



Window functions in SQL

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Window functions applies aggregate and ranking functions over a particular window (set of rows). OVER clause is used with window functions to define that window. OVER clause does two things :

- Partitions rows into form set of rows. (PARTITION BY clause is used)
- Orders rows within those partitions into a particular order. (ORDER BY clause is used)

Note: If partitions aren't done, then ORDER BY orders all rows of table.

Syntax:

```
SELECT coulmn_name1,  
    window_function(cloumn_name2)  
    OVER([PARTITION BY column_name1] [ORDER BY column_name3]) AS  
    new_column  
FROM table_name;
```

window_function= any aggregate or ranking function

column_name1= column to be selected

coulmn_name2= column on which window function is to be applied

column_name3= column on whose basis partition of rows is to be done

new_column= Name of new column

table_name= Name of table

Aggregate Window Function :

Various aggregate functions such as SUM(), COUNT(), AVERAGE(), MAX(), MIN() applied over a particular window (set of rows) are called aggregate window functions.

Consider the following **employee** table :



| Name | Age | Department | Salary |
|---------|-----|------------|---------|
| Ramesh | 20 | Finance | 50, 000 |
| Deep | 25 | Sales | 30, 000 |
| Suresh | 22 | Finance | 50000 |
| Ram | 28 | Finance | 20, 000 |
| Pradeep | 22 | Sales | 20, 000 |

Example –

Find average salary of employees for each department and order employees within a department by age.

```
SELECT Name, Age, Department, Salary,
       AVERAGE(Salary) OVER( PARTITION BY Department) AS Avg_Salary
FROM employee
```

This outputs the following:

| Name | Age | Department | Salary | Avg_Salary |
|---------|-----|------------|--------|------------|
| Ramesh | 20 | Finance | 50,000 | 40,000 |
| Suresh | 22 | Finance | 50000 | 40,000 |
| Ram | 28 | Finance | 20,000 | 40,000 |
| Pradeep | 22 | Sales | 20,000 | 25,000 |
| Deep | 25 | Sales | 30,000 | 25,000 |

Notice how all the average salaries in a particular window have the same value.

Let's consider another case:

```
SELECT Name, Age, Department, Salary,  
       AVERAGE(Salary) OVER( PARTITION BY Department ORDER BY Age) AS  
       Avg_Salary  
FROM employee
```

Here we also order the records within the partition as per age values and hence the average values change as per the sorted order.

The output of above query will be :

| Name | Age | Department | Salary | Avg_Salary |
|---------|-----|------------|--------|------------|
| Ramesh | 20 | Finance | 50,000 | 50,000 |
| Suresh | 22 | Finance | 50000 | 50,000 |
| Ram | 28 | Finance | 20,000 | 40,000 |
| Pradeep | 22 | Sales | 20,000 | 20,000 |
| Deep | 25 | Sales | 30,000 | 25,000 |

Hence, we should be careful while adding order by clauses to window functions with aggregates.

Ranking Window Functions :

Ranking functions are, RANK(), DENSE_RANK(), ROW_NUMBER()

- **RANK()** –

As the name suggests, the rank function assigns rank to all the rows within every partition. Rank is assigned such that rank 1 is given to the first row and rows having same value are assigned same rank. For the next rank after two same rank values, one rank value will be skipped.

- **DENSE_RANK()** –

It assigns rank to each row within partition. Just like rank function first row is assigned rank 1 and rows having same value have same rank. The difference between RANK() and DENSE_RANK() is that in

DENSE_RANK(), for the next rank after two same rank, consecutive integer is used, no rank is skipped.

- **ROW_NUMBER()** –

It assigns consecutive integers to all the rows within partition. Within a partition, no two rows can have same row number.

Note –

ORDER BY() should be specified compulsorily while using rank window functions.

Example –

Calculate row no., rank, dense rank of employees in employee table according to salary within each department.

```
SELECT
ROW_NUMBER() OVER (PARTITION BY Department ORDER BY Salary DESC)
AS emp_row_no, Name, Department, Salary,
RANK() OVER(PARTITION BY Department
ORDER BY Salary DESC) AS emp_rank,
DENSE_RANK() OVER(PARTITION BY Department
ORDER BY Salary DESC)
AS emp_dense_rank,
FROM employee
```

The output of above query will be :

| emp_row_no | Name | Department | Salary | emp_rank | emp_dense_rank |
|------------|--------|------------|--------|----------|----------------|
| 1 | Suresh | Finance | 50,000 | 1 | 1 |
| 2 | Ramesh | Finance | 50,000 | 1 | 1 |
| 3 | Ram | Finance | 20,000 | 3 | 2 |

| | | | | | |
|---|---------|-------|--------|---|---|
| 1 | Deep | Sales | 30,000 | 1 | 1 |
| 2 | Pradeep | Sales | 20,000 | 2 | 2 |

So, we can see that as mentioned in the definition of ROW_NUMBER() the row numbers are consecutive integers within each partition. Also, we can see difference between rank and dense rank that in dense rank there is no gap between rank values while there is gap in rank values after repeated rank.

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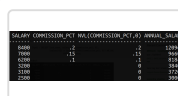
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