DATA FOLKZ
CATAPULT DATA LEADERS

RDBMS

Relational Database Management System

MySQL®

DATABASE

- May be defined as a collection of interrelated data stored together to serve multiple application
- It is computer based record keeping system.
- It not only allows to store but also allows us modification of data as per requirements.

Database: Database is a collection of inter-related data which helps in efficient retrieval, insertion and deletion of data from database and organizes the data in the form of tables, views, schemas, reports etc. For Example, university database organizes the data about students, faculty, and admin staff etc. which helps in efficient retrieval, insertion and deletion of data from it.

DATABASE CONCEPTS

► WHY DO WE NEED DATABASE

- ❑ To manage large chunks of data: If size of data increases into thousands of records, it will simply create problem to manage.Database can manage large amount of data.

- ❑ Accuracy: Through validation rule in database ,data accuracy can

- ► be maintained.

- ❑ Ease of updating data: With the database, we can flexibly update the data according to our convenience. Moreover, multiple people can also edit data at same time.

- ❑ Security of data: With databases we have security groups and

- ► privileges to restrict access.

- ❑ Data integrity: In databases, we can be assured of accuracy and consistency of data due to the built in integrity checks and access

DBMS

- A DBMS refers to Database Management System
- It is a software that is responsible for storing, manipulating, maintaining and utilizing database.
- A database along with the a DBMS is referred to as a database system.
- There are various DBMS software available in the market like :-
- Oracle, MS SQL Server, MySQL, Sybase, PostgreSQL, SQLite, MS Access, Paradox, DB2 and etc.
- MySQL is open source and freeware DBMS.

Data Model Way of data representation

Data model is a model or presentation which shows How data is organized or stored in the database. The data is modeled by one of the following given models-

❖ Relational Data Model

In this model data is organized into Relations or Tables (i.e. Rows and Columns). A row in a table represents a relationship of data to each other and also called a Tuple or Record. A column is called Attribute or Field.

❖ Network Data Model

In this model, data is represented by collection of records and relationship among data is shown by Links.

❖ Hierarchical Data Model

In this model, Records are organized as Trees. Records at top level is called Root record and this may contains multiple directly linked children records.

❖ Object Oriented Data Model

- In this model, records are represented as a objects. The collection of similar types of object is called class.

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RELATIONAL DATABASE MODEL

- In relational database model data is organized into table (i.e. rows and columns).
- These tables are also known as relations.
- A row in a table represent relationship among a set of values.
- A column represent the field/attributes related to relation under which information will be stored.
- For example if we want to store details of students then : Roll, Name, Class, Section, etc. will be the column/attributes and the collection of all the column information will become a Row/Record

RELATIONAL DATABASE MODEL

- A Relational database use Structured Query Language (SQL), which is a standard user application that provides an easy programming interface for database interaction.

SAMPLE TABLES

EMPLOYEE

EMPNO	ENAME	GENDER	DEPTNO	SALARY	COMM
1	ANKITA	F	10	20000	1200
2	SUJEET	M	20	24000	
3	VIJAYA	F	10	28000	2000
4	NITIN	M	30	18000	3000
5	VIKRAM	M	30	22000	1700

DEPARTMENT

DEPTNO	DNAME	LOCATION
10	HR	NEW YORK
20	ACCOUNTS	BRAZIL
30	SALES	CANADA
40	IT	INDIA

COMPONENT OF A TABLE

- Byte : group of 8 bits and is used to store a
  character.
- Data Item : smallest unit of named data. It represent one type of information and often
  referred to as a field or column information
- Record : collection of data items
  which represent a complete
  unit of information
- Tabl
  e : collection of all Rows and
  Columns.

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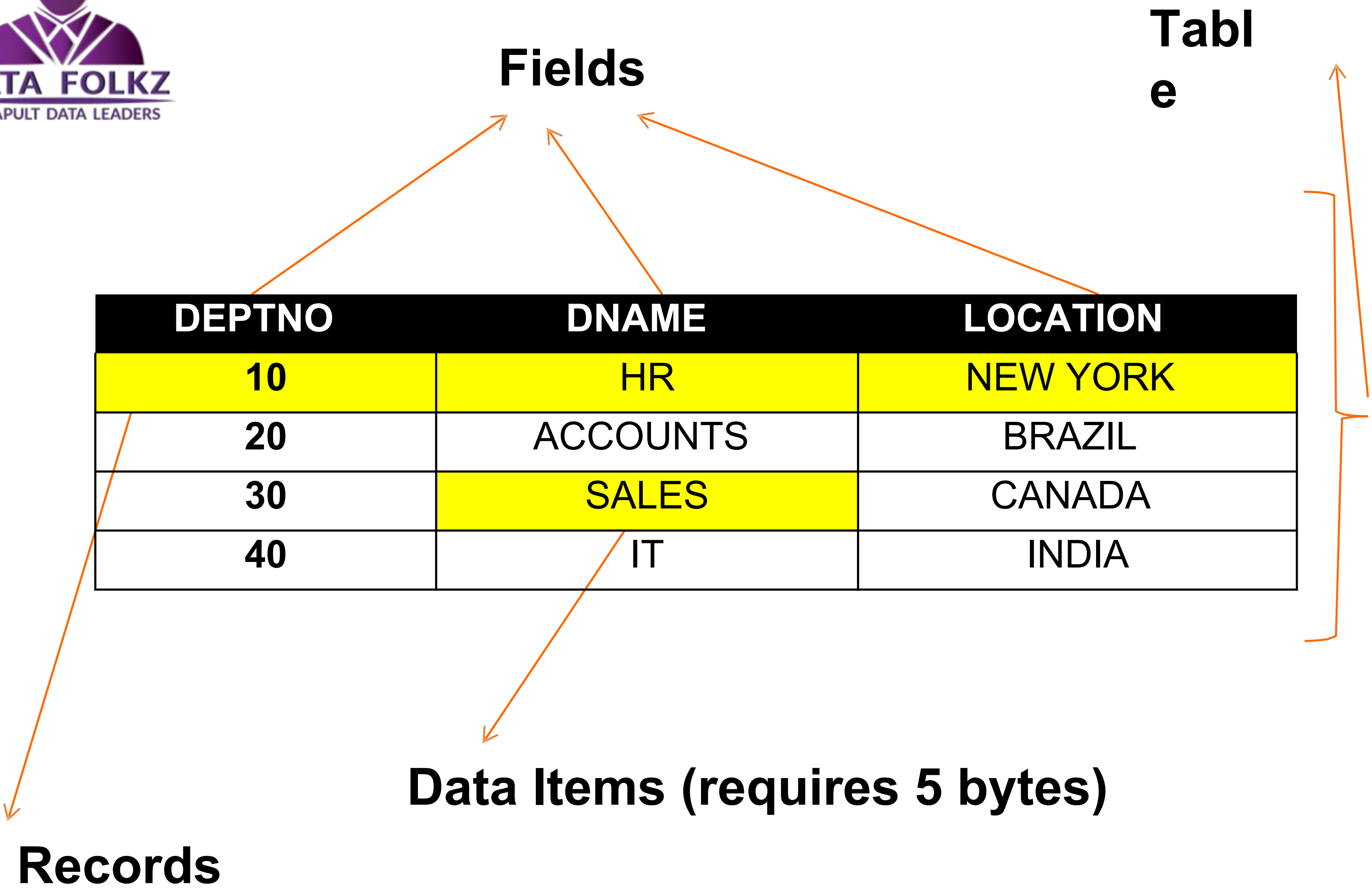


Fields

Table

DEPTNO	DNAME	LOCATION
10	HR	NEW YORK
20	ACCOUNTS	BRAZIL
30	SALES	CANADA
40	IT	INDIA

Data Items (requires 5 bytes)

Records

COMMON RDBMS

- Oracle, MS SQL Server, MySQL, IBM DB2, IBM Informix, SAP Sybase, Adaptive Server Enterprise SAP IQ, Teradata ,PostgreSQL, SQLite, etcS.ybas ,
- Out of these MySQL, PostgreSQL and SQLite are Open source implementation.

COMMON RDBMS

- MySQL
  - Runs on all platforms including Linux, Unix Virtually Windows. Popular for web based application and online publishing. It is part of LAMP (Linux, and Apache, PHP) stack a MySQL,
- SQLite
  - Relational DBMS but it not client-server database engine rather, it is isembedded end program. Arguably the most widely deployed into database engine as it is used by several browsers, OS and embedded systems(Mobiles).
- PostgreSQL
  - General purpose object-relational DBMS. It is the most advanced open source database system. It is free and open source
    i.e. source codeis available under PostgreSQL license, a liberal open source license.

COMMON DBMS TOOLS FOR MOBILE DEVICES

- SQL Anywhere, DB2 Everywhere, IBM Mobile Database, SQL Server Compact, SQL Server Express, Oracle DatabaseLite, SQLite, SQLBase etc.

- Out of these SQLite is public domain open source implementation

Various Terms used in the Relational Model

Relational Model was developed by E.F.codd of the IBM and used widely in the most of the DBMS.

Relation (Table)

A Relation or Table is Matrix like structure arranged in Rows or Columns. It has the following properties-

- All items in a column are homogeneous i.e. same data type.
- Each column assigned a unique name and must have atomic (indivisible) value.
- All rows of a relation are distinct i.e. no two identical rows (record) are present in the Relation.
- Ordering or Rows (Records) or Columns (fields) are immaterial.

Domain

It is collection of values from which the value is derived for a column.

Tuple / Entity / Record

Rows of a table is called Tuple or Record.

Attribute/ Field

Column of a table is called Attribute or Field.

Degree

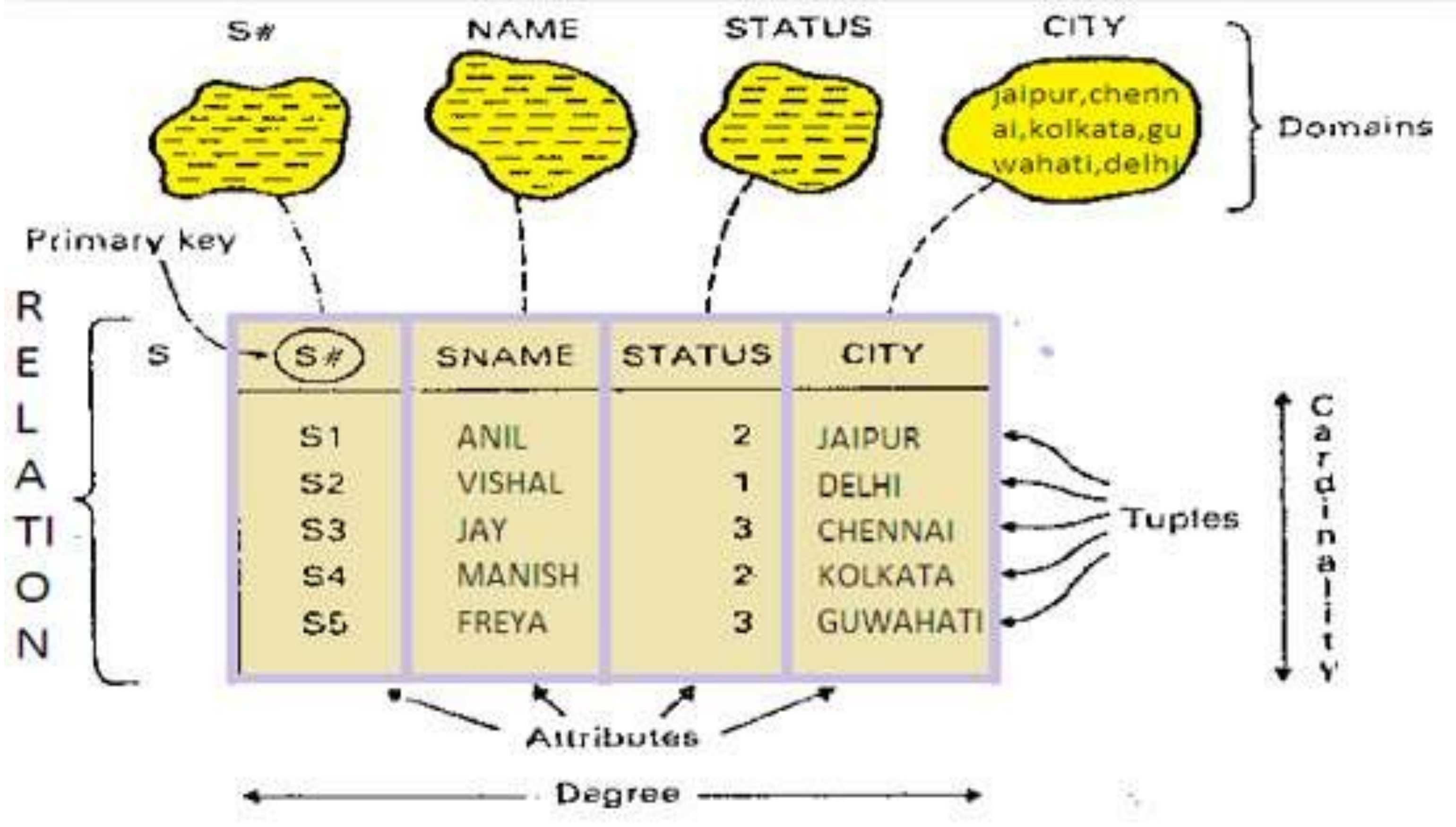
Number of columns (attributes) in a table.

Cardinality

Number of Records in a table.

DATABASE

RELATIONAL DATABASE CONCEPTS



S#	SNAME	STATUS	CITY
S1	ANIL	2	JAIPUR
S2	VISHAL	1	DELHI
S3	JAY	3	CHENNAI
S4	MANISH	2	KOLKATA
S5	FREYA	3	GUWAHATI

Data Types in SQL

- Characters:

CHAR(20) --fixedlength
VARCHAR(40) –variablelength

- Numbers:

–BIGINT, INT, SMALLINT,TINYINT
–DOUBLE,FLOAT--differ inprecision

- Times anddates:

–DATE--stores date value in Y-M-Dformat
–DATETIME--stores date and time in Y-M-D HH:MM:SSformat

Just a Minute…

BOOKCODE	BOOKNAME	PUB	PRICE
B001	LET US C	BPB	400
B002	VISUAL BASIC	EEE	350
B003	JAVA	PHI	550
B004	VC++	BPB	750

Identify the following in the above table

1) **Degree of Table**
2) **Cardinality of Table**
3) **Attributes of Table**
4) **Tuple**
5) **Data types of Book Code and Price (as studied in Python)**

CONCEPT OF KEYS

EMPNO	ENAME	GENDER	DEPTNO	SALARY	COMM
1	ANKITA	F	10	20000	1200
2	SUJEET	M	20	24000	
3	VIJAYA	F	10	28000	2000
4	NITIN	M	30	18000	3000
5	VIKRAM	M	30	22000	1700

In relation each record must be unique i.e. no two identical records are allowed in the Database. A key attribute identifies the record and must have unique values. There are various types of Keys:

Primary Key, Candidate Key, Alternate Key and Foreign Key.

KEYS

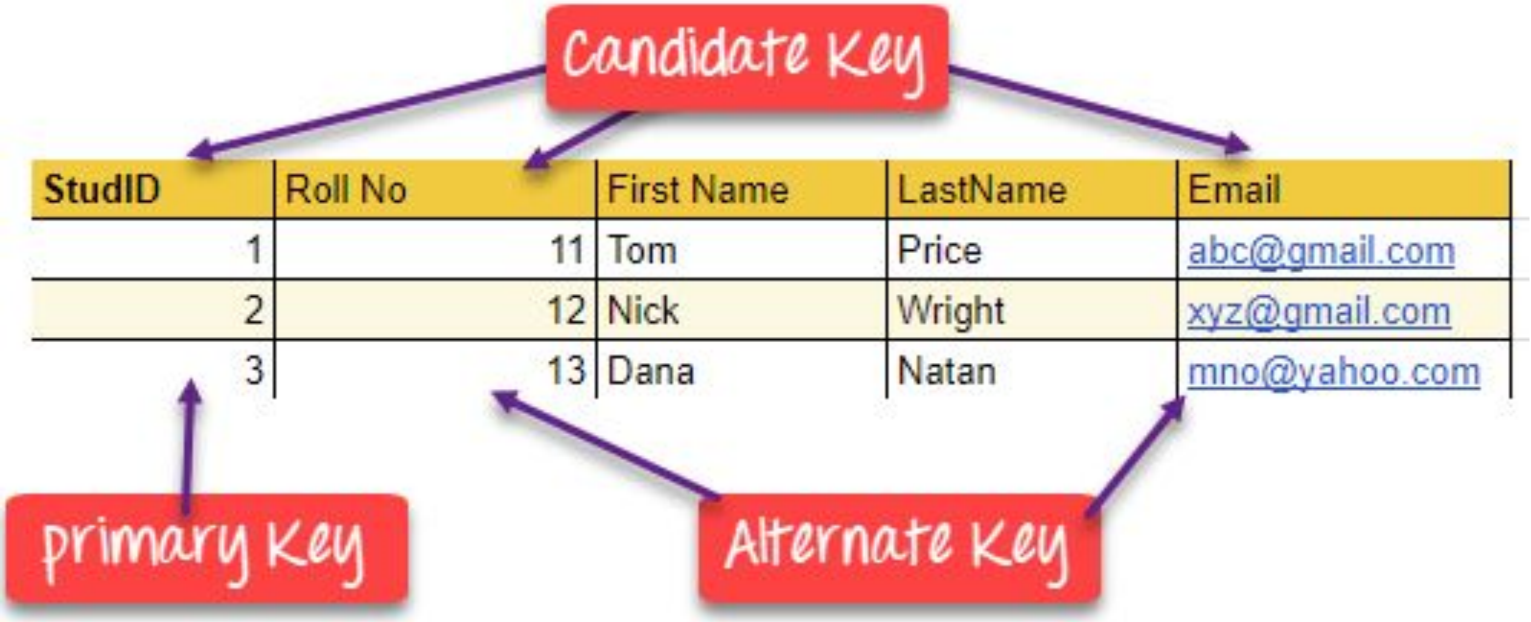
- Primary Key
  - A set of one or more attribute that can identify a record uniquely in the relation is called Primary Key.
  - There can be only 1 primary key in a table
  - Allows only distinct (no duplicate) values and also forces mandatory entry (NOT NULL) i.e. we cannot left it blank.
- Candidate Key
  - In a table there can be more than one attribute which contains unique values. These columns are known as candidate key as they are the candidate for primary key.
  - Among these database analyst select one as a primary key based on requirement like must contain unique value, compulsory entry and where maximum searching is done etc.

KEYS

- Alternate Key
  - In case of multiple candidate keys, one of them will be selected as Primary Key and rest of the column will serve as Alternate Key
  - A Candidate Key which is not a primary key is an Alternate Key.
- Foreign key
  - Used to create relationship between two tables.
  - It is a non-key attribute whose value is derived from

the Primary key of another table.

  - Foreign key column will for the value in Primary key of another table, if present then entry will be allowed otherwise data will be rejected.
  - Primary Key column table from where values will be derived is known as Primary Table or Master Table or Parent Table and Foreign key column table will be Foreign Table or Detail Table or Child table



Candidate Key
primary Key
Alternate Key

StudID	Roll No	First Name	LastName	Email
1	11	Tom	Price	abc@gmail.com
2	12	Nick	Wright	xyz@gmail.com
3	13	Dana	Natan	mno@yahoo.com

EMPLOYEE

EMPNO	ENAME	GENDER	DEPTNO	SALARY	COMM
1	ANKITA	F	10	20000	1200
2	SUJEET	M	20	24000	
3	VIJAYA	F	10	28000	2000
4	NITIN	M	30	18000	3000
5	VIKRAM	M	30	22000	1700

Child Table

DEPARTMENT

DEPTNO	DNAME	LOCATION
10	HR	NEW YORK
20	ACCOUNTS	BRAZIL
30	SALES	CANADA
40	IT	INDIA

Parent

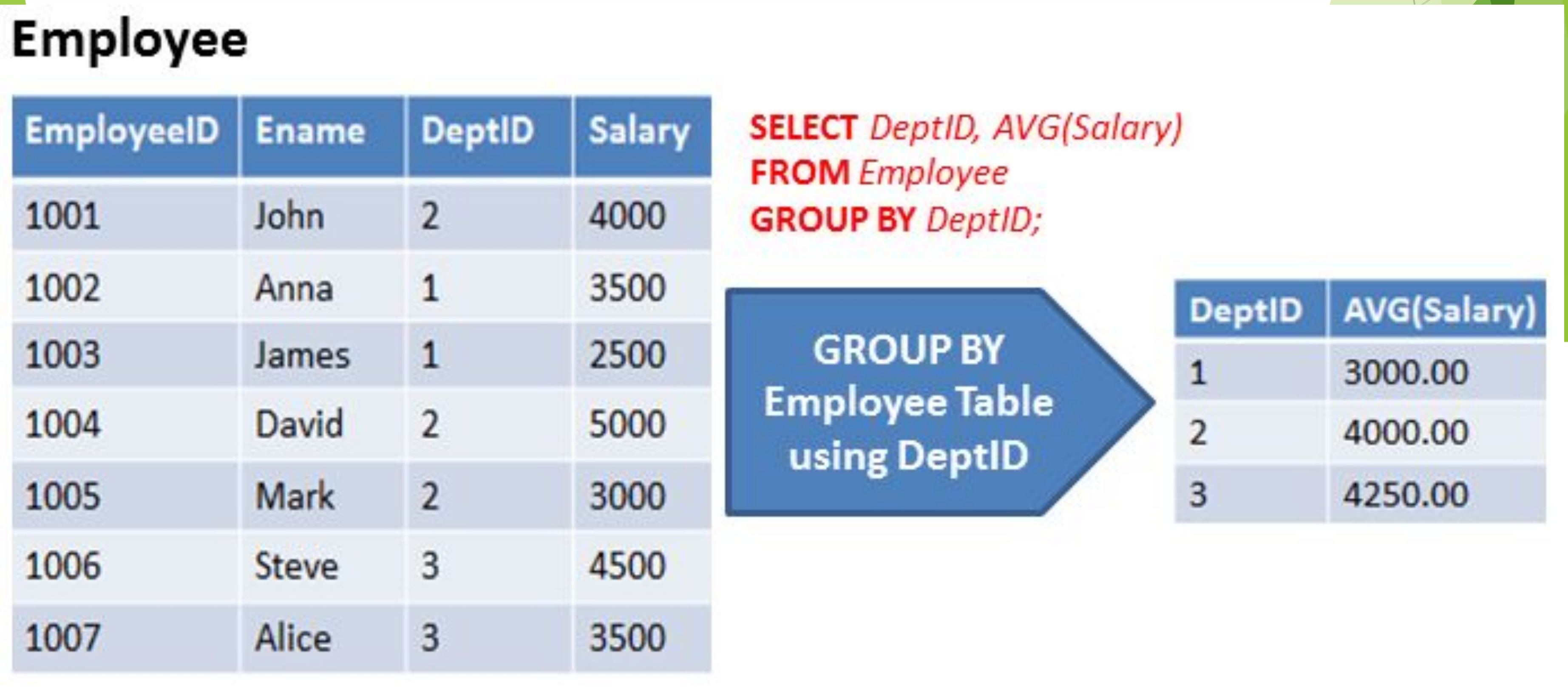
From the Above table definition we can observe that the **DEPTNO** column of EMPLOYEE table is deriving its value from **DEPTNO** of table DEPARTMENT. So we can say that the **DEPTNO** of EMPLOYEE table is a foreign key whose value is dependent upon the Primary key column **DEPTNO** of table DEPARTMENT.

An important component for Analyst to summarize the data such as sales, profit, cost, and salary. Data Summarization is very helpful for Analyst to create a visualization, conclude findings, and report writing. In SQL, GROUP BY Clause is one of the tools to summarize or aggregate the data series. For example, sum up the daily sales and combine in a single quarter and show it to the senior management. Similarly, if you want to count how many employees in each department of the company. It groups the databases on the basis of one or more column and aggregates the results.

Group by

"GROUP BY" is similar to "ORDER BY," but it will aggregate data that has similarities. For example, if you have any duplicates in your data, you can use "GROUP BY" to count the number of duplicates in your fields.

Here is your SQL query:



Employee

EmployeeID	Ename	DeptID	Salary
1001	John	2	4000
1002	Anna	1	3500
1003	James	1	2500
1004	David	2	5000
1005	Mark	2	3000
1006	Steve	3	4500
1007	Alice	3	3500

```
SELECT DeptID, AVG(Salary)
FROM Employee
GROUP BY DeptID;
```

DeptID	AVG(Salary)
1	3000.00
2	4000.00
3	4250.00

Aggregating Data

SQL is excellent at aggregating data:

- COUNT counts how many rows are in a particular column.
- SUM adds together all the values in a particular column.
- MIN and MAX return the lowest and highest values in a particular
column, respectively.
- AVG calculates the average of a group of selected values.

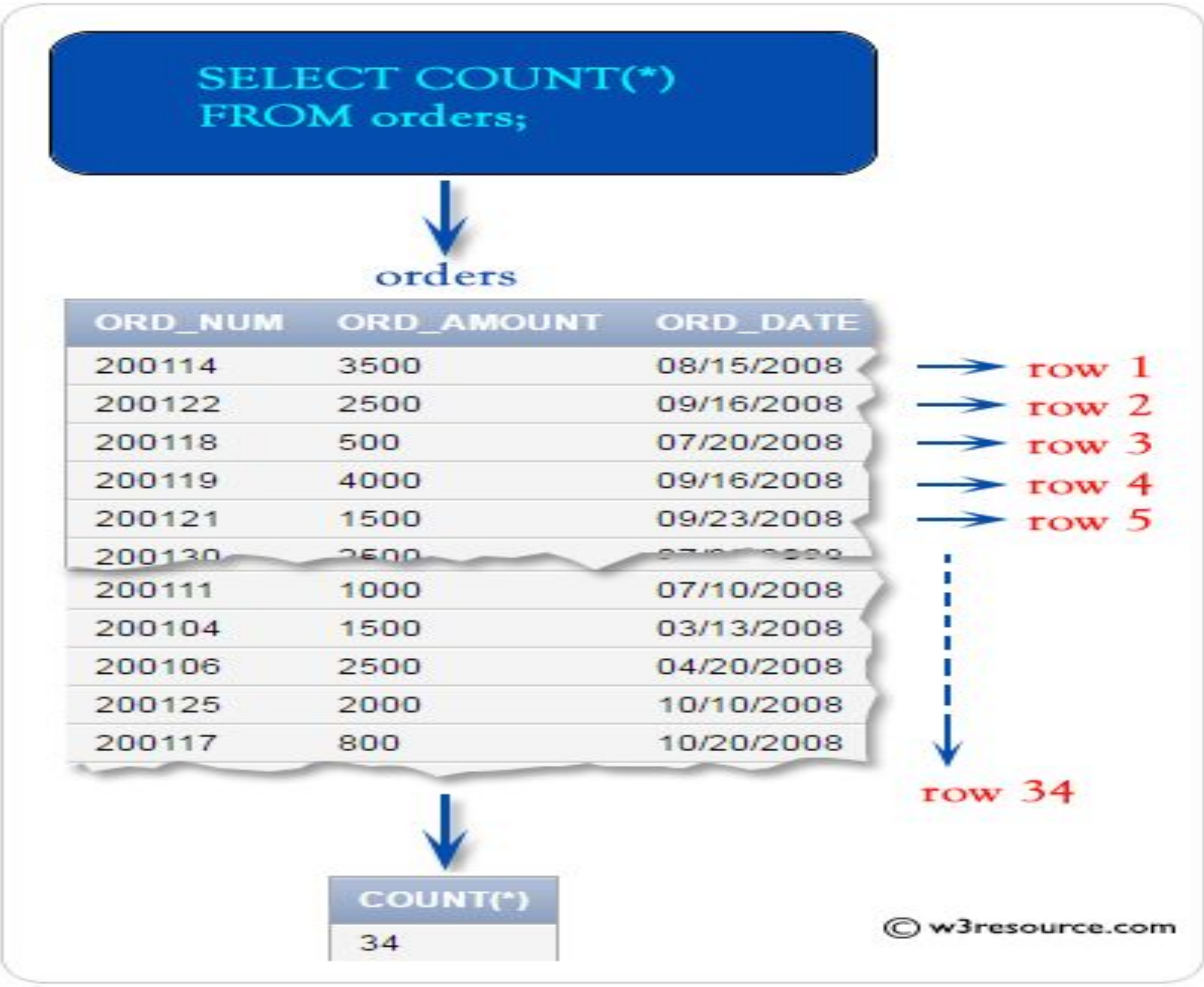
Examples:

```
SELECT min(salary) FROM Employees;

SELECT max(salary) FROM Employees;

SELECT avg(salary) FROM Employees WHERE city = “Hyderabad”;

SELECT sum(salary) FROM Employees WHERE city = “Chennai”;
```

Counting the Records in a Table

A query can be issued on a table to get a quick count of the number of records
in the table or on the number of values for a column in the table. A count is accomplished by the function COUNT.
The syntax of the COUNT function is as follows:

SELECT COUNT(*)
FROM Employees;



```
SELECT COUNT(*)
FROM orders;
```

orders

ORD_NUM	ORD_AMOUNT	ORD_DATE
200114	3500	08/15/2008
200122	2500	09/16/2008
200118	500	07/20/2008
200119	4000	09/16/2008
200121	1500	09/23/2008
200130	2500	[illegible]
200111	1000	07/10/2008
200104	1500	03/13/2008
200106	2500	04/20/2008
200125	2000	10/10/2008
200117	800	10/20/2008

COUNT(*)
34

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wild card in SQL

A wildcard character is used to alternate for any other character or characters in a string.

- To **search for data** in a table, SQL wildcards are used.
- One or more wildcards can be **combined**.

Example:

This example selects all developers with a City starting with any character, followed by "ondon":

```
SELECT * FROM Developers
WHERE City LIKE '_ondon';
```

Sub queries

A sub query is a select query that is contained inside another query. Example:

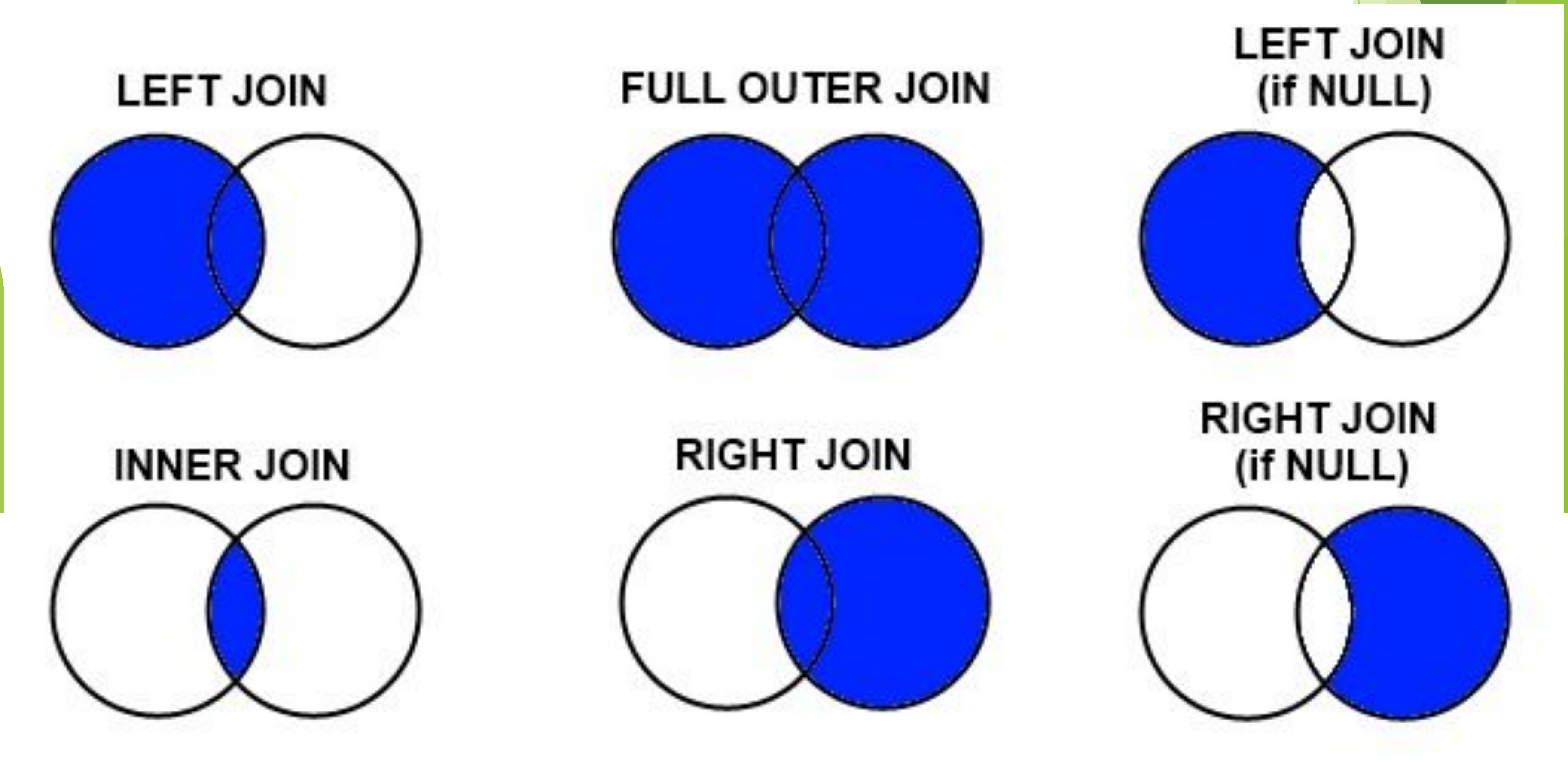
```
SELECT salary FROM Employees WHERE
salary =( SELECT MIN(salary) from
Employees);
```

Sub-Queries Vs Joins

When compare with Joins , sub-queries are simple to use and easy to read.
They are not as complicated as Joins
But sub-queries have performance issues. Using a join instead of a sub-query
can at times give you upto 500 times performance boost.
Given a choice, it is recommended to use a JOIN over a sub query.

Joins in SQL

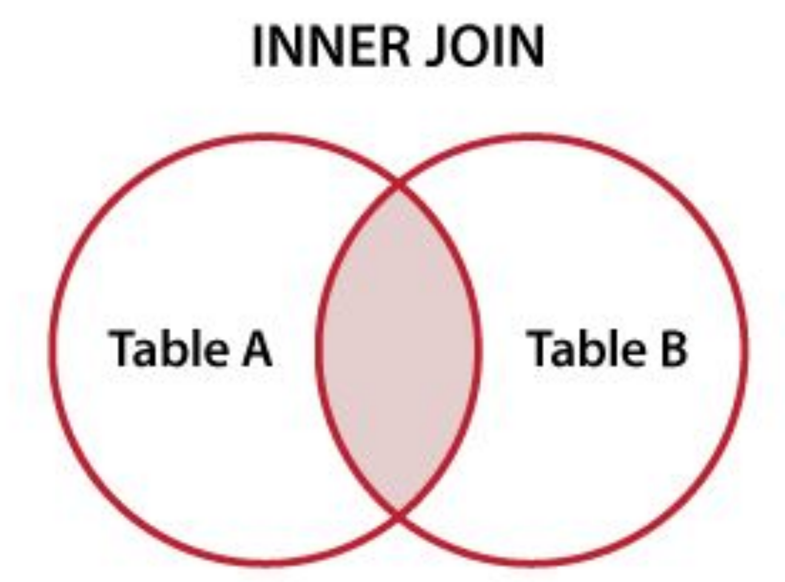
Joins are a way of retrieving information from two, three or more related tables. Suppose there are 2 tables. One is Employee table and the other being department table. We may need to get data from both these tables.



INNER JOIN

The inner JOIN is used to return rows from both tables that satisfy the given condition.

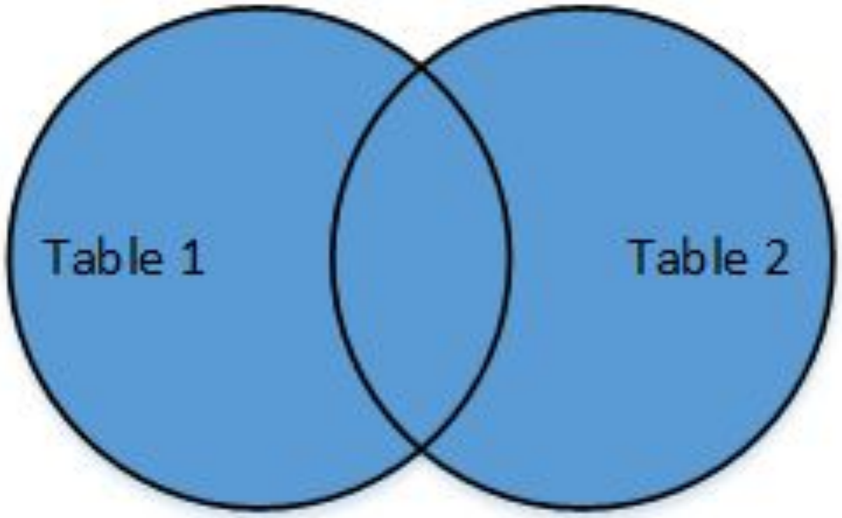
```
SELECT e.lname,e.emp_id,d.dept_name
FROM Employees e INNER JOIN department d
ON e.emp_id = d.emp_id;
```



Full OUTER JOIN

It can detect records having no match in joined table. It returns NULL values for records of joined table if no match is found.

```
SELECT * FROM Employee
 FULL OUTER JOIN Departments ON
  e.EmpID = d.EmpID;
```



Full Outer Join

LEFT JOIN

Assume now you want to get titles of all movies together with names of members who have rented them. It is clear that some movies have not being rented by any one. We can simply use **LEFT JOIN** for the purpose.

The LEFT JOIN returns all the rows from the table on the left even if no matching rows have been found in the table on the right. **Where no matches have been found in the table on the right, NULL is returned.**

```
SELECT A.`title` , B.`first_name` ,
B.`last_name`
FROM `movies` AS A
LEFT JOIN `members` AS B
ON B.`movie_id` = A.`id`;
```

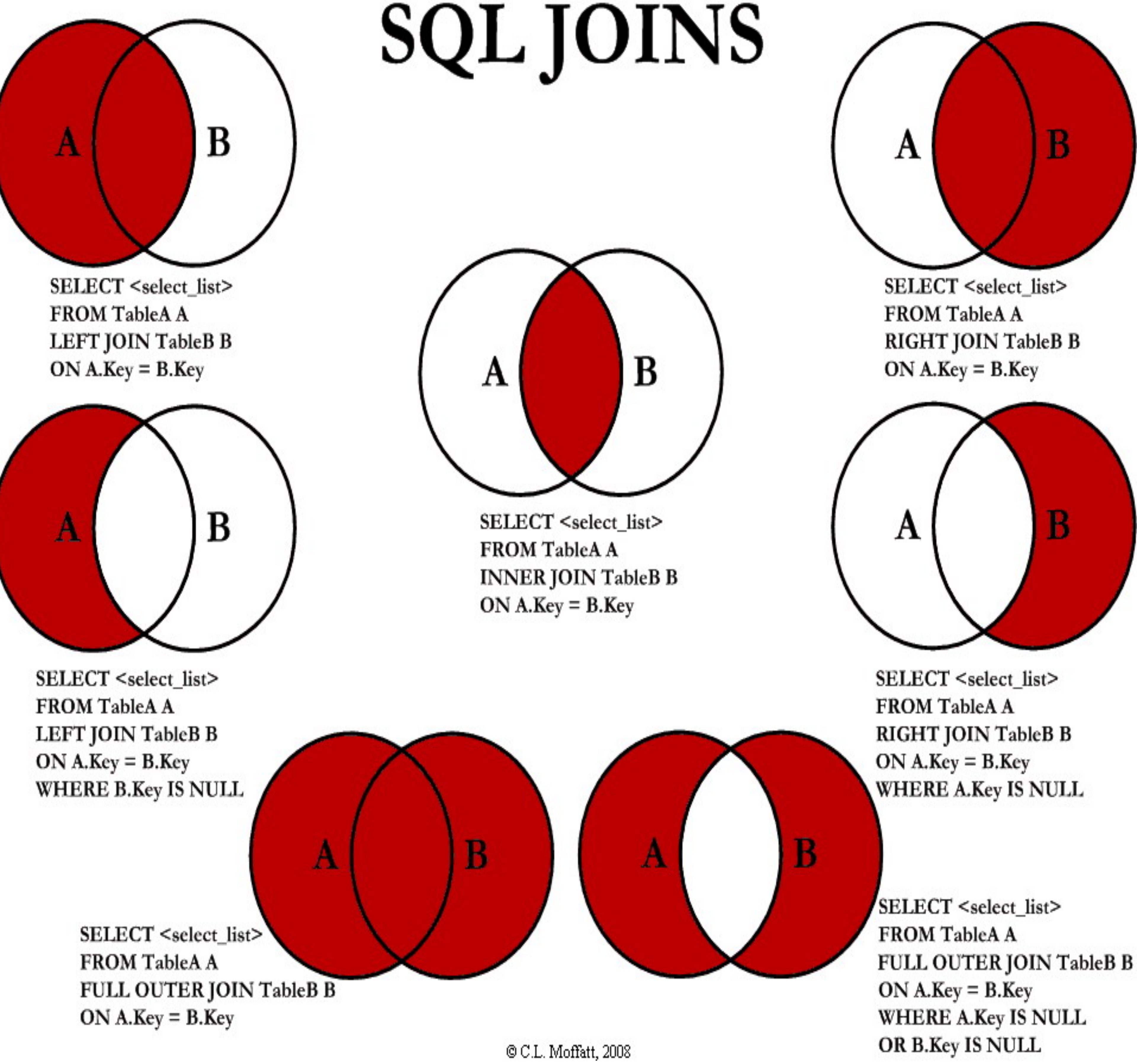
RIGHT JOIN

RIGHT JOIN is obviously the opposite of LEFT JOIN. The RIGHT JOIN returns all the columns from the table on the right even if no matching rows have been found in the table on the left. Where no matches have been found in the table on the left, NULL is returned.

In our example, let's assume that you need to get names of members and movies rented by them. Now we have a new member who has not rented any movie yet

```
SELECT A.`first_name` , A.`last_name`,
B.`title`
FROM `members` AS A
RIGHT JOIN `movies` AS B
ON B.`id` = A.`movie_id`;
```

SQL JOINS



```
SELECT <select_list>
FROM TableA A
LEFT JOIN TableB B
ON A.Key = B.Key
```

```
SELECT <select_list>
FROM TableA A
INNER JOIN TableB B
ON A.Key = B.Key
```

```
SELECT <select_list>
FROM TableA A
RIGHT JOIN TableB B
ON A.Key = B.Key
```

```
SELECT <select_list>
FROM TableA A
LEFT JOIN TableB B
ON A.Key = B.Key
WHERE B.Key IS NULL
```

```
SELECT <select_list>
FROM TableA A
RIGHT JOIN TableB B
ON A.Key = B.Key
WHERE A.Key IS NULL
```

```
SELECT <select_list>
FROM TableA A
FULL OUTER JOIN TableB B
ON A.Key = B.Key
```

```
SELECT <select_list>
FROM TableA A
FULL OUTER JOIN TableB B
ON A.Key = B.Key
WHERE A.Key IS NULL
OR B.Key IS NULL
```

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CASE Clause

SQL handles if/then logic using CASE clause.

This statement is followed by at least one pair of WHEN and THEN statements.

Example:

```
update employee
set gender =
CASE gender
WHEN 'F' THEN 'M’
WHEN 'M' THEN 'F’
END;
```

Date and Time functions in SQL

Example:

Q: Print the current date

A. select curdate(); //prints the current date

Q: If you want the date to be printed in specific format

A. select date_format('2018-03-21','%W %M %Y’);

A : select date_format(curdate(),'%W %M %Y’);

Q: To print the name of the day

selectdayname(curdate());

Q: DATE_FORMAT() function

A: SELECT DATE_FORMAT(CURDATE(), '%m/%d/%Y') today;

Date and Time functions in SQL

Q: DATE_DIFF()

A. select datediff(curdate(),'2018-03-01’);

SELECT orderId,

DATEDIFF(reqDate, shippedDate) daysLeft

FROM orders

ORDER BY daysLeft DESC;

Q: Display current date and time together

A: select now();

BRIEF HISTORY OF MYSQL

- MySQL is freely available open source RDBMS
- Can be downloaded from www.mysql.org
- In MySQL information is stored in Tables.
- Provides features that support secure environment for storing, maintaining and accessing data.
- Itis fast, reliable, scalable alternative to many of the commercial RDBMS today.
- Create and supported by MySQL AB,a company based in Sweden. This company is now subsidiary of ***Sun Microsystems***. On April 2009 Oracle Corp. acquires ***Sun Microsystems***.
- The chief inventor of MySQL was Michael Widenius(a.k.a Monty). MySQL has been named after Monty’s daughter ***My***. The logo of MySQL is dolphin and name of that dolphin is ‘***Sakila***’

MYSQL DATABASE SYSTEM

- MySQL database system refers to the combination of a MySQL server instance and MySQL database.

- It operates using Client/Server architecture in which the server runs on the machine containing the database and client connects to server over a network

- MySQL is a multiuser database system, meaning several users can access the database simultaneously

MYSQL DATABASE SYSTEM

- The Server
  - Listens for client requests coming in over network and access the database as the per the requirements and provide the requested information to the Client
- The Client
  - Are the programs that connect to MySQL server and sends requests to the server and receives the response of Server. Client may be the MySQL prompt or it may be Front-end programming which connect to programmatically like connecting to MySQL using server Language or Java or any other language Python

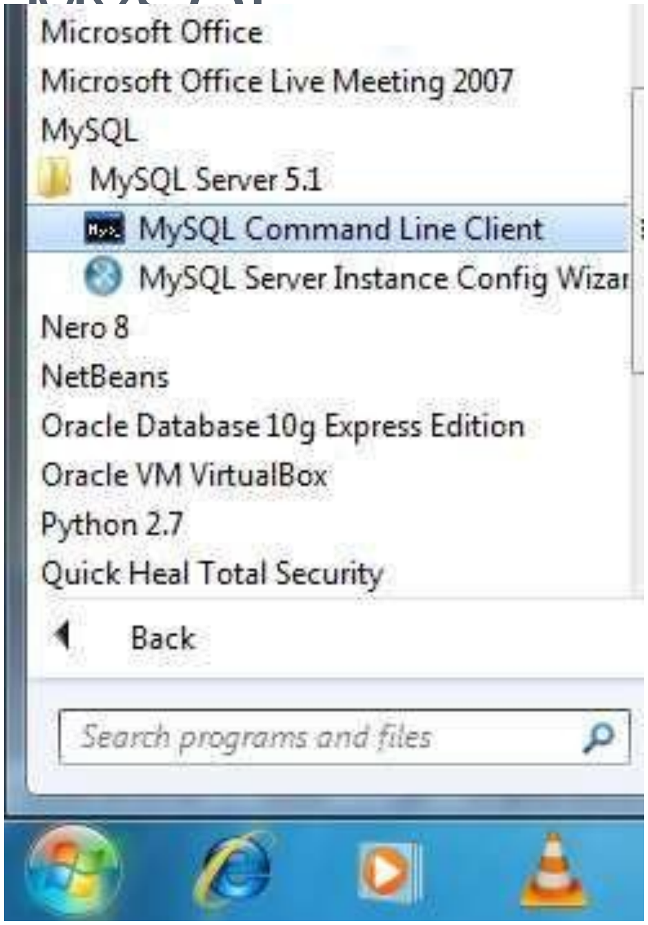
FEATURES OF MYSQL

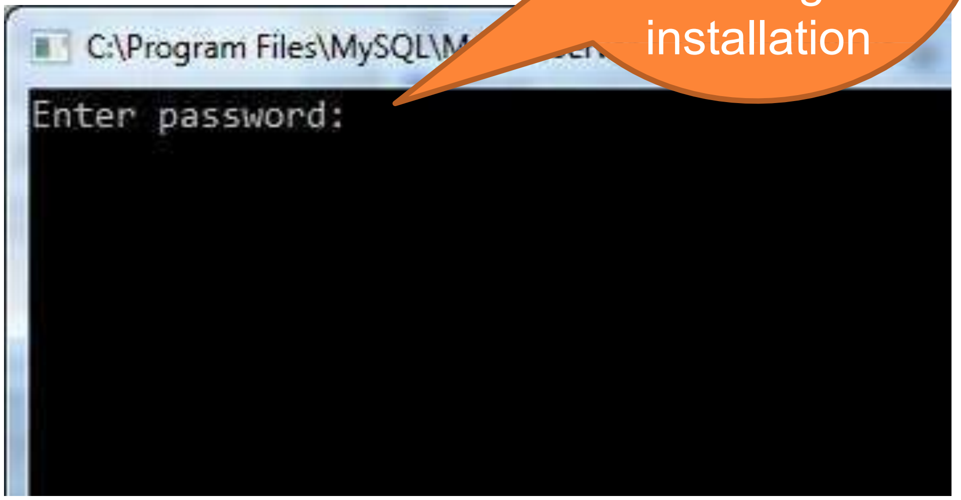
- Speed
  - MySQL runs very fast.
- Ease of Use
  - Can be managed from command line or GUI
- Cost
  - Is available free of cost. It is Open Source
- Query language Support
  - Supports SQL
- Portability
  - Can be run on any platform and supported by various compilers
- Data Types
  - Supports various data types like Numbers, Char etc.

FEATURES OF MYSQL

- Security
  - Offers privileges and password systems that is very flexible and secure.
- Scalability and Limits
  - Can handle large databases. Some of real life MySQL databases contains millions of records.
- Connectivity
  - Clients can connect to MySQL using drivers
- Localization
  - The server can provide error message to client in many language
- Client and Tools
  - Provides several client and utility programs. Like ***mysqldump*** and ***mysqladmin***. GUI tools like MySQL Administration and Query Browser

Starting MySQL

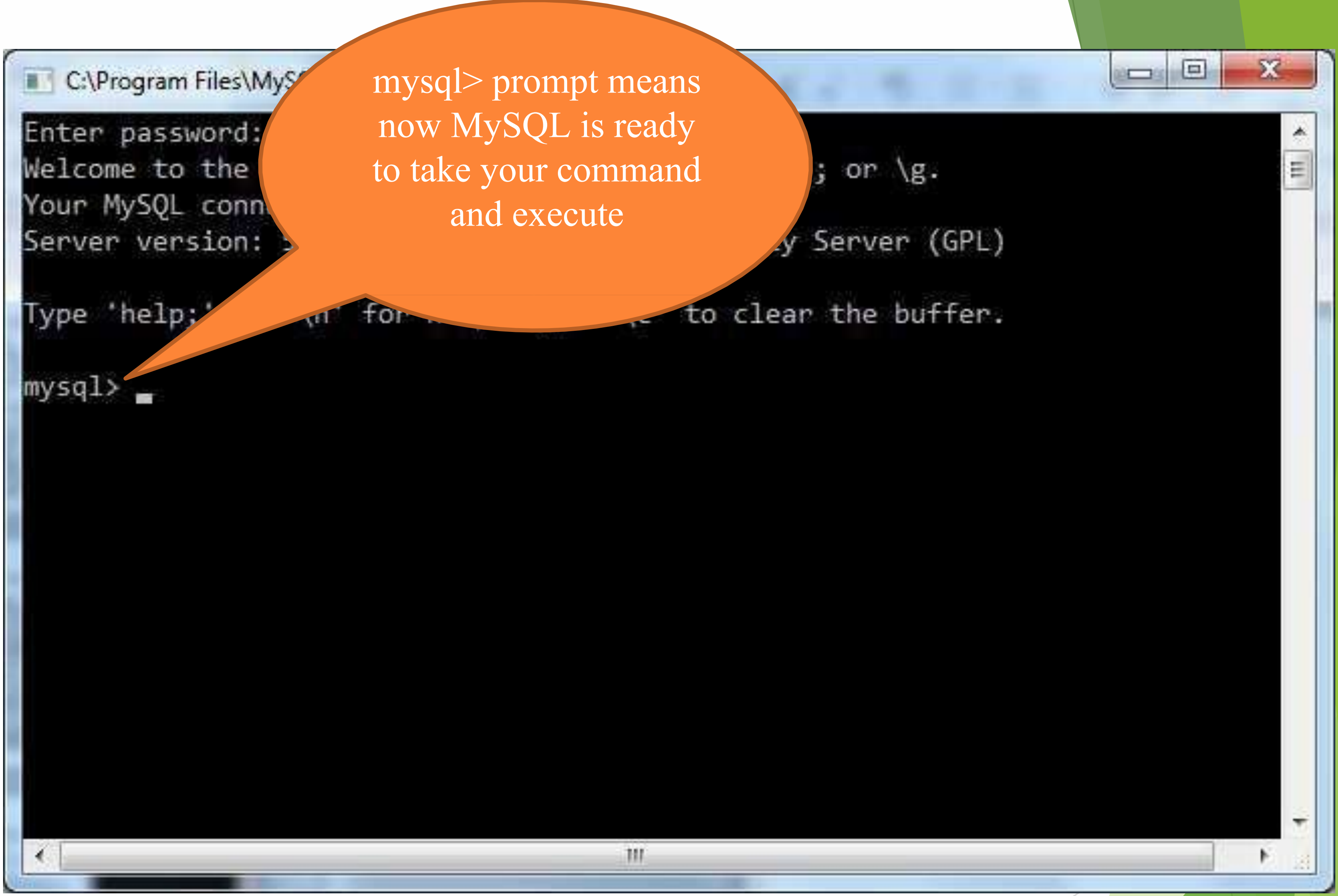

Microsoft Office
Microsoft Office Live Meeting 2007
MySQL
MySQL Server 5.1
MySQL Command Line Client
MySQL Server Instance Config Wizar
Nero 8
NetBeans
Oracle Database 10g Express Edition
Oracle VM VirtualBox
Python 2.7
Quick Heal Total Security
Back
Search programs and files



```
Enter password:
```

Enter the password given during installation

Click on **Start** All Programs MySQL MySQL Server **MySQL Command Line Client**



```
Enter password:
Welcome to the                                        ; or \g.
Your MySQL conn
Server version:                                    y Server (GPL)

Type 'help;'          \n' for                  \c' to clear the buffer.

mysql> _
```

mysql> prompt means now MySQL is ready to take your command and execute

To exit from MySQL type **exit or quit** in front of

mysql prompt

KIRTI GUPTA, PGT CS, K V NTPC

SQL AND MYSQL

DATA FOLKZ
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- SQL stands for Structured Query Language.
- Is a language that enables you to create and operate on relational databases.
- MySQL uses SQL in order to access databases.
- It is the standard language used by almost all the database s/w vendors.
- Pronounced as SEQUEL
- Original versionwasdeveloped by IBM's **Almanden Research Center**
- Latest ISO standard of SQL was released in 2008 and named as SQL:2008

PROCESSING CAPABILITIES OF SQL

- *DDL (Data Definition Language)*
- *DML (Data Manipulation Language)*
- *Embedded DML*
- *View*
- *Authorization*
- *Integrity*
- *Transaction Control*

DATA dEFINITION LANGUAGE

- It allows to create database objects likecreating a table, view or any other database objects.
  - The information about created objects are stored in special file called DATA DICTIONARY
- DATA DICTIONARY contains metadata i.e. data about data.
  - While creating a table DDL allows to specify–

    name of table, attributes, data types of each attribute, may define range of values that attributes can store, etc
  - Major commands of DDL are – **CREATE, ALTER, DROP**

DATA MANIPULATION LANGUAGE

- It allows to perform following operation on table
  - Retrieval of information stored in table
  - Insertion of new data in table
  - Modification of existing data in table
  - Deletion of existing data from table
- DML is of 2 type
  - **Procedural DML** (in this we specify what data is needed and how to get it)
  - **Non-Procedural DML** (in this we specify what data is needed without specifying how to get it)
- Main DML commands are –

SELECT, INSERT, UPDATE AND DELETE

JUST A MINUTE…

- What is Database? What are the advantages of Database System?
  - What is DDL and DML? Give examples of command belonging to each category
- What is the difference between Primary key and Candidate key
  - What is Primary Key? What are the restriction imposed by Primary Key? How primary key many can be applied on a Table?
  - What is Degree and Cardinality of table?

Thank You!