UNIT 3- Interactive SQL And Advance SQL :-SQL Performance Tuning

Oracle Built in Functions

There are two types of functions in Oracle.

1) **Single Row Functions:** Single row or Scalar functions return a value for every row that is processed in a query.

2) **Group Functions:** These functions group the rows of data based on the values returned by the query. This is discussed in SQL GROUP Functions. The group functions are used to calculate aggregate values like total or average, which return just one total or one average value after processing a group of rows.

There are four types of single row functions. They are:

1) **Numeric Functions:** These are functions that accept numeric input and return numeric values.

2) **Character or Text Functions:** These are functions that accept character input and can return both character and number values.

3) **Date Functions:** These are functions that take values that are of datatype DATE as input and return values of datatype DATE, except for the MONTHS_BETWEEN function, which returns a number.

4) **Conversion Functions:** These are functions that help us to convert a value in one form to another form. For Example: a null value into an actual value, or a value from one datatype to another datatype like NVL, TO_CHAR, TO_NUMBER, TO_DATE etc.

You can combine more than one function together in an expression. This is known as nesting of functions.

String Functions:

Character or text functions are used to manipulate text strings. They accept strings or characters as input and can return both character and number values as output.

Few of the character or text functions are as given below:

Function Name	**Return Value**
LOWER (string_value)	All the letters in *'string_value'* is converted to lowercase.
UPPER (string_value)	All the letters in *'string_value'* is converted to uppercase.
INITCAP (string_value)	All the letters in *'string_value'* is converted to mixed case.
LTRIM (string_value, trim_text)	All occurrences of *'trim_text'* is removed from the left of *'string_value'*.
RTRIM (string_value, trim_text)	All occurrences of *'trim_text'* is removed from the right of *'string_value'* .
TRIM (trim_text FROM string_value)	All occurrences of *'trim_text'* from the left and right of *'string_value'* , *'trim_text'* can also be only one character long
SUBSTR (string_value, m, n)	Returns *'n'* number of characters from *'string_value'* starting from the '*m'* position.
LENGTH (string_value)	Number of characters in *'string_value'* in returned.
LPAD (string_value, n, pad_value)	Returns '*string_value'* left-padded with *'pad_value'* . The length of the whole string will be of *'n'* characters.
RPAD (string_value, n, pad_value)	Returns '*string_value'* right-padded with *'pad_value'* . The length of the whole string will be of *'n'* characters.

Table Name :- Person

LastName	**FirstName**	**Address**	**City**
Sharma	Oli	GM Road 10	Pune
Mante	Edison	Camp 23	Pune
Johnson	Kari	RTO Road 20	Banglore

1) InitCap: It Display the initial letter as Capital.

   SYNTAX:-Initcap(String)

   Ex:- SELECT initcap(City) from Person;

City
Pune
Pune
Banglore

Table Name :- Person

LastName	FirstName	Address	City
Sharma	Oli	GM Road 10	Pune
Mante	Edison	Camp 23	Pune
Johnson	Kari	RTO Road 20	Banglore

2) Lower and upper: It Display the string into either lower or uppercase.

SYNTAX:-lower(String)
upper(String)

Ex:- SELECT lower(City) from Person;
SELECT upper(City) from Person;

City

Table Name :- Person

LastName	**FirstName**	**Address**	**City**
Sharma	Oli	GM Road 10	Pune
Mante	Edison	Camp 23	Pune
Johnson	Kari	RTO Road 20	Banglore

3) Ltrim And Rtim: It trims or cuts the character from left or right.

SYNTAX:-ltrim(String,trim text)
rtrim(String,trim text)

Ex:- SELECT ltrim('Pune', 'P') from Person;
SELECT rtrim('Pune', 'e') from Person;

City

Table Name :- Person

LastName	**FirstName**	**Address**	**City**
Sharma	Oli	GM Road 10	Pune
Mante	Edison	Camp 23	Pune
Johnson	Kari	RTO Road 20	Banglore

4) TRIM (trim_text FROM string_value)

SYNTAX:-trim(String,trim text)

Ex:- SELECT trim(‘o’) from Person;

City

Table Name :- Person

LastName	FirstName	Address	City
Sharma	Oli	GM Road 10	Pune
Mante	Edison	Camp 23	Pune
Johnson	Kari	RTO Road 20	Banglore

5) Substr:-It returns the substring from the specified position

SYNTAX:-Substr(Main String, Position, Characters to be replaced)

Ex:- SELECT substr(City,1,3) from Person;

City
Pun
Pun
Ban

Table Name :- Person

LastName	**FirstName**	**Address**	**City**
Sharma	Oli	GM Road 10	Pune
Mante	Edison	Camp 23	Pune
Johnson	Kari	RTO Road 20	Banglore

6) Lpad and Rpad:-It is used for formatting from left and right side by using any character

SYNTAX:-
lpad(Main string, length , character to be padded)
rpad(Main string, length , character to be padded)
Length is including the total size of the city column

Ex:- SELECT lpad(City,15,'*') from Person;

City
********Pune
********Pune
******Banglore

Table Name :- Person

LastName	**FirstName**	**Address**	**City**
Sharma	Oli	GM Road 10	Pune
Mante	Edison	Camp 23	Pune
Johnson	Kari	RTO Road 20	Banglore

7) Concatenation:-It is used to Concatenate several expression together.

SYNTAX:-
CONCAT(expr1,expr2,expr3,……)

Ex:- SELECT concat(firstName,City) from Person;

Oli Pune
Edison Pune
Kari Banglore

Table Name :- Person

LastName	**FirstName**	**Address**	**City**
Sharma	Oli	GM Road 10	Pune
Mante	Edison	Camp 23	Pune
Johnson	Kari	RTO Road 20	Banglore

8) Length:-It is used to Calculate the length of the given string.

SYNTAX:-
Length(string)

Ex:- SELECT length(City) from Person;

City
4
4
8

Numeric or Arithmetic Functions:

Numeric functions are used to perform operations on numbers.

They accept numeric values as input and return numeric values as output. Few of the Numeric functions

Function Name	**Return Value**
ABS (x)	Absolute value of the number '*x*'
CEIL (x)	Integer value that is Greater than or equal to the number '*x*'
FLOOR (x)	Integer value that is Less than or equal to the number '*x*'
TRUNC (x, y)	Truncates value of number '*x*' up to '*y*' decimal places
ROUND (x, y)	Rounded off value of the number '*x*' up to the number '*y*' decimal places

Example:

1) ABS():

This SQL ABS() returns the absolute value of a number passed as argument.

Ex:- SELECT ABS(-17.38) FROM dual;

Output:- 17.38

2) CEIL():

This SQL CEIL() will rounded up any positive or negative decimal value within the function upwards.

Ex:- SELECT CEIL(-17.38) FROM dual;

Output:- 18

Example:

3) FLOOR():

This SQL FLOOR() rounded up any positive or negative decimal value down to the next least integer value.

Ex:- SELECT FLOOR(17.38) FROM dual;

Output:- 17

4) Trunc(x,y):

Truncates the value of number x to y decima places.

Ex:- SELECT TRUNC(125.456,1) FROM dual;

Output:- 125.4

Example:

5) Round(x,y):

Round the value of number x to y decimal places.

Ex:- SELECT Round (140.234,2) FROM dual;

Output:- 140.23

6) Exp(x):

Returns e raised to the xth power where e =2.71828183

Ex:- SELECT EXP (5) FROM dual;

Output:- 148.413159

Example:

7) Power(x,y):

Returns x raised to the nth power .y must be an integer else an error is returned.

Ex:- SELECT Power (4,2) FROM dual;

Output:- 16

8) SQRT(x):

Returns square root of x

Ex:- SELECT sqrt (25) FROM dual;

Output:- 5

Example:

9) Mod(x,y):

Returns the remainder of a first number divided by second no. passes a parameter.If the second no. is zero the result of the same as the first no.

Ex:- SELECT Mod (10,3) FROM dual;

Output:- 1

Date and Time Functions:

These are functions that take values that are of data type DATE as input and return value of data types DATE,expect for the months_between function , which return a number as output:

1) Add_Months:-Adds the specified number of months to the date value

   Syntax:- Add-Months(date,number of months)

   Ex;-Select add_months(sysdate,5) from dual;

   This will add 5 months to the existing date.

Date and Time Functions:

2) Greatest :-Returns the greatest value in a list of expression

   Syntax:- Greatest (expr1 ,expr2 ,expr3)

   Ex;-Select Greatest('10-JAN-07','12-OCT-07') from dual;   Output;-

3) Least :-Returns the Least value in a list of expression

   Syntax:- Least(expr1 ,expr2 ,expr3)

   Ex;-Select least('10-JAN-07','12-OCT-07') from dual;   Output;-

4) Datediff:- Return the difference in days between two days values.

   Syntax:- Datediff(date1 ,date2)

   Ex;-Select datediff('10-JAN-07','12-OCT-07') from dual;   Output;

Aggregate Functions:

- SQL aggregation function is used to perform the calculations on multiple rows of a single column of a table. It returns a single value.
- It is also used to summarize the data.

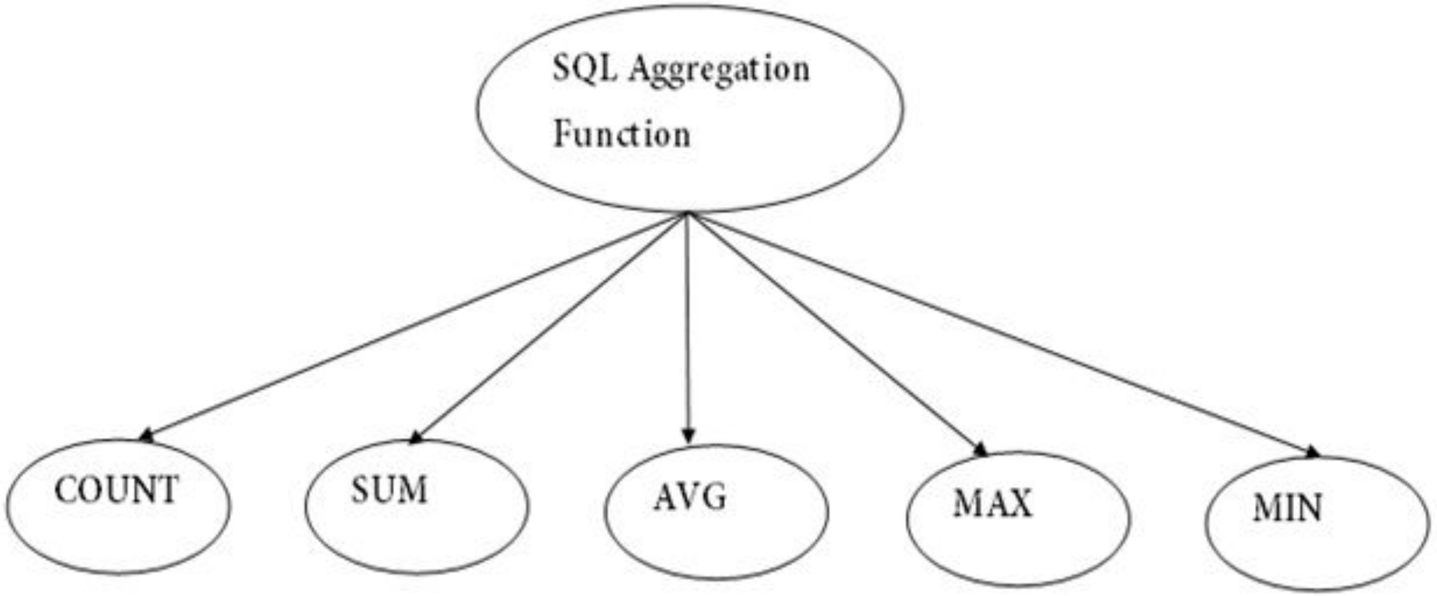


Table Name :- Persons

LastName	**FirstName**	**Age**	**City**
Sharma	Oli	34	Pune
Mante	Edison	45	Pune
Johnson	Kari	19	Banglore

1) AVG: The Avg function returns the average value of a column in a selection.NULL Values are not included in the calculation.

SYNTAX:-Select avg(column) from table_name;

Ex1: Find the average age of the persons in the persons table:
Sql >>Select AVG(Age) from persons;

Exp2:Find the average age for the persons that are older than 20 years:
Sql>> Select AVG(Age) from persons where Age>20;

Values
32.67
39.5

Table Name :- Persons

LastName	**FirstName**	**Age**	**City**
Sharma	Oli	34	Pune
Mante	Edison		Pune
Johnson	Kari	19	Banglore

2) Count: The Count function returns the number of rows without a null value in the specified column.

SYNTAX:-Select count(column) from table_name;

Ex1: Find the number of persons with a value in the age filed in the persons table:

Sql >>Select count(Age) from persons;

Values
2

Table Name :- Persons

LastName	**FirstName**	**Age**	**City**
Sharma	Oli	34	Pune
Mante	Edison	45	Pune
Johnson	Kari	19	Banglore

3) Count(*) Function: The Count(*) function returns the number of selected rows in a selection.

SYNTAX:-Select count(*) from table_name;

Values
3

Ex1: Find the number of persons with a value in the age filed in the persons table:
Sql >>Select count(*) from persons;

Ex2: Find the number of persons that are older than 20 yrs:
Sql>> Select count(*) from persons where age>>20;

Table Name :- Persons

LastName	FirstName	Age	City
Sharma	Oli	34	Pune
Mante	Edison	45	Pune
Johnson	Kari	19	Banglore

4. Max Function: The max function returns the highest value in a column.Null Values are not included in the calculation
SYNTAX:-Select max(column) from table_name;

Ex1: Find the maximum age from the persons table:
Sql >>Select max(age) from persons;

Values
45

Table Name :- Persons

LastName	**FirstName**	**Age**	**City**
Sharma	Oli	34	Pune
Mante	Edison	45	Pune
Johnson	Kari	19	Banglore

5. Min Function: The min function returns the lowest value in a column.Null Values are not included in the calculation

SYNTAX:-Select min(column) from table_name;

Ex1: Find the minimum age from the persons table:

Sql >>Select min(age) from persons;

Values
19

Table Name :- Persons

LastName	**FirstName**	**Age**	**City**
Sharma	Oli	34	Pune
Mante	Edison	45	Pune
Johnson	Kari	19	Banglore

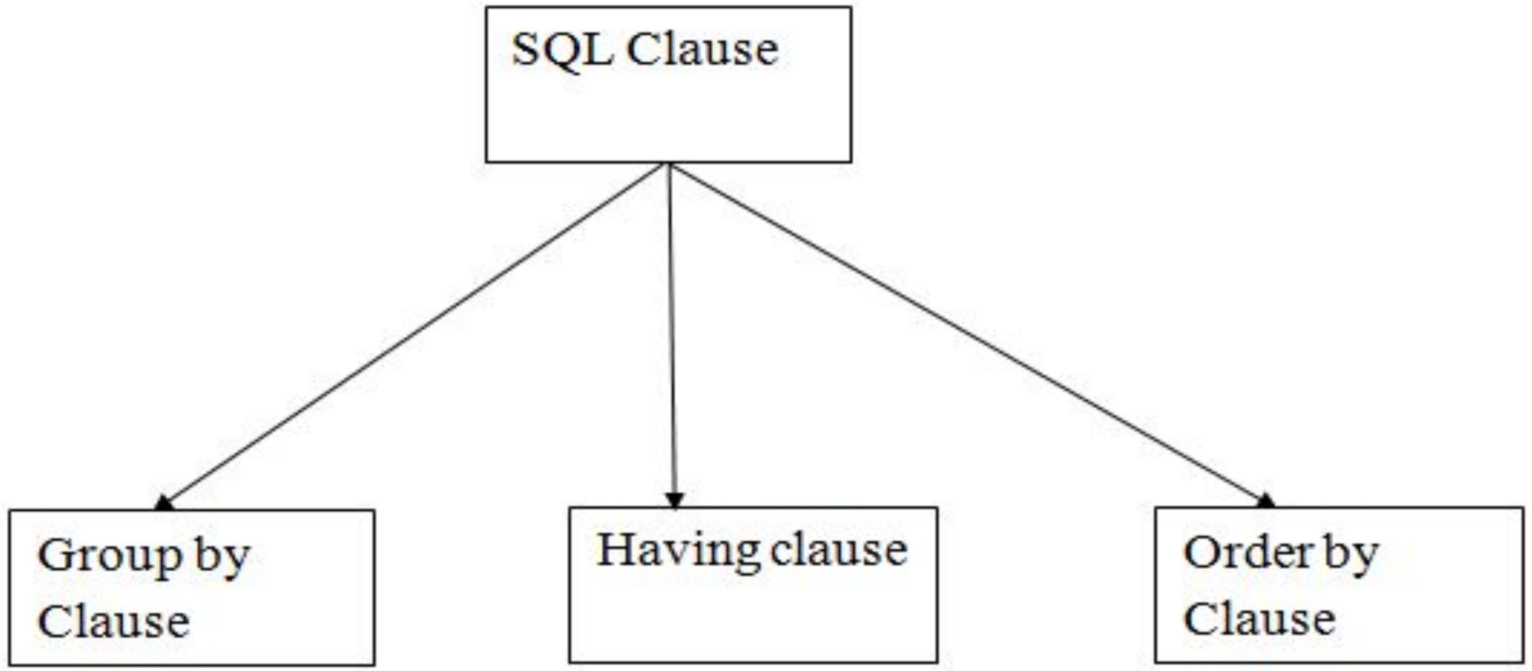
6. Sum Function: The sum function returns the total sum of a column in a given selection.Null Values are not included in the calculation
SYNTAX:-Select sum(column) from table_name;

Ex1: Find the sum of all ages from the persons table:
Sql >>Select sum(age) from persons;
Ex2: Find the sum of ages for persons that are more than 20 yrs old

Sql>> Select sum(age) from persons where age >20;

Values
98
79

Group by, Having and order by clauses:



1. GROUP BY

- SQL GROUP BY statement is used to arrange identical data into groups. The GROUP BY statement is used with the SQL SELECT statement.
- The GROUP BY statement follows the WHERE clause in a SELECT statement and precedes the ORDER BY clause.
- The GROUP BY statement is used with aggregation function.

Syntax:- Select column , sum(column) from table group by column;

Ex:-sales

Company	Amount
Wipro	5500
IBM	4500
Wipro	7100

Sql>>Select company, sum (amount) from sales;

Company	Amount
Wipro	17100
IBM	17100
Wipro	17100

Sql>>Select company,sum(amount) from sales

GROUP BY company;

Company	Amount
Wipro	12600
IBM	4500

2. Having Clause

- Having clause was added to sql because the where keyword could not be used against aggregate functions(like sum) and without having clause would be impossible to test for result conditions.

Syntax:- Select column , sum(column) from table group by column

Having sum(column) condition value;

Ex:-sales

Company	Amount
Wipro	5500
IBM	4500
Wipro	7100

Sql>>Select company, sum (amount) from sales group by

Company having sum(amount)>10000;

Company	Amount
Wipro	12600

3. Order by clause:

- The ORDER BY clause sorts the result-set in ascending or descending order.
- It sorts the records in ascending order by default. DESC keyword is used to sort the records in descending order.

```
Syntax:- SELECT column1, column2  FROM table_name
         WHERE condition
         ORDER BY column1, column2... ASC|DESC;
;
```

Ex:-orders

Company	Amount
sega	3412
MBT	5678
Wipro	2312
Wipro	6798

Company	Amount
MBT	5678
sega	3412
Wipro	**6798**
Wipro	**2312**

Ex1) To display company names in alphabetical order

Sql>>Select company, Amount from orders Order by company;

Ex2) To display company names in alphabetical order and the amount in numerical order

Sql>>Select company, amount from orders Order by company,amount;

Ex:-orders

Company	Amount
sega	3412
MBT	5678
Wipro	2312
Wipro	6798

Company	Amount
Wipro	**6798**
Wipro	**2312**
sega	3412
MBT	5678

Ex1) To display company names in reverse alphabetical order

Sql>>Select company, Amount from orders Order by company Desc;

Ex2) To display company names in reverse alphabetical order and the amount in numerical order

Sql>>Select company, amount from orders Order by company desc ,amount desc;

Sql Joins

As the name shows, JOIN means *to combine something*. In case of SQL, JOIN means **"to combine two or more tables"**.

The SQL JOIN clause takes records from two or more tables in a database and combines it together.

Sql Joins

There are different types of joins available in SQL −

- INNER JOIN − returns rows when there is a match in both tables.
- LEFT outer JOIN − returns all rows from the left table, even if there are no matches in the right table.
- RIGHT outer JOIN − returns all rows from the right table, even if there are no matches in the left table.
- FULL JOIN − returns rows when there is a match in one of the tables.
- SELF JOIN − is used to join a table to itself as if the table were two tables, temporarily renaming at least one table in the SQL statement.
- CARTESIAN JOIN − returns the Cartesian product of the sets of records from the two or more joined tables.

● SQL - INNER JOINS

The most important and frequently used of the joins is the INNER JOIN. They are also referred to as an EQUIJOIN.

The INNER JOIN creates a new result table by combining column values of two tables (table1 and table2) based upon the join-predicate.

The query compares each row of table1 with each row of table2 to find all pairs of rows which satisfy the join-predicate. When the join-predicate is satisfied, column values for each matched pair of rows of A and B are combined into a result row.

Consider the following two tables –

Table 1 – CUSTOMERS Table

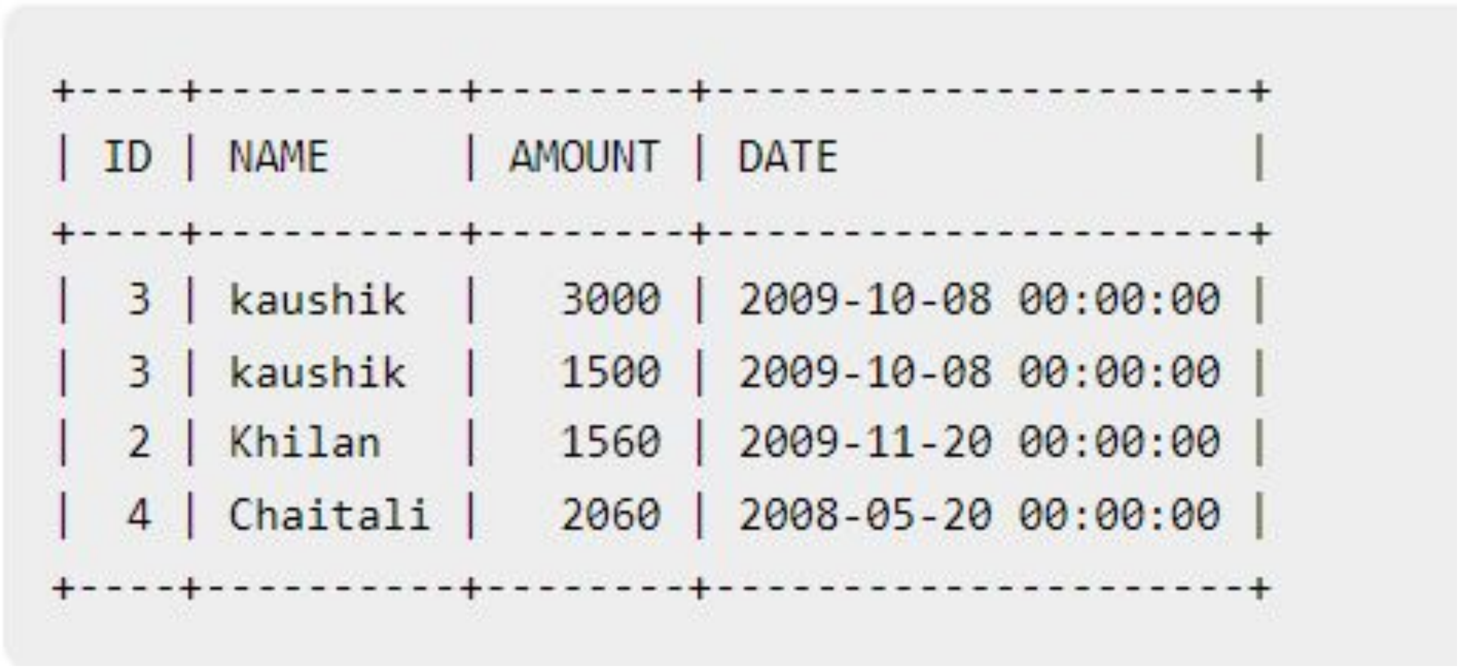
```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
|  7 | Muffy    |  24 | Indore    | 10000.00 |
+----+----------+-----+-----------+----------+
```

Table 2 - ORDERS Table

```
+-----+---------------------+-------------+--------+
|OID  | DATE                | CUSTOMER_ID | AMOUNT |
+-----+---------------------+-------------+--------+
| 102 | 2009-10-08 00:00:00 |           3 |   3000 |
| 100 | 2009-10-08 00:00:00 |           3 |   1500 |
| 101 | 2009-11-20 00:00:00 |           2 |   1560 |
| 103 | 2008-05-20 00:00:00 |           4 |   2060 |
+-----+---------------------+-------------+--------+
```

Now, let us join these two tables using the INNER JOIN as follows −

```
SQL> SELECT  ID, NAME, AMOUNT, DATE
   FROM CUSTOMERS INNER JOIN ORDERS
   ON CUSTOMERS.ID = ORDERS.CUSTOMER_ID;
```



```
+----+----------+--------+---------------------+
| ID | NAME     | AMOUNT | DATE                |
+----+----------+--------+---------------------+
|  3 | kaushik  |   3000 | 2009-10-08 00:00:00 |
|  3 | kaushik  |   1500 | 2009-10-08 00:00:00 |
|  2 | Khilan   |   1560 | 2009-11-20 00:00:00 |
|  4 | Chaitali |   2060 | 2008-05-20 00:00:00 |
+----+----------+--------+---------------------+
```

● SQL - LEFT OUTER JOINS

The SQL LEFT JOIN returns all rows from the left table, even if there are no matches in the right table. This means that a left join returns all the values from the left table, plus matched values from the right table or NULL in case of no matching join predicate.

Syntax

```
SELECT table1.column1, table2.column2...
FROM table1
LEFT JOIN table2
  ON table1.common_field = table2.common_field;
```

Consider the following two tables –

Table 1 – CUSTOMERS Table

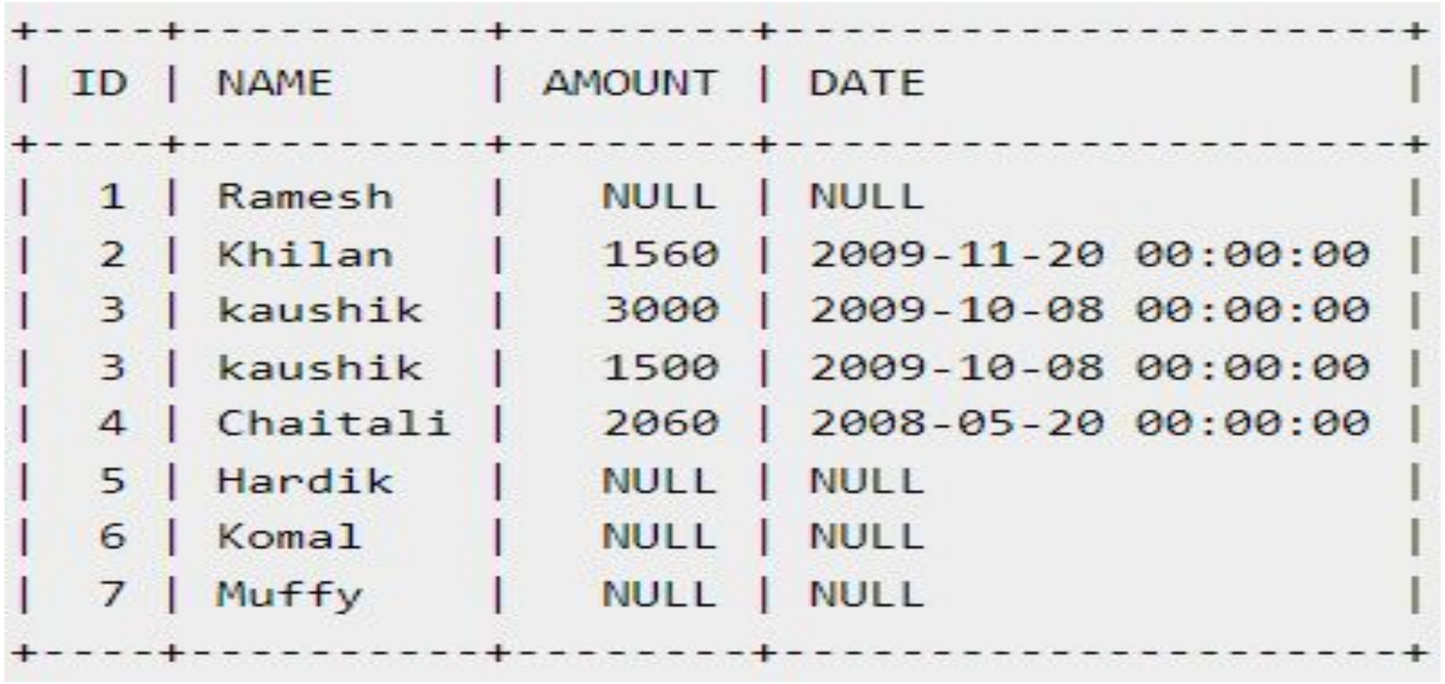
```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
|  7 | Muffy    |  24 | Indore    | 10000.00 |
+----+----------+-----+-----------+----------+
```

Table 2 – ORDERS Table

```
+-----+---------------------+-------------+--------+
|OID  | DATE                | CUSTOMER_ID | AMOUNT |
+-----+---------------------+-------------+--------+
| 102 | 2009-10-08 00:00:00 |           3 |   3000 |
| 100 | 2009-10-08 00:00:00 |           3 |   1500 |
| 101 | 2009-11-20 00:00:00 |           2 |   1560 |
| 103 | 2008-05-20 00:00:00 |           4 |   2060 |
+-----+---------------------+-------------+--------+
```

Now, let us join these two tables using the Left JOIN as follows −

```
SQL> SELECT  ID, NAME, AMOUNT, DATE   FROM CUSTOMERS
   LEFT JOIN ORDERS
ON CUSTOMERS.ID = ORDERS.CUSTOMER_ID;
```



```
+----+----------+--------+---------------------+
| ID | NAME     | AMOUNT | DATE                |
+----+----------+--------+---------------------+
|  1 | Ramesh   |   NULL | NULL                |
|  2 | Khilan   |   1560 | 2009-11-20 00:00:00 |
|  3 | kaushik  |   3000 | 2009-10-08 00:00:00 |
|  3 | kaushik  |   1500 | 2009-10-08 00:00:00 |
|  4 | Chaitali |   2060 | 2008-05-20 00:00:00 |
|  5 | Hardik   |   NULL | NULL                |
|  6 | Komal    |   NULL | NULL                |
|  7 | Muffy    |   NULL | NULL                |
+----+----------+--------+---------------------+
```

● SQL - RIGHT OUTER JOINS

The SQL RIGHT JOIN returns all rows from the right table, even if there are no matches in the left table. This means that a right join returns all the values from the right table, plus matched values from the left table or NULL in case of no matching join predicate.

Syntax

The basic syntax of a RIGHT JOIN is as follow.

```
SELECT table1.column1, table2.column2...
FROM table1
RIGHT JOIN table2
ON table1.common_field = table2.common_field;
```

Consider the following two tables –

Table 1 – CUSTOMERS Table

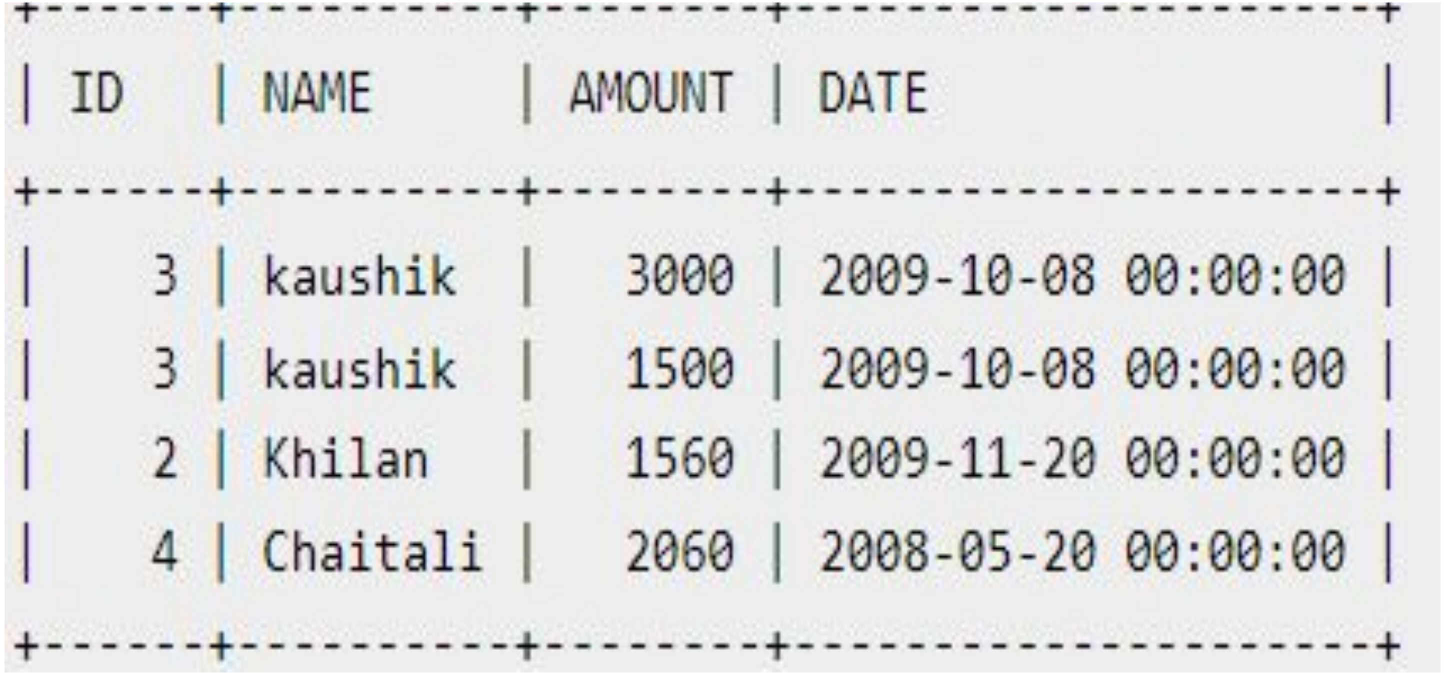
```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
|  7 | Muffy    |  24 | Indore    | 10000.00 |
+----+----------+-----+-----------+----------+
```

Table 2 – ORDERS Table

```
+-----+---------------------+-------------+--------+
|OID  | DATE                | CUSTOMER_ID | AMOUNT |
+-----+---------------------+-------------+--------+
| 102 | 2009-10-08 00:00:00 |           3 |   3000 |
| 100 | 2009-10-08 00:00:00 |           3 |   1500 |
| 101 | 2009-11-20 00:00:00 |           2 |   1560 |
| 103 | 2008-05-20 00:00:00 |           4 |   2060 |
+-----+---------------------+-------------+--------+
```

Now, let us join these two tables using the RIGHT JOIN as follows −

```
SQL> SELECT  ID, NAME, AMOUNT, DATE   FROM CUSTOMERS
   RIGHT JOIN ORDERS
ON CUSTOMERS.ID = ORDERS.CUSTOMER_ID;
```



```
+------+----------+--------+---------------------+
| ID   | NAME     | AMOUNT | DATE                |
+------+----------+--------+---------------------+
|    3 | kaushik  |   3000 | 2009-10-08 00:00:00 |
|    3 | kaushik  |   1500 | 2009-10-08 00:00:00 |
|    2 | Khilan   |   1560 | 2009-11-20 00:00:00 |
|    4 | Chaitali |   2060 | 2008-05-20 00:00:00 |
+------+----------+--------+---------------------+
```

SQL - FULL JOINS

The SQL FULL JOIN combines the results of both left and right outer joins.

The joined table will contain all records from both the tables and fill in NULLs for missing matches on either side.

Syntax

The basic syntax of a FULL JOIN is as follows −

```
SELECT table1.column1, table2.column2...
FROM table1
FULL JOIN table2
ON table1.common_field = table2.common_field;
```

Consider the following two tables –

Table 1 – CUSTOMERS Table

```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
|  7 | Muffy    |  24 | Indore    | 10000.00 |
+----+----------+-----+-----------+----------+
```

Table 2 – ORDERS Table

```
+-----+---------------------+-------------+--------+
|OID  | DATE                | CUSTOMER_ID | AMOUNT |
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| 100 | 2009-10-08 00:00:00 |           3 |   1500 |
| 101 | 2009-11-20 00:00:00 |           2 |   1560 |
| 103 | 2008-05-20 00:00:00 |           4 |   2060 |
+-----+---------------------+-------------+--------+
```
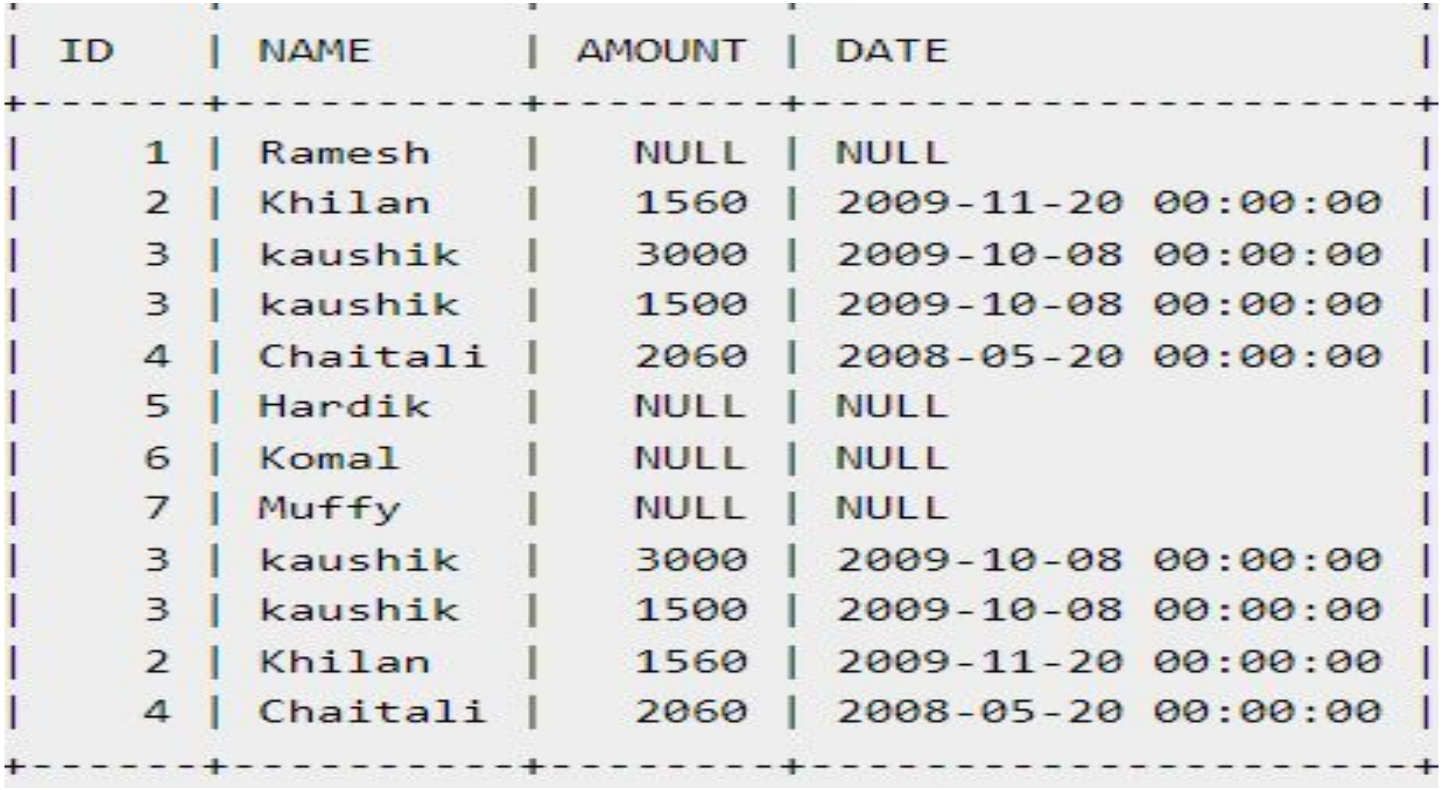

Now, let us join these two tables using the FULL JOIN as follows −

```
SQL> SELECT  ID, NAME, AMOUNT, DATE   FROM CUSTOMERS
  FULL JOIN ORDERS  ON CUSTOMERS.ID = ORDERS.CUSTOMER_ID;
```



```
| ID     | NAME       | AMOUNT | DATE                |
+--------+------------+--------+---------------------+
|      1 | Ramesh     |   NULL | NULL                |
|      2 | Khilan     |   1560 | 2009-11-20 00:00:00 |
|      3 | kaushik    |   3000 | 2009-10-08 00:00:00 |
|      3 | kaushik    |   1500 | 2009-10-08 00:00:00 |
|      4 | Chaitali   |   2060 | 2008-05-20 00:00:00 |
|      5 | Hardik     |   NULL | NULL                |
|      6 | Komal      |   NULL | NULL                |
|      7 | Muffy      |   NULL | NULL                |
|      3 | kaushik    |   3000 | 2009-10-08 00:00:00 |
|      3 | kaushik    |   1500 | 2009-10-08 00:00:00 |
|      2 | Khilan     |   1560 | 2009-11-20 00:00:00 |
|      4 | Chaitali   |   2060 | 2008-05-20 00:00:00 |
+--------+------------+--------+---------------------+
```

SQL -Sub Query

A Subquery is a query within another SQL query and embedded within the WHERE clause.

Important Rule:

- A subquery can be placed in a number of SQL clauses like WHERE clause, FROM clause, HAVING clause.
- You can use Subquery with SELECT, UPDATE, INSERT, DELETE statements along with the operators like =, <, >, >=, <=, IN, BETWEEN, etc.
- A subquery is a query within another query. The outer query is known as the main query, and the inner query is known as a subquery.
- Subqueries are on the right side of the comparison operator.
- A subquery is enclosed in parentheses.
- In the Subquery, ORDER BY command cannot be used. But GROUP BY command can be used to perform the same function as ORDER BY command.

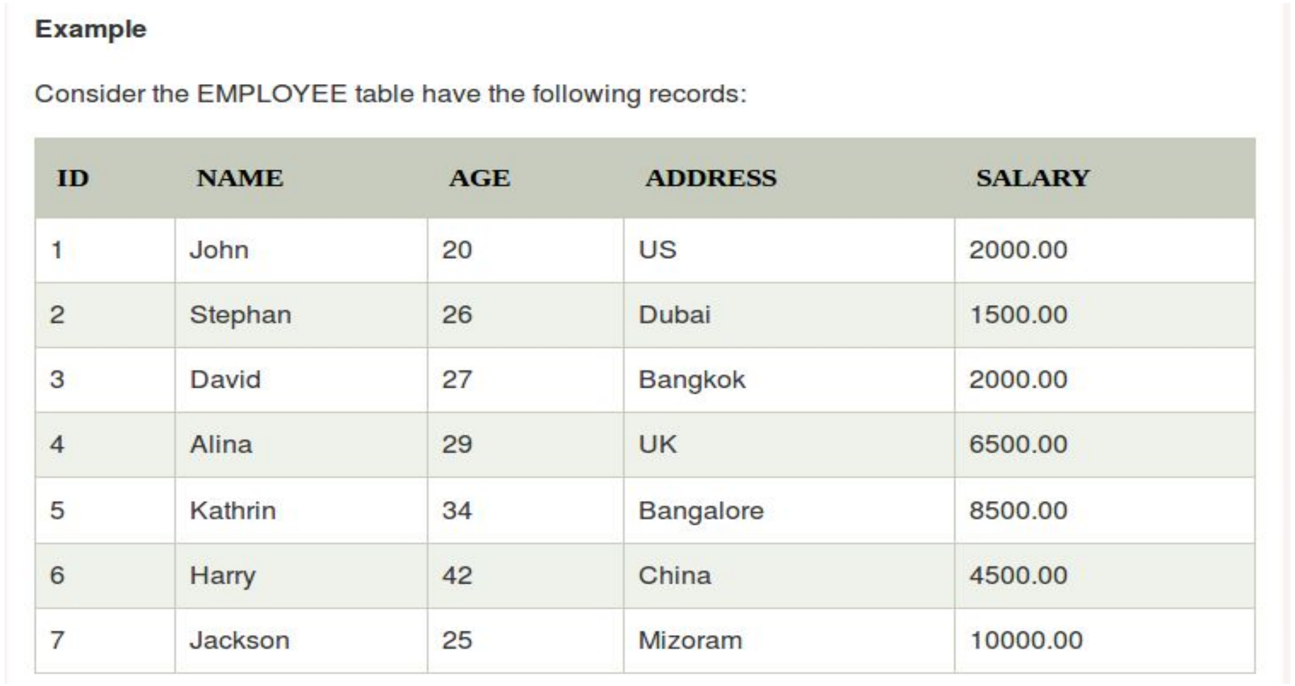
SQL -Sub Query

- **1. Subqueries with the Select Statement**

  SQL subqueries are most frequently used with the Select statement.

  Syntax

```
SELECT column_name  FROM table_name

WHERE column_name expression operator

( SELECT column_name  from table_name WHERE ... );
```

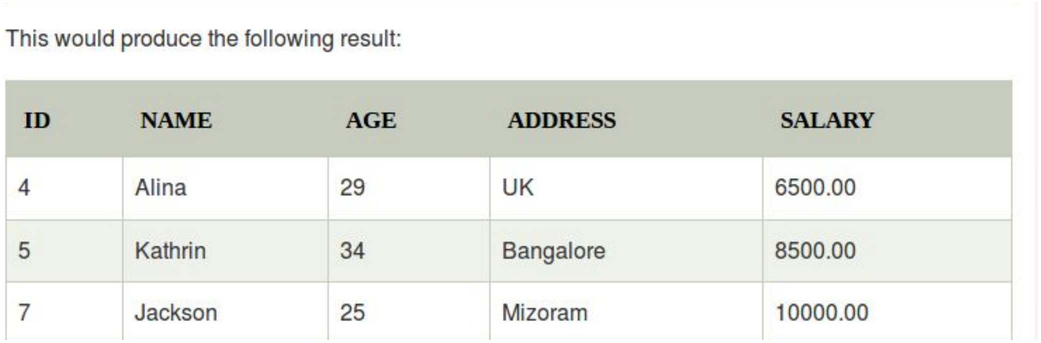


Example

Consider the EMPLOYEE table have the following records:

ID	NAME	AGE	ADDRESS	SALARY
1	John	20	US	2000.00
2	Stephan	26	Dubai	1500.00
3	David	27	Bangkok	2000.00
4	Alina	29	UK	6500.00
5	Kathrin	34	Bangalore	8500.00
6	Harry	42	China	4500.00
7	Jackson	25	Mizoram	10000.00

```
SELECT *   FROM
EMPLOYEE  WHERE ID IN
(SELECT ID FROM
EMPLOYEE   WHERE
SALARY > 4500);
```



This would produce the following result:

ID	NAME	AGE	ADDRESS	SALARY
4	Alina	29	UK	6500.00
5	Kathrin	34	Bangalore	8500.00
7	Jackson	25	Mizoram	10000.00

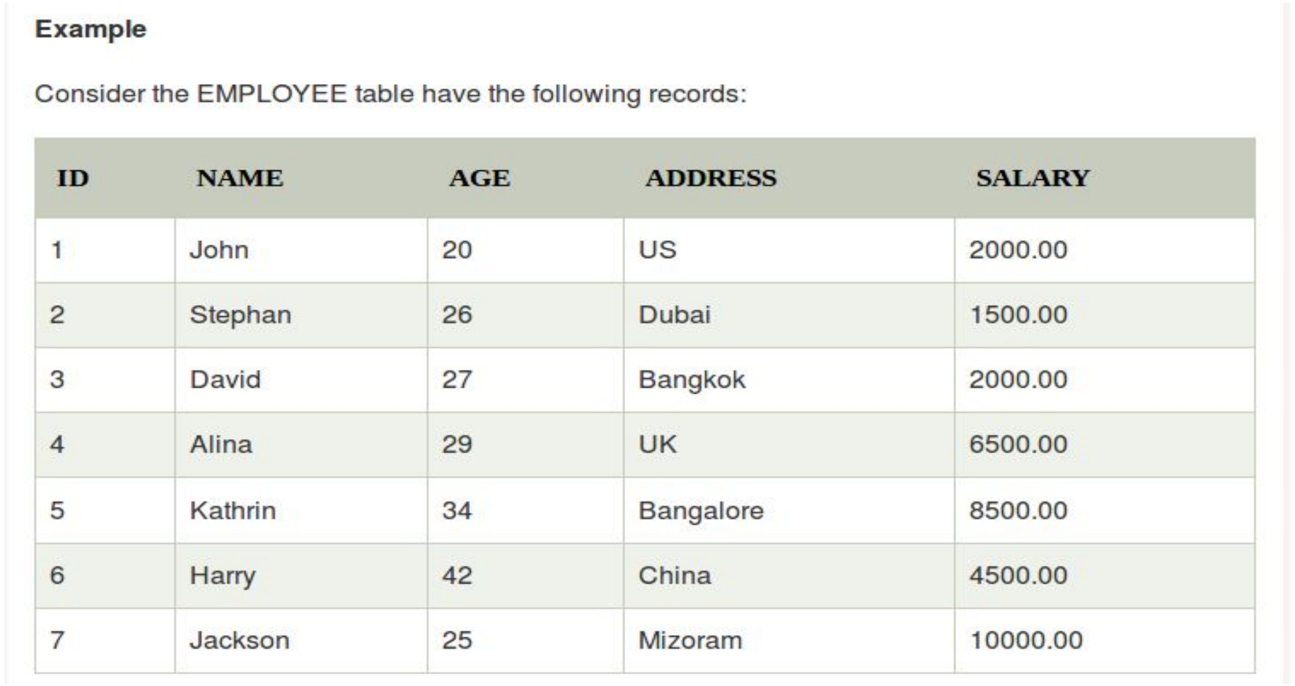
SQL -Sub Query

2. Subqueries with the Insert Statement

- SQL subquery can also be used with the Insert statement. In the insert statement, data returned from the subquery is used to insert into another table.
- In the subquery, the selected data can be modified with any of the character, date functions.

Syntax

```
INSERT INTO table_name (column1, column2, column3....)

SELECT *  FROM table_name  WHERE VALUE OPERATOR
```


Example

Consider the EMPLOYEE table have the following records:

ID	NAME	AGE	ADDRESS	SALARY
1	John	20	US	2000.00
2	Stephan	26	Dubai	1500.00
3	David	27	Bangkok	2000.00
4	Alina	29	UK	6500.00
5	Kathrin	34	Bangalore	8500.00
6	Harry	42	China	4500.00
7	Jackson	25	Mizoram	10000.00

```
INSERT INTO
EMPLOYEE_BKP   SELECT
* FROM EMPLOYEE
WHERE ID IN (SELECT ID
FROM EMPLOYEE);
```

SQL -Sub Query

3. Subqueries with the UPDATE Statement

- The subquery of SQL can be used in conjunction with the Update statement. When a subquery is used with the Update statement, then either single or multiple columns in a table can be updated.

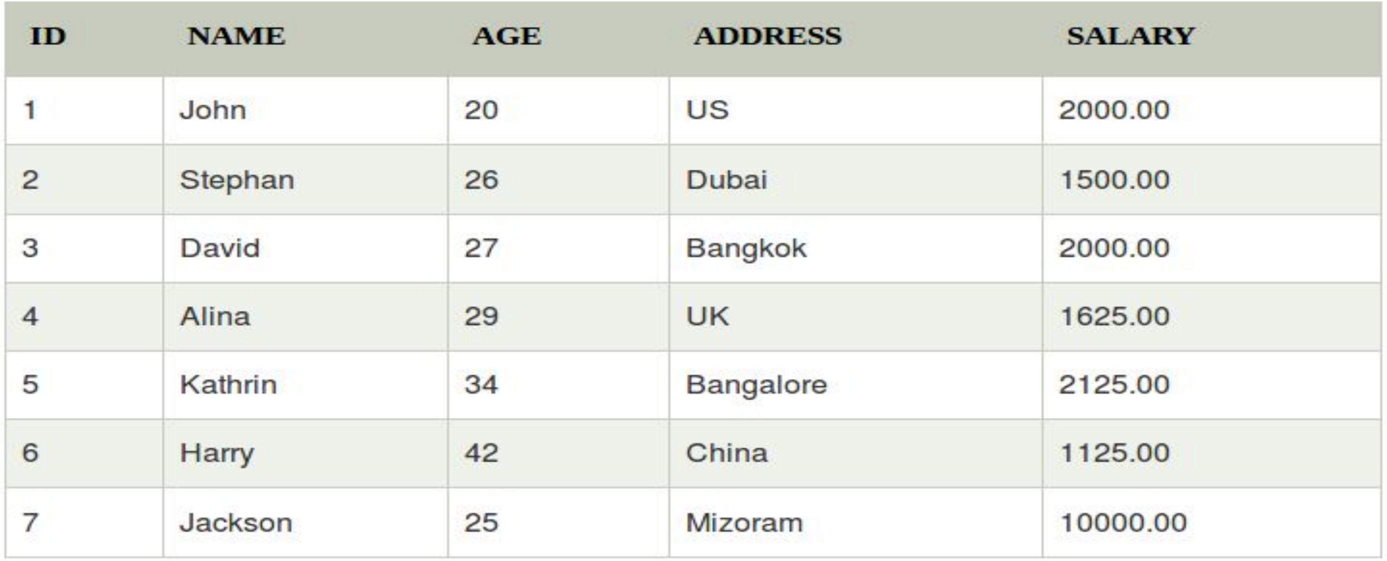
  Syntax

```
UPDATE table  SET column_name = new_value  WHERE VALUE OPERATOR  (SELECT
COLUMN_NAME  FROM TABLE_NAME   WHERE condition);
```

Example

Let's assume we have an EMPLOYEE_BKP table available which is backup of EMPLOYEE table. The given example updates the SALARY by .25 times in the EMPLOYEE table for all employee whose AGE is greater than or equal to 29.

```
UPDATE EMPLOYEE    SET SALARY = SALARY * 0.25  WHERE AGE IN (SELECT
AGE FROM CUSTOMERS_BKP  WHERE AGE >= 29);
```



ID	NAME	AGE	ADDRESS	SALARY
1	John	20	US	2000.00
2	Stephan	26	Dubai	1500.00
3	David	27	Bangkok	2000.00
4	Alina	29	UK	1625.00
5	Kathrin	34	Bangalore	2125.00
6	Harry	42	China	1125.00
7	Jackson	25	Mizoram	10000.00

SQL -Sub Query

4. Subqueries with the DELETE Statement

- The subquery of SQL can be used in conjunction with the Delete statement just like any other statements mentioned above.

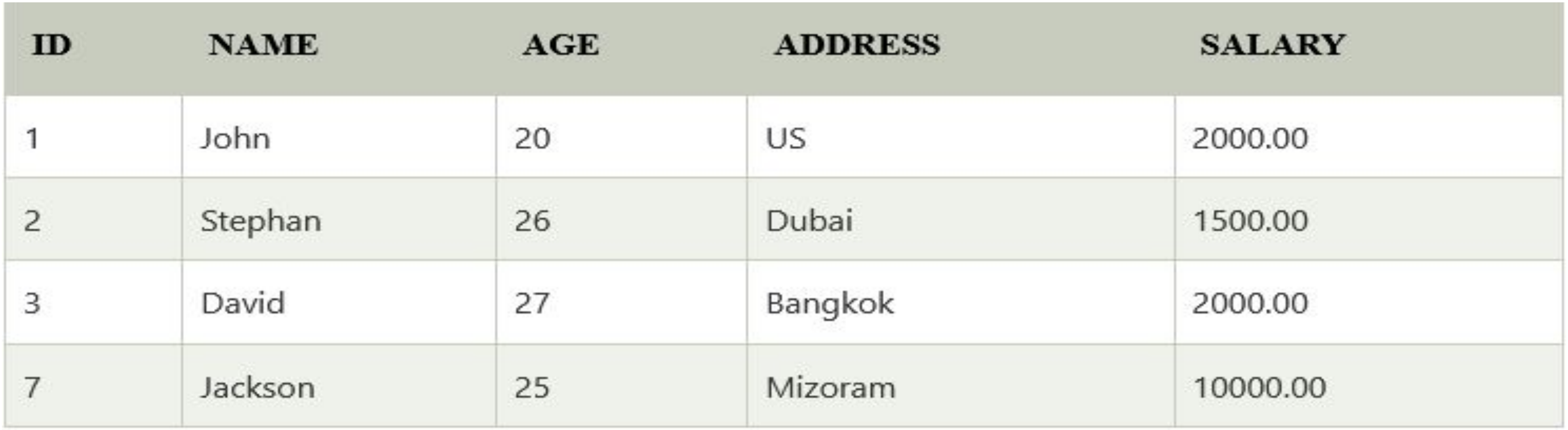
  Syntax

  DELETE FROM TABLE_NAME WHERE VALUE OPERATOR (SELECT COLUMN_NAME FROM TABLE_NAME WHERE condition);

Example

Let's assume we have an EMPLOYEE_BKP table available which is backup of EMPLOYEE table. The given example deletes the records from the EMPLOYEE table for all EMPLOYEE whose AGE is greater than or equal to 29.

```
DELETE FROM EMPLOYEE WHERE AGE IN (SELECT AGE FROM
EMPLOYEE_BKP WHERE AGE >= 29 );
```



ID	NAME	AGE	ADDRESS	SALARY
1	John	20	US	2000.00
2	Stephan	26	Dubai	1500.00
3	David	27	Bangkok	2000.00
7	Jackson	25	Mizoram	10000.00

3.3 Views

- Views in SQL are considered as a virtual table. A view also contains rows and columns.
- To create the view, we can select the fields from one or more tables present in the database.
- A view can either have specific rows based on certain condition or all the rows of a table.

Views, which are a type of virtual tables allow users to do the following −

- Structure data in a way that users or classes of users find natural or intuitive.
- Restrict access to the data in such a way that a user can see and (sometimes) modify exactly what they need and no more.
- Summarize data from various tables which can be used to generate reports.

- **Creating Views**

  Database views are created using the **CREATE VIEW** statement. Views can be created from a single table, multiple tables or another view.

  To create a view, a user must have the appropriate system privilege according to the specific implementation.

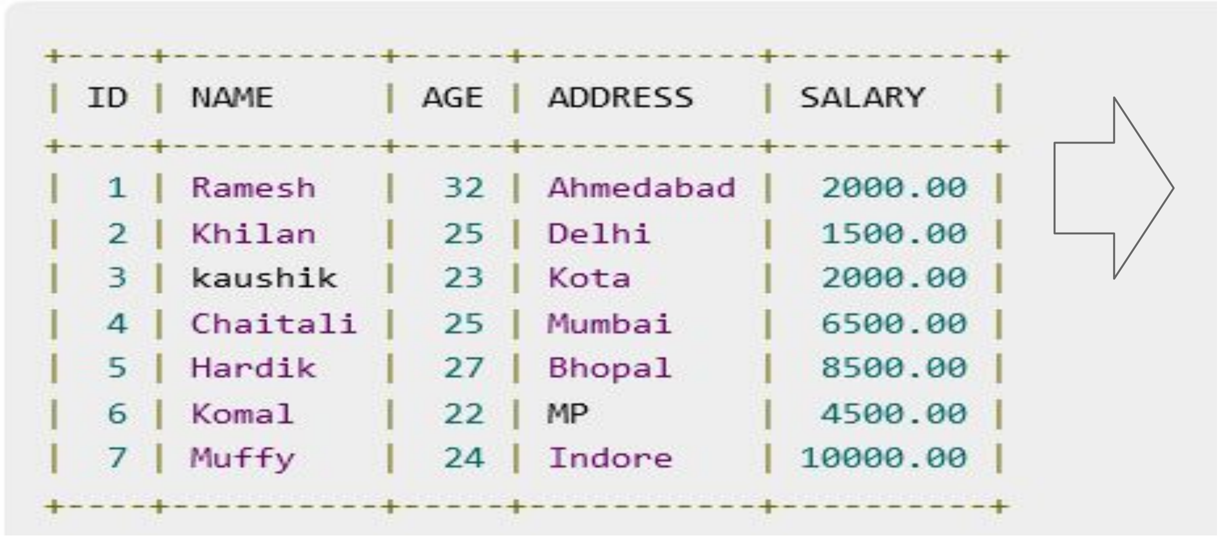
  The basic **CREATE VIEW** syntax is as follows −

  CREATE VIEW view_name AS SELECT column1, column2.....

  FROM table_name WHERE [condition];

Example

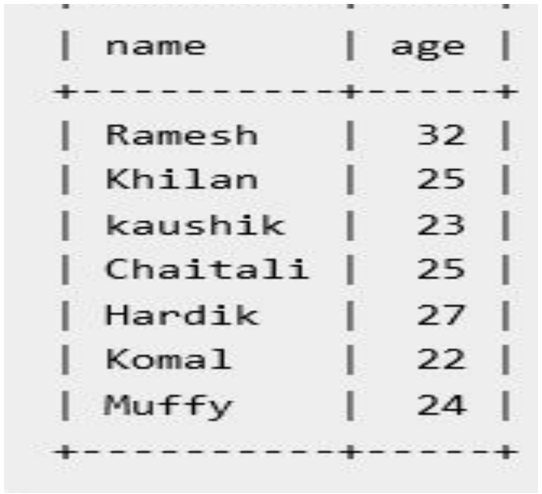
Consider the CUSTOMERS table having the following records –



```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
|  7 | Muffy    |  24 | Indore    | 10000.00 |
+----+----------+-----+-----------+----------+
```

SQL > CREATE VIEW CUSTOMERS_VIEW AS SELECT name, age FROM CUSTOMERS;

SQL > SELECT * FROM CUSTOMERS_VIEW;



```
| name     | age |
+----------+-----+
| Ramesh   |  32 |
| Khilan   |  25 |
| kaushik  |  23 |
| Chaitali |  25 |
| Hardik   |  27 |
| Komal    |  22 |
| Muffy    |  24 |
+----------+-----+
```

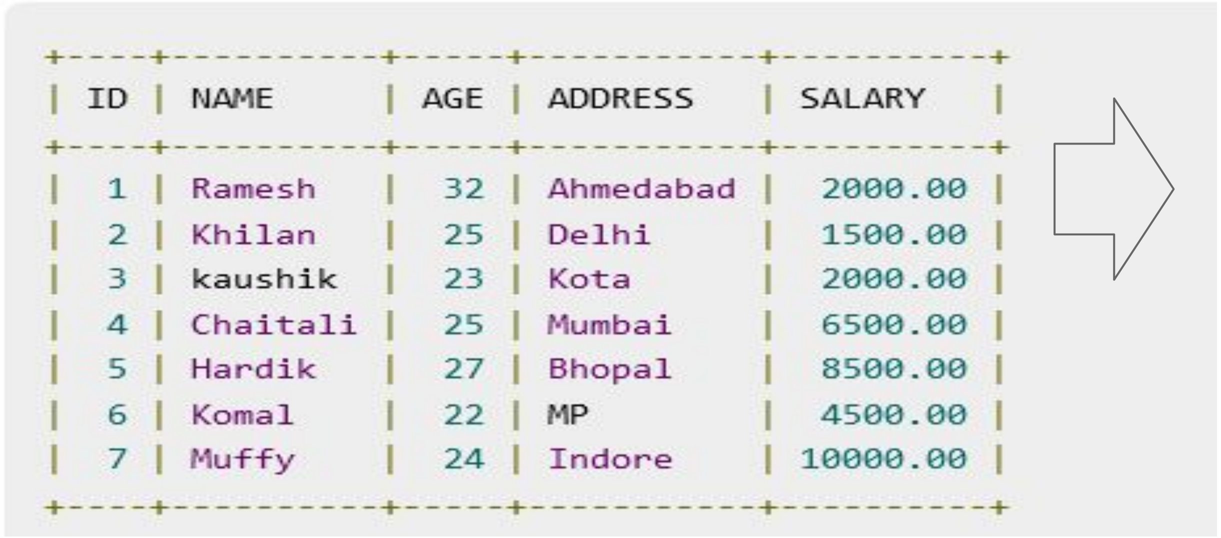
- **Updating Views**

A view can be updated under certain conditions which are given below −

- The SELECT clause may not contain the keyword DISTINCT.
- The SELECT clause may not contain summary functions.
- The SELECT clause may not contain set functions.
- The SELECT clause may not contain set operators.
- The SELECT clause may not contain an ORDER BY clause.
- The FROM clause may not contain multiple tables.
- The WHERE clause may not contain subqueries.
- The query may not contain GROUP BY or HAVING.
- Calculated columns may not be updated.
- All NOT NULL columns from the base table must be included in the view in order for the INSERT query to function.

Example

Consider the CUSTOMERS table having the following records –



```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
|  7 | Muffy    |  24 | Indore    | 10000.00 |
+----+----------+-----+-----------+----------+
```

```
SQL > UPDATE CUSTOMERS_VIEW
  SET AGE = 35
 WHERE name = 'Ramesh';
```

```
SQL > SELECT * FROM CUSTOMERS_VIEW;
```

OUTPUT

- **Inserting Rows into a View**

  Rows of data can be inserted into a view. The same rules that apply to the UPDATE command also apply to the INSERT command.

  Here, we cannot insert rows in the CUSTOMERS_VIEW because we have not included all the NOT NULL columns in this view, otherwise you can insert rows in a view in a similar way as you insert them in a table.

- **Deleting Rows into a View**

  Rows of data can be deleted from a view. The same rules that apply to the UPDATE and INSERT commands apply to the DELETE command.

  Following is an example to delete a record having AGE = 22.

  ```
  SQL > DELETE FROM CUSTOMERS_VIEW  WHERE age = 22;
  ```

Dropping Views

Obviously, where you have a view, you need a way to drop the view if it is no longer needed. The syntax is very simple and is given below −

```
DROP VIEW view_name;
```

Following is an example to drop the CUSTOMERS_VIEW from the CUSTOMERS table.

```
DROP VIEW CUSTOMERS_VIEW;
```

SEQUENCES

Sequence is a set of integers 1, 2, 3, … that are generated and supported by some database systems to produce unique values on demand.

- A sequence is a user defined schema bound object that generates a sequence of numeric values.
- Sequences are frequently used in many databases because many applications require each row in a table to contain a unique value and sequences provides an easy way to generate them.
- The sequence of numeric values is generated in an a**scending or descending order** at defined intervals and can be configured to restart when exceeds max_value.

Syntax:

```
CREATE SEQUENCE
sequence_name
START WITH
initial_value
INCREMENT BY
increment_value
MINVALUE minimum
value
MAXVALUE maximum
value
CYCLE | NOCYCLE ;
```

sequence_name: Name of the sequence.

initial_value: starting value from where the sequence starts. Initial_value should be greater than or equal to minimum value and less than equal to maximum value.

increment_value: Value by which sequence will increment itself. Increment_value can be positive or negative.

minimum_value: Minimum value of the sequence.

maximum_value: Maximum value of the sequence.

cycle: When sequence reaches its set_limit it starts from beginning.

nocycle: An exception will be thrown if sequence exceeds its max_value.

Example 1:

CREATE SEQUENCE
EID

start with 1

increment by 1

minvalue 0

maxvalue 100

cycle;

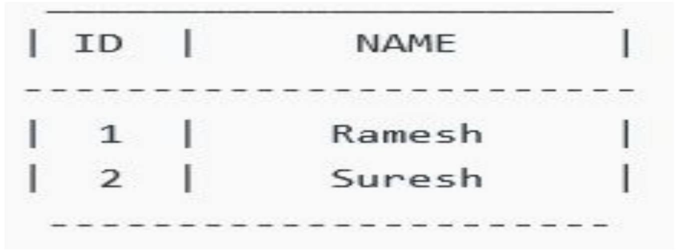
CREATE TABLE students (ID number (10) Primary key ,NAME char(20));

Now insert values into table

INSERT into students VALUES(EID.nextval,'Ramesh');

INSERT into students VALUES(EID.nextval,'Suresh');

where *EID.nextval* will insert id's in id column in a sequence as defined in sequence_1.



```
 _______________________________
| ID  |          NAME           |
---------------------------------
|  1  |         Ramesh          |
|  2  |         Suresh          |
 -------------------------------
```

ALTER SEQUENCE

Use the ALTER SEQUENCE statement to change the increment, minimum and maximum values, cached numbers, and behavior of an existing sequence.

```
ALTER SEQUENCE  sequence_name
    [ START  WITH Start_num ]
    [ INCREMENT BY increment_num ]
    [ { MINVALUE minimum_num  | NO MINVALUE } ]
    [ { MAXVALUE maximum_num |NO MAXVALUE } ]
    [ CYCLE | { NO CYCLE } ]
    [ { CACHE  cache_num | NO CACHE } ]
    [ {ORDER | NOORDER}];
```

Maxvalue=1500

Dropping Sequences

If a sequence is no longer required, you can drop the sequence using the DROP Sequence statement.

Syntax:-DROP Sequence;

Following is an example to drop the EID Sequence

SQL> Drop Sequence EID;

INDEXES

Indexes are optional structures associated with tables and clusters that allow sql statements to execute more quickly against a table.

Just as the index in this manual helps you locate information faster than if there were no index, an oracle index provides a faster access path to table data.

You can use indexes without rewriting any queries.

Being independent structures,they require storage space. You can create or drop an Index without affecting the base tables,database applications, or other indexes.

Oracle automatically maintains indexes when you insert, update and delete rows of the associated tables.

The CREATE INDEX Command

The basic syntax of a **CREATE INDEX** is as follows.

CREATE INDEX index_name ON table_name;

1.**Single-Column Indexes**

A single-column index is created based on only one table column. The basic syntax is as follows.

Syntax:-CREATE INDEX index_name ON table_name (column_name);

Sql> Create index emp on employee(emp_id);

2.Unique Indexes

Unique indexes are used not only for performance, but also for data integrity. A unique index does not allow any duplicate values to be inserted into the table. The basic syntax is as follows.

CREATE UNIQUE INDEX index_name on table_name (column_name);

Sql> Create unique index emp on employee(emp_id);

3.**Compsite Indexes**

A composite index is an index on two or more columns of a table.

A composite index also called a concatenated index.

Syntax:-CREATE INDEX index_name ON table_name (column_name1,column_name 2);

Sql> Create index emp on employee(emp_id,Dept_id);

DROPPING INDEXES

An index can be dropped using SQL **DROP** command. Care should be taken when dropping an index because the performance may either slow down or improve.

The basic syntax is as follows −

Syntax:-DROP INDEX index_name;

Synonyms

A Synonyms is an alias for a table, view,snapshot,sequence, procedure,function,or package.

Synonyms can provide a level of security by masking the name and owner of an object and by providing location transparency for remote objects of a distributed database.

They are convenient to use and reduce the complexity of sql statements for database users.

You can create both public and private synonyms. A public synonym is owned by the special user group named public is accessible to every user in a database.

A private synonym is contained in the schema of a specific user and available only to the user and the user’s grantees.

Creating Synonyms

- ❖ To create a private synonym you must have the create synonym privilege.
- ❖ To create a public synonym you must have the create public synonym system privilege.

The syntax for creating the synonym is:

```
Create synonym synonym_name for table_name;
```

Example:- The following example create the synonym emp for the relation employee.

```
SQL> Create synonym emp for employee;

Synonym Created.

SQL> Select * from emp;
```

*You can insert the rows in the synonym emp as you insert the rows in the employee table.

Dropping Synonyms

- If a synonym is no longer required,you can drop the sequence using the drop synonym statement.
- The original table for which synonym is created does not get deleted when you delete the synonym.
- When you drop a synonym, its definition is removed from the data dictionary.

The syntax for dropping the synonym is:

```
Drop synonym synonym_name;
```

Example:- The following example drop the synonym emp for the relation employee.

```
SQL> Drop synonym emp;

Synonym dropped.
```