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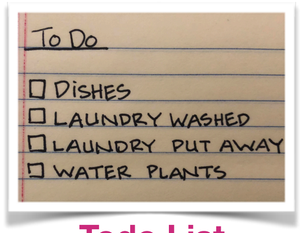
SQL TUTORING SUMMER 2021

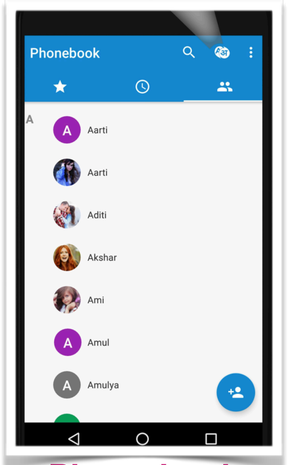
What is DataBase ?

DataBase is a collection of related information

DataBase can be stored in different ways



Todo List



Phone book

My 4 best friends

Names of Facebook users

Names of Students in a School

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Advantages of Storing Data in Computer's Memory or Cloud

1) Huge amount of data can be stored ✓

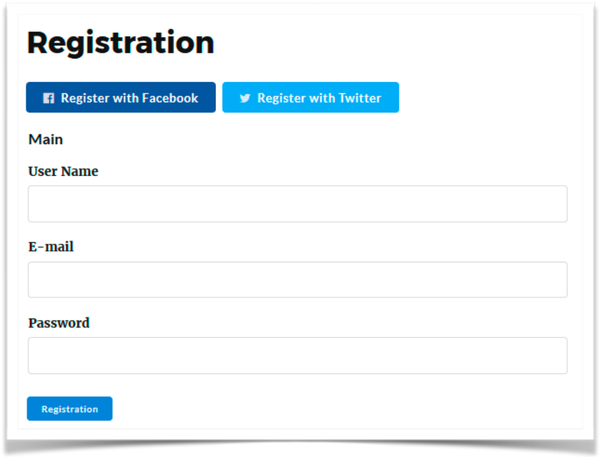
2) Easy to Create, Read, Update, Delete ✓

3) Easy to access ✓

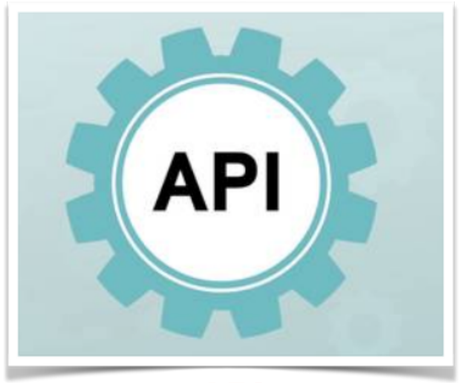
4) Quick access ✓

5) Security ✓

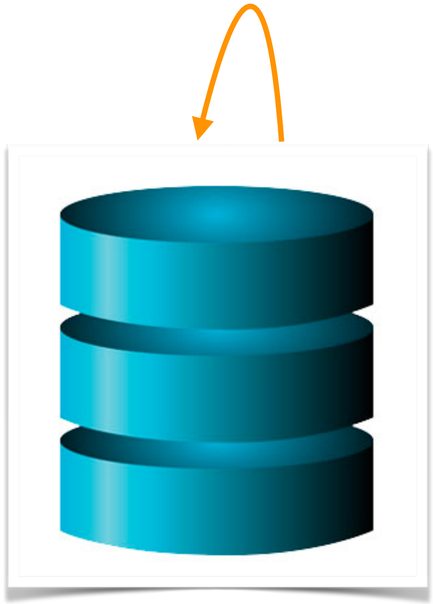
Database Validation Test



User Interface



API



Database

END To END (E2E) Testing

1) If you send data to database by using UI
   A) Validate data from UI by using search functionality (Selenium)
   B) Validate data by using SQL Codes (SQL + Selenium)
   C) Validate data by using API Codes (API + Selenium)

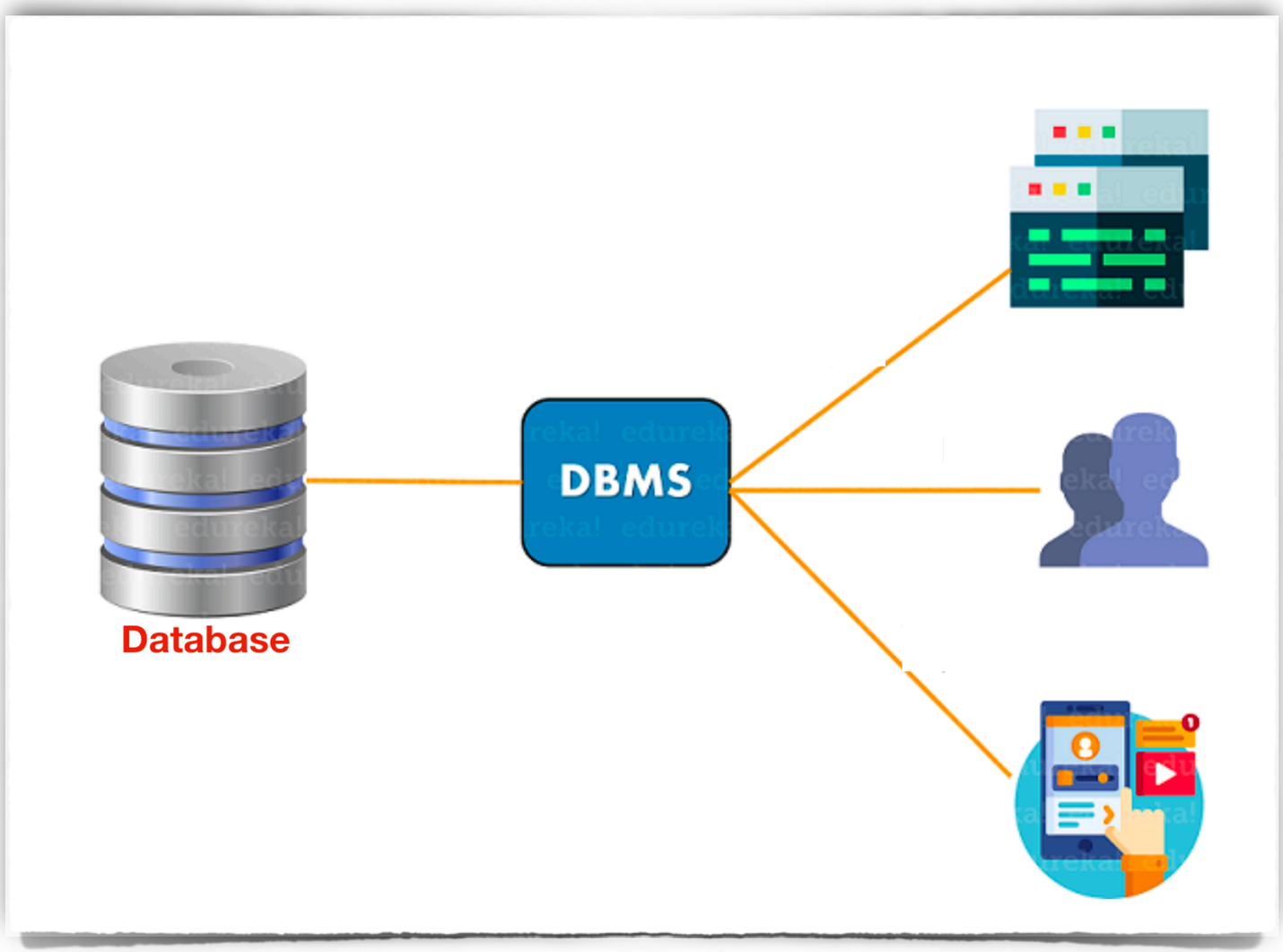
2) If you send data to database by using SQL codes
   A) Validate data from UI by using search functionality (Selenium)
   B) Validate data by using SQL Codes (SQL + Selenium)
   C) Validate data by using API Codes (API + Selenium)

3) If you send data to database by using API codes
   A) Validate data from UI by using search functionality (Selenium)
   B) Validate data by using SQL Codes (SQL + Selenium)
   C) Validate data by using API Codes (API + Selenium)

Data Base Management System (DBMS)

DBMS is a special software program which enables its users

1) To access database,
2) To Create, Read, Update, Delete, (CRUD)
3) To get reports form database,
4) To control access to the database, (Security)
5) To interact with other applications



Tables in SQL (Structured Query Language)

Row *(Record)* ====>

Row *(Record)* ====>

Row *(Record)* ====>

Row *(Record)* ====>

contactID	name	company	email
1	Bill Gates	Microsoft	bill@XBoxOneRocks.com
2	Steve Jobs	Apple	steve@rememberNewton.com
3	Linus Torvalds	Linux Foundation	linus@gnuWho.org
4	Andy Harris	Wiley Press	andy@aharrisBooks.net

Column *(Field)* ====>

Column *(Field)* ====>

Column *(Field)* ====>

Column *(Field)* ====>

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Relational Databases *(SQL Databases)*

1) A relational database stores data in tables.

2) The relationship between each data point is clear and searching through those relationships is easy.

3) The relationship between tables and field types is called a schema.

4) Relational Databases are also called SQL Databases. (Structured Query Language)

Schema

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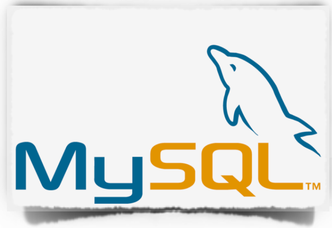
Popular Relational Databases(SQL Database)

SQL Server : Developed by Microsoft

Cons: It can be expensive – with the Enterprise level costing thousands of dollars.
Pros: It has rich user interface and can handle large quantities of data.



MySQL Server : Created by a Swedish Company

Cons: Tends to stop working when it's given too many operations at a given time.
Pros: It's free and open-source. There's also a lot of documentation and online support.

PostgreSQL Server : Created by a computer science professor Michael Stonebraker.

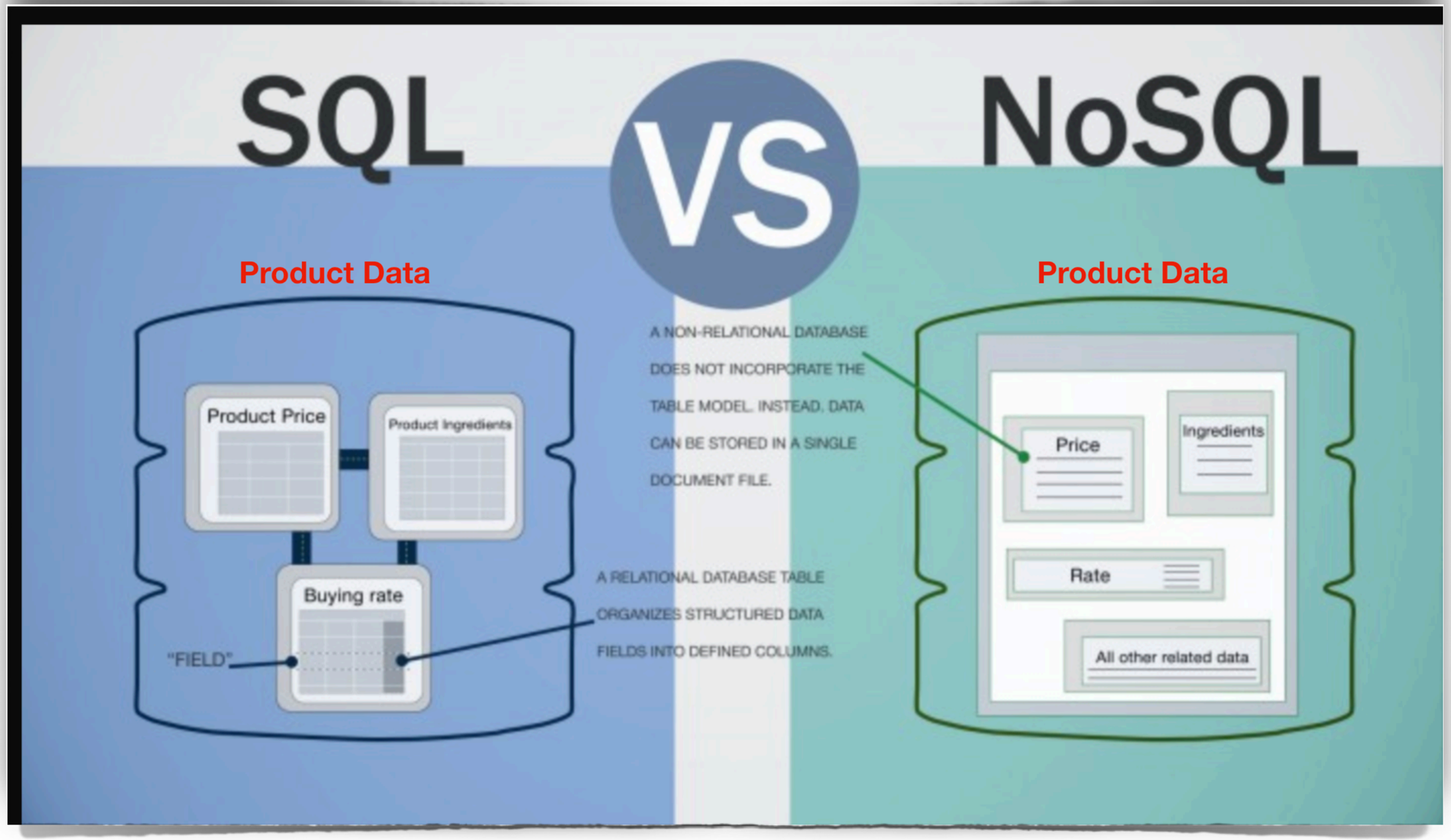
Cons: Installation and configuration can be difficult.
Pros: If you need additional features in PostgreSQL, you can add it yourself – a difficult task in most databases.

PL/SQL is a procedural language designed specifically to embrace SQL statements within its syntax.
PL/SQL program units are compiled by the Oracle Database server and stored inside the database.

Pros: PL/SQL provides high security level.
PL/SQL provides support for Object-Oriented Programming.

Non Relational Databases *(non-SQL Databases)*

A non-relational database does not use the tabular schema of rows and columns like in relational databases



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Primary Key

Primary Key : Primary keys must contain **UNIQUE** values, and **cannot contain NULL** values.
For data whose all attributes are same, we need **primary key** to differentiate between them
A table can have only **one** primary key; and in the table, this primary key **can consist of multiple columns**

Note: Primary key can be anything, a number, String, character etc.

Note: If you use real values as a primary key like SSN or email address, it is called "**Natural Primary Key**"
If you use any values like 1, 2, 3, 4, … , it is called "**Surrogate Primary Key.**"
Surrogate key values are just numbers.

StudentID	FirstName	LastName
10	John	Walker
11	Tom	Hanks
12	Kevin	Star
13	Carl	Wall
14	Andrei	Apazniak
15	Mark	High
16	Clara	Star
17	John	Ocean
18	John	Walker
19	Pamela	Star
20	Carl	Wall

Email	FirstName	LastName
JWalker@gmail.com	John	Walker
THanks@gmail.com	Tom	Hanks
KStar@gmail.com	Kevin	Star
CWall@gmail.com	Carl	Wall
AApazniak@gmail.com	Andrei	Apazniak
MHigh@gmail.com	Mark	High
CStar@gmail.com	Clara	Star
JOcean@gmail.com	John	Ocean
JWalker01@gmail.com	John	Walker
PStar@gmail.com	Pamela	Star
CWall01@gmail.com	Carl	Wall

primary key **can consist of multiple columns**

Job_ID	Recruiter	Company
2	Mark Eye	RCG
3	John Ted	RCG
1	Mark Eye	Signature
1	John Ted	InfoLog
1	Cory Al	InfoLog
2	Angela Star	Signature

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Foreign Key

A **Foreign Key** is a key used to create **link between two tables**.

A **Foreign Key** is a field *(or collection of columns)* **in one table that refers to the Primary Key in another table.**

A table can have multiple **Foreign Key**s

Foreign Key can have NULL values and repeated values

StudentID	FirstName	LastName	CourseID
10	John	Walker	200
11	Tom	Hanks	400
12	Kevin	Star	400
13	Carl	Wall	200
14	Andrei	Apazniak	300
15	Mark	High	400
16	Clara	Star	100
17	John	Ocean	100
18	John	Walker	200
19	Pamela	Star	300
20	Carl	Wall	NULL

Child Table

CourseID	CourseName	CourseCredit	CourseFee
100	Biology	3	1200
200	Math	3	1200
300	English	2	600
400	Selective	1	200

Parent Table

The "CourseID" column in the "Parent Table" table is the primary key.
The "CourseID" column in the “Child Table" table is a foreign key.

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Foreign and Primary Key

Note: Foreign key can create a relation between the table and the table itself.

1) Who is the Manager of Michael Scott ?

2) What is the job name of Angela Martin ?

3) What is the average salary of Manual Testers ?

4) What is the job name of the highest salary ?

Emp_ID	first_name	last_name	birth_date	Gender	salary	Job_ID	Manager_ID
100	Jan	Levinson	1961-05-11	F	110,000	1	NULL
101	Michael	Scott	1964-03-15	M	75,000	2	100
102	Josh	Porter	1969-09-05	M	78,000	3	100
103	Angela	Martin	1971-06-25	F	63,000	2	101
104	Andy	Bernard	1973-07-22	M	65,000	3	101

Job_ID	Job_Name
2	SDET
3	Manual Tester
1	QE Lead

SQL Composite Key

A composite key is a combination of two or more columns in a table that can be used to uniquely identify each row in the table when the columns are combined uniqueness is guaranteed, but when it taken individually it does not guarantee uniqueness.

Note: Branch_ID and Recruiter are the primary keys for the Job and Recruiter tables; in addition, they are foreign key for the Company table.
The combination of Job_ID and Recruiter foreign keys in Company table is primary key for Company table.

Job_ID	Job_Name
2	SDET
3	Manual Tester
1	QE Lead

Job Table

Recruiter	NumberOfClient
Mark Eye	121
John Ted	283
Cory Al	67
Angela Star	301

Recruiter Table

Job_ID	Recruiter	Company
2	Mark Eye	RCG
3	John Ted	RCG
1	Mark Eye	Signature
1	John Ted	InfoLog
1	Cory Al	InfoLog
2	Angela Star	Signature

Company Table

Difference between “UNIQUE KEY” and “PRIMARY KEY”

Primary Key

Only one primary key is allowed to use in a table.

Primary key does not accept NULL values.

Unique Key

A table can have more than one unique key.

Unique key can accept multiple NULL values for column.

Common features of “UNIQUE KEY” and “PRIMARY KEY”

Primary Key

A primary key of one table can be referenced by the foreign key of another table.

Primary key does not allow duplication

Unique Key

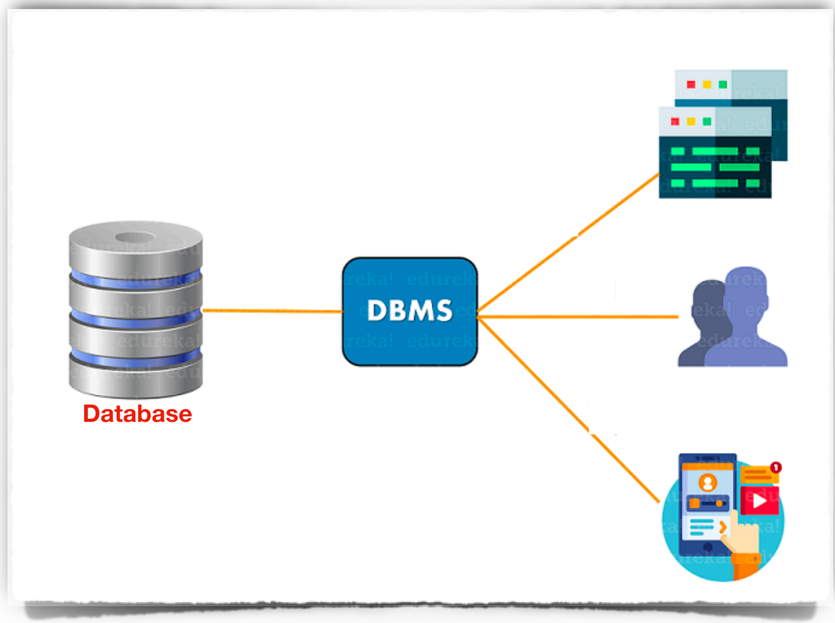
Unique keys are also referenced by the foreign key of another table.

Unique key also does not allow duplication except null

What is SQL ?

SQL stands for Structured Query Language

SQL is a language used for interacting with Relational Data Base Management Systems (RDBMS)



By using SQL we can;

1) **Create and Manage databases**
2) **Create and Design database tables**
3) **Create, Read, Update, and Delete data (CRUD)**
4) **Perform administration tasks like security, user management etc.**

We can use SQL for all RDBMS (MySQL, Microsoft SQL, PostgreSQL, Oracle SQL)

The concepts are same but implementation can be slightly different.

More about SQL

SQL is the combination of 4 different languages;

1) Data Control Language (DCL)
DCL is used to control privileges in Database. To perform any operation in the database, such as for creating tables, sequences or views, a user needs privileges.
DCL manages users and permissions

2) Data Definition Language (DDL)
DDL deals with descriptions of the database schema (tables, columns, rows) **and is used to create and modify the structure of database objects**

3) Data Manipulation Language (DML) ==> For Create, Update, Delete
DML deals with the manipulation of data present in the database. For example, insert, update, and delete data

4) Data Query Language (DQL) ==> Read
DQL is used to query the database for information
DQL is used to get information that is already stored in database

Working with Related Tables

<=== One to One Relation ===>

1) Find the address of the Tom Hanks
2) Find the address of the John Walker
3) Find the address of the student whose ID is 17

StudentID	FirstName	LastName
10	John	Walker
11	Tom	Hanks
12	Kevin	Star
13	Carl	Wall
14	Andrei	Apazniak
15	Mark	High
16	Clara	Star
17	John	Ocean
18	John	Walker
19	Pamela	Star
20	Carl	Wall

StudentID	Street	ZipCode	City	State
10	1234 W 23th Street	33018	Hialeah	Florida
11	1235 N 3th Street	22145	Austwell	Texas
12	1236 SE 12th Street	54234	Orange	California
13	1237 N 5th Street	33018	Hialeah	Florida
14	1238 SW 53th Street	33026	Miami	Florida
15	1239 S 123th Street	22314	Avery	Texas
16	1240 N 1st Street	12345	Arlington	Virginia
17	1241 NW 2nd Street	65432	Pittsburgh	Pensylvania
18	1242 W 5th Street	22133	Baytown	Texas
19	1243 SE 55th Street	74352	Beachwood	Ohio
20	1244 SW 17th Street	22314	Avery	Texas

<===== One to Many Relation ====>

1) Find the names of the students who take Biology class
2) Find the names of the students who take Selective class
3) Find the names of the students who take the class whose course fee is 600

CourseID	CourseName	CourseCredit	CourseFee	InstructorID
100	Biology	3	1200	1
200	Math	3	1200	2
300	English	2	600	3
400	Selective	1	200	1

StudentID	FirstName	LastName	CourseID
10	John	Walker	200
11	Tom	Hanks	400
12	Kevin	Star	400
13	Carl	Wall	200
14	Andrei	Apazniak	300
15	Mark	High	400
16	Clara	Star	100
17	John	Ocean	100
18	John	Walker	200
19	Pamela	Star	300
20	Carl	Wall	400

<=== Many to Many Relation ====>

To resolve Many to Many relation we need Linking Table

1) Find the names of the students whose instructor is Mark Adam
2) Find the names of the instuctors of Kevin Star
3) Find the names of the instuctors of Pamela Star

StudentID	FirstName	LastName
10	John	Walker
11	Tom	Hanks
12	Kevin	Star
13	Carl	Wall
14	Andrei	Apazniak
15	Mark	High
16	Clara	Star
17	John	Ocean
18	John	Walker
19	Pamela	Star
20	Carl	Wall

StudentID	InstructorID
12	1
11	2
12	2
13	1
15	1
17	3
15	4

InstructorID	FirstName	LastName	Phone	Department
1	Mark	Adam	1234567891	Science
2	Eve	Sky	1239876543	Engineering
3	Leo	Ocean	1237845691	Language
4	Andy	Mark	1232134567	Health

SQL Data Types

String Data Types

Data Type	*Description*
char(size)	Maximum size of **2000 bytes**. **1** character uses **1** byte. **"size"** is the **number of characters** to store. "char" is used to store character data. **Fixed length** Strings. The "char" is useful for expressions where the length of characters is always fix like SSN or ZipCode or State Abbreviations (FL, CA, …)
nchar(size)	Maximum size of **2000 bytes**. **1** character uses **2** bytes. **"size"** is the **number of characters** to store. "**nchar**" is used to **store Unicode** Data. It is often used to store data in **different language**s. **Fixed length** Strings.
varchar2(size)	Maximum size of **4000 bytes**. **1** character uses **1** byte. **"size"** is the **number of characters** to store. **Variable length** string.
nvarchar2(size)	Maximum size of **8000 bytes**. **1** character uses **2** byte. **"size"** is the **number of characters** to store. "**varchar**" uses **Non-Unicode** data while "**nvarchar**" uses **Unicode Data** **Variable length** string.

Value	CHAR(4)	Storage Required	VARCHAR(4)	Storage Required
''	' '	4 bytes	''	1 byte
'ab'	'ab '	4 bytes	'ab'	3 bytes
'abcd'	'abcd'	4 bytes	'abcd'	5 bytes
'abcdefgh'	'abcd'	4 bytes	'abcd'	5 bytes

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Numeric Data Types

Data Type	***Description***
number(p, s)	The "**Precision**" is a **number of digits** in a number. The "**Scale**" is the **number of digits** to the **right of the decimal** point in a number. For example, for **1234,56** ==> **Precision** is **6**, and **Scale** is **2**. **1) "number(5, 2)"** is a number that has **3 digits before** the decimal and **2 digits after** the decimal. **==>** ***123,45*** *is stored as* ***123,45*** **2) "number(7)"** defines a 7 digits number with scale zero. **==>** ***12345,67*** *is stored as* ***12345*** **Note: "number(7)"** and **"number(7, 0)"** are **same**. **3) "number(7, -2)"** rounds the numeric value to hundreds. **==>** ***1234567,89*** **==>** ***1234600*** **4) "number(4, 2)" ==>** ***123,45*** **==>** Exceeds precision ***error*** ***Note:*** **If the precision is exceeded, SQL will give error**

Date Data Types

Data Type	*Description*
DATE	"**DATE**" stores values that **include** both **date and time** with a precision of one second "**DATE**" stores the **year**, the **month**, the **day**, the **hours**, the **minutes**, and the **seconds**. The standart **"Date Format"** for input and output is "**dd - MMM - yy"** like 09 - Aug - 21 We can change the format by using "**ALTER SESSION SET NLS_DATE_FORMAT = "YYYY-MM-DD"** The new date format is 2020 - 04 - 13

BLOB Data Types

Data Type	*Description*
BLOB	"**BLOB**" stands for "**B**inary **L**arge **OB**jects" "**BLOB**" is good to store digitized information like images, audios, and videos.

How to Create a Table

1) Create from Scratch

```
CREATE TABLE students
(
id number(9),
name varchar2(50),
grade number(2),
address varchar2(100),
last_modification date
);
```

Columns

#	Column	Type	Length	Precision	Scale	Nullable	Semantics
1	ID	NUMBER	22	9	0	Yes	
2	NAME	VARCHAR2	50			Yes	Byte
3	GRADE	NUMBER	22	2	0	Yes	
4	ADDRESS	VARCHAR2	100			Yes	Byte
5	LAST_MODIFICATION	DATE	7			Yes	

2) Create from an Existing Table

```
CREATE TABLE studentsIdName
AS
SELECT id, name
FROM students;
```

Columns

#	Column	Type	Length	Precision	Scale	Nullable	Semantics
1	ID	NUMBER	22	9	0	Yes	
2	NAME	VARCHAR2	50			Yes	Byte

Practice Exercise 1:

Create a table called “*suppliers”* that stores “supplier_ID”, “name”, address information which has “street”, “city”, “state”, and “zip_code” columns separately.

Practice Exercise 2:

Create a table called “*suppliers_id_name”* that stores “supplier ID”, “name” by using “suppliers” table

Constraints

1) How to Enforce a Column not to Accept “repeated” Values

To make “id” column “not repeated”, we need to type “UNIQUE” after the id column data type

```
CREATE TABLE students
(
id char(11),
name varchar2(50),
grade number(3),
address varchar2(80),
update_date date
);
```



```
CREATE TABLE students
(
id char(11) UNIQUE,
name varchar2(50),
grade number(3),
address varchar2(80),
update_date date
);
```

2) How to Enforce a Column not to Accept “null” Values

To make “id” column “not null”, we need to type “not null” after the id column data type

```
CREATE TABLE students
(
id number(9),
name varchar2(50),
grade number(2),
address varchar2(100),
last_modification date
);
```



```
CREATE TABLE students
(
id number(9),
name varchar2(50) NOT NULL,
grade number(2),
address varchar2(100),
last_modification date
);
```

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3) How to Add a "Primary Key" for a Table

1) A primary key is a single field or combination of fields that uniquely defines a record.
2) A table can have only one primary key.
3) None of the fields that are part of the primary key can contain a null value.

To Make "id" Column "primary key"

1) We can type "primary key" after the id column data type.
   If you want to give a name to constraint you can type "CONSTRAINT constraintName PRIMARY KEY"

```
CREATE TABLE students
(
id number(9),
name varchar2(50),
grade number(2),
address varchar2(100),
last_modification date
);
```



```
CREATE TABLE students
(
id number(9) primary key,
name varchar2(50),
grade number(2),
address varchar2(100),
last_modification date
);
```

2) We can use "CONSTRAINT constraintName PRIMARY KEY(column1, column2, ... column_n)"

```
CREATE TABLE students
(
id number(9),
name varchar2(50),
grade number(2),
address varchar2(100),
last_modification date
);
```



```
CREATE TABLE students
(
id number(9),
name varchar2(50),
grade number(2),
address varchar2(100),
last_modification date,
CONSTRAINT id_pk PRIMARY KEY(id)
);
```

Practice Exercise 3:

Create a table called “*cities*” that stores “area code”, “name”, “population”, “state”
The “area code” will be “primary key”
Add “primary key” by using first method.

Practice Exercise 4:

Create a table called “*teachers*” that stores “SSN”, “name”, “subject”, “gender”
The “SSN” will be “primary key”
Add “primary key” by using second method.

4) How to Add “foreign key” to a Table

A Foreign Key is a key used to create link between two tables.

A Foreign Key is a column *(or collection of column)* in one table that refers to the Primary Key in another table.

The referenced table is called the *parent table* while the table with the foreign key is called the *child table*.

A table can have many Foreign Keys

Foreign Key can have NULL value

Syntax: CONSTRAINT constraintName FOREIGN KEY(column1, column2, ...) REFERENCES parentTableName(column1, column2, ...)

```
CREATE TABLE students
(
id number(9),
name varchar2(50),
grade number(2),
address varchar2(100),
last_modification date
);
```

Child Table

```
CREATE TABLE studentPhoneNumber
(
studentId number(9),
PhoneNumber varchar2(10),
CONSTRAINT studentId_fk FOREIGN KEY(studentId) REFERENCES students(id)
);
```

Parent Table

Note 1: If “Parent Table” does not have same student id with the “Child Table” you cannot insert data

Note 2: You cannot drop “Parent Table” without dropping the “Child Table”
You need to drop “Child Table” first, then you can drop “Parent Table”

Practice Exercise 5:

Create a table called "*supplier*" that stores "supplier_id", "supplier_name", "contact_name" and make "supplier_id" as primary key.
Create another table called "*products*" that stores "supplier_id" and "product_id" and make "supplier_id" as foreign key.

```
CREATE TABLE supplier
(
  supplier_id number(10) not null,
  supplier_name varchar2(50) not null,
  contact_name varchar2(50),
  CONSTRAINT supplier_pk PRIMARY KEY (supplier_id)
);
```

```
CREATE TABLE products
(
  supplier_id number(10),
  product_id number(10),
  CONSTRAINT fk_supplier FOREIGN KEY (supplier_id) REFERENCES supplier(supplier_id)
);
```

Practice Exercise 6:

Create a table called "*supplier*" that stores "supplier_id", "supplier_name", "contact_name" and make the combination of "supplier_id" and "supplier_name" as primary key.
Create another table called "*products*" that stores "supplier_id" and "product_id" and make the combination of "supplier_id" and "supplier_name" as foreign key.

```
CREATE TABLE supplier
(
  supplier_id number(10) not null,
  supplier_name varchar2(50) not null,
  contact_name varchar2(50),
  CONSTRAINT supplier_pk PRIMARY KEY (supplier_id, supplier_name)
);
```

```
CREATE TABLE products
(
  product_id number(10),
  supplier_id number(10),
  supplier_name varchar2(50) not null,
  CONSTRAINT fk_supplier FOREIGN KEY (supplier_id, supplier_name) REFERENCES supplier(supplier_id, supplier_name)
);
```

5) How to use Check Constraint

A check constraint allows you to specify a condition on each row in a table.
A check constraint can be defined in either a SQL CREATE TABLE statement or a SQL ALTER TABLE statement.

1)
```
CREATE TABLE suppliers
(
  supplier_id numeric(4),
  supplier_name varchar2(50),
  CONSTRAINT check_supplier_id
  CHECK (supplier_id BETWEEN 100 AND 9999)
);
```

We've created a check constraint on the suppliers table called check_supplier_id.
This constraint ensures that the supplier_id field contains values between 100 and 9999.

2)
```
CREATE TABLE suppliers
(
  supplier_id numeric(4),
  supplier_name varchar2(50),
  CONSTRAINT check_supplier_name
  CHECK (supplier_name = upper(supplier_name))
);
```

We've created a check constraint called check_supplier_name.
This constraint ensures that the supplier_name column always contains uppercase characters.

How to Insert Data Into a Table

The Oracle INSERT INTO statement is used to insert a single record or multiple records into a table in Oracle.

```
CREATE TABLE students
(
id number(9),
name varchar2(50) NOT NULL,
grade number(2),
address varchar2(100),
last_modification date
);
```

1) To insert values for all columns

```
INSERT INTO students VALUES(123456789, 'John Walker', 11, '1234 W 12th TER Addison Texas 75001', '14-Apr-2020' );
```

ID	NAME	GRADE	ADDRESS	LAST_MODIFICATION
123456789	John Walker	11	1234 W 12th TER Addison Texas 75001	14-APR-20

2) To insert values for some selected columns

```
INSERT INTO students(id, name) VALUES(234567890, 'John Walker');
```

ID	NAME	GRADE	ADDRESS	LAST_MODIFICATION
234567890	John Walker	-	-	-

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Note: When inserting records into a table using the INSERT INTO statement, you must provide a value for every NOT NULL column.

```
CREATE TABLE students
(
id number(9),
name varchar2(50) NOT NULL,
grade number(2),
address varchar2(100),
last_modification date
);
```

```
INSERT INTO students(id, grade) VALUES(123456789, 11);
```

```
ORA-01400: cannot insert NULL into ("SQL_LFGUHVRSOWWDACLEMHRMQGCJQ"."STUDENTS"."NAME") ORA-06512: at "SYS.DBMS_SQL", line 1721
```

Practice Exercise 7:

Create an Oracle table called "*teachers*" that stores "SSN", "name", "subject", "gender"
Based on the "*teachers*" table, insert a contact record whose *SSN* is 234 43 1223, *name* is Jane Smith, subject is Mathematics, and gender is female.

Practice Exercise 8:

Based on the "*teachers*" table, insert a contact record whose *SSN* is 567 59 7624, *name* is Leo Mark

How to use UPDATE SET

The UPDATE SET statement is used to update existing records in a table.

1)

```
CREATE TABLE supplier
(
  supplier_id number(10),
  supplier_name varchar2(50),
  contact_name varchar2(50),
  CONSTRAINT supplier_pk PRIMARY KEY (supplier_id, supplier_name)
);
```

```
INSERT INTO supplier VALUES(1, 'IBM', 'John Walker');
INSERT INTO supplier VALUES(2, 'APPLE', 'Steve Max');
INSERT INTO supplier VALUES(3, 'SAMSUNG', 'Tae Shaun');
```

SUPPLIER_ID	SUPPLIER_NAME	CONTACT_NAME
1	IBM	John Walker
2	APPLE	Steve Max
3	SAMSUNG	Tae Shaun

```
UPDATE supplier
SET supplier_name = 'LINUX',
    contact_name = 'Alex Leo'
WHERE supplier_id=1;
```

SUPPLIER_ID	SUPPLIER_NAME	CONTACT_NAME
1	LINUX	Alex Leo
2	APPLE	Steve Max
3	SAMSUNG	Tae Shaun

2)

```
UPDATE supplier
SET supplier_name = 'LG',
    contact_name = 'El Ci'
WHERE supplier_id<3;
```

SUPPLIER_ID	SUPPLIER_NAME	CONTACT_NAME
1	LG	El Ci
2	LG	El Ci
3	SAMSUNG	Tae Shaun

3)

```
CREATE TABLE workers
(
    id CHAR(5),
    name VARCHAR2(50),
    salary NUMBER(5),
    CONSTRAINT id3_pk PRIMARY KEY(id)
);
```



```
INSERT INTO workers VALUES('10001', 'Ali Can', 12000);
INSERT INTO workers VALUES('10002', 'Veli Han', 2000);
INSERT INTO workers VALUES('10003', 'Mary Star', 7000);
INSERT INTO workers VALUES('10004', 'Angie Ocean', 8500);
```


	ID	NAME	SALARY
1	10001	Ali Can	12000
2	10002	Veli Han	2000
3	10003	Mary Star	7000
4	10004	Angie Ocean	8500

Example: Company decided to increase the salary of Veli Han. However, instead of setting a specific price, they want to make it 40% less than the highest salary.

```
UPDATE workers
SET salary = (SELECT MAX(salary)*0.6
              FROM workers)
WHERE name = 'Veli Han';
```

	ID	NAME	SALARY
1	10001	Ali Can	12000
2	10002	Veli Han	7200
3	10003	Mary Star	7000
4	10004	Angie Ocean	8500

4)

```
CREATE TABLE workers
(
    id CHAR(5),
    name VARCHAR2(50),
    salary NUMBER(5),
    CONSTRAINT id3_pk PRIMARY KEY(id)
);
```

```
INSERT INTO workers VALUES('10001', 'Ali Can', 12000);
INSERT INTO workers VALUES('10002', 'Veli Han', 2000);
INSERT INTO workers VALUES('10003', 'Mary Star', 7000);
INSERT INTO workers VALUES('10004', 'Angie Ocean', 8500);
```

	ID	NAME	SALARY
1	10001	Ali Can	12000
2	10002	Veli Han	2000
3	10003	Mary Star	7000
4	10004	Angie Ocean	8500

```
CREATE TABLE parents
(
  id CHAR(5),
  num_of_kids NUMBER(2),
  total_income NUMBER(5),
  CONSTRAINT id3_fk FOREIGN KEY(id) REFERENCES workers(id)
);
```

```
INSERT INTO parents VALUES('10001', 4, 17000);
INSERT INTO parents VALUES('10002', 2, 5000);
INSERT INTO parents VALUES('10003', 1, 7000);
INSERT INTO parents VALUES('10004', 1, 10000);
```

Example: If the salary equals to total income increase the salary 20 percent.

```
UPDATE workers
SET salary = (SELECT total_income*1.2
              FROM parents
              WHERE workers.salary = parents.total_income
              )
WHERE salary = (SELECT total_income
                FROM parents
                WHERE workers.salary = parents.total_income
                );
```

	ID	NAME	SALARY
1	10001	Ali Can	12000
2	10002	Veli Han	2000
3	10003	Mary Star	8400
4	10004	Angie Ocean	8500

Practice Exercise 9:

a) Create a table called "*students*" that stores "student_id", "student_name", "student_grade", "student_gpa", "school_name"

b) Insert 5 different data with 2.6, 1.9, 3.2, 3.8, 3.5 GPA scores.

c) Update the student names whose GPAs are more than 3.0 to "Gifted Student".

Practice Exercise 10:

a) Create a table called "*students*" that stores "student_id", "student_name", "student_grade", "school_name"

b) Insert 5 different data with 2.6, 1.9, 3.2, 3.8, 3.5 GPA scores.

c) Create a table called "*parents*" that stores "student_id", "parent_name", "school_name"

d) Insert 5 different data with at least 2 same school names with the students table.

e) Update the *student names* in the *students* table with the *parent name* in the *parents* table when the *school name* in the *students* table matches the school *name* in the *parents* table.

```
CREATE TABLE suppliers
(
supplier_id number(11) PRIMARY KEY,
supplier_name varchar2(50),
contact_name varchar2(50)
);
```

```
INSERT INTO suppliers VALUES(100, 'IBM', 'Ali Can');
INSERT INTO suppliers VALUES(101, 'APPLE', 'Merve Temiz');
INSERT INTO suppliers VALUES(102, 'SAMSUNG', 'Kemal Can');
INSERT INTO suppliers VALUES(103, 'LG', 'Ali Can');
```

```
CREATE TABLE products
(
supplier_id number(11),
product_id number(11),
product_name varchar2(50),
costumer_name varchar2(50),
CONSTRAINT supplier_id_fk FOREIGN KEY(supplier_id) REFERENCES suppliers(supplier_id)
);
```

```
INSERT INTO products VALUES(100, 1001,'Laptop', 'Suleyman');
INSERT INTO products VALUES(101, 1002,'iPad', 'Fatma');
INSERT INTO products VALUES(102, 1003,'TV', 'Ramazan');
INSERT INTO products VALUES(103, 1004,'Phone', 'Ali Can');
```

Practice Exercise 11:

According to the given tables do the followings

a) Change the product which Ali Can purchased to the supplier name which Merve Temiz is contact person

b) Change the customer name who purchased TV to the contact name of Apple

“IS NULL” Condition

```
CREATE TABLE people
(
 ssn char(9),
 name varchar2(50),
 address varchar2(50)
);
```

```
INSERT INTO people VALUES(123456789, 'Mark Star', 'Florida');
INSERT INTO people VALUES(234567890, 'Angie Way', 'Virginia');
INSERT INTO people VALUES(345678901, 'Maryy Tien', 'New Jersey');
INSERT INTO people(ssn, address) VALUES(456789012, 'Michigan');
INSERT INTO people(ssn, address) VALUES(567890123, ‘California');
INSERT INTO people(ssn, name) VALUES(567890123, 'California');
```

	SSN	NAME	ADDRESS
1	123456789	Mark Star	Florida
2	234567890	Angie Way	Virginia
3	345678901	Maryy Tien	New Jersey
4	456789012	(null)	Michigan
5	567890123	(null)	California
6	567890123	California	(null)

Table name is “people”

Example: Return all records from the *people* table where the *name* contains a null value.

```
SELECT *
FROM people
WHERE name IS NULL OR address IS NULL;
```

	SSN	NAME	ADDRESS
1	456789012	(null)	Michigan
2	567890123	(null)	California
3	567890123	California	(null)

1) **Example**: Update all null names to “No Name” from the *people* table

```
UPDATE people
SET name = 'No Name'
WHERE name IS NULL;
```

	SSN	NAME	ADDRESS
1	123456789	Mark Star	Florida
2	234567890	Angie Way	Virginia
3	345678901	Maryy Tien	New Jersey
4	456789012	No Name	Michigan
5	567890123	No Name	California
6	567890123	California	(null)

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```
CREATE TABLE people
(
 ssn char(9),
 name varchar2(50),
 address varchar2(50)
);
```

```
INSERT INTO people VALUES(123456789, 'Mark Star', 'Florida');
INSERT INTO people VALUES(234567890, 'Angie Way', null);
INSERT INTO people VALUES(345678901, 'Maryy Tien', null);
INSERT INTO people(ssn, address) VALUES(456789012, null);
INSERT INTO people(ssn, address) VALUES(567890123, 'California');
```

2) Example: Update all nulls in different columns to 'Not inserted yet!'

```
UPDATE people
SET name = COALESCE(name, 'Name is not inserted yet!'),
      address = COALESCE(address, 'Address is not inserted yet!');
```

How to Delete Data from a Table

1) "DELETE FROM students" deletes all inserted data inside the table, but it does not delete the table. After using "DELETE FROM students", you will have an empty table.

```
CREATE TABLE students
(
  id number(9),
  name varchar2(50),
  state varchar2(50),
  last_modification date
);
```

```
INSERT INTO students VALUES(123456789, 'John Walker', 'Texas', '14-Apr-2020');
INSERT INTO students VALUES(234567890, 'Eddie Murphy', 'Florida', '15-Apr-2020');
INSERT INTO students VALUES(345678901, 'Adam Eve', 'New York', '16-Apr-2020');
```

ID	NAME	STATE	LAST_MODIFICATION
123456789	John Walker	Texas	14-APR-20
234567890	Eddie Murphy	Florida	15-APR-20
345678901	Adam Eve	New York	16-APR-20

```
DELETE FROM students;
```

ID	NAME	STATE	LAST_MODIFICATION

Empty Table

2) " DELETE FROM students WHERE name = 'John Walker' " deletes the data whose name is John Walker.

```
CREATE TABLE students
(
  id number(9),
  name varchar2(50),
  state varchar2(50),
  last_modification date
);
```

```
INSERT INTO students VALUES(123456789, 'John Walker', 'Texas', '14-Apr-2020');
INSERT INTO students VALUES(234567890, 'Eddie Murphy', 'Florida', '15-Apr-2020');
INSERT INTO students VALUES(345678901, 'Adam Eve', 'New York', '16-Apr-2020');
```

ID	NAME	STATE	LAST_MODIFICATION
123456789	John Walker	Texas	14-APR-20
234567890	Eddie Murphy	Florida	15-APR-20
345678901	Adam Eve	New York	16-APR-20

```
DELETE FROM students WHERE name = 'John Walker';
```

ID	NAME	STATE	LAST_MODIFICATION
234567890	Eddie Murphy	Florida	15-APR-20
345678901	Adam Eve	New York	16-APR-20

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3) " DELETE FROM students WHERE name = 'John Walker' OR state = 'New York' " deletes the data whose name is John Walker.

```
CREATE TABLE students
(
  id number(9),
  name varchar2(50),
  state varchar2(50),
  last_modification date
);
```

```
INSERT INTO students VALUES(123456789, 'John Walker', 'Texas', '14-Apr-2020');
INSERT INTO students VALUES(234567890, 'Eddie Murphy', 'Florida', '15-Apr-2020');
INSERT INTO students VALUES(345678901, 'Adam Eve', 'New York', '16-Apr-2020');
```

ID	NAME	STATE	LAST_MODIFICATION
123456789	John Walker	Texas	14-APR-20
234567890	Eddie Murphy	Florida	15-APR-20
345678901	Adam Eve	New York	16-APR-20

```
DELETE FROM students WHERE name = 'John Walker' OR state = 'New York';
```

ID	NAME	STATE	LAST_MODIFICATION
234567890	Eddie Murphy	Florida	15-APR-20

4)

```
CREATE TABLE people
(
 ssn char(9),
 name varchar2(50),
 address varchar2(50)
);
```

```
INSERT INTO people VALUES(123456789, 'Mark Star', 'Florida');
INSERT INTO people VALUES(234567890, 'Angie Way', null);
INSERT INTO people VALUES(345678901, 'Maryy Tien', null);
INSERT INTO people(ssn, address) VALUES(456789012, null);
INSERT INTO people(ssn, address) VALUES(567890123, 'California');
```

Example: Delete the records whose ADDRESSES are NOT null

```
DELETE FROM people
WHERE address IS NOT NULL;
```

Example: Delete all records whose names or addresses are null

```
DELETE FROM people
WHERE name IS NULL OR address IS NULL;
```

Review Question

SSN	NAME	ADDRESS
123456789	Mark Star	Florida
234567890	Angie Way	Virginia
345678901	Maryy Tien	New Jersey

Table name is “people”

1) Create the given table by using SQL Queries
2) Update “Virginia” to “Pennsylvania ”
3) Delete 3rd row from the table
4) Drop the table

Note: Use SELECT * FROM people; to see the table on the console.

“Truncate” Statement

“Truncating” a table is a fast way to clear out records from a table if you don't need to worry about rolling back.

1) The TRUNCATE TABLE statement is used to remove all records from a table in Oracle.
2) We cannot use “WHERE” clause in TRUNCATE
3) It performs the same function as a DELETE statement without a “WHERE” clause.

```
TRUNCATE TABLE customers;
```

=

```
DELETE FROM customers;
```

Note: The main difference between the two is that you can roll back the DELETE FROM statement, but you can't roll back the TRUNCATE TABLE statement.

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How to Drop (Deletes table contents and table structure) a Table

```
CREATE TABLE students
(
id number(9),
name varchar2(50),
grade number(2),
address varchar2(100),
last_modification date
);
```

→ `DROP TABLE students;` →

Table with all contents and structure moved to the trash

```
CREATE TABLE students
(
id number(9),
name varchar2(50),
grade number(2),
address varchar2(100),
last_modification date
);
```

→ `DROP TABLE students PURGE;` →

The PURGE option will purge the table and its dependent objects so that they do not appear in the recycle bin.

Warning: The risk of specifying the PURGE option is that you will not be able to recover the table.

Benefit of PURGE: You can ensure that sensitive data will not be left sitting in the recycle bin.

Operators to use in WHERE filter

WHERE clause is used to filter the results from a SELECT, INSERT, UPDATE, or DELETE statement.

“ = “ ==> Equal to sign

“ > “ ==> Greater than sign

“ < “ ==> Less than sign

“ >= “ ==> Greater than or equal to sign

“ <= “ ==> Less than or equal to sign

“ < > “ ==> Not Equal to sign

“AND” ==> And operator

“OR” ==> Or operator

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“SELECT” Statement

```
CREATE TABLE workers
(
   id CHAR(5),
   name VARCHAR2(50),
   salary NUMBER(5),
   CONSTRAINT id4_pk PRIMARY KEY(id)
);
```

```
INSERT INTO workers VALUES(10001, 'Ali Can', 12000);
INSERT INTO workers VALUES(10002, 'Veli Han', 2000);
INSERT INTO workers VALUES(10003, 'Mary Star', 7000);
INSERT INTO workers VALUES(10004, 'Angie Ocean', 8500);
```

1) To get all records from a table

```
SELECT *
FROM workers;
```

2) To get specific column/columns from a table

```
SELECT name
FROM workers;

SELECT name, salary
FROM workers;
```

3)To get a specific data from a column

```
SELECT name
FROM workers
WHERE id = 10001;
```

4) To get a specific record from a column

```
SELECT *
FROM workers
WHERE id = 10002;
```

5) Select all records whose names lengths are greater than 8

```
SELECT *
FROM workers
WHERE LENGTH(name)>8;
```

6) Select the record whose salary is the highest

```
SELECT *
FROM workers
WHERE salary = (SELECT MAX(salary)
                FROM workers
                );
```

7) Select the name whose salary is the lowest

```
SELECT name
FROM workers
WHERE salary = (SELECT MIN(salary)
                FROM workers
                );
```

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8) Select name and salary of the workers whose salary is the lowest or the highest

```
SELECT name, salary
FROM workers
WHERE salary = (SELECT MIN(salary) FROM workers) OR salary = (SELECT MAX(salary) FROM workers);
```

9) Select id of the workers whose salary is 8500 and name is Mary Star

```
SELECT id
FROM workers
WHERE salary = 8500 AND name = 'Mary Star';
```

10) Select the second highest salary from workers table

```
SELECT MAX(salary) AS second_highest_salary
FROM workers
WHERE salary < (SELECT MAX(salary)
                FROM workers
                );
```

11) Select the second minimum salary from the workers table

```
SELECT MIN(salary) AS second_min_salary
FROM workers
WHERE salary > (SELECT MIN (salary)
                FROM workers
                );
```

12) Select the third highest salary from workers table

```
SELECT MAX(salary) AS third_highest_salary
FROM workers
WHERE salary < (SELECT MAX(salary)
                FROM workers
                WHERE salary < (SELECT MAX(salary)
                                FROM workers
                                )
                );
```

13) Select all records whose salary is the second highest salary from workers table

```
SELECT *
FROM workers
WHERE salary = (SELECT MAX(salary)
                FROM workers
                WHERE salary < (SELECT MAX(salary)
                                FROM workers
                                )
                );
```

14) Select all records whose salary is the third highest salary from workers table

```
SELECT *
FROM workers
WHERE salary = ( SELECT MAX(salary)
                 FROM workers
                 WHERE salary < (SELECT MAX(salary)
                                 FROM workers
                                 WHERE salary < (SELECT MAX(salary)
                                                 FROM workers
                                                 )
                                 )
                );
```

Practice Exercise 11:

ID	NAME	STATE	GPA
123456789	John Walker	Texas	2.8
234567890	Eddie Murphy	Florida	3.2
345678901	Adam Eve	New York	3.5
456789012	Alex Tien	New York	3.8
567890123	Chris Matala	Virginia	4

a) Create the given table
b) Select all fields from the *students* table whose *gpa* is greater than 3.1 or school name is “Texas”
c) Select students name from the *students* table whose *gpa* is less than 3.5 and state is “Florida”
d) Select students names and student ids from the *students* table whose *gpa* is between 2.8 and 3.5
e) Select all fields from the *students* table whose *state is “New York”, and gpa is greater than 3.3, and gpa is less than 3.7*
f) Select all fields from the *students* table whose *state is “New York” and gpa is greater than 3.7, or gpa is less than 3.3*

“IN” Condition

IN condition is used to help reduce the need to use multiple OR conditions in a SELECT, INSERT, UPDATE, or DELETE statement.

```
CREATE TABLE customers_products
(
  product_id number(10),
  customer_name varchar2(50),
  product_name varchar2(50)
);
```

```
INSERT INTO customers_products VALUES (10, 'Mark', 'Orange');
INSERT INTO customers_products VALUES (10, 'Mark', 'Orange');
INSERT INTO customers_products VALUES (20, 'John', 'Apple');
INSERT INTO customers_products VALUES (30, 'Amy', 'Palm');
INSERT INTO customers_products VALUES (20, 'Mark', 'Apple');
INSERT INTO customers_products VALUES (10, 'Adem', 'Orange');
INSERT INTO customers_products VALUES (40, 'John', 'Apricot');
INSERT INTO customers_products VALUES (20, ‘Eddie', 'Apple');
```

PRODUCT_ID	CUSTOMER_NAME	PRODUCT_NAME
10	Mark	Orange
10	Mark	Orange
20	John	Apple
30	Amy	Palm
20	Mark	Apple
10	Adem	Orange
40	John	Apricot
20	Eddie	Apple

```
SELECT *
FROM customers_products
WHERE  product_name ='Orange' OR product_name ='Apple' OR product_name ='Apricot';
```

```
SELECT *
FROM customers_products
WHERE  product_name IN  ('Orange', 'Apple', 'Apricot');
```

PRODUCT_ID	CUSTOMER_NAME	PRODUCT_NAME
10	Mark	Orange
10	Mark	Orange
20	John	Apple
20	Mark	Apple
10	Adem	Orange
40	John	Apricot
20	Eddie	Apple

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“NOT IN” Condition

Question: Select records whose product name is not Orange or Apple or Palm

```
SELECT *
FROM customers_products
WHERE product_name NOT IN('Orange', 'Apple', 'Palm');
```

	PRODUCT_ID	CUSTOMER_NAME	PRODUCT_NAME
1	40	John	Apricot

“BETWEEN” Condition

```
CREATE TABLE customers_likes
(
  product_id number(10),
  customer_name varchar2(50),
  liked_product varchar2(50)
);
```

```
INSERT INTO customers_likes VALUES (10, 'Mark', 'Orange');
INSERT INTO customers_likes VALUES (50, 'Mark', 'Pineapple');
INSERT INTO customers_likes VALUES (60, 'John', 'Avocado');
INSERT INTO customers_likes VALUES (30, 'Lary', 'Cherries');
INSERT INTO customers_likes VALUES (20, 'Mark', 'Apple');
INSERT INTO customers_likes VALUES (10, 'Adem', 'Orange');
INSERT INTO customers_likes VALUES (40, 'John', 'Apricot');
INSERT INTO customers_likes VALUES (20, 'Eddie', 'Apple');
```

PRODUCT_ID	CUSTOMER_NAME	LIKED_PRODUCT
10	Mark	Orange
50	Mark	Pineapple
60	John	Avocado
30	Lary	Cherries
20	Mark	Apple
10	Adem	Orange
40	John	Apricot
20	Eddie	Apple

```
SELECT *
FROM customers_likes
WHERE product_id BETWEEN 20 AND 40;
```

```
SELECT *
FROM customers_likes
WHERE product_id >= 20 AND product_id <= 40;
```

PRODUCT_ID	CUSTOMER_NAME	LIKED_PRODUCT
30	Lary	Cherries
20	Mark	Apple
40	John	Apricot
20	Eddie	Apple

Note: 20 and 40 are **inclusive** for BETWEEN condition

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“NOT BETWEEN” Condition

```
CREATE TABLE customers_likes
(
  product_id number(10),
  customer_name varchar2(50),
  liked_product varchar2(50)
);
```

```
INSERT INTO customers_likes VALUES (10, 'Mark', 'Orange');
INSERT INTO customers_likes VALUES (50, 'Mark', 'Pineapple');
INSERT INTO customers_likes VALUES (60, 'John', 'Avocado');
INSERT INTO customers_likes VALUES (30, 'Lary', 'Cherries');
INSERT INTO customers_likes VALUES (20, 'Mark', 'Apple');
INSERT INTO customers_likes VALUES (10, 'Adem', 'Orange');
INSERT INTO customers_likes VALUES (40, 'John', 'Apricot');
INSERT INTO customers_likes VALUES (20, 'Eddie', 'Apple');
```

PRODUCT_ID	CUSTOMER_NAME	LIKED_PRODUCT
10	Mark	Orange
50	Mark	Pineapple
60	John	Avocado
30	Lary	Cherries
20	Mark	Apple
10	Adem	Orange
40	John	Apricot
20	Eddie	Apple

```
SELECT *
FROM customers_likes
WHERE product_id NOT BETWEEN 20 AND 40;
```

```
SELECT *
FROM customers_likes
WHERE product_id < 20 OR product_id > 40;
```

PRODUCT_ID	CUSTOMER_NAME	LIKED_PRODUCT
10	Mark	Orange
50	Mark	Pineapple
60	John	Avocado
10	Adem	Orange

Note: 20 and 40 are **exclusive** for NOT BETWEEN condition

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Review Questions 10 Minutes

1) What is the difference between “DELETE” and “TRUNCATE”

2) What is the difference between “DELETE” and “DROP”

3) What is the difference between “DROP” and “DROP PURGE”

4) Type a query which gives the same result with the following query

```
SELECT *
FROM students
WHERE age>=8 AND age<=17;
```

5) Type a query which gives the same result with the following query

```
SELECT *
FROM students
WHERE age<8 OR age>17;
```

6) Type a query which gives the same result with the following query

```
SELECT *
FROM students
WHERE  grade = 6 OR grade = 7 OR grade = 8 OR grade = 9;
```

Answers of Review Questions

1) What is the difference between “DELETE” and “TRUNCATE”

A)TRUNCATE removes all rows from a table. DELETE command is used to remove all or specific rows from a table based on WHERE condition.

B)If you use TRUNCATE rollback is not possible. For DELETE rollback is possible.

C)We cannot use WHERE clause with TRUNCATE but we can use WHERE with DELETE.

2) What is the difference between “DELETE” and “DROP”

A) DROP command removes a table from the database while DELETE removes records from a table.

3) What is the difference between “DROP” and “DROP PURGE”

A) The DROP will drop the table and place it into the recycle bin.
DROP with PURGE will drop the table and flush it out from the recycle bin also.

4)

```
SELECT *
FROM students
WHERE age>=8 AND age<=17;
```

→

```
SELECT *
FROM students
WHERE age BETWEEN 8 AND 17;
```

5)

```
SELECT *
FROM students
WHERE age<8 OR age>17;
```

→

```
SELECT *
FROM students
WHERE age NOT BETWEEN 8 AND 17;
```

6)

```
SELECT *
FROM students
WHERE  grade = 6 OR grade = 7 OR grade = 8 OR grade = 9;
```

```
SELECT *
FROM students
WHERE  grade IN (6, 7, 8, 9);
```

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“EXISTS” Condition

EXISTS condition is used in combination with a subquery and is considered "to be met" if the subquery returns at least one row.
It can be used in a SELECT, INSERT, UPDATE, or DELETE statement.

```
CREATE TABLE customers_products
(
  product_id number(10),
  customer_name varchar2(50),
  product_name varchar2(50)
);
```

```
INSERT INTO customers_products VALUES (10, 'Mark', 'Orange');
INSERT INTO customers_products VALUES (10, 'Mark', 'Orange');
INSERT INTO customers_products VALUES (20, 'John', 'Apple');
INSERT INTO customers_products VALUES (30, 'Amy', 'Palm');
INSERT INTO customers_products VALUES (20, 'Mark', 'Apple');
INSERT INTO customers_products VALUES (10, 'Adem', 'Orange');
INSERT INTO customers_products VALUES (40, 'John', 'Apricot');
INSERT INTO customers_products VALUES (20, 'Eddie', ‘Apple');
```

PRODUCT_ID	CUSTOMER_NAME	PRODUCT_NAME
10	Mark	Orange
10	Mark	Orange
20	John	Apple
30	Amy	Palm
20	Mark	Apple
10	Adem	Orange
40	John	Apricot
20	Eddie	Apple

```
CREATE TABLE customers_likes
(
  product_id number(10),
  customer_name varchar2(50),
  liked_product varchar2(50)
);
```

```
INSERT INTO customers_likes VALUES (10, 'Mark', 'Orange');
INSERT INTO customers_likes VALUES (50, 'Mark', 'Pineapple');
INSERT INTO customers_likes VALUES (60, 'John', 'Avocado');
INSERT INTO customers_likes VALUES (30, 'Lary', 'Cherries');
INSERT INTO customers_likes VALUES (20, 'Mark', 'Apple');
INSERT INTO customers_likes VALUES (10, 'Adem', 'Orange');
INSERT INTO customers_likes VALUES (40, 'John', 'Apricot');
INSERT INTO customers_likes VALUES (20, 'Eddie', 'Apple');
```

PRODUCT_ID	CUSTOMER_NAME	LIKED_PRODUCT
10	Mark	Orange
50	Mark	Pineapple
60	John	Avocado
30	Lary	Cherries
20	Mark	Apple
10	Adem	Orange
40	John	Apricot
20	Eddie	Apple

```
SELECT customer_name
FROM customers_products
WHERE  EXISTS (SELECT product_id FROM customers_likes WHERE customers_products.product_id = customers_likes.product_id);
```

CUSTOMER_NAME
Mark
Mark
Adem
Amy
John
Mark
Eddie
John

“SUBQUERIES”

SUBQUERY is a query within a query

```
CREATE TABLE employees
(
  id number(9),
  name varchar2(50),
  state varchar2(50),
  salary number(20),
  company varchar2(20)
);
```

```
INSERT INTO employees VALUES(123456789, 'John Walker', 'Florida', 2500, 'IBM');
INSERT INTO employees VALUES(234567890, 'Brad Pitt', 'Florida', 1500, 'APPLE');
INSERT INTO employees VALUES(345678901, 'Eddie Murphy', 'Texas', 3000, 'IBM');
INSERT INTO employees VALUES(456789012, 'Eddie Murphy', 'Virginia', 1000, 'GOOGLE');
INSERT INTO employees VALUES(567890123, 'Eddie Murphy', 'Texas', 7000, 'MICROSOFT');
INSERT INTO employees VALUES(456789012, 'Brad Pitt', 'Texas', 1500, 'GOOGLE');
INSERT INTO employees VALUES(123456710, 'Mark Stone', 'Pennsylvania', 2500, 'IBM');
```

ID	NAME	STATE	SALARY	COMPANY
123456789	John Walker	Florida	2500	IBM
234567890	Brad Pitt	Florida	1500	APPLE
345678901	Eddie Murphy	Texas	3000	IBM
456789012	Eddie Murphy	Virginia	1000	GOOGLE
567890123	Eddie Murphy	Texas	7000	MICROSOFT
456789012	Brad Pitt	Texas	1500	GOOGLE
123456710	Mark Stone	Pennsylvania	2500	IBM

```
CREATE TABLE companies
(
  company_id number(9),
  company varchar2(20),
  number_of_employees number(20)
);
```

```
INSERT INTO companies VALUES(100, 'IBM', 12000);
INSERT INTO companies VALUES(101, 'GOOGLE', 18000);
INSERT INTO companies VALUES(102, 'MICROSOFT', 10000);
INSERT INTO companies VALUES(100, 'APPLE', 21000);
```

COMPANY_ID	COMPANY	NUMBER_OF_EMPLOYEES
100	IBM	12000
101	GOOGLE	18000
102	MICROSOFT	10000
100	APPLE	21000

Example: Find the employee and company names whose company has more than 15000 employees

```
SELECT name, company
FROM employees
WHERE company IN (SELECT company
                  FROM companies
                  WHERE number_of_employees > 15000);
```

NAME	COMPANY
Eddie Murphy	GOOGLE
Brad Pitt	GOOGLE
Brad Pitt	APPLE

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2) SUBQUERY in the SELECT clause

A SUBQUERY in the select clause must return a single value.
Therefore, an aggregate function such as SUM, COUNT, MIN, or MAX is commonly used in the subquery.

```
CREATE TABLE employees
(
  id number(9),
  name varchar2(50),
  state varchar2(50),
  salary number(20),
  company varchar2(20)
);
```

```
INSERT INTO employees VALUES(123456789, 'John Walker', 'Florida', 2500, 'IBM');
INSERT INTO employees VALUES(234567890, 'Brad Pitt', 'Florida', 1500, 'APPLE');
INSERT INTO employees VALUES(345678901, 'Eddie Murphy', 'Texas', 3000, 'IBM');
INSERT INTO employees VALUES(456789012, 'Eddie Murphy', 'Virginia', 1000, 'GOOGLE');
INSERT INTO employees VALUES(567890123, 'Eddie Murphy', 'Texas', 7000, 'MICROSOFT');
INSERT INTO employees VALUES(456789012, 'Brad Pitt', 'Texas', 1500, 'GOOGLE');
INSERT INTO employees VALUES(123456710, 'Mark Stone', 'Pennsylvania', 2500, 'IBM');
```

ID	NAME	STATE	SALARY	COMPANY
123456789	John Walker	Florida	2500	IBM
234567890	Brad Pitt	Florida	1500	APPLE
345678901	Eddie Murphy	Texas	3000	IBM
456789012	Eddie Murphy	Virginia	1000	GOOGLE
567890123	Eddie Murphy	Texas	7000	MICROSOFT
456789012	Brad Pitt	Texas	1500	GOOGLE
123456710	Mark Stone	Pennsylvania	2500	IBM

```
CREATE TABLE companies
(
  company_id number(9),
  company varchar2(20),
  number_of_employees number(20)
);
```

```
INSERT INTO companies VALUES(100, 'IBM', 12000);
INSERT INTO companies VALUES(101, 'GOOGLE', 18000);
INSERT INTO companies VALUES(102, 'MICROSOFT', 10000);
INSERT INTO companies VALUES(100, 'APPLE', 21000);
```

COMPANY_ID	COMPANY	NUMBER_OF_EMPLOYEES
100	IBM	12000
101	GOOGLE	18000
102	MICROSOFT	10000
100	APPLE	21000

Example: Find the company number of employees and average salary for every company

```
SELECT company, number_of_employees,

  (SELECT AVG(salary)
   FROM employees
   WHERE companies.company = employees.company) Average_Salary_Per_Company

FROM companies;
```

COMPANY	NUMBER_OF_EMPLOYEES	AVERAGE_SALARY_PER_COMPANY
GOOGLE	18000	1250
MICROSOFT	10000	7000
APPLE	21000	1500
IBM	12000	2666.6666666666666666666666666666666666667

Example: Find the name of the companies, company ids, and the number of states for every company

```
SELECT company, company_id, (SELECT COUNT(state)
                             FROM employees
                             WHERE companies.company = employees.company
                             ) number_of_states
FROM companies;
```

Example: Find the name of the companies, company ids, maximum and minimum salaries per company.

```
SELECT company, company_id, (SELECT MAX(salary)
                             FROM employees
                             WHERE companies.company = employees.company
                             ) max_salary,

                            (SELECT MIN(salary)
                            FROM employees
                            WHERE companies.company = employees.company
                            ) min_salary
FROM companies;
```

LIKE Condition

LIKE condition allows wildcards to be used in the WHERE Clause of a SELECT, INSERT, UPDATE, or DELETE statement. This allows you to perform pattern matching.

Wildcard Characters

1) % => Represents zero or more characters

WHERE customer_name LIKE 'J%' ==> Finds any values that starts with “J”

WHERE customer_name LIKE '%e' ==> Finds any values that ends with “e”

WHERE customer_name LIKE '%an%' ==> Finds any values that have “an” in any position

```
CREATE TABLE customers
(
customer_id number(10) UNIQUE,
customer_name varchar2(50) NOT NULL,
income number(6)
);
```

→

```
INSERT INTO customers (customer_id, customer_name, income)
VALUES (1001, 'John', 62000);

INSERT INTO customers (customer_id, customer_name, income)
VALUES (1002, 'Jane', 57500);

INSERT INTO customers (customer_id, customer_name, income)
VALUES (1003, 'Brad', 71000);

INSERT INTO customers (customer_id, customer_name, income)
VALUES (1004, ‘Manse', 42000);
```

→

CUSTOMER_ID	CUSTOMER_NAME	INCOME
1001	John	62000
1002	Jane	57500
1003	Brad	71000
1004	Manse	42000

2) _ => Represents just one character

WHERE CustomerName LIKE '_ohn' ==> Finds all customer's name starting with any character, followed by "ohn"

WHERE CustomerName LIKE '_a_e' ==> Finds all sized 4 customer's name whose 2nd character is "a", and 4th character is "e"

WHERE CustomerName LIKE '_r%' ==> Finds any values that have "r" in the second position

WHERE CustomerName LIKE 'M_%_%_%' ==> Finds any values that starts with "M" and are at least 4 characters in length

WHERE CustomerName LIKE 'B%d' ==> Finds any values that starts with "B" and ends with "d"

```
CREATE TABLE customers
(
customer_id number(10) UNIQUE,
customer_name varchar2(50) NOT NULL,
income number(6)
);
```

```
INSERT INTO customers (customer_id, customer_name, income)
VALUES (1001, 'John', 62000);

INSERT INTO customers (customer_id, customer_name, income)
VALUES (1002, 'Jane', 57500);

INSERT INTO customers (customer_id, customer_name, income)
VALUES (1003, 'Brad', 71000);

INSERT INTO customers (customer_id, customer_name, income)
VALUES (1004, 'Manse', 42000);
```

CUSTOMER_ID	CUSTOMER_NAME	INCOME
1001	John	62000
1002	Jane	57500
1003	Brad	71000
1004	Manse	42000

3) REGEXP_LIKE Condition

WHERE REGEXP_LIKE(word, 'h[oa]t') ==> Finds “hot” and “hat”, but not “hit”

WHERE REGEXP_LIKE(word, ‘h(o|a)t’) ==> Finds “hot” and “hat”, but not “hit”

WHERE REGEXP_LIKE(word, 'h[a-c]t') ==> Finds “hat” and “hbt” and “hct”

WHERE REGEXP_LIKE(word, ‘h(a|b|c)t’) ==> Finds “hat” and “hbt” and “hct”

WHERE REGEXP_LIKE(word, '[au](*)') ==> Finds all contains “a” or “u”
“hat” and “selena” and “yusuf” and “adem”

WHERE REGEXP_LIKE(word, '^[asy](*)') ==> Finds all start with “a” or “s” or “y”
“adem” and “selena” and “yusuf”

WHERE REGEXP_LIKE(word, ‘(*) f $') ==> Finds all end with “f” ==> “yusuf”

```
CREATE TABLE words
(
  word_id number(10) UNIQUE,
  word varchar2(50) NOT NULL,
  number_of_letters number(6)
);
```

→

```
INSERT INTO words VALUES (1001, 'hot', 3);
INSERT INTO words VALUES (1002, 'hat', 3);
INSERT INTO words VALUES (1003, 'hit', 3);
INSERT INTO words VALUES (1004, 'hbt', 3);
INSERT INTO words VALUES (1008, 'hct', 3);
INSERT INTO words VALUES (1005, 'adem', 4);
INSERT INTO words VALUES (1006, 'selena', 6);
INSERT INTO words VALUES (1007, 'yusuf', 5);
```

→

WORD_ID	WORD	NUMBER_OF_LETTERS
1001	hot	3
1002	hat	3
1003	hit	3
1004	hbt	3
1006	selena	6
1007	yusuf	5
1005	adem	4
1008	hct	3

WHERE REGEXP_LIKE(word, 'a') ==> Retrieve all of the names that contain the letter ‘a’

WHERE REGEXP_LIKE(word, 'a', 'i') ==> By specifying the letter ‘i’ (as the third argument of the REGEXP_LIKE function)
we can make a case insensitive search.
It is case sensitive as default in Oracle

WHERE REGEXP_LIKE(word, ‘at') ==> Retrieve all of the names that contain the letter ‘at’

WHERE REGEXP_LIKE(word, ‘[a-i]d’) ==> Retrieve all words that contain a letter in the range of ‘a’ and ‘i’,
followed by the letter ‘d’.

WHERE REGEXP_LIKE(word, ‘[a-i].[e]’) ==> Retrieve all words that contain a letter in the range of ‘a’ and ‘i’,
followed by any character, followed by the letter ‘e’.

WHERE REGEXP_LIKE(word, ‘[a-i]..[m]’) ==> Retrieve all words that contain a letter in the range of ‘a’ and ‘i’,
followed by any two characters, followed by the letter ‘m’.

WHERE REGEXP_LIKE(word, ‘[e{2}]’) ==> The curly brackets are used to specify an exact number of occurrences, for example
display all words that contain double ‘e’ letters.

NOT LIKE Condition

WHERE word NOT LIKE 'h%' ==> Finds all words which do NOT start with 'h'.

WHERE word NOT LIKE '%t' ==> Finds all words which do NOT end with 't'.

WHERE word NOT LIKE '%a%' ==> Finds all words which do NOT contain "a" in any position

WHERE word NOT LIKE '_us%' ==> Finds all customer's name starting with any character, NOT followed by "us"

WHERE NOT REGEXP_LIKE(word, '[_ead](*)'); ==> Find all words starting with any character, NOT followed by 'e' or 'a' or 'd'

```
CREATE TABLE words
(
  word_id number(10) UNIQUE,
  word varchar2(50) NOT NULL,
  number_of_letters number(6)
);
```

```
INSERT INTO words VALUES (1001, 'hot', 3);
INSERT INTO words VALUES (1002, 'hat', 3);
INSERT INTO words VALUES (1003, 'hit', 3);
INSERT INTO words VALUES (1004, 'hbt', 3);
INSERT INTO words VALUES (1004, 'hct', 3);
INSERT INTO words VALUES (1005, 'adem', 4);
INSERT INTO words VALUES (1006, 'selena', 6);
INSERT INTO words VALUES (1007, 'yusuf', 5);
```

WORD_ID	WORD	NUMBER_OF_LETTERS
1001	hot	3
1002	hat	3
1003	hit	3
1004	hbt	3
1006	selena	6
1007	yusuf	5
1005	adem	4
1008	hct	3

“ORDER BY” Clause

The ORDER BY clause is used to sort the records in result set.

The ORDER BY clause can only be used in SELECT statements.

1)

ID	NAME	STATE	GPA
123456789	John Walker	Texas	2.8
234567890	Eddie Murphy	Florida	3.2
345678901	Adam Eve	New York	3.5
456789012	Alex Tien	New York	3.8
567890123	Chris Matala	Virginia	4

→

```
SELECT *
FROM students
ORDER BY name;
```

→

ID	NAME	STATE	GPA
345678901	Adam Eve	New York	3.5
456789012	Alex Tien	New York	3.8
567890123	Chris Matala	Virginia	4
234567890	Eddie Murphy	Florida	3.2
123456789	John Walker	Texas	2.8

2)

ID	NAME	STATE	GPA
123456789	John Walker	Texas	2.8
234567890	Eddie Murphy	Florida	3.2
345678901	Adam Eve	New York	3.5
456789012	Alex Tien	New York	3.8
567890123	Chris Matala	Virginia	4

→

```
SELECT name
FROM students
WHERE gpa = 2.8 OR state ='Florida'
ORDER BY name;
```

→

NAME
Eddie Murphy
John Walker

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3)

ID	NAME	STATE	GPA
123456789	John Walker	Texas	2.8
234567890	Eddie Murphy	Florida	3.2
345678901	Adam Eve	New York	3.5
456789012	Alex Tien	New York	3.8
567890123	Chris Matala	Virginia	4

→

```
SELECT *
FROM students
ORDER BY name DESC;
```

→

ID	NAME	STATE	GPA
123456789	John Walker	Texas	2.8
234567890	Eddie Murphy	Florida	3.2
567890123	Chris Matala	Virginia	4
456789012	Alex Tien	New York	3.8
345678901	Adam Eve	New York	3.5

4)

ID	NAME	STATE	GPA
123456789	John Walker	Texas	2.8
234567890	Eddie Murphy	Florida	3.2
345678901	Adam Eve	New York	3.5
456789012	Alex Tien	New York	3.8
567890123	Chris Matala	Virginia	4

→

```
SELECT *
FROM students
ORDER BY 3 DESC;
```

Number of columns

→

ID	NAME	STATE	GPA
567890123	Chris Matala	Virginia	4
123456789	John Walker	Texas	2.8
345678901	Adam Eve	New York	3.5
456789012	Alex Tien	New York	3.8
234567890	Eddie Murphy	Florida	3.2

5)

ID	NAME	STATE	GPA
123456789	John Walker	Texas	2.8
234567890	Eddie Murphy	Florida	3.2
345678901	Adam Eve	New York	3.5
456789012	Zeyna Rose	New York	3.8
567890123	Chris Matala	Virginia	4
456789012	Brad Pitt	New York	3.8

→

```
SELECT *
FROM students
ORDER BY 3 DESC, 2 ASC;
```

→

ID	NAME	STATE	GPA
567890123	Chris Matala	Virginia	4
123456789	John Walker	Texas	2.8
345678901	Adam Eve	New York	3.5
456789012	Brad Pitt	New York	3.8
456789012	Zeyna Rose	New York	3.8
234567890	Eddie Murphy	Florida	3.2

ORDER BY will return all records sorted by the *3rd* field in descending order, with a secondary sort by *2nd field* in ascending order.

“ALIASES”

```
CREATE TABLE employees
(
  employee_id number(9),
  employee_first_name varchar2(20)
  employee_last_name varchar2(20)
);
```

```
INSERT INTO employees VALUES(14, 'Chris', ‘Tae’);
INSERT INTO employees VALUES(11, 'John', 'Walker');
INSERT INTO employees VALUES(12, 'Amy', 'Star');
INSERT INTO employees VALUES(13, 'Brad', 'Pitt');
INSERT INTO employees VALUES(15, 'Chris', ‘Way’);
```

EMPLOYEE_ID	EMPLOYEE_FIRST_NAME	EMPLOYEE_LAST_NAME
14	Chris	Tae
11	John	Walker
12	Amy	Star
13	Brad	Pitt
15	Chris	Way

1)
```
SELECT employee_id AS id, employee_first_name AS first_name, employee_last_name AS last_name
FROM employees;
```

ID	FIRST_NAME	LAST_NAME
14	Chris	Tae
11	John	Walker
12	Amy	Star
13	Brad	Pitt
15	Chris	Way

2)
```
SELECT employee_id AS id, employee_first_name || employee_last_name AS full_name
FROM employees;
```

ID	FULL_NAME
14	ChrisTae
11	JohnWalker
12	AmyStar
13	BradPitt
15	ChrisWay

```
CREATE TABLE employees
(
  employee_id number(9),
  employee_first_name varchar2(20),
  employee_last_name varchar2(20)
);
```

```
INSERT INTO employees VALUES(14, 'Chris', 'Tae');
INSERT INTO employees VALUES(11, 'John', 'Walker');
INSERT INTO employees VALUES(12, 'Amy', 'Star');
INSERT INTO employees VALUES(13, 'Brad', 'Pitt');
INSERT INTO employees VALUES(15, 'Chris', 'Way');
```

EMPLOYEE_ID	EMPLOYEE_FIRST_NAME	EMPLOYEE_LAST_NAME
14	Chris	Tae
11	John	Walker
12	Amy	Star
13	Brad	Pitt
15	Chris	Way

```
CREATE TABLE addresses
(
  employee_id number(9),
  street varchar2(20),
  city varchar2(20),
  state char(2),
  zipcode char(5)
);
```

```
INSERT INTO addresses VALUES(11, '32nd Star 1234', 'Miami', 'FL', '33018');
INSERT INTO addresses VALUES(12, '23rd Rain 567', 'Jacksonville', 'FL', '32256');
INSERT INTO addresses VALUES(13, '5th Snow 765', 'Hialeah', 'VA', '20121');
INSERT INTO addresses VALUES(14, '3rd Man 12', 'Weston', 'MI', '12345');
INSERT INTO addresses VALUES(15, '11th Chris 12', 'St. Johns', 'FL', '32259');
```

EMPLOYEE_ID	STREET	CITY	STATE	ZIPCODE
11	32nd Star 1234	Miami	FL	33018
12	23rd Rain 567	Jacksonville	FL	32256
13	5th Snow 765	Hialeah	VA	20121
14	3rd Man 12	Weston	MI	12345
15	11th Chris 12	St. Johns	FL	32259

3)
```
SELECT e.employee_first_name, e.employee_last_name, a.city
FROM employees e, addresses a
WHERE e.employee_id = a.employee_id;
```

EMPLOYEE_FIRST_NAME	EMPLOYEE_LAST_NAME	CITY
John	Walker	Miami
Amy	Star	Jacksonville
Brad	Pitt	Hialeah
Chris	Tae	Weston
Chris	Way	St. Johns

"GROUP BY" Clause

GROUP BY clause is used in a SELECT statement to collect data across multiple records and group the results by one or more columns.

```
CREATE TABLE workers
(
  id number(9),
  name varchar2(50),
  state varchar2(50),
  salary number(20),
  company varchar2(20)
);
```

```
INSERT INTO workers VALUES(123456789, 'John Walker', 'Florida', 2500, 'IBM');
INSERT INTO workers VALUES(234567890, 'Brad Pitt', 'Florida', 1500, 'APPLE');
INSERT INTO workers VALUES(345678901, 'Eddie Murphy', 'Texas', 3000, 'IBM');
INSERT INTO workers VALUES(456789012, 'Eddie Murphy', 'Virginia', 1000, 'GOOGLE');
INSERT INTO workers VALUES(567890123, 'Eddie Murphy', 'Texas', 7000, 'MICROSOFT');
INSERT INTO workers VALUES(456789012, 'Brad Pitt', 'Texas', 1500, 'GOOGLE');
INSERT INTO workers VALUES(123456710, 'Mark Stone', 'Pennsylvania', 2500, 'IBM');
```

ID	NAME	STATE	SALARY	COMPANY
123456789	John Walker	Florida	2500	IBM
234567890	Brad Pitt	Florida	1500	APPLE
345678901	Eddie Murphy	Texas	3000	IBM
456789012	Eddie Murphy	Virginia	1000	GOOGLE
567890123	Eddie Murphy	Texas	7000	MICROSOFT
456789012	Brad Pitt	Texas	1500	GOOGLE
123456710	Mark Stone	Pennsylvania	2500	IBM

1) Example: Find the total salary for every employee

```
SELECT name, SUM(salary) AS "Total Salary"
FROM workers
GROUP BY name;
```

NAME	Total Salary
Brad Pitt	3000
Mark Stone	2500
John Walker	2500
Eddie Murphy	11000

2) Example: Find the number of employees per state

```
SELECT state, COUNT(state) AS "Number Of Workers"
FROM workers
GROUP BY state;
```

STATE	Number Of Employees
Virgina	1
Florida	2
Pennsylvania	1
Texas	3

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```
CREATE TABLE workers
(
  id number(9),
  name varchar2(50),
  state varchar2(50),
  salary number(20),
  company varchar2(20)
);
```

```
INSERT INTO workers VALUES(123456789, 'John Walker', 'Florida', 2500, 'IBM');
INSERT INTO workers VALUES(234567890, 'Brad Pitt', 'Florida', 1500, 'APPLE');
INSERT INTO workers VALUES(345678901, 'Eddie Murphy', 'Texas', 3000, 'IBM');
INSERT INTO workers VALUES(456789012, 'Eddie Murphy', 'Virginia', 1000, 'GOOGLE');
INSERT INTO workers VALUES(567890123, 'Eddie Murphy', 'Texas', 7000, 'MICROSOFT');
INSERT INTO workers VALUES(456789012, 'Brad Pitt', 'Texas', 1500, 'GOOGLE');
INSERT INTO workers VALUES(123456710, 'Mark Stone', 'Pennsylvania', 2500, 'IBM');
```

ID	NAME	STATE	SALARY	COMPANY
123456789	John Walker	Florida	2500	IBM
234567890	Brad Pitt	Florida	1500	APPLE
345678901	Eddie Murphy	Texas	3000	IBM
456789012	Eddie Murphy	Virginia	1000	GOOGLE
567890123	Eddie Murphy	Texas	7000	MICROSOFT
456789012	Brad Pitt	Texas	1500	GOOGLE
123456710	Mark Stone	Pennsylvania	2500	IBM

3) Example: Find the number of the employees whose salary is more than $2000 per company

```
SELECT company, COUNT(*) AS “Number Of Workers"
FROM workers
WHERE salary > 2000
GROUP BY company;
```

COMPANY	Number Of Employees
MICROSOFT	1
IBM	3

4) Example: Find the minimum and maximum salary for every company

```
SELECT company, MIN(salary) AS “Min Salary”, MAX(salary) AS “Max Salary”
FROM workers
GROUP BY company;
```

COMPANY	Min Salary	Max Salary
GOOGLE	1000	1500
MICROSOFT	7000	7000
APPLE	1500	1500
IBM	2500	3000

“HAVING” Clause

HAVING clause is used in combination with the GROUP BY clause to restrict the groups of returned rows to only those whose the condition is TRUE.
This is a further condition applied only to the aggregated results to restrict the groups of returned rows.

```
CREATE TABLE workers
(
  id number(9),
  name varchar2(50),
  state varchar2(50),
  salary number(20),
  company varchar2(20)
);
```

```
INSERT INTO workers VALUES(123456789, 'John Walker', 'Florida', 2500, 'IBM');
INSERT INTO workers VALUES(234567890, 'Brad Pitt', 'Florida', 1500, 'APPLE');
INSERT INTO workers VALUES(345678901, 'Eddie Murphy', 'Texas', 3000, 'IBM');
INSERT INTO workers VALUES(456789012, 'Eddie Murphy', 'Virginia', 1000, 'GOOGLE');
INSERT INTO workers VALUES(567890123, 'Eddie Murphy', 'Texas', 7000, 'MICROSOFT');
INSERT INTO workers VALUES(456789012, 'Brad Pitt', 'Texas', 1500, 'GOOGLE');
INSERT INTO workers VALUES(123456710, 'Mark Stone', 'Pennsylvania', 2500, 'IBM');
```

ID	NAME	STATE	SALARY	COMPANY
123456789	John Walker	Florida	2500	IBM
234567890	Brad Pitt	Florida	1500	APPLE
345678901	Eddie Murphy	Texas	3000	IBM
456789012	Eddie Murphy	Virginia	1000	GOOGLE
567890123	Eddie Murphy	Texas	7000	MICROSOFT
456789012	Brad Pitt	Texas	1500	GOOGLE
123456710	Mark Stone	Pennsylvania	2500	IBM

1) Example: Find the total salary if it is greater than 2500 for every employee

```
SELECT name, SUM(salary) AS "Total Salary"
FROM workers
GROUP BY name
HAVING SUM(salary) >= 2500;
```

NAME	Total Salary
Brad Pitt	3000
Mark Stone	2500
John Walker	2500
Eddie Murphy	11000

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2) Example: Find the number of employees if it is more than 1 per state

```
SELECT state, COUNT(state) AS “Number Of Employees"
FROM workers
GROUP BY state
HAVING COUNT(state) > 1;
```

→

STATE	Number Of Employees
Florida	2
Texas	3

3) Example: Find the minimum salary if it is more than 2000 for every company

```
SELECT company, MIN(salary) AS “Min Salary"
FROM workers
GROUP BY company
HAVING MIN(salary) > 2000;
```

→

COMPANY	Min Salary
MICROSOFT	7000
IBM	2500

4) Example: Find the maximum salary if it is less than 3000 for every state

```
SELECT state, MAX(salary) AS “Max Salary"
FROM workers
GROUP BY state
HAVING MAX(salary) < 3000;
```

→

STATE	Max Salary
Florida	2500
Pennsylvania	2500
Virginia	1000

"UNION" Operator

UNION operator is used to combine the result sets of two or more SELECT statements.

It removes duplicate rows between the SELECT statements.

Each SELECT statement within the UNION operator must have the same number of fields in the result sets with similar data types.

```
CREATE TABLE employees
(
  id number(9),
  name varchar2(50),
  state varchar2(50),
  salary number(20),
  company varchar2(20)
);
```

```
INSERT INTO employees VALUES(123456789, 'John Walker', 'Florida', 2500, 'IBM');
INSERT INTO employees VALUES(234567890, 'Brad Pitt', 'Florida', 1500, 'APPLE');
INSERT INTO employees VALUES(345678901, 'Eddie Murphy', 'Texas', 3000, 'IBM');
INSERT INTO employees VALUES(456789012, 'Eddie Murphy', 'Virginia', 1000, 'GOOGLE');
INSERT INTO employees VALUES(567890123, 'Eddie Murphy', 'Texas', 7000, 'MICROSOFT');
INSERT INTO employees VALUES(456789012, 'Brad Pitt', 'Texas', 1500, 'GOOGLE');
INSERT INTO employees VALUES(123456710, 'Mark Stone', 'Pennsylvania', 2500, 'IBM');
```

ID	NAME	STATE	SALARY	COMPANY
123456789	John Walker	Florida	2500	IBM
234567890	Brad Pitt	Florida	1500	APPLE
345678901	Eddie Murphy	Texas	3000	IBM
456789012	Eddie Murphy	Virginia	1000	GOOGLE
567890123	Eddie Murphy	Texas	7000	MICROSOFT
456789012	Brad Pitt	Texas	1500	GOOGLE
123456710	Mark Stone	Pennsylvania	2500	IBM

1) Example: Find the state or employee names whose salary is greater than 3000, less than 2000 without duplication.

```
SELECT state AS "State or Employee Name", salary
FROM employees
WHERE salary >3000
UNION
SELECT name  AS "State or Employee Name", salary
FROM employees
WHERE salary < 2000;
```

State or Employee Name	SALARY
Brad Pitt	1500
Eddie Murphy	1000
Texas	7000

Note: If you add ORDER BY 2 after the last WHERE statement, you get the salary in ascending order.

"UNION ALL" Operator

UNION operator is used to combine the result sets of two or more SELECT statements.

It returns all rows from the query and does not remove duplicate rows between the SELECT statements.

Each SELECT statement within the UNION ALL operator must have the same number of fields in the result sets with similar data types.

```
CREATE TABLE employees
(
  id number(9),
  name varchar2(50),
  state varchar2(50),
  salary number(20),
  company varchar2(20)
);
```

```
INSERT INTO employees VALUES(123456789, 'John Walker', 'Florida', 2500, 'IBM');
INSERT INTO employees VALUES(234567890, 'Brad Pitt', 'Florida', 1500, 'APPLE');
INSERT INTO employees VALUES(345678901, 'Eddie Murphy', 'Texas', 3000, 'IBM');
INSERT INTO employees VALUES(456789012, 'Eddie Murphy', 'Virginia', 1000, 'GOOGLE');
INSERT INTO employees VALUES(567890123, 'Eddie Murphy', 'Texas', 7000, 'MICROSOFT');
INSERT INTO employees VALUES(456789012, 'Brad Pitt', 'Texas', 1500, 'GOOGLE');
INSERT INTO employees VALUES(123456710, 'Mark Stone', 'Pennsylvania', 2500, 'IBM');
```

ID	NAME	STATE	SALARY	COMPANY
123456789	John Walker	Florida	2500	IBM
234567890	Brad Pitt	Florida	1500	APPLE
345678901	Eddie Murphy	Texas	3000	IBM
456789012	Eddie Murphy	Virginia	1000	GOOGLE
567890123	Eddie Murphy	Texas	7000	MICROSOFT
456789012	Brad Pitt	Texas	1500	GOOGLE
123456710	Mark Stone	Pennsylvania	2500	IBM

1) Example: Find all state or employee names whose salary is greater than 3000, less than 2000

```
SELECT state AS "State or Employee Name", salary
FROM employees
WHERE salary >3000
UNION ALL
SELECT name AS "State or Employee Name", salary
FROM employees
WHERE salary < 2000;
```

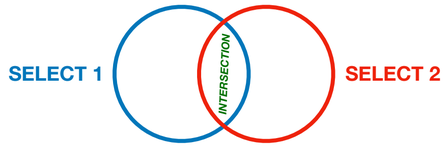
State or Employee Name	SALARY
Texas	7000
Brad Pitt	1500
Eddie Murphy	1000
Brad Pitt	1500

Note: When you use "UNION", Brad Pitt is printed just once as you can see in the previous slide.

Note: If you add ORDER BY 1 after the last WHERE statement, you get the salary in ascending order.

“INTERSECT” Operator

INTERSECT operator is used to return the **common results** of 2 or more **SELECT** statements.




```
CREATE TABLE employees
(
  id number(9),
  name varchar2(50),
  state varchar2(50),
  salary number(20),
  company varchar2(20)
);
```

```
INSERT INTO employees VALUES(123456789, 'John Walker', 'Florida', 2500, 'IBM');
INSERT INTO employees VALUES(234567890, 'Brad Pitt', 'Florida', 1500, 'APPLE');
INSERT INTO employees VALUES(345678901, 'Eddie Murphy', 'Texas', 3000, 'IBM');
INSERT INTO employees VALUES(456789012, 'Eddie Murphy', 'Virginia', 1000, 'GOOGLE');
INSERT INTO employees VALUES(567890123, 'Eddie Murphy', 'Texas', 7000, 'MICROSOFT');
INSERT INTO employees VALUES(456789012, 'Brad Pitt', 'Texas', 1500, 'GOOGLE');
INSERT INTO employees VALUES(123456710, 'Mark Stone', 'Pennsylvania', 2500, 'IBM');
```

ID	NAME	STATE	SALARY	COMPANY
123456789	John Walker	Florida	2500	IBM
234567890	Brad Pitt	Florida	1500	APPLE
345678901	Eddie Murphy	Texas	3000	IBM
456789012	Eddie Murphy	Virginia	1000	GOOGLE
567890123	Eddie Murphy	Texas	7000	MICROSOFT
456789012	Brad Pitt	Texas	1500	GOOGLE
123456710	Mark Stone	Pennsylvania	2500	IBM

1) Example: Find all common employee names whose salary is greater than 1000, less than 2000

```
SELECT name
FROM employees
WHERE salary < 2000
```

NAME
Brad Pitt
Eddie Murphy
Brad Pitt

INTERSECT

```
SELECT name
FROM employees
WHERE salary > 1000;
```

NAME
John Walker
Brad Pitt
Eddie Murphy
Eddie Murphy
Brad Pitt
Mark Stone

NAME
Brad Pitt
Eddie Murphy

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```
CREATE TABLE employees
(
  id number(9),
  name varchar2(50),
  state varchar2(50),
  salary number(20),
  company varchar2(20)
);
```

```
INSERT INTO employees VALUES(123456789, 'John Walker', 'Florida', 2500, 'IBM');
INSERT INTO employees VALUES(234567890, 'Brad Pitt', 'Florida', 1500, 'APPLE');
INSERT INTO employees VALUES(345678901, 'Eddie Murphy', 'Texas', 3000, 'IBM');
INSERT INTO employees VALUES(456789012, 'Eddie Murphy', 'Virginia', 1000, 'GOOGLE');
INSERT INTO employees VALUES(567890123, 'Eddie Murphy', 'Texas', 7000, 'MICROSOFT');
INSERT INTO employees VALUES(456789012, 'Brad Pitt', 'Texas', 1500, 'GOOGLE');
INSERT INTO employees VALUES(123456710, 'Mark Stone', 'Pennsylvania', 2500, 'IBM');
```

ID	NAME	STATE	SALARY	COMPANY
123456789	John Walker	Florida	2500	IBM
234567890	Brad Pitt	Florida	1500	APPLE
345678901	Eddie Murphy	Texas	3000	IBM
456789012	Eddie Murphy	Virginia	1000	GOOGLE
567890123	Eddie Murphy	Texas	7000	MICROSOFT
456789012	Brad Pitt	Texas	1500	GOOGLE
123456710	Mark Stone	Pennsylvania	2500	IBM

2) Example: Find all common employee names whose salary is greater than 2000 and company name is IBM, APPLE or GOOGLE

```
SELECT name
FROM employees
WHERE salary > 2000

INTERSECT

SELECT name
FROM employees
WHERE company in ('IBM', 'APPLE', 'GOOGLE');
```

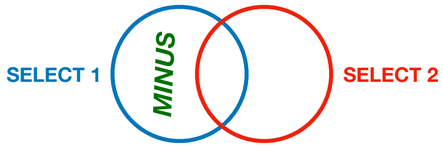
NAME
John Walker
Eddie Murphy
Eddie Murphy
Mark Stone

NAME
John Walker
Brad Pitt
Eddie Murphy
Eddie Murphy
Brad Pitt
Mark Stone

NAME
Eddie Murphy
John Walker
Mark Stone

“MINUS” Operator

MINUS operator is used to return all rows in the first SELECT statement that are not returned by the second SELECT statement.




```
CREATE TABLE employees
(
  id number(9),
  name varchar2(50),
  state varchar2(50),
  salary number(20),
  company varchar2(20)
);
```

```
INSERT INTO employees VALUES(123456789, 'John Walker', 'Florida', 2500, 'IBM');
INSERT INTO employees VALUES(234567890, 'Brad Pitt', 'Florida', 1500, 'APPLE');
INSERT INTO employees VALUES(345678901, 'Eddie Murphy', 'Texas', 3000, 'IBM');
INSERT INTO employees VALUES(456789012, 'Eddie Murphy', 'Virginia', 1000, 'GOOGLE');
INSERT INTO employees VALUES(567890123, 'Eddie Murphy', 'Texas', 7000, 'MICROSOFT');
INSERT INTO employees VALUES(456789012, 'Brad Pitt', 'Texas', 1500, 'GOOGLE');
INSERT INTO employees VALUES(123456710, 'Mark Stone', 'Pennsylvania', 2500, 'IBM');
```

ID	NAME	STATE	SALARY	COMPANY
123456789	John Walker	Florida	2500	IBM
234567890	Brad Pitt	Florida	1500	APPLE
345678901	Eddie Murphy	Texas	3000	IBM
456789012	Eddie Murphy	Virginia	1000	GOOGLE
567890123	Eddie Murphy	Texas	7000	MICROSOFT
456789012	Brad Pitt	Texas	1500	GOOGLE
123456710	Mark Stone	Pennsylvania	2500	IBM

2) Example: Find the employee names whose salary is less than 3000 and not working in GOOGLE

```
SELECT name, company
FROM employees
WHERE salary < 3000

MINUS

SELECT name, company
FROM employees
WHERE company IN (‘GOOGLE’);
```

NAME	COMPANY
Brad Pitt	APPLE
Eddie Murphy	GOOGLE
Brad Pitt	GOOGLE

NAME	COMPANY
Eddie Murphy	GOOGLE
Brad Pitt	GOOGLE

NAME	COMPANY
Brad Pitt	APPLE

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Review Question

COMPANY_ID	COMPANY_NAME
100	IBM
101	GOOGLE
102	MICROSOFT
103	APPLE

Companies

ORDER_ID	COMPANY_ID	ORDER_DATE
11	101	17-APR-20
22	102	18-APR-20
33	103	19-APR-20
44	104	20-APR-20
55	105	21-APR-20

Orders

1) Create the given tables and insert data

2) Find the common company ids

NOTE: When you use SET OPERATIONS(Union, Union ALll, Intersect, Minus) both queries must return
1) Same number of columns. Following example gives error due to number of columns

```
SELECT name, state
FROM employees1
WHERE salary < 2800

UNION

SELECT name, state, salary
FROM employees1
WHERE salary < 3000;
```

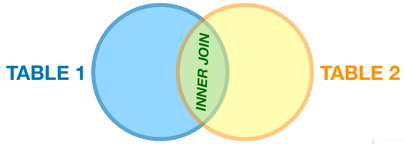
2) Corresponding columns must have same data types. Following example gives error due to data type

```
SELECT name, state
FROM employees1
WHERE salary < 2800

INTERSECT

SELECT name, salary
FROM employees1
WHERE salary < 3000;

--Following example does not give error because number of columns and data types are fine.
--But SQL mixes the names and states, it is not good but no error
SELECT name, state
FROM employees1
WHERE salary < 2800

UNION

SELECT state, name
FROM employees1 > 3000;
```

“JOINS”

1) INNER JOIN

The INNER JOIN would return the common records of two tables




```
CREATE TABLE my_companies
(
  company_id number(9),
  company_name varchar2(20)
);
```

```
INSERT INTO my_companies VALUES(100, 'IBM');
INSERT INTO my_companies VALUES(101, 'GOOGLE');
INSERT INTO my_companies VALUES(102, 'MICROSOFT');
INSERT INTO my_companies VALUES(103, 'APPLE');
```

COMPANY_ID	COMPANY_NAME
100	IBM
101	GOOGLE
102	MICROSOFT
103	APPLE

```
CREATE TABLE orders
(
  order_id number(9),
  company_id number(9),
  order_date date
);
```

```
INSERT INTO orders VALUES(11, 101, '17-Apr-2020');
INSERT INTO orders VALUES(22, 102, '18-Apr-2020');
INSERT INTO orders VALUES(33, 103, '19-Apr-2020');
INSERT INTO orders VALUES(44, 104, '20-Apr-2020');
INSERT INTO orders VALUES(55, 105, '21-Apr-2020');
```

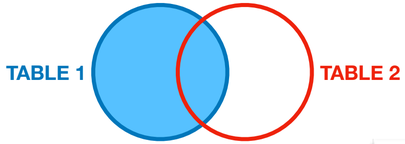
ORDER_ID	COMPANY_ID	ORDER_DATE
11	101	17-APR-20
22	102	18-APR-20
33	103	19-APR-20
44	104	20-APR-20
55	105	21-APR-20

```
SELECT my_companies.company_name, orders.order_id, orders.order_date
FROM my_companies INNER JOIN orders
ON my_companies.company_id = orders.company_id;
```

COMPANY_NAME	ORDER_ID	ORDER_DATE
GOOGLE	11	17-APR-20
MICROSOFT	22	18-APR-20
APPLE	33	19-APR-20

2) LEFT JOIN

The LEFT JOIN returns all rows from the LEFT-Hand table




```
CREATE TABLE companies
(
  company_id number(9),
  company_name varchar2(20)
);
```

```
INSERT INTO companies VALUES(100, 'IBM');
INSERT INTO companies VALUES(101, 'GOOGLE');
INSERT INTO companies VALUES(102, 'MICROSOFT');
INSERT INTO companies VALUES(103, 'APPLE');
```

COMPANY_ID	COMPANY_NAME
100	IBM
101	GOOGLE
102	MICROSOFT
103	APPLE

```
CREATE TABLE orders
(
  order_id number(9),
  company_id number(9),
  order_date date
);
```

```
INSERT INTO orders VALUES(11, 101, '17-Apr-2020');
INSERT INTO orders VALUES(22, 102, '18-Apr-2020');
INSERT INTO orders VALUES(33, 103, '19-Apr-2020');
INSERT INTO orders VALUES(44, 104, '20-Apr-2020');
INSERT INTO orders VALUES(55, 105, '21-Apr-2020');
```

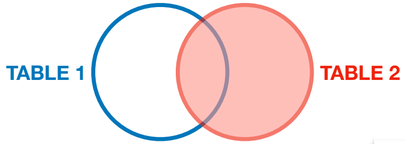
ORDER_ID	COMPANY_ID	ORDER_DATE
11	101	17-APR-20
22	102	18-APR-20
33	103	19-APR-20
44	104	20-APR-20
55	105	21-APR-20

```
SELECT companies.company_name, orders.order_id, orders.order_date
FROM companies LEFT JOIN orders
ON companies.company_id = orders.company_id;
```

COMPANY_NAME	ORDER_ID	ORDER_DATE
GOOGLE	11	17-APR-20
MICROSOFT	22	18-APR-20
APPLE	33	19-APR-20
IBM	-	-

3) RIGHT JOIN

The RIGHT JOIN returns all rows from the RIGHT-Hand table




```
CREATE TABLE companies
(
  company_id number(9),
  company_name varchar2(20)
);
```

```
INSERT INTO companies VALUES(100, 'IBM');
INSERT INTO companies VALUES(101, 'GOOGLE');
INSERT INTO companies VALUES(102, 'MICROSOFT');
INSERT INTO companies VALUES(103, 'APPLE');
```

COMPANY_ID	COMPANY_NAME
100	IBM
101	GOOGLE
102	MICROSOFT
103	APPLE

```
CREATE TABLE orders
(
  order_id number(9),
  company_id number(9),
  order_date date
);
```

```
INSERT INTO orders VALUES(11, 101, '17-Apr-2020');
INSERT INTO orders VALUES(22, 102, '18-Apr-2020');
INSERT INTO orders VALUES(33, 103, '19-Apr-2020');
INSERT INTO orders VALUES(44, 104, '20-Apr-2020');
INSERT INTO orders VALUES(55, 105, '21-Apr-2020');
```

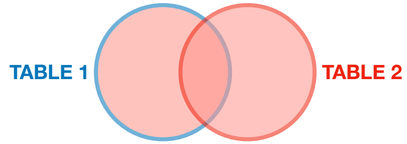
ORDER_ID	COMPANY_ID	ORDER_DATE
11	101	17-APR-20
22	102	18-APR-20
33	103	19-APR-20
44	104	20-APR-20
55	105	21-APR-20

```
SELECT companies.company_name, orders.order_id, orders.order_date
FROM companies RIGHT JOIN orders
ON companies.company_id = orders.company_id;
```

COMPANY_NAME	ORDER_ID	ORDER_DATE
GOOGLE	11	17-APR-20
MICROSOFT	22	18-APR-20
APPLE	33	19-APR-20
-	55	21-APR-20
-	44	20-APR-20

4) FULL JOIN

The FULL JOIN returns all rows from the LEFT-Hand table and RIGHT-Hand table with nulls in place where the join condition is not met.




```
CREATE TABLE companies
(
  company_id number(9),
  company_name varchar2(20)
);
```

```
INSERT INTO companies VALUES(100, 'IBM');
INSERT INTO companies VALUES(101, 'GOOGLE');
INSERT INTO companies VALUES(102, 'MICROSOFT');
INSERT INTO companies VALUES(103, 'APPLE');
```

COMPANY_ID	COMPANY_NAME
100	IBM
101	GOOGLE
102	MICROSOFT
103	APPLE

```
CREATE TABLE orders
(
  order_id number(9),
  company_id number(9),
  order_date date
);
```

```
INSERT INTO orders VALUES(11, 101, '17-Apr-2020');
INSERT INTO orders VALUES(22, 102, '18-Apr-2020');
INSERT INTO orders VALUES(33, 103, '19-Apr-2020');
INSERT INTO orders VALUES(44, 104, '20-Apr-2020');
INSERT INTO orders VALUES(55, 105, '21-Apr-2020');
```

ORDER_ID	COMPANY_ID	ORDER_DATE
11	101	17-APR-20
22	102	18-APR-20
33	103	19-APR-20
44	104	20-APR-20
55	105	21-APR-20

```
SELECT companies.company_name, orders.order_id, orders.order_date
FROM companies FULL JOIN orders
ON companies.company_id = orders.company_id;
```

COMPANY_NAME	ORDER_ID	ORDER_DATE
GOOGLE	11	17-APR-20
MICROSOFT	22	18-APR-20
APPLE	33	19-APR-20
-	44	20-APR-20
-	55	21-APR-20
IBM	-	-

5) SELF JOIN

```
CREATE TABLE workers
(
  id number(2),
  name varchar2(20),
  title varchar2(60),
  manager_id number(2)
);
```



```
INSERT INTO workers VALUES(1, 'Ali Can', 'SDET', 2);
INSERT INTO workers VALUES(2, 'John Walker', 'QA', 3);
INSERT INTO workers VALUES(3, 'Angie Star', 'QA Lead', 4);
INSERT INTO workers VALUES(4, 'Amy Sky', 'CEO', 5);
```


ID	NAME	TITLE	BOSS_ID
1	Ali Can	SDET	2
2	John Walker	QA	3
3	Angie Star	QA Lead	4
4	Amy Sky	CEO	5

```
SELECT e1.name AS employee_name, e2.name AS manager_name
FROM my_employees  e1 INNER JOIN my_employees  e2
ON e1.manager_id = e2.id;
```


EMPLOYEE_NAME	BOSS_NAME
Ali Can	John Walker
John Walker	Angie Star
Angie Star	Amy Sky

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“PIVOT” Clause

PIVOT Clause allows you to aggregate your results and rotate rows into columns

```
CREATE TABLE customers_products
(
  product_id number(10),
  customer_name varchar2(50),
  product_name varchar2(50)
);
```

```
INSERT INTO customers_products VALUES (10, 'Mark', 'Orange');
INSERT INTO customers_products VALUES (10, 'Mark', 'Orange');
INSERT INTO customers_products VALUES (20, 'John', 'Apple');
INSERT INTO customers_products VALUES (30, 'Amy', 'Palm');
INSERT INTO customers_products VALUES (20, 'Mark', 'Apple');
INSERT INTO customers_products VALUES (10, 'Adem', 'Orange');
INSERT INTO customers_products VALUES (40, 'John', 'Apricot');
INSERT INTO customers_products VALUES (20, 'Eddie', ‘Apple');
```

PRODUCT_ID	CUSTOMER_NAME	PRODUCT_NAME
10	Mark	Orange
10	Mark	Orange
20	John	Apple
30	Amy	Palm
20	Mark	Apple
10	Adem	Orange
40	John	Apricot
20	Eddie	Apple

```
SELECT * FROM (SELECT product_name, customer_name FROM customers_products)
PIVOT
(COUNT(product_name) FOR product_name IN ('Orange','Apple','Apricot','Palm'));
```

CUSTOMER_NAME	'Orange'	'Apple'	'Apricot'	'Palm'
Amy	0	0	0	1
Mark	2	1	0	0
Adem	1	0	0	0
Eddie	0	1	0	0
John	0	1	1	0

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“ALTER TABLE” Statement

ALTER TABLE statement is used to add, modify, or drop/delete columns in a table.

ALTER TABLE statement is also used to rename a table.

```
CREATE TABLE employees
(
  id number(9),
  name varchar2(50),
  state varchar2(50),
  salary number(20),
  company varchar2(20)
);
```

```
INSERT INTO employees VALUES(123456789, 'John Walker', 'Florida', 2500, 'IBM');
INSERT INTO employees VALUES(234567890, 'Brad Pitt', 'Florida', 1500, 'APPLE');
INSERT INTO employees VALUES(345678901, 'Eddie Murphy', 'Texas', 3000, 'IBM');
INSERT INTO employees VALUES(456789012, 'Eddie Murphy', 'Virginia', 1000, 'GOOGLE');
INSERT INTO employees VALUES(567890123, 'Eddie Murphy', 'Texas', 7000, 'MICROSOFT');
INSERT INTO employees VALUES(456789012, 'Brad Pitt', 'Texas', 1500, 'GOOGLE');
INSERT INTO employees VALUES(123456710, 'Mark Stone', 'Pennsylvania', 2500, 'IBM');
```

ID	NAME	STATE	SALARY	COMPANY
123456789	John Walker	Florida	2500	IBM
234567890	Brad Pitt	Florida	1500	APPLE
345678901	Eddie Murphy	Texas	3000	IBM
456789012	Eddie Murphy	Virginia	1000	GOOGLE
567890123	Eddie Murphy	Texas	7000	MICROSOFT
456789012	Brad Pitt	Texas	1500	GOOGLE
123456710	Mark Stone	Pennsylvania	2500	IBM

1) ADD a column into a table with a default value

```
ALTER TABLE employees
ADD country_name varchar2(20) DEFAULT 'USA';
```

ID	NAME	STATE	SALARY	COMPANY	COUNTRY_NAME
123456789	John Walker	Florida	2500	IBM	USA
234567890	Brad Pitt	Florida	1500	APPLE	USA
345678901	Eddie Murphy	Texas	3000	IBM	USA
456789012	Eddie Murphy	Virginia	1000	GOOGLE	USA
567890123	Eddie Murphy	Texas	7000	MICROSOFT	USA
456789012	Brad Pitt	Texas	1500	GOOGLE	USA
123456710	Mark Stone	Pennsylvania	2500	IBM	USA

2) ADD multiple columns into a table

```
ALTER TABLE employees
ADD (gender varchar2(6),
     age number(3)
     );
```

ID	NAME	STATE	SALARY	COMPANY	COUNTRY_NAME	GENDER	AGE
123456789	John Walker	Florida	2500	IBM	USA	–	–
234567890	Brad Pitt	Florida	1500	APPLE	USA	–	–
345678901	Eddie Murphy	Texas	3000	IBM	USA	–	–
456789012	Eddie Murphy	Virginia	1000	GOOGLE	USA	–	–
567890123	Eddie Murphy	Texas	7000	MICROSOFT	USA	–	–
456789012	Brad Pitt	Texas	1500	GOOGLE	USA	–	–
123456710	Mark Stone	Pennsylvania	2500	IBM	USA	–	–

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3)DROP COLUMN in a table

ID	NAME	STATE	SALARY	COMPANY	COUNTRY_NAME	GENDER	AGE
123456789	John Walker	Florida	2500	IBM	USA	–	–
234567890	Brad Pitt	Florida	1500	APPLE	USA	–	–
345678901	Eddie Murphy	Texas	3000	IBM	USA	–	–
456789012	Eddie Murphy	Virginia	1000	GOOGLE	USA	–	–
567890123	Eddie Murphy	Texas	7000	MICROSOFT	USA	–	–
456789012	Brad Pitt	Texas	1500	GOOGLE	USA	–	–
123456710	Mark Stone	Pennsylvania	2500	IBM	USA	–	–

```
ALTER TABLE employees
DROP COLUMN age;
```

ID	NAME	STATE	SALARY	COMPANY	COUNTRY_NAME	GENDER
123456789	John Walker	Florida	2500	IBM	USA	–
234567890	Brad Pitt	Florida	1500	APPLE	USA	–
345678901	Eddie Murphy	Texas	3000	IBM	USA	–
456789012	Eddie Murphy	Virginia	1000	GOOGLE	USA	–
567890123	Eddie Murphy	Texas	7000	MICROSOFT	USA	–
456789012	Brad Pitt	Texas	1500	GOOGLE	USA	–
123456710	Mark Stone	Pennsylvania	2500	IBM	USA	–

4)RENAME COLUMN in a table

ID	NAME	STATE	SALARY	COMPANY	COUNTRY_NAME	GENDER
123456789	John Walker	Florida	2500	IBM	USA	–
234567890	Brad Pitt	Florida	1500	APPLE	USA	–
345678901	Eddie Murphy	Texas	3000	IBM	USA	–
456789012	Eddie Murphy	Virginia	1000	GOOGLE	USA	–
567890123	Eddie Murphy	Texas	7000	MICROSOFT	USA	–
456789012	Brad Pitt	Texas	1500	GOOGLE	USA	–
123456710	Mark Stone	Pennsylvania	2500	IBM	USA	–

```
ALTER TABLE employees
RENAME COLUMN company TO company_name;
```

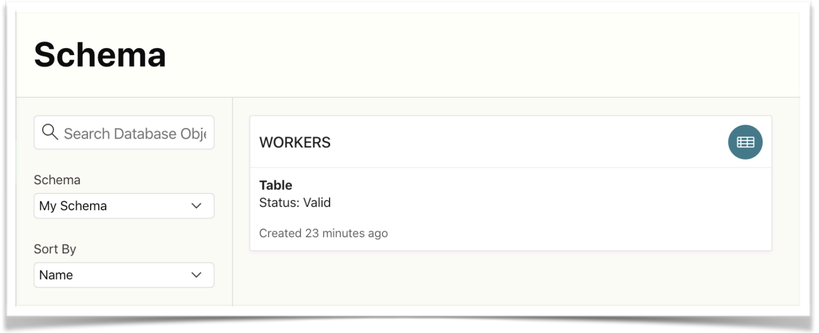
ID	NAME	STATE	SALARY	COMPANY_NAME	COUNTRY_NAME	GENDER
123456789	John Walker	Florida	2500	IBM	USA	–
234567890	Brad Pitt	Florida	1500	APPLE	USA	–
345678901	Eddie Murphy	Texas	3000	IBM	USA	–
456789012	Eddie Murphy	Virginia	1000	GOOGLE	USA	–
567890123	Eddie Murphy	Texas	7000	MICROSOFT	USA	–
456789012	Brad Pitt	Texas	1500	GOOGLE	USA	–
123456710	Mark Stone	Pennsylvania	2500	IBM	USA	–

5)RENAME table name in a table

```
ALTER TABLE employees
RENAME TO workers;
```

```
SELECT * FROM workers;
```

ID	NAME	STATE	SALARY	COMPANY_NAME	COUNTRY_NAME	GENDER
123456789	John Walker	Florida	2500	IBM	USA	-
234567890	Brad Pitt	Florida	1500	APPLE	USA	-
345678901	Eddie Murphy	Texas	3000	IBM	USA	-
456789012	Eddie Murphy	Virginia	1000	GOOGLE	USA	-
567890123	Eddie Murphy	Texas	7000	MICROSOFT	USA	-
456789012	Brad Pitt	Texas	1500	GOOGLE	USA	-
123456710	Mark Stone	Pennsylvania	2500	IBM	USA	-



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6)MODIFY column or columns in a table

Columns

#	Column	Type	Length	Precision	Scale	Nullable	Semantics
1	ID	NUMBER	22	9	0	Yes	
2	NAME	VARCHAR2	50			Yes	Byte
3	STATE	VARCHAR2	50			Yes	Byte
4	SALARY	NUMBER	22	20	0	Yes	
5	COMPANY_NAME	VARCHAR2	20			Yes	Byte
6	COUNTRY_NAME	VARCHAR2	20			Yes	Byte
7	GENDER	VARCHAR2	11			Yes	Byte

```
ALTER TABLE workers
MODIFY state varchar2(70) NOT NULL;
```

Columns

#	Column	Type	Length	Precision	Scale	Nullable	Semantics
1	ID	NUMBER	22	9	0	Yes	
2	NAME	VARCHAR2	50			Yes	Byte
3	STATE	VARCHAR2	70			No	Byte
4	SALARY	NUMBER	22	20	0	Yes	
5	COMPANY_NAME	VARCHAR2	20			Yes	Byte
6	COUNTRY_NAME	VARCHAR2	20			Yes	Byte
7	GENDER	VARCHAR2	11			Yes	Byte

To modify multiple columns →

```
ALTER TABLE workers
MODIFY (state varchar2(70) NOT NULL,
        id  number(11) NULL);
```

Exceptions in Oracle SQL

1)
```
CREATE TABLE students
(
        id char(11),
        name VARCHAR2(50),
        grade number(3),
        address VARCHAR2(80),
        update_date date
);
```

2)
```
INSERT INTO students VALUES(123456789, 'John Walker', 11, '1234 Texas', '14-Apr-2020');
INSERT INTO students VALUES(223456789, 'Johnny Walker', 12, '1234 Florida', '14-Apr-2020');
```

3)
```
SELECT * FROM students;
```

	ID	NAME	GRADE	ADDRESS	UPDATE_DATE
1	123456789	John Walker	11	1234 Texas	14-APR-20
2	223456789	Johnny Walker	12	1234 Florida	14-APR-20

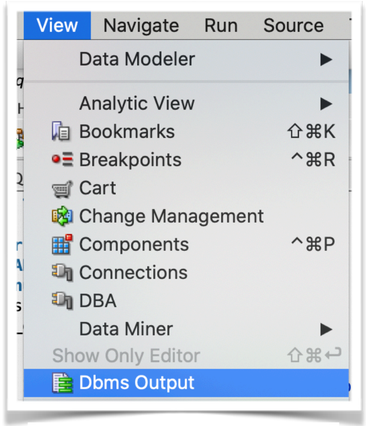
4)
```
DECLARE
    employee_id char(11);
    employee_name VARCHAR2(50);
BEGIN
    SELECT id, name
    INTO employee_id, employee_name
    FROM students;
END;
/
```

5)
```
Error starting at line : 15 in command -
DECLARE
employee_id char(11);
employee_name VARCHAR2(50);
BEGIN
SELECT id, name
INTO employee_id, employee_name
FROM students;
END;
Error report -
ORA-01422: exact fetch returns more than requested number of rows
ORA-06512: at line 5
01422. 00000 -  "exact fetch returns more than requested number of rows"
*Cause:    The number specified in exact fetch is less than the rows returned.
*Action:   Rewrite the query or change number of rows requested
```

Note: If we run the 4th code we get the 5th Error Message on the console.
Because, employee_id and employee_name can store just a single value but more than one data is coming from table.
SQL cannot store multiple data into a single variable so it throws Exception.
How can we handle Exception in SQL?

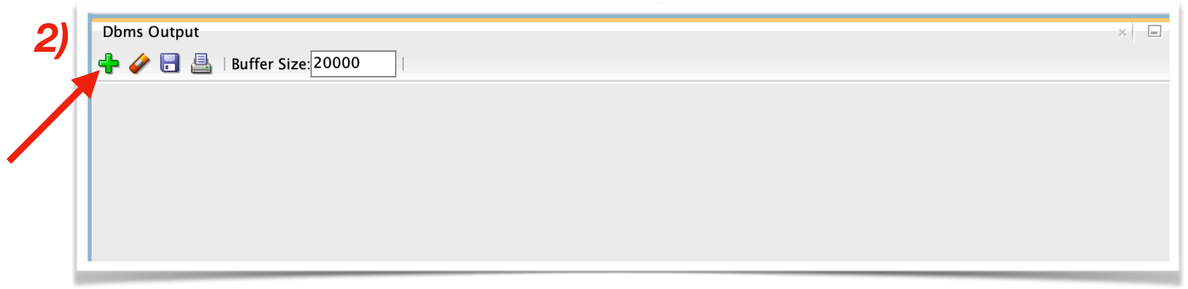
How to Turn On DBMS_OUTPUT in Oracle SQL

1)



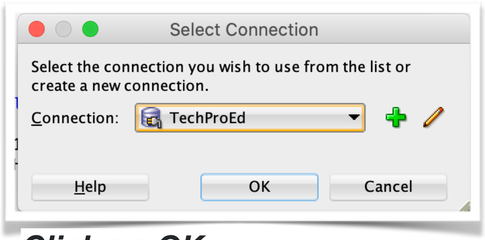
View->DBMS Output

2)



You will get a new opened window at the bottom
Click on '+' sign

3)



Click on OK

How to Handle Exceptions in Oracle SQL

Using Predefined Exception to Handle Exceptions

1) TOO_MANY_ROWS Example:

```
DECLARE
   std_id char(11);
   std_name VARCHAR2(50);
BEGIN
   SELECT id, name
   INTO std_id, std_name
   FROM students;
   DBMS_OUTPUT.PUT_LINE('Student id: '||std_id);
   DBMS_OUTPUT.PUT_LINE('Student name: '||std_name);
   DBMS_OUTPUT.PUT_LINE('Query is completed successfully!');
   DBMS_OUTPUT.PUT_LINE(std_id || ' ' || std_name);
EXCEPTION
   WHEN TOO_MANY_ROWS THEN
   DBMS_OUTPUT.PUT_LINE('Too many rows!!!');
END;
```

2) NO_DATA_FOUND Example:

```
DECLARE
   std_id char(11);
   std_name varchar2(50);
BEGIN
      SELECT id, name
      INTO std_id, std_name
      FROM students
      WHERE id = '13579';
      DBMS_OUTPUT.PUT_LINE('Employee id: ' || std_id);
      DBMS_OUTPUT.PUT_LINE('Employee name: ' || std_name);
   EXCEPTION
   WHEN NO_DATA_FOUND THEN
   DBMS_OUTPUT.PUT_LINE('Query did not return any data');
END;
```

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3) ZERO_DIVIDE Example:

```
DECLARE
   result number(4, 2);
   num1 number(4) := 12;
   num2 number(4) := 0;
BEGIN
      result := num1 / num2;
      DBMS_OUTPUT.PUT_LINE(num1||'/'||num2||'='||result);
   EXCEPTION
   WHEN ZERO_DIVIDE THEN
   DBMS_OUTPUT.PUT_LINE('Do not divide by zero');
END;
```

4) INVALID_NUMBER Example:

```
DECLARE
   new_grade number(3);
BEGIN
      INSERT INTO students(id, grade) VALUES('523456789', 'A');
      SELECT grade
      INTO new_grade
      FROM students
      WHERE id = '323456789';
      DBMS_OUTPUT.PUT_LINE('Grade is '||new_grade);
   EXCEPTION
   WHEN INVALID_NUMBER THEN
   DBMS_OUTPUT.PUT_LINE('Conversion of String to number is failed!');
END;
```

Pre-defined Exceptions in PL/SQL

Exception	Oracle Error	SQLCODE	Description
ACCESS_INTO_NULL	06530	-6530	It is raised when a null object is automatically assigned a value.
CASE_NOT_FOUND	06592	-6592	It is raised when none of the choices in the WHEN clause of a CASE statement is selected, and there is no ELSE clause.
COLLECTION_IS_NULL	06531	-6531	It is raised when a program attempts to apply collection methods other than EXISTS to an uninitialized nested table or varray, or the program attempts to assign values to the elements of an uninitialized nested table or varray.
DUP_VAL_ON_INDEX	00001	-1	It is raised when duplicate values are attempted to be stored in a column with unique index.
INVALID_CURSOR	01001	-1001	It is raised when attempts are made to make a cursor operation that is not allowed, such as closing an unopened cursor.
INVALID_NUMBER	01722	-1722	It is raised when the conversion of a character string into a number fails because the string does not represent a valid number.
LOGIN_DENIED	01017	-1017	It is raised when a program attempts to log on to the database with an invalid username or password.
NO_DATA_FOUND	01403	+100	It is raised when a SELECT INTO statement returns no rows.
NOT_LOGGED_ON	01012	-1012	It is raised when a database call is issued without being connected to the database.
PROGRAM_ERROR	06501	-6501	It is raised when PL/SQL has an internal problem.
ROWTYPE_MISMATCH	06504	-6504	It is raised when a cursor fetches value in a variable having incompatible data type.
SELF_IS_NULL	30625	-30625	It is raised when a member method is invoked, but the instance of the object type was not initialized.
STORAGE_ERROR	06500	-6500	It is raised when PL/SQL ran out of memory or memory was corrupted.
TOO_MANY_ROWS	01422	-1422	It is raised when a SELECT INTO statement returns more than one row.
VALUE_ERROR	06502	-6502	It is raised when an arithmetic, conversion, truncation, or sizeconstraint error occurs.
ZERO_DIVIDE	01476	1476	It is raised when an attempt is made to divide a number by zero.

Using User-defined Exception to Handle Exceptions

1) Example:

```
DECLARE
    employee_id NUMBER;
    wrong_entry EXCEPTION;
BEGIN
    employee_id := ‘&Three_Digits_Number’;
    IF(employee_id>999 or employee_id<100) THEN
      RAISE wrong_entry;
    ELSE
      DBMS_OUTPUT.PUT_LINE(employee_id);
    END IF;
EXCEPTION
WHEN wrong_entry THEN
  DBMS_OUTPUT.put_line('Employee id must have 3 digits!!!');
END;
```

Note: This user-defined exception is throwing exception if the employee_id has no 3 digits.

Using User-defined Exception and Pre-Defined Exception together to Handle Exceptions

2) Example: How to use multiple Exceptions…

```
DECLARE
    new_grade students.grade%TYPE;
    new_name students.name%TYPE;

    invalid_grade EXCEPTION;
BEGIN
    new_grade := ‘&std_grade’;
    new_name := ‘&std_name’;
    IF(new_grade <=0 or new_grade >=12) THEN
        RAISE invalid_grade;
    ELSE
    DBMS_OUTPUT.put_line(new_grade);
END IF;
    EXCEPTION
    WHEN invalid_grade THEN
      DBMS_OUTPUT.put_line('Employee id must be from 0 to 12');
    WHEN value_error THEN
      DBMS_OUTPUT.put_line(‘Do not use characters different from 0 to 4’);
END;
```

3) Example: How to use multiple Exceptions…

```
DECLARE
    std_id char(11);
    std_name varchar2(50);
    result number(4,2);
    num1 number(4,2) := ‘&num1’;
    num2 number(4,2) := ‘&num2’;
BEGIN
    SELECT id, name
    INTO std_id, std_name
    FROM students
    WHERE grade = 21;
    DBMS_OUTPUT.put_line('ID: ' || std_id);
    DBMS_OUTPUT.put_line('Name: ' || std_name);
    result := num1 / num2;
    DBMS_OUTPUT.put_line(num1 ||'/'|| num2 ||'='||result);
    EXCEPTION
    WHEN NO_DATA_FOUND THEN
    DBMS_OUTPUT.put_line('Query did not return any data');
    WHEN ZERO_DIVIDE THEN
    DBMS_OUTPUT.put_line('Divisor cannot be zero!’);
    WHEN OTHERS THEN
    DBMS_OUTPUT.put_line(‘Undefined error!');

END;
```

User Defined Functions(PL/SQL Block) in Oracle SQL

Note: Functions are created for 2 main reasons
1) Calculations
2) To fetch data from database

Advantage: Reusability

Functions : Functions must return a value; mainly used to compute and return a value.
Functions can have just input parameters
We can use functions in SQL statements like SELECT, INSERT, UPDATE, DELETE etc.
We cannot call Procedures from inside the Functions

DUAL is a 1 row 1 column table automatically created by Oracle Database along with the data dictionary.
DUAL is in the schema of the user SYS but is accessible by the name DUAL to all users.
It has one column whose name is DUMMY, defined to be VARCHAR2(1), and contains one row with a value X.
Selecting from the DUAL table is useful for computing a constant expression with the SELECT statement because DUAL has only one row, the constant is returned only once.

Usage Examples of DUAL Table:
1) SELECT 3+5 FROM DUAL;
2) SELECT sysdate FROM DUAL;
3) SELECT user FROM DUAL;

RealLife Example of DUAL Table Usage

```
CREATE TABLE students
(
    name VARCHAR2(50),
    avg_score NUMBER(4,2),
    modify_date DATE,
    modifier VARCHAR2(50)
);

DECLARE
cur_date DATE;
modifer_name VARCHAR2(50);

BEGIN
    SELECT sysdate, user
    INTO cur_date, modifer_name
    FROM DUAL;

    INSERT INTO students VALUES('John Walker', 87.23, cur_date, modifer_name);
    INSERT INTO students VALUES('Mary Star', 95.12, cur_date,  modifer_name);
    INSERT INTO students VALUES('Angie Ocean', 68.54, cur_date,  modifer_name);
END;
```

```
SELECT * FROM students;
```


	NAME	AVG_SCORE	MODIFY_DATE	MODIFIER
1	John Walker	87.23	16-DEC-20	HR
2	Mary Star	95.12	16-DEC-20	HR
3	Angie Ocean	68.54	16-DEC-20	HR

Example 1:

1) Syntax to Create a Function

```
CREATE OR REPLACE FUNCTION addf(a number, b number)
RETURN NUMBER IS
BEGIN
RETURN a+b;
END;
```

2) Syntax to Call the Function

1. Way: Syntax to Call the Function

```
SELECT addf(10, 20) FROM DUAL;
```

2. Way: Syntax to Call the Function

```
EXECUTE DBMS_OUTPUT.PUT_LINE(addf(10, 20));
```

3. Way: Syntax to Call the Function

```
VARIABLE K NUMBER;
EXECUTE :K := addf(10, 20);
PRINT K;
```

Example 2:

1) Syntax to Create a Function

```
CREATE OR REPLACE FUNCTION calcf(a number, b number, opr char)
RETURN NUMBER IS
BEGIN
   IF opr = '+' THEN
      RETURN a+b;
   ELSIF opr = '-' THEN
      RETURN a-b;
   ELSIF opr = '*' THEN
      RETURN a*b;
   ELSIF opr = '/' THEN
      RETURN a/b;
   ELSE
     DBMS_OUTPUT.PUT_LINE('Select one of the +, -, *, /');
     RETURN 0;     ==> Functions must return value, we must put that over here
   END IF;
     EXCEPTION
     WHEN ZERO_DIVIDE THEN
     DBMS_OUTPUT.PUT_LINE('Do not divide by zero!!!');
     RETURN 0;    ==> Functions must return value, we must put that over here
END;
```

2) Syntax to Call the Function

1. Way: Syntax to Call the Function

```
SELECT calcf(30, 20, 'm') FROM DUAL; ==> This gives error sometimes
```

2. Way: Syntax to Call the Function

```
EXECUTE DBMS_OUTPUT.PUT_LINE(calcf(10, 20, 'm'));
```

3. Way: Syntax to Call the Function

```
VARIABLE K NUMBER;
EXECUTE :K := calcf(400, 20, '+');
PRINT K;
```

Example 3:

1) Syntax to Create and call a Function with DECLARE part

```
DECLARE
   a number := '&numA';
   b number := '&numB';

FUNCTION findMax(x number, y number)
RETURN NUMBER IS

BEGIN
   IF x > y THEN
      RETURN x;
   ELSE
     RETURN  y;
   END IF;
END;

-  - The following part is to call function
-  - When you use DECLARE in the method use the following way to call method
-  - When you use DECLARE do not type “CREATE OR REPLACE FUNCTION” type just “FUNCTION”
BEGIN
   dbms_output.put_line(' Maximum value of '||a||' and '||b||' is ' ||  findMax(a, b));
END;
```

Example 4:

1) Syntax to Create and call a Function with DECLARE part

```
DECLARE
  num number := '&num';

FUNCTION fact(x number)
RETURN NUMBER IS

BEGIN
  IF x=0 THEN
     RETURN 1;
  ELSE
    RETURN x * fact(x-1);
  END IF;
END;

BEGIN

  dbms_output.put_line(num|| '! = ' || fact(num));
END;
```

How to Drop a Function from Database

Once you have created your function in Oracle, you might find that you need to remove it from the database.

Syntax
DROP FUNCTION function_name;

Example: Let us drop DivNumber function
DROP FUNCTION DivNumber;

User Defined Procedures(PL/SQL Block) in Oracle SQL

Procedures : Procedures may or may not return a value; mainly used to perform an action.
Procedures can have input, output, and input/output parameters
We cannot use procedures in SQL statements like SELECT, INSERT, UPDATE, DELETE, MERGE etc.
We can call functions from inside the procedures

Parameters are in 3 types in PL/SQL

IN: An IN parameter lets you pass a value to the subprogram.
It is a read-only parameter.
Inside the subprogram, an IN parameter acts like a constant.
It cannot be assigned a value.

OUT: An OUT parameter returns a value to the calling program.
Inside the subprogram, an OUT parameter acts like a variable.
You can change its value and reference the value after assigning it.

IN OUT: An IN OUT parameter passes an initial value to a subprogram and returns an updated value to the caller.
It can be assigned a value and the value can be read.

Example 1:

—How to create a procedure

```
CREATE OR REPLACE PROCEDURE findMin(x IN number, y IN number, z OUT number) IS
BEGIN
        IF x < y THEN
          z:= x;
        ELSE
          z:= y;
        END IF;
END;
```

—How to call a procedure

```
DECLARE
  a number;
  b number;
  c number;
BEGIN
  a:= 23;
  b:= 45;
  findMin(a, b, c);
  dbms_output.put_line(' Minimum is ' || c);
END;
```

Example 2:

```
DECLARE
   a number;

PROCEDURE squareNum(x IN OUT number) IS
BEGIN
    x := x*x;
END;

BEGIN
   a:= 23;
   squareNum(a);
   dbms_output.put_line('Square is ' || a);
END;
/
```

Example 3:

```
CREATE TABLE workers
(
   id CHAR(5),
   name VARCHAR2(50),
   salary NUMBER(5),
   CONSTRAINT id4_pk PRIMARY KEY(id)
);
```

```
INSERT INTO workers VALUES(10001, 'Ali Can', 12000);
INSERT INTO workers VALUES(10002, 'Veli Han', 2000);
INSERT INTO workers VALUES(10003, 'Mary Star', 7000);
INSERT INTO workers VALUES(10004, 'Angie Ocean', 8500);
```

```
DECLARE
  a number := '&emp_id';
  b number := '&raise_amount';
  c number;

      PROCEDURE Raise_Salary(w_id IN number, amount IN number, raisedSalary OUT number) IS
BEGIN

       UPDATE workers
       SET salary =  salary + amount
       WHERE id = w_id;

      COMMIT;     - - If you want you can remove COMMIT;
                  - - DBMS does it automatically to make sure you can type
      SELECT salary INTO raisedSalary FROM workers WHERE id = w_id;

END;

BEGIN
  Raise_Salary(a, b, c);
  dbms_output.put_line('Raised salary is ' || c);
END;
```

Example 4:

```
--Create a procedure to withdraw money from an account.
--Account id and withdraw amount will be given by user.
--If the withdraw amount is greater than the balance
  withdraw cannot be done
--otherwise do withdraw and display the remaining balance
  on the output console.
```

```
CREATE TABLE accounts
(
   id CHAR(3),
   name VARCHAR2(50),
   balance NUMBER(10,2)
);
```

```
INSERT INTO accounts VALUES(101, 'Ali Can', 12000);
INSERT INTO accounts VALUES(102, 'Veli Han', 2000);
INSERT INTO accounts VALUES(103, 'Mary Star', 7000);
INSERT INTO accounts VALUES(104, 'Angie Ocean', 8500);
```

```
DECLARE
a_id accounts.id%TYPE := '&account_id';
w_amount accounts.balance%TYPE := '&withdraw_amount';
a_balance accounts.balance%TYPE;
r_balance accounts.balance%TYPE;

PROCEDURE withdrawP(account_id IN CHAR, withdraw_amount IN NUMBER, remaining_balance OUT NUMBER) IS

BEGIN

   SELECT balance
   INTO a_balance
   FROM accounts
   WHERE id = account_id;

   IF withdraw_amount <= a_balance THEN
      UPDATE accounts
      SET balance = balance - withdraw_amount
      WHERE id = account_id;
   ELSE
     DBMS_OUTPUT.put_line('Insufficient balance!');
   END IF;

   SELECT balance
   INTO remaining_balance
   FROM accounts
   WHERE id = account_id;

END;

BEGIN
   withdrawP(a_id, w_amount, r_balance);
   DBMS_OUTPUT.put_line('Remaining balance is ' || r_balance);
END;
```

How to Drop a Procedure from Database

Once you have created your procedure in Oracle, you might find that you need to remove it from the database.

Syntax
DROP PROCEDURE procedure_name;

Example: Let us drop Raise_Salary procedure
DROP PROCEDURE Raise_Salary;

Sequences in Oracle SQL

You can create an auto-number field by using sequences.
A sequence is an object in Oracle that is used to generate a number sequence.
This can be useful when you need to create a unique number to act as a primary key.

For example; when you create a student list you may want to create student ids automatically,
or when you order products from an online website, the order numbers are created automatically in your cart.

Example 1:

```
CREATE SEQUENCE sequence1;
```

→ Sequence SEQUENCE1 created. → After creating sequence you can use it in any query.

```
CREATE TABLE STUDENTS
(
   student_id NUMBER(4),
   student_name VARCHAR2(50)
);
```

→

```
INSERT INTO students VALUES(sequence1.NEXTVAL, '&student_name');
```

Example 2:

```
CREATE SEQUENCE sequence1
START WITH 101;
```

→ Sequence SEQUENCE1 created. → After creating sequence you can use it in any query.

```
CREATE TABLE STUDENTS
(
   student_id NUMBER(4),
   student_name VARCHAR2(50)
);
```

→

```
INSERT INTO students VALUES(sequence1.NEXTVAL, '&student_name');
```

Example 3:

```
CREATE SEQUENCE sequence1
START WITH 101
INCREMENT BY 2;
```

→ Sequence SEQUENCE1 created. → After creating sequence you can use it in any query.

```
CREATE TABLE STUDENTS
(
   student_id NUMBER(4),
   student_name VARCHAR2(50)
);
```

→ `INSERT INTO students VALUES(sequence1.NEXTVAL, '&student_name');`

Example 4:

```
CREATE SEQUENCE sequence1
START WITH 101
INCREMENT BY 2
MAXVALUE 105;
```

→ Sequence SEQUENCE1 created. → After creating sequence you can use it in any query.

```
CREATE TABLE STUDENTS
(
   student_id NUMBER(4),
   student_name VARCHAR2(50)
);
```

→ `INSERT INTO students VALUES(sequence1.NEXTVAL, '&student_name');`

Example 5:

```
CREATE SEQUENCE sequence2
START WITH 101
INCREMENT BY 2
MAXVALUE 105
MINVALUE 99
CYCLE
CACHE 3;
```



```
CREATE TABLE bank_customers
(
   customer_order_number NUMBER(3),
   customer_name VARCHAR2(50)
);
```

```
INSERT INTO bank_customers VALUES(sequence2.NEXTVAL, '&customer_name');
```


	CUSTOMER_ORDER_NUMBER	CUSTOMER_NAME
1	101	ALi Can
2	102	Veli Han
3	103	Ayse Tan
4	100	Mary Star
5	101	Angie Ocean

Note: **Cache** is a memory which holds **20 numbers as default**.
If the **Cycle is less than 20** you have to declare.
Note: Using **Cache improves the performance**

How to Alter Sequences

1)
```
CREATE TABLE bank_customers
(
   customer_order_number NUMBER(3),
   customer_name VARCHAR2(50)
);
```

2)
```
CREATE SEQUENCE seq1
START WITH 101
INCREMENT BY 2
MAXVALUE 105;
```

3) Following code updates the Max Value from 107 to 103

```
ALTER SEQUENCE seq1
MAXVALUE 103;
```

4) Following code updates the increment value from 2 to 1

```
ALTER SEQUENCE seq1
INCREMENT BY 1;
```

5) Following code opens a CYCLE

```
ALTER SEQUENCE seq1
CYCLE
CACHE 3;
```

Note: START WITH cannot be altered.
If you want to change START WITH value, you should drop then recreate the sequence with a new

Triggers(PL/SQL Block) in Oracle SQL

Basically, there are 2 types of Triggers

1) DML Triggers: They are used before or after INSERT INTO, UPDATE or DELETE (Table Level)
2) DDL Triggers: They are used before or after DROP, TRUNCATE (Database Level)

Note: Procedures are executed manually but Triggers are executed automatically by Oracle Server implicitly

Difference Between Before and After Triggers

1) Before Triggers are executed before DML Commands
   Trigger is Executed
   DML Command is executed

2) After Triggers are executed after DML Commands
   DML Command is executed
   Trigger is Executed

Levels of DML Triggers

1) Statement Level Triggers: They are executed just once for the statement.
For example; when you create a trigger for “update” statement even it updates 5 records, the trigger is executed just once.
Note: Triggers are statement level as default

2) Record Level Triggers: They are executed once for every record.
For example; when you create a record level trigger for “update” statement and if the “update” statement updates 5 records, the trigger is executed five times.

Examples

```
CREATE TABLE workers
(
    id CHAR(5),
    name VARCHAR2(50),
    salary NUMBER(5)
);
```

```
INSERT INTO workers VALUES(10001, 'Ali Can', 12000);
INSERT INTO workers VALUES(10002, 'Veli Han', 2000);
INSERT INTO workers VALUES(10003, 'Mary Star', 7000);
INSERT INTO workers VALUES(10004, 'Angie Ocean', 8500);
```

Example 1 (DML Trigger):

Create Statement Level Trigger

```
CREATE OR REPLACE TRIGGER workers_trigger BEFORE UPDATE ON workers
BEGIN
   DBMS_OUTPUT.PUT_LINE('Record updated message from trigger!');
END;
/
```

Create Update Query

```
UPDATE workers
SET salary = salary + 100
WHERE salary < 10000;
```

Note: After running update command you will get “Record updated message from trigger!” Message on DBMS Output console just once even 2 records are updated because Triggers are statement level as default

Example 2 (DML Trigger):

Create Record Level Trigger

```
CREATE OR REPLACE TRIGGER workers_trigger BEFORE UPDATE ON workers FOR EACH ROW
BEGIN
   DBMS_OUTPUT.PUT_LINE('Record updated message from trigger!');
END;
/
```

Create Update Query

```
UPDATE workers
SET salary = salary + 100
WHERE salary < 10000;
```

Note: After running update command you will get “Record updated message from trigger!” message on DBMS Output console twice because I added “FOR EACH ROW” in the first row of trigger creation

Example 3 (DML Trigger):

1)
```
CREATE TABLE workers
(
   id CHAR(5),
   name VARCHAR2(50),
   salary NUMBER(5)
);
```

```
INSERT INTO workers VALUES(10001, 'Ali Can', 12000);
INSERT INTO workers VALUES(10002, 'Veli Han', 2000);
INSERT INTO workers VALUES(10003, 'Mary Star', 7000);
INSERT INTO workers VALUES(10004, 'Angie Ocean', 8500);
```

2)
```
CREATE OR REPLACE TRIGGER display_salary_changes
BEFORE INSERT OR UPDATE ON workers FOR EACH ROW

DECLARE
  salary_diff number;
BEGIN
  salary_diff := :NEW.salary  - :OLD.salary;
  dbms_output.put_line('Old salary: ' || :OLD.salary);
  dbms_output.put_line('New salary: ' || :NEW.salary);
  dbms_output.put_line('Salary difference: ' || salary_diff);
END;
```

3) `INSERT INTO workers VALUES (10005, 'Kemal Man', 8000);` →

```
Old salary:
New salary: 8000
Salary difference:
```

4)
```
UPDATE workers
SET salary = salary + 500
WHERE id = 10002;
```
→
```
Old salary: 9200
New salary: 9700
Salary difference: 500
```

Example 4 (DDL Trigger):

Create Trigger: BE CAREFUL ==> In the first line at the end you have to type “database name” and “.schema”

```
CREATE OR REPLACE TRIGGER workers_drop_trigger BEFORE DROP ON hr.schema
BEGIN
   DBMS_OUTPUT.PUT_LINE(‘Table dropped message from trigger!');
END;
/
```

Create Drop Query

```
DROP TABLE workers;
```

Note: After running drop command you will get “Table dropped message from trigger!” message on DBMS Output console

How to DISABLE and ENABLE Triggers

How to alter a specific TRIGGER

```
ALTER TRIGGER workers_trigger DISABLE;
ALTER TRIGGER workers_trigger ENABLE;
```

How to alter ALL TRIGGERS on a TABLE

```
ALTER TABLE workers DISABLE ALL TRIGGERS;
ALTER TABLE workers ENABLE ALL TRIGGERS;
```

Example 5 (DML Trigger) Real Time:

When you update salary of a worker, trigger will store old data in workers_history table

1)
```
CREATE TABLE workers
(
   id CHAR(5),
   name VARCHAR2(50),
   salary NUMBER(5)
);
```

```
INSERT INTO workers VALUES(10001, 'Ali Can', 12000);
INSERT INTO workers VALUES(10002, 'Veli Han', 2000);
INSERT INTO workers VALUES(10003, 'Mary Star', 7000);
INSERT INTO workers VALUES(10004, 'Angie Ocean', 8500);
```

2)
```
CREATE TABLE workers_history
(
   id CHAR(5),
   name VARCHAR2(50),
   salary NUMBER(5),
   m_date DATE
);
```

3)
```
CREATE or REPLACE TRIGGER w_h_trigger
BEFORE UPDATE OF salary ON workers
FOR EACH ROW
BEGIN
  INSERT INTO workers_history VALUES  ( :old.id,  :old.name,  :old.salary, sysdate);
END;
```

4)
```
UPDATE workers
SET salary = salary + 500
WHERE id = 10002;
```

5)
```
SELECT * FROM workers_history;
```

Example 6 (DML Trigger) Real Time:

When you update the salary of a worker, insert the following data into salary_changes table
Name, Old Salary, New Salary, Raise Amount, date

```
CREATE TABLE workers
(
    id CHAR(5),
    name VARCHAR2(50),
    salary NUMBER(5)
);
```

```
INSERT INTO workers VALUES(10001, 'Ali Can', 12000);
INSERT INTO workers VALUES(10002, 'Veli Han', 2000);
INSERT INTO workers VALUES(10003, 'Mary Star', 7000);
INSERT INTO workers VALUES(10004, 'Angie Ocean', 8500);
```

```
CREATE TABLE salary_changes
(
    name VARCHAR2(50),
    old_salary NUMBER(5),
    new_salary NUMBER(5),
    raise_amount NUMBER(5),
    update_date DATE
);
```

```
SELECT * FROM salary_changes;
```

```
CREATE OR REPLACE TRIGGER w_c_trigger BEFORE UPDATE OF salary ON workers FOR EACH ROW
BEGIN
    INSERT INTO salary_changes VALUES(:old.name, :old.salary, :new.salary, :new.salary - :old.salary, SYSDATE);
END;
```

```
SELECT * FROM salary_changes;
```

Example 7 (DML Trigger) Real Time:

Note: In that example, we will make payment to a worker and the Trigger will save, payment amount, payment date, worker id etc. into Payment table automatically

Create Payment Table

```
CREATE TABLE payments
(
   payment_id CHAR(5),
   id CHAR(5),
   payment_date DATE,
   payment_amount NUMBER(5),
   salary NUMBER(5)
);
```

Create s Sequence

```
CREATE SEQUENCE payment_seq;
```

Create Trigger

```
CREATE OR REPLACE TRIGGER payment_trigger BEFORE UPDATE ON workers FOR EACH ROW
BEGIN
   INSERT INTO payments VALUES(payment_seq.NEXTVAL,  :new.id,  SYSDATE,  ABS(:old.salary - :new.salary),  :new.salary);
   DBMS_OUTPUT.PUT_LINE('Payment is done message from trigger!');
END;
/
```

Look at the payments table there is nothing in it

```
SELECT * FROM payments;
```

→

Create Update Query

```
UPDATE workers
SET salary = salary - 100
WHERE id = 10003;
```

→

Look at the payments table there is nothing in it

```
SELECT * FROM payments;
```

Example 8 (DML Trigger) Real Time:

Create a trigger like
When you UPDATE any record or INSERT any record it will be triggered
It will store updated or inserted records into "changes" table

```
CREATE TABLE changes
(
   order_number NUMBER(3),
   id CHAR(5),
   name VARCHAR2(50),
   salary NUMBER(5),
   change_date DATE
);

CREATE SEQUENCE seq_changes;

CREATE OR REPLACE TRIGGER w_ui_trigger BEFORE INSERT OR UPDATE ON workers FOR EACH ROW
BEGIN
    IF :old.id IS NULL THEN
        INSERT INTO changes VALUES(seq_changes.NEXTVAL, :new.id, :new.name, :new.salary, sysdate);
    ELSE
        INSERT INTO changes VALUES(seq_changes.NEXTVAL, :old.id, :old.name, :old.salary, sysdate);
    END IF;
END;

SELECT * FROM changes;

SELECT * FROM workers;

INSERT INTO workers VALUES(10005, 'XXX YYY', 6600);

UPDATE workers
SET name = ‘Angie Star'
WHERE id < 10003;
```

Example 9 (DML Trigger) Real Time:

Create a record level trigger like
When you DELETE or INSERT any record it will be triggered
It will store deleted or inserted records with the statement name into "changes" table
Use sequence and date in records table

```
CREATE TABLE workers
(
   id CHAR(5),
   name VARCHAR2(50),
   salary NUMBER(5)
);
```

```
INSERT INTO workers VALUES(10001, 'Ali Can', 12000);
INSERT INTO workers VALUES(10002, 'Veli Han', 2000);
INSERT INTO workers VALUES(10003, 'Mary Star', 7000);
INSERT INTO workers VALUES(10004, 'Angie Ocean', 8500);
```

```
CREATE TABLE changes
(
   order_number NUMBER(3),
   type CHAR(20),
   id CHAR(5),
   name VARCHAR2(50),
   salary NUMBER(5),
   change_date DATE
);
```

```
CREATE SEQUENCE seq_changes;

CREATE OR REPLACE TRIGGER w_di_trigger BEFORE DELETE OR INSERT ON workers FOR EACH ROW
BEGIN
   IF :old.id IS NULL THEN
        INSERT INTO changes VALUES(seq_changes.NEXTVAL, 'Inserted', :new.id, :new.name, :new.salary, sysdate);
   ELSE
         INSERT INTO changes VALUES(seq_changes.NEXTVAL, 'Deleted', :old.id, :old.name, :old.salary, sysdate);
   END IF;
END;

SELECT * FROM changes;

DELETE FROM workers
WHERE id = 10001;

INSERT INTO workers VALUES(10005, 'Ali Can', 8800);
```

Cursors

Context Area: Oracle creates a memory area, known as the context area, for processing an SQL statement, which contains all the information needed for processing the statement

Cursor: A cursor is a pointer to this context area.
PL/SQL controls the context area through a cursor.
A cursor holds the rows (one or more) returned by an SQL statement.
The set of rows the cursor holds is called as the active set.

What are the advantages of Cursors?

1) Cursors can provide the first few rows before the whole result set is assembled.
Without using cursors, the entire result set must be delivered before any rows are displayed by the application.
So using cursor, better response time is achieved.

2) Cursors can be faster than a loop

What are the disadvantages of Cursors?

1) Cursor in SQL is temporary work area created in the system memory,
thus it occupies memory from your system that may be available for other processes.
So occupies more resources and temporary storage.

There are two types of cursors 1)Implicit cursors 2)Explicit cursors

Implicit cursors:
Implicit cursors are automatically created by Oracle whenever an SQL statement is executed, when there is no explicit cursor for the statement.
Programmers cannot control the implicit cursors and the information in it.
Whenever a DML statement (INSERT, UPDATE and DELETE) is issued, an implicit cursor is associated with this statement.
For INSERT operations, the cursor holds the data that needs to be inserted.
For UPDATE and DELETE operations, the cursor identifies the rows that would be affected.

Note: Implicit cursors have attributes such as %FOUND, %NOTFOUND, and %ROWCOUNT

%FOUND
It returns TRUE if an INSERT, UPDATE, or DELETE statement affected one or more rows or a SELECT INTO statement returned one or more rows.
Otherwise, it returns FALSE.

%NOTFOUND
The logical opposite of %FOUND.
It returns TRUE if an INSERT, UPDATE, or DELETE statement affected no rows, or a SELECT INTO statement returned no rows.
Otherwise, it returns FALSE.

%ROWCOUNT
Returns the number of rows affected by an INSERT, UPDATE, or DELETE statement, or returned by a SELECT INTO statement.

Example 1 (%FOUND):

```
CREATE TABLE workers
(
   id CHAR(5),
   name VARCHAR2(50),
   salary NUMBER(5)
);
```

```
INSERT INTO workers VALUES(10001, 'Ali Can', 12000);
INSERT INTO workers VALUES(10002, 'Veli Han', 2000);
INSERT INTO workers VALUES(10003, 'Mary Star', 7000);
INSERT INTO workers VALUES(10004, 'Angie Ocean', 8500);
```

```
DECLARE
  empId workers.id%type;
BEGIN
  empId := '&id';
DELETE FROM workers WHERE id = empId;
COMMIT;
END;
```


old:

```
DECLARE
empId workers.id%type;
BEGIN
empId := &id;
DELETE FROM workers WHERE id = empId;
COMMIT;
END;
```

new:

```
DECLARE
empId workers.id%type;
BEGIN
empId := 10001;
DELETE FROM workers WHERE id = empId;
COMMIT;
END;
```

```
PL/SQL procedure successfully completed.
```


When we run the code on the left the console will be like the right part. As you see there is no any information about the data is deleted or not. It says just the procedure successfully completed but user should get a message about the result.
To do that we will use "implicit cursor"

If we type the code like on the right, we can get message together with the above console like "Record is deleted" if the record is found and we get "Record could not be found" message if the record could not be found.


```
DECLARE
  empId workers.id%type;
BEGIN
  empId := &id;
DELETE FROM workers WHERE id = empId;
  IF SQL%FOUND THEN
    DBMS_OUTPUT.PUT_LINE('Record is deleted');
  ELSE
    DBMS_OUTPUT.PUT_LINE('Record could not be found');
  END IF;
COMMIT;
END;
```

Example 2 (%ROWCOUNT):

```
CREATE TABLE workers
(
   id CHAR(5),
   name VARCHAR2(50),
   salary NUMBER(5)
);
```

```
INSERT INTO workers VALUES(10001, 'Ali Can', 12000);
INSERT INTO workers VALUES(10002, 'Veli Han', 2000);
INSERT INTO workers VALUES(10003, 'Mary Star', 7000);
INSERT INTO workers VALUES(10004, 'Angie Ocean', 8500);
```

The program will update the table and increase the salary of each customer by 500 and use the SQL%ROWCOUNT attribute to determine the number of rows affected

```
DECLARE
   totalRows number(2);
BEGIN
   UPDATE workers
   SET salary = salary + 500;
   IF SQL%NOTFOUND THEN
      dbms_output.put_line('No workers selected');
   ELSIF SQL%FOUND THEN
      totalRows := SQL%ROWCOUNT;
      dbms_output.put_line(totalRows || ' workers selected');
   END IF;
END;
```

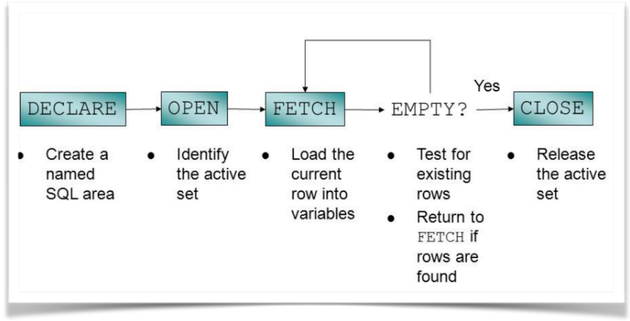
→ 4 workers selected

Explicit cursors:

Explicit cursors are programmer-defined cursors for gaining more control over the context area.
An explicit cursor should be defined in the declaration section of the PL/SQL Block.
It is created on a SELECT Statement which returns more than one row.

Steps to create Explicit Cursor:

1) Declare Cursor
2) Open Cursor
3) Fetch Cursor
4) Close Cursor



Example 1:

Your manager asks you to prepare a report like 10% raise for the salaries greater than or equal to 9000 and 20% raise for the salaries less than 9000. You do not update the table, your manager just wants to see the report.

```
DECLARE
   employee_name    workers.name%TYPE;
   raised_salary        workers.salary%TYPE;
   CURSOR cursor1 IS SELECT name, salary FROM workers;
BEGIN
   OPEN cursor1;
LOOP
   FETCH cursor1 INTO employee_name, raised_salary;
      IF raised_salary >= 9000 THEN
      raised_salary := raised_salary*1.1;
      ELSE
      raised_salary := raised_salary*1.2;
      END IF;
EXIT WHEN cursor1%NOTFOUND;
   DBMS_OUTPUT.PUT_LINE(employee_name||' '||raised_salary);
END LOOP;
  CLOSE cursor1;
END;
```

Example 2: (2nd way to solve Example 1 by using For-Loop)

Your manager asks you to prepare a report like 10% raise for the salaries greater than or equal to 9000 and 20% raise for the salaries less than 9000. You do not update the table, your manager just wants to see the report.

```
DECLARE
   CURSOR cursor2 IS SELECT name, salary FROM workers;
BEGIN
  FOR r IN cursor2 LOOP
        IF r.salary>=9000 THEN
          r.salary := r.salary*1.1;
        ELSE
          r.salary := r.salary*1.2;
        END IF;
       DBMS_OUTPUT.PUT_LINE(r.name||' '||r.salary);
  END LOOP;
END;
```

Note: If you use FOR-LOOP with Cursor, no need to Open, Fetch and Close Cursor just Declaration will be enough.

Note: If you use FOR-LOOP with Cursor, no need to declare variables, just using "r" is enough.
"r" is a variable declared by Oracle Server implicitly and it is RowType variable and stores all row.

Example 3: (3rd way to solve Example 1 by using While-Loop)

Your manager asks you to prepare a report like 10% raise for the salaries greater than 9000 and 20% raise for the salaries less than 9000. You do not update the table, your manager just wants to see the report.

```
DECLARE
     CURSOR cursor3 IS SELECT name, salary FROM workers;
     workers_data cursor3%ROWTYPE;
BEGIN
    OPEN cursor3;
    FETCH cursor3 INTO workers_data;
WHILE  cursor3%FOUND LOOP
       IF workers_data.salary>9000 THEN
       workers_data.salary := workers_data.salary*1.1;
       ELSE
       workers_data.salary := workers_data.salary*1.2;
       END IF;
       DBMS_OUTPUT.PUT_LINE(workers_data.name||' - '||workers_data.salary);
    FETCH cursor3 INTO workers_data;
END LOOP;
    CLOSE cursor3;
END;
```

Packages

```
CREATE TABLE workers
(
   id CHAR(5),
   name VARCHAR2(50),
   salary NUMBER(5)
);
```

```
INSERT INTO workers VALUES(10001, 'Ali Can', 12000);
INSERT INTO workers VALUES(10002, 'Veli Han', 2000);
INSERT INTO workers VALUES(10003, 'Mary Star', 7000);
INSERT INTO workers VALUES(10004, 'Angie Ocean', 8500);
```

Package Creation:

```
CREATE OR REPLACE PACKAGE workers_package AS

  -- Adds a worker
  PROCEDURE addWorker(w_id workers.id%TYPE, w_name workers.name%TYPE, w_sal workers.salary%TYPE);

  -- Removes a worker
  PROCEDURE delWorker(w_id workers.id%TYPE);

  --Lists all customers
  PROCEDURE listWorkers;

END workers_package;
```

Package Body Creation:

```
CREATE OR REPLACE PACKAGE BODY workers_package AS

  PROCEDURE addWorker(w_id workers.id%TYPE, w_name workers.name%TYPE, w_sal workers.salary%TYPE) IS
    BEGIN
      INSERT INTO workers(id, name, salary) VALUES(w_id, w_name, w_sal);
    END addWorker;

  PROCEDURE delWorker(w_id workers.id%TYPE) IS
    BEGIN
      DELETE FROM workers
      WHERE id = w_id;
    END delWorker;

  PROCEDURE listWorkers IS
    CURSOR w_cursor IS SELECT name FROM workers;
    BEGIN
        FOR r IN w_cursor LOOP
            dbms_output.put_line(r.name);
        EXIT WHEN  w_cursor%NOTFOUND;
        END LOOP;
       dbms_output.put_line('All workers names are listed');
    END listWorkers;

END workers_package;
```

Usage of things in the package:

Example 1:

1) Lists the names of workers before adding workers
2) Adds Canan Can and Ayse Yaman to the workers table
3) Lists the names of workers after adding workers

```
BEGIN
  workers_package.listWorkers;

  workers_package.addWorker(1005, 'Canan Can', 22000);
  workers_package.addWorker(1006, 'Ayse Yaman',33000);

  workers_package.listWorkers;
END;
```

Example 2:

1) Lists the names of workers before deleting worker
2) Deletes the worker by using given id
3) Lists the names of workers after deleting worker

```
DECLARE
  w_id workers.id%type:= '&worker_id';
BEGIN
   workers_package.listWorkers;

   workers_package.delWorker(w_id);

   workers_package.listWorkers;
END;
```

SQL Technical Interview Questions

```
CREATE TABLE students
(
  id number(9),
  name varchar2(50),
  state varchar2(50),
  salary number(20),
  company varchar2(20)
);
```

```
INSERT INTO students VALUES(123456789, 'Johnny Walk', 'New Hampshire', 2500, 'IBM');
INSERT INTO students VALUES(234567891, 'Brian Pitt', 'Florida', 1500, 'LINUX');
INSERT INTO students VALUES(245678901, 'Eddie Murphy', 'Texas', 3000, 'WELLS FARGO');
INSERT INTO students VALUES(456789012, 'Teddy Murphy', 'Virginia', 1000, 'GOOGLE');
INSERT INTO students VALUES(567890124, 'Eddie Murphy', 'Massachuset', 7000, 'MICROSOFT');
INSERT INTO students VALUES(456789012, 'Brad Pitt', 'Texas', 1500, 'TD BANK');
INSERT INTO students VALUES(123456719, 'Adem Stone', 'New Jersey', 2500, 'IBM');
```

ID	NAME	STATE	SALARY	COMPANY
123456789	Johnny Walk	New Hampshire	2500	IBM
234567891	Brian Pitt	Florida	1500	LINUX
245678901	Eddie Murphy	Texas	3000	WELLS FARGO
456789012	Teddy Murphy	Virginia	1000	GOOGLE
567890124	Eddie Murphy	Massachuset	7000	MICROSOFT
456789012	Brad Pitt	Texas	1500	TD BANK
123456719	Adem Stone	New Jersey	2500	IBM

```
CREATE TABLE employees
(
  id number(9),
  name varchar2(50),
  state varchar2(50),
  salary number(20),
  company varchar2(20)
);
```

```
INSERT INTO employees VALUES(123456789, 'John Walker', 'Florida', 2500, 'IBM');
INSERT INTO employees VALUES(234567890, 'Brad Pitt', 'Florida', 1500, 'APPLE');
INSERT INTO employees VALUES(345678901, 'Eddie Murphy', 'Texas', 3000, 'IBM');
INSERT INTO employees VALUES(456789012, 'Eddie Murphy', 'Virginia', 1000, 'GOOGLE');
INSERT INTO employees VALUES(567890123, 'Eddie Murphy', 'Texas', 7000, 'MICROSOFT');
INSERT INTO employees VALUES(456789012, 'Brad Pitt', 'Texas', 1500, 'GOOGLE');
INSERT INTO employees VALUES(123456710, 'Mark Stone', 'Pennsylvania', 2500, 'IBM');
```

ID	NAME	STATE	SALARY	COMPANY
123456789	John Walker	Florida	2500	IBM
234567890	Brad Pitt	Florida	1500	APPLE
345678901	Eddie Murphy	Texas	3000	IBM
456789012	Eddie Murphy	Virginia	1000	GOOGLE
567890123	Eddie Murphy	Texas	7000	MICROSOFT
456789012	Brad Pitt	Texas	1500	GOOGLE
123456710	Mark Stone	Pennsylvania	2500	IBM

1) How to fetch common records from two tables?

```
SELECT id, name
FROM students
INTERSECT
SELECT id, name
FROM employees;
```

ID	NAME
456789012	Brad Pitt

```
SELECT name
FROM students
INTERSECT
SELECT name
FROM employees;
```

NAME
Brad Pitt
Eddie Murphy

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2) How to fetch unique records from a table?

```
SELECT DISTINCT state
FROM employees;
```


STATE
Florida
Pennsylvania
Virginia
Texas

Note: DISTINCT Clause is used to remove duplicates from the result set.

3) What is the command used to fetch even id's?

```
SELECT *
FROM students
WHERE MOD(id,2)=0;
```

ID	NAME	STATE	SALARY	COMPANY
456789012	Teddy Murphy	Virginia	1000	GOOGLE
567890124	Eddie Murphy	Massachuset	7000	MICROSOFT
456789012	Brad Pitt	Texas	1500	TD BANK

Note: To fetch odd id's use the following script

```
SELECT *
FROM students
WHERE MOD(id,2)=1;
```

4) What is the command to count records in a table?

```
SELECT COUNT(*) AS number_of_records
FROM students;
```

NUMBER_OF_RECORDS
7

5) What is the SQL Query to get the highest salary of a worker from a table?

```
SELECT MAX(salary) AS maximum_salary
FROM workers;
```

```
SELECT salary
FROM employees
ORDER BY salary DESC
FETCH NEXT 1 ROW ONLY;
```

MAXIMUM_SALARY
7000

6) What is the SQL Query to get all records about the worker who has the highest salary from a table?

```
SELECT *
FROM workers
WHERE salary = (SELECT MAX(salary)
                FROM workers);
```

```
SELECT *
FROM employees
ORDER BY salary DESC
FETCH NEXT 1 ROW ONLY;
```

ID	NAME	STATE	SALARY	COMPANY_NAME	COUNTRY_NAME	GENDER
567890123	Eddie Murphy	Texas	7000	MICROSOFT	USA	-

7) What is the SQL Query to get the second highest salary of a worker from a table?

```
SELECT MAX(salary) AS second_maximum_salary
FROM employees
WHERE salary < (SELECT MAX(salary)
                FROM employees);
```

```
SELECT salary
FROM employees
ORDER BY salary DESC
OFFSET 1 ROW
FETCH NEXT 1 ROW ONLY;
```

SECOND_MAXIMUM_SALARY
3000

8) What is the SQL Query to get all records about the worker who has the second highest salary from a table?

ID	NAME	STATE	SALARY	COMPANY
123456789	John Walker	Florida	2500	IBM
234567890	Brad Pitt	Florida	1500	APPLE
345678901	Eddie Murphy	Texas	3000	IBM
456789012	Eddie Murphy	Virginia	1000	GOOGLE
567890123	Eddie Murphy	Texas	7000	MICROSOFT
456789012	Brad Pitt	Texas	1500	GOOGLE
123456710	Mark Stone	Pennsylvania	2500	IBM

```
SELECT *
FROM (SELECT *
      FROM employees
      WHERE salary < (SELECT MAX(salary)
                      FROM employees)
      ORDER BY salary DESC)
FETCH NEXT 1 ROW ONLY;
```

```
SELECT *
FROM employees
ORDER BY salary DESC
OFFSET 1 ROW
FETCH NEXT 1 ROW ONLY;
```

ID	NAME	STATE	SALARY	COMPANY_NAME	COUNTRY_NAME	GENDER
345678901	Eddie Murphy	Texas	3000	IBM	USA	–

9) What is the SQL Query to get all records from a column in uppercase from a table?

NAME	STATE
John Walker	Florida
Brad Pitt	Florida
Eddie Murphy	Texas
Eddie Murphy	Virginia
Eddie Murphy	Texas
Brad Pitt	Texas
Mark Stone	Pennsylvania

```
SELECT name, UPPER(state)
FROM workers;
```

NAME	UPPER(STATE)
John Walker	FLORIDA
Brad Pitt	FLORIDA
Eddie Murphy	TEXAS
Eddie Murphy	VIRGINIA
Eddie Murphy	TEXAS
Brad Pitt	TEXAS
Mark Stone	PENNSYLVANIA

10) What is the SQL Query to get all records from a column in lowercase from a table?

NAME	STATE
John Walker	Florida
Brad Pitt	Florida
Eddie Murphy	Texas
Eddie Murphy	Virginia
Eddie Murphy	Texas
Brad Pitt	Texas
Mark Stone	Pennsylvania

```
SELECT name, LOWER(state)
FROM workers;
```

NAME	LOWER(STATE)
John Walker	florida
Brad Pitt	florida
Eddie Murphy	texas
Eddie Murphy	virginia
Eddie Murphy	texas
Brad Pitt	texas
Mark Stone	pennsylvania

11) What is the SQL Query to get all records from a column in initials uppercase rests lowercase from a table?

NAME	COMPANY_NAME
John Walker	IBM
Brad Pitt	APPLE
Eddie Murphy	IBM
Eddie Murphy	GOOGLE
Eddie Murphy	MICROSOFT
Brad Pitt	GOOGLE
Mark Stone	IBM

```
SELECT name, INITCAP(state)
FROM workers;
```

NAME	INITCAP(COMPANY_NAME)
John Walker	Ibm
Brad Pitt	Apple
Eddie Murphy	Ibm
Eddie Murphy	Google
Eddie Murphy	Microsoft
Brad Pitt	Google
Mark Stone	Ibm