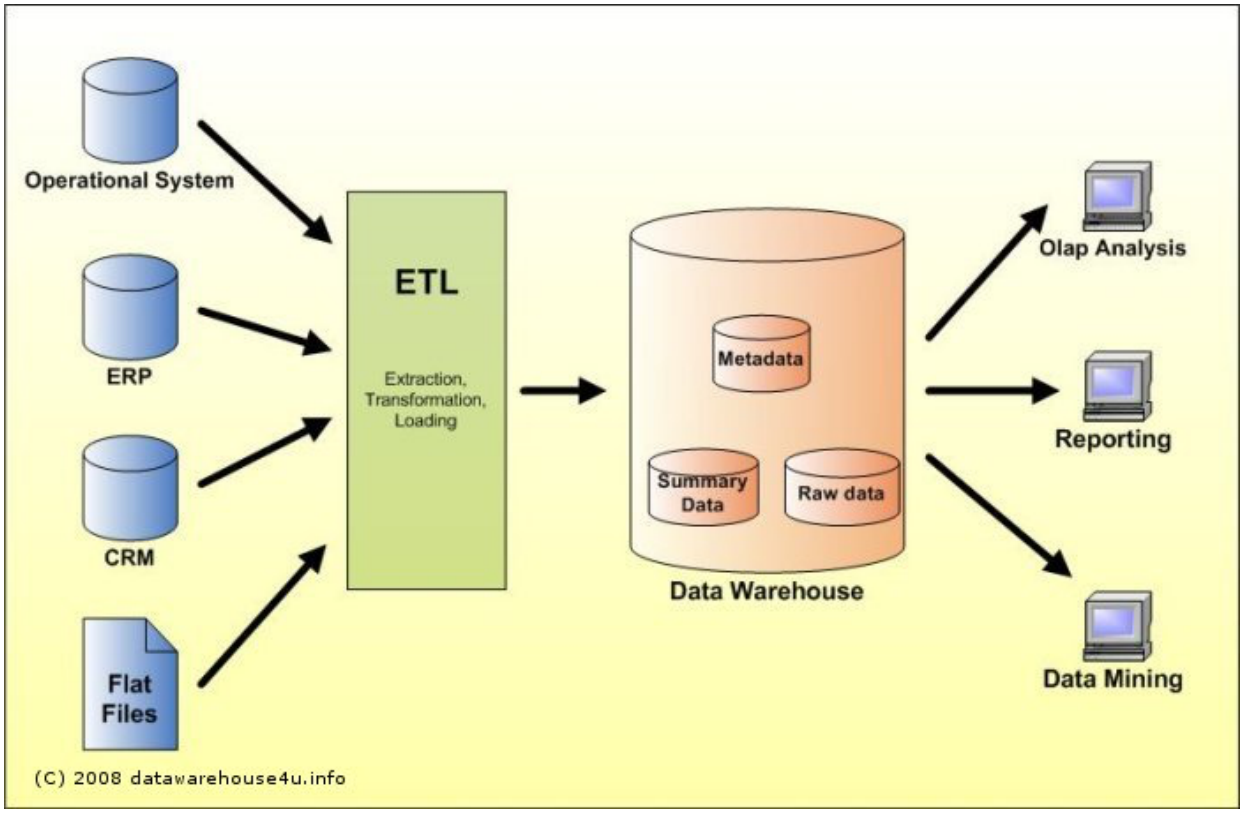
Data Warehousing
Practical Task # 01 **Hands**-on **MySQL**

Over View of Data Warehouse:

Data warehouse is an information system that stores historical and commutative data from single or multiple sources.



1. Installation of MySQL

MYSQL Installation Guide

Useful Concepts:

Setup are available on Datum network for Vista & Win.7, Win 10. Oracle for MAC OS is not available.

Datum Access:

1) Press Win+R

2) Enter \\172.16.100.104

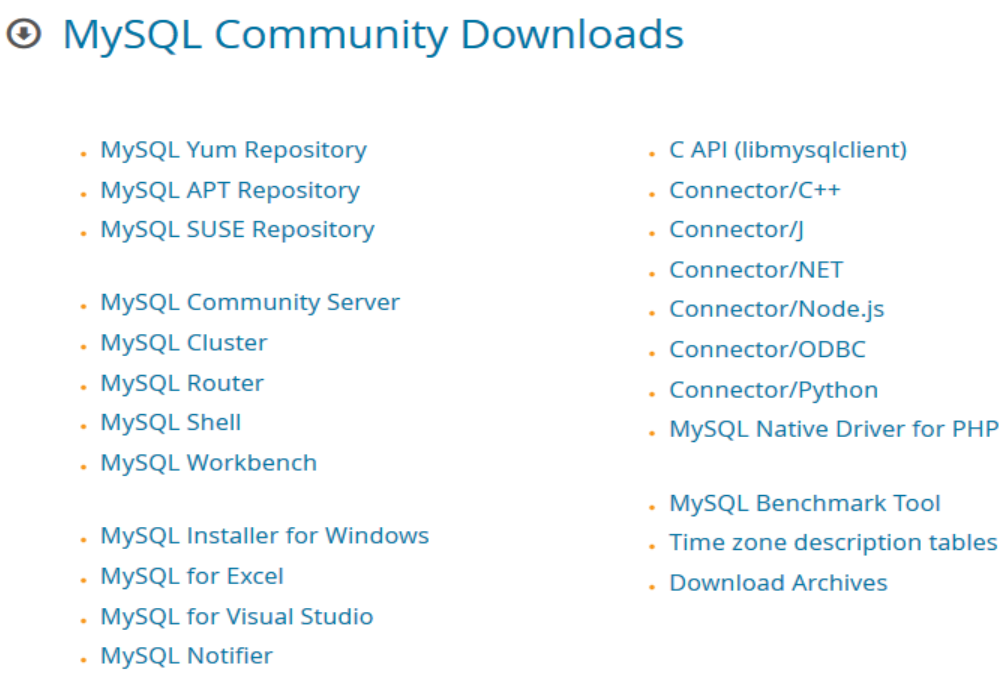
3) Username: nuisb\i181234

4) Password: Your Wifi's password **OR**

Download it from Internet

Step 1: Go to the link given below

https://dev.mysql.com/downloads/



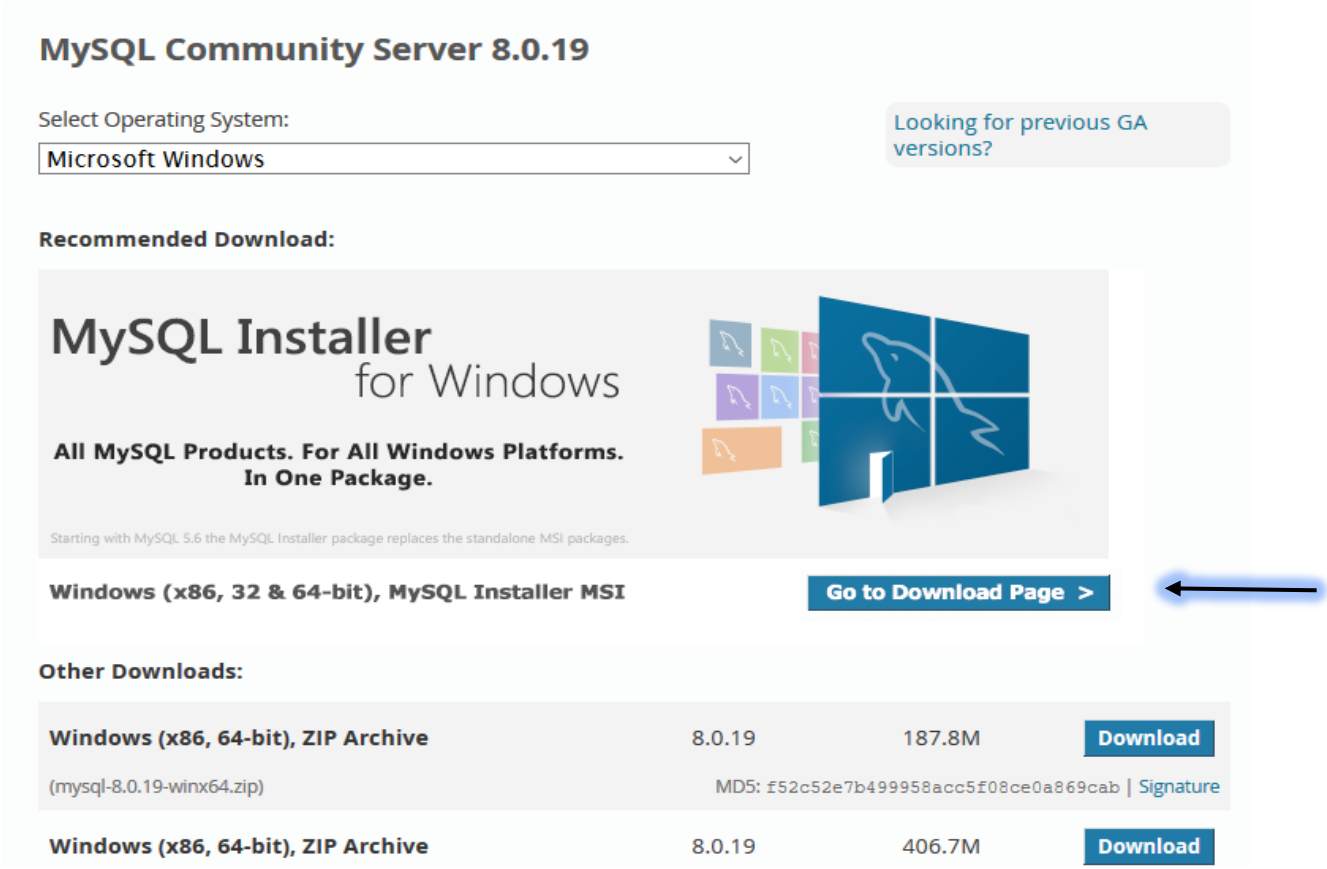
Step 2: Install MYSQL Community Server then MYSQL Workbench.

Installation of MYSQL Community Server

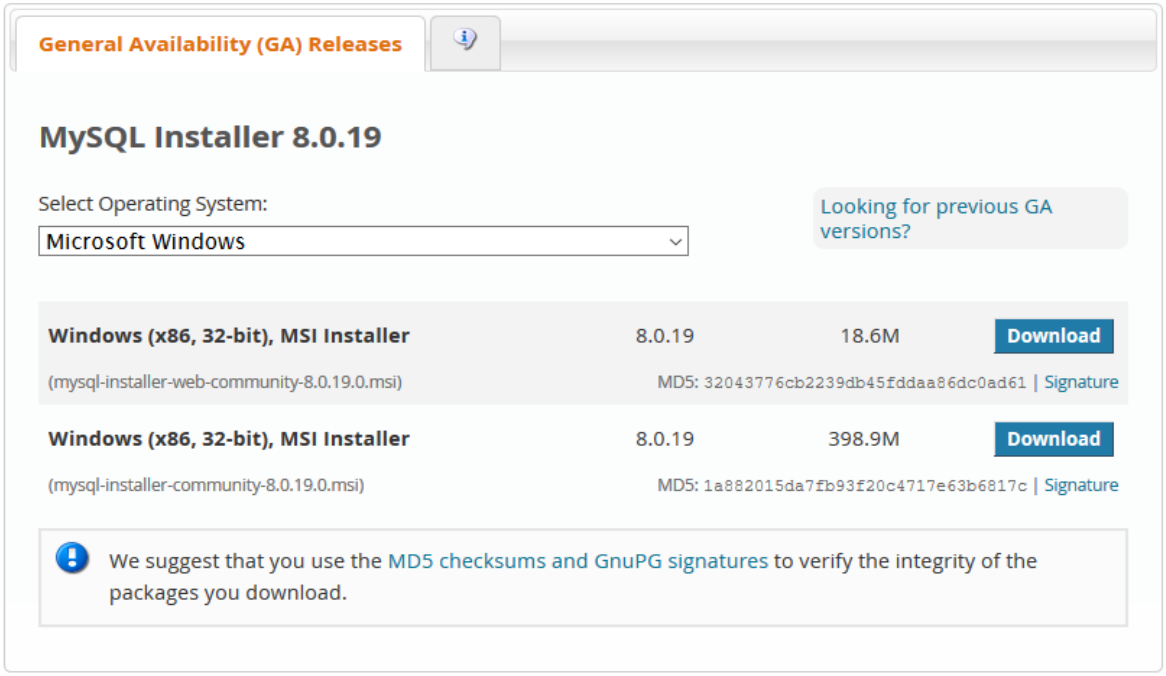
- Click on the MYSQL Community Server from the above list OR Go to the directly from the link below:

  https://dev.mysql.com/downloads/mysql/

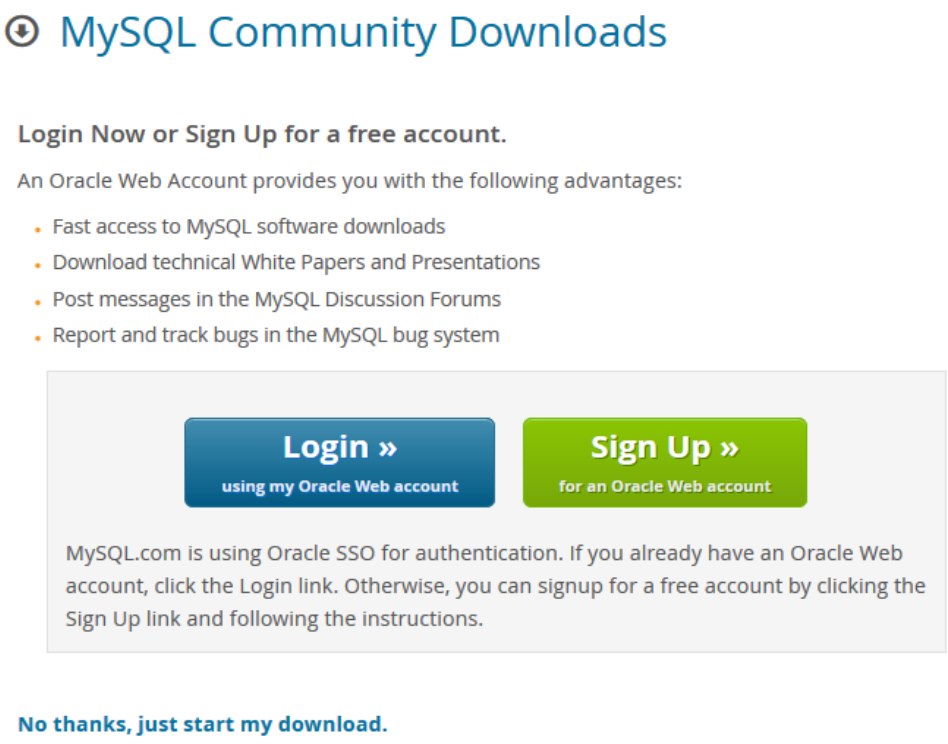
  a window will appear as follows:



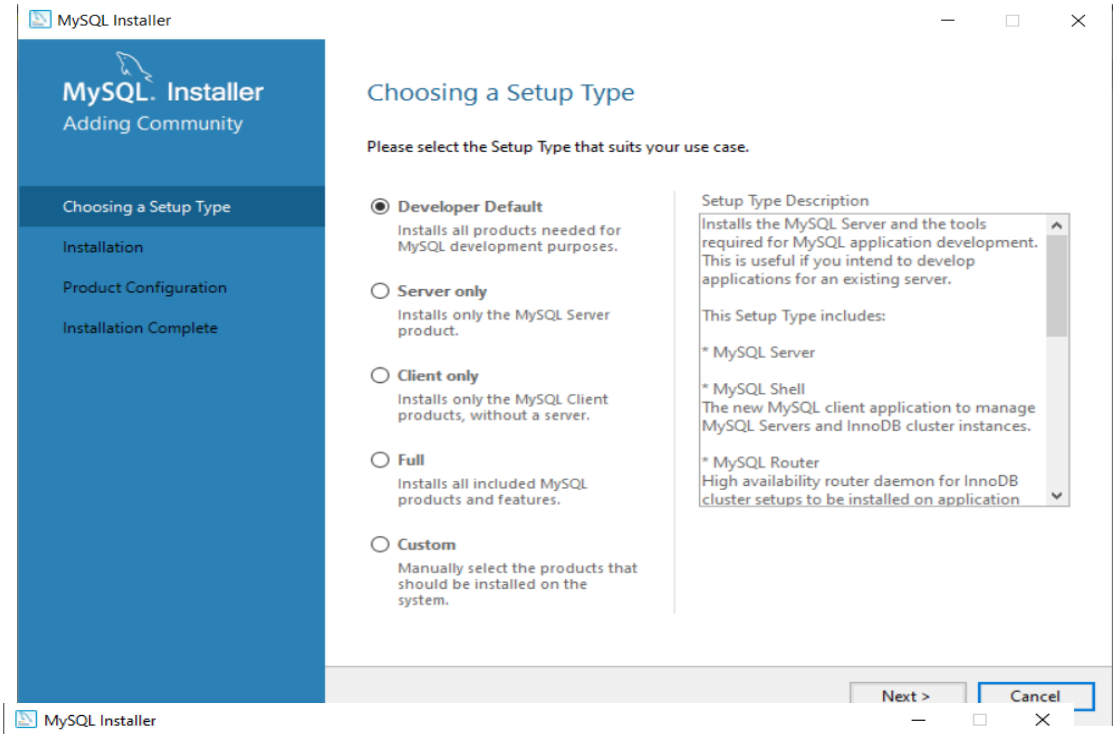
- Click on ***"Go to Download Page"*** *new page will appear as follows:*

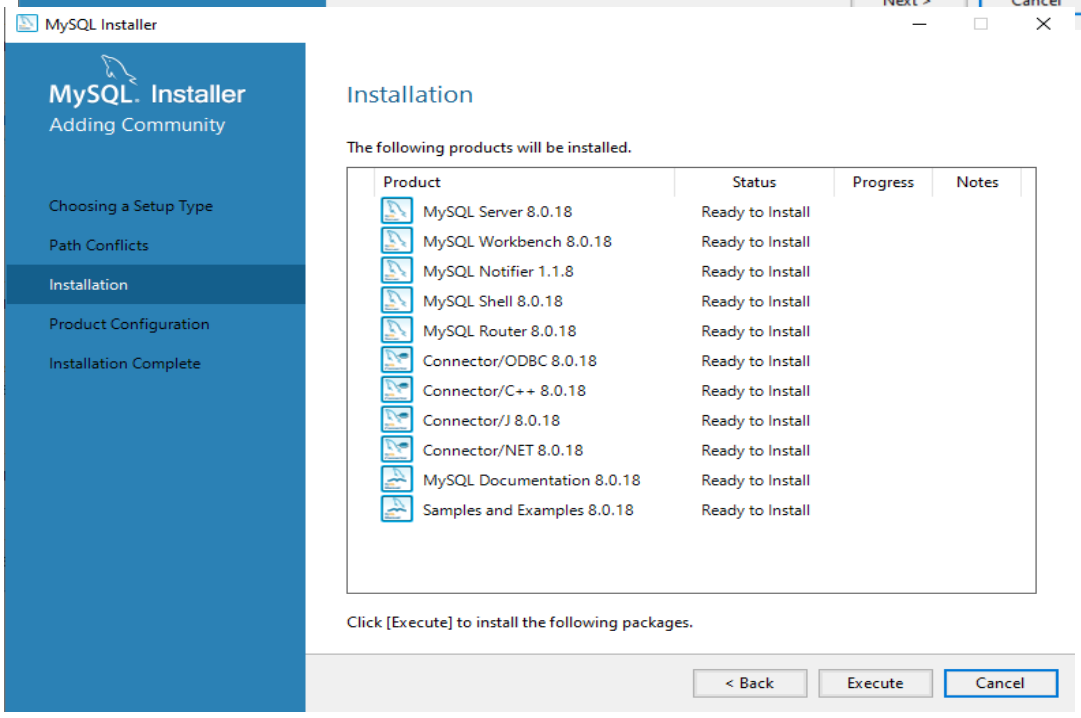


- Click on ***mysql-installer-community-8.0.19.0.msi*** then click *on* ***"no thanks, just start my download."***

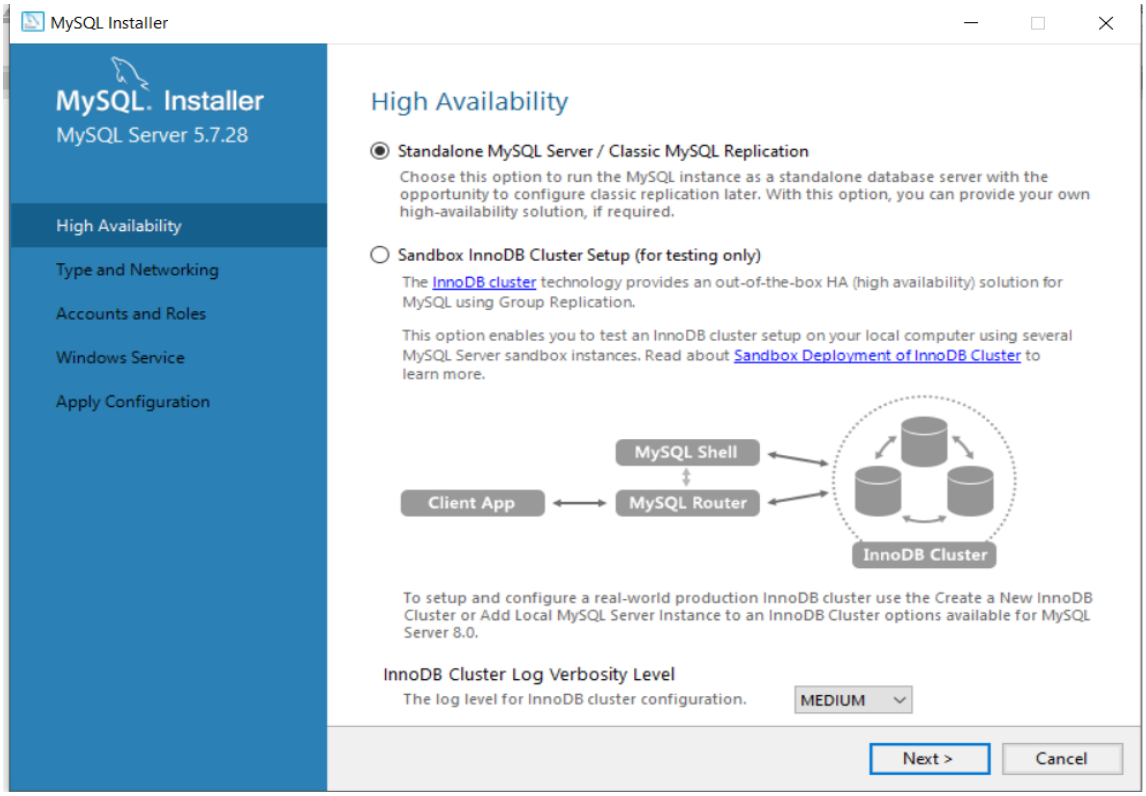


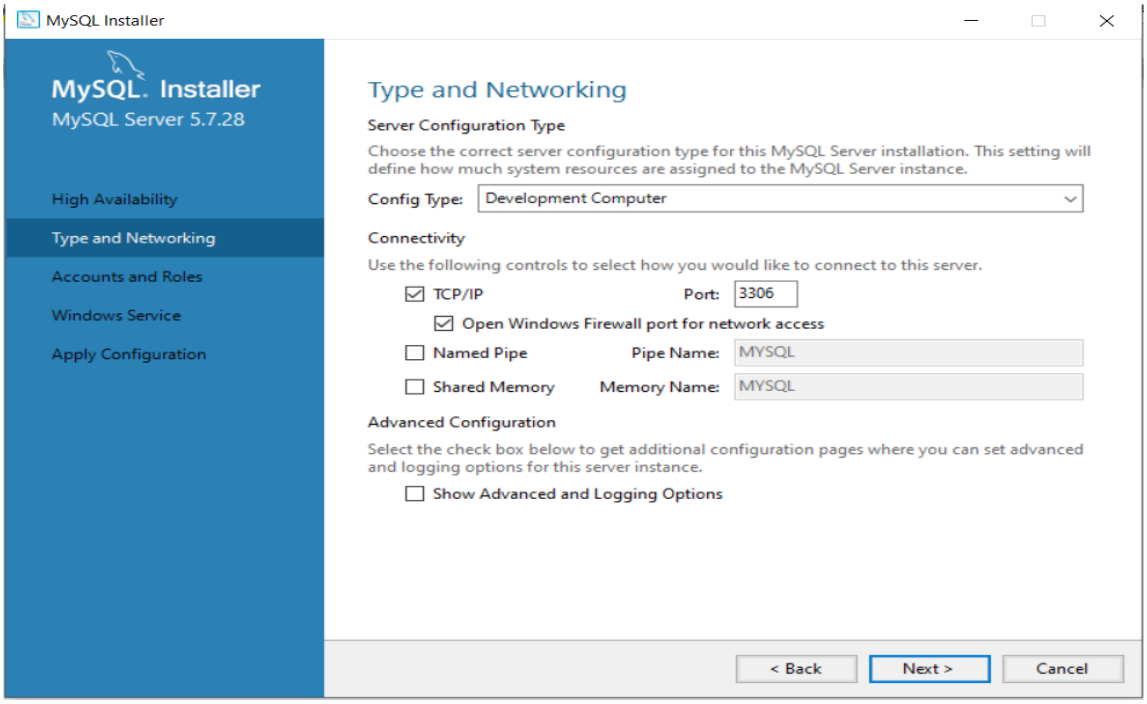
- Download will be start. Double Click on the downloaded file in order to start the installation.
- Run the setup. The following window will appear and click on next.



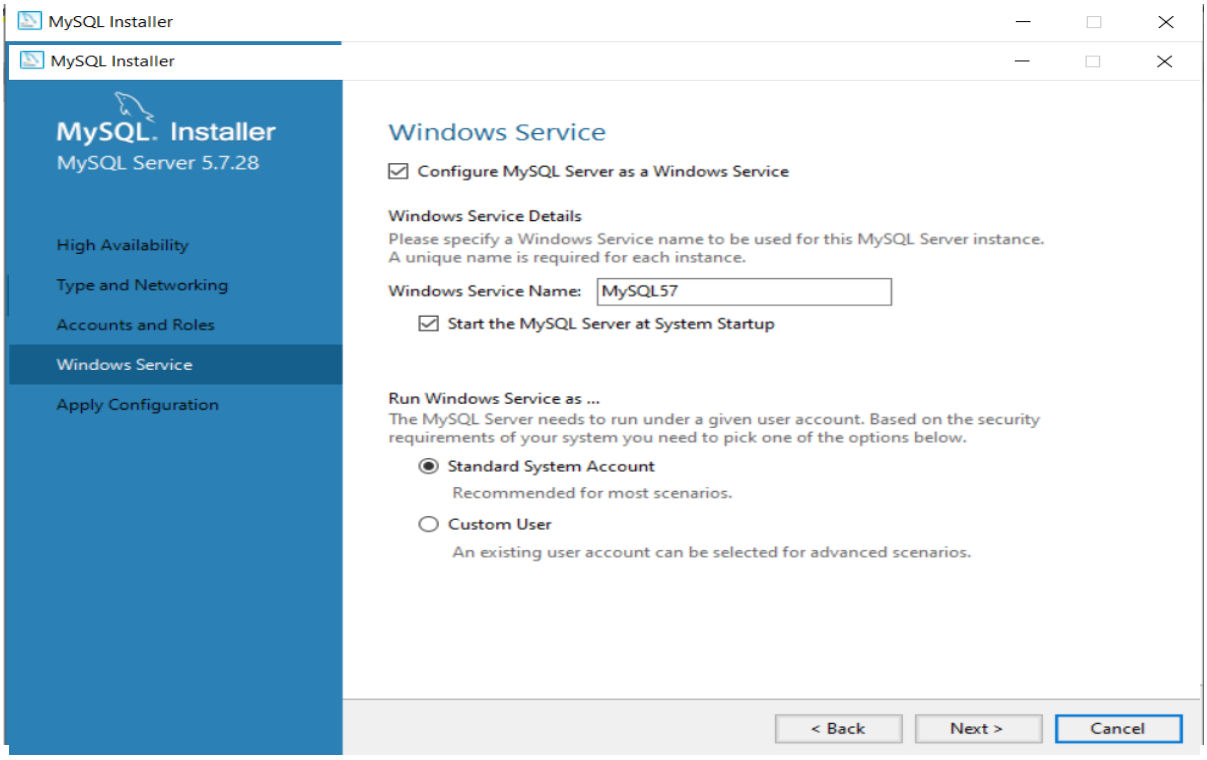


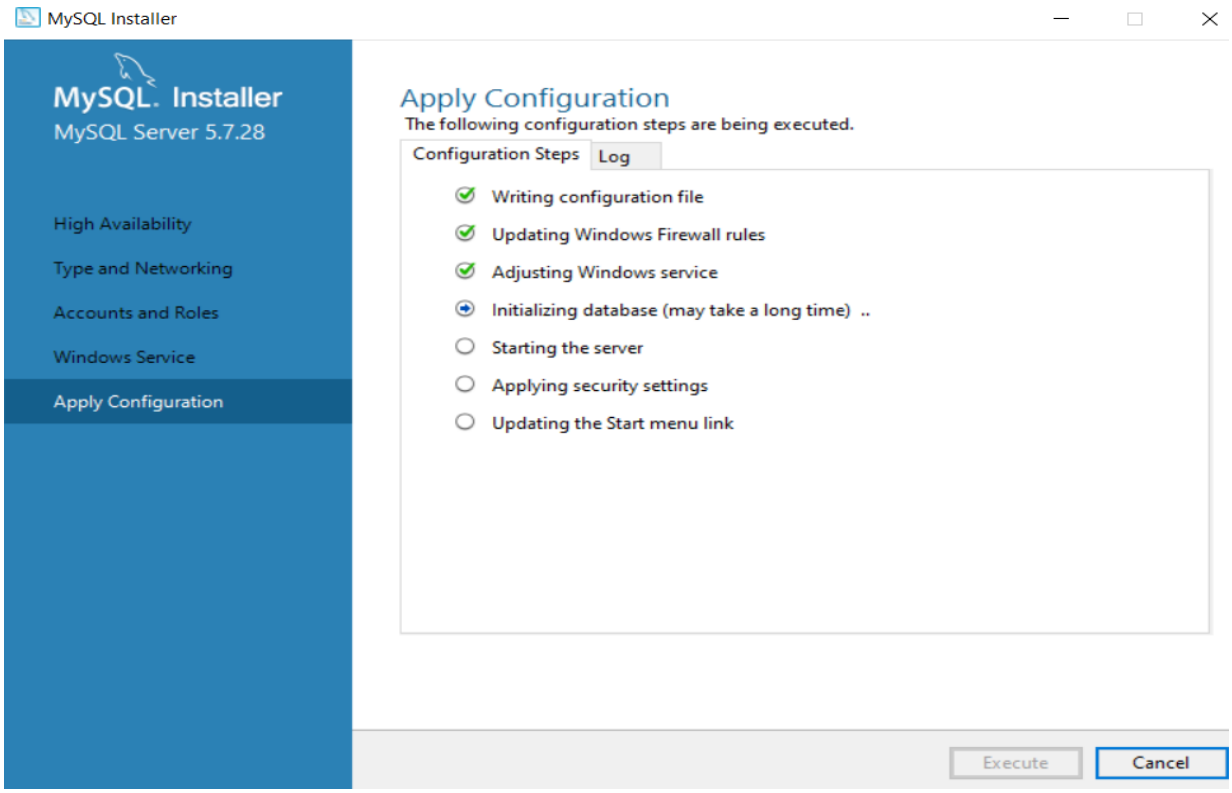
- Click on next.





- Enter a **strong** password and click next.

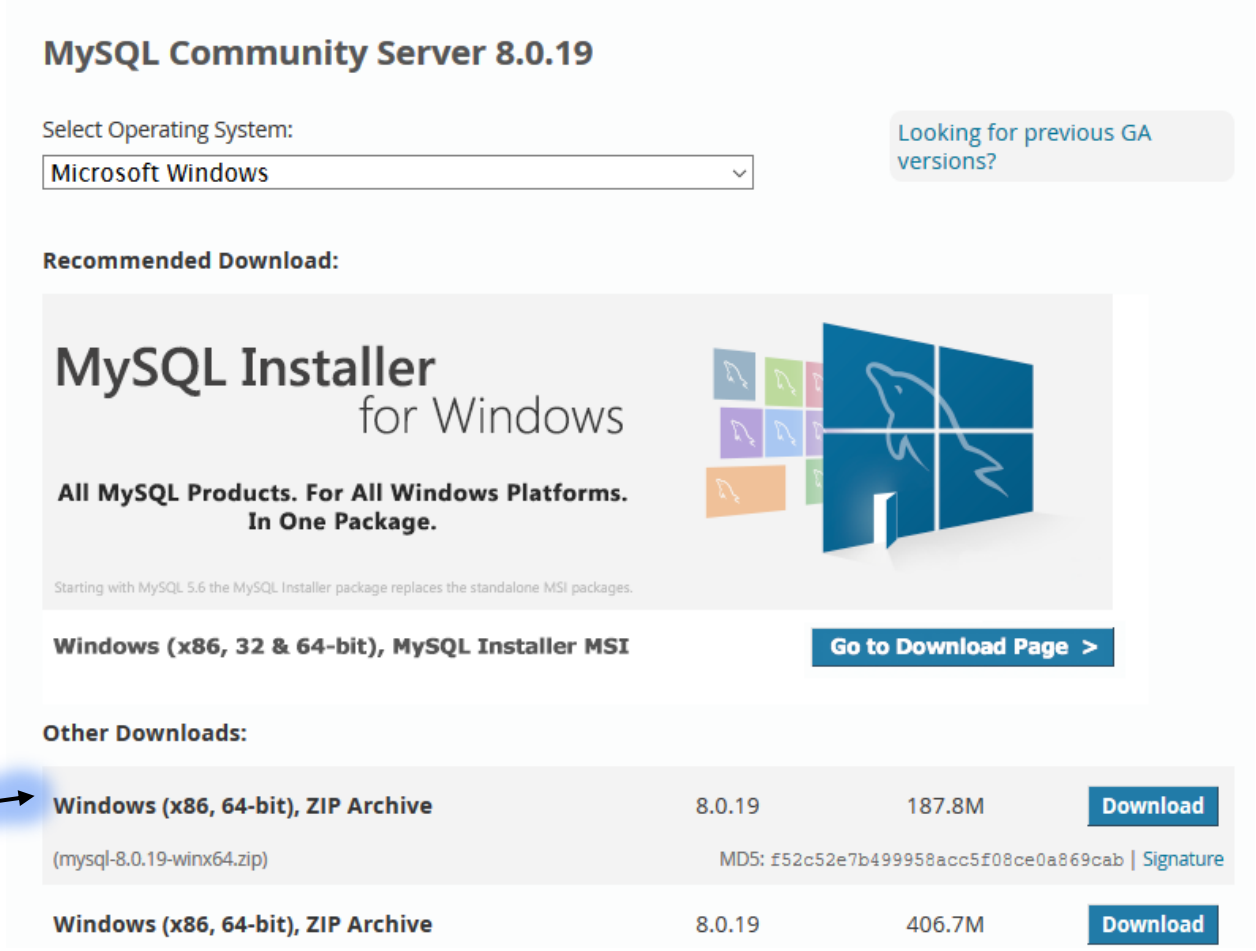




- Click Next

2nd Method to download and execute MYSQL Community server

1. Download MySQL Community Server ZIP ARCHIVE from https://dev.mysql.com/downloads/mysql/



- Under "General Available (GA) Releases" tab.
- Under "MySQL Community Server 8.0.{xx}", where {xx} is the latest update number ⇒ In "Select Operating System", choose "Microsoft Windows".
- Under "Other Downloads", download "**Windows (x86, 64-bit), ZIP ARCHIVE (mysql-8.0.{xx}-winx64.zip)**".
- Under "Begin your Download", there is NO need to "Login" or "Sign up" - Just click **"No thanks, just start my downloads!"**

2. UNZIP the downloaded file into your project directory "C:\DataWarehouse". MySQL will be unzipped as "c:\DataWarehouse**mysql**". Take note and remember your MySQL installed directory!!!

3. Start a CMD (as administrator) ("Search" button ⇒ Enter "cmd" ⇒ Right-Click on "Command Prompt" ⇒ Run as Administrator) and issue these commands.

// Change directory to the MySQL's binary directory

// Suppose that your MySQL is installed in " **c:\DataWarehouse\mysql** "

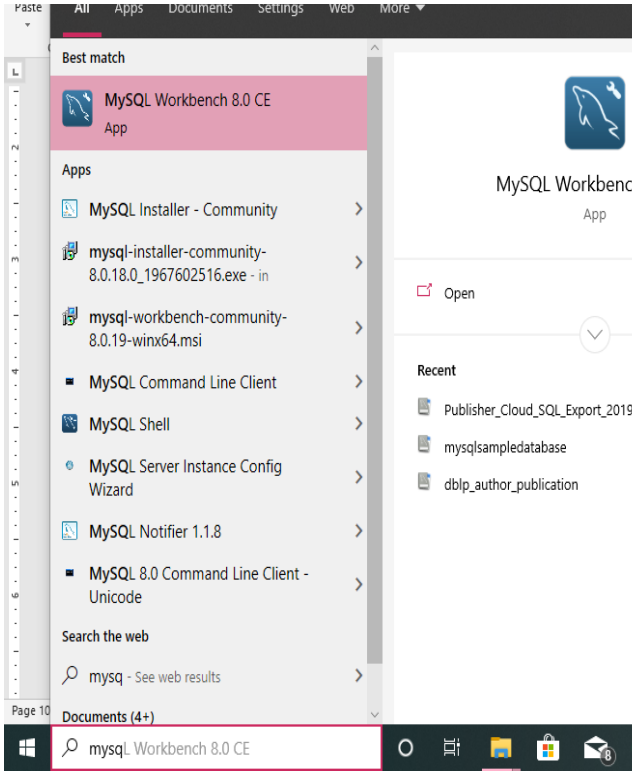
c:

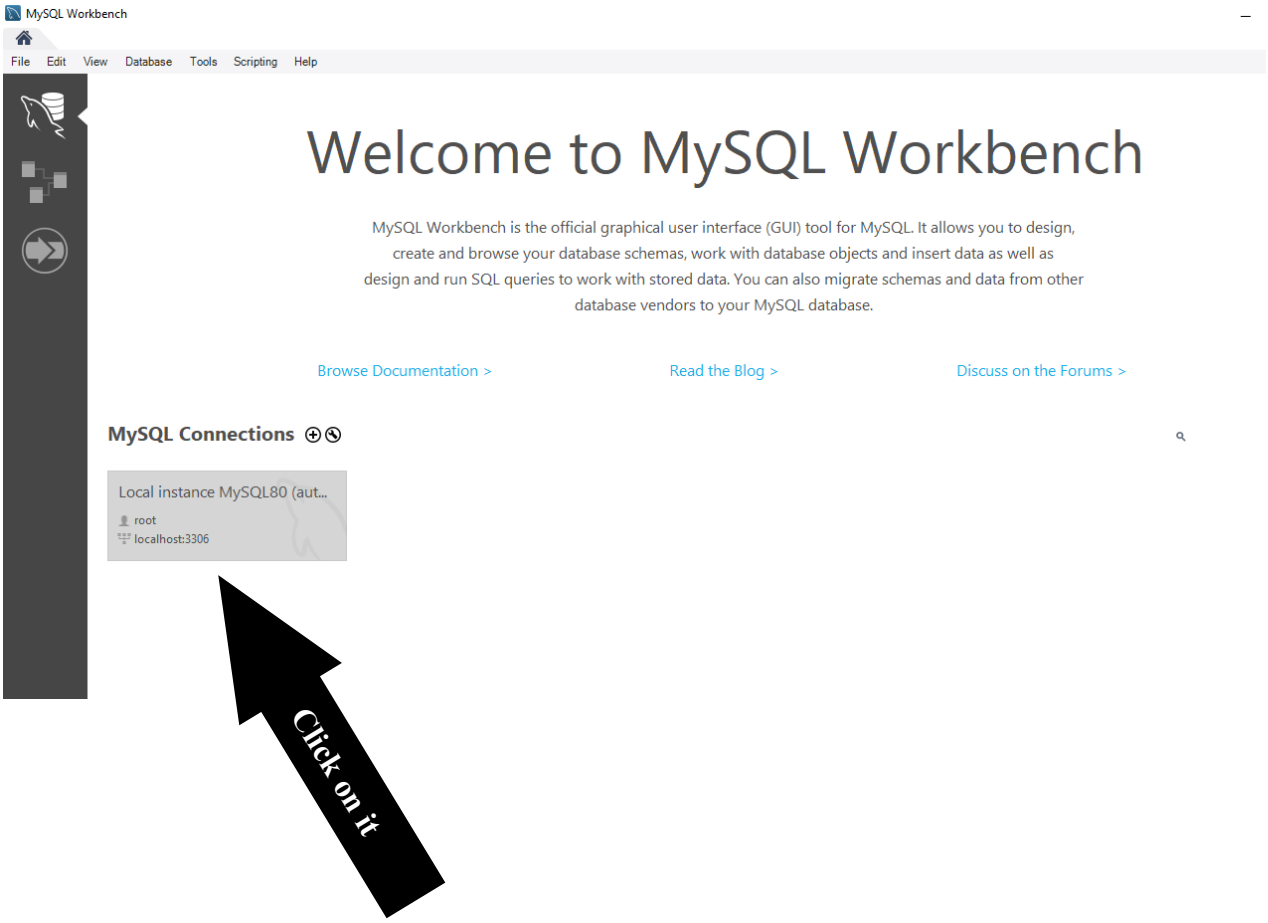
cd \DataWarehouse\mysql

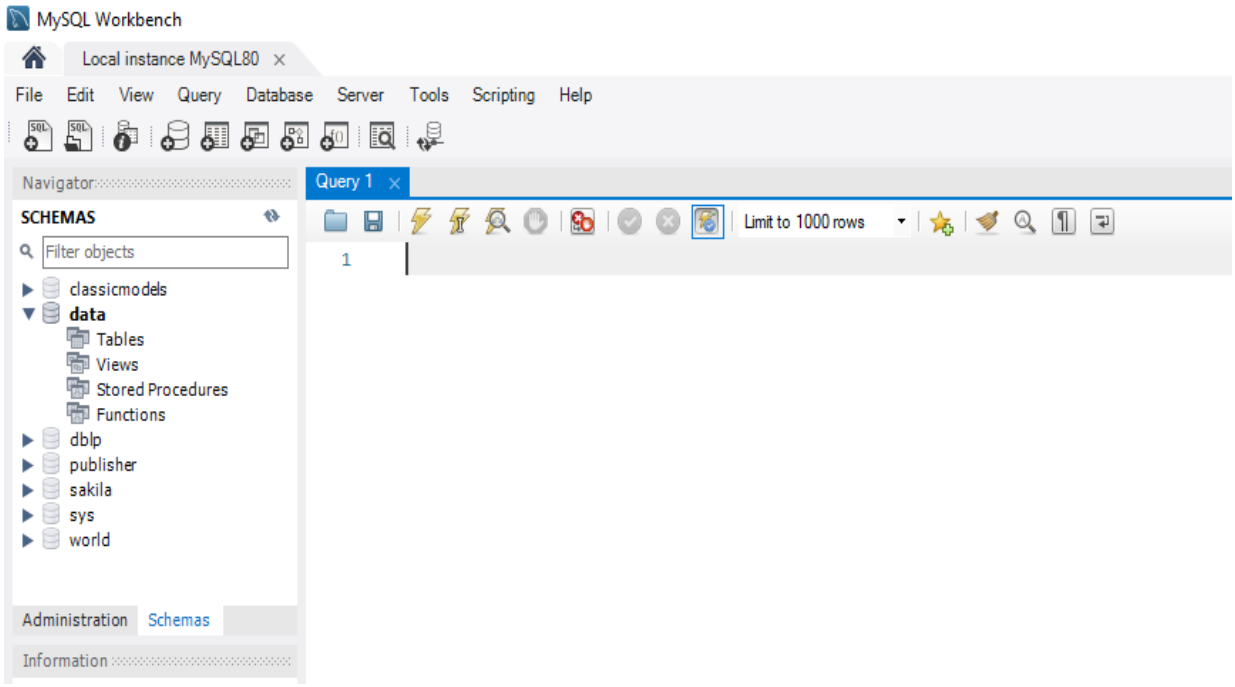
---

4. During the installation, a superuser called root is created with a temporary password, as shown above. **TAKE NOTE of the PASSWORD, COPY and save it somewhere, and TAKE A PICTURE!!!!**
5. If you make a mistake or forgot your password, DELETE the entire MySQL directory "C:\DataWarehouse\mysql", and REPEAT step 2 and 3.

- After installation. Go to the Start>MYSQL Workbench
- Click to open it.

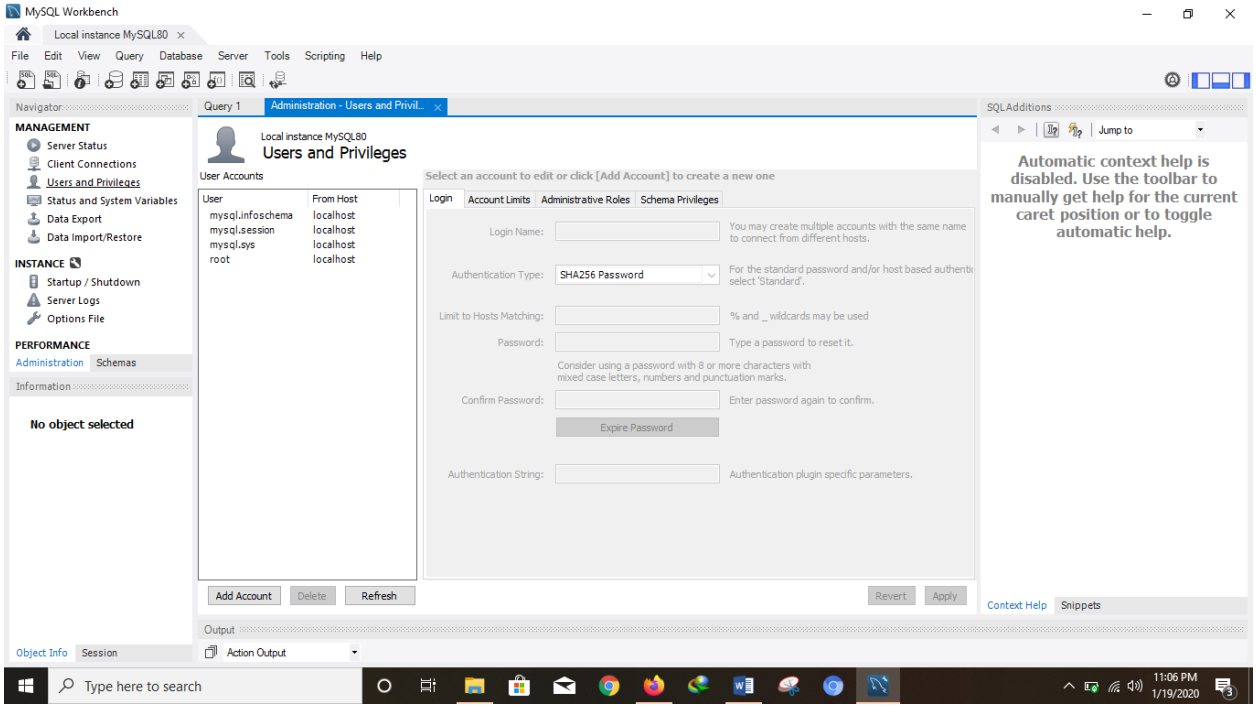



MySQL Workbench
File Edit View Database Tools Scripting Help
Welcome to MySQL Workbench
MySQL Workbench is the official graphical user interface (GUI) tool for MySQL. It allows you to design, create and browse your database schemas, work with database objects and insert data as well as design and run SQL queries to work with stored data. You can also migrate schemas and data from other database vendors to your MySQL database.
Browse Documentation >
Read the Blog >
Discuss on the Forums >
MySQL Connections
Local instance MySQL80 (aut...
root
localhost:3306
Click on it

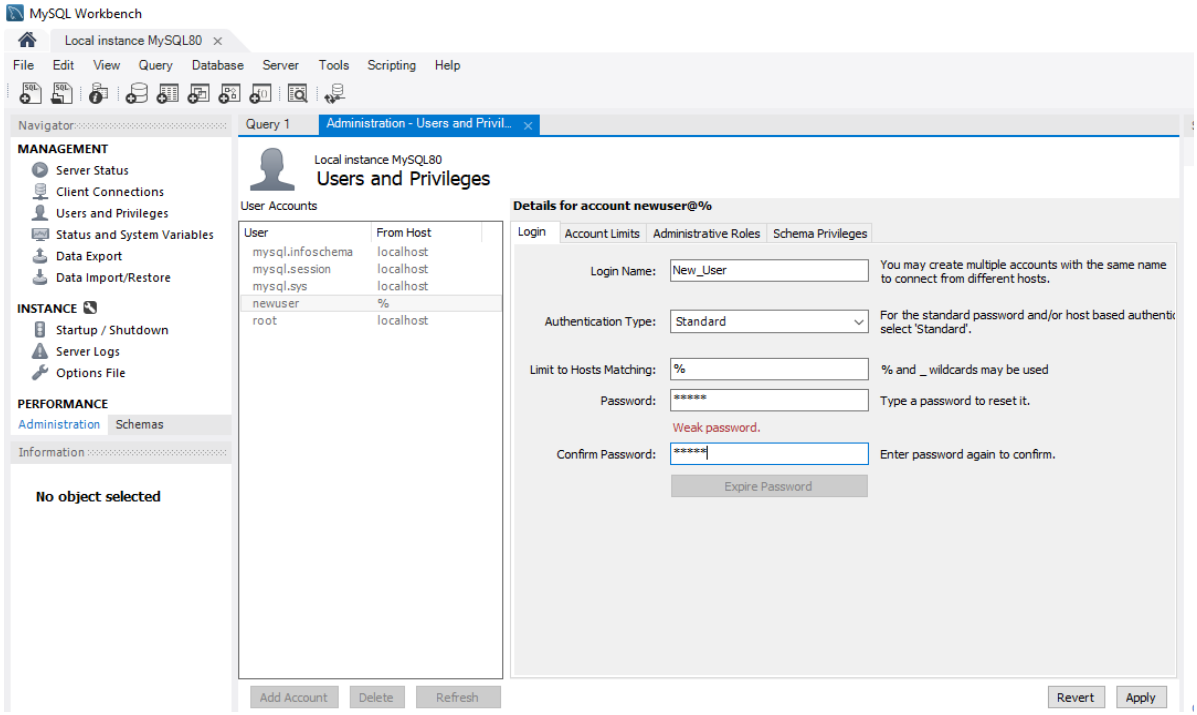

MySQL Workbench
Local instance MySQL80
File Edit View Query Database Server Tools Scripting Help
Navigator
SCHEMAS
Filter objects
classicmodels
data
Tables
Views
Stored Procedures
Functions
dblp
publisher
sakila
sys
world
Administration Schemas
Information
Query 1
Limit to 1000 rows
1

How to Add User:

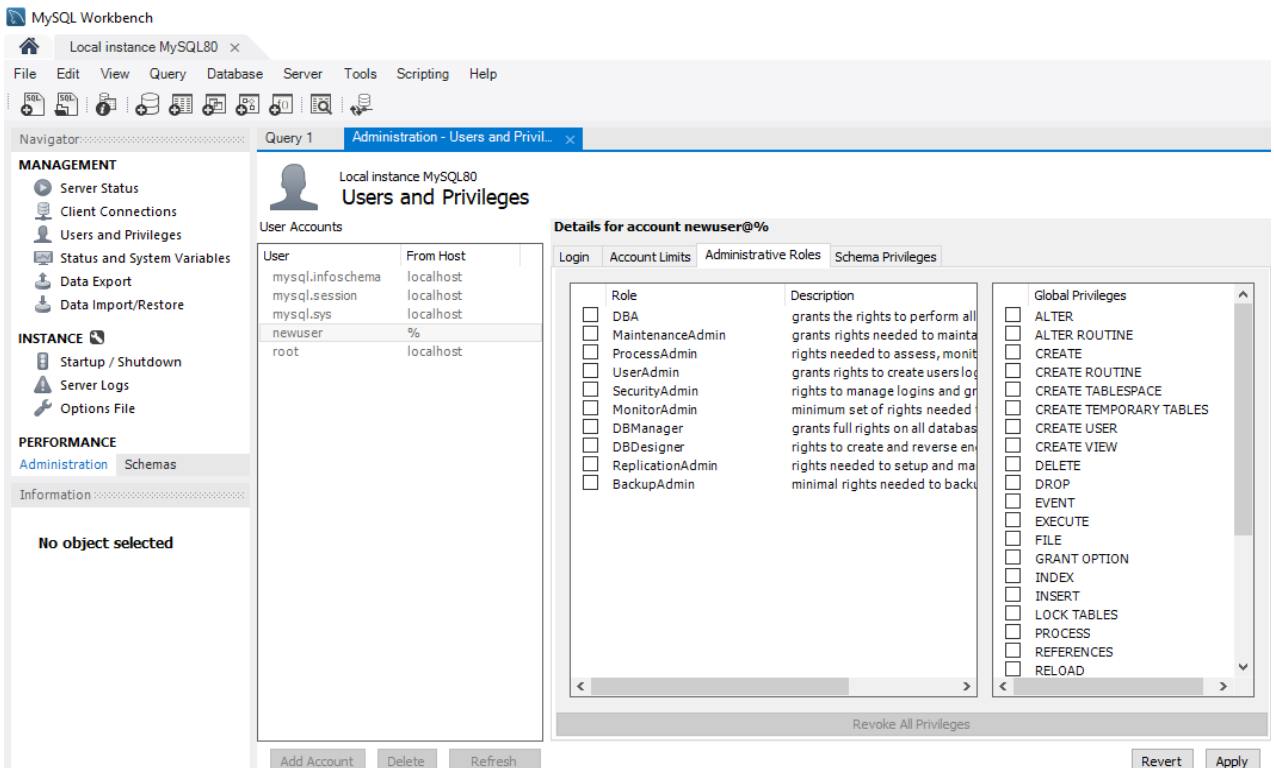
- Go to the ***Users and privileges*** option under MANAGEMENT



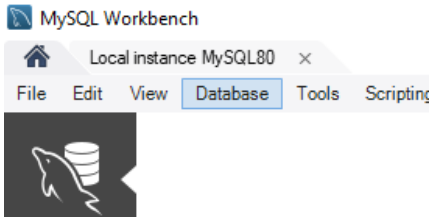
- Click on Add user. Enter User Name and password for the new connection



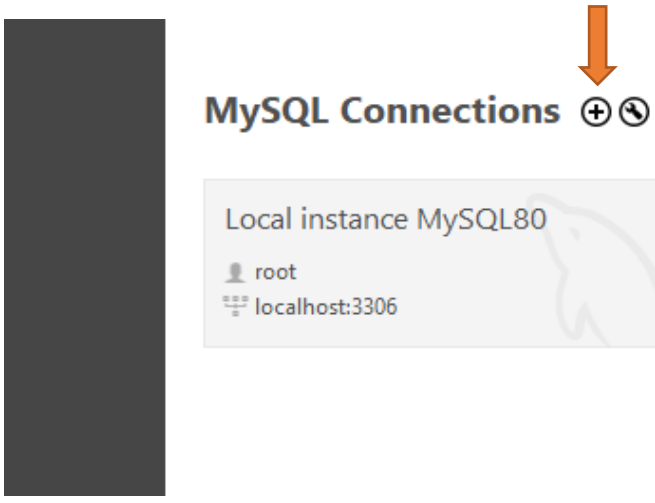
- Set privileges to the new user.



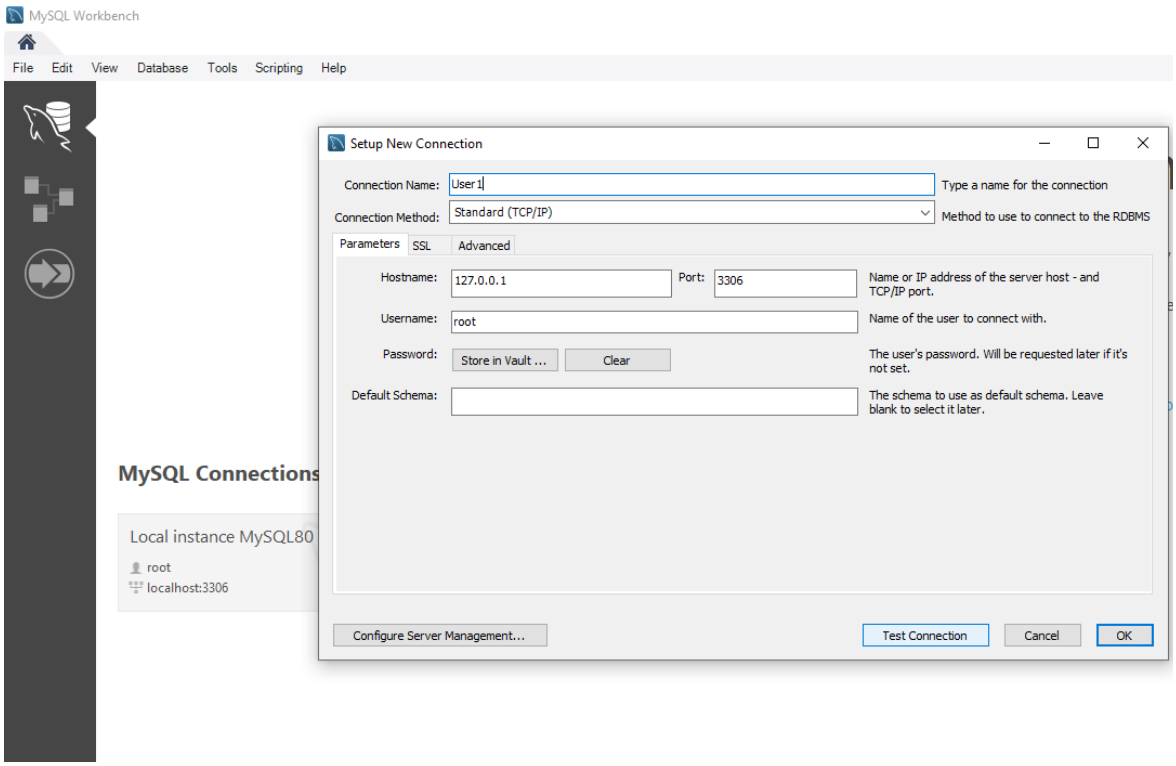
- Click “Apply”. For test the connection, Go to the home button on the top left corner



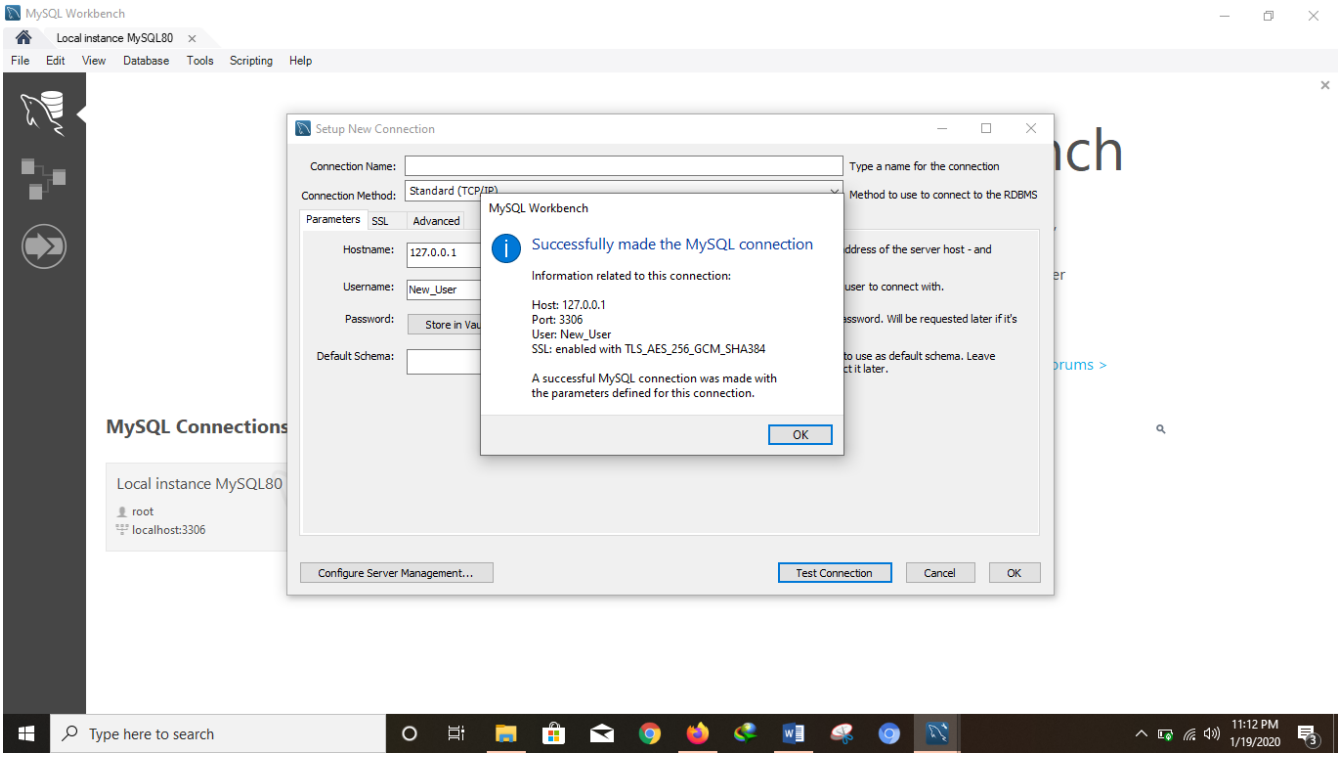
- Click on the + button on the existing connection.

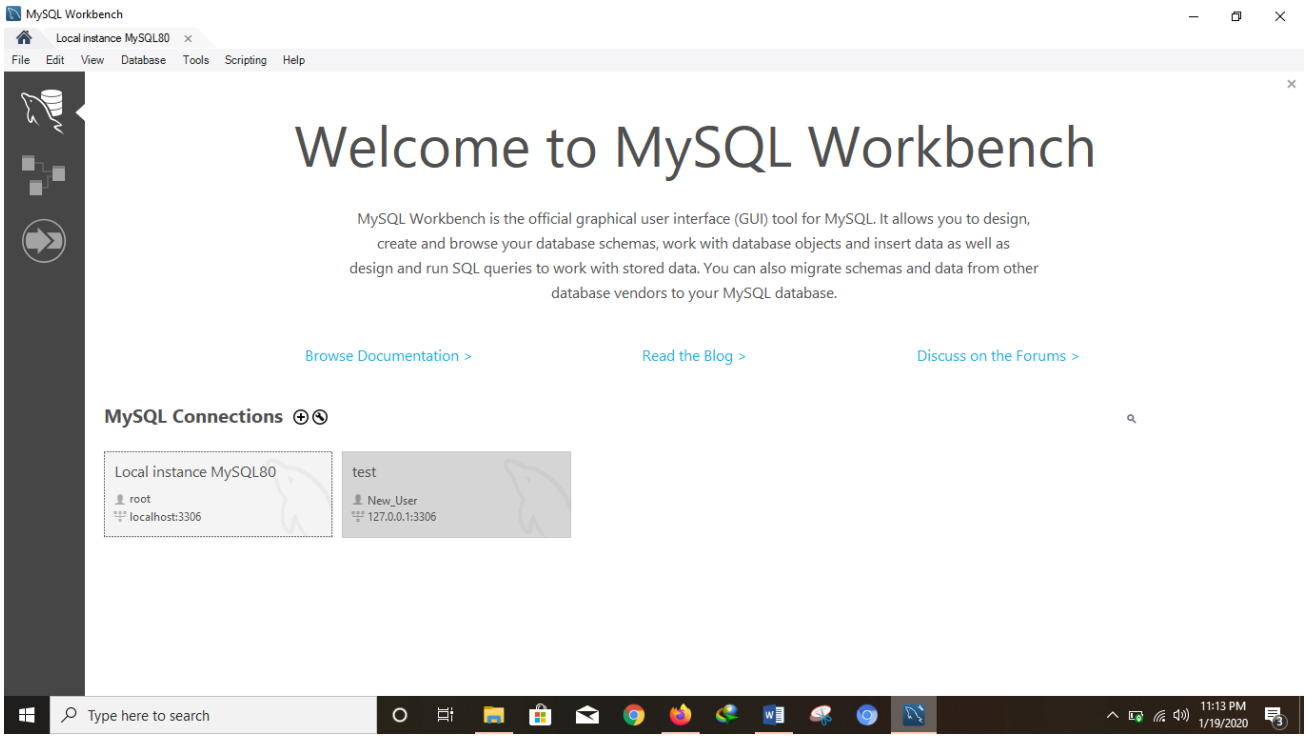


- Enter Connection name and remaining information and click on Test Connection.



- Enter password for the target user. And click ok. Connection will be established

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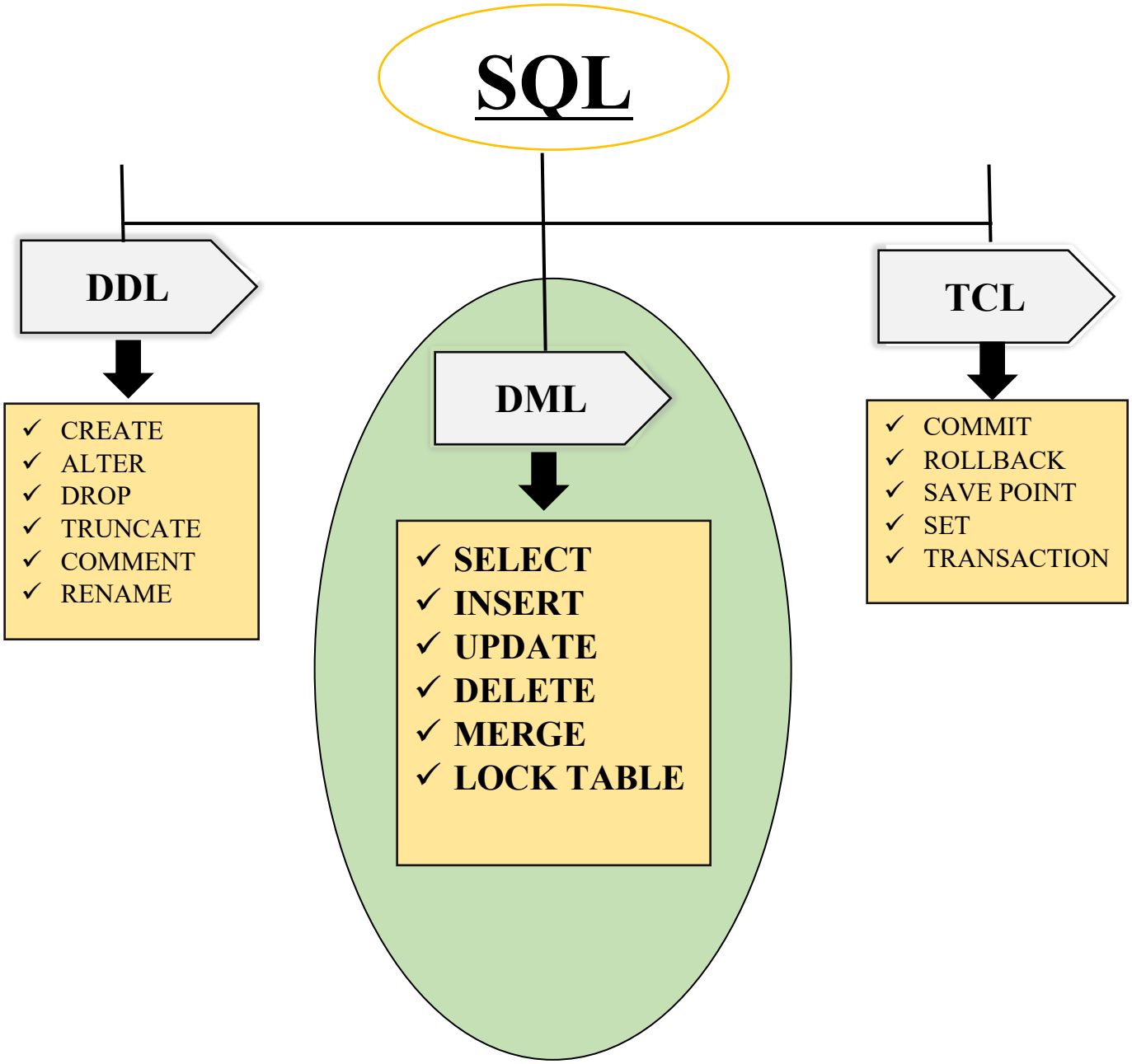
Browse Documentation >
Read the Blog >
Discuss on the Forums >
MySQL Connections
Local instance MySQL80
root
localhost:3306
test
New_User
127.0.0.1:3306
Type here to search
11:13 PM
1/19/2020

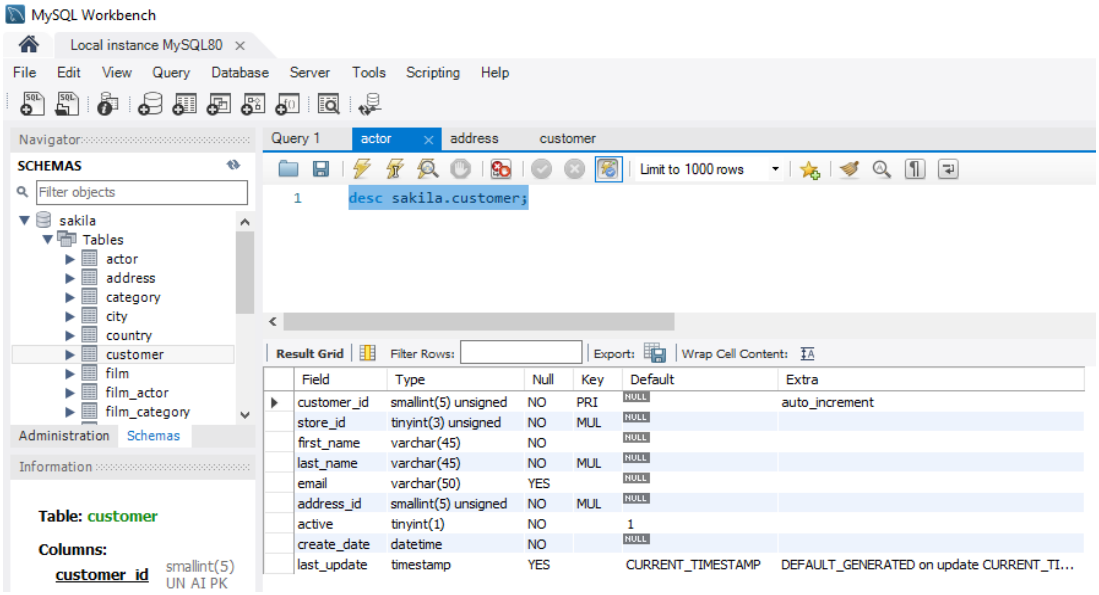
2. SQL SELECT statement

Structure Query Language (SQL)



Describing Table Schema: To see the schema of the table, type the following query

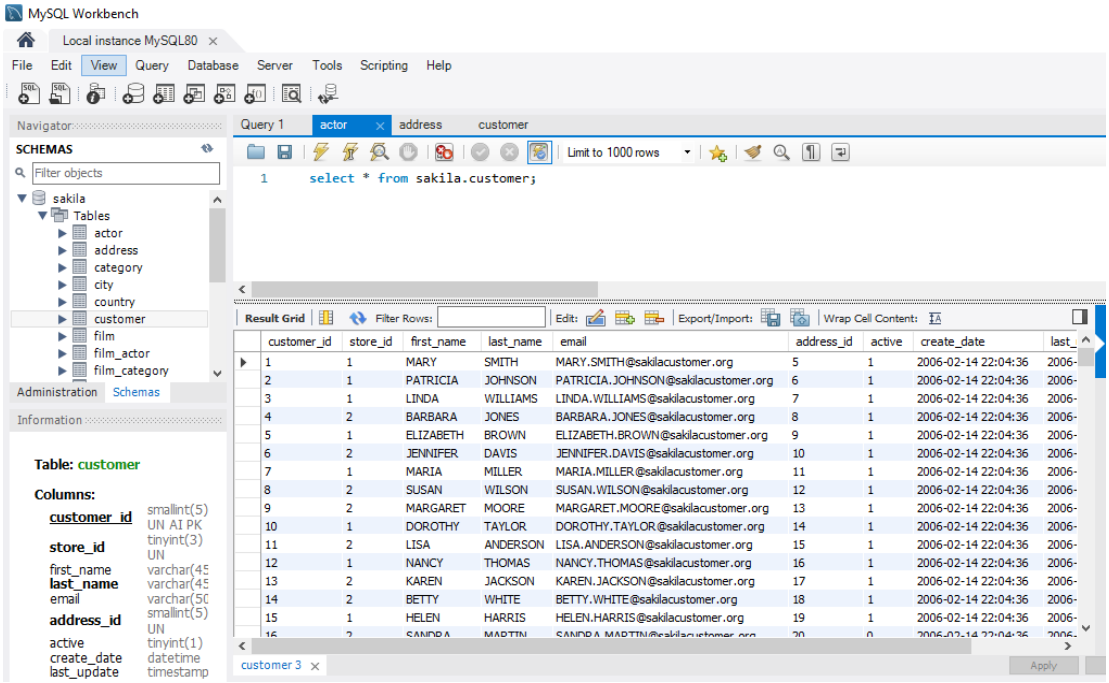
This output gives the attribute name, specify this attribute is null or not and also display the data type of the attribute.



SELECT

SELECT statement is used to fetch data from a database table.

Syntax: SELECT column_name(s) FROM table_name;

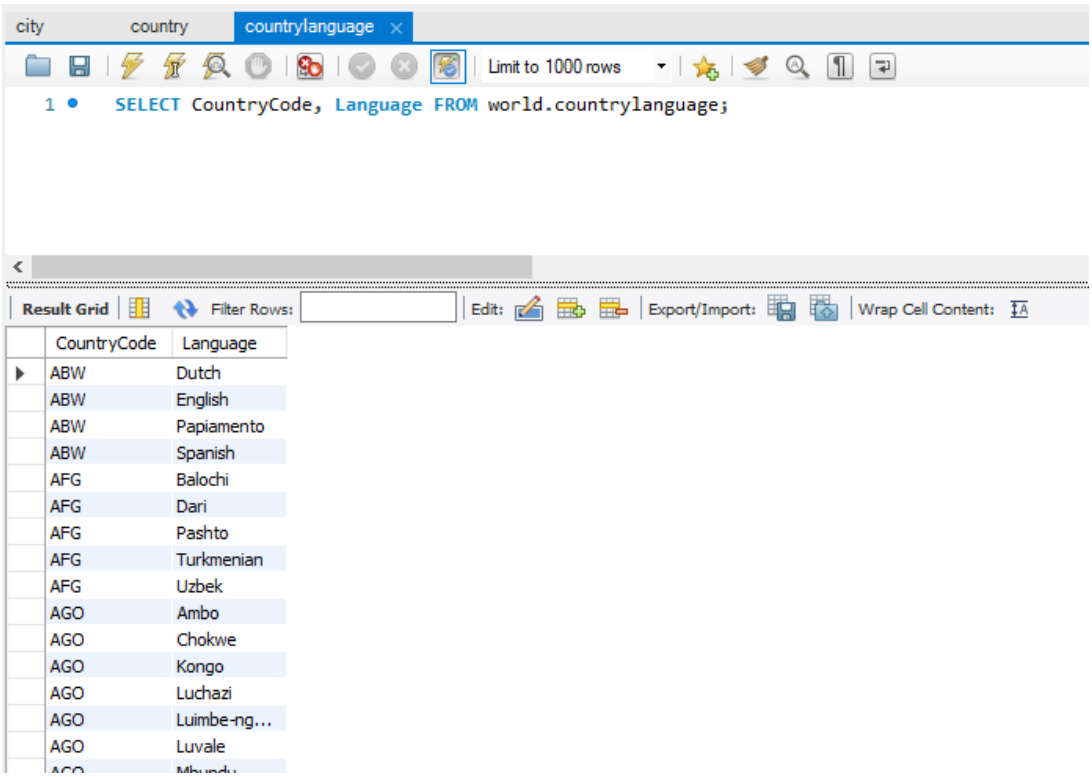


Select all columns:

The asterisk (*) in **select *** tells the database to return all the columns associated with the given table described in the **FROM** clause.

Selecting Specific Columns:

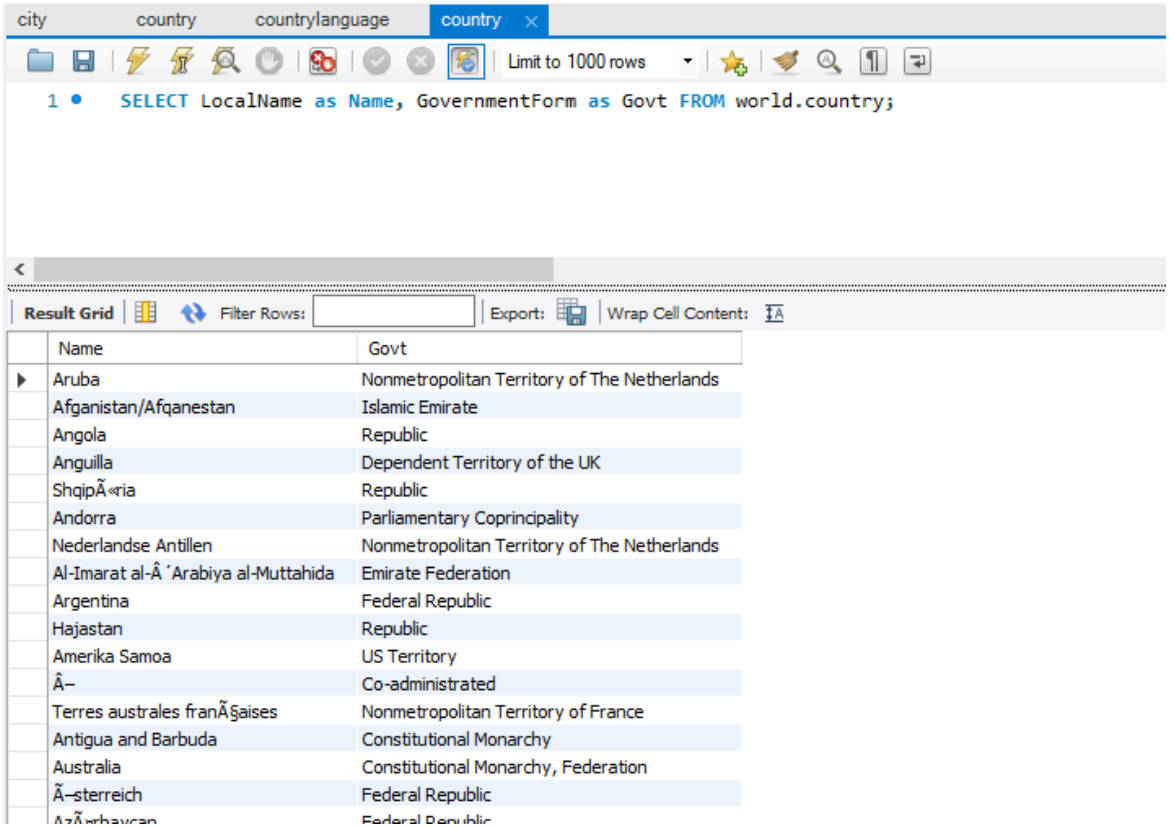
In the query example given below, each column name is listed in the SELECT clause.



CountryCode	Language
ABW	Dutch
ABW	English
ABW	Papiamento
ABW	Spanish
AFG	Balochi
AFG	Dari
AFG	Pashto
AFG	Turkmenian
AFG	Uzbek
AGO	Ambo
AGO	Chokwe
AGO	Kongo
AGO	Luchazi
AGO	Luimbe-ng...
AGO	Luvale

Defining Column Alias:

A column alias renames a column heading. It is useful with calculations immediately follows the column name (There can also be the optional AS keyword between the column name and alias.) It requires double quotation marks if it contains spaces or special characters or if it is case-sensitive.



Name	Govt
Aruba	Nonmetropolitan Territory of The Netherlands
Afganistan/Afqanestan	Islamic Emirate
Angola	Republic
Anguilla	Dependent Territory of the UK
ShqipÃ«ria	Republic
Andorra	Parliamentary Coprincipality
Nederlandse Antillen	Nonmetropolitan Territory of The Netherlands
Al-Imarat al-Â´Arabiya al-Muttahida	Emirate Federation
Argentina	Federal Republic
Hajastan	Republic
Amerika Samoa	US Territory
Â–	Co-administrated
Terres australes franÃ§aises	Nonmetropolitan Territory of France
Antigua and Barbuda	Constitutional Monarchy
Australia	Constitutional Monarchy, Federation
Ã–sterreich	Federal Republic
AzÃ¤rbaycan	Federal Republic

Where Clause

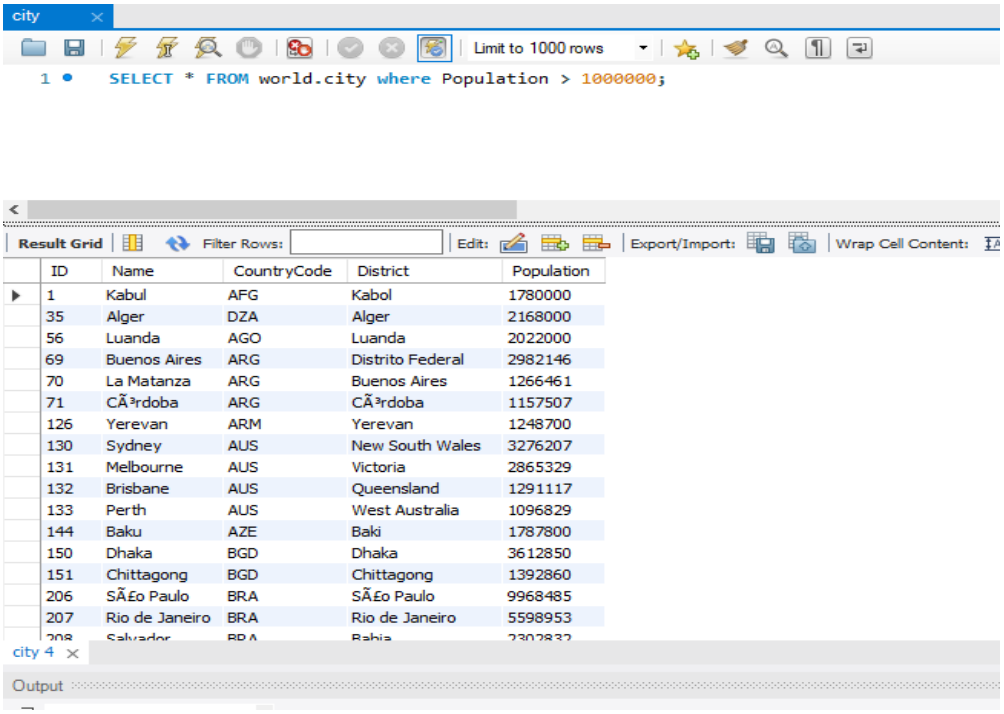
The WHERE clause is used to filter records at the time of SELECT.

Syntax: SELECT [*] FROM [Table Name] WHERE [condition(s)]

- WHERE clause can be used to apply various comma separated condition, in one or more tables.
- Using the WHERE clause to select the specified condition.
- Specific conditions using AND or OR operators

Operator	Meaning
=	Equal to
>	Greater than
>=	Greater than or equal to
<	Less than
<=	Less than or equal to
<>	Not equal to
BETWEEN ...AND...	Between two values (inclusive)

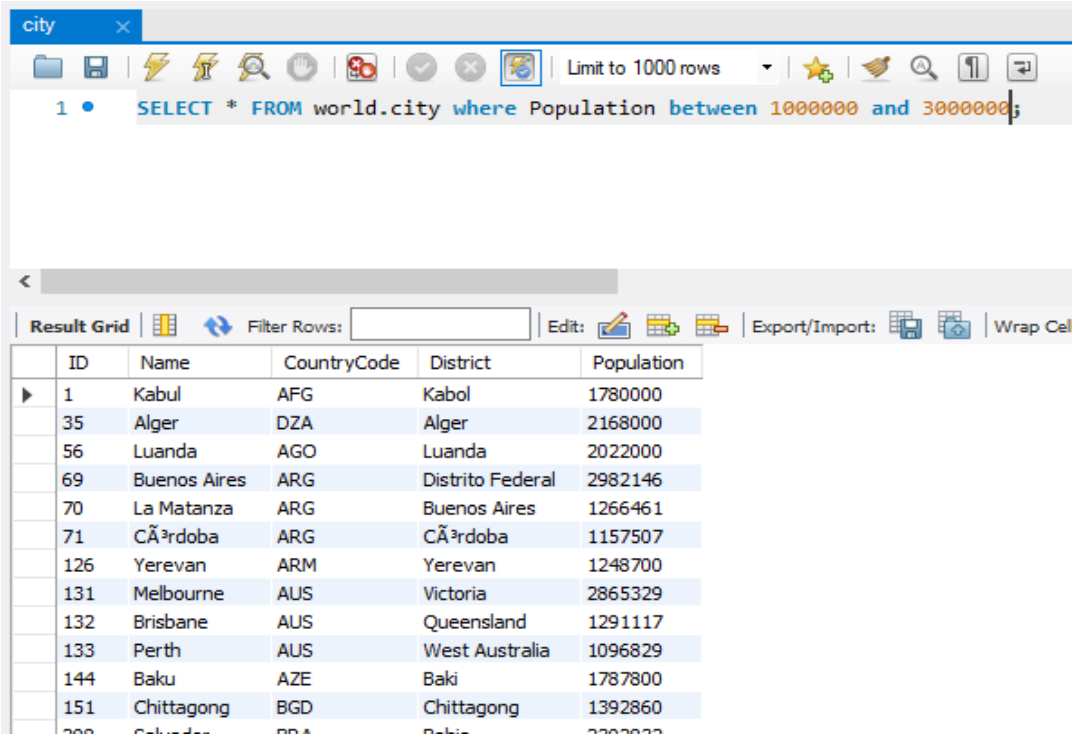
IN (set)	Match any of a list of values
LIKE	Match a character pattern
IS NULL	Is a null value



In the above example, select the records of only those countries whose population is greater than equal to 1000000.

Using BETWEEN condition:

BETWEEN condition is used to display the rows based on a range of values given in query



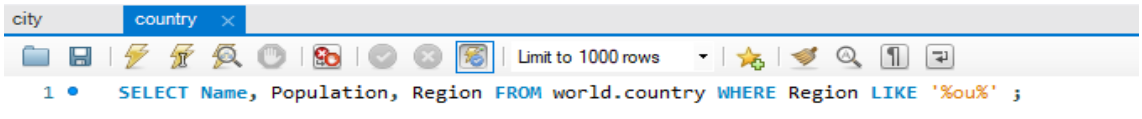
ID	Name	CountryCode	District	Population
1	Kabul	AFG	Kabol	1780000
35	Alger	DZA	Alger	2168000
56	Luanda	AGO	Luanda	2022000
69	Buenos Aires	ARG	Distrito Federal	2982146
70	La Matanza	ARG	Buenos Aires	1266461
71	CÃ³rdoba	ARG	CÃ³rdoba	1157507
126	Yerevan	ARM	Yerevan	1248700
131	Melbourne	AUS	Victoria	2865329
132	Brisbane	AUS	Queensland	1291117
133	Perth	AUS	West Australia	1096829
144	Baku	AZE	Baki	1787800
151	Chittagong	BGD	Chittagong	1392860

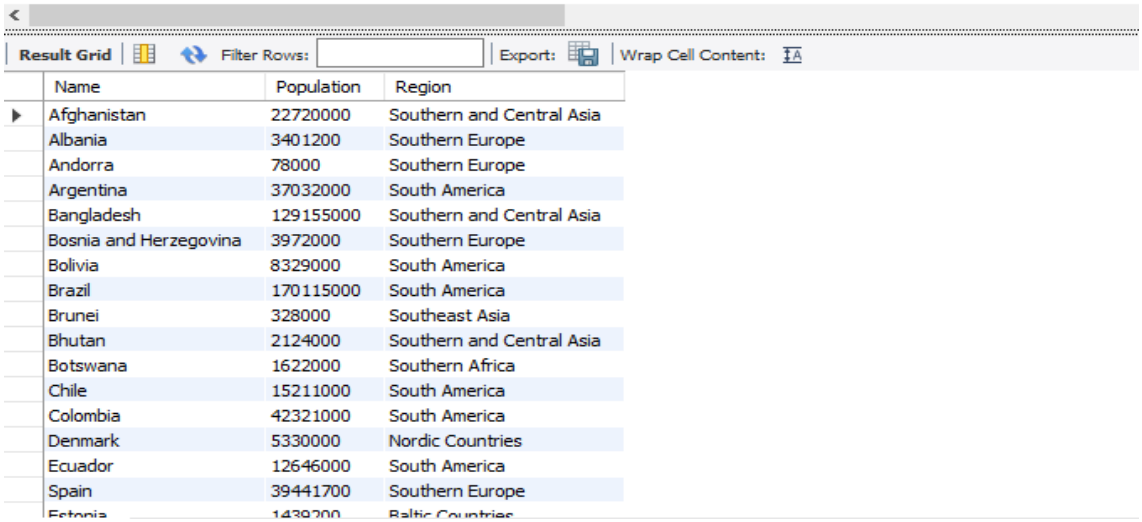
Using LIKE condition:

LIKE condition is used to perform searches of valid search string values. Search conditions can contain either literal characters or numbers. Like condition includes some symbols: % is used to denote zero or many characters, while _ represent one character.

LIKE Operator	Description
WHERE District LIKE 'a%'	Finds any values that start with "a"
WHERE District LIKE '%a'	Finds any values that end with "a"
WHERE District LIKE '%or%'	Finds any values that have "or" in any position
WHERE District LIKE '_r%	Finds any values that have "r" in the second position
WHERE District LIKE 'a__%'	Finds any values that start with "a" and are at least 3 characters in length
WHERE District LIKE 'a%o'	Finds any values that start with "a" and ends with "o"

The mentioned Query shows the Name, Population and Region where Region name have “ou” on any location.



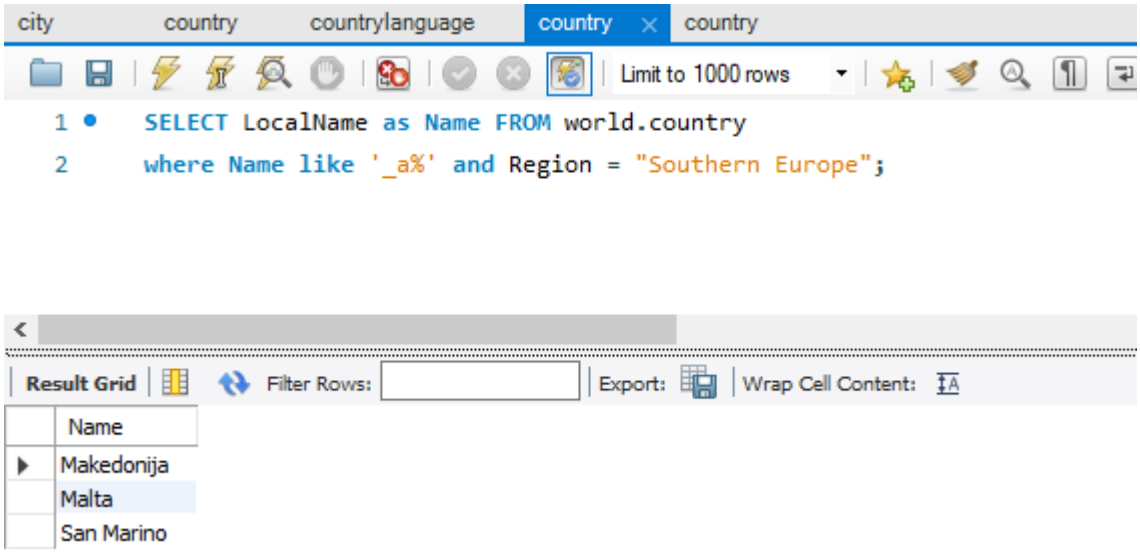


Name	Population	Region
Afghanistan	22720000	Southern and Central Asia
Albania	3401200	Southern Europe
Andorra	78000	Southern Europe
Argentina	37032000	South America
Bangladesh	129155000	Southern and Central Asia
Bosnia and Herzegovina	3972000	Southern Europe
Bolivia	8329000	South America
Brazil	170115000	South America
Brunei	328000	Southeast Asia
Bhutan	2124000	Southern and Central Asia
Botswana	1622000	Southern Africa
Chile	15211000	South America
Colombia	42321000	South America
Denmark	5330000	Nordic Countries
Ecuador	12646000	South America
Spain	39441700	Southern Europe
Estonia	1439200	Baltic Countries

Logical Conditions:

Operator	Meaning
AND	Returns TRUE if *both* component conditions are true
OR	Returns TRUE if *either* component condition is true
NOT	Returns TRUE if the following condition is false

Using the AND Operator:
AND operator is used to perform logical comparisons. AND operator indicates that it gives true result when both conditions are true.

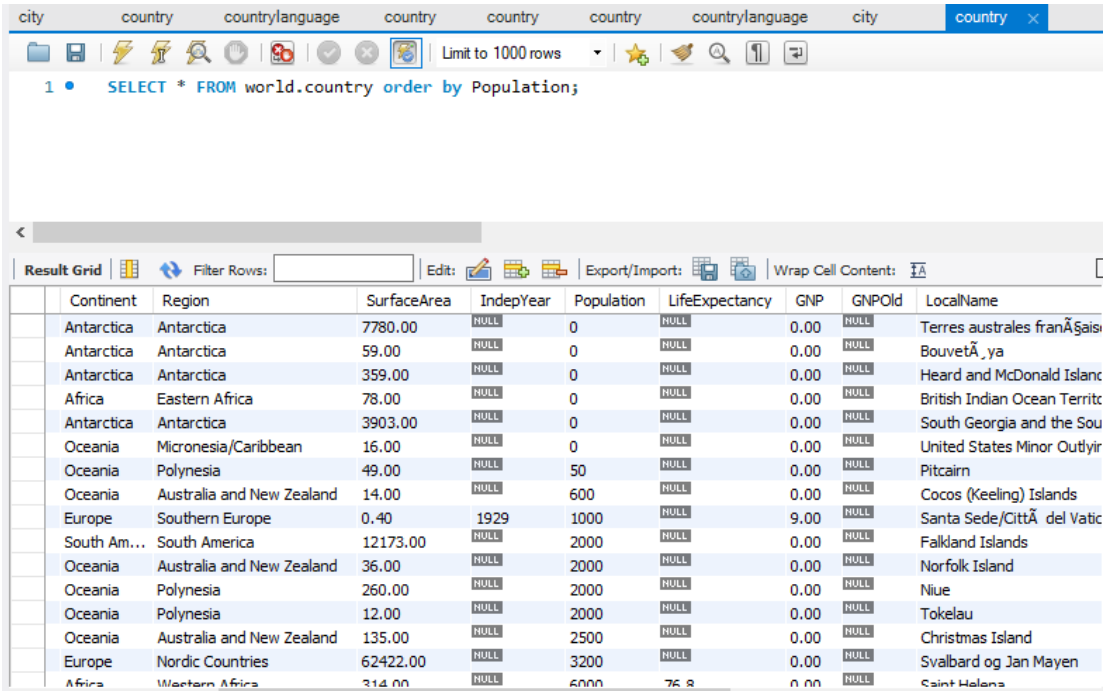


In the above example, select Name of those Countries whose name contain ‘a’ at second position and Region is Southern Europe.

ORDER BY Clause:

ORDER BY clause is used to sort retrieved rows with the ORDER BY clause. The ORDER BY clause comes last in the SELECT statement. By default, it is in ascending order, but you can change it in descending order. Following symbols are used:

- ASC: ascending order, default
- DESC: descending order



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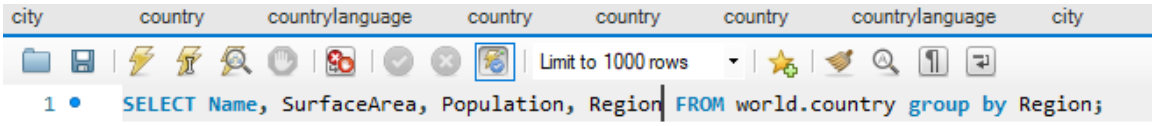
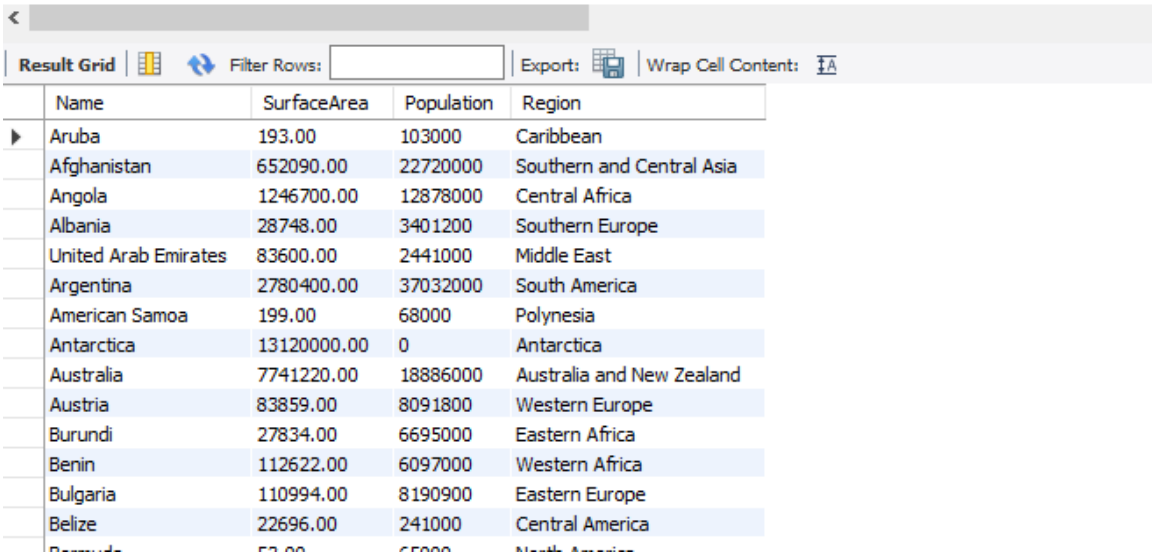
Group BY Clause:

The GROUP BY statement groups rows that have the same values into summary rows, like "find the number of customers in each country".

The GROUP BY statement is often used with aggregate functions (COUNT, MAX, MIN, SUM, AVG) to group the result-set by one or more columns.





Name	SurfaceArea	Population	Region
Aruba	193.00	103000	Caribbean
Afghanistan	652090.00	22720000	Southern and Central Asia
Angola	1246700.00	12878000	Central Africa
Albania	28748.00	3401200	Southern Europe
United Arab Emirates	83600.00	2441000	Middle East
Argentina	2780400.00	37032000	South America
American Samoa	199.00	68000	Polynesia
Antarctica	13120000.00	0	Antarctica
Australia	7741220.00	18886000	Australia and New Zealand
Austria	83859.00	8091800	Western Europe
Burundi	27834.00	6695000	Eastern Africa
Benin	112622.00	6097000	Western Africa
Bulgaria	110994.00	8190900	Eastern Europe
Belize	22696.00	241000	Central America

3. SQL Joins and sub Queries

Displaying Data from Multiple Tables (Joins):

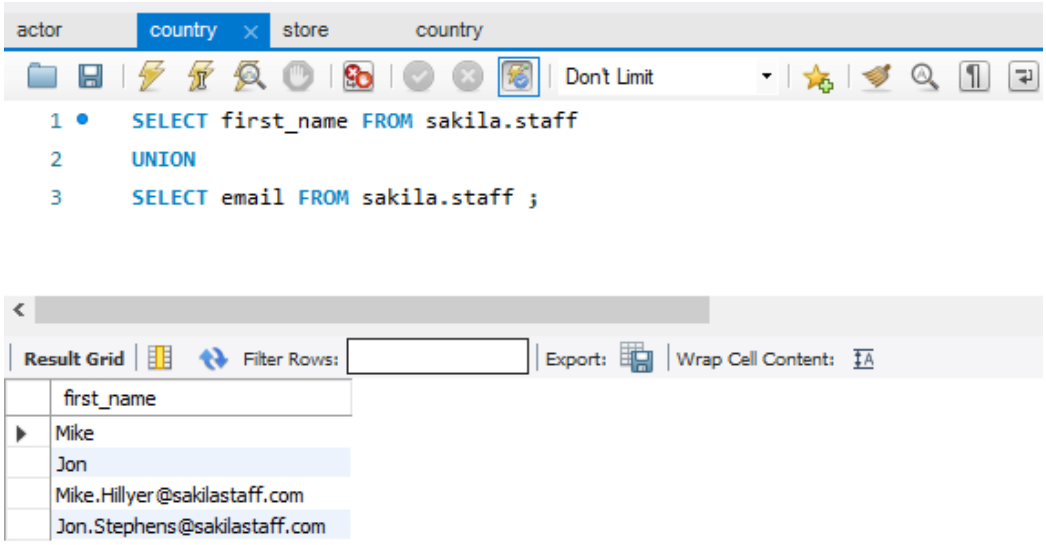
In this lab, we will explore how to write a SELECT statement to access data from more than one table using different types of joins.

1 SQL UNION Clause

- UNION combines the result sets of two queries.
- Column data types in the two queries must match.
- UNION combines by column position rather than column name.

```
SELECT column-names

FROM table-name

UNION

SELECT column-names

FROM table-name
```

Example:



Join

Join is used to query data from more than one table. Rows in one table can be joined to rows in another table according to common values existing in corresponding columns, that is usually primary and foreign key columns.'

Types of Join

- Inner Join
- Outer join
- Self join
- Cross join

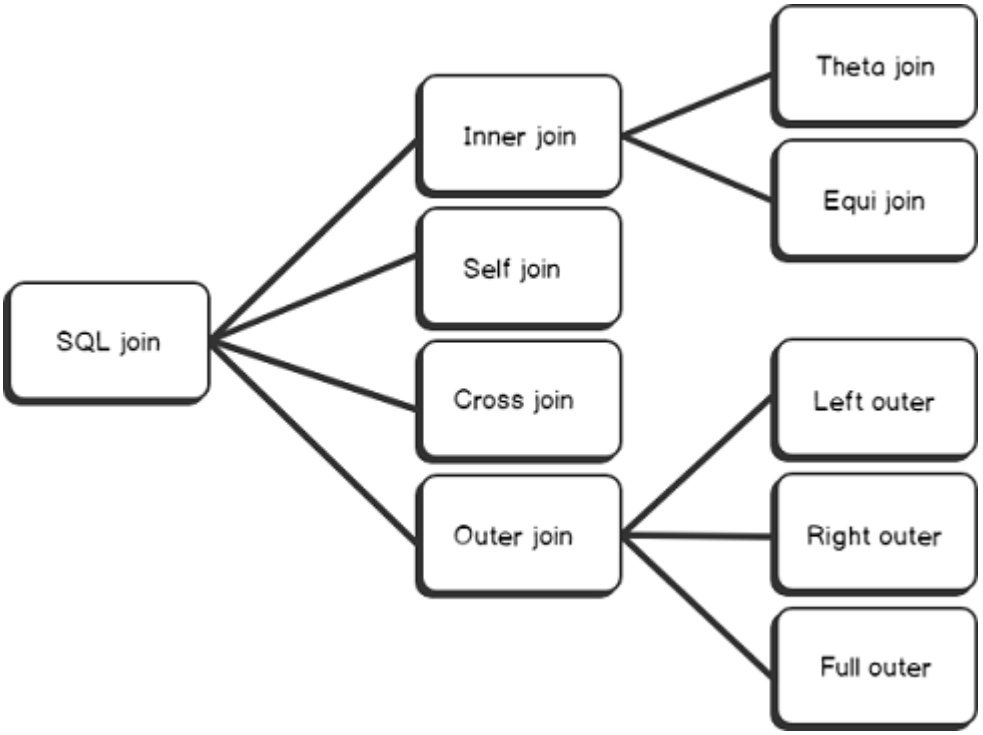
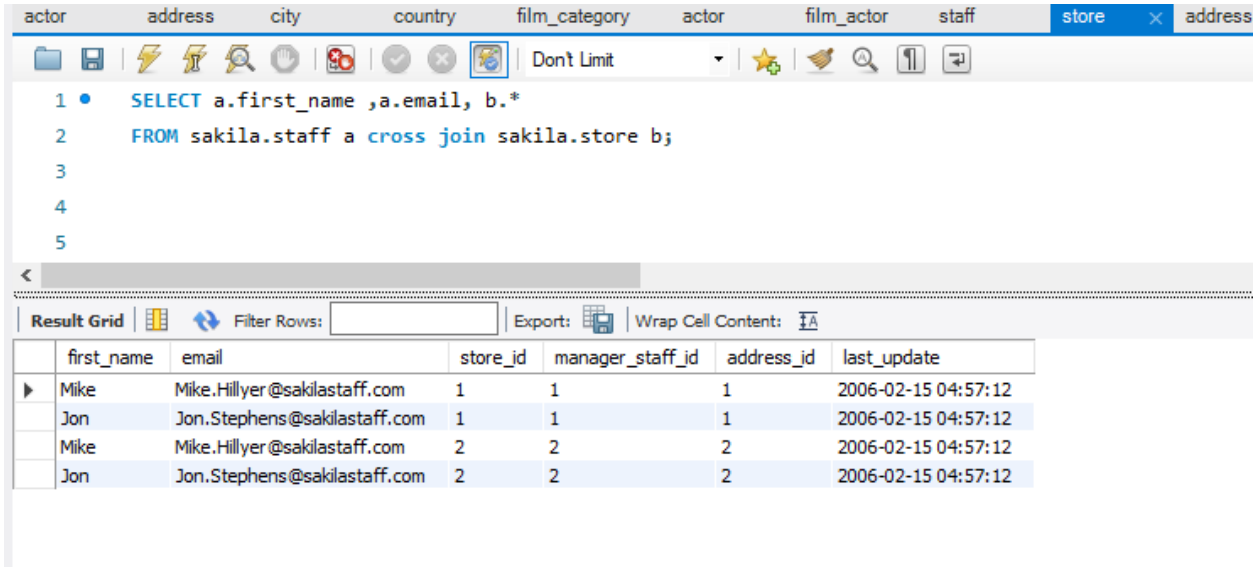


Fig 1: Types of Joins

Cartesian Product / Cross Join

A cartesian product is formed when all rows in the first table are joined to all rows in the second table , and when join condition is omitted or invalid. Cartesian products are useful for some tests when you need to generate a large number of rows to simulate a reasonable amount of time.



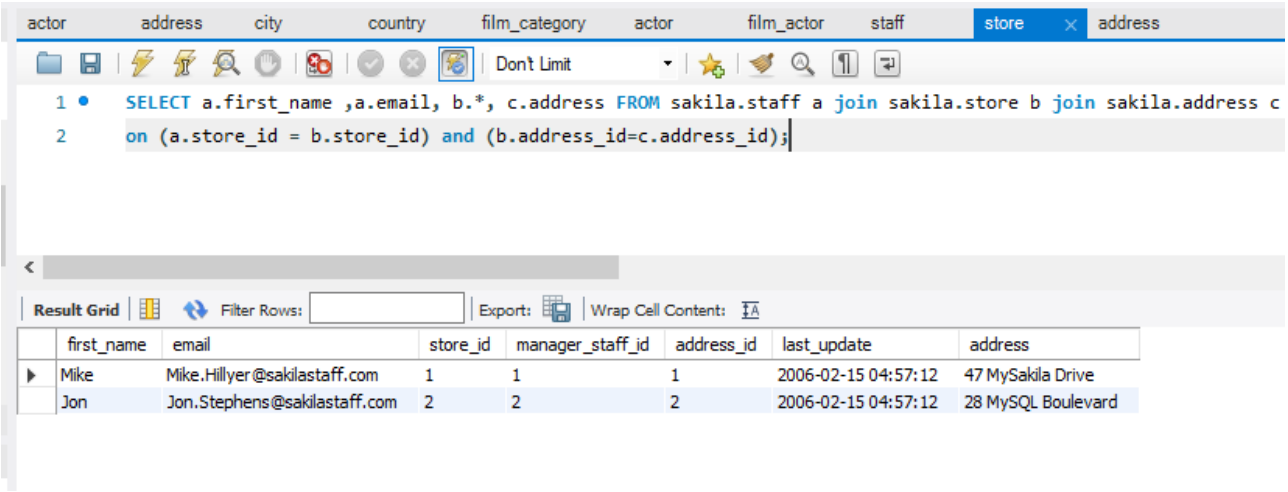
Inner Join:

It will display all the records that have matched. The syntax of Inner join query is:

```
Select schema. table1.column (s)
From schema. table1 join schema. table2
on (schema.table1.column1=schema.table2. column1);
```

Example:

Query that displays staff information and corresponding to their address.



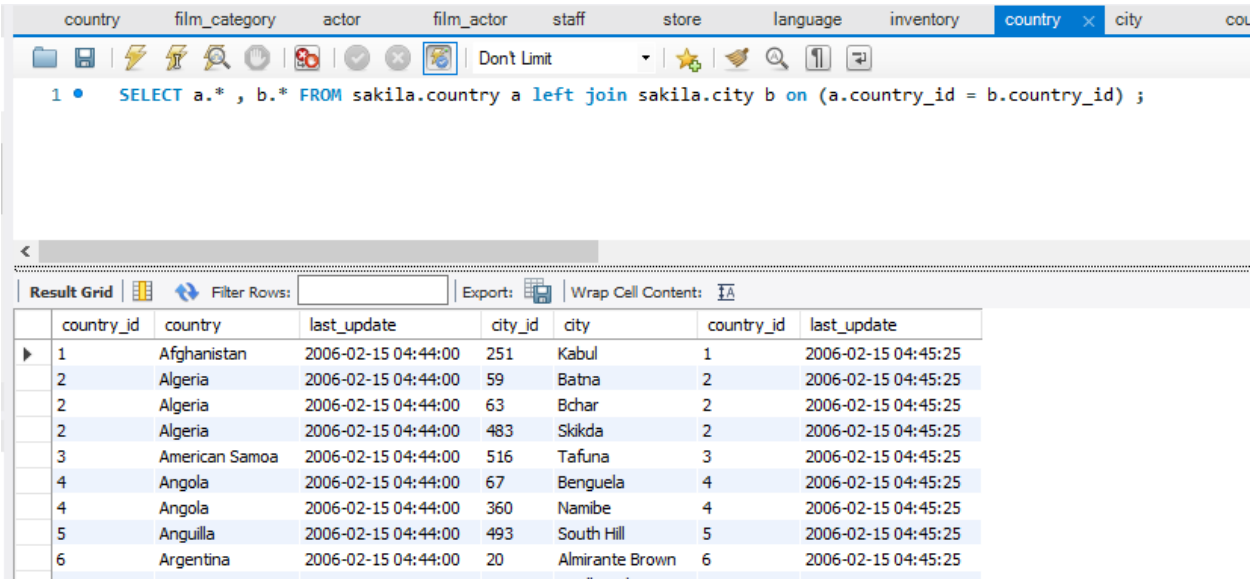
"ON" and "USING" clauses

In above JOIN query examples, we have used ON clause to match the records between table.

USING clause can also be used for the same purpose. The difference with **USING** is it **needs to have identical names for matched columns in both tables.**

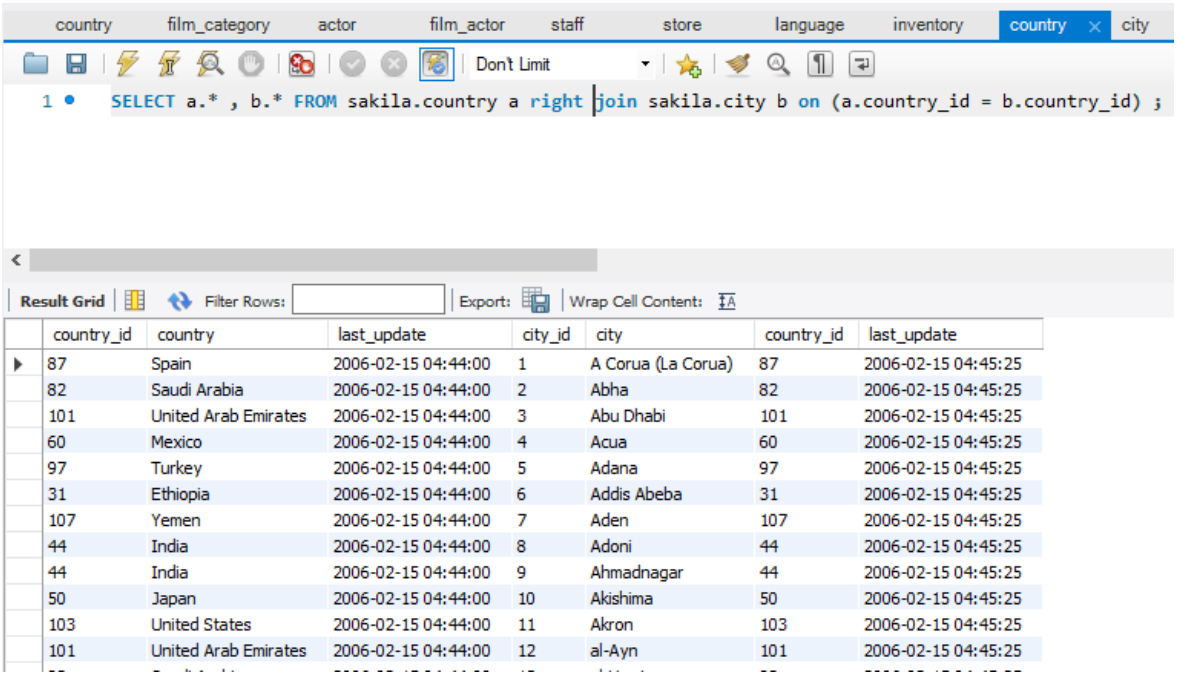
Outer Join:

- **LEFT (OUTER) JOIN**: Select records from the first (left-most) table with matching right table records.



country_id	country	last_update	city_id	city	country_id	last_update
1	Afghanistan	2006-02-15 04:44:00	251	Kabul	1	2006-02-15 04:45:25
2	Algeria	2006-02-15 04:44:00	59	Batna	2	2006-02-15 04:45:25
2	Algeria	2006-02-15 04:44:00	63	Bchar	2	2006-02-15 04:45:25
2	Algeria	2006-02-15 04:44:00	483	Skikda	2	2006-02-15 04:45:25
3	American Samoa	2006-02-15 04:44:00	516	Tafuna	3	2006-02-15 04:45:25
4	Angola	2006-02-15 04:44:00	67	Benguela	4	2006-02-15 04:45:25
4	Angola	2006-02-15 04:44:00	360	Namibe	4	2006-02-15 04:45:25
5	Anguilla	2006-02-15 04:44:00	493	South Hill	5	2006-02-15 04:45:25
6	Argentina	2006-02-15 04:44:00	20	Almirante Brown	6	2006-02-15 04:45:25

- **RIGHT (OUTER) JOIN**: Select records from the second (right-most) table with matching left table records.



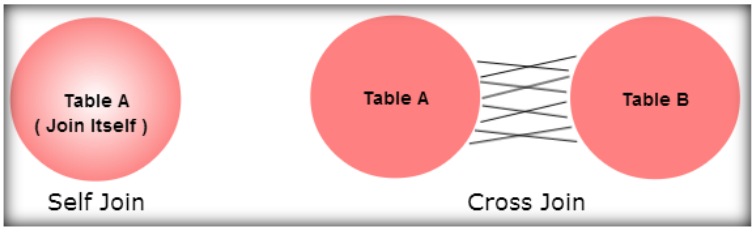
country_id	country	last_update	city_id	city	country_id	last_update
87	Spain	2006-02-15 04:44:00	1	A Corua (La Corua)	87	2006-02-15 04:45:25
82	Saudi Arabia	2006-02-15 04:44:00	2	Abha	82	2006-02-15 04:45:25
101	United Arab Emirates	2006-02-15 04:44:00	3	Abu Dhabi	101	2006-02-15 04:45:25
60	Mexico	2006-02-15 04:44:00	4	Acua	60	2006-02-15 04:45:25
97	Turkey	2006-02-15 04:44:00	5	Adana	97	2006-02-15 04:45:25
31	Ethiopia	2006-02-15 04:44:00	6	Addis Abeba	31	2006-02-15 04:45:25
107	Yemen	2006-02-15 04:44:00	7	Aden	107	2006-02-15 04:45:25
44	India	2006-02-15 04:44:00	8	Adoni	44	2006-02-15 04:45:25
44	India	2006-02-15 04:44:00	9	Ahmadnagar	44	2006-02-15 04:45:25
50	Japan	2006-02-15 04:44:00	10	Akishima	50	2006-02-15 04:45:25
103	United States	2006-02-15 04:44:00	11	Akron	103	2006-02-15 04:45:25
101	United Arab Emirates	2006-02-15 04:44:00	12	al-Ayn	101	2006-02-15 04:45:25

- **FULL (OUTER) JOIN**: Selects all records that match either left or right table records

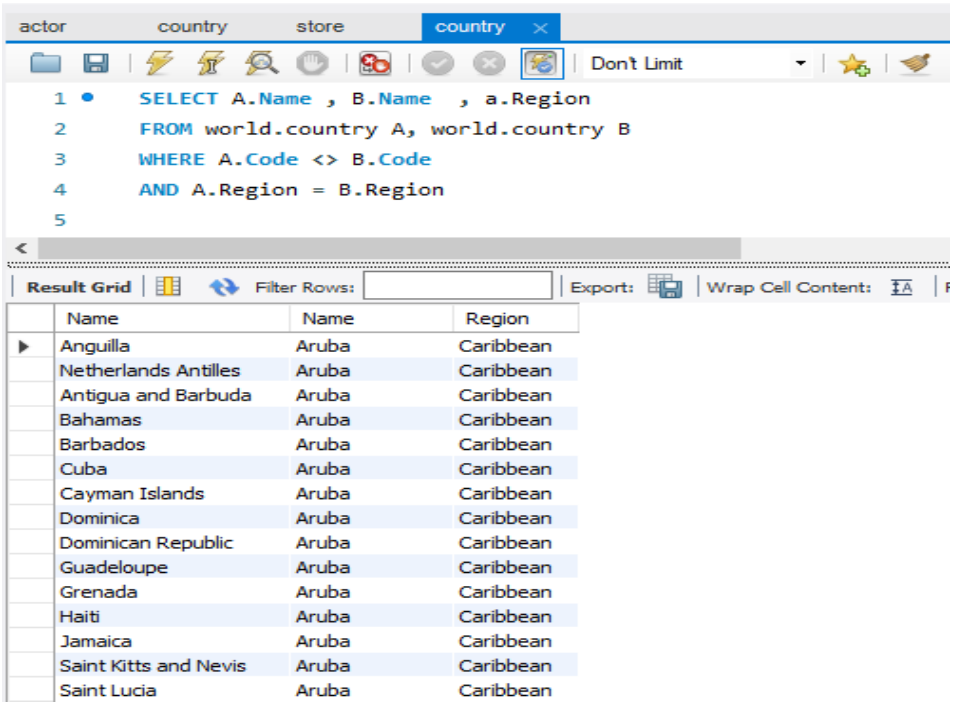
```
SELECT * FROM t1
LEFT JOIN t2 ON t1.id = t2.id
UNION
SELECT * FROM t1
RIGHT JOIN t2 ON t1.id = t2.id
```

Self join:

A self-join is a join in which a table is joined with itself (which is also called Unary relationships), especially when the table has a FOREIGN KEY which references its own PRIMARY KEY. To join a table itself means that each row of the table is combined with itself and with every other row of the table.



city	customer_1	customer_2
Albany	Douglass Blankenship	Mi Gray
Albany	Douglass Blankenship	Priscilla Wilkins
Albany	Mi Gray	Douglass Blankenship
Albany	Mi Gray	Priscilla Wilkins
Albany	Priscilla Wilkins	Douglass Blankenship
Albany	Priscilla Wilkins	Mi Gray

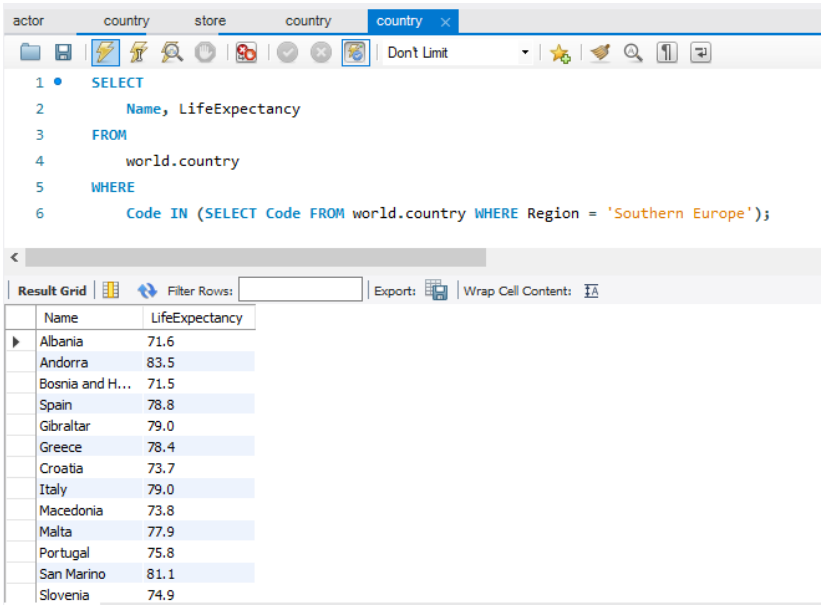


1.1 The SQL subquery syntax

There is no general syntax; subqueries are regular queries placed inside parenthesis. Subqueries can be used in different ways and at different locations inside a query:
Here is an subquery with the IN operator

Syntax:

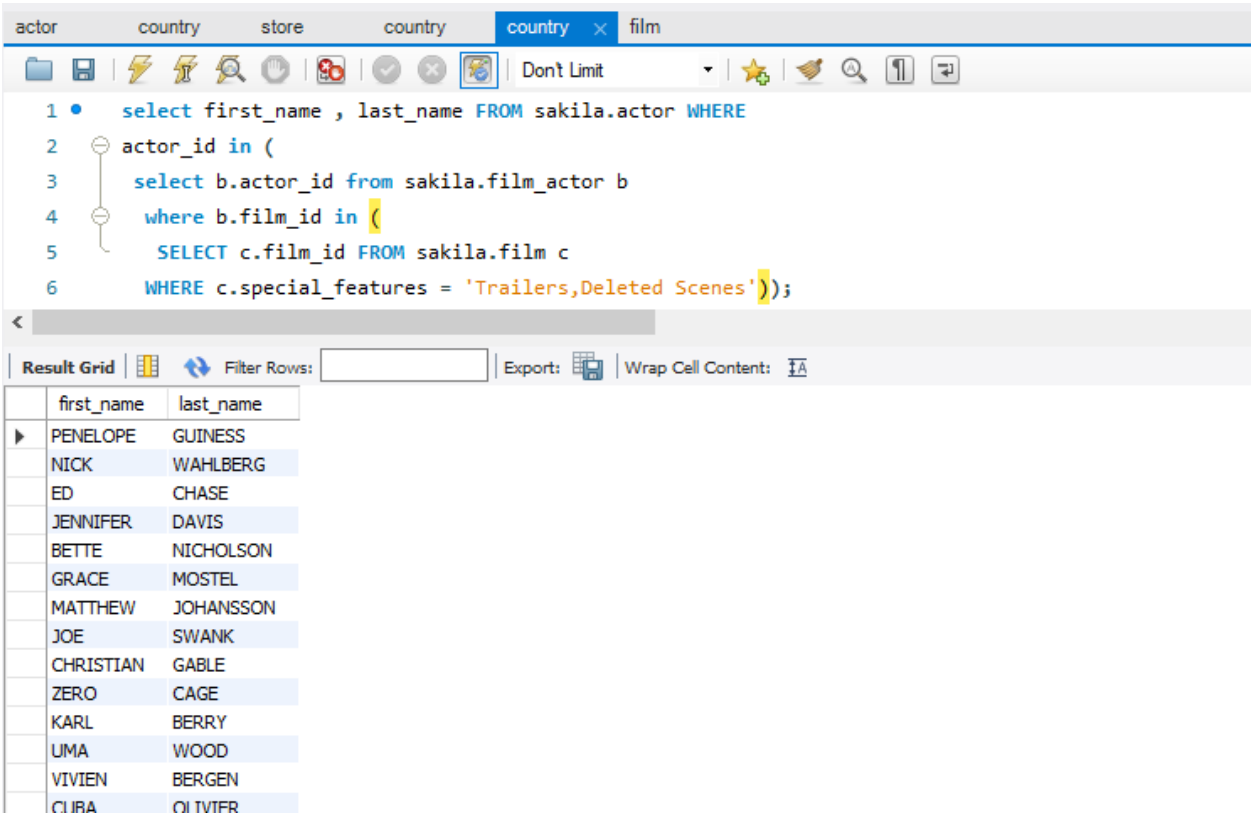
```
SELECT column-names

FROM table-name1

WHERE value IN

(SELECT column-name

FROM table-name2

WHERE condition)
```



Subqueries can also assign column values for each record:

```
SELECT column1 = (SELECT column-name FROM table-name WHERE condition),
column-names

FROM table-name

WEHRE condition;
```

Extract data based on some other table



SELECT name , Continent, max(mycount)
FROM (SELECT Name,Continent,COUNT(Name) as mycount
FROM world.country
GROUP BY Continent) as cnt;

4. SQL INSERT, UPDATE AND DELETE statements

INSERT Statement

It is possible to write the INSERT INTO statement in two ways.

- The first way specifies both the column names and the values to be inserted:

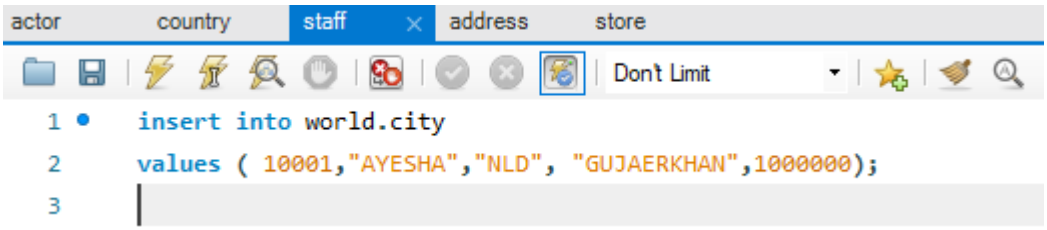
Syntax:

INSERT INTO table_name (column1, column2, column3, ...)
VALUES (value1, value2, value3, ...);

- If you are adding values for all the columns of the table, you do not need to specify the column names in the SQL query. The INSERT INTO syntax would be as follows:

Syntax:

INSERT INTO table_name
VALUES (value1, value2, value3, ...);



Handle NULL Values

It is not possible to test for NULL values with comparison operators, such as =, <, or <>. We will have to use the **IS NULL** and **IS NOT NULL** operators instead.

Syntax:

SELECT column_names
FROM table_name
WHERE column_name IS NULL;

The SQL SELECT TOP Clause

The SELECT TOP clause is used to specify the number of records to return.

Syntax:

SELECT column name(s)
FROM table_name
WHERE condition
LIMIT number;

1.2 The SQL INSERT INTO SELECT Statement

The INSERT INTO SELECT statement copies data from one table and inserts it into another table.

- INSERT INTO SELECT requires that data types in source and target tables match
- The existing records in the target table are unaffected

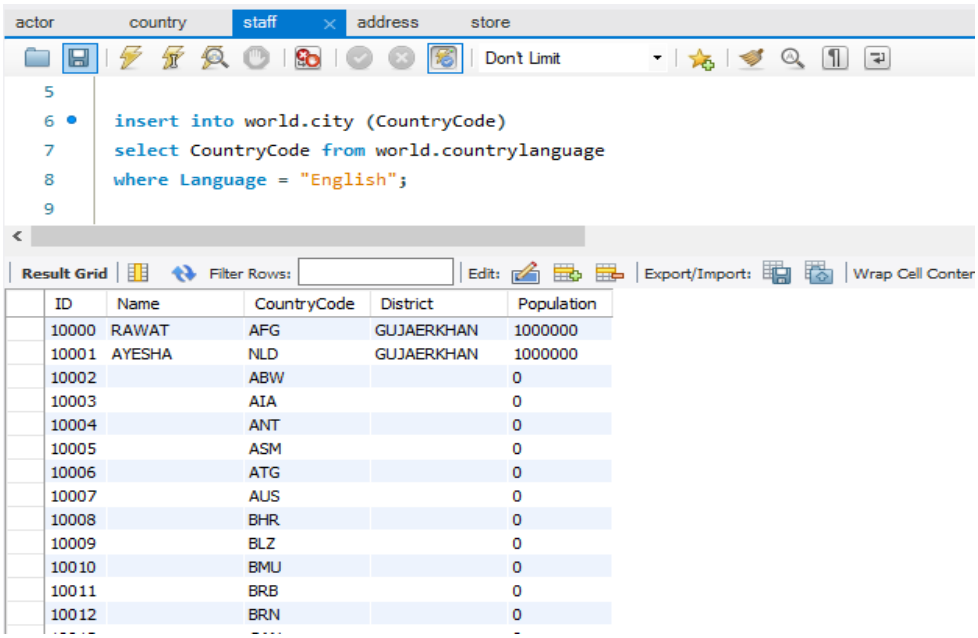
1.2.1 INSERT INTO SELECT Syntax

Copy all columns from one table to another table:

Syntax:

INSERT INTO *table2*
SELECT * FROM *table1*
WHERE *condition*;

Example



SQL UPDATE Statement

The UPDATE statement is used to modify the existing records in a table.

Syntax:

UPDATE table_name
SET column1 = value1, column2 = value2, ...
WHERE condition;

```
UPDATE world.city
SET Name = "AYESHA"
WHERE ID= 10001;
```

Note: You can't update or delete records without specifying a key (ex. `primary key`) in the where clause. If you want kindly update the save mode by the following query.

```
SET SQL_SAFE_UPDATES = 0;  # update save mode

UPDATE world.city
SET Name = "RAWAT"
WHERE Name = "AYESHA";
```

OR

1. Go to `Edit` --> `Preferences`
2. Click `"SQL Editor"` tab and `uncheck` "Safe Updates" `check box`
3. `Query` --> `Reconnect to Server` // logout and then login
4. Now execute your SQL query

The SQL CASE Statement

The CASE statement goes through conditions and returns a value when the first condition is met (like an IF-THEN-ELSE statement). So, once a condition is true, it will stop reading and return the result. If no conditions are true, it returns the value in the ELSE clause.

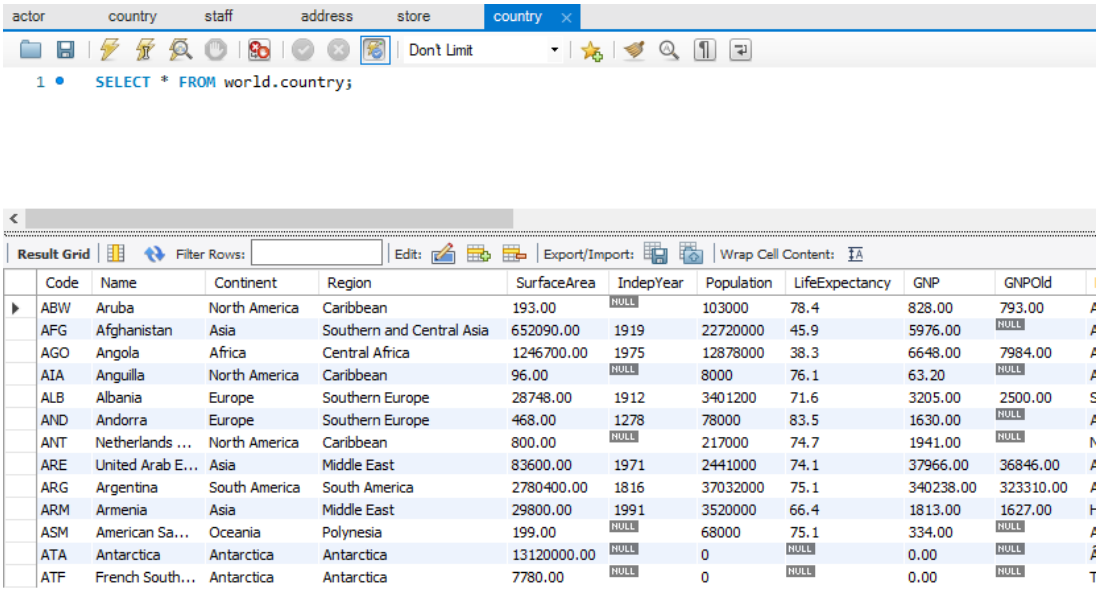
If there is no ELSE part and no conditions are true, it returns NULL.

Syntax:

```
CASE
  WHEN condition1 THEN result1
  WHEN condition2 THEN result2
                .
                .
                .
  WHEN conditionN THEN resultN
  ELSE result
END;
```

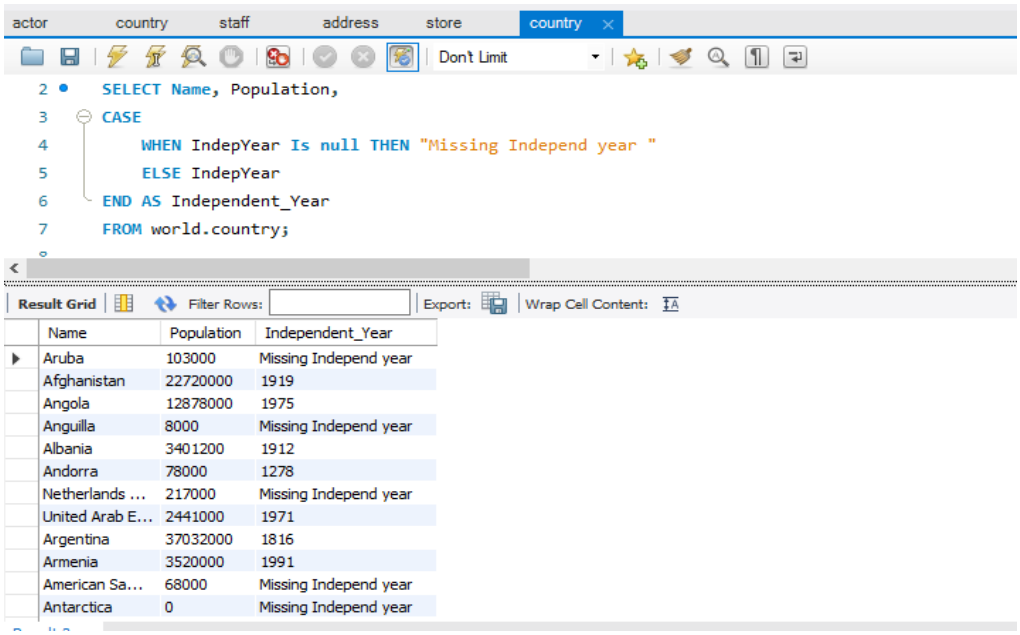
Example:

Before: information of Independent Year of most of the records are missing in the Country column



Code	Name	Continent	Region	SurfaceArea	IndepYear	Population	LifeExpectancy	GNP	GNPOld
ABW	Aruba	North America	Caribbean	193.00	NULL	103000	78.4	828.00	793.00
AFG	Afghanistan	Asia	Southern and Central Asia	652090.00	1919	22720000	45.9	5976.00	NULL
AGO	Angola	Africa	Central Africa	1246700.00	1975	12878000	38.3	6648.00	7984.00
AIA	Anguilla	North America	Caribbean	96.00	NULL	8000	76.1	63.20	NULL
ALB	Albania	Europe	Southern Europe	28748.00	1912	3401200	71.6	3205.00	2500.00
AND	Andorra	Europe	Southern Europe	468.00	1278	78000	83.5	1630.00	NULL
ANT	Netherlands ...	North America	Caribbean	800.00	NULL	217000	74.7	1941.00	NULL
ARE	United Arab E...	Asia	Middle East	83600.00	1971	2441000	74.1	37966.00	36846.00
ARG	Argentina	South America	South America	2780400.00	1816	37032000	75.1	340238.00	323310.00
ARM	Armenia	Asia	Middle East	29800.00	1991	3520000	66.4	1813.00	1627.00
ASM	American Sa...	Oceania	Polynesia	199.00	NULL	68000	75.1	334.00	NULL
ATA	Antarctica	Antarctica	Antarctica	13120000.00	NULL	0	NULL	0.00	NULL
ATF	French South...	Antarctica	Antarctica	7780.00	NULL	0	NULL	0.00	NULL

After Applying following query, you are not only able to change the null values from the column but also replace information according to your need.



Name	Population	Independent_Year
Aruba	103000	Missing Independ year
Afghanistan	22720000	1919
Angola	12878000	1975
Anguilla	8000	Missing Independ year
Albania	3401200	1912
Andorra	78000	1278
Netherlands ...	217000	Missing Independ year
United Arab E...	2441000	1971
Argentina	37032000	1816
Armenia	3520000	1991
American Sa...	68000	Missing Independ year
Antarctica	0	Missing Independ year

What are views?

Simply put, VIEWS are virtual tables. By virtual, we mean, the tables do not store any data of their own but display data stored in other tables.

In other words, VIEWS are nothing but SELECT Queries.

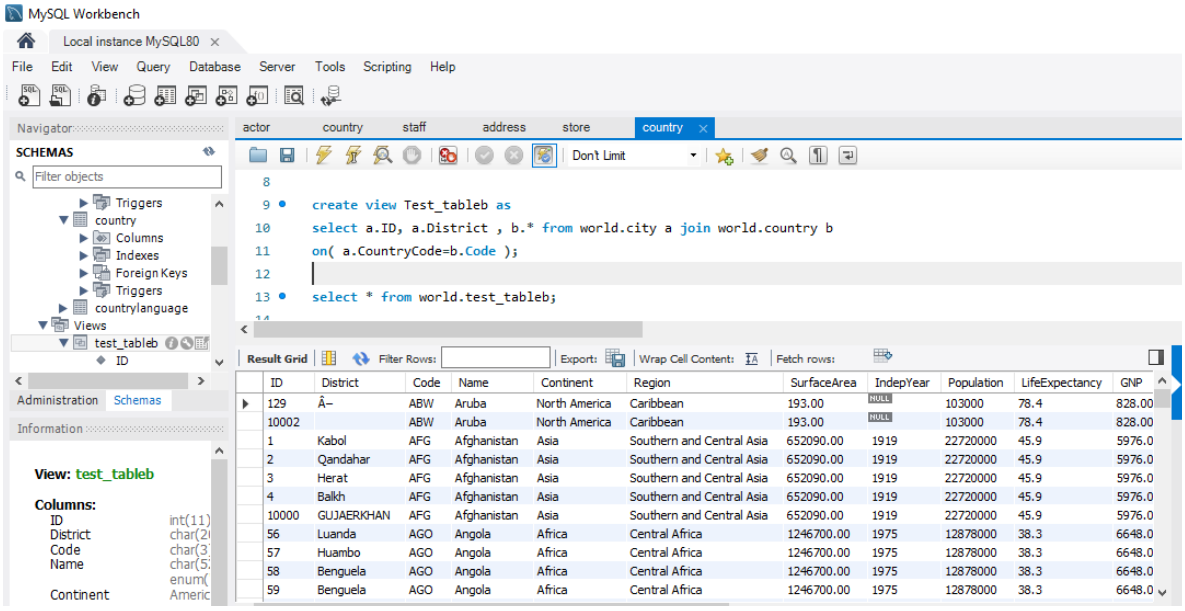
Views syntax

Let's now look at the basic syntax used to create a view in MySQL.

```
CREATE VIEW `view_name` AS SELECT statement;
```

- **"CREATE VIEW `view_name`"** tells MySQL server to create a view object in the database named `view_name`
- **"AS SELECT statement"** is the SQL statements to be packed in the views. It can be a SELECT statement can contain data from one table or multiple tables.

Result:



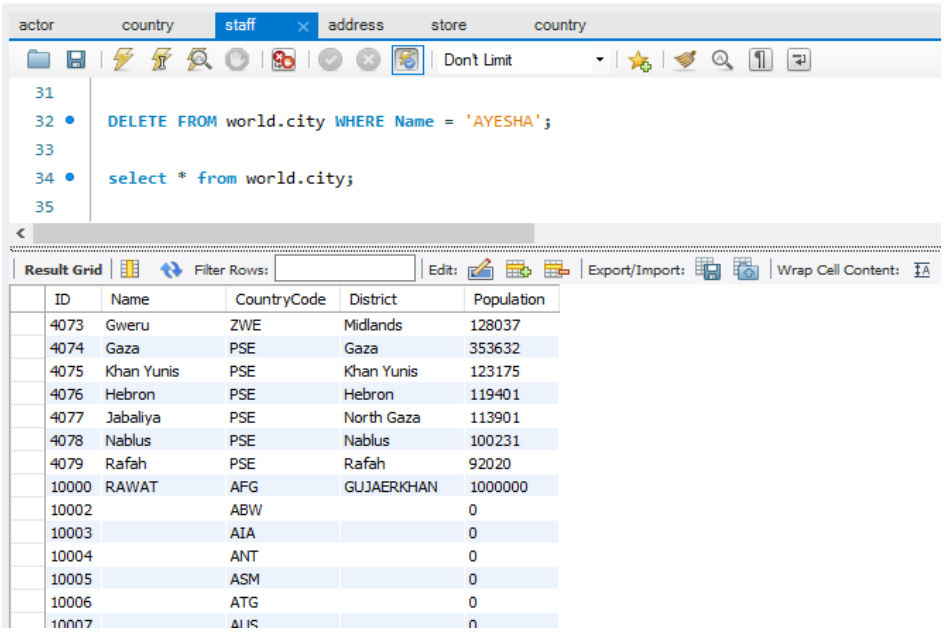
SQL Delete Statement:

The DELETE statement is used to delete existing records in a table.

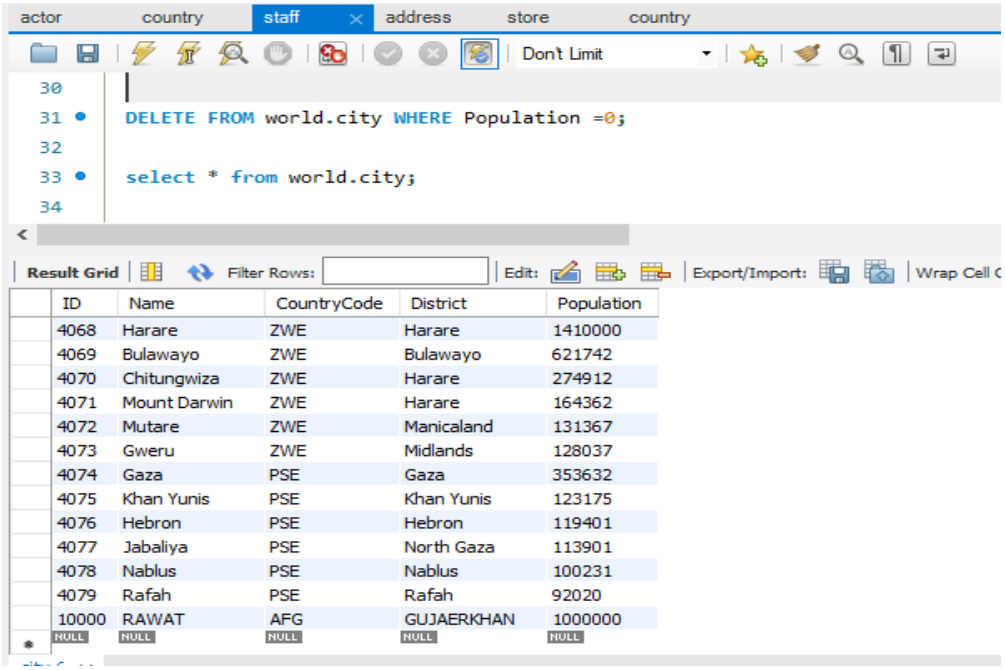
Syntax:

DELETE FROM *table_name* WHERE *condition*;

Example:



Example # 2:



- Delete records having more than 2 columns are empty

```
DELETE FROM world.city
where Name ='' and District =''
```

Delete MYSQL TABLE

It is very easy to drop an existing MySQL table, but you need to be very careful while deleting any existing table because the data lost will not be recovered after deleting a table.

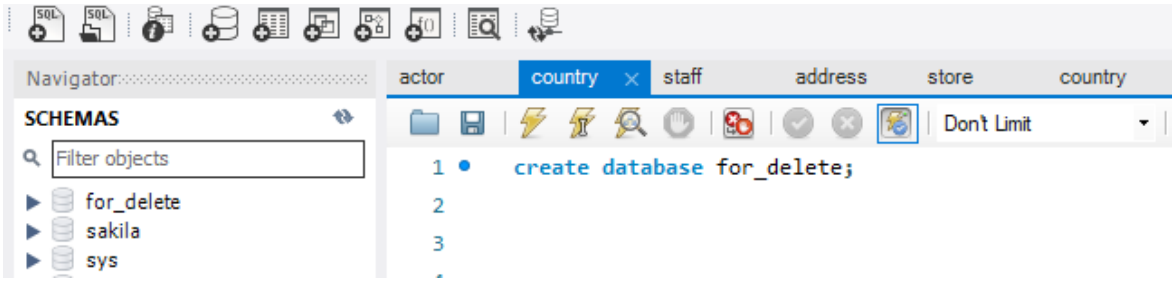
Syntax: DROP TABLE table_name;

Delete MYSQL Database

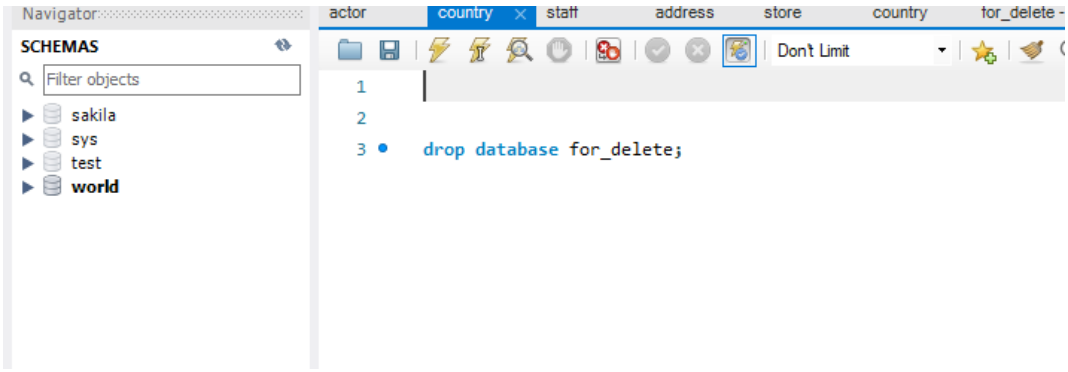
Syntax: DROP DATABASE database_name;

Example:

Create the new database:



Now, delete the created database by the following query as follows:



5. SQL CREATE AND ALTER statements

1.3 The SQL CREATE TABLE Statement

The CREATE TABLE statement is used to create a new table in a database.

Syntax:

```
CREATE TABLE table_name (
    column1 datatype,
    column2 datatype,
    column3 datatype,
    ....);
```

Data Types	Description
INT	✓ A normal-sized integer that can be signed or unsigned. If signed, the allowable range is from -2147483648 to 2147483647. ✓ You can specify a width of up to 11 digits.
DOUBLE (M, D)	✓ Define the display length (M) and the number of decimals (D). This is not required and will default to 16,4, where 4 is the number of decimals. Decimal precision can go to 53 places for a DOUBLE. ✓ Will default to 10,2 in **FLOAT (M, D)**
DATE	A date in YYYY-MM-DD format, between 1000-01-01 and 9999-12-31. For example, December 30th, 1973 would be stored as 1973-12-30.
YEAR(M)	Stores a year in a 2-digit or a 4-digit format. If the length is specified as 2 (for example YEAR (2)), YEAR can be between 1970 to 2069 (70 to 69). If the length is specified as 4, then YEAR can be 1901 to 2155. The default length is 4.
TIME	Stores the time in a HH:MM: SS format.
DATETIME	A date and time combination in YYYY-MM-DD HH:MM: SS format, between 1000-01-01 00:00:00 and 9999-12-31 23:59:59. For example, 3:30 in the afternoon on December 30th, 1973 would be stored as 1973-12-30 15:30:00.

CHAR(M)	A fixed-length string between 1 and 255 characters in length (for example CHAR (5)), right-padded with spaces to the specified length when stored. Defining a length is not required, but the default is 1.
VARCHAR(M)	A variable-length string between 1 and 255 characters in length. For example, VARCHAR (25). You must define a length when creating a VARCHAR field.

SQL Constraints

- SQL constraints are used to specify rules for the data in a table.
- Constraints are used to limit the type of data that can go into a table. This ensures the accuracy and reliability of the data in the table. If there is any violation between the constraint and the data action, the action is aborted.
- Constraints can be column level or table level. Column level constraints apply to a column, and table level constraints apply to the whole table.

The following constraints are commonly used in SQL:

- **NOT NULL**
  - Ensures that a column cannot have a NULL value
- **UNIQUE**
  - 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**
  - Uniquely identifies a row/record in another table
- **CHECK**
  - Ensures that all values in a column satisfies a specific condition
- **DEFAULT**
  - Sets a default value for a column when no value is specified
- **INDEX**
  - Used to create and retrieve data from the database very quickly

ALTER TABLE Statement

Syntax:

```
ALTER TABLE table_name
  ADD new_column_name column_definition
    [ FIRST | AFTER column_name];
```

We will discuss how to use the MySQL **ALTER TABLE statement** to add a column, modify a column, drop a column, rename a column or rename a table.

NOT NULL

Example:

```
CREATE TABLE Schema.Persons (
   ID int NOT NULL,
   LastName varchar (255) NOT NULL,
   FirstName varchar (255) NOT NULL,
   Age int);
```

Add NOT NULL Constraint after creating table:

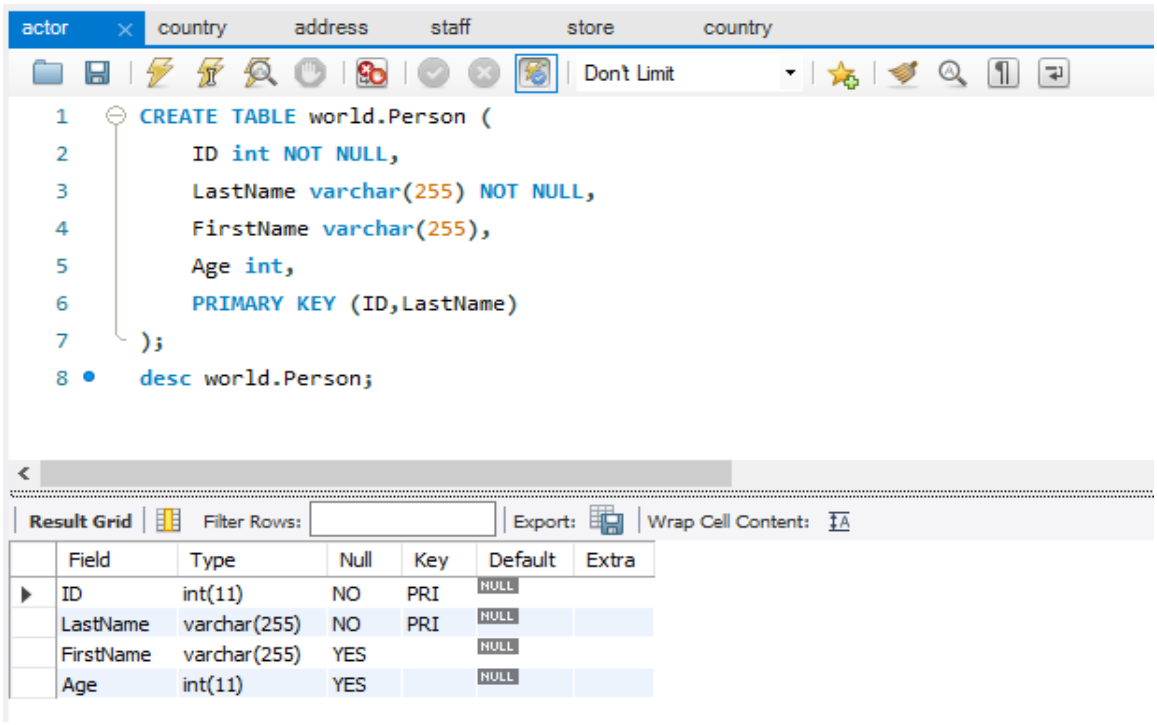
```
ALTER TABLE Persons
MODIFY Age int NOT NULL;
```

PRIMARY KEY

```
CREATE TABLE Persons (
   ID int NOT NULL,
   LastName varchar (255) NOT NULL,
   FirstName varchar (255),
   Age int,
   PRIMARY KEY (ID));
```

2nd Way:

```
CREATE TABLE Persons (
    ID int NOT NULL,
    LastName varchar (255) NOT NULL,
    FirstName varchar (255),
    Age int,
    CONSTRAINT PK_Person PRIMARY KEY (ID, LastName));
```



Add Primary key Constraint after creating table:

```
ALTER TABLE Persons
ADD PRIMARY KEY (ID);
```

SQL FOREIGN KEY Constraint

- A FOREIGN KEY is a key used to link two tables together.
- A FOREIGN KEY is a field (or collection of fields) in one table that refers to the PRIMARY KEY in another table.
- The table containing the foreign key is called the child table, and the table containing the candidate key is called the referenced or parent table

Syntax:

```
CREATE TABLE Orders (
    OrderID int NOT NULL,
```

```
    OrderNumber int NOT NULL,
    PersonID int,
    PRIMARY KEY (OrderID),
    FOREIGN KEY (PersonID) REFERENCES Persons (PersonID) );
```

OR

```
CREATE TABLE Orders (
    OrderID int NOT NULL,
    OrderNumber int NOT NULL,
    PersonID int,
    PRIMARY KEY (OrderID),
    CONSTRAINT FK_PersonOrder FOREIGN KEY (PersonID)
    REFERENCES Persons (PersonID));
```

Add foreign key Constraint after creating table:

```
ALTER TABLE Orders
ADD FOREIGN KEY (PersonID) REFERENCES Persons (PersonID);
```

Index in MYSQL

The `CREATE INDEX` command is used to create indexes in tables (allows duplicate values).

Indexes are used to retrieve data from the database very fast. The users cannot see the indexes, they are just used to speed up searches/queries.

Syntax: CREATE INDEX index_name ON table_name (column_list)

The following SQL creates an index named "idx_lastname" on the "LastName" column in the "Persons" table:

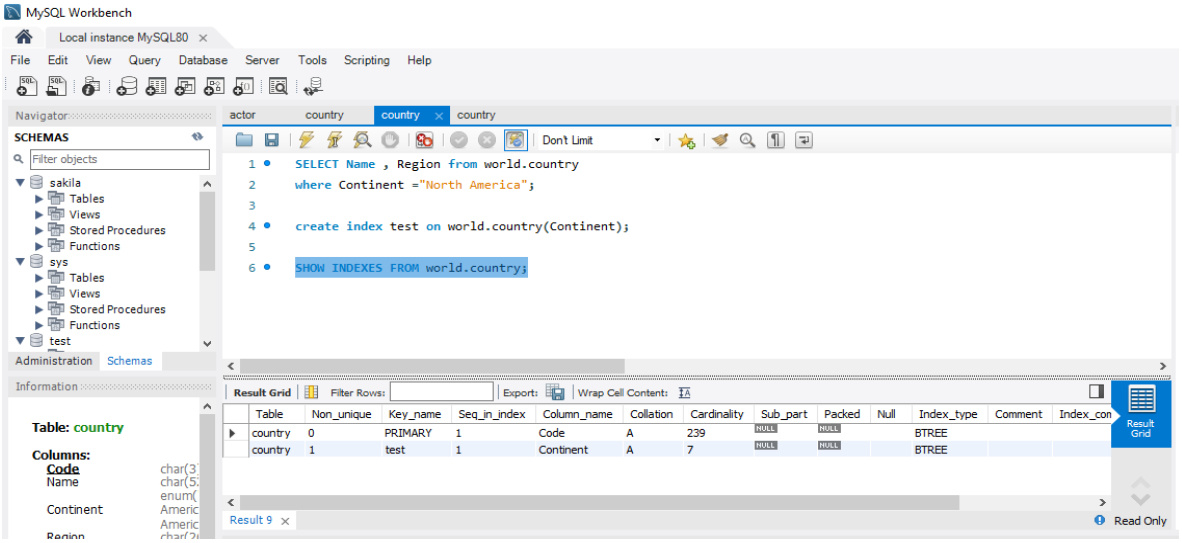
```
CREATE INDEX idx_lastname
ON Persons (LastName);
```

If you want to create an index on a combination of columns, you can list the column names within the parentheses, separated by commas:

```
CREATE INDEX idx_pname
ON Persons (LastName, FirstName);
```

Show Indexes of a Table

Show indexes from table_name:



Check

Syntax:

```
CREATE TABLE Persons (
    Age int,
    CHECK (Age>=18)
);
```

Using Alter query:

```
ALTER TABLE Persons
ADD CHECK (Age>=18);
```

Default

Syntax:

```
CREATE TABLE Persons (
    City varchar (255) DEFAULT 'ISLAMABAD'
);
```

- **ALTER TABLE – Set Default value:**

```
ALTER TABLE Persons
ALTER City SET DEFAULT ' ISLAMABAD ';
```

- **ALTER TABLE - ADD Column**

  To add a column in a table, use the following syntax:

  ALTER TABLE *table_name*
  ADD *column_name datatype*;

- ALTER TABLE - DROP COLUMN

  To delete a column in a table, use the following syntax.

  ALTER TABLE *table_name*
  DROP COLUMN *column_name*;

Practical Task # 1, Hands-on MySQL

Instructions:

This task is designed to run-through all the basic concepts of database and data warehouse practically. In detailed every concept is discussed above to give you an overview of the installation process, commands and syntax. You have to understand and utilize all the information given in this manual to implement practical task#1. This task is divided into three subtasks respectively. You have to submit report of each subtask per week on Google classroom in case of Online teaching while need to present these to your TA in the class in case the classes are on Campus.
Task grading will be based on how smartly you have mined the insights from database and to what extend your output is easily understandable. You have to submit a zip file which must be comprised of task report and .sql script file. The name of your zip file must be in this format: Rollno_FirsName-LastName-Task1A, otherwise your task will not be accepted.

Task 1A

a. Create schema for Shopify in MySQL and populate data into the schema using attached shopcars.sql file.
b. Write a query to display number of classic cars and motorcycles shipped per month in the year of 2003 and 2004.
c. Write a query to display those customers from which city has made least purchase of vintage cars.
d. Write a query to find the order numbers which have taken more than 4 days to be shipped and display the order number and number of days in a table.
e. Write a query to display and find the remaining stock of per product in warehouse.

Task 1B

a. Create a table Amount with two columns i.e ProfitAmount and Dates. Insert the values in the table using script file amount.sql. Write a query to display and find the start_date and end_date when there are continuous values in ProfitAmount column.

b. How to replace multiple commas from a given text into single comma.
   Text: 'ABC,,,DDDD,,,,,,DDE,,2LMDL3EMF,CEWEC,,,,,,'

c. Using the given Grades.sql file create a database and then solve the case study given below.

   John gives James a task to generate a report containing three columns: Name, Grade, and Mark. John doesn't want the NAMES of those students who received a grade lower than 8. And if the grades of two students are same then order the name alphabetically.

d. Create two table T1 and T2.

T1

4
2
1

T2

P
Q
R

Write a SQL query to display a drive of table T3 from T1 and T2.

T3

4PPPP
2QQ
1R

Honor Policy: This assignment is a learning opportunity that will be evaluated based on your ability to think, work through a problem in a logical manner. You may however discuss verbally or via email the assignment with your classmates or the course instructor, and use the Internet to do your research, but the written work should be your own. Plagiarized reports or code will get a zero. If in doubt, ask the course instructor.