch\_id, 1 as quantity

from batch\_split;

with recursive orders\_split as

(select order\_number, 1 as quantity from bat\_orders

union all

select b.order\_number, (cte.quantity+1) as quantity

from orders\_split cte

join bat\_orders b

on b.order\_number = cte.order\_number

and b.quantity > cte.quantity)

select order\_number, 1 as quantity

from orders\_split;

**Adding the row numbers**

select \*, row\_number() over(order by batch\_id) as rn

from

(with recursive batch\_split as

(select batch\_id, 1 as quantity from batch

union all

select b.batch\_id, (cte.quantity+1) as quantity

from batch\_split cte

join batch b

on b.batch\_id = cte.batch\_id

and b.quantity > cte.quantity)

select batch\_id, 1 as quantity

from batch\_split) x;

select \*, row\_number() over(order by order\_number) as rn

from

(with recursive orders\_split as

(select order\_number, 1 as quantity from bat\_orders

union all

select b.order\_number, (cte.quantity+1) as quantity

from orders\_split cte

join bat\_orders b

on b.order\_number = cte.order\_number

and b.quantity > cte.quantity)

select order\_number, 1 as quantity

from orders\_split) x;

**Final Query to join the tables**

**with batch\_cte as**

**(select \*, row\_number() over(order by batch\_id) as rn**

**from**

**(with recursive batch\_split as**

**(select batch\_id, 1 as quantity from batch**

**union all**

**select b.batch\_id, (cte.quantity+1) as quantity**

**from batch\_split cte**

**join batch b**

**on b.batch\_id = cte.batch\_id**

**and b.quantity > cte.quantity)**

**select batch\_id, 1 as quantity**

**from batch\_split) x),**

**order\_cte as**

**(select \*, row\_number() over(order by order\_number) as rn**

**from**

**(with recursive orders\_split as**

**(select order\_number, 1 as quantity from bat\_orders**

**union all**

**select b.order\_number, (cte.quantity+1) as quantity**

**from orders\_split cte**

**join bat\_orders b**

**on b.order\_number = cte.order\_number**

**and b.quantity > cte.quantity)**

**select order\_number, 1 as quantity**

**from orders\_split) x)**

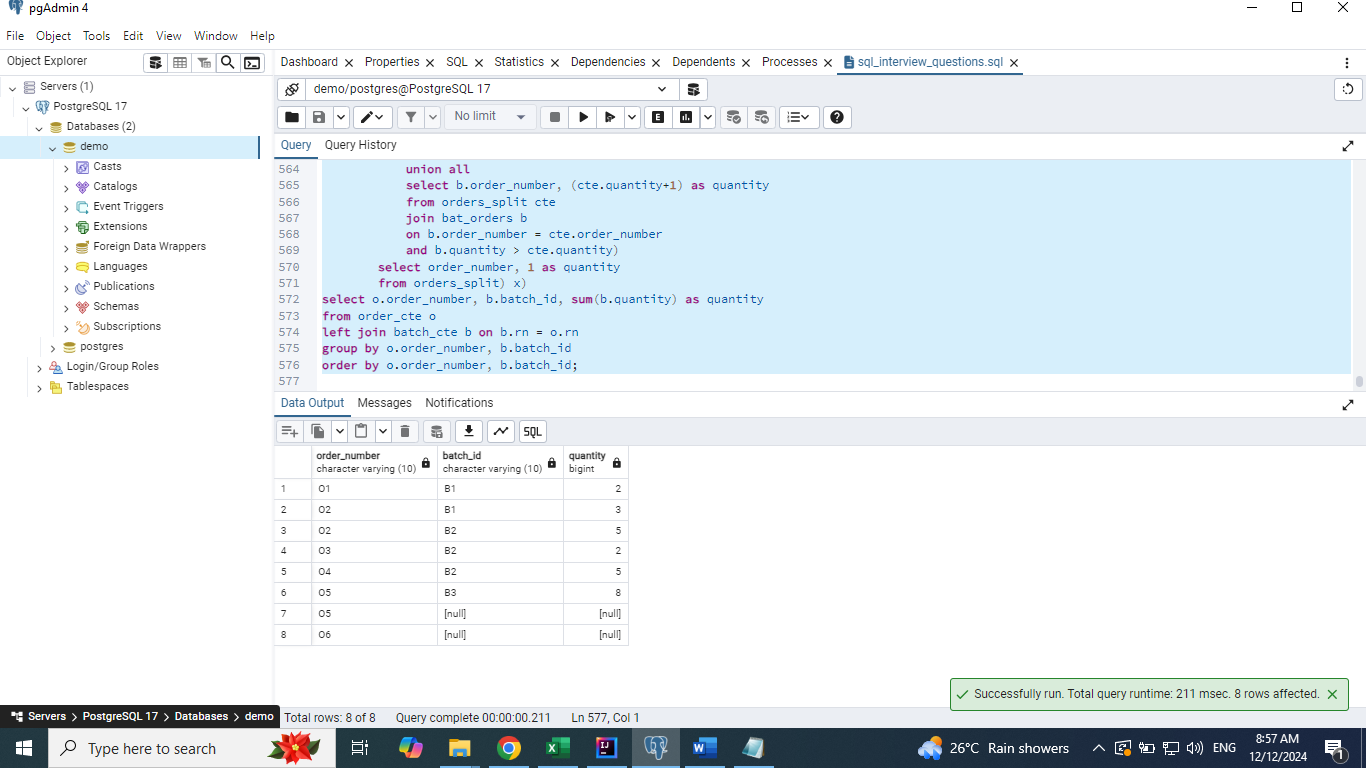
**select o.order\_number, b.batch\_id, sum(b.quantity) as quantity**

**from order\_cte o**

**left join batch\_cte b on b.rn = o.rn**

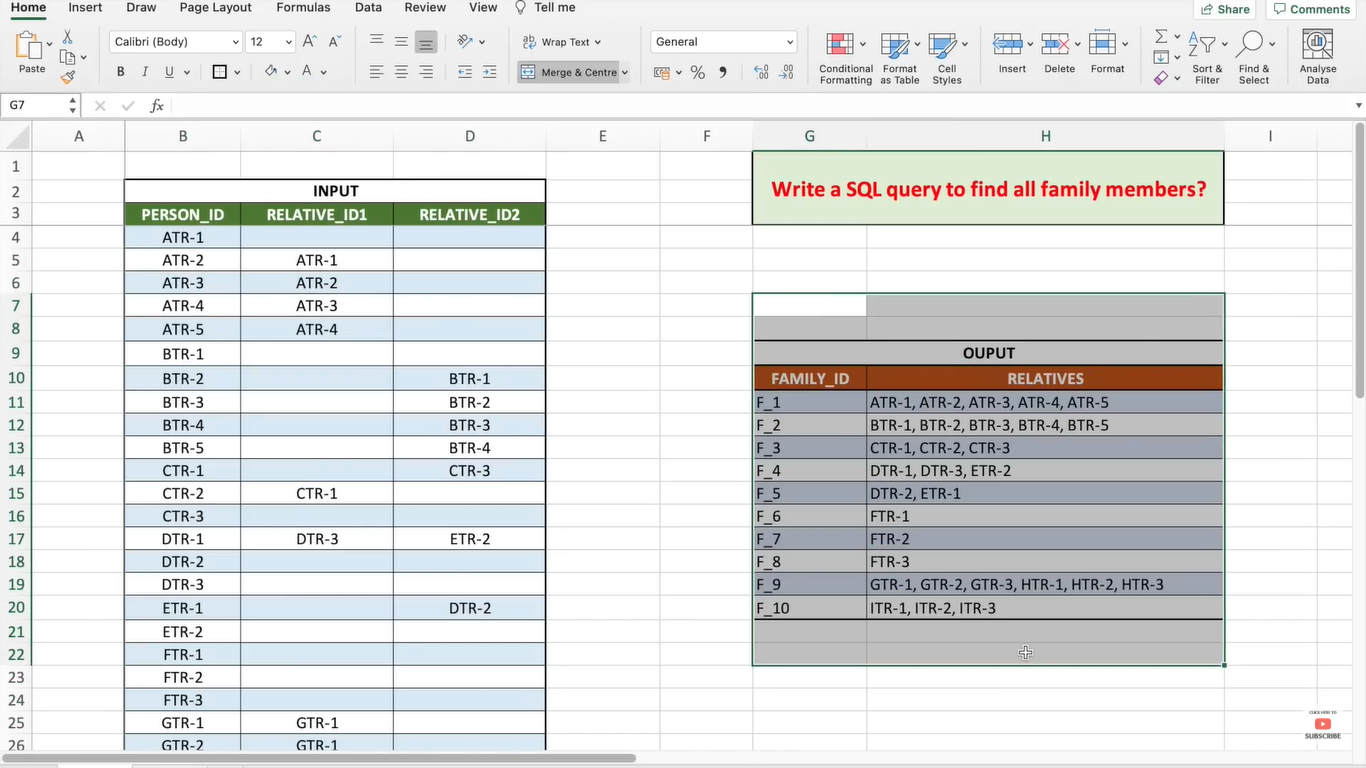
**group by o.order\_number, b.batch\_id**

**order by o.order\_number, b.batch\_id;**



# Problem 9:

# Write a SQL query to find the family members



## Query Explanation:

This SQL query uses a recursive common table expression (CTE) to group related family members based on their relationships.

## Query Breakdown:

**Step 1: Define the base relationships (base\_query)**

The base\_query CTE extracts the basic relationships from the family\_members table:

relative\_id1 and relative\_id2 are treated as relatives.

The fam\_grp column groups members by the first 3 characters of person\_id.

base\_query as

(select relative\_id1 as relatives, substring(person\_id, 1, 3) as fam\_grp from family\_members

where relative\_id1 is not null

union

select relative\_id2 as relatives, substring(person\_id, 1, 3) as fam\_grp from family\_members

where relative\_id2 is not null

order by 1)

**Step 2: Define the recursive relationships (related\_fam\_members)**

The related\_fam\_members CTE starts with base\_query and recursively joins to find transitive relationships:

Each iteration identifies new members connected via relative\_id1 or relative\_id2.

with recursive related\_fam\_members as

(select \* from base\_query

union

select fam.person\_id, r.fam\_grp

from related\_fam\_members r

join family\_members fam

on fam.relative\_id1 = r.relatives

or fam.relative\_id2 = r.relatives)

This ensures that all family members directly or indirectly related are grouped together.

**Step 3: Identify individuals with no relatives (no\_relatives)**

The no\_relatives CTE identifies person\_id values that:

Have no relative\_id1 or relative\_id2.

Are not part of the base\_query.

no\_relatives as

(select person\_id from

family\_members fam

where relative\_id1 is null and relative\_id2 is null

and person\_id not in (select relatives from base\_query))

**Step 4: Group relatives into families and assign IDs**

In the final query:

related\_fam\_members aggregates all related members into a single group using STRING\_AGG().

no\_relatives are included as individual families.

Each group is assigned a family\_id using ROW\_NUMBER().

select concat('F\_', row\_number() over(order by relatives)) as family\_id,

relatives from

(select distinct string\_agg(relatives, ', ' order by relatives) as relatives

from related\_fam\_members

group by fam\_grp

union

select \* from no\_relatives) x;

**Grouping all the relatives together**

select relative\_id1 as relatives from family\_members

where relative\_id1 is not null

union

select relative\_id2 as relatives from family\_members

where relative\_id2 is not null

order by 1;

**Adding relatives into the family**

select relative\_id1 as relatives, substring(person\_id, 1, 3) as fam\_grp from family\_members

where relative\_id1 is not null

union

select relative\_id2 as relatives, substring(person\_id, 1, 3) as fam\_grp from family\_members

where relative\_id2 is not null

order by 1;

**Final Query**

**with recursive related\_fam\_members as**

**(select \* from base\_query**

**union**

**select fam.person\_id, r.fam\_grp**

**from related\_fam\_members r**

**join family\_members fam**

**on fam.relative\_id1 = r.relatives**

**or fam.relative\_id2 = r.relatives),**

**base\_query as**

**(select relative\_id1 as relatives, substring(person\_id, 1, 3) as fam\_grp from family\_members**

**where relative\_id1 is not null**

**union**

**select relative\_id2 as relatives, substring(person\_id, 1, 3) as fam\_grp from family\_members**

**where relative\_id2 is not null**

**order by 1),**

**no\_relatives as**

**(select person\_id from**

**family\_members fam**

**where relative\_id1 is null and relative\_id2 is null**

**and person\_id not in (select relatives from base\_query))**

**select concat('F\_', row\_number() over(order by relatives)) as family\_id,**

**relatives from**

**(select distinct String\_agg(relatives, ', ' order by relatives) as relatives**

**from related\_fam\_members**

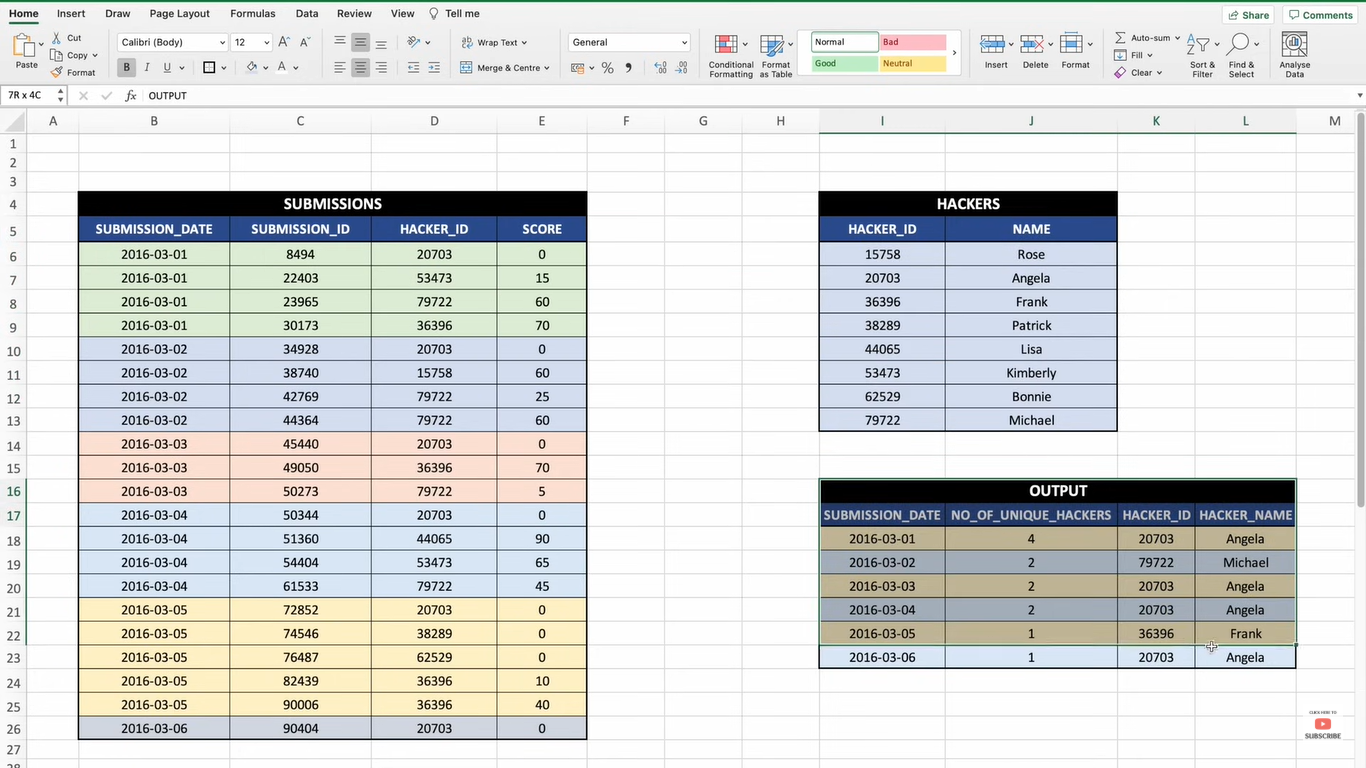
**group by fam\_grp**

**union**

**select \* from no\_relatives) x;**

# Problem 10:

# Julia conducted a 15 days of learning SQL contest. The start date of the contest was March 01, 2016 and the end date was March 15, 2016. Write a query to print total number of unique hackers who made at least 1 submission each day (starting on the first day of the contest), and find the hacker\_id and name of the hacker who made maximum number of submissions each day. If more than one such hacker has a maximum number of submissions, print the lowest hacker\_id. The query should print this information for each day of the contest, sorted by the date.



## Query Explanation:

The query provided is designed to solve a SQL challenge where we analyze data about a contest conducted over multiple days.

## Query Breakdown:

**Step 1: Recursive Common Table Expression (CTE)**

**cte**

Purpose: To determine all unique hackers who made submissions each day, starting from the first day of the contest.

**Logic:**

Initially selects the distinct submission\_date and hacker\_id for the first day (min(submission\_date)).

Recursively joins the cte with the submissions table to identify hackers who made submissions on subsequent days. It ensures that each recursive step considers hackers from the previous days and selects submissions made on the next day (submission\_date > cte.submission\_date).

**Step 2: Count Unique Hackers Per Day**

**unique\_hackers**

Purpose: To count the total number of unique hackers who made submissions on each day.

**Logic:**

Groups the data from cte by submission\_date.

Uses COUNT(1) to calculate the total number of unique hackers for each day.

**Step 3: Count Submissions Per Hacker Per Day**

**submission\_count**

Purpose: To count the number of submissions made by each hacker on each day.

**Logic:**

Groups data by submission\_date and hacker\_id.

Calculates the count of submissions using COUNT(1).

**Step 4: Find the Maximum Submissions Per Day**

**max\_submission**

Purpose: To determine the maximum number of submissions made by a hacker for each day.

**Logic:**

Groups the submission\_count data by submission\_date.

Uses MAX(no\_of\_submission) to find the highest number of submissions for each day.

**Step 5: Identify Hacker(s) with Maximum Submissions**

**final\_hackers**

Purpose: To identify the hacker with the maximum number of submissions for each day. If there is a tie, the hacker with the lowest hacker\_id is selected.

**Logic:**

Joins max\_submission and submission\_count on submission\_date and max\_submission to get the list of hackers who made the maximum number of submissions.

Uses MIN(hacker\_id) to resolve ties by selecting the hacker with the smallest ID.

**Step 6: Combine Results**

**Final SELECT**

Purpose: To consolidate and display the results for each day, including:

The date of the submissions (submission\_date).

The total number of unique hackers who submitted (no\_of\_hackers).

The hacker\_id and name of the hacker with the maximum submissions for that day.

**Logic:**

Joins unique\_hackers with final\_hackers and the hackers table (to get hacker names).

Orders the results by submission\_date.

**Base query**

select distinct submission\_date, hacker\_id

from submissions

where submission\_date = (select min(submission\_date) from submissions);

**Print total number of unique hackers who made at least submission each day (starting on the first day of the contest)**

with recursive cte as

(select distinct submission\_date, hacker\_id

from submissions

where submission\_date = (select min(submission\_date) from submissions)

union

select s.submission\_date, s.hacker\_id

from submissions s

join cte on cte.hacker\_id = s.hacker\_id

where s.submission\_date = (select min(submission\_date) from submissions

where submission\_date > cte.submission\_date)),

unique\_hackers as

(select submission\_date, count(1) as no\_of\_hackers

from cte

group by submission\_date);

**Find the hacker\_id and name of the hacker who made maximum number of submissions each day. If more than one such hacker has a maximum number of submissions, print the lowest hacker\_id.**

with submission\_count as

(select submission\_date, hacker\_id, count(1) as no\_of\_submission

from submissions

group by submission\_date, hacker\_id

order by 1),

max\_submission as

(select submission\_date, max(no\_of\_submission) as max\_submission

from submission\_count

group by submission\_date)

select c.submission\_date, min(c.hacker\_id) as hacker\_id

from max\_submission m

join submission\_count c

on c.submission\_date = m.submission\_date

and c.no\_of\_submission = m.max\_submission

group by c.submission\_date;

**Final query**

**with recursive cte as**

**(select distinct submission\_date, hacker\_id**

**from submissions**

**where submission\_date = (select min(submission\_date) from submissions)**

**union**

**select s.submission\_date, s.hacker\_id**

**from submissions s**

**join cte on cte.hacker\_id = s.hacker\_id**

**where s.submission\_date = (select min(submission\_date) from submissions**

**where submission\_date > cte.submission\_date)),**

**unique\_hackers as**

**(select submission\_date, count(1) as no\_of\_hackers**

**from cte**

**group by submission\_date),**

**submission\_count as**

**(select submission\_date, hacker\_id, count(1) as no\_of\_submission**

**from submissions**

**group by submission\_date, hacker\_id**

**order by 1),**

**max\_submission as**

**(select submission\_date, max(no\_of\_submission) as max\_submission**

**from submission\_count**

**group by submission\_date),**

**final\_hackers as**

**(select c.submission\_date, min(c.hacker\_id) as hacker\_id**

**from max\_submission m**

**join submission\_count c**

**on c.submission\_date = m.submission\_date**

**and c.no\_of\_submission = m.max\_submission**

**group by c.submission\_date)**

**select uh.submission\_date, uh.no\_of\_hackers, fh.hacker\_id, hk.name as hacker\_name**

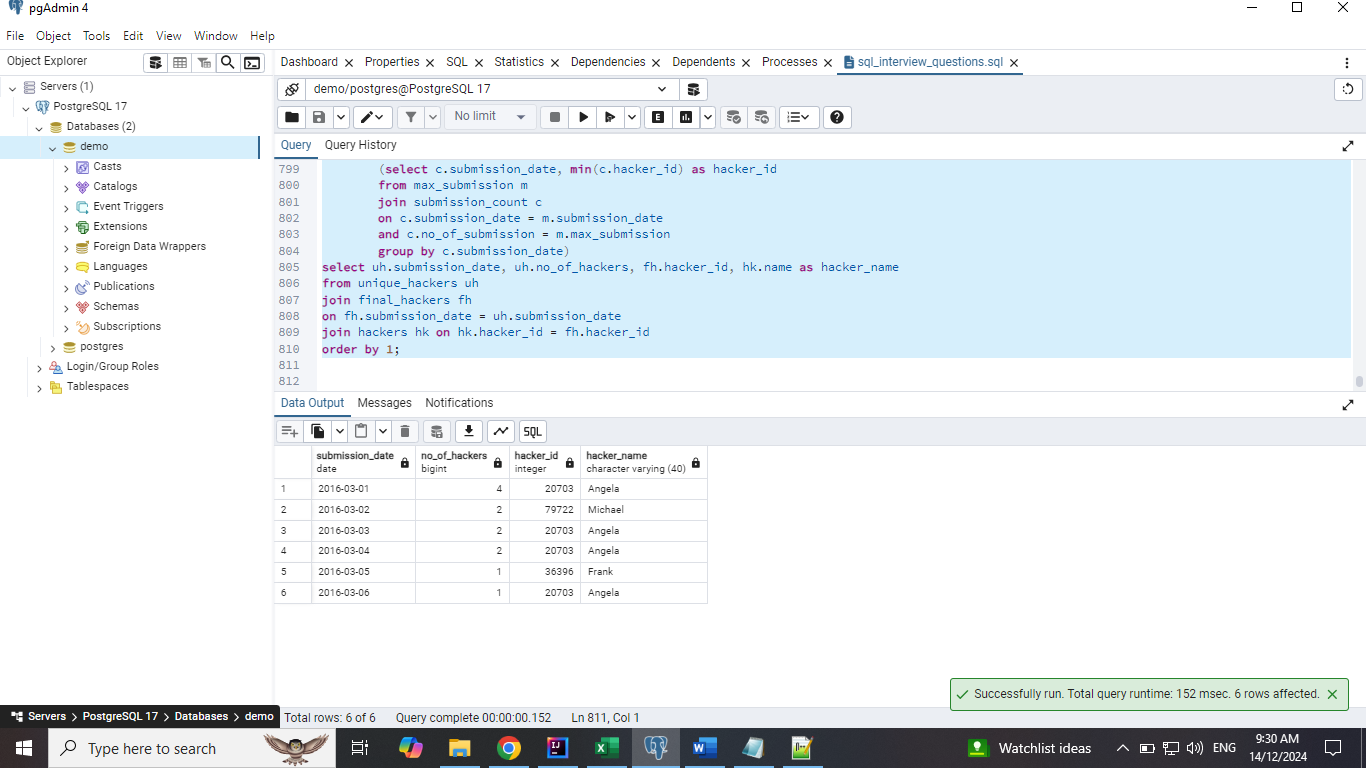
**from unique\_hackers uh**

**join final\_hackers fh**

**on fh.submission\_date = uh.submission\_date**

**join hackers hk on hk.hacker\_id = fh.hacker\_id**

**order by 1;**



# Problem 11:

# We want to generate an inventory age report which would show the distribution of remaining inventory across the length of time the inventory has been sitting at the warehouse. We are trying to classify the inventory on hand across the below 4 buckets to denote the time the inventory has been lying the warehouse.

0-90 days old

91-180 days old

181-270 days old

271 – 365 days old

For example, the warehouse received 100 units yesterday and shipped 30 units today, then there are 70 units which are a day old.

The warehouses use FIFO (first in first out) approach to manage inventory, i.e., the inventory that comes first will be sent out first.

Table

Description automatically generated

For example, on 20th May 2019, 250 units were inbounded into the FC. On 22nd May 2019, 8 units were shipped out (outbound) from the FC, reducing inventory on hand to 242 units. On 31st December, 120 units were further inbounded into the FC increasing the inventory on hand from 242 to 362.On 29th January 2020, 27 units were shipped out reducing the inventory on hand to 335 units.

On 29th January, of the 335 units on hands, 120 units were 0-90 days old (29 days old) and 215 units were 181-270 days old (254 days old).

**Columns:**

ID of the log entry

OnHandQuantity: Quantity in warehouse after an event

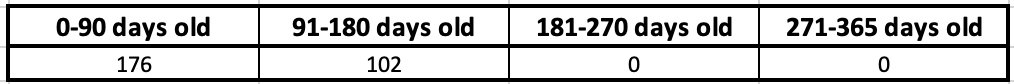
OnHandQuantityDelta: Change in on-hand quantity due to an event

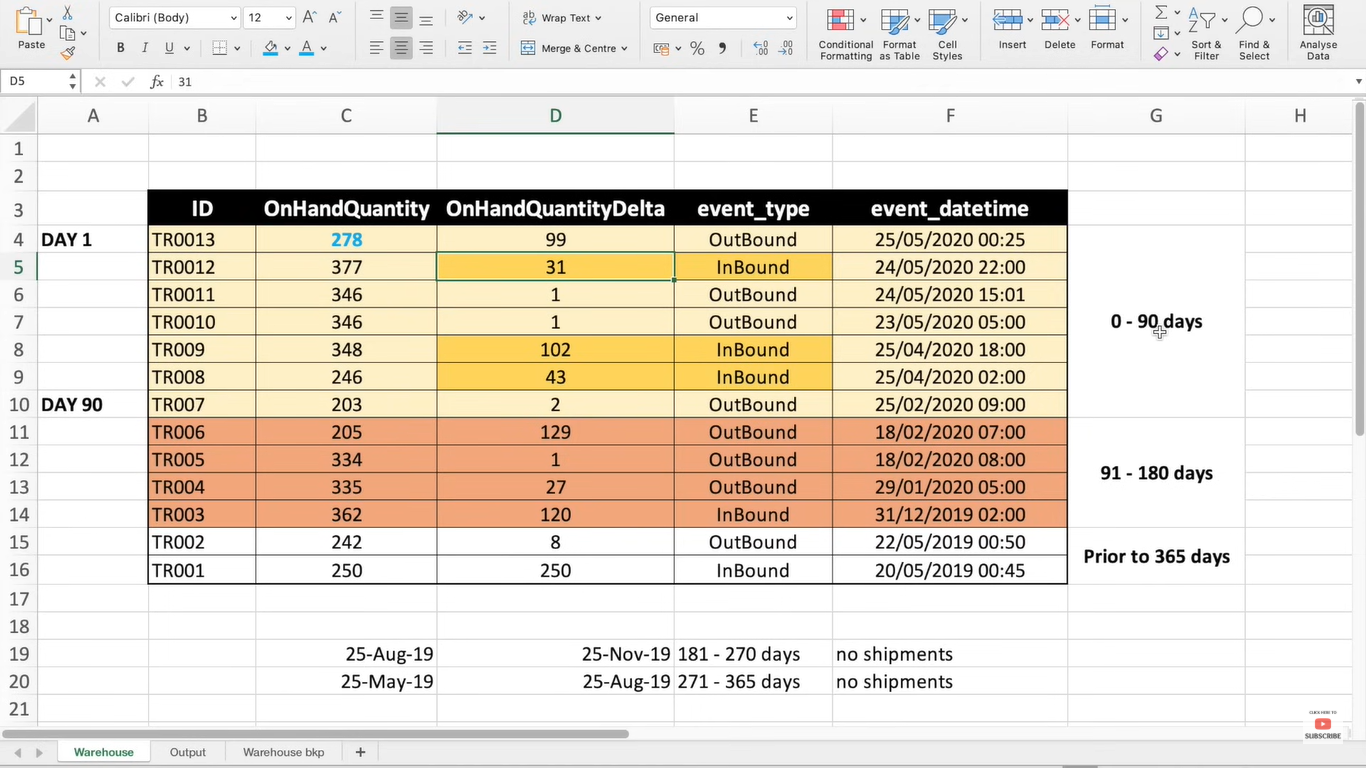
event\_type: Inbound – inventory being brought into the warehouse; Outbound – inventory being sent out of warehouse

event\_datetime: date- time of event

**The data is sorted with latest entry at top.**

**Sample output:**

­­



## Query Explanation:

The data records inbound and outbound inventory transactions in a warehouse, sorted in descending order by event\_datetime.

Inbound: Adds inventory to the warehouse.

Outbound: Reduces inventory from the warehouse.

The task involves distributing the total OnHandQuantity (inventory available at the latest date) into four time buckets based on the age of the inventory:

0-90 days old

91-180 days old

181-270 days old

271-365 days old

The query applies FIFO logic: the oldest inventory is used for outbound transactions first.

## Query Breakdown:

**Step 1: Sorting the Input Data**

with WH as

(select \* from warehouse order by event\_datetime desc)

This ensures the latest inventory transaction appears first. The alias WH represents the entire table sorted in descending order of event\_datetime.

**Step 2: Define Time Intervals**

days as

(select onhandquantity, event\_datetime,

(event\_datetime - interval '90 DAY') as day90,

(event\_datetime - interval '180 DAY') as day180,

(event\_datetime - interval '270 DAY') as day270,

(event\_datetime - interval '365 DAY') as day365

from WH limit 1)

Purpose: To calculate time boundaries for the four buckets relative to the latest event\_datetime in the data.

limit 1: Selects the most recent event to define the starting point for the calculations.

Results in four cutoff dates:

day90: Boundary for 0-90 days.

day180: Boundary for 91-180 days.

day270: Boundary for 181-270 days.

day365: Boundary for 271-365 days.

**Step 3: Calculate Inventory for 0-90 Days Old**

inv\_90\_days as

(select coalesce(sum(onhandquantitydelta), 0) as DaysOld\_90

from WH cross join days d

where event\_type = 'InBound'

and WH.event\_datetime >= d.day90),

inv\_90\_days\_final as

(select case when DaysOld\_90 > d.onhandquantity then d.onhandquantity

else DaysOld\_90

end DaysOld\_90

from inv\_90\_days

cross join days d)

Purpose: Identifies inventory added in the last 90 days.

Sum all onhandquantitydelta values for inbound events with event\_datetime ≥ day90.

Use coalesce to handle null values.

Boundary Check: If the total exceeds onhandquantity (the current total inventory), cap it at onhandquantity.

**Step 4: Calculate Inventory for 91-180 Days Old**

inv\_180\_days as

(select coalesce(sum(onhandquantitydelta), 0) as DaysOld\_180

from WH cross join days d

where event\_type = 'InBound'

and WH.event\_datetime between d.day180 and d.day90),

inv\_180\_days\_final as

(select case when DaysOld\_180 > (d.onhandquantity - DaysOld\_90)

then (d.onhandquantity - DaysOld\_90)

else DaysOld\_180

end DaysOld\_180

from inv\_180\_days

cross join days d

cross join inv\_90\_days\_final)

Purpose: Identifies inventory added between 91-180 days.

Sum onhandquantitydelta for inbound events within this date range.

Boundary Check: Ensure the inventory doesn't exceed the remaining inventory (onhandquantity - DaysOld\_90).

**Step 5: Calculate Inventory for 181-270 Days Old**

inv\_270\_days as

(select coalesce(sum(onhandquantitydelta), 0) as DaysOld\_270

from WH cross join days d

where event\_type = 'InBound'

and WH.event\_datetime between d.day270 and d.day180),

inv\_270\_days\_final as

(select case when DaysOld\_270 > (d.onhandquantity - (DaysOld\_90 + DaysOld\_180))

then (d.onhandquantity - (DaysOld\_90 + DaysOld\_180))

else DaysOld\_270

end DaysOld\_270

from inv\_270\_days

cross join days d

cross join inv\_90\_days\_final

cross join inv\_180\_days\_final)

Purpose: Identifies inventory added between 181-270 days.

Sum onhandquantitydelta for inbound events within this date range.

Boundary Check: Ensure inventory doesn't exceed the remaining inventory after accounting for the 0-90 and 91-180 day buckets.

**Step 6: Calculate Inventory for 271-365 Days Old**

inv\_365\_days as

(select coalesce(sum(onhandquantitydelta), 0) as DaysOld\_365

from WH cross join days d

where event\_type = 'InBound'

and WH.event\_datetime between d.day365 and d.day270),

inv\_365\_days\_final as

(select case when DaysOld\_365 > (d.onhandquantity - (DaysOld\_90 + DaysOld\_180 + DaysOld\_270))

then (d.onhandquantity - (DaysOld\_90 + DaysOld\_180 + DaysOld\_270))

else DaysOld\_365

end DaysOld\_365

from inv\_365\_days

cross join days d

cross join inv\_90\_days\_final

cross join inv\_180\_days\_final

cross join inv\_270\_days\_final)

Purpose: Identifies inventory added between 271-365 days.

Sum onhandquantitydelta for inbound events within this date range.

Boundary Check: Ensure inventory doesn't exceed the remaining inventory after accounting for the previous three buckets.

**Step 7: Final Output**

select DaysOld\_90 as "0-90 days old",

DaysOld\_180 as "91-180 days old",

DaysOld\_270 as "181-270 days old",

DaysOld\_365 as "270-365 days old"

from inv\_90\_days\_final

cross join inv\_180\_days\_final

cross join inv\_270\_days\_final

cross join inv\_365\_days\_final;

Combines the results from all four buckets into a single output table.

Each column corresponds to one bucket's inventory distribution.

**Get the Day 1 data**

with WH as

(select \* from warehouse order by event\_datetime desc),

days as

(select \*

from WH limit 1)

select \* from days;

**Get the 90 Days / 180 Days / 270 Days / 365 Days date**

with WH as

(select \* from warehouse order by event\_datetime desc),

days as

(select onhandquantity, event\_datetime,

(event\_datetime - interval '90 DAY') as day90,

(event\_datetime - interval '180 DAY') as day180,

(event\_datetime - interval '270 DAY') as day270,

(event\_datetime - interval '365 DAY') as day365

from WH limit 1)

select \* from days;

**Final Query**

**with WH as**

**(select \* from warehouse order by event\_datetime desc),**

**days as**

**(select onhandquantity, event\_datetime,**

**(event\_datetime - interval '90 DAY') as day90,**

**(event\_datetime - interval '180 DAY') as day180,**

**(event\_datetime - interval '270 DAY') as day270,**

**(event\_datetime - interval '365 DAY') as day365**

**from WH limit 1),**

**inv\_90\_days as**

**(select coalesce(sum(onhandquantitydelta), 0) as DaysOld\_90**

**from WH cross join days d**

**where event\_type = 'InBound'**

**and WH.event\_datetime >= d.day90),**

**inv\_90\_days\_final as**

**(select case when DaysOld\_90 > d.onhandquantity then d.onhandquantity**

**else DaysOld\_90**

**end DaysOld\_90**

**from inv\_90\_days**

**cross join days d),**

**inv\_180\_days as**

**(select coalesce(sum(onhandquantitydelta), 0) as DaysOld\_180**

**from WH cross join days d**

**where event\_type = 'InBound'**

**and WH.event\_datetime between d.day180 and d.day90),**

**inv\_180\_days\_final as**

**(select case when DaysOld\_180 > (d.onhandquantity - DaysOld\_90) then (d.onhandquantity - DaysOld\_90)**

**else DaysOld\_180**

**end DaysOld\_180**

**from inv\_180\_days**

**cross join days d**

**cross join inv\_90\_days\_final),**

**inv\_270\_days as**

**(select coalesce(sum(onhandquantitydelta), 0) as DaysOld\_270**

**from WH cross join days d**

**where event\_type = 'InBound'**

**and WH.event\_datetime between d.day270 and d.day180),**

**inv\_270\_days\_final as**

**(select case when DaysOld\_270 > (d.onhandquantity - (DaysOld\_90 + DaysOld\_180)) then (d.onhandquantity - (DaysOld\_90 + DaysOld\_180))**

**else DaysOld\_270**

**end DaysOld\_270**

**from inv\_270\_days**

**cross join days d**

**cross join inv\_90\_days\_final**

**cross join inv\_180\_days\_final),**

**inv\_365\_days as**

**(select coalesce(sum(onhandquantitydelta), 0) as DaysOld\_365**

**from WH cross join days d**

**where event\_type = 'InBound'**

**and WH.event\_datetime between d.day365 and d.day270),**

**inv\_365\_days\_final as**

**(select case when DaysOld\_365 > (d.onhandquantity - (DaysOld\_90 + DaysOld\_180 + DaysOld\_270)) then (d.onhandquantity - (DaysOld\_90 + DaysOld\_180 + DaysOld\_270))**

**else DaysOld\_365**

**end DaysOld\_365**

**from inv\_365\_days**

**cross join days d**

**cross join inv\_90\_days\_final**

**cross join inv\_180\_days\_final**

**cross join inv\_270\_days\_final)**

**select DaysOld\_90 as "0-90 days old" ,**

**DaysOld\_180 as "91-180 days old",**

**DaysOld\_270 as "181-270 days old",**

**DaysOld\_365 as "270-365 days old"**

**from inv\_90\_days\_final**

**cross join inv\_180\_days\_final**

**cross join inv\_270\_days\_final**

**cross join inv\_365\_days\_final;**

