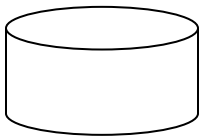
SQL (Structure Query Language)

Data: Data is a raw fact which describes the attributes of an entity.

Data Base: Data Base is a place or medium in which we store the data in a systematic and organized way.

Eg:- Facebook data base, oracle data base, drop box, google drive.

Basic operation done on a data base is



1. Create
2. Read/retrieve
3. Update
4. Delete

There are also known as CRUD operation.

Data Base Management System (DBMS)

Data Base Management system is a software which is used to manage the data base.

Security and authorization are the 2 most important features given by the Data Base Management System (DBMS)

Basic operation done in DBMS

1. Insert data
2. Read the data
3. Update the existing data
4. Delete the unwanted data

To communicate or interact with DBMS we use Query language.

Types of DBMS

1. Hierarchical
2. Relational
3. Network
4. Object oriented

Relational Data Base Management System (RDBMS) :-

Any DBMS which follows relational model is known as RDBMS.

To communicate with RDBMS we use structured Query Language (SQL)

Relational Model:-

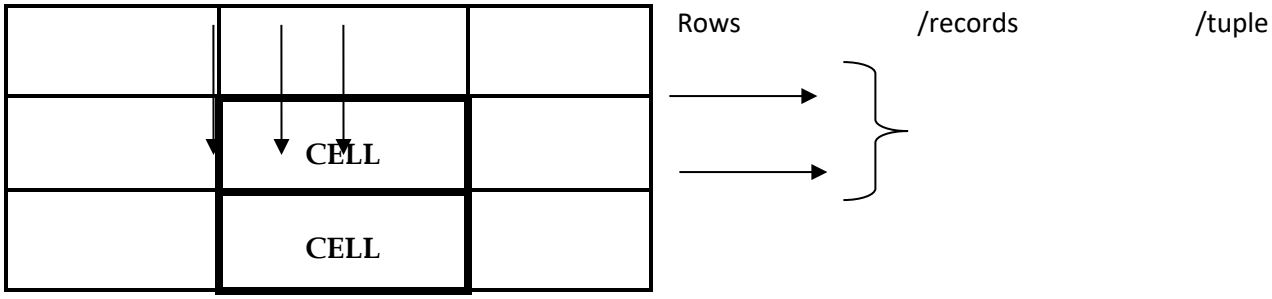
Relation model was designed by "E.F CODD".

In relational model we organize and store the data in the form of relations.

According to E.F CODD data in the relational model should be logically organized and stored in the form of tables.

Tables: - Table is logical organization of data. It consists of rows and columns.

– a table is a collection of rows and columns.



Columns Attributes / field

A table is also called as an entity / relation.
A cell is an intersection of a row and a column

Column: - Column is also known as attributes or fields. A column is used to represent an attribute of all the entities.

Row: - A row is also known as record or tuple.

A row is used to represent all the attributes of a single entity.

Note **:-**

- If we install any of the database related software(s) – we can create our own database, we can create our own tables and we can store the data inside it.
- When we install any database s/w(s) – a part of hard disk will be designated / reserved to perform database related activities
- Some of the database software(s) we have are,

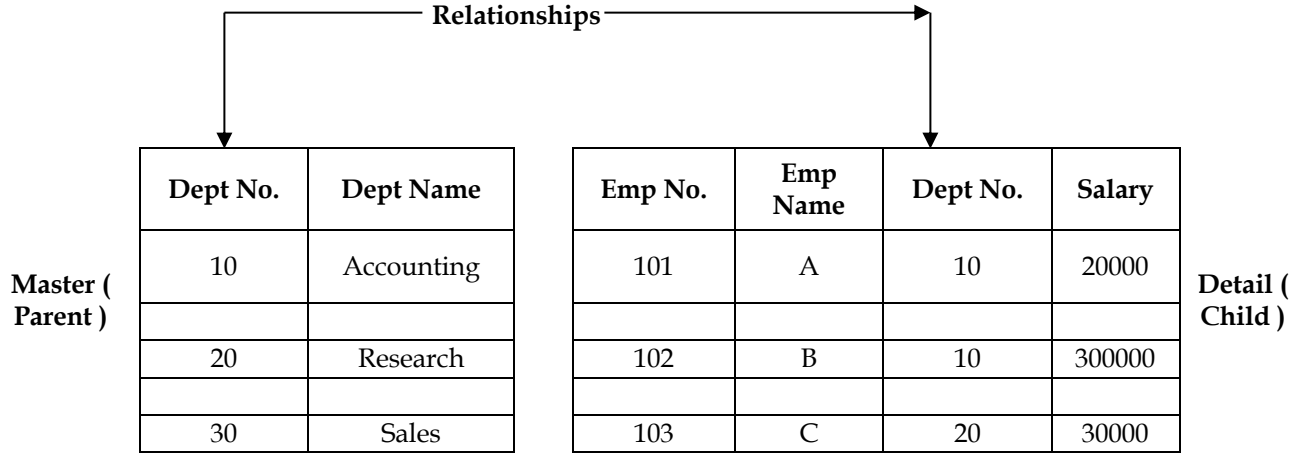
Oracle, SQL Server, DB2, Sybase, Informix, MySQL, MS – Access, Foxbase, FoxPro

Among the above database software – some of them are DBMS and some of them are RDBMS

The s/w which is widely used today is Oracle. The different versions of Oracle starting from the earliest to the latest are – Oracle 2, Oracle 3, Oracle 4, Oracle 5, Oracle 6, Oracle 7, Oracle 8i, Oracle 9i, Oracle 10g, and the latest to hit the market is Oracle 11g. here 'i' stands for Internet and 'g' stands for Grid / Grid computing.

RELATIONSHIPS

A relationship is the association between any two tables which preserves data integrity.



Dept No.	Dept Name
10	Accounting
20	Research
30	Sales

Emp No.	Emp Name	Dept No.	Salary
101	A	10	20000
102	B	10	300000
103	C	20	30000

Relationship helps to prevent the incorrect data in the child tables

Once the relationship is created, one table becomes master (or parent) and the other one becomes the child (or detail).

Whatever we insert into the child should be present in the master, else the record will be rejected from the child.

The master table contains the master data which will not change frequently.

The child table contains the transactional data which will change quite often

DBMS & RDBMS

DBMS – stands for Database Management System

DBMS is a database s/w which allows us to store the data in the form of tables.

RDBMS – stands for Relational DBMS

RDBMS is also a database s/w which has facility to handle more data volume, good performance, enhanced security features etc when compared against DBMS.

Any DBMS to qualify as a RDBMS should support the Codd rules / Codd laws

Ex for DBMS – FoxPro, FoxBase, Dbase

Ex for RDBMS – Oracle, Sybase, DB2, Teradata, SQL Server, MySQL

Data type: -

It is an attribute that specify the type of data the object can hold.

Char: - char data type is used to store character, numerical and also special characters (A-Z, a-z, 0-9, !,@,#,$, ...)

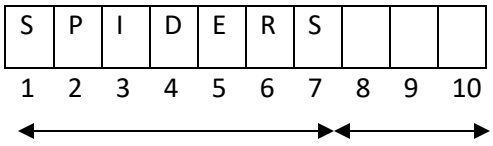
Every time we define char data type we have to mention the size.

Fixed memory allocation type.

Size: - it is the maximum no. of characters that can be hold in char data type (maximum no. of character which it can hold is 2000)

Syntax: char(size)

EX: - char(10)



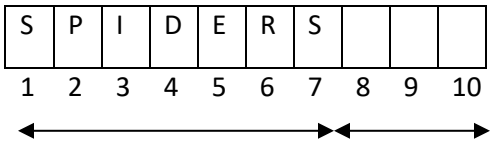
Varchar:- Varchar data type is used to store characters numerical and also special characters (A-Z, a-z, 0-9, !,@,#,……)

Every time we define varchar data type we have to mention the size (maximum size is 4000)

Variable length memory allocation type.

Syntax: - varchar(size)

Ex: - varchar(10)



Number :- Number data type is used to store only numerical data type.

It can accept only 2 arguments

Syntax: number(precision, scale)

Ex: - number(4)

Precision specifies only the no. of digits needed and the range is -9999 to 9999, maximum limit of precision 38.

EX: - number(4, 1)

Scale specifies the no. of digits it needs to store the decimal value. Maximum limit for scale 127 -999.9 to 999.9

Ex:- number(6, 2)

-9999.99 to 9999.99

Date: - Date data type is a format given by oracle

DD/MM/YYYY or MM/DD/YYYY

Large object:-

1. **Character large object (CLOB) :-** it is use to store character up to 4GB of size.
2. **Binary large object (BLOB):-** Binary Large Objects are used to store images, MP3's, MP4's, documents etc., up to 4 GB of size.

CONSTRAINTS

A constraint are the rules which to be satisfy before the data is entered into the table

A constraint is a condition which restricts the invalid data in the table.

A constraint can be provided for a column of a table.

Types of Constraints

- ❖ NOT NULL
- ❖ UNIQUE
- ❖ Primary Key
- ❖ Foreign Key
- ❖ Check

Characteristics of NULL

- → NULL is nothing, Null is not equal to zero or space
- → It will not occupy any space in the memory
- → Two NULLS are never same in Oracle.
- → NULL represents unknown value
- → Any arithmetic operation we perform on NULL will result in NULL itself. For ex, 100000 + NULL = NULL ; 100000 * NULL = NULL

NOT NULL

- NOT NULL will ensure at least some value should be present in a column

UNIQUE

- → It will not allow any duplicates in a column
- → UNIQUE column can take multiple NULL (s)

Primary Key

- → It is the combination of NOT NULL and UNIQUE
- → Only one PK is allowed in a table
- → PK identifies a record uniquely in a table
- → Creation of PK is not mandatory, but it is highly recommended to create

Foreign Key

- → FK creates relationship between any two tables
- → FK is also called as referential integrity constraints

→ FK is created on the child table

→ FK can take both NULL and duplicate values

→ To create FK, the master table should have PK defined on the common column of the master table

→ We can have more than 1 FK in a given table

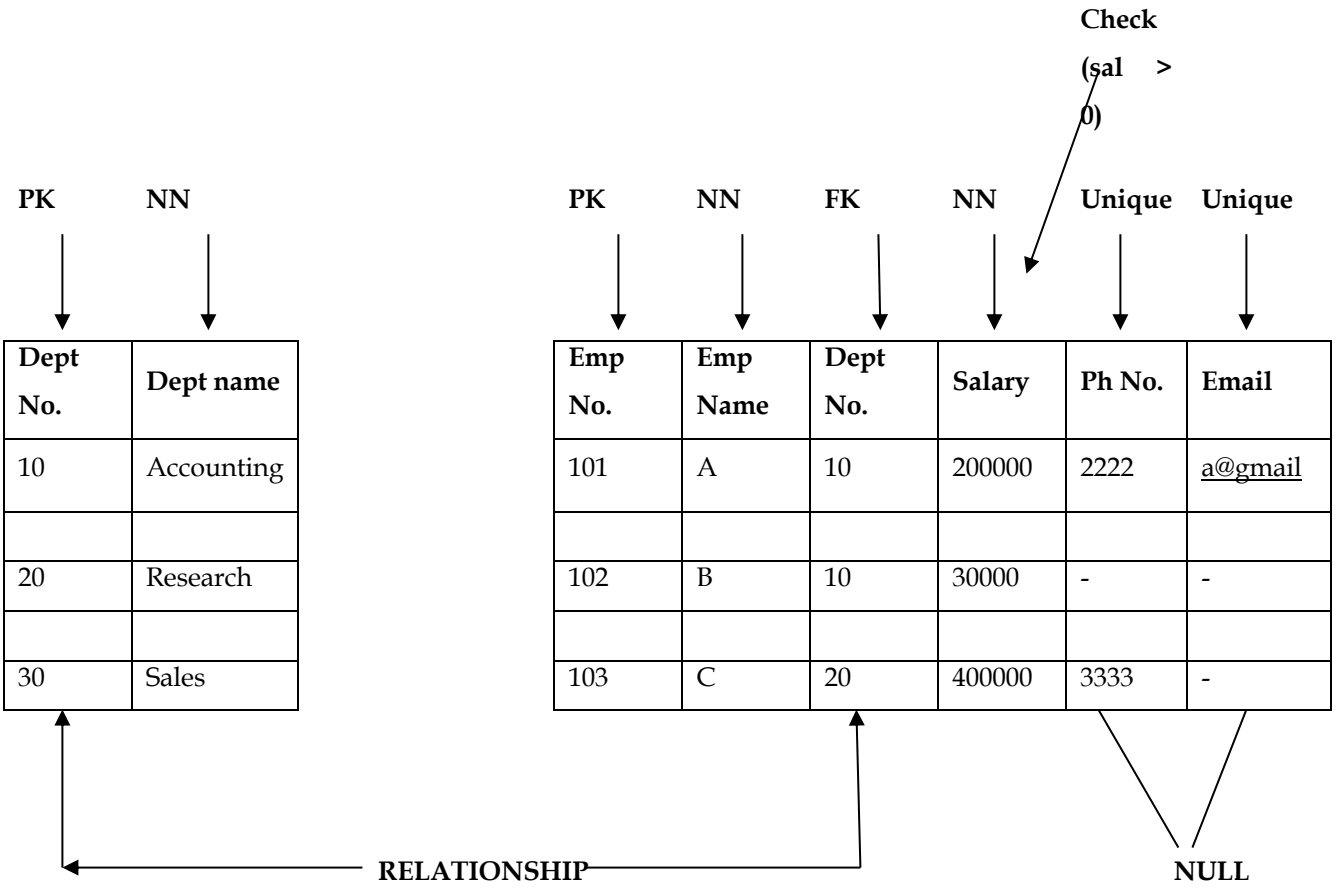
CHECK

It is used to provide additional validations as per the customer requirements.

Ex - 1) sal > 0

2) empnum should start with 1

3) commission should be between 1000 & 5000



History of SQL

In the early 80's relational model was quite popular, IBM used relational model and develop an RDBMS.

To communicate or to interact with system they developed Query language called SEQUEL (simple English query language)

All the industries started using SEQUEL, then ANSI (American National Standard Institute) took SEQUEL they made it a standard language.

SEQUAL was renamed as structured query language (SQL)

SQL was made the standard language to communicate with RDBMS.

SQL – it is a language to talk to the database / to access the database

SQL – it is a language, whereas SQL server is a database.
To work on SQL , a DB software (RDBMS) is required.

SQL is not case sensitive

Username - Scott
Password – Tiger

Projection: -

SQL statement consist of multiple clause, each clause is a sub program which can accept argument as input.

Syntax: select * /[distinct] column name/ expression[alias]

From <table_name>;

1. From clause will execute first.
2. For from clause we can pass table name as an argument.
3. Select clause will execute after from clause.
4. For select clause we can pass asterisk symbol, column name or expression as an argument.
5. Select clause is used to select a column or expression from the table which is achieved by from clause.
6. Select clause is responsible to prepare the result set

Expression:

Expression is something which gives result.

Selection: -

- ✓ Selection is a processer retrieval of data by selecting both rows as well as columns.
- ✓ From clause is use to select the table from the data base and put it under execution
- ✓ Select clause is use to select the column present in the table which is under execution.
- ✓ There is a clause which is use to select the records that is where clause.

```
SQL> select * from tab;

TNAME                          TABTYPE  CLUSTERID
------------------------------ ------- ----------
DEPT                           TABLE
EMP                            TABLE
BONUS                          TABLE
SALGRADE                       TABLE
```

This query gives the list of tables.
* - selects all

```
SQL> desc dept ;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 DEPTNO                                    NOT NULL NUMBER(2)
 DNAME                                              VARCHAR2(14)
 LOC                                                VARCHAR2(13)
```

This query gives the description of the table "department".
The description of the table has **column names, constraints, datatypes**

```
SQL> select * from dept;

    DEPTNO DNAME          LOC
---------- -------------- -------------
        10 ACCOUNTING     NEW YORK
        20 RESEARCH       DALLAS
        30 SALES          CHICAGO
        40 OPERATIONS     BOSTON
```

This query gives the description of the table "department"

```
SQL> select * from emp ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM
---------- ---------- --------- ---------- --------- ---------- ----------
    DEPTNO
----------
      7369 SMITH      CLERK           7902 17-DEC-80        800
        20

      7499 ALLEN      SALESMAN        7698 20-FEB-81       1600        300
        30

      7521 WARD       SALESMAN        7698 22-FEB-81       1250        500
        30


     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM
---------- ---------- --------- ---------- --------- ---------- ----------
    DEPTNO
----------
      7566 JONES      MANAGER         7839 02-APR-81       2975
        20
```

The above query gives the description of the "employee" table. But we see that all the data is in different lines which makes it very difficult to analyse.
So we use the following command to see the data in a more orderly fashion,

```
SQL> set linesize 120 ;
SQL> select * from emp ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7369 SMITH      CLERK           7902 17-DEC-80        800                    20
      7499 ALLEN      SALESMAN        7698 20-FEB-81       1600        300         30
      7521 WARD       SALESMAN        7698 22-FEB-81       1250        500         30
      7566 JONES      MANAGER         7839 02-APR-81       2975                    20
      7654 MARTIN     SALESMAN        7698 28-SEP-81       1250       1400         30
      7698 BLAKE      MANAGER         7839 01-MAY-81       2850                    30
      7782 CLARK      MANAGER         7839 09-JUN-81       2450                    10
      7788 SCOTT      ANALYST         7566 19-APR-87       3000                    20
      7839 KING       PRESIDENT            17-NOV-81       5000                    10
      7844 TURNER     SALESMAN        7698 08-SEP-81       1500          0         30
      7876 ADAMS      CLERK           7788 23-MAY-87       1100                    20

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7900 JAMES      CLERK           7698 03-DEC-81        950                    30
      7902 FORD       ANALYST         7566 03-DEC-81       3000                    20
      7934 MILLER     CLERK           7782 23-JAN-82       1300                    10

14 rows selected.
```

The **"set linesize"** command helps in increasing the line size , thus the data is arranged in a orderly fashion.

```
SQL>  set pagesize 20 ;
SQL> select * from emp ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7369 SMITH      CLERK            7902 17-DEC-80        800                    20
      7499 ALLEN      SALESMAN         7698 20-FEB-81       1600        300         30
      7521 WARD       SALESMAN         7698 22-FEB-81       1250        500         30
      7566 JONES      MANAGER          7839 02-APR-81       2975                    20
      7654 MARTIN     SALESMAN         7698 28-SEP-81       1250       1400         30
      7698 BLAKE      MANAGER          7839 01-MAY-81       2850                    30
      7782 CLARK      MANAGER          7839 09-JUN-81       2450                    10
      7788 SCOTT      ANALYST          7566 19-APR-87       3000                    20
      7839 KING       PRESIDENT             17-NOV-81       5000                    10
      7844 TURNER     SALESMAN         7698 08-SEP-81       1500          0         30
      7876 ADAMS      CLERK            7788 23-MAY-87       1100                    20
      7900 JAMES      CLERK            7698 03-DEC-81        950                    30
      7902 FORD       ANALYST          7566 03-DEC-81       3000                    20
      7934 MILLER     CLERK            7782 23-JAN-82       1300                    10

14 rows selected.
```

The above command **"set pagesize 20"** increases the page size, thus accommodating more number of rows in a single page.

```
SQL> select ename, job, sal
  2  from emp ;

ENAME      JOB              SAL
---------- --------- ----------
SMITH      CLERK             800
ALLEN      SALESMAN         1600
WARD       SALESMAN         1250
JONES      MANAGER          2975
MARTIN     SALESMAN         1250
BLAKE      MANAGER          2850
CLARK      MANAGER          2450
SCOTT      ANALYST          3000
KING       PRESIDENT        5000
TURNER     SALESMAN         1500
ADAMS      CLERK            1100
JAMES      CLERK             950
FORD       ANALYST          3000
MILLER     CLERK            1300

14 rows selected.
```

The above query gives the value of only these 3 columns from the table "employee".

Where clause: -

'where' clause is used to restrict the number of records displayed. It gives only the records of the specified condition.

or

Where clause is used to filter the records present in the table.

Syntax: select * /[distinct] column /expression [alias]

From < table_name>

Where <filter condition>;

Order of execution

1. **From clause**
2. **Where cause**
3. **Select clause**

- ✓ **Where clause execute row by row**
- ✓ **Where clause can accept multiple conditions**
- ✓ **For where clause we can pass filter condition or multiple condition**

Ex: - select *

From emp

Where sal>200;

```
SQL> select * from emp where sal = 3000 ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7788 SCOTT      ANALYST         7566 19-APR-87       3000                    20
      7902 FORD       ANALYST         7566 03-DEC-81       3000                    20
```

Any string data should be enclosed within **single quotes** (' ') and the same becomes **case sensitive**.

```
SQL> select * from emp where job='MANAGER' ;
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7566	JONES	MANAGER	7839	02-APR-81	2975		20
7698	BLAKE	MANAGER	7839	01-MAY-81	2850		30
7782	CLARK	MANAGER	7839	09-JUN-81	2450		10

Assignment

1) List the employees in dept 20

```
SQL> select * from emp where deptno = 20 ;
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7369	SMITH	CLERK	7902	17-DEC-80	800		20
7566	JONES	MANAGER	7839	02-APR-81	2975		20
7788	SCOTT	ANALYST	7566	19-APR-87	3000		20
7876	ADAMS	CLERK	7788	23-MAY-87	1100		20
7902	FORD	ANALYST	7566	03-DEC-81	3000		20

2) List the employees earning more than Rs 2500.

```
SQL> select * from emp where sal > 2500 ;
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7566	JONES	MANAGER	7839	02-APR-81	2975		20
7698	BLAKE	MANAGER	7839	01-MAY-81	2850		30
7788	SCOTT	ANALYST	7566	19-APR-87	3000		20
7839	KING	PRESIDENT		17-NOV-81	5000		10
7902	FORD	ANALYST	7566	03-DEC-81	3000		20

3) Display all salesmen

```
SQL> select * from emp where job= 'SALESMAN' ;
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7499	ALLEN	SALESMAN	7698	20-FEB-81	1600	300	30
7521	WARD	SALESMAN	7698	22-FEB-81	1250	500	30
7654	MARTIN	SALESMAN	7698	28-SEP-81	1250	1400	30
7844	TURNER	SALESMAN	7698	08-SEP-81	1500	0	30

Questions

1. WAQTD name, salary and annual salary of an employee who is working as sales man.
2. WAQTD ename, job, hired date of all employes who is working in department no. 10
3. WAQTD ename, job, MGR no. of all the employee who are working in department 30 and having salary of 3000
4. WAQTD ename, dept no. comm. And sal of smith.

5. WAQTD name of an employee who is working in department 10 and having salary greater than 1500
6. WAQTD name of an employee who is having salary greater than 950 and working as cleark
7. WAQTD department name and location from department table
8. List the employees in dept 20
9. List the employees earning more than Rs 2500.
10. Display all salesmen

Operators

Operators are classified into,

- **Arithmetic Operators** (+, - , * , /)
- **Relational Operators** (> , < , >= , <= , = , <> or != - not equals to)
- **Logical Operators** (NOT, AND, OR)
- **Special Operators** (IN , LIKE , BETWEEN , IS)

  NOT IN, NOT LIKE, NOT BETWEEN, NOT IS

Questions

1. WAQTD name, salary and job of all the employees working as clerk with a salary greater than 1500.

Ename, Salary, JOB

JOB = clerk

Sal>1500

Select ename, sal, job

From emp

Where sal>1500 AND JOB='CLERK';

2. WAQTD name, hire date and salary of the employees who gets a salary greater that 1250 and hired before 19-nov-82
3. WAQTD name and designation of all those employees who were hired after 1981 and before 1986

   Select ename, job,

   From emp

   Where hireddate>31 dec -81 and hiredate< 01-jan-86
4. WAQTD all the details of employees who work as sales man or manager in department no 10 or 20

   (Sales man or manager) and ()

   Dept no = 10 or 20

Sales man or manager in dept 10 or 20

Select *

From emp

Where (job='salesman' or job= ' manager')and (deptno.= 10 or deptno.= 20);

5. Display "Mr 'ENAME' gets a salary of rupees 'SAL' and works as 'JOB' in department no. 'DEPTNO'"

   ⇨ **Here we use concatenation operator (||)**

   Select "'Mr '||ename||'gets a salary of rupees '||sal||' and works as'||job||'in dept no'||deptno.|| "

   From emp;

6. WAQTD details of all employees who work as clerk or manager or salesman in department no. 10 or 20 or 30

   Select *

   From emp

   Where job IN (clerk, manager,salesman) and dept no. IN (10,20,30);

7. WAQTD ename, dept. no. and designation of all the employees who are reporting to 7782

Special Operators

IN operators: it is used for evaluating multiple values.

In operator is a multi value operator which can accept one value at the LHS and multiple values at RHS.

We can provide upto 1000 values at the max

Syntax: column name IN (v1, v2, v3, …….,vn);

Ex – 1) List the employees in dept 10 or 20

```
SQL> select * from emp where deptno in (10 , 20 ) ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7369 SMITH      CLERK           7902 17-DEC-80        800                    20
      7566 JONES      MANAGER         7839 02-APR-81       2975                    20
      7782 CLARK      MANAGER         7839 09-JUN-81       2450                    10
      7788 SCOTT      ANALYST         7566 19-APR-87       3000                    20
      7839 KING       PRESIDENT            17-NOV-81       5000                    10
      7876 ADAMS      CLERK           7788 23-MAY-87       1100                    20
      7902 FORD       ANALYST         7566 03-DEC-81       3000                    20
      7934 MILLER     CLERK           7782 23-JAN-82       1300                    10

8 rows selected.
```

2) List all the clerks or analysts

```
SQL> select * from emp where job in ('CLERK', 'ANALYST' ) ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7369 SMITH      CLERK           7902 17-DEC-80        800                    20
      7788 SCOTT      ANALYST         7566 19-APR-87       3000                    20
      7876 ADAMS      CLERK           7788 23-MAY-87       1100                    20
      7900 JAMES      CLERK           7698 03-DEC-81        950                    30
      7902 FORD       ANALYST         7566 03-DEC-81       3000                    20
      7934 MILLER     CLERK           7782 23-JAN-82       1300                    10

6 rows selected.
```

1. WAQTD name and job of a employee who work in dept. 10 or 20 or 40

2) LIKE – used for pattern matching

% **(percentage) -** matches 0 or ‘n’ characters

_ **(underscore)** - matches exactly one character

Ex – 1) <u>List all the employees whose name starts with 'S'</u>

Select *

From emp

Where ename like 's%'

```
SQL> select * from emp where ename like 'S%' ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7369 SMITH      CLERK           7902 17-DEC-80        800                    20
      7788 SCOTT      ANALYST         7566 19-APR-87       3000                    20
```

Whenever we use % or _, always ensure that it is preceded by the word **'like'**

2) <u>List the employees whose name is having letter 'L' as 2nd character</u>

```
SQL> select * from emp where ename like '_L%' ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7499 ALLEN      SALESMAN        7698 20-FEB-81       1600        300         30
      7698 BLAKE      MANAGER         7839 01-MAY-81       2850                    30
      7782 CLARK      MANAGER         7839 09-JUN-81       2450                    10
```

ASSIGNMENT

1) List the employees whose name is having at least 2 L's
2) List the employees whose name is having letter 'E' as the last but one character
3) List all the employees whose name is having letter 'R' in the 3rd position
4) List all the employees who are having exactly 5 characters in their job
5) List the employees whose name is having at least 5 characters

3) BETWEEN operator – used for searching based on range of values.

Select *

From emp

Where sal between 200 and 300;

Ex – 1) List the employees whose salary is between 200 and 300

```
SQL> select * from emp where
  2  sal between 2000 and 3000 ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7566 JONES      MANAGER         7839 02-APR-81       2975                    20
      7698 BLAKE      MANAGER         7839 01-MAY-81       2850                    30
      7782 CLARK      MANAGER         7839 09-JUN-81       2450                    10
      7788 SCOTT      ANALYST         7566 19-APR-87       3000                    20
      7902 FORD       ANALYST         7566 03-DEC-81       3000                    20
```

4) IS operator – it is used to compare null values

Ex – 1) List all the employees whose commission is null

Select *

From emp

Where comm IS null;

```
SQL> select * from emp where comm is null ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7369 SMITH      CLERK           7902 17-DEC-80        800                    20
      7566 JONES      MANAGER         7839 02-APR-81       2975                    20
      7698 BLAKE      MANAGER         7839 01-MAY-81       2850                    30
      7782 CLARK      MANAGER         7839 09-JUN-81       2450                    10
      7788 SCOTT      ANALYST         7566 19-APR-87       3000                    20
      7839 KING       PRESIDENT            17-NOV-81       5000                    10
      7876 ADAMS      CLERK           7788 23-MAY-87       1100                    20
      7900 JAMES      CLERK           7698 03-DEC-81        950                    30
      7902 FORD       ANALYST         7566 03-DEC-81       3000                    20
      7934 MILLER     CLERK           7782 23-JAN-82       1300                    10

10 rows selected.
```

ASSIGNMENT

1) List all the employees who don't have a reporting manager

```
SQL> select * from emp where mgr is null ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7839 KING       PRESIDENT            17-NOV-81       5000                    10
```

LOGICAL OPERATORS

1) List all the salesmen in dept 30

2) List all the salesmen in dept number 30 and having salary greater than 1500

3) List all the employees whose name starts with 's' or 'a'

4) List all the employees except those who are working in dept 10 or 20.

5) List the employees whose name does not start with 'S'

Select *

From emp

Where ename not like 's%'

6) <u>List all the employees who are having reporting managers in dept 10</u>

Select *

From emp

Where mgr not IS null and dept no.=10;

<u>ASSIGNMENT</u>

1) List the employees who are not working as managers and clerks in dept 10 and 20 with a salary in the range of 1000 to 3000
   JOB = Manager and clerks
   Dept no = 10 and 20
   Sal 1000 to 3000

   Select *
   From emp
   Where (job = 'manager, job='clerk') and (deptno=10, deptno=20) and sal between 1000 to 3000;

2) List the employees whose salary not in the range of 1000 to 2000 in dept 10,20,30 except all salesmen
   Sal not in between 1000 to 2000

Dept no = 10, 20,30

Job <> saleseman

Where (sal not between 1000 and 2000) and (deptno in (10,20,30)) and (job <> salesman));

3) List the department names which are having letter 'O' in their locations

Select *

From dept

Where loc like '%o%';

ALIAS: -

- ✓ Alias is a name given to a expression or to the column present in the result table.
- ✓ We can write alias name with or without using **as** key work
- ✓ If column name requires a space between two words then it is mandatory to enclose the name with double cote (" ")
- ✓ Syntax:

Select <*/column/expression> as <alilas name>

From <table name>;

Q. WAQTD name of an employ, his salary as Monthly salary and his designation of all the employees.

Select Ename, Sal as "SALARY of an Employee", job

From emp;

Q. WAQTD name of an employ, his annual salary as Annual Salary and his designation for all the employees.

Select Ename, sal* 12 as "Annual Salary", job
From emp;

SORTING

It arranges the data either in ascending / descending order
Ascending – ASC / Descending – DESC
We can sort the data using **ORDER BY**

By default, the data is always arranged in ASC order

Syntax:
Select <*/column/expression>
From <table name>
Where <filter condition>
Order by <column name> asc/desc;

For ex – 1) Arrange all the employees by their salary
Select *
From emp
Order by sal asc;

```
SQL> select * from emp
  2  order by sal;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7369 SMITH      CLERK            7902 17-DEC-80        800                    20
      7900 JAMES      CLERK            7698 03-DEC-81        950                    30
      7876 ADAMS      CLERK            7788 23-MAY-87       1100                    20
      7521 WARD       SALESMAN         7698 22-FEB-81       1250        500         30
      7654 MARTIN     SALESMAN         7698 28-SEP-81       1250       1400         30
      7934 MILLER     CLERK            7782 23-JAN-82       1300                    10
      7844 TURNER     SALESMAN         7698 08-SEP-81       1500          0         30
```

```
      7499 ALLEN      SALESMAN        7698 20-FEB-81       1600        300         30
      7782 CLARK      MANAGER         7839 09-JUN-81       2450                    10
      7698 BLAKE      MANAGER         7839 01-MAY-81       2850                    30
      7566 JONES      MANAGER         7839 02-APR-81       2975                    20
      7788 SCOTT      ANALYST         7566 19-APR-87       3000                    20
      7902 FORD       ANALYST         7566 03-DEC-81       3000                    20
      7839 KING       PRESIDENT            17-NOV-81       5000                    10

14 rows selected.
```

2) Arrange all the employees by their salary in the descending order

```
SQL> select * from emp
  2  order by sal desc;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7839 KING       PRESIDENT            17-NOV-81       5000                    10
      7902 FORD       ANALYST         7566 03-DEC-81       3000                    20
      7788 SCOTT      ANALYST         7566 19-APR-87       3000                    20
      7566 JONES      MANAGER         7839 02-APR-81       2975                    20
      7698 BLAKE      MANAGER         7839 01-MAY-81       2850                    30
      7782 CLARK      MANAGER         7839 09-JUN-81       2450                    10
      7499 ALLEN      SALESMAN        7698 20-FEB-81       1600        300         30
      7844 TURNER     SALESMAN        7698 08-SEP-81       1500          0         30
      7934 MILLER     CLERK           7782 23-JAN-82       1300                    10
      7521 WARD       SALESMAN        7698 22-FEB-81       1250        500         30
      7654 MARTIN     SALESMAN        7698 28-SEP-81       1250       1400         30
      7876 ADAMS      CLERK           7788 23-MAY-87       1100                    20
      7900 JAMES      CLERK           7698 03-DEC-81        950                    30
      7369 SMITH      CLERK           7902 17-DEC-80        800                    20

14 rows selected.
```

3) Arrange ename, sal, job, empno and sort by descending order of salary

Select ename, sal, job, empno
From emp
Order by 2 desc;

1. **From**
2. **Select**
3. **Order by**

```
SQL> select ename, sal, job, empno
  2  from emp
  3  order by 2 desc ;

ENAME              SAL JOB             EMPNO
---------- ---------- --------- ----------
KING             5000 PRESIDENT       7839
FORD             3000 ANALYST         7902
SCOTT            3000 ANALYST         7788
JONES            2975 MANAGER         7566
BLAKE            2850 MANAGER         7698
CLARK            2450 MANAGER         7782
ALLEN            1600 SALESMAN        7499
TURNER           1500 SALESMAN        7844
MILLER           1300 CLERK           7934
WARD             1250 SALESMAN        7521
MARTIN           1250 SALESMAN        7654
ADAMS            1100 CLERK           7876
JAMES             950 CLERK           7900
SMITH             800 CLERK           7369

14 rows selected.
```

In the above query we have – **order by 2** – thus it arranges only the 2nd column 'salary' in the descending order.
Thus to arrange the specific columns in order – we must have to specify the column number.

NOTE :- **ORDER BY** should be used always as the last statement in the SQL query.

Distinct clause:

Distinct clause is used to remove the duplicate records from the column.

Syntax :

Select distinct <column name>

From <table name>;

Select distinct sal

From emp

Selecting DISTINCT VALUES

```
SQL> select distinct deptno
  2  from emp ;

    DEPTNO
----------
        30
        20
        10
```

The above query arranges all the distinct values of department number.

Functions

Function is a block of code which is used to perform particular operation or task

Any functions involves 3 things

1. Function name
2. No. of argument / type of argument
3. Return type

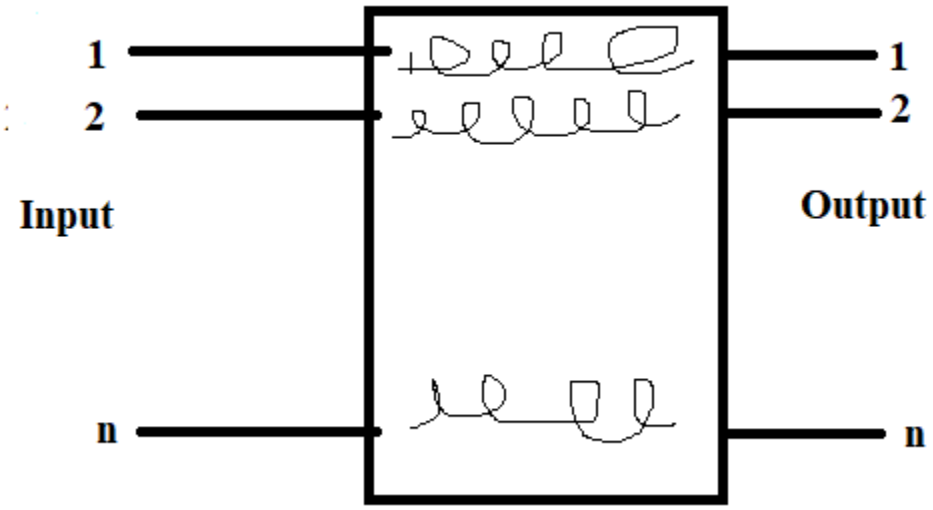
There are 2 types of functions in SQL

1. Single row function
2. Multi row function or group function or aggregate function

Single row function:

Single row function is the functions which will execute for each and every row and generate results or output for each row.

If n No. of input's are given the function will generate 'n' No. of output

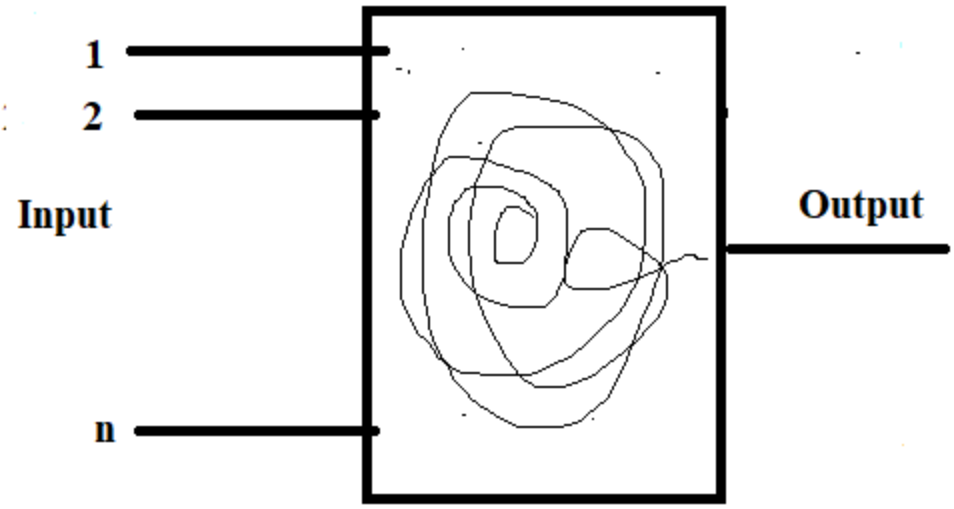


In single row function executes row by row.

Multi row function:

Multi row function is the function which will aggregate (combine) all the inputs and executes only one hence aggregating one output.

If there are n No. of inputs multi function will written single output



List of multi row functions

1. MAX() – returns maximum value
2. MIN() –returns minimum value
3. SUM() – returns total value
4. AVG() – returns average value
5. COUNT() – returns no. of records

   Count is a multi row function for which we can pass any column name.

Note: Multi row functions will ignore null values

Ex –

1) display the maximum salary, minimum salary and total salary of all the employee

```
select max(sal) as "Maximum Salary", min(sal) as "Minimum Salary ", sum(sal) Total
from emp;
```

3.

```
select count (empno) as "Total No. of employees"
form emp
```

```
SQL> select max(sal), min(sal), sum(sal) from emp;

  MAX(SAL)   MIN(SAL)   SUM(SAL)
---------- ---------- ----------
      5000        800      29025
```

To give aliases for the columns :-

```
SQL> select max(sal) "high",
  2  min(sal) "low",
  3  sum(sal) "total"
  4  from emp ;

      high        low      total
---------- ---------- ----------
      5000        800      29025
```

3) The below query gives the total number of employees

```
SQL> select count(*), count(empno)
  2  from emp ;

  COUNT(*) COUNT(EMPNO)
---------- ------------
        14           14
```

4) The below query gives the number of employees who have commission

```
SQL> select count(*), count(comm)
  2  from emp ;

  COUNT(*) COUNT(COMM)
---------- ------------
        14            4
```

6) List the number of employees in department 30

Select count(*)
From emp
Where deptno=30;

```
SQL> select count(*) from emp
  2  where deptno = 30 ;

  COUNT(*)
----------
         6
```

Assignment:

1. WAQTD maximum salary of an employee and his name, job who is working as salesman
2. Display the total salary in department 3
3. List the number of clerks in department 20
4. List the highest and lowest salary earned by salesmen
5. WAQTD minimum salary of an employee who works in Dept. No. 20 or 30.
6. WAQTD average salary needed to pay all the employees who are working as a clerk.
7. WAQT find the total salary of all the employees who are working as analyst or president.
8. WADTD No. of people who are working as salesman with a salary of more than 1500.

GROUPING

Group by clause:

1. Group by clause is used to group the records present in the table
2. Group by clause executes row by row
3. After the execution of group by clause, the records are grouped.
4. After the execution of group by clause all the other clause will execute group by group.
5. In select clause we can use only group by expression and multi row functions which will be executed after group by clause.

Syntax: select <group_by expression / multi row function>
From <table name>
Where <filter condition>
Group by <column name or expression>;

Example:

Select class, count(*)

From student

Group by class;

class	Count()

SID	Sname	class
1	A	11
2	B	12
3	C	12
4	D	10
5	E	10
6	F	11

1	A	11
6	F	11
2	B	12
3	C	12

12

4	D	10
5	E	10

10

11	2
12	2
10	2

For ex – 1) <u>Display the total salary of all departments</u>

```
SQL> select deptno, sum(sal)
  2  from emp
  3  group by deptno ;

    DEPTNO   SUM(SAL)
---------- ----------
        30       9400
        20      10875
        10       8750
```

2) <u>Display the maximum salary of each job</u>

```
SQL> select job, max(sal)
  2  from emp
  3  group by job ;

JOB         MAX(SAL)
--------- ----------
CLERK           1300
SALESMAN        1600
PRESIDENT       5000
MANAGER         2975
ANALYST         3000
```

<u>HAVING</u>

'Having' is used to filter the grouped data.
'Where' is used to filter the non grouped data.

'**Having'** should be used after **group by** clause
'Where' should be used before **group by** clause

For ex – 1) <u>Display job-wise highest salary only if the highest salary is more than Rs1500</u>

```
SQL> select job, max(sal)
  2  from emp
  3  group by job
  4  having max(sal) > 1500 ;

JOB         MAX(SAL)
--------- ----------
SALESMAN        1600
PRESIDENT       5000
MANAGER         2975
ANALYST         3000
```

2) <u>Display job-wise highest salary only if the highest salary is more than 1500 excluding department 30. Sort the data based on highest salary in the ascending order.</u>

Group by job
Max(sal)>1500
Deptno<>30
Orderby sal

```
SQL> select job, max(sal)
  2  from emp
  3  where deptno <>30
  4  group by job
  5  having max(sal) >1500
  6  order by 2 ;

JOB         MAX(SAL)
--------- ----------
MANAGER         2975
ANALYST         3000
PRESIDENT       5000
```

<u>RESTRICTIONS ON GROUPING</u>
- we can select only the columns that are part of '**group by'** statement
If we try selecting other columns, we will get an error as shown below,

```
SQL> select deptno, job, sum(sal), sum(comm)
  2  from emp
  3  group by deptno ;
select deptno, job, sum(sal), sum(comm)
               *
ERROR at line 1:
ORA-00979: not a GROUP BY expression
```

The above query is an error because '**job**' is there in the **select** query but not in the **group by** query.
If it is enclosed in any of the **group functions like sum(sal)** etc – then it is not an error. But whatever table is included in the **select** query must also be included in the **group by** query.

The above problem can be overcome with the following query as shown below,

```
SQL>  select deptno, job, sum(sal), sum(comm)
  2   from emp
  3   group by deptno, job ;

    DEPTNO JOB         SUM(SAL)  SUM(COMM)
---------- --------- ---------- ----------
        20 CLERK           1900
        30 SALESMAN        5600       2200
        20 MANAGER         2975
        30 CLERK            950
        10 PRESIDENT       5000
        30 MANAGER         2850
        10 CLERK           1300
        10 MANAGER         2450
        20 ANALYST         6000

9 rows selected.
```

The below query is also correct to rectify the above error,

```
  1  select deptno, sum(sal), sum(comm)
  2  from emp
  3  group by deptno, job
  4* order by deptno
SQL> /

    DEPTNO   SUM(SAL)  SUM(COMM)
---------- ---------- ----------
        10       1300
        10       2450
        10       5000
        20       6000
        20       1900
        20       2975
        30        950
        30       2850
        30       5600       2200

9 rows selected.
```

Whatever is there in the **select** statement must be there in the **group by** statement. But, whatever is there in the **group by** statement need not be present in the **select** statement. This is shown in the above two corrected queries.

ASSIGNMENT

1) Display the department numbers along with the number of employees in it

```
SQL> select deptno, count(*)
  2  from emp
  3  group by deptno
  4  order by deptno ;

    DEPTNO   COUNT(*)
---------- ----------
        10          3
        20          5
        30          6
```

2) Display the department numbers which are having more than 4 employees in them

```
SQL> select deptno from emp
  2  group by deptno
  3  having count(*) >4
  4  order by deptno ;

    DEPTNO
----------
        20
        30
```

3) Display the maximum salary for each of the job excluding all the employees whose name ends with 'S'

```
SQL>  select ename, job, min(sal)
  2   from emp
  3   where ename not like '%S'
  4   group by ename, job
  5  order by 3 ;

ENAME      JOB         MIN(SAL)
---------- --------- ----------
SMITH      CLERK            800
MARTIN     SALESMAN        1250
WARD       SALESMAN        1250
MILLER     CLERK           1300
TURNER     SALESMAN        1500
ALLEN      SALESMAN        1600
CLARK      MANAGER         2450
BLAKE      MANAGER         2850
FORD       ANALYST         3000
SCOTT      ANALYST         3000
KING       PRESIDENT       5000

11 rows selected.
```

4) Display the department numbers which are having more than 9000 as their departmental total salary

```
SQL>  select deptno, sum(sal)
  2   from emp
  3   group by deptno
  4   having sum(sal) >9000
  5  order by 1 ;

    DEPTNO   SUM(SAL)
---------- ----------
        20      10875
        30       9400
```

Difference between where and having clause

Where	having
1. Where clause is used to filter the records in the table	1. Having clause is used to filter the groups
2. Where clause execute row by row	2. Having clause execute group by group
3. We cannot use multi row function in where clause	3. We can use multi row function
4. Where clause execute before group by	4. Having clause execute after group by
5. In where clause we can write any filter condition	6. In having we can have only group by expression and conditions with multi row function

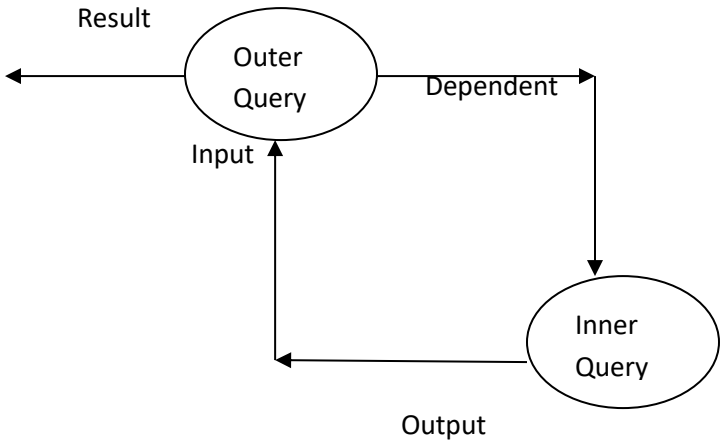
Order of execution

1. From
2. Where
3. Group by
4. Having
5. Select

Sub Query:

A query written inside another query is known as sub query.

Working principle / Procedure



1. The inner query will execute first
2. The inner query generates an output, which is given as an input to the outer query.
3. With this input the outer query executes completely. Hence, generates the result.
4. The outer query cannot execute without the inner query (the outer query is dependent on inner query)

When do we use sub query?

- ⇨ Case I :- whenever we have unknown we go for sub query
  Example : - WAQTD details of all the employees whose salary is greater that FORD salary

  Details of all the employees
  Sal > fords sal

```
Select *
    From emp
    Where sal > (select sal
                 From emp
                 Where ename='FORD' );
```

- ⇨ Case ii : - whenever the condition to be executed is in one table and the data to be displayed is from another table

  Example :- WAQTD Dept. name of SMITH

```
Select dname
From dept
Where deptno= (select deptno
                From emp
                Where ename='SMITH');
```

Questions: -

1. WAQTD name and dept no. of all the employees who are working in the same dept. in which JONES is working
   - ⇨ Ename, Dept NO.

```
Select Ename , deptno
From emp
Where deptno =  (Select deptno
                 From emp
                 Where ename =jones);
```

2. WAQTD name and job of all the employees who are working in the same designation in which SMITH works.
3. WAQTD name, hire date of all the employees who were hired after and before WARD
4. WAQTD dept.name of all the employee whose salary is greater than 1300.
5. WAQTD names of all the employees who are working in sales dept.
6. WAQTD details of employees whose dept name ending with 's'
7. WAQTD the employees name who is having maximum salary in dept. name 'ACCOUNTING'

Types of sub query

There are 2 types of sub query

1. Single row sub query
2. Multi row sub query

Single row sub query: -

If the inner query written exactly one record then it is called as single row sub query.

In single row sub query all the comparison operators can be used (=, >, <, >=, <=, <>)

Multi row sub query: -

If the inner query written more than one record then it is called as multi row sub query.

In multi row sub query we cannot use the comparison operator directly therefore we have 2 operators they are

i. ALL
ii. ANY

ALL : -

ALL operators is a multi valued relational operator which will written true only if all of the values that is compared is true.

If any of the value is false then it written false

Syntax: **column_name relational_operator ALL(v1, v2, v3, …….vn)**

ANY: -

ANY operator is a multi valued relational operator it will write true if any of the values that has compared is true.

Syntax: **column_name relational_operator ANY(v1, v2, v3, …….vn)**

Nested Sub Query

We can nest a sub query to the where clause 255 times

Q. WAQTD 4th maximum salary of the employees

```
Select max(sal)
From emp
Where sal< (Select max(sal)
            from emp
           Where sal< (Select max(sal)
                       From emp
                        Where sal< (Select max(sal)


                                    From emp)  ));
```

(9, 5, 4, 1, 7, 3, 2, 6, 8)

```
Select max(sal)
From emp
Where sal<(10
```

questions.

1. WAQTD 2nd min salary of an employee
2. WAQTD 5th max SALARY of an employee
3. WAQTD hire date of all the employees working in location 'DALLAS'
4. WAQTD all the details of employee who are reporting to 'KING'
5. WAQTD details of all the employees who are acting as manager
6. WAQTD name of all the employees who gets 3rd max sales man among all the sales mans

JOIN

Merging of two or more tables horizontally is known as Joins
Q. Why do we need Join's?
➔ To retrieve the data from multiple tables we use join's.
When we have to retrieve the data from 2 tables then we perform join.

Note: - from clause is responsible to merge the table

Types of Join's

1. Cartesian join or cross join
2. Inner join or equi join
3. Outer join
    i. left outer join or left join
    ii. right outer join or right join
    iii. full outer join or full join
4. self join

1. **Cartesian join or cross joins: -**

If we join 2 tables, records from one table is merged with each and every records present in the other table is known as Cartesian join or cross join.

Ex. Let us consider 2 tables T1 and T2 with columns each and m, n as no. of rows respectively

T1

A1	**B1**
A	10
B	20
C	30

T2

A2	**B2**
B	200
C	300
D	400

If we perform a Cartesian join on table T1 and T2 the newly obtain table will have 4 columns and m X n no. of rows.

Note: -

1. Cartesian join has valid as well as invalid pairs.
2. Cartesian join as a universal set as it is having all the possible combinations.

T1 X T2 only when A2 = B

A1	B1	A2	B2
A	10	B	200
A	10	C	300
A	10	D	400
B	20	B	200
B	20	C	300
B	20	D	400
C	30	B	200
C	30	C	300
C	30	D	400

m X n = 3 X 3 = 9

Syntax for Cartesian join: -

1. ANSI syntax : -
   Select */column/expression
   From table1 cross join table2;

Eg. Select *

From T1 cross join T2;

2. Oracle syntax:-
   Select */column/expression
   From table1, table2,…..;

Eg. Select *

From T1, T2, T3,….;

For ex, let us consider the following query
Display employee name along with the department name

```
SQL> select A.ename, A.sal, B.dname
  2  from emp A, dept B ;
```

ENAME	SAL	DNAME
SMITH	800	ACCOUNTING
ALLEN	1600	ACCOUNTING
WARD	1250	ACCOUNTING
JONES	2975	ACCOUNTING
MARTIN	1250	ACCOUNTING
BLAKE	2850	ACCOUNTING
CLARK	2450	ACCOUNTING
SCOTT	3000	ACCOUNTING
KING	5000	ACCOUNTING
TURNER	1500	ACCOUNTING
ADAMS	1100	ACCOUNTING
JAMES	950	ACCOUNTING
FORD	3000	ACCOUNTING
MILLER	1300	ACCOUNTING
SMITH	800	RESEARCH
ALLEN	1600	RESEARCH
WARD	1250	RESEARCH
JONES	2975	RESEARCH
MARTIN	1250	RESEARCH
BLAKE	2850	RESEARCH
CLARK	2450	RESEARCH
SCOTT	3000	RESEARCH
KING	5000	RESEARCH
TURNER	1500	RESEARCH
ADAMS	1100	RESEARCH
JAMES	950	RESEARCH
FORD	3000	RESEARCH
MILLER	1300	RESEARCH
SMITH	800	SALES
ALLEN	1600	SALES
WARD	1250	SALES
JONES	2975	SALES
MARTIN	1250	SALES
BLAKE	2850	SALES

```
ENAME             SAL DNAME
---------- ---------- --------------
CLARK             2450 SALES
SCOTT             3000 SALES
KING              5000 SALES
TURNER            1500 SALES
ADAMS             1100 SALES
JAMES              950 SALES
FORD              3000 SALES
MILLER            1300 SALES
SMITH              800 OPERATIONS
ALLEN             1600 OPERATIONS
WARD              1250 OPERATIONS
JONES             2975 OPERATIONS
MARTIN            1250 OPERATIONS
BLAKE             2850 OPERATIONS
CLARK             2450 OPERATIONS
SCOTT             3000 OPERATIONS
KING              5000 OPERATIONS

SCOTT             3000 RESEARCH
KING              5000 RESEARCH
TURNER            1500 RESEARCH
ADAMS             1100 RESEARCH
JAMES              950 RESEARCH
FORD              3000 RESEARCH
MILLER            1300 RESEARCH
SMITH              800 SALES
ALLEN             1600 SALES
WARD              1250 SALES
JONES             2975 SALES
MARTIN            1250 SALES
BLAKE             2850 SALES

ENAME             SAL DNAME
---------- ---------- --------------
TURNER            1500 OPERATIONS
ADAMS             1100 OPERATIONS
JAMES              950 OPERATIONS
FORD              3000 OPERATIONS
MILLER            1300 OPERATIONS

56 rows selected.
```

From above – we can see that the above query returns 56 records – but we are expecting 14 records. This is because each and every record of employee table will be combined with each & every record of department table.
Thus, Cartesian join should not be used in real time scenarios.
The Cartesian join contains both correct and incorrect sets of data. We have to retain the correct ones & eliminate the incorrect ones by using the **inner join**.

3. **Inner join: -**

Inner join are also called as **equijoins**.
They return the matching records between the tables.
In the real time scenarios, this is the most frequently used Join.
We join two tables such that a record from one table is merged to a record from another table only when given condition is satisfied is known as inner join.

For ex, consider the query shown below,

```
Select A.ename, A.sal, B.dname
From emp A, dept B
Where A.deptno = B.deptno          - JOIN condition
And A.sal > 2000                   - FILTER condition
Order by A.sal ;
```

Let us see the output shown below,

```
SQL> Select A.ename, A.sal, B.dname
  2  From emp A, dept B
  3  Where A.deptno = B.deptno
  4  And A.sal > 2000
  5  Order by A.sal ;

ENAME             SAL DNAME
---------- ---------- --------------
CLARK            2450 ACCOUNTING
BLAKE            2850 SALES
JONES            2975 RESEARCH
FORD             3000 RESEARCH
SCOTT            3000 RESEARCH
KING             5000 ACCOUNTING

6 rows selected.
```

JOIN condition is mandatory for removing the Cartesian output.

Let us consider the following 2 scenarios shown below,

Scenario 1

A		
P	**Q**	**R**

B		
P	**S**	**T**

C		
P	**X**	**Y**

We want			
P	**Q**	**S**	**X**

The SQL query will be,

Select A.P, A.Q, B.S, C.X
From A, B, C
Where A.P = B.P
And A.P = C.P
} **Number of joins = 2**

Therefore, Number of JOINS = Number of tables - 1

Scenario 2

A		
P	**Q**	**R**

B			
P	**Q**	**S**	**T**

C		
P	**X**	**Y**

We want				
P	**Q**	**R**	**S**	**X**

The **SQL query is ,**

Select A.P, A.Q, A.R, B.S, C.X
From A, B, C
Where A.P = B.P
And A.Q = B.Q
And A.P = C.P ;

Number of Joins = 3

Therefore, Number of JOINS = Number of common columns

If there are no common columns, then reject it saying that the two tables can't be joined.

But there are some cases – where the 2 columns will be same but having different column names.
For ex – customerid & cid

ANSI Syntax:

Select *
From table1 inner join table 2
ON <join condition>
Where <filter condition>

Thus we, can see the changes ,

- In the 2nd line - ,(comma) has been replaced by the word 'join'
- In the 3rd line – 'where' has been replaced with 'on'

Note :

1. To perform inner join, join condition is mandatory
2. Join condition: - it is a condition which includes column from both the tables
3. Inner join is a sub set of Cartesian join or cross join
   Ex. Let us consider the table T1 And T2 we join T1 and T2 using the join condition
   T1.A1 = T2.A2
   The table obtained is as follows

A1	B1	A2	B2
B	20	B	200
C	30	C	300

Q. WAQTD Dept name, salary, comm of all the employees who are working in accounts or research dept. as a manager

Select dname, salary, comm.

From emp, dept

ON emp.deptno=dept.deptno

Where job=’manaager’ and (dname = accounts or dname=’’research)

ANSI
Select dname, sal, comm
From emp inner join dept
ON emp.deptno = dept.deptno
Where dname IN (‘account’,’research’) and job =’manager’;

Select dname, sal, comm.
From emp, dept
Where emp.deptno=dept.deptno
And dname in (‘account’,’research’) and job =’manager’;

Q. WAQTD dept name, ename, sal of all the employee whose name starts with A whose dept name ends with S and having the salary between 3000 and 5000

Dept Name, Ename, SAL
Condition
Ename starts with A and
Dname ends with S and
sal between 3000 and 5000

select detname, ename, sal
from emp, dept
where emp.deptno=dept.deptno and

Assignment

1) Display employee name and his department name for the employees whose name starts with 'S'

```
SQL> select A.ename, B.dname
  2  from emp A, dept B
  3  where A.deptno = B.deptno
  4  and A.ename not like 'S%' ;

ENAME      DNAME
---------- --------------
ALLEN      SALES
WARD       SALES
JONES      RESEARCH
MARTIN     SALES
BLAKE      SALES
CLARK      ACCOUNTING
KING       ACCOUNTING
TURNER     SALES
ADAMS      RESEARCH
JAMES      SALES
FORD       RESEARCH
MILLER     ACCOUNTING

12 rows selected.
```

Outer Join: -

It returns both matching and non-matching records

Outer join = inner join + non-matching records

Non-matching records means data present in one table, but absent in another table w.r.to common columns.

For ex, 40 is there in deptno of dept table, but not there in deptno of emp table.

Emp

Ename	Dept no.
1	10
2	20
3	10
4	10
5	40

Dept

Dname	Dept No.
D1	10
D2	20
D3	30

Dname	Dept NO.	ename	Dept no.
D1	10	1	10
D1	10	3	10
D1	10	4	10
D2	20	2	20
D3	30		

Ename	Dept NO.	Dname	Dept no.
1	10	D1	10
2	20	D2	20
3	10	D1	10
4	10	D1	10
5	40		

Left outer join: - left outer join is used to obtain the unmatched of left table

Select *

From table1 left outer join table 2

On <join condition>

Where <filter conditioin>;

Note:

1. To get only unmatched records from the left table we should write a condition that is R_table_name.column_name IS null;
2. To get only unmatched records from right table we should write the condition that is L_table_name.columnname IS null;

Q. WAQTD name of an employee who is not working in any department

```
Select ename
From emp left outer join dept
ON emp.deptno=dept.deptno
Where dept.deptno = null
```

2. Right outer join: - it is used to obtain the unmatched records go the right table

Display all the department names irrespective of any employee working in it or not. If an employee is working – display his name.

Using right join

```
SQL> select A.ename, A.job, B.dname, B.loc
  2  from emp A right join dept B
  3  on A.deptno = B.deptno ;

ENAME      JOB       DNAME          LOC
---------- --------- -------------- -------------
CLARK      MANAGER   ACCOUNTING     NEW YORK
KING       PRESIDENT ACCOUNTING     NEW YORK
MILLER     CLERK     ACCOUNTING     NEW YORK
JONES      MANAGER   RESEARCH       DALLAS
FORD       ANALYST   RESEARCH       DALLAS
ADAMS      CLERK     RESEARCH       DALLAS
SMITH      CLERK     RESEARCH       DALLAS
SCOTT      ANALYST   RESEARCH       DALLAS
WARD       SALESMAN  SALES          CHICAGO
TURNER     SALESMAN  SALES          CHICAGO
ALLEN      SALESMAN  SALES          CHICAGO
JAMES      CLERK     SALES          CHICAGO
BLAKE      MANAGER   SALES          CHICAGO
MARTIN     SALESMAN  SALES          CHICAGO
                     OPERATIONS     BOSTON

15 rows selected.
```

Using left join

```
SQL> select A.ename, A.job, B.dname, B.loc
  2  from dept B left join emp A
  3  on A.deptno = B.deptno ;
```

Using full join

```
SQL> select A.ename, A.job, B.dname, B.loc
  2  from dept B full join emp A
  3  on A.deptno = B.deptno ;
```

Assignment

1) Display employee name and his department name for the employees whose name starts with 'S'

```
SQL> select A.ename, B.deptno
  2  from emp A, dept B
  3  where A.deptno = B.deptno
  4  and A.ename like 'S%' ;

ENAME          DEPTNO
---------- ----------
SMITH              20
SCOTT              20
```

2) Display employee name and his department name who is earning 1st maximum salary

```
SQL> select A.ename, B.dname
  2  from emp A, dept B
  3  where A.deptno = B.deptno
  4  and A.sal = (select max(sal) from emp) ;

ENAME      DNAME
---------- --------------
KING       ACCOUNTING
```

SELF JOIN

Self join used to obtain the data to be selected in the same record or row
Joining a table to itself is called self join

The **FROM** clause looks like this,

FROM emp A, emp B

Or

FROM emp A join emp B - *ANSI style*

For ex, - **Display employee name along with their manager name**

Select a.ename, b.ename
From emp A, emp B
Where A.mgr=b.empno

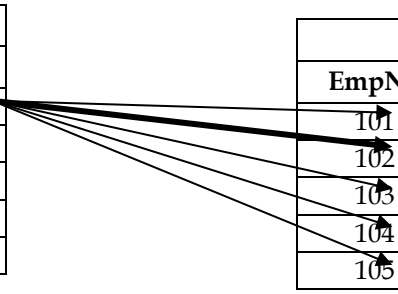
```
SQL> select A.ename "EMP",
  2         B.ename "MANAGER"
  3  from emp A, emp B
  4  where A.mgr = B.empno ;

EMP        MANAGER
---------- ----------
SMITH      FORD
ALLEN      BLAKE
WARD       BLAKE
JONES      KING
MARTIN     BLAKE
BLAKE      KING
CLARK      KING
SCOTT      JONES
TURNER     BLAKE
ADAMS      SCOTT
JAMES      BLAKE
FORD       JONES
MILLER     CLARK

13 rows selected.
```

Now, let us see how this i.e the logic (the above query) works,

Emp (A)		
EmpNo	**Ename**	**Mgr**
101	Scott	102
102	Blake	103
103	King	-
104	Smith	103
105	Jones	104



Emp (B)		
EmpNo	**Ename**	**Mgr**
101	Scott	102
102	Blake	103
103	King	-
104	Smith	103
105	Jones	104

Now, when we give the above query – in Oracle – it starts matching the '**mgr**' column of **emp A** with the '**empno**' of **emp b** – we get two tables because in **self join** – a duplicate of the table required is created.

Now let us consider the **first employee Scott** – it starts the **mgrid** of **Scott** with the **empno** of all the records in **emp B** – when two **ids** match, then the **empno** in **emp B** becomes the **mgr** of the **empno** in **emp A**. Thus, we can see that – **mgr id** 102 is matching with **empno** 102 **Blake** in **emp B**. Therefore, Blake is the manager of Scott.
Similarly we do the same for all the other records of **emp A** and thus find the employees and their respective managers.

Display the employees who are getting the same salary

Select a.ename, a.sal
From emp a, emp b
Where a.sal=b.sal

```
SQL> select A.ename, A.sal
  2  from emp A join emp B
  3  on A.sal = B.sal
  4  and A.empno <> B.empno ;

ENAME             SAL
---------- ----------
MARTIN            1250
WARD              1250
FORD              3000
SCOTT             3000
```

Co –related Sub-query

In Co-related sub queries the outer query is dependent on inner query and inner query is also dependent on outer query, this is called Co-related sub query

In Co-related sub queries the inner should consists the condition which includes a column from the outer query.

This introduces the dependence between the inner query and the outer query.

Q WAQTD a Dname where at least one employee is working

```
Select dname
From dept
Where deptno IN (select deptno
                 From emp
                 Where dept.deptno=emp.deptno);
```

Co –related sub query were under the principle of sub-query and join

The execution flow of co-related subqueries

1. Outer query gets partially executed
2. If a record in the outer query is selected or rejected it is purely depends on the output generated by the inner query.
3. Since the inner query depends on outer query, inner query gets completely executed for each and every records present in the outer query.

Q . WAQTD a Dname where there are no employees are working

Q WAQTD dname where at least 2 employees are working

Using the sub query in from clause

We can use sub query in from clause.

The output of the sub query (result set table) is considered as the table for execution.

The processes of using a sub query in from clause are also known as Inline Views.

Ex.

```
Select *
From (select *
      From emp
      Where deptno=10);
```

Order by:

Order by clause is used to sort the table based on any columns in ascending order or by descending order.

Order by clause executes after select clause. We can use the alias name which is given in select clause and order the data.

Syntax:

Select <*/column name>
From <table name>
Where <filter condition>
Group by <column name>
Having <group by filter condition>
Order by <column name> asc/desc

Order of execution

1. From
2. Where
3. Group by
4. Having
5. Select
6. Order by

- Order by clause should be last statement written in the query
- Order by will always executed after select clause
- Order by clause by default sort the column in ascending order
- In order by clause we can use alias name but we cannot assign alias name.

Q. WAQTD all the employees according to date of joining only for sales man.

```
Select *
From emp
Where job =sales man
Order by hiredate
```

Statements

Statements – they help us to create the table and insert the data.
There are 3 types of statements,

- **DDL** – Data Definition Language – the various commands in DDL are :- Create, Drop, Truncate, Alter, Rename
- **DML** – Data Manipulation Language – the various commands in DML are :- Insert, Update, Delete
- **TCL** – Transaction Control Language – the various commands in TCL are :- Rollback, Commit, Savepoint

DDL

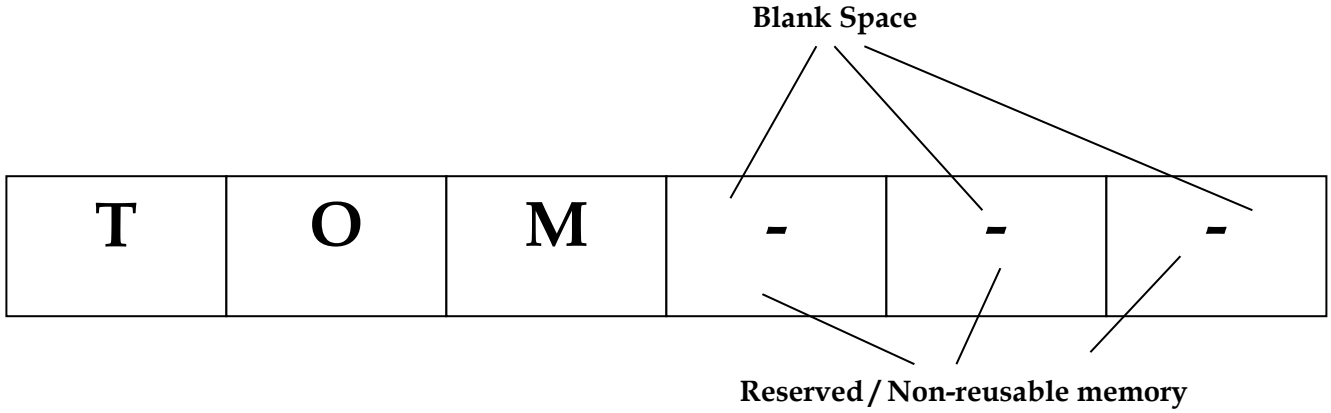
CREATE – It creates the table.

Create table <table name>
(
<Column name> data type constraint,
.

);

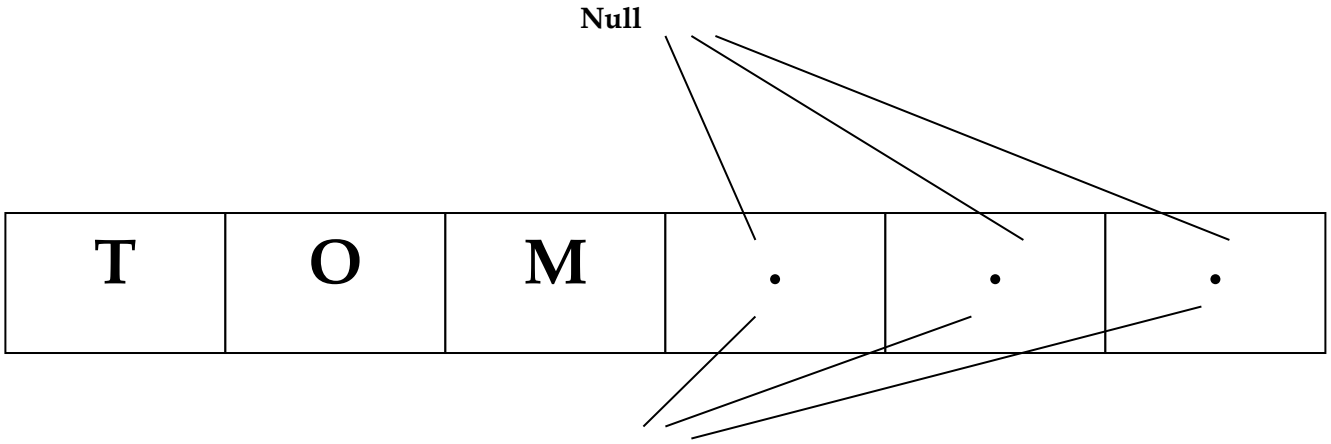
Before we study the **Create** command, let us first study the some of the basic **datatypes** we use in SQL.
1) CHAR :-
It stores the fixed length character data.
It can store the alphanumeric data (i.e, numbers and characters).
2) VARCHAR
It stores the variable length character data
It can store alphanumeric data.

Difference between CHAR & VARCHAR
Let us consider an example as shown below to explain the difference.
Name char (6) ;
Here we are defining **name** which is of 6characters in length.
Now, let us store '***Tom***' in the name field. Let us understand how the memory is allocated for this,



When we declare anything of type **char**, the memory is allocated as of the size given and its fixed length – hence it cannot be altered.
Now, when we give ***tom***, it allocates 6 bytes for **name char –** only the 1st 3bytes are used to store **Tom –** the rest becomes waste as it is a blank space and it is reserved memory.
The **length(name) = 6**.

Name varchar (6) ;
Here we are defining **name** which is of 6characters in length.
Now, let us store '***Tom***' in the name field. Let us understand how the memory is allocated for this,



When we declare anything of type **varchar**, the memory is allocated as shown above and it is variable length
When we give ***tom***, it allocates 6bytes for **name varchar –** only the 1st 3bytes are used to store **tom –** the remaining 3 fields becomes **null**. As we know the property of **null –** null does not occupy any memory space **– thus the memory is not wasted here.**
The **length(name) = 3**.

Another difference is : -
In **char**, maximum value we can store is 2000 characters
In **varchar**, maximum value we can store is 4000 characters.

3) NUMBER
- it stores numeric data.
For ex – 1) sal number(4) ;
Here the maximum possible value is 9999.

2) sal number (6, 2) ;
Here, 2 – scale (total number of decimal places)
6 – precision (total number of digits including decimal places)
Maximum value is 9999.99
sal number (4, 3) ;
maximum value is 9.999
sal number (2, 2)

maximum value is .99

4) DATE

- it stores date and time
- no need to specify any length for this type.

For ex, SQL > order_dt DATE ;

Date is always displayed in the default format :- **dd – month – yy**

. **Create the following tables**

PRODUCTS
ProdID (PK)
ProdName (Not Null)
Qty (Chk > 0)
Description

ORDERS
ProdID (FK from products)
OrderID (PK)
Qty_sold (chk > 0)
Price
Order_Date

```
SQL> CREATE TABLE products
  2  (
  3   prodid  NUMBER(4) PRIMARY KEY ,
  4   prodname  VARCHAR(10) NOT NULL ,
  5   qty  NUMBER(3) CHECK (qty > 0) ,
  6   description VARCHAR(20)
  7  ) ;

Table created.
```

We can see that the table has been created.

Now, let us verify if the table has really been created and also the description of the table,

```
SQL> select * from tab ;

TNAME                          TABTYPE  CLUSTERID
------------------------------ ------- ----------
DEPT                           TABLE
EMP                            TABLE
BONUS                          TABLE
SALGRADE                       TABLE
PRODUCTS                       TABLE
```

The new table **products** has been added to the database.

```
SQL> desc products ;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 PRODID                                    NOT NULL NUMBER(4)
 PRODNAME                                  NOT NULL VARCHAR2(10)
 QTY                                               NUMBER(3)
 DESCRIPTION                                       VARCHAR2(20)
```

Thus, we get the description of the table **products**.

```
SQL> CREATE TABLE orders
  2  (
  3   prodid  NUMBER(4) REFERENCES  products (prodid) ,
  4   orderid  NUMBER(4) PRIMARY KEY ,
  5   qty_sold NUMBER(3) CHECK (qty_sold > 0),
  6   price NUMBER(8, 2) ,
  7   order_dt DATE
  8  ) ;

Table created.
```

The new table **orders** has been created. We can see from the above query how to reference a child table to the parent table using the **references** keyword.

```
SQL> select * from tab ;

TNAME                          TABTYPE  CLUSTERID
------------------------------ ------- ----------
DEPT                           TABLE
EMP                            TABLE
BONUS                          TABLE
SALGRADE                       TABLE
PRODUCTS                       TABLE
ORDERS                         TABLE

6 rows selected.
```

Thus we can verify that **orders** table has been created and added to the database.

```
SQL> desc orders ;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 PRODID                                             NUMBER(4)
 ORDERID                                   NOT NULL NUMBER(4)
 QTY_SOLD                                           NUMBER(3)
 PRICE                                              NUMBER(8,2)
 ORDER_DT                                           DATE
```

Thus, we get the description of the **orders** table.

Creating a table from another table :-
Now, we will see how to create a table from another table – i.e, it duplicates all the records and the characteristics of another table.
The SQL query for it is as follows,

```
SQL> CREATE TABLE temp
  2  AS
  3  select * from dept ;

Table created.
```

Thus we can see that we have created another table **temp** from the table **dept**.
We can verify it as shown below,

```
SQL> select * from tab ;

TNAME                          TABTYPE  CLUSTERID
------------------------------ ------- ----------
DEPT                           TABLE
EMP                            TABLE
BONUS                          TABLE
SALGRADE                       TABLE
PRODUCTS                       TABLE
ORDERS                         TABLE
TEMP                           TABLE

7 rows selected.
```

Thus, we can see that the **table temp** has been created.

```
SQL> desc temp ;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 DEPTNO                                             NUMBER(2)
 DNAME                                              VARCHAR2(14)
 LOC                                                VARCHAR2(13)
```

Thus, we can see that the table **temp** has copied the structure of the table **dept**. Here, we must observe that **temp** copies all the columns, rows and NOT NULL constraints only from the table **dept**. It never copies PK, FK, Check constraints.

Thus, when in the interview somebody asks you "I have a table which has about 1million records. How do I duplicate it into another table without using Insert keyword and without inserting it individually all the records into the duplicated table ?
Answer is - Use the above query of creating a table from another table and explain it.

```
SQL> select * from temp ;

    DEPTNO DNAME          LOC
---------- -------------- -------------
        10 ACCOUNTING     NEW YORK
        20 RESEARCH       DALLAS
        30 SALES          CHICAGO
        40 OPERATIONS     BOSTON
```

Thus, from the above query – we can see that all the records of the table **dept** has been copied into the table **temp**.

TRUNCATE

It removes all the data permanently, but the structure of the table remains as it is.
Ex – SQL > TRUNCATE TABLE temp ;

DROP

It removes both data and the structure of the table permanently from the database.
Ex – SQL > DROP TABLE test ;

Let us understand the difference between **drop** & **truncate** using the below shown example,

```
SQL> CREATE TABLE test1
  2  AS
  3  select * from dept ;

Table created.
```

```
SQL> CREATE TABLE test2
  2  AS
  3  select * from dept ;

Table created.
```

Let us create 2 tables Test1 and Test2 as shown above.

```
SQL> desc test1 ;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 DEPTNO                                             NUMBER(2)
 DNAME                                              VARCHAR2(14)
 LOC                                                VARCHAR2(13)
```

```
SQL> select * from test1 ;

    DEPTNO DNAME          LOC
---------- -------------- -------------
        10 ACCOUNTING     NEW YORK
        20 RESEARCH       DALLAS
        30 SALES          CHICAGO
        40 OPERATIONS     BOSTON
```

The above shows the description of the table test1.

```
SQL> desc test2 ;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 DEPTNO                                             NUMBER(2)
 DNAME                                              VARCHAR2(14)
 LOC                                                VARCHAR2(13)


SQL> select * from test2 ;

    DEPTNO DNAME          LOC
---------- -------------- -------------
        10 ACCOUNTING     NEW YORK
        20 RESEARCH       DALLAS
        30 SALES          CHICAGO
        40 OPERATIONS     BOSTON
```

The above gives the description of the table Test2.

Now, let us use the **Truncate query on Test1** and **Drop query on Test2** and see the difference.

```
SQL> truncate table test1 ;

Table truncated.

SQL> select * from test1 ;

no rows selected

SQL> desc test1 ;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 DEPTNO                                             NUMBER(2)
 DNAME                                              VARCHAR2(14)
 LOC                                                VARCHAR2(13)
```

The above 3 queries show that – 1st query has the table test1 truncated.
2nd query – it shows **no rows selected** – thus only the records from the table has been removed.
3rd query – it shows that the structure of the table is still present. Only the records will be removed.
Thus, this **explains the truncate query.**

```
SQL> drop table test2 ;

Table dropped.

SQL> select * from test2 ;
select * from test2
              *
ERROR at line 1:
ORA-00942: table or view does not exist


SQL> desc test2 ;
ERROR:
ORA-04043: object test2  does not exist
```

Thus from the above queries we can explain how **drop** works. 1st query – it drops the table. Thus – the entire structure and records of the table are dropped.
2nd and 3rd query – since, there is no table – **select & desc** query for **test2** will throw an error.
Thus, this **explains the drop query.**
Hence, we have seen the difference between **drop & truncate** query.

RENAME

It renames a table.
For ex, let us see the query of how we do this renaming a table.

```
SQL> CREATE TABLE temp
  2  AS
  3  select * from dept ;

Table created.

SQL> select * from temp ;

    DEPTNO DNAME          LOC
---------- -------------- -------------
        10 ACCOUNTING     NEW YORK
        20 RESEARCH       DALLAS
        30 SALES          CHICAGO
        40 OPERATIONS     BOSTON

SQL> select * from tab ;

TNAME                          TABTYPE  CLUSTERID
------------------------------ ------- ----------
DEPT                           TABLE
EMP                            TABLE
BONUS                          TABLE
SALGRADE                       TABLE
PRODUCTS                       TABLE
ORDERS                         TABLE
TEMP                           TABLE

7 rows selected.
```

In the above 3queries – we have created a table **temp** which copies table **dept** – we see the records of the table temp – and also check if the table has really been created.

Now let us **rename temp to temp23** as shown below,

```
SQL> RENAME temp TO temp23 ;

Table renamed.
```

The above query is used to rename a table.
Now let us verify the contents of the table and check if it has really been modified,

```
SQL> select * from tab ;

TNAME                          TABTYPE  CLUSTERID
------------------------------ ------- ----------
DEPT                           TABLE
EMP                            TABLE
BONUS                          TABLE
SALGRADE                       TABLE
PRODUCTS                       TABLE
ORDERS                         TABLE
TEMP23                         TABLE

7 rows selected.

SQL> select * from temp23 ;

    DEPTNO DNAME          LOC
---------- -------------- -------------
        10 ACCOUNTING     NEW YORK
        20 RESEARCH       DALLAS
        30 SALES          CHICAGO
        40 OPERATIONS     BOSTON
```

Thus the table has been renamed and its contents are verified.

ALTER

- this query alters / changes the structure of the table (i.e, - adding columns, removing columns, renaming columns etc).
Now let us **alter** the table **products** (which we have created earlier).
1) Let us add a new column *'model_no'* to the table.

```
SQL> ALTER TABLE products
  2  ADD model_no VARCHAR(10) NOT NULL ;

Table altered.
```

Thus, a new column has been added. Let's verify it with the query shown below,

```
SQL> desc products ;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 PRODID                                    NOT NULL NUMBER(4)
 PRODNAME                                  NOT NULL VARCHAR2(10)
 QTY                                               NUMBER(3)
 DESCRIPTION                                       VARCHAR2(20)
 MODEL_NO                                  NOT NULL VARCHAR2(10)
```

2) Now let us drop the column model_no from products.

```
SQL> ALTER TABLE products
  2  DROP COLUMN model_no ;

Table altered.
```

Thus, the column has been dropped.

```
SQL> desc products ;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 PRODID                                    NOT NULL NUMBER(4)
 PRODNAME                                  NOT NULL VARCHAR2(10)
 QTY                                               NUMBER(3)
 DESCRIPTION                                       VARCHAR2(20)
```

Thus, we can see from the description of the table – the column **model_no** has been dropped.

3) Let us rename the column *qty* to *qty_available*.

```
SQL> ALTER TABLE products
  2  RENAME column qty to qty_available ;

Table altered.
```

Let us verify if it has been renamed,

```
SQL> desc products ;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 PRODID                                    NOT NULL NUMBER(4)
 PRODNAME                                  NOT NULL VARCHAR2(10)
 QTY_AVAILABLE                                     NUMBER(3)
 DESCRIPTION                                       VARCHAR2(20)
```

NOTE : *SELECT* is neither DML nor DDL. It does not belong to any group because it does not alter anything, it just displays the data as required by the user.

DML

INSERT

It inserts a record to a table.
Let us observe how it is done,

```
SQL>  INSERT INTO products
  2   values (1001, 'CAMERA' , 10, 'Digital') ;

1 row created.

SQL> INSERT INTO products
  2  values (1002, 'Laptop', 23, 'Dell') ;

1 row created.
```

This is how we insert values into a table. All characters and alpha-numeric characters(ex – 10023sdf78) must be enclosed in single quotes (‘ ‘) and each value must be separated by comma. Also we must be careful in entering the data without violating the primary key, foreign key , unique constraints.

Now let us see the table in which the data in has been inserted,

```
SQL> select * from products ;

    PRODID PRODNAME   QTY_AVAILABLE DESCRIPTION
---------- ---------- ------------- --------------------
      1001 CAMERA                10 Digital
      1002 Laptop                23 Dell
```

Now, let us insert data into the table **orders** in which a foreign key is referencing primary key,

```
SQL> INSERT INTO orders
  2  values (1001, 9001, 2, 9867.1, sysdate ) ;

1 row created.
```

Here, we see that 1001 is the same prodid as of the earlier table.
Sysdate – it displays the current date set in the system .

```
SQL> INSERT INTO orders
  2  values (1002, 9023, 2, 98756.23, ' 02 - Oct - 2010 ' ) ;

1 row created.
```

Now, let us see the table,

```
SQL> select * from orders ;

    PRODID    ORDERID   QTY_SOLD      PRICE ORDER_DT
---------- ---------- ---------- ---------- ---------
      1001       9001          2     9867.1 06-APR-11
      1002       9023          2   98756.23 02-OCT-10
```

Another way of inserting data into the table is shown below,

```
SQL> INSERT INTO orders (prodid, orderid, qty_sold, price, order_dt)
  2  values (1002, 99, 7, 23678.9, '02 - Oct - 1987' ) ;

1 row created.
```

Now, let us see the table,

```
SQL> select * from orders ;

    PRODID    ORDERID   QTY_SOLD      PRICE ORDER_DT
---------- ---------- ---------- ---------- ---------
      1001       9001          2     9867.1 06-APR-11
      1002       9023          2   98756.23 02-OCT-10
      1002         99          7    23678.9 02-OCT-87
```

UPDATE :-

It updates one or more records.

For ex – 1) Let us update salary by increasing it by Rs200 and also give commission of Rs100 where empno = 7369.

```
SQL> select * from emp ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7369 SMITH      CLERK            7902 17-DEC-80        800                    20
      7499 ALLEN      SALESMAN         7698 20-FEB-81       1600        300         30
      7521 WARD       SALESMAN         7698 22-FEB-81       1250        500         30
      7566 JONES      MANAGER          7839 02-APR-81       2975                    20
      7654 MARTIN     SALESMAN         7698 28-SEP-81       1250       1400         30
      7698 BLAKE      MANAGER          7839 01-MAY-81       2850                    30
      7782 CLARK      MANAGER          7839 09-JUN-81       2450                    10
      7788 SCOTT      ANALYST          7566 19-APR-87       3000                    20
      7839 KING       PRESIDENT             17-NOV-81       5000                    10
      7844 TURNER     SALESMAN         7698 08-SEP-81       1500          0         30
      7876 ADAMS      CLERK            7788 23-MAY-87       1100                    20
      7900 JAMES      CLERK            7698 03-DEC-81        950                    30
      7902 FORD       ANALYST          7566 03-DEC-81       3000                    20
      7934 MILLER     CLERK            7782 23-JAN-82       1300                    10

14 rows selected.
```

Now, let us **update** the said record as shown below,

```
SQL> update emp set sal = sal + 200, comm = 100 where empno = 7369 ;

1 row updated.
```

Let us verify if the record has been updated,

```
SQL> select * from emp ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7369 SMITH      CLERK           7902 17-DEC-80       1000        100         20
      7499 ALLEN      SALESMAN        7698 20-FEB-81       1600        300         30
      7521 WARD       SALESMAN        7698 22-FEB-81       1250        500         30
      7566 JONES      MANAGER         7839 02-APR-81       2975                    20
      7654 MARTIN     SALESMAN        7698 28-SEP-81       1250       1400         30
      7698 BLAKE      MANAGER         7839 01-MAY-81       2850                    30
      7782 CLARK      MANAGER         7839 09-JUN-81       2450                    10
      7788 SCOTT      ANALYST         7566 19-APR-87       3000                    20
      7839 KING       PRESIDENT            17-NOV-81       5000                    10
      7844 TURNER     SALESMAN        7698 08-SEP-81       1500          0         30
      7876 ADAMS      CLERK           7788 23-MAY-87       1100                    20
      7900 JAMES      CLERK           7698 03-DEC-81        950                    30
      7902 FORD       ANALYST         7566 03-DEC-81       3000                    20
      7934 MILLER     CLERK           7782 23-JAN-82       1300                    10

14 rows selected.
```

Thus, the record(empno – 7369) has been updated.

2) Increase all salary by 10%

```
SQL> update emp set sal = sal + sal * 0.1 ;

14 rows updated.
```

Let us verify it,

```
SQL> select * from emp ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7369 SMITH      CLERK           7902 17-DEC-80       1100        100         20
      7499 ALLEN      SALESMAN        7698 20-FEB-81       1760        300         30
      7521 WARD       SALESMAN        7698 22-FEB-81       1375        500         30
      7566 JONES      MANAGER         7839 02-APR-81     3272.5                    20
      7654 MARTIN     SALESMAN        7698 28-SEP-81       1375       1400         30
      7698 BLAKE      MANAGER         7839 01-MAY-81       3135                    30
      7782 CLARK      MANAGER         7839 09-JUN-81       2695                    10
      7788 SCOTT      ANALYST         7566 19-APR-87       3300                    20
      7839 KING       PRESIDENT            17-NOV-81       5500                    10
      7844 TURNER     SALESMAN        7698 08-SEP-81       1650          0         30
      7876 ADAMS      CLERK           7788 23-MAY-87       1210                    20
      7900 JAMES      CLERK           7698 03-DEC-81       1045                    30
      7902 FORD       ANALYST         7566 03-DEC-81       3300                    20
      7934 MILLER     CLERK           7782 23-JAN-82       1430                    10

14 rows selected.
```

DELETE

It deletes one / some / all the records.
Let us create a table test from table emp – and see how to delete 1 record and how to delete all records from it,

```
SQL> select * from test ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7369 SMITH      CLERK           7902 17-DEC-80        800                    20
      7499 ALLEN      SALESMAN        7698 20-FEB-81       1600        300         30
      7521 WARD       SALESMAN        7698 22-FEB-81       1250        500         30
      7566 JONES      MANAGER         7839 02-APR-81       2975                    20
      7654 MARTIN     SALESMAN        7698 28-SEP-81       1250       1400         30
      7698 BLAKE      MANAGER         7839 01-MAY-81       2850                    30
      7782 CLARK      MANAGER         7839 09-JUN-81       2450                    10
      7788 SCOTT      ANALYST         7566 19-APR-87       3000                    20
      7839 KING       PRESIDENT            17-NOV-81       5000                    10
      7844 TURNER     SALESMAN        7698 08-SEP-81       1500          0         30
      7876 ADAMS      CLERK           7788 23-MAY-87       1100                    20
      7900 JAMES      CLERK           7698 03-DEC-81        950                    30
      7902 FORD       ANALYST         7566 03-DEC-81       3000                    20
      7934 MILLER     CLERK           7782 23-JAN-82       1300                    10

14 rows selected.
```

Thus, we have created the table test.

```
SQL> delete from test where empno = 7934 ;

1 row deleted.
```

Thus 1 row, 'miller' has been deleted.

```
SQL> select * from test ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7369 SMITH      CLERK           7902 17-DEC-80        800                    20
      7499 ALLEN      SALESMAN        7698 20-FEB-81       1600        300         30
      7521 WARD       SALESMAN        7698 22-FEB-81       1250        500         30
      7566 JONES      MANAGER         7839 02-APR-81       2975                    20
      7654 MARTIN     SALESMAN        7698 28-SEP-81       1250       1400         30
      7698 BLAKE      MANAGER         7839 01-MAY-81       2850                    30
      7782 CLARK      MANAGER         7839 09-JUN-81       2450                    10
      7788 SCOTT      ANALYST         7566 19-APR-87       3000                    20
      7839 KING       PRESIDENT            17-NOV-81       5000                    10
      7844 TURNER     SALESMAN        7698 08-SEP-81       1500          0         30
      7876 ADAMS      CLERK           7788 23-MAY-87       1100                    20
      7900 JAMES      CLERK           7698 03-DEC-81        950                    30
      7902 FORD       ANALYST         7566 03-DEC-81       3000                    20

13 rows selected.
```

Thus, the deletion has been confirmed.

TCL

Any DML change on a table is not a permanent one.
We need to save the DML changes in order to make it permanent
We can also undo (ignore) the same DML changes on a table.

The DDL changes cannot be undone as they are implicitly saved.

ROLLBACK

It undoes the DML changes performed on a table.
Let us see in the below example how **rollback** works,

```
SQL> delete from emp ;

14 rows deleted.

SQL> select * from emp ;

no rows selected
```

Let us delete the employee table. When we perform **select** operation on emp, we can see that all the rows have been deleted.
We now perform the **rollback** operation,

```
SQL> rollback ;

Rollback complete.
```

Now let us perform the **select** operation,

```
SQL> select * from emp ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7369 SMITH      CLERK           7902 17-DEC-80        800                    20
      7499 ALLEN      SALESMAN        7698 20-FEB-81       1600        300         30
      7521 WARD       SALESMAN        7698 22-FEB-81       1250        500         30
      7566 JONES      MANAGER         7839 02-APR-81       2975                    20
      7654 MARTIN     SALESMAN        7698 28-SEP-81       1250       1400         30
      7698 BLAKE      MANAGER         7839 01-MAY-81       2850                    30
      7782 CLARK      MANAGER         7839 09-JUN-81       2450                    10
      7788 SCOTT      ANALYST         7566 19-APR-87       3000                    20
      7839 KING       PRESIDENT            17-NOV-81       5000                    10
      7844 TURNER     SALESMAN        7698 08-SEP-81       1500          0         30
      7876 ADAMS      CLERK           7788 23-MAY-87       1100                    20
      7900 JAMES      CLERK           7698 03-DEC-81        950                    30
      7902 FORD       ANALYST         7566 03-DEC-81       3000                    20
      7934 MILLER     CLERK           7782 23-JAN-82       1300                    10

14 rows selected.
```

Thus performing the **rollback** operation, we can retrieve all the records which had been deleted.

COMMIT

It saves the DML changes permanently to the database.

Committing after rollback & vice versa will not have any effect
Let us explain the above statement with an example,

```
SQL> select * from test ;

    DEPTNO DNAME          LOC
---------- -------------- -------------
        10 ACCOUNTING     NEW YORK
        20 RESEARCH       DALLAS
        30 SALES          CHICAGO
        40 OPERATIONS     BOSTON

SQL> delete from test ;

4 rows deleted.

SQL> select * from test ;

no rows selected

SQL> rollback ;

Rollback complete.

SQL> commit  ;

Commit complete.

SQL> select * from test ;

    DEPTNO DNAME          LOC
---------- -------------- -------------
        10 ACCOUNTING     NEW YORK
        20 RESEARCH       DALLAS
        30 SALES          CHICAGO
        40 OPERATIONS     BOSTON
```

We can see that **commit** has no effect after **rollback** operation.

```
SQL> select * from test ;

    DEPTNO DNAME          LOC
---------- -------------- -------------
        10 ACCOUNTING     NEW YORK
        20 RESEARCH       DALLAS
        30 SALES          CHICAGO
        40 OPERATIONS     BOSTON

SQL> delete from test ;

4 rows deleted.

SQL> commit ;

Commit complete.

SQL> rollback ;

Rollback complete.

SQL> select * from test ;

no rows selected
```

Thus, from above – we can see that **rollback** has no effect after **commit** operation.

During an abnormal exit – i.e, shutdown or if the SQL window is closed by mouse click – then all the DML's will be rolled back automatically.

During a normal exit – **exit ;** - all the DML's will be auto-committed – and there will be no rollback.

Ex – 1) INSERT
UPDATE
ALTER
DELETE
ROLLBACK

When we perform the following operations in the same order for a table – then INSERT, UPDATE will be committed – because ALTER is a DDL – and thus all the DML's above it will also be committed – because DDL operations cannot be undone.
Here – only DELETE will be rolled back because it's a DML.

2) INSERT
UPDATE
DELETE
ROLLBACK

Here, all are rolled back.

SAVEPOINT :

It is like a pointer (break-point) till where a DML will be rolled back.
Ex :-
Insert …

Save point x ;
Update …
Delete ..

Rollback to x ;
…
…

Here, only DELETE & UPDATE are rolled back.
INSERT is neither rolled back nor committed.

Assignments
1) Create the following tables

a) Table name :- STUDENTS
regno (PK)
name (NN)
semester
DOB
Phone

b) Table name :- BOOKS
bookno (PK)
bname
author

c) Table name :- LIBRARY
regno (FK from students)
bookno (FK from books)
DOI –date of issue
DOR – date of return

2) Insert 5 records to each of these tables

3) Differentiate between,
a) Delete and Truncate
b) Truncate and Drop
c) Char and Varchar
d) Drop and Delete

Single row functions

Functions – it is a re-usable program that returns a value.

Single row functions executes row by row that is it provide output for every record given as input.

Input argument of a single row function can be column name or expression.

→ GROUP functions
→ CHARACTER functions
→ NUMERIC functions
→ DATE functions
→ SPECIAL functions

We have already learnt about GROUP functions.
Now, let us study the various CHARACTER functions.

CHARACTER functions

a) Upper: - it is used to convert the given string to upper case
b) Lower: - it is used to convert the given string to lower case
c) Length: - it is used to obtain no. of characters or digits present in the given string or no.
d)initcap: - it is used to convert the given string into init cap case.

For ex :-

```
SQL> select upper ('oracle'), lower ('ORacLE')
  2  from dual ;

UPPER( LOWER(
------ ------
ORACLE oracle

SQL> select ename, lower(ename) from emp ;

ENAME      LOWER(ENAM
---------- ----------
SMITH      smith
ALLEN      allen
WARD       ward
JONES      jones
MARTIN     martin
BLAKE      blake
CLARK      clark
SCOTT      scott
KING       king
TURNER     turner
ADAMS      adams
JAMES      james
FORD       ford
MILLER     miller

14 rows selected.
```

In the 1st query, we see something called as **dual**.

Dual – is a dummy table which is used for performing some independent operations which will not depend on any of the existing tables.

For ex,

1)

```
SQL> select sysdate from dual ;

SYSDATE
---------
09-APR-11
```

This gives the system date.

2)

```
SQL> select 100 + 200 from dual ;

   100+200
----------
       300

SQL> select 100 + 200 " ADDITION "
  2  from dual ;

 ADDITION
----------
       300
```

3)

```
SQL> select ename, sal + 100 from emp ;

ENAME         SAL+100
---------- ----------
SMITH             900
ALLEN            1700
WARD             1350
JONES            3075
MARTIN           1350
BLAKE            2950
CLARK            2550
SCOTT            3100
KING             5100
TURNER           1600
ADAMS            1200
JAMES            1050
FORD             3100
MILLER           1400

14 rows selected.
```

We use dual – when the data is not present in any of the existing tables. Then we use dual.

Length – it returns the length of a given string.

For ex,

1)

```
SQL> select length ('oracle') from dual ;

LENGTH('ORACLE')
----------------
               6
```

2)

```
SQL> select ename, length(ename) from emp ;
```

```
ENAME      LENGTH(ENAME)
---------- -------------
SMITH                  5
ALLEN                  5
WARD                   4
JONES                  5
MARTIN                 6
BLAKE                  5
CLARK                  5
SCOTT                  5
KING                   4
TURNER                 6
ADAMS                  5
JAMES                  5
FORD                   4
MILLER                 6

14 rows selected.
```

1) <u>Display all the employees whose name & job is having exactly 5 characters</u>

Select *
From emp
Where length(ename) and length(job) =5;

<u>REPLACE</u>

It replaces the old value with a new value in the given string.

For ex,

```
SQL> select replace ('oracle','a','p') from dual ;

REPLAC
------
orpcle
```

Here, **a –** is the old value to be replaced with **p** – which is the new value.

```
SQL> select ename, replace(ename, 'A', 'B')
  2  from emp ;
```

This query replaces all the names which has 'A' in it with 'B'.

Let us see the output as shown below,

```
ENAME      REPLACE(EN
---------- ----------
SMITH      SMITH
ALLEN      BLLEN
WARD       WBRD
JONES      JONES
MARTIN     MBRTIN
BLAKE      BLBKE
CLARK      CLBRK
SCOTT      SCOTT
KING       KING
TURNER     TURNER
ADAMS      BDBMS

ENAME      REPLACE(EN
---------- ----------
JAMES      JBMES
FORD       FORD
MILLER     MILLER

14 rows selected.
```

```
SQL> select ename, replace (ename, 'A', NULL)
  2  from emp ;

ENAME      REPLACE(EN
---------- ----------
SMITH      SMITH
ALLEN      LLEN
WARD       WRD
JONES      JONES
MARTIN     MRTIN
BLAKE      BLKE
CLARK      CLRK
SCOTT      SCOTT
KING       KING
TURNER     TURNER
ADAMS      DMS

ENAME      REPLACE(EN
---------- ----------
JAMES      JMES
FORD       FORD
MILLER     MILLER

14 rows selected.
```

SUBSTR

Substring function is used to obtain a new string from a given string. This is called **substring**.
It extracts 'n' characters from x(th) position of a given string.
For ex,

```
SQL> select job,
  2  substr (job,1,3) "1 - 3",
  3  substr (job,2,4) "2 - 4",
  4  substr (job,3) "3 - n",
  5  substr (job, -4) "last"
  6  from emp ;

JOB       1 - 3  2 - 4  3 - n   last
--------- ------ ------ ------- ----
CLERK     CLE    LERK   ERK     LERK
SALESMAN  SAL    ALES   LESMAN  SMAN
SALESMAN  SAL    ALES   LESMAN  SMAN
MANAGER   MAN    ANAG   NAGER   AGER
SALESMAN  SAL    ALES   LESMAN  SMAN
MANAGER   MAN    ANAG   NAGER   AGER
MANAGER   MAN    ANAG   NAGER   AGER
ANALYST   ANA    NALY   ALYST   LYST
PRESIDENT PRE    RESI   ESIDENT DENT
SALESMAN  SAL    ALES   LESMAN  SMAN
CLERK     CLE    LERK   ERK     LERK

JOB       1 - 3  2 - 4  3 - n   last
--------- ------ ------ ------- ----
CLERK     CLE    LERK   ERK     LERK
ANALYST   ANA    NALY   ALYST   LYST
CLERK     CLE    LERK   ERK     LERK

14 rows selected.
```

Here **, (job, '1' , '3')** – means from **job** – extract **from 1st position , 3 characters**.

1) Display the employees whose job starts with 'man'

```
SQL> select * from emp
  2  where substr (job,1,3) = 'MAN';

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7566 JONES      MANAGER         7839 02-APR-81       2975                    20
      7698 BLAKE      MANAGER         7839 01-MAY-81       2850                    30
      7782 CLARK      MANAGER         7839 09-JUN-81       2450                    10
```

2) Display the employees whose job ends with 'man'

```
SQL> select * from emp
  2  where substr (job,-3) = 'MAN' ;
```

```
     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7499 ALLEN      SALESMAN         7698 20-FEB-81       1600        300         30
      7521 WARD       SALESMAN         7698 22-FEB-81       1250        500         30
      7654 MARTIN     SALESMAN         7698 28-SEP-81       1250       1400         30
      7844 TURNER     SALESMAN         7698 08-SEP-81       1500          0         30
```

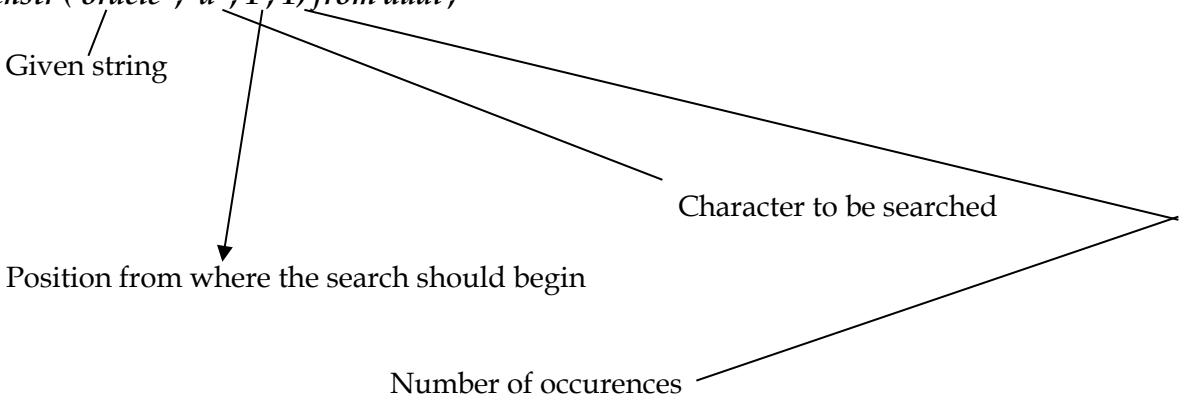
INSTR

This is also called as **instring.**

It returns position of a given character in a given string.

For ex,

Select instr ('oracle' , 'a' , 1 , 1) from dual ;




```
SQL> select instr ('oraclea','a',1,1),
  2         instr ('oraclea','a',1,2),
  3         instr ('oraclea','a')
  4  from dual ;

INSTR('ORACLEA','A',1,1) INSTR('ORACLEA','A',1,2) INSTR('ORACLEA','A')
------------------------ ------------------------ --------------------
                       3                        7                    3
```

Display all the employees whose name is having 'L'

```
SQL> select * from emp
  2  where instr (ename,'L',1,1) >0 ;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7499 ALLEN      SALESMAN         7698 20-FEB-81       1600        300         30
      7698 BLAKE      MANAGER          7839 01-MAY-81       2850                    30
      7782 CLARK      MANAGER          7839 09-JUN-81       2450                    10
      7934 MILLER     CLERK            7782 23-JAN-82       1300                    10
```

List the employees whose job is having atleast 2 A's in it

```
SQL> select * from emp
  2  where instr(job,'A',1,2) >=2;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7499 ALLEN      SALESMAN         7698 20-FEB-81       1600        300         30
      7521 WARD       SALESMAN         7698 22-FEB-81       1250        500         30
      7566 JONES      MANAGER          7839 02-APR-81       2975                    20
      7654 MARTIN     SALESMAN         7698 28-SEP-81       1250       1400         30
      7698 BLAKE      MANAGER          7839 01-MAY-81       2850                    30
      7782 CLARK      MANAGER          7839 09-JUN-81       2450                    10
      7788 SCOTT      ANALYST          7566 19-APR-87       3000                    20
      7844 TURNER     SALESMAN         7698 08-SEP-81       1500          0         30
      7902 FORD       ANALYST          7566 03-DEC-81       3000                    20

9 rows selected.
```

CONCAT

It concatenates any two values or columns.
It is represented by - **||**

For ex,

```
SQL> select ename ||' Works as '||job "statement" from emp ;

statement
----------------------------
SMITH Works as CLERK
ALLEN Works as SALESMAN
WARD Works as SALESMAN
JONES Works as MANAGER
MARTIN Works as SALESMAN
BLAKE Works as MANAGER
CLARK Works as MANAGER
SCOTT Works as ANALYST
KING Works as PRESIDENT
TURNER Works as SALESMAN
ADAMS Works as CLERK
JAMES Works as CLERK
FORD Works as ANALYST
MILLER Works as CLERK

14 rows selected.
```

NUMERIC FUNCTIONS

1) **Mod** :- it returns the remainder when 1 number is divided by the other.

```
SQL> select mod(7,2) "REM", 7/2 "QUO" from dual ;

       REM        QUO
---------- ----------
         1        3.5
```

Display the employees earning odd numbered salaries.

```
SQL> select * from emp
  2  where mod(sal,2)<>0;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7566 JONES      MANAGER          7839 02-APR-81       2975                    20
```

Round
It rounds off a given number to the nearest decimal place.

Trunc
It truncates the given number to the given decimal place. Truncate does not do any rounding.

For ex,

```
SQL> select round(34.76,1),
  2         trunc(34.76,1)
  3  from dual ;

ROUND(34.76,1) TRUNC(34.76,1)
-------------- --------------
          34.8           34.7
```

Here, '**1**' indicates the number of positions.

DATE FUNCTIONS

1) Sysdate
Stands for System date.
It returns both date & time, but by default – only date is displayed.
The default format is,

dd – mon – yy

```
SQL> select sysdate from dual;

SYSDATE
---------
10-APR-11
```

2) Systimestamp
Introduced from Oracle 9i

Returns date, time and timezone.

```
SQL> select systimestamp from dual
  2  /

SYSTIMESTAMP
---------------------------------------------------------------------------
10-APR-11 06.49.08.914000 AM +05:30
```

Here, **.914000** – gives the fraction of millisecond which keeps changing as shown below,

```
SQL> select systimestamp from dual
  2  /

SYSTIMESTAMP
---------------------------------------------------------------------------
10-APR-11 06.49.08.914000 AM +05:30

SQL> /

SYSTIMESTAMP
---------------------------------------------------------------------------
10-APR-11 06.50.25.614000 AM +05:30

SQL> /

SYSTIMESTAMP
---------------------------------------------------------------------------
10-APR-11 06.50.26.726000 AM +05:30

SQL> /

SYSTIMESTAMP
---------------------------------------------------------------------------
10-APR-11 06.50.27.697000 AM +05:30

SQL> /

SYSTIMESTAMP
---------------------------------------------------------------------------
10-APR-11 06.50.29.109000 AM +05:30
```

In interview – if they ask you – *" which function contains fractions of a second " OR "how to see the system time "* – then answer is "SYSTIMESTAMP".

SPECIAL FUNCTIONS

1) TO – CHAR
Used for displaying the date in different formats.

For ex,

```
SQL> select to_char(sysdate, 'mm/dd/yyyy') from dual ;

TO_CHAR(SY
----------
04/10/2011
```

```
SQL> select to_char (sysdate, 'day, dd-month')from dual ;

TO_CHAR(SYSDATE,'DAY,DD
-----------------------
sunday   , 10-april
```

```
SQL> select ename, to_char(hiredate, 'mm/dd/yyyy') from emp;

ENAME      TO_CHAR(HI
---------- ----------
SMITH      12/17/1980
ALLEN      02/20/1981
WARD       02/22/1981
JONES      04/02/1981
MARTIN     09/28/1981
BLAKE      05/01/1981
CLARK      06/09/1981
SCOTT      04/19/1987
KING       11/17/1981
TURNER     09/08/1981
ADAMS      05/23/1987
JAMES      12/03/1981
FORD       12/03/1981
MILLER     01/23/1982

14 rows selected.
```

```
SQL> select to_char(sysdate,'mm-yyyy hh:mi:ss') from dual ;

TO_CHAR(SYSDATE,
----------------
04-2011 06:56:30
```

Now, let us see how to add 5 hrs to the existing time,

```
SQL> select to_char(sysdate + (5/24),'hh:mi') from dual ;

TO_CH
-----
11:59

SQL> select systimestamp from dual;

SYSTIMESTAMP
---------------------------------------------------------------------------
10-APR-11 06.59.44.909000 AM +05:30
```

We can see that 5 hrs has been added to the current time.

DECODE

It works like '**if – then – else**' statement.

For ex,

```
SQL> select ename,job,
  2  decode (job,'CLERK','C','SALESMAN','S','O')
  3  from emp;

ENAME      JOB       D
---------- --------- -
SMITH      CLERK     C
ALLEN      SALESMAN  S
WARD       SALESMAN  S
JONES      MANAGER   O
MARTIN     SALESMAN  S
BLAKE      MANAGER   O
CLARK      MANAGER   O
SCOTT      ANALYST   O
KING       PRESIDENT O
TURNER     SALESMAN  S
ADAMS      CLERK     C
JAMES      CLERK     C
FORD       ANALYST   O
MILLER     CLERK     C

14 rows selected.
```

The above query states that – in job, if clerk is there, replace with C – else if salesman is there, replace it with S – else replace with 'O'.

NVL
It substitutes a value for a null.

For ex,

```
SQL> select ename,sal,comm,sal+NVL(comm,0) "total Sal" from emp;

ENAME             SAL       COMM  total Sal
---------- ---------- ---------- ----------
SMITH              800                  800
ALLEN             1600        300       1900
WARD              1250        500       1750
JONES             2975                  2975
MARTIN            1250       1400       2650
BLAKE             2850                  2850
CLARK             2450                  2450
SCOTT             3000                  3000
KING              5000                  5000
TURNER            1500          0       1500
ADAMS             1100                  1100
JAMES              950                   950
FORD              3000                  3000
MILLER            1300                  1300

14 rows selected.
```

The above query means – if the employee has commission, then add sal + comm. To get total salary – else add 0 to the sal and display total salary.

Display employee name, job, salary and commission. If the commission is NULL, then display -100

```
SQL> select ename, job, sal, NVL(comm, -100) from emp ;

ENAME      JOB              SAL NVL(COMM,-100)
---------- --------- ---------- --------------
SMITH      CLERK             800           -100
ALLEN      SALESMAN         1600            300
WARD       SALESMAN         1250            500
JONES      MANAGER          2975           -100
MARTIN     SALESMAN         1250           1400
BLAKE      MANAGER          2850           -100
CLARK      MANAGER          2450           -100
SCOTT      ANALYST          3000           -100
KING       PRESIDENT        5000           -100
TURNER     SALESMAN         1500              0
ADAMS      CLERK            1100           -100

ENAME      JOB              SAL NVL(COMM,-100)
---------- --------- ---------- --------------
JAMES      CLERK             950           -100
FORD       ANALYST          3000           -100
MILLER     CLERK            1300           -100

14 rows selected.
```

Display all employees whose name is having exactly 1 'L' in it

```
SQL> select * from emp
  2  where instr (ename, 'L',1,1) >0
  3  and instr (ename, 'L',1,2) =0;

     EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7698 BLAKE      MANAGER         7839 01-MAY-81       2850                    30
      7782 CLARK      MANAGER         7839 09-JUN-81       2450                    10
```