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In SQL Server we have different categories of **window functions**

**Aggregate functions -** AVG, SUM, COUNT, MIN, MAX etc..

**Ranking functions -** RANK, DENSE\_RANK, ROW\_NUMBER etc..

**Analytic functions -** LEAD, LAG, FIRST\_VALUE, LAST\_VALUE etc...

**OVER** Clause defines the partitioning and ordering of a rows (i.e a window) for the above functions to operate on. Hence these functions are called window functions. The OVER clause accepts the following three arguments to define a window for these functions to operate on.

**ORDER BY :** Defines the logical order of the rows

**PARTITION BY :** Divides the query result set into partitions. The window function is applied to each partition separately.

**ROWSor RANGE clause :** Further limits the rows within the partition by specifying start and end points within the partition.

The default for **ROWS**or **RANGE**clause is

RANGE BETWEEN UNBOUNDED PRECEDING AND CURRENT ROW

**Rank and Dense\_Rank functions**

Introduced in SQL Server 2005

Returns a rank starting at 1 based on the ordering of rows imposed by the ORDER BY clause

ORDER BY clause is required

PARTITION BY clause is optional

When the data is partitioned, rank is reset to 1 when the partition changes

Difference between Rank and Dense\_Rank functions  
Rank function skips ranking(s) if there is a tie where as Dense\_Rank will not

**Use case for RANK and DENSE\_RANK functions :** Both these functions can be used to find Nth highest salary. However, which function to use depends on what you want to do when there is a tie. Let me explain with an example.  
  
**If there are 2 employees with the FIRST highest salary, there are 2 different business cases**

If your business case is, not to produce any result for the SECOND highest salary, then use RANK function

If your business case is to return the next Salary after the tied rows as the SECOND highest Salary, then use DENSE\_RANK function

Since we have 2 Employees with the FIRST highest salary.

Rank() function will not return any rows for the SECOND highest Salary..

**Similarities between RANK, DENSE\_RANK and ROW\_NUMBER functions**

Returns an increasing integer value starting at 1 based on the ordering of rows imposed by the ORDER BY clause (if there are no ties)

ORDER BY clause is required

PARTITION BY clause is optional

When the data is partitioned, the integer value is reset to 1 when the partition changes

So all the 3 functions RANK, DENSE\_RANK and ROW\_NUMBER produce the same increasing integer value when ordered by Salary column.

You will only see the difference when there ties (duplicate values in the column used in the ORDER BY clause).

**Difference between RANK, DENSE\_RANK and ROW\_NUMBER functions**

**ROW NUMBER** : Returns an increasing unique number for each row starting at 1, even if there are duplicates.

**RANK** : Returns an increasing unique number for each row starting at 1. When there are duplicates, same rank is assigned to all the duplicate rows, but the next row after the duplicate rows will have the rank it would have been assigned if there had been no duplicates. So RANK function skips rankings if there are duplicates.

**DENSE\_RANK** : Returns an increasing unique number for each row starting at 1. When there are duplicates, same rank is assigned to all the duplicate rows but the DENSE\_RANK function will not skip any ranks. This means the next row after the duplicate rows will have the next rank in the sequence.

**FIRST\_VALUE function**

* Introduced in SQL Server 2012
* Retrieves the first value from the specified column
* ORDER BY clause is required
* PARTITION BY clause is optional

Syntax : FIRST\_VALUE(Column\_Name) OVER (ORDER BY Col1, Col2, ...)

FIRST\_VALUE function example WITHOUT partitions :

In the following example, FIRST\_VALUE function returns the name of the lowest paid employee from the entire table.

**FIRST\_VALUE function example WITH partitions** : In the following example, FIRST\_VALUE function returns the name of the lowest paid employee from the respective partition.

**LAST\_VALUE function not working as expected** : In the following example, LAST\_VALUE function does not return the name of the highest paid employee. This is because we have not specified an explicit value for ROWS or RANGE clause. As a result it is using it's default value RANGE BETWEEN UNBOUNDED PRECEDING AND CURRENT ROW

**LAST\_VALUE function working as expected :**In the following example, LAST\_VALUE function returns the name of the highest paid employee as expected. Notice we have set an explicit value for ROWS or RANGE clause to ROWS BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING.