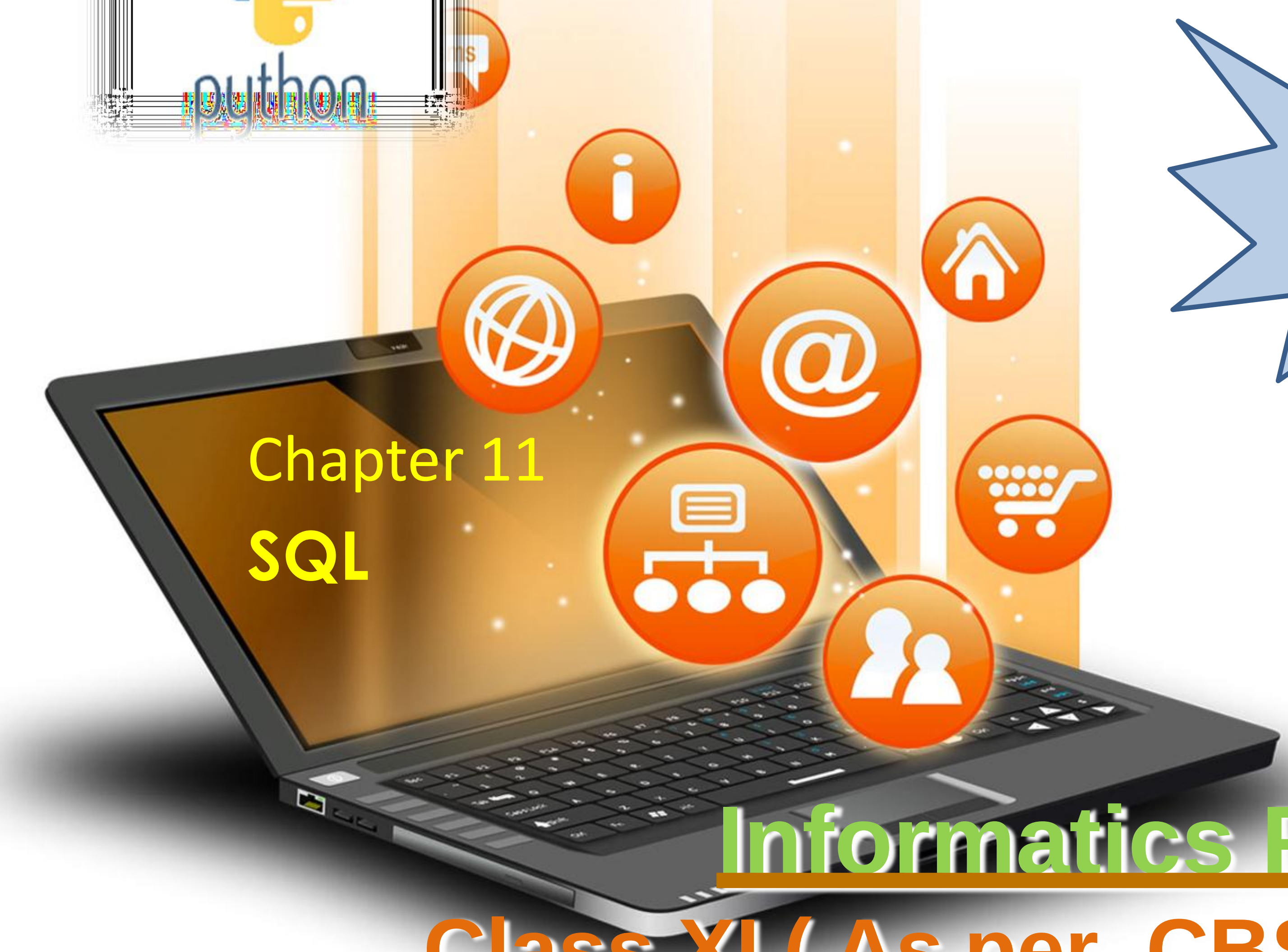

Chapter 11

SQL

New syllabus 2020-21

Informatics Practices

Class XI (As per CBSE Board)

Visit : python.mykvs.in for regular updates

SQL

SQL is an acronym of Structured Query Language. It is a standard language developed and used for accessing and modifying relational databases.

The SQL language was originally developed at the IBM research laboratory in San José, in connection with a project developing a prototype for a relational database management system called System R in the early 70s.

SQL is being used by many database management systems. Some of them are:

- **MySQL**
- **PostgreSQL**
- **Oracle**
- **SQLite**
- **Microsoft SQL Server**

SQL

Advantages of using SQL

- High speed.
- No coding needed.
- Well defined standards.
- Portability.
- Interactive language.
- Multiple data view.

MYSQL

MySQL is currently the most popular open source database software. It is a multi-user, multithreaded database management system. MySQL is especially popular on the web. It is one of the parts of the very popular LAMP platform. Linux, Apache, MySQL and PHP or WIMP platform Windows,Apache,MySQL and PHP.

MySQL AB was founded by Michael Widenius (Monty), David Axmark and Allan Larsson in Sweden in year 1995.

MYSQL

MySQL Features

Open Source & Free of Cost:

It is Open Source and available at free of cost.

** Portability:**

Small enough in size to instal and run it on any types of Hardware and OS like Linux,MS Windows or Mac etc.

** Security :**

Its Databases are secured & protected with password.

** Connectivity**

Various APIs are developed to connect it with many programming languages.

** Query Language**

It supports SQL (Structured Query Language) for handling database.

MYSQL

Types of SQL Commands

□ DDL (Data Definition Language)

To create database and table structure-commands like CREATE , ALTER , DROP etc.

□ DQL (Data Query Language)

To retrieve the data from database

SELECT

□ DML (Data Manipulation Language)

Record/rows related operations.commands like INSERT..., DELETE..., UPDATE.... etc.

□ DCL (Data Control Language)

used to manipulate permissions or access rights to the tables.commands like GRANT , REVOKE etc.

□ Transactional control Language.

Used to control the transactions.commands like COMMIT, ROLLBACK, SAVEPOINT etc.

MYSQL

MySql datatypes

numeric

decimal -decimal(<precision>, [<scale>]) [zerofill] For storing floating-point numbers where precision is critical.

Int - int(<size>) [auto_increment] [unsigned] [zerofill]
A whole number, 4 bytes, with a maximum range of -2,147,483,648 to 2,147,483,647 (unsigned: 0 to 4,294,967, 295)

string

char-char(<size>) [binary]
Fixed length – for storing strings that won't vary much in size.
Range of 0 to 255, stores that amount in bytes
Varchar-varchar(<size>) [binary]
Variable length – for storing strings that will vary in size.
Range of 0 to 255, stores that amount in bytes, plus 1 byte

date

Date-Format: YYYY-MM-DD ,Example: 2006-09-23,Range of years 1000 to 9999

MYSQL

Database Commands in MySql

Getting listings of database and tables

```
mysql> SHOW DATABASES;
mysql> SHOW TABLES;
```

Creating a database-

```
mysql> CREATE database myschool;
```

Deleting a database mysql> DROP database abc;

to remove table mysql> drop table abctable;

After we have created the database we use the USE statement to change the current

```
mysql> USE myschool;
```

Creating a table in the database is achieved with CREATE table statement.

```
mysql> CREATE TABLE student (lastname varchar(15),firstname varchar(15),
city varchar(20), class char(2));
```

The command DESCRIBE is used to view the structure of a table.

```
mysql> DESCRIBE student;
```

MYSQL

Database Commands in MySql

To insert new rows into an existing table use the INSERT command:

```
mysql>INSERT INTO student values(‘dwivedi’,’freya’,’Udaipur’,’4’);
```

Similarly we can insert multiple records.With the SELECT command we can retrieve previously inserted rows:

```
mysql> SELECT * FROM student;
```

Selecting rows by using the WHERE clause in the SELECT command

```
mysql> SELECT * FROM student WHERE class=“4";
```

Selecting specific columns(Projection) by listing their names

```
mysql> SELECT first_name, class FROM student;
```

To modify or update entries in the table use the UPDATE command

```
mysql> UPDATE student SET class=“V" WHERE firstname=“freya";
```

MYSQL

Database Commands in MySql

Deleting selected rows from a table using the DELETE command

```
mysql> DELETE FROM student WHERE firstname=“amar";
```

A general form of SELECT is:

SELECT *what to select(field name)* **FROM** *table(s)*
WHERE *condition that the data must satisfy*;

Comparison operators are: < ; <= ; = ; != or <> ; >= ; >

Logical operators are: AND ; OR ; NOT

Comparison operator for special value NULL: IS

```
mysql> SELECT * FROM Student WHERE City IS NULL ;
```

BETWEEN- to access data in specified range

```
mysql> SELECT * FROM Student WHERE class between 4 and 6;
```

IN- operator allows us to easily test if the expression in the list of values.

```
mysql> SELECT * FROM Student WHERE class in (4,5,6);
```

MYSQL

Database Commands in MySql

 Pattern Matching – LIKE Operator

A string pattern can be used in SQL using the following wild card

 % Represents a substring in any length

 _ Represents a single character

Example:

‘A%’ represents any string starting with ‘A’ character.

‘_ _A’ represents any 3 character string ending with ‘A’.

‘_B%’ represents any string having second character ‘B’

‘_ _ _’ represents any 3 letter string.

A pattern is case sensitive and can be used with LIKE operator.

```
mysql> SELECT * FROM Student WHERE Name LIKE ‘A%’;
mysql> SELECT * FROM Student WHERE Name LIKE%Singh%’;
mysql> SELECT Name, City FROM Student WHERE Class>=8 AND Name
LIKE ‘%Kumar%’ ;
```

MYSQL

Database Commands in MySql

Ordering Query Result – ORDER BY Clause

A query result can be orders in ascending (A-Z) or descending (Z-A) order as per any column. Default is Ascending order.

```
mysql> SELECT * FROM Student ORDER BY class;
```

To get descending order use DESC key word.

```
mysql> SELECT * FROM Student ORDER BY class DESC;
```

MYSQL

Database Commands in MySql

Creating Table with Constraints

The following constraints are commonly used in SQL:

NOT NULL -It Ensures that a column cannot have a NULL value

UNIQUE - It Ensures that all values in a column are different

PRIMARY KEY - A combination of a NOT NULL and UNIQUE. Uniquely identifies each row in a table

FOREIGN KEY - It Uniquely identifies a row/record in another table

CHECK - It Ensures that all values in a column satisfies a specific condition

DEFAULT - It Sets a default value for a column when no value is specified

INDEX - It is Used to create and retrieve data from the database very quickly

Database Commands in MySql

Creating Table with Constraints

```
mysql> CREATE TABLE Persons (
    ID int NOT NULL PRIMARY KEY,
    LastName varchar(255) NOT NULL,
    FirstName varchar(255),
    Age int,
    City varchar(255) DEFAULT ‘Jaipur',
    CONSTRAINT CHK_Person CHECK (Age>=18)
);
mysql> CREATE TABLE Orders (
    OrderID int NOT NULL,
    OrderNumber int NOT NULL,
    PersonID int,
    PRIMARY KEY (OrderID),
    FOREIGN KEY (PersonID) REFERENCES Persons(ID)
);
```

Database Commands in MySql

Altering Table

The SQL ALTER TABLE command is used to add, delete or modify columns in an existing table. You should also use the ALTER TABLE command to add and drop various constraints on an existing table.

Syntax

The basic syntax of an ALTER TABLE command to add a New Column in an existing table is as follows.

```
ALTER TABLE table_name ADD column_name datatype;
```

The basic syntax of an ALTER TABLE command to DROP COLUMN in an existing table is as follows.

```
ALTER TABLE table_name DROP COLUMN column_name;
```

The basic syntax of an ALTER TABLE command to change the DATA TYPE of a column in a table is as follows.

```
ALTER TABLE table_name MODIFY COLUMN column_name datatype;
```

Database Commands in MySql

Altering Table

The basic syntax of an ALTER TABLE command to add a NOT NULL constraint to a column in a table is as follows.

```
ALTER TABLE table_name MODIFY column_name datatype NOT NULL;
```

The basic syntax of ALTER TABLE to ADD UNIQUE CONSTRAINT to a table is as follows.

```
ALTER TABLE table_name
ADD CONSTRAINT MyUniqueConstraint UNIQUE(column1, column2...);
```

The basic syntax of an ALTER TABLE command to ADD CHECK CONSTRAINT to a table is as follows.

```
ALTER TABLE table_name
ADD CONSTRAINT MyUniqueConstraint CHECK (CONDITION);
```

The basic syntax of an ALTER TABLE command to ADD PRIMARY KEY constraint to a table is as follows.

```
ALTER TABLE table_name
ADD CONSTRAINT MyPrimaryKey PRIMARY KEY (column1, column2...);
```

The basic syntax of an ALTER TABLE command to DROP CONSTRAINT from a table is as follows.

```
ALTER TABLE table_name
DROP CONSTRAINT MyUniqueConstraint;
```

MYSQL

Database Commands in MySql

Altering Table

```
ALTER TABLE table_name
DROP INDEX MyUniqueConstraint;
```

The basic syntax of an ALTER TABLE command to DROP PRIMARY KEY constraint from a table is as follows.

```
ALTER TABLE table_name
DROP CONSTRAINT MyPrimaryKey;
```

If we are using MySQL, the code is as follows –

```
ALTER TABLE table_name
DROP PRIMARY KEY;
```

Grouping Records in a Query

- **Some time it is required to apply a Select query in a group of records instead of whole table.**
- **We can group records by using GROUP BY <column> clause with Select command. A group column is chosen which have non-distinct (repeating) values like City, Job etc.**
- **Generally, the following Aggregate Functions [MIN(), MAX(), SUM(), AVG(), COUNT()] etc. are applied on groups.**

Name	Purpose
SUM()	Returns the sum of given column.
MIN()	Returns the minimum value in the given column.
MAX()	Returns the maximum value in the given column.
AVG()	Returns the Average value of the given column.
COUNT()	Returns the total number of values/ records as per given column.

NOTE – groupby and having clause is not included in class xi syllabus but aggregation functions are there.

MYSQL

Aggregate Functions & NULL

Consider a table Emp having following records as-

Null values are excluded while (avg)aggregate function is used

Emp		
Code	Name	Sal
E1	Mohak	NULL
E2	Anuj	4500
E3	Vijay	NULL
E4	Vishal	3500
E5	Anil	4000

SQL Queries	Result of query
mysql> Select Sum(Sal) from EMP;	12000
mysql> Select Min(Sal) from EMP;	3500
mysql> Select Max(Sal) from EMP;	4500
mysql> Select Count(Sal) from EMP;	3
mysql> Select Avg(Sal) from EMP;	4000
mysql> Select Count(*) from EMP;	5

MYSQL

Aggregate Functions & Group

An Aggregate function may applied on a column with DISTINCT or ALL keyword. If nothing is given ALL is assumed.

Using SUM (<Column>)

This function returns the sum of values in given column or expression.

```
mysql> Select Sum(Sal) from EMP;
mysql> Select Sum(DISTINCT Sal) from EMP;
mysql> Select Sum (Sal) from EMP where City=‘Jaipur’;
mysql> Select Sum (Sal) from EMP Group By City;
mysql> Select Job, Sum(Sal) from EMP Group By Job;
```

Using MIN (<column>)

This functions returns the Minimum value in the given column.

```
mysql> Select Min(Sal)  from EMP;
mysql> Select Min(Sal)  from EMP Group By City;
mysql> Select  Job, Min(Sal) from EMP Group By Job;
```

MYSQL

Aggregate Functions & Group

Using MAX (<Column>)

This function returns the Maximum value in given column.

```
mysql> Select Max(Sal) from EMP;
mysql> Select Max(Sal) from EMP where City=‘Jaipur’;
mysql> Select Max(Sal) from EMP Group By City;
```

Using AVG (<column>)

This functions returns the Average value in the given column.

```
mysql> Select     AVG(Sal) from     EMP;
mysql> Select     AVG(Sal) from     EMP     Group     By City;
```

Using COUNT (<*|column>)

This functions returns the number of rows in the given column.

```
mysql> Select Count (*) from EMP;
mysql> Select Count(Sal) from EMP Group By City;
mysql> Select Count(*), Sum(Sal) from EMP Group By Job;
```

MYSQL

Aggregate Functions & Conditions

You may use any condition on group, if required. HAVING <condition> clause is used to apply a condition on a group.

mysql> Select Job,Sum(Pay) from EMP

```
Group    By Job HAVING Sum(Pay)>=8000;

mysql>  Select     Job,      Sum(Pay) from      EMP
Group    By Job HAVING Avg(Pay)>=7000;

mysql>  Select     Job,      Sum(Pay) from      EMP
Group    By Job HAVING Count(*)>=5;

mysql>  Select     Job, Min(Pay),Max(Pay),     Avg(Pay) from EMP Group    By Job
HAVING Sum(Pay)>=8000;

mysql>  Select     Job, Sum(Pay)      from EMP  Where City=‘Jaipur’
```

Note :- Where clause works in respect of whole table but Having works on Group only. If Where and Having both are used then Where will be executed first.

MYSQL

Ordering Query Result – ORDER BY Clause

A query result can be orders in ascending (A-Z) or descending (Z-A)

order as per any column. Default is Ascending order.

```
mysql> SELECT * FROM Student ORDER BY City;
```

To get descending order use DESC key word.

```
mysql> SELECT * FROM Student ORDER BY City DESC;
mysql> SELECT Name, Fname, City FROM Student
Where Name LIKE ‘R%’ ORDER BY Class;
```