SQL

Structured Query Language

Lets do practical on DATABASE…

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SQL – Structured Query Language

- *Is a language that enables you to create and operate on relational databases*
- *It is the standard language used by almost all the database s/w vendors.*
- *Pronounced as SEQUEL*
- *Original version was developed by IBM's Almanden Research Center*
- *Latest ISO standard of SQL was released in 2008 and named as SQL:2008*

SQL – features

- *Allows creating/modifying a database's structure*
- *Changing security settings for system*
- *Permitting users for working on databases or tables*
- *Querying database*
- *Inserting/modifying/deleting the database contents*

MYSQL Elements

- *Literals*
- *Datatypes*
- *Nulls*
- *Comments*

Literals

- *It means the fixed value or constant value. It may be of character, numeric or date time type.*
- *Character and date/time literals are always in single quotation marks whereas numeric literals must be without single quotation marks*
- *For example – 'Virat', 12, 12.56, '04-20-2018'*
- *Date and time values are always in the format YYYY-MM-DD HH:MI:SS*
- *Special character like quotes are always written be preceding it back-slash(\). For example if we want to store value as **Tom's Cat** then it should be written as **Tom\'s Cat***

Data Type

- *Means the type of value and type of operation we can perform on data. For example on numeric value we can store numbers and perform all arithmetic operations and so on.*
- *MySQL support three categories of data types:*
  - *Numeric*
  - *Date and time*
  - *String types*

Numeric Data Types

Data type	Description
INT	Numbers without decimal. Store up to 11 digits. -2147483648 to 2147483647
TINYINT	Small integer value between 0 – 255 (4 digits)
SMALLINT	More than TINYINT between -32768 to 32767 (5 digit)
MEDIUMINT	Integer values up to 9 digits
BIGINT	Very large integer value up to 11 digits
FLOAT(M,D)	Real numbers i.e. number with decimal. M specify length of numeric value including decimal place D and decimal symbol. For example if it is given as FLOAT(8,2) then 5 integer value 1 decimal symbol and 2 digit after decimal TOTAL – 8. it can work on 24 digits after decimal.
DOUBLE(M,D)	Real numbers with more precision up to 53 place after decimal.

Date and Time Types

Data type	Description
DATE	A date in YYY-MM-DD format between 1000-01-01 to 9999-12-31
DATETIME	Combination of date and time. For example to store 4th December 2018 and time is afternoon 3:30 then it should be written as – 2018-12-04 15:30:00
TIMESTAMP	Similar to DATATIME but it is written without hyphen for example the above date time is stored as 20181204153000
TIME	To store time in the format HH:MM:SS
YEAR(M)	To store only year part of data where M may be 2 or 4 i.e. year in 2 digit like 18 or 4 digit like 2018

String Types

Data type	Description
CHAR(M)	Fixed length string between 1 and 255. it always occupy M size for each data for example if size is CHAR(20) and we store value 'MOBILE' , although the size of MOBILE is 6 but in a table it will occupy 20 size with space padded at right side for remaining place. Mostly use in the case where the data to be insert is of fixed size like Grade (A,B,C,..) or Employee code as E001, E002, etc. In this case CHAR will give better performance than varchar
VARCHAR(M)	Variable length string between 1 and 255. it takes size as per the data entered for example with VARCHAR(20) if the data entered in MOBILE then it will take only 6 byte. It is useful for the data like name, address where the number of character to be enter is not fixed.
BLOB	Fixed length string upto 655535
ENUM	Provides list of values that can only be enter in any column for example with dept column, if it is given as dept enum('IT','HR','RD') then in dept column we cannot enter value other than IT, HR, RD

Difference between CHAR & VARCHAR

CHAR	VARCHAR
Fixed length string	Variable length string
Used where number of character to enter is fixed like Grade, EmpCode, etc	Used where number of character to be enter is not fixed like name, address etc.
Fast, no memory allocation every time	Slow, as it take size according to data so every time memory allocation is done
It takes more memory	It takes less space

NULL VALUE

- NULL means missing information
- NULL can appear in any type of column if it is not restricted by NOT NULL or PRIMARY KEY
- Always remember NULL is neither equal to 0 nor space. NULL means nothing
- Used in situation like if email id is not available with students then we will insert NULL

COMMENTS

- It is a text that is not executed, only for documentation purpose. Comments in MySQL can be written as
  - Begin the comment with /* and */
  - Begin the comment with – (followed by space)
  - Begin then comment with #
- For example
  - /* Select * from emp where empno=4 */
  - Select * from emp; -- it will fetch all details

SQL COMMAND SYNTAX

Commands	Description
Keywords	That have special meaning in SQL. They are the commands in mysql
Clause	They are used to support mysql commands like FROM, WHERE etc.
Arguments	Values passed to clause like table name to FROM clause conditions to WHERE clause for e.g. SELECT * FROM EMP WHERE SALARY>12000; In the above command SELECT is keyword FROM AND WHERE is clause EMP is an argument to FROM SALARY>12000 is argument to WHERE

EXPORTING DATABASE

- Exporting means creating the text file containing all the database contents which can be imported to any other computer. We use **mysqldump** command for this purpose. To export:
- Open **cmd** from **Start** button
- Or
- Press ***Window Key + R and type cmd*** and press Enter
- At cmd prompt like **C:\....>** type **mysqldump** command

EXPORTING DATABASE

- To export all database
  - **mysqldump --all-databases > c:\mydb.sql**
    - It will create mydb.sql in C:\, we can check it by open it.
- To export single database
  - **mysqldump myworks > c:\mydb2.sql**
- To export multiple datbase
  - **mysqldump myworks company c:\mydb3.sql**

IMPORTINGDATABASE

- **STEP – 1**
  - **Open Notepad and type the following commands**

```
drop database if exists myworks;
create database myworks;
use myworks;
create table emp(empno int,name varchar(20),dept varchar(20), salary int);
create table student(roll int, name varchar(20), per int);
insert into emp values
(1,'Amit','IT',8000),
(2,'Sumit','SALES',9000),
(3,'Ajit','HR',8500),
(4,'Vikram','SALES',10000),
(5,'Shaban','HR',12000);
insert into student values
(1,'Amit',99),
(2,'Sumit',97),
(3,'Vikas',95),
(4,'Jitendra',49);
```

IMPORTINGDATABASE

- **STEP – 1**
  - **Save this file with mydb.sql or any name, in your desired location for e.g. C:**
- **STEP – 2**
  - **Open MySQL and type**
    - **SOURCE C:\mydb.sql**
  - **It will create database myworks, 2 tables emp, students with records. We can check it by "SHOW TABLES" or "SELECT" command**

CREATING and USING DATABASE

CREATE DATABASE <DATABASE NAME>

CREATE DATABASE MYDB;

TO SEE LIST OF DATABASES:

SHOW DATABASES;

TO OPEN ANY DATABASE TO WORK

USE DATABASENAME

USE MYDB

CREATING TABLE

Syntax:-

Create Table TableName(ColumnName datatype(size), ColumnName datatype(size),.....);

Example:-

Create Table Employee(empno int, name varchar(20), dept varchar(20), salary int);

Create table Student(roll int, name varchar(20), stream varchar(20), per int);

INSERTING RECORDS IN TABLE

Syntax:-

Insert into tablename values(value1,value2,…)

Note:-

1) *char, varchar and date value must be in single quotes*
2) *Values must be passed in the order of their column*
3) *Date values are passed in the format*

   dd-mon-yyyy i.e. 20-Sep-2015 (in oracle)

   yyyy-mm-dd (in mysql)

INSERTING RECORDS IN TABLE

Syntax:-

Insert into emp values(1, 'Rakesh','Sales',34000)

Insert into student values(1,'Mahi','Science',89);

Inserting in selected columns

Insert into emp (empno, name, dept) values (2,'dipanker','IT')

SELECTING RECORD

Select statement allows to send queries to table and fetch the desired record. Select can be used to select both horizontal and vertical subset.

Syntax:-

Select * / columnnames FROM tablename [where condition]

SELECTING RECORD

Selecting all record and all columns

```
Select * from emp;
```

Selecting desired columns

```
select empno, name from emp;
```

Changing the order of columns

```
select dept, name from emp;
```

DISTINCT keyword

DISTINCT keyword is used to eliminate the duplicate records from output. For e.g. if we select dept from employee table it will display all the department from the table including duplicate rows.

Select dept from emp;

Output will be:-

Dept

Sales
Sales
IT
IT
HR

Empno	Name	Dept	Salary
1	Ravi	Sales	24000
2	Sunny	Sales	35000
3	Shobit	IT	30000
4	Vikram	IT	27000
5	nitin	HR	45000

DISTINCT keyword

If we don't want to see the duplicate rows in output we have to use DISTINCT keyword.

Select DISTINCT dept from emp;

Output will be:-

Dept

Sales

IT

HR

Empno	Name	Dept	Salary
1	Ravi	Sales	24000
2	Sunny	Sales	35000
3	Shobit	IT	30000
4	Vikram	IT	27000
5	nitin	HR	45000

PERFORMING SIMPLE CALCULATION

While performing SQL operations sometimes simple calculations are required, SQL provides facility to perform simple arithmetic operations in query. In MySQL we can give these queries without FROM clause i.e. table name is not required for these queries,

For Example

```
Select 10*2;
Select 10*3/6;
```

PERFORMING SIMPLE CALCULATION

MySQL also provides DUAL table to provide compatibility with other DBMS. It is dummy table used for these type queries where table name is not required. It contains one row and one column. For example:

Select 100+200 from DUAL;

Select curdate() from dual;

CALCULATION WITH TABLE DATA

Select name, salary, salary * 12 Annual_Salary from emp;

Select empno, salary+1000 from emp

Update student set total=phy+chem+maths+cs+eng;

COLUMN ALIAS

It is a temporary name/label given to column that will appear in output. For example if column name is dept and you want Department to appear as column heading then we have to give Column Alias. If we want alias name of multiple words then it should be enclosed in double quotes. Its format is :

ColumnName [AS] ColumnAlias

Example

(i) Select empno Employee_Number, name, dept Department, Salary Income from emp;

(ii) Select name, Salary*12 as “Annual Income” from emp;

HANDLING NULL

```
mysql> select * from emp;
+-------+--------+-------+--------+
| empno | name   | dept  | salary |
+-------+--------+-------+--------+
|     1 | Amit   | IT    |   8000 |
|     2 | Sumit  | SALES |   9000 |
|     3 | Ajit   | HR    |   8500 |
|     4 | Vikram | SALES |  10000 |
|     5 | Shaban | HR    |   NULL |
+-------+--------+-------+--------+
5 rows in set (0.15 sec)
```

```
mysql> select empno,name,ifnull(salary,"not assigned") from emp;
+-------+--------+-------------------------------+
| empno | name   | ifnull(salary,"not assigned") |
+-------+--------+-------------------------------+
|     1 | Amit   | 8000                          |
|     2 | Sumit  | 9000                          |
|     3 | Ajit   | 8500                          |
|     4 | Vikram | 10000                         |
|     5 | Shaban | not assigned                  |
+-------+--------+-------------------------------+
5 rows in set (0.05 sec)
```

From the above table we can observe that salary of Shaban is NULL i.e. not assigned, Now if we want 0 or "not assigned" for the salary information of shaban, we have to use IFNULL()

Select empno,name,IFNULL(Salary,"not assigned") from emp;

Column **value to substitute if NULL found**

PUTTING TEXT IN QUERY OUTPUT

SQL allows to put user defined symbols or text with table output. Like 'Rs' with Salary or '%' symbol with commission

For e.g.

Select name, dept, 'Rs.', salary from emp;

Select name, ' works in department', dept, ' and getting salary rs. ', salary from emp;

Select name, concat('Rs. ', salary) from emp;

WHERE clause

WHERE clause is used to select specified rows. It allows to select only desired rows by applying condition. We can use all comparison(>, <, >=, <=, =, <>) and logical operator (AND, OR, NOT).

AND (&&), OR (||) , NOT (!)

For example

Select * from emp where salary>4000;

Select * from emp where empno=1;

Select name,dept from emp where dept='HR';

WHERE clause

AND(&&) means both conditions must be true, OR(||) means any condition must be true to produce output. NOT(!) will do the reverse checking.

Select * from emp where salary>4000 and salary<8000;

Select * from emp where dept='Sales' and salary<30000;

Select name,dept from emp where dept='HR' and salary>=20000 and salary<=40000;

Select * from emp where dept='HR' or dept='IT';

Select * from emp where NOT empno=4;

SQL operators

1) BETWEEN
2) IN
3) LIKE
4) IS NULL

BETWEEN

BETWEEN allows to specify range of values to search in any column. It is used with AND clause and it will include the specified values during the searching. For e.g.

*Select * from emp where salary between 18000 and 30000;*

Select name from emp where empno between 2 and 5;

*Select * from emp where salary **NOT** between 25000 and 35000*

IN

IN allows to specify LIST of values in which searching will be performed. It will return all those record that matches any value in a given list of values. It can be thought as an alternative of multiple ORs

*Select * from emp where dept IN('sales','it');*

Select name from emp where empno IN (2,4,5);

*Select * from emp where dept **NOT** IN('sales','it')*

LIKE

LIKE allows to search based on pattern. It is used when we don't want to search an exact value or we don't know that exact value, and we know only the pattern of value like name starting from any particular letter, or ending with and containing any particular letter or word.

LIKE is used with two wildcard characters:

a) **%** : used when we want to substitute multiple characters. With % length is not fixed

b) **_** (underscore) : used when we want to substitute Single character

LIKE

Search for employee whose name begins from ‘s’

Select * from emp where name like ‘s%’;

Search for employee whose name ends with ‘r’

Select * from emp where name like ‘%r’;

Search for employee whose name contains ‘a’ anywhere

Select * from emp where name like ‘%a%’

Search for employee whose dob is in feb

Select * from emp where dob like ‘%-02-%’

Search employee whose name is of 5 letters begins from ‘s’

Select * from emp where name like ‘s_ _ _ _’;

IS NULL

IS NULL is used to compare NULL values present in any column. Because NULL is not considered as value so we cannot compare with = sign, so to compare with NULL SQL provides IS NULL.

Select * from emp where salary is null;

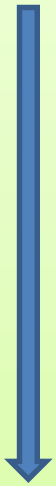
Select * from emp where salary is not null;

OPERATOR PRECEDENCE

When multiple operators are used in expression, then evaluation of expression takes place in the order of precedence. Higher precedence operator will execute first.

!
*, /, DIV, %, MOD
- +
<, >
==, >=, <=, !=, IS, LIKE, IN, BETWEEN
NOT
AND
OR

HIGH



LOW

SORTING OUTPUT

By default records will come in the output in the same order in which it was entered. To see the output rows in sorted or arranged in ascending or descending order SQL provide **ORDER BY** clause. By default output will be ascending order(ASC) to see output in descending order we use DESC clause with ORDER BY.

Select * from emp order by name; (ascending order)

Select * from emp order by salary desc;

Select * from emp order by dept asc, salary desc;

JUST A MINUTE…

- Create the following table and add the records

ItemNo	Item	Dcode	Qty	UnitPrice	StockDate
5005	Ball Pen 0.5	102	100	16	2018-03-10
5003	Ball Pen 0.25	102	150	20	2017-05-17
5002	Gel Pen Premium	101	125	14	2018-04-20
5006	Gel Pen Classic	101	200	22	2018-10-08
5001	Eraser Small	102	210	5	2018-03-11
5004	Eraser Big	102	60	10	2017-11-18
5009	Sharpener Classic	NULL	160	8	2017-06-12

JUST A MINUTE…

Write down the following queries based on the given table:

1) Select all record of table
2) Select ItemNo, name and Unitprice
3) Select all item record where Unitprice is more than 20
4) Select Item name of those items which are quantity between 100-200
5) Select all record of Items which contains pen word in it
6) Select unique dcode of all items
7) Display all record in the descending order of UnitPrice
8) Display all items which are stocked in the month of March

JUST A MINUTE…

Write down the following queries based on the given table:

11) Change the unitprice to 20 for itemno 5005

12) Delete the record of itemno 5001

13) Display all the item name in capital letters

14) Display first 4 character of every item name

15) Display all record whose dcode is not assigned