Birla Institute of Technology & Science, Pilani, K. K. BIRLA Goa campus
Database Systems (CS F212)
Second Semester 2025-2026
To study DDL and DML commands.

Introduction: SQL stands for Structured Query Language. It was invented & developed by IBM in the early 1970's. SQL is a standard language common to all relational databases. It is actually a database language. A table is a primary database object of SQL.

For the Database Lab we will be using the MySql database.

Through MYSQL we can :

- enter, edit, store, retrieve and run SQL commands and PL/SQL blocks.
- format, perform calculation, store, & print query results.
- list column definitions for any table.
- access and copy data between SQL databases.
- send/accept messages from/to the end user.

With SQL we can:

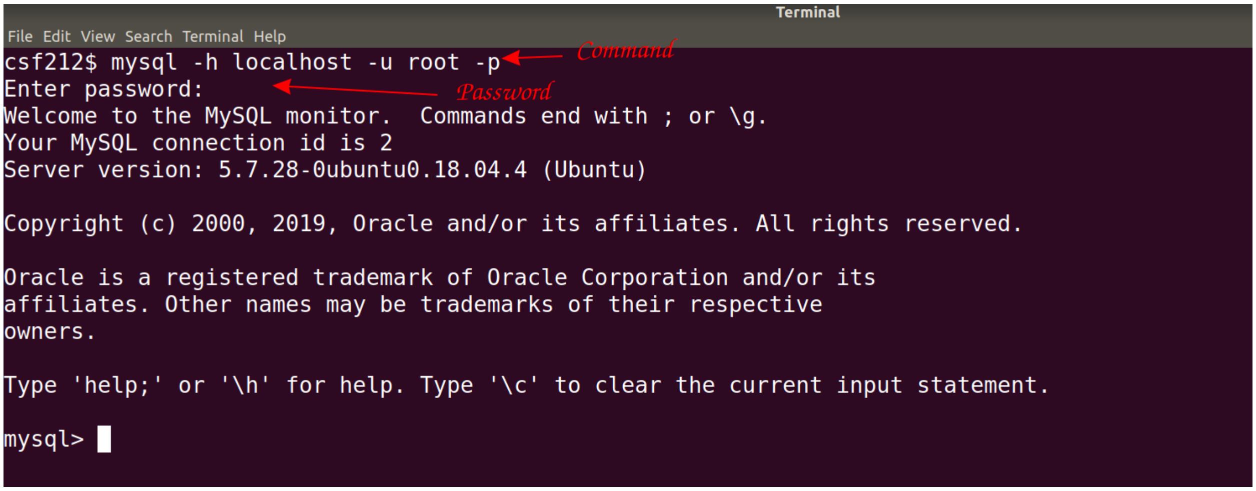
- Create tables in the database
- Store data
- Retrieve data
- Change data and change the structure of the underlying tables
- Combine and calculate data
- Provide security

The aim of this reading material is to introduce you to the syntax and functionality of different SQL commands. It assumes that you already have installed MySQL on your machine. The first thing that we need to do is to log into MySQL.

If you have MySQL server installed on your machine, then you can login into the server using the following command:

```
mysql -h localhost -u root -p
```

The system will prompt you for a password as shown in the below screenshot.



```
csf212$ mysql -h localhost -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 2
Server version: 5.7.28-0ubuntu0.18.04.4 (Ubuntu)

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owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> 
```

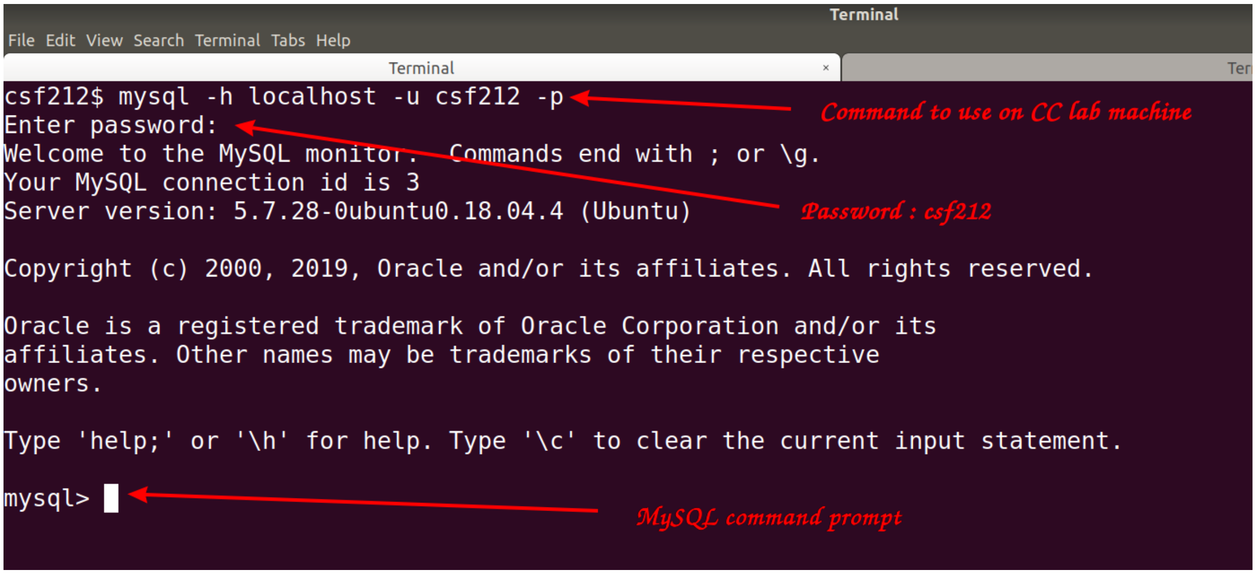
Command

Password

Important : On the CC lab machines you cannot log into mysql as a root user. You have to use the following command:

mysql -h localhost -u csf212 -p

Follow the instructions in the screenshot below to log into mysql on the CC lab machines.



```
csf212$ mysql -h localhost -u csf212 -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 3
Server version: 5.7.28-0ubuntu0.18.04.4 (Ubuntu)

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owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> 
```

Command to use on CC lab machine

Password : csf212

MySQL command prompt

Once logged in you will be able to run SQL queries on the MySQL command prompt.

Before proceeding to different types of SQL commands we will look at four commands:

1. show databases;

This command shows different databases that are present in the mysql server. If you have not logged in as a root user, then some databases may not be shown. A database can contain several different tables.

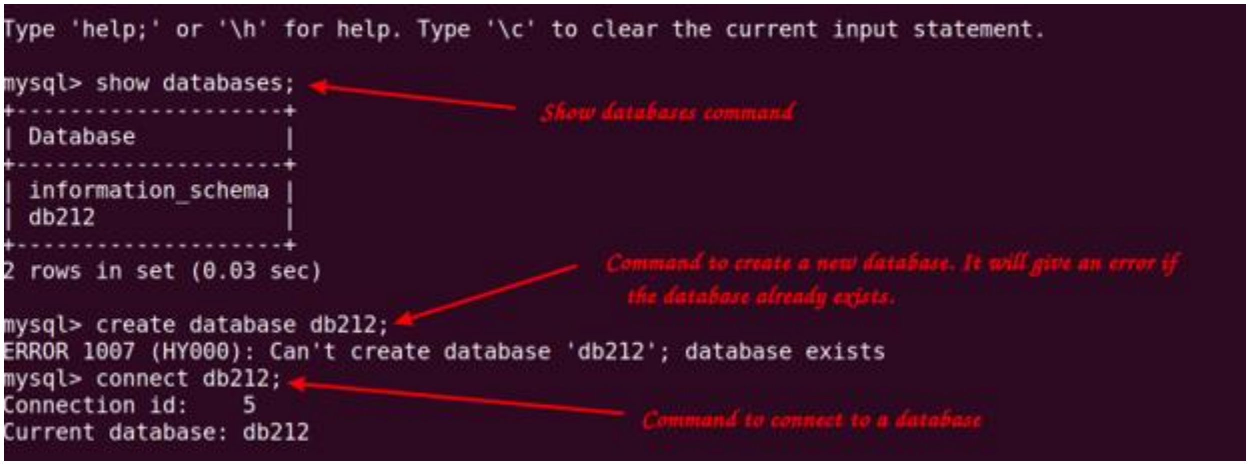
2. create database <xyz>;

This command creates a new database that a user can connect to. To create a new database we need to log into MySQL as a root user.

3. connect <xyz>;

This command allows a user to connect to the database <xyz>.

The screenshot below shows the three commands that have been explained above.



```
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| db212              |
+--------------------+
2 rows in set (0.03 sec)

mysql> create database db212;
ERROR 1007 (HY000): Can't create database 'db212'; database exists
mysql> connect db212;
Connection id:    5
Current database: db212
```

Show databases command

Command to create a new database. It will give an error if the database already exists.

Command to connect to a database

Now we are ready to learn the different types of SQL commands.

Types of SQL commands:

Data Definition Language (DDL) Commands

CREATE TABLE
CREATE INDEX
CREATE VIEW
DESC
ALTER TABLE
DROP DATABASE
DROP TABLE
TRUNCATE

Data Manipulation Language (DML) Commands

DELETE
INSERT
UPDATE

Data Query Language (DQL) Commands

SELECT

Conventions used:

Keywords in syntax are shown in bold letters.
Words in syntax between ‘<’ and ‘>’ signify the name of the table or column given by the user.
Words in syntax between ‘[’ and ‘]’ are optional.

NOTE: It is healthy to make a habit of writing your SQL command in an editor (such as gedit), and then copy and paste by right-clicking on MySQL prompt.

DDL COMMANDS

Creating Database:

Syntax to create a database:

create database <database name>;

Example:

```
mysql> create database mydb;
```

Listing Databases:

Syntax:

show databases;

Using Database:

Syntax to use a database:

use <database name>;

Example:

```
mysql> use mydb;
```

Listing tables in current database:

Syntax:

show tables;

NOTE: If you are getting a syntax error when executing these commands (after copy pasting), check the quotes. Due to formatting on Word, mySQL throws an error for quotes. Retype the quotes and it should work.

```
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use…
```

Creating tables:

Syntax to create a table

create table <table name> (column definition 1, column definition 2, …. ,);

Example:

```
mysql> CREATE TABLE students (id CHARACTER (12),
          -> name VARCHAR(30),
          -> hostel INTEGER NOT NULL,
          -> percentage DECIMAL(5,2) DEFAULT 0.0,
          -> phone INT,
          -> bdate DATE,
          -> gender ENUM('F','M'),
          -> CONSTRAINT uk UNIQUE(name));
```

(OR)

```
CREATE TABLE students (id CHAR(12), name VARCHAR(30) UNIQUE, hostel
INT NOT NULL, percentage DECIMAL(5,2) DEFAULT 0.0, phone INT UNIQUE, bdate DATE,
gender ENUM('F','M'));
```

Check using 'show tables' command.

NOTE: 1) Every SQL statement ends with a semicolon.
2) SQL keywords are not case sensitive, but the data in the table and the name of the table are case sensitive.
3) It is a good practice to write the query with line separator to make error detection more convenient.

There are various inbuilt data types like char (for fixed-length character string to store alphanumeric values), varchar (for variable-length character strings to store alphanumeric values), integer (for integer values), decimal (to store floating-point values), date (for date and time) and others like RAW, Long RAW, LOB, BLOB, CLOB, Bfile for audio and video files.

//Explore big int

Syntax to add constraints like primary key, unique, not null and check while creating a table:

create table <table name> (column definition 1, column definition 2, …. , **primary key**(column name));

Example:

```
mysql> CREATE TABLE gradstudents (id CHARACTER (12), name VARCHAR(30), hostel
INTEGER NOT NULL, percentage DECIMAL(5,2) DEFAULT 0.0, phone INT, bdate DATE,
gender ENUM('F','M'), CONSTRAINT ue UNIQUE (phone),PRIMARY KEY (id) );
```

(OR)

```
mysql> CREATE TABLE gradstudents (id CHARACTER (12) PRIMARY KEY, name
VARCHAR(30), hostel INTEGER NOT NULL, percentage DECIMAL(5,2) DEFAULT 0.0,
phone INT, bdate DATE, gender ENUM('F','M'),CONSTRAINT ue UNIQUE (phone));
```

TRY THIS (justify if you get errors):

```
mysql> CREATE TABLE temp (id char(10), name varchar(30) unique, hostel int, percentage
decimal(5,2) default 0.0, phone VARCHAR(11), bdate date, gender enum('F','M'),  primary
key(id), primary key(name) );
```

Correct method to create a composite primary key:

```
mysql> CREATE TABLE temp (id char(10), name varchar(30) unique, hostel int, percentage
decimal(5,2) default 0.0, phone varchar(11), bdate date, gender enum('F','M'), primary
key(id,name) );
```

Describe Table:

Syntax to view the table structure
desc <table name>;

Example:

```
mysql> desc students;
mysql> desc gradstudents;
```

Why is the NULL column of the 'id' row in 'students' table YES? Why is it NO in the case of the gradstudents table?

To alter a table:

Syntax to alter the table structure:

alter table <table name> **modify** <column name> <column definition>**;**

alter table <table name> **rename** <new table name>**;**

alter table <table name> **add column** (column definition)**;**

alter table <table name> **change** <old column name> <new name> <old column definition>**;**

alter table <table name> **drop column** <column name>**;**

alter table <table name> **add constraint** <constraint name> (condition);

alter table <table name> **drop constraint** <constraint name>;

Example:

```
mysql> alter table students modify name varchar (40); //to increase the size.
mysql> alter table students modify name varchar (10);  //to decrease the size.
mysql > alter table students add column address varchar (25); //to add new column.
```

```
mysql> alter table students change address postaladdress varchar (25); //to rename a column.
mysql > alter table students drop column postaladdress; //to remove a column.
mysql > alter table students modify phone varchar(10); //changing type, to accept realistic phone numbers.
mysql > alter table gradstudents drop index ue; //to remove unique constraint on phone.
```

Check the result of the above queries by ‘desc’ command.

DML COMMANDS

Insert data:

Syntax to insert a row in a table:
insert into <table name> [field names] **values** (a list of data values);

Examples:

```
mysql> INSERT INTO students VALUES ('PS99305017', 'Mohan Sharma', 13,76.23,
'9800000002', '2001-03-15', 'M');
```

(OR)

```
mysql> INSERT INTO students (id, name, hostel, percentage,phone, bdate, gender) VALUES
('PS99305017', 'Sai Sundar',11,77.23, '9800000001', '2001-01-25','M');
//(Date format is 'YYYY-MM-DD')
```

TRY THIS (justify if you get errors):

```
mysql > INSERT INTO students VALUES ('Sai Sundar','PS99305017',11,77.23,'2001-01-25',
'9800000001','M');
```

Correcting this:

(We cannot enter duplicate values of phone into the table, as we have defined it to be unique)

```
mysql > INSERT INTO students (name, id, hostel, percentage, bdate, phone, gender) VALUES
('Jay Singh','PS99305012',11,83.73,'2000-07-04', '9900000002','M');
```

```
/* to violate unique constraint by inserting same name to another student*/
mysql> INSERT INTO students VALUES ('PS99305018','Sai
Sundar',11,90.23,'9800000001','2001-01-25','M');
```

```
/* to insert blank in primary key column by giving blank id to a student*/
```

```
mysql> INSERT INTO students VALUES (",'Shyam Sundar',11,90.23,9800000004,'2001-01-
25','M');
```

```
/* to insert blank in column having unique constraint by giving blank name to a student*/
mysql> INSERT INTO students VALUES ( 'PS99305018', NULL, 11, 90.23, '9800000009',
'2001-01-25',' M');
mysql> INSERT INTO students VALUES ( 'PS99305018',", 11, 90.23, '9800000009', '2001-01-
25',' M');
```

Try running both commands twice. As you can see, NULL does not count as a repeated value.

```
/* to violate not null constraint by inserting NULL in hostel column*/
mysql >INSERT INTO students VALUES ('PS99305020','Sundaram',NULL,90.23,'9800000005',
'2001-01-25', 'M');
```

```
/* to miss single quote in char or varchar data type);*/
mysql> INSERT INTO students VALUES (PS99305020, 'Sundaram',11,90.23,9800000006,'2001-
01-25','M');
```

```
/*to exceed the size of an attribute(name here)*/
mysql > INSERT INTO students VALUES ('PS99305021','Ram Prabhu Sundaran',11,90.23,
'9800000006', '2001-01-25','M');
```

```
/*to exceed date limit*/
mysql> INSERT INTO students VALUES ('PS99305023','Ramnarayan
Sundaran',11,90.23,'9800000006','2001-02-30','M');
```

```
/*to violate enum datatype */
mysql> INSERT INTO students VALUES ('PS99305025', 'Narayan
Sundar',11,90.23,'9800000007','2001-02-16','K');
```

DQL COMMAND

Syntax of select command:

- *to display all rows*

select * from <tablename>;

Example:

```
mysql>SELECT * FROM students;
```

Observe the bdate of student with id PS99305023, it is the default value.
Observe percentage of student with id PS99305019, it is 0.0, the default value set by user.
Observe value in gender column of student with id PS99305025, its blank.

- *to display particular column(s)*

select column name …. **from** table name;

Example:

```
        mysql >SELECT  id FROM students;
        mysql >SELECT  id, name FROM students;
```

- *to display distinct rows*

select distinct column name **from** tablename;

Example:

```
      mysql > SELECT DISTINCT name from students;
```

<u>Update Query</u>

Syntax of update command

update tablename **set** field=value, …**where** condition;

Example:

```
mysql >UPDATE students SET percentage=90.46 WHERE id='PS99305018';
mysql > UPDATE students SET name ='Sham' WHERE name ='Sai Sundar';
mysql > UPDATE students SET hostel=hostel*10;
```

<u>Delete Query:</u>

Syntax of delete command

delete from <table name> **where** condition(and/or conditions);

Example: ***to delete record of a particular student***

```
mysql > delete from students where id='PS99305018';
```

<u>Display system date:</u>

```
mysql >SELECT sysdate() from dual;
```

<u>Some more DDL Commands</u>

Enter some records in gradstudents table and try following commands

<u>Truncate the table:</u> (Used to delete all records from a table)

<u>*Syntax to truncate a table:*</u>

truncate table <table name>;

<u>*Example:*</u>

```
mysql> truncate table gradstudents;
mysql> select * from gradstudents;  //to test test result of truncate
```

<u>Dropping the database:</u>

<u>*Syntax to drop a database:*</u>

drop database <database name>;

<u>*Example:*</u>

```
mysql> drop database mydb;
mysql> show databases;//to check status
```

<u>Dropping the tables:</u>

<u>*Syntax to drop a table:*</u>

drop table <table name>;

<u>*Example:*</u>

```
mysql> drop table gradstudents;
mysql> show tables;//to check status
```

Q. Find the difference between truncate and drop SQL command? ____

Export

To Export a database, open up terminal, making sure that you are not logged into MySQL and type,

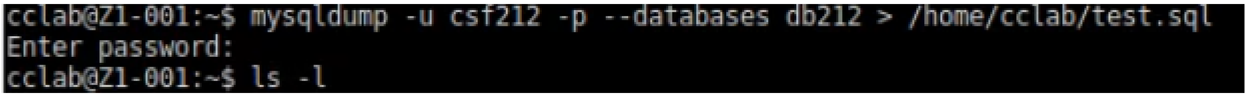
For root user:

mysqldump -u [username] -p [database name] > [database name].sql

For non-root user:

mysqldump -u {db_user} -p --databases {db_name} > /home/{user}/my.dump.sql

example:



```
cclab@Z1-001:~$ mysqldump -u csf212 -p --databases db212 > /home/cclab/test.sql
Enter password:
cclab@Z1-001:~$ ls -l
```

The database that you selected in the command will now be exported to your droplet.

Import

To import a database, first create a new blank database in the MySQL shell to serve as a destination for your data.

CREATE DATABASE newdatabase;
Then log out of the MySQL shell and type the following on the command line:

mysql -u [username] -p newdatabase < [database name].sql

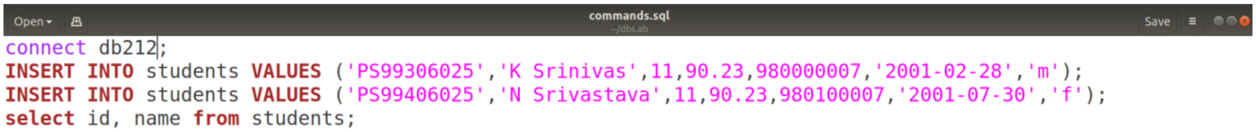
With that, your chosen database has been imported into your destination database in MySQL.

Running SQL script

As described above you can run SQL script from the linux terminal using the following command: mysql -u [username] -p newdatabase < [database name].sql

But, there is also another way of running the SQL script from within the MySQL shell. You can use the ‘source’ command for this purpose.

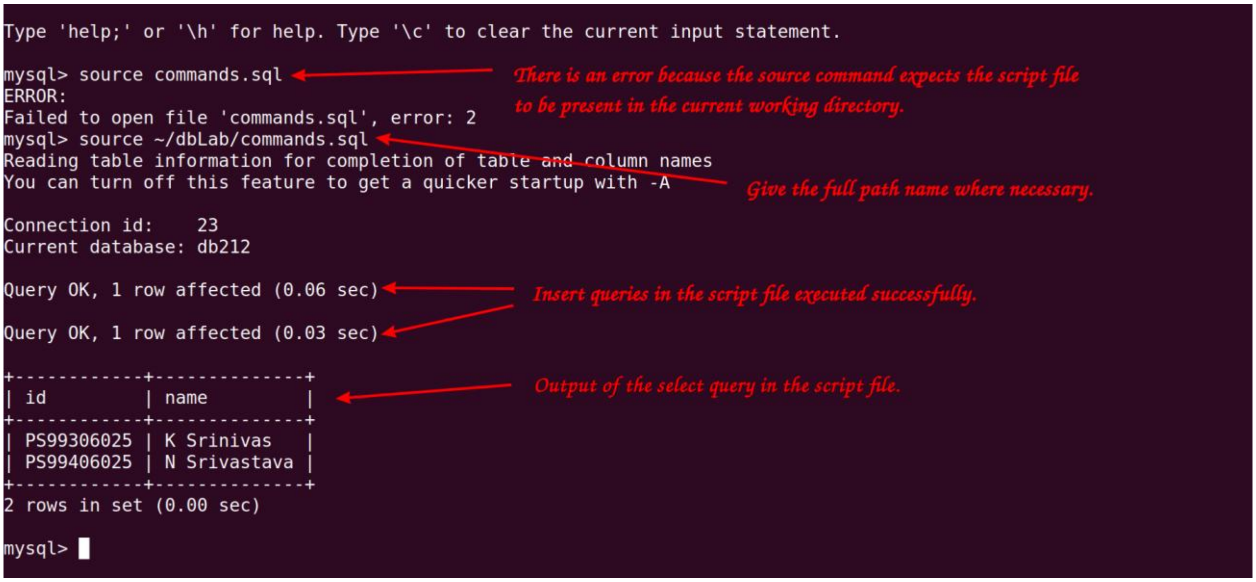
Suppose you have an SQL script as shown below. You can edit the script using any text editor.



```
connect db212;
INSERT INTO students VALUES ('PS99306025','K Srinivas',11,90.23,980000007,'2001-02-28','m');
INSERT INTO students VALUES ('PS99406025','N Srivastava',11,90.23,980100007,'2001-07-30','f');
select id, name from students;
```

The SQL script shown above contains three different SQL commands. The script can be run from within the MySQL shell as shown below.

The screenshot below shows how to run the script from within the MySQL shell.



```
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> source commands.sql
ERROR:
Failed to open file 'commands.sql', error: 2
mysql> source ~/dbLab/commands.sql
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Connection id:    23
Current database: db212

Query OK, 1 row affected (0.06 sec)

Query OK, 1 row affected (0.03 sec)

+------------+--------------+
| id         | name         |
+------------+--------------+
| PS99306025 | K Srinivas   |
| PS99406025 | N Srivastava |
+------------+--------------+
2 rows in set (0.00 sec)

mysql> █
```

There is an error because the source command expects the script file to be present in the current working directory.

Give the full path name where necessary.

Insert queries in the script file executed successfully.

Output of the select query in the script file.

To Explore:

Try enum (‘f’, ‘F’,’m’,’M’) and study the error.