Database Administration Homework

PART 1

1. Download MySQL server for your OS on VM.

2. Install MySQL server on VM.

I am going to use AWS EC2 instance.

```
ubuntu@ip-172-31-91-211:~ (43.736s)
sudo apt install mysql-server

Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libcgi-fast-perl libcgi-pm-perl libclone-perl libencode-locale-perl
  libevent-pthreads-2.1-7 libfcgi-bin libfcgi-perl libfcgi0ldbl libhtml-parser-perl
  libhtml-tagset-perl libhtml-template-perl libhttp-date-perl libhttp-message-perl
  libio-html-perl liblwp-mediatypes-perl libmecab2 libprotobuf-lite23 libtimedate-perl
  liburi-perl mecab-ipadic mecab-ipadic-utf8 mecab-utils mysql-client-8.0
  mysql-client-core-8.0 mysql-common mysql-server-8.0 mysql-server-core-8.0
Suggested packages:
  libdata-dump-perl libipc-sharedcache-perl libbusiness-isbn-perl libwww-perl mailx
  tinyca
```

```
ubuntu@ip-172-31-91-211:~ (0.204s)
sudo systemctl start mysql.service

ubuntu@ip-172-31-91-211:~ (5.085s)
sudo systemctl status mysql.service
● mysql.service - MySQL Community Server
     Loaded: loaded (/lib/systemd/system/mysql.service; enabled; vendor preset: enabled)
     Active: active (running) since Thu 2023-01-19 11:46:42 UTC; 44s ago
    Process: 5462 ExecStartPre=/usr/share/mysql/mysql-systemd-start pre (code=exited, s>
   Main PID: 5476 (mysqld)
     Status: "Server is operational"
      Tasks: 39 (limit: 1143)
     Memory: 356.2M
        CPU: 1.193s
     CGroup: /system.slice/mysql.service
             └─5476 /usr/sbin/mysqld

Jan 19 11:46:41 ip-172-31-91-211 systemd[1]: Starting MySQL Community Server...
Jan 19 11:46:42 ip-172-31-91-211 systemd[1]: Started MySQL Community Server.
lines 1-14/14 (END)
```

3. Select a subject area and describe the database schema, (minimum 3 tables)

Subject area: Online Shopping

Table 1: Users

- UserID (Primary Key)
- Name
- Email
- Password
- ShippingAddress

Table 2: Products

- ProductID (Primary Key)
- Name
- Description
- Price
- Quantity

Table 3: Orders

- OrderID (Primary Key)
- UserID (Foreign Key referencing Users table)
- ProductID (Foreign Key referencing Products table)
- Quantity
- TotalPrice
- OrderDate

4. Create a database on the server through the console.

```
mysql> create database homework;
Query OK, 1 row affected (0.01 sec)

mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| homework           |
| information_schema |
| mysql              |
| performance_schema |
| sys                |
+--------------------+
5 rows in set (0.00 sec)

mysql> use homework;
Database changed
```

```
mysql> CREATE TABLE Users (
    ->     UserID INT AUTO_INCREMENT PRIMARY KEY,
    ->     Name VARCHAR(255) NOT NULL,
    ->     Email VARCHAR(255) NOT NULL,
    ->     Password VARCHAR(255) NOT NULL,
    ->     ShippingAddress VARCHAR(255) NOT NULL
    -> );
Query OK, 0 rows affected (0.05 sec)

mysql> CREATE TABLE Products (
    ->     ProductID INT AUTO_INCREMENT PRIMARY KEY,
    ->     Name VARCHAR(255) NOT NULL,
    ->     Description VARCHAR(255) NOT NULL,
    ->     Price DECIMAL(10,2) NOT NULL,
    ->     Quantity INT NOT NULL
    -> );
Query OK, 0 rows affected (0.05 sec)

mysql> CREATE TABLE Orders (
    ->     OrderID INT AUTO_INCREMENT PRIMARY KEY,
    ->     UserID INT NOT NULL,
    ->     ProductID INT NOT NULL,
    ->     Quantity INT NOT NULL,
    ->     TotalPrice DECIMAL(10,2) NOT NULL,
    ->     OrderDate DATE NOT NULL,
    ->     FOREIGN KEY (UserID) REFERENCES Users(UserID),
    ->     FOREIGN KEY (ProductID) REFERENCES Products(ProductID)
    -> );
Query OK, 0 rows affected (0.04 sec)
```

```
mysql> show tables;
+--------------------+
| Tables_in_homework |
+--------------------+
| Orders             |
| Products           |
| Users              |
+--------------------+
3 rows in set (0.00 sec)
```

5. Fill in tables.

```
mysql> INSERT INTO Users (Name, Email, Password, ShippingAddress) VALUES
    -> ("John Smith", "johnsmith@example.com", "password123", "123 Main St"),
    -> ("Jane Doe", "janedoe@example.com", "password456", "456 Park Ave"),
    -> ("Bob Johnson", "bobjohnson@example.com", "password789", "789 Elm St");
Query OK, 3 rows affected (0.01 sec)
Records: 3  Duplicates: 0  Warnings: 0

mysql> INSERT INTO Products (Name, Description, Price, Quantity) VALUES
    -> ("Product 1", "This is a sample product", 19.99, 10),
    -> ("Product 2", "Another sample product", 29.99, 20),
    -> ("Product 3", "Yet another sample product", 39.99, 30);
Query OK, 3 rows affected (0.01 sec)
Records: 3  Duplicates: 0  Warnings: 0

mysql> INSERT INTO Orders (UserID, ProductID, Quantity, TotalPrice, OrderDate) VALUES
    -> (1,1,1,19.99,'2022-01-01'),
    -> (2,2,2,59.98,'2022-01-02'),
    -> (3,3,3,119.97,'2022-01-03');
Query OK, 3 rows affected (0.01 sec)
Records: 3  Duplicates: 0  Warnings: 0
```

```
mysql> select * from Users
    -> ;
+--------+-------------+----------------------+-------------+-----------------+
| UserID | Name        | Email                | Password    | ShippingAddress |
+--------+-------------+----------------------+-------------+-----------------+
|      1 | John Smith  | johnsmith@example.com | password123 | 123 Main St     |
|      2 | Jane Doe    | janedoe@example.com   | password456 | 456 Park Ave    |
|      3 | Bob Johnson | bobjohnson@example.com | password789 | 789 Elm St      |
+--------+-------------+----------------------+-------------+-----------------+
3 rows in set (0.00 sec)

mysql> select * from Products;
+-----------+-----------+---------------------------+-------+----------+
| ProductID | Name      | Description               | Price | Quantity |
+-----------+-----------+---------------------------+-------+----------+
|         1 | Product 1 | This is a sample product  | 19.99 |       10 |
|         2 | Product 2 | Another sample product    | 29.99 |       20 |
|         3 | Product 3 | Yet another sample product | 39.99 |       30 |
+-----------+-----------+---------------------------+-------+----------+
3 rows in set (0.00 sec)

mysql> select * from Orders;
+---------+--------+-----------+----------+------------+------------+
| OrderID | UserID | ProductID | Quantity | TotalPrice | OrderDate  |
+---------+--------+-----------+----------+------------+------------+
|       1 |      1 |         1 |        1 |      19.99 | 2022-01-01 |
|       2 |      2 |         2 |        2 |      59.98 | 2022-01-02 |
|       3 |      3 |         3 |        3 |     119.97 | 2022-01-03 |
+---------+--------+-----------+----------+------------+------------+
3 rows in set (0.00 sec)
```

6. Construct and execute SELECT operator with WHERE, GROUP BY and ORDER BY.

- Retrieve all the orders placed by a user with a specific email address, ordered by the order date:

```
mysql> SELECT * FROM Orders
    -> WHERE UserID = (SELECT UserID FROM Users WHERE Email = "johnsmith@example.com")
    -> ORDER BY OrderDate;
+---------+--------+-----------+----------+------------+------------+
| OrderID | UserID | ProductID | Quantity | TotalPrice | OrderDate  |
+---------+--------+-----------+----------+------------+------------+
|       1 |      1 |         1 |        1 |      19.99 | 2022-01-01 |
+---------+--------+-----------+----------+------------+------------+
1 row in set (0.00 sec)
```

- Retrieve the total quantity and total price of products sold for each product:

```
mysql> SELECT ProductID, SUM(Quantity) as TotalQuantity, SUM(TotalPrice) as TotalPrice
    -> FROM Orders
    -> GROUP BY ProductID;
+-----------+---------------+------------+
| ProductID | TotalQuantity | TotalPrice |
+-----------+---------------+------------+
|         1 |             1 |      19.99 |
|         2 |             2 |      59.98 |
|         3 |             3 |     119.97 |
+-----------+---------------+------------+
3 rows in set (0.00 sec)
```

- Retrieve the total price of orders for each user, ordered by the total price in descending order:

```
mysql> SELECT UserID, SUM(TotalPrice) as TotalPrice
    -> FROM Orders
    -> GROUP BY UserID
    -> ORDER BY TotalPrice DESC;
+--------+------------+
| UserID | TotalPrice |
+--------+------------+
|      3 |     119.97 |
|      2 |      59.98 |
|      1 |      19.99 |
+--------+------------+
3 rows in set (0.01 sec)
```

7. Execute other different SQL queries DDL, DML, DCL.

1) DDL (Data Definition Language)

- CREATE TABLE: Creates a new table in the database.

```
mysql> CREATE TABLE Customers (
    ->     CustomerID INT AUTO_INCREMENT PRIMARY KEY,
    ->     Name VARCHAR(255) NOT NULL,
    ->     Email VARCHAR(255) NOT NULL,
    ->     Phone VARCHAR(255) NOT NULL
    -> );
Query OK, 0 rows affected (0.04 sec)
```

- ALTER TABLE: Modifies an existing table in the database.

```
mysql> ALTER TABLE Customers
    -> ADD COLUMN Address VARCHAR(255);
Query OK, 0 rows affected (0.02 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

- DROP TABLE: Deletes an existing table in the database.

```
mysql> DROP TABLE Customers;
Query OK, 0 rows affected (0.08 sec)
```

2) DML (Data Manipulation Language)

- INSERT INTO: Inserts new data into a table in the database.

```
mysql> INSERT INTO Customers (Name, Email, Phone) VALUES
    -> ("Jane Doe", "janedoe@example.com", "555-555-5555"),
    -> ("John Smith", "johnsmith@example.com", "555-555-5556");
Query OK, 2 rows affected (0.00 sec)
Records: 2  Duplicates: 0  Warnings: 0
```

- SELECT: Retrieves data from one or more tables in the database.

```
mysql> SELECT * FROM Customers;
+------------+------------+----------------------+--------------+---------+
| CustomerID | Name       | Email                | Phone        | Address |
+------------+------------+----------------------+--------------+---------+
|          1 | Jane Doe   | janedoe@example.com  | 555-555-5555 | NULL    |
|          2 | John Smith | johnsmith@example.com | 555-555-5556 | NULL    |
+------------+------------+----------------------+--------------+---------+
2 rows in set (0.00 sec)
```

- UPDATE: Modifies existing data in a table in the database.

```
mysql> UPDATE Customers
    -> SET Phone = "555-555-5557"
    -> WHERE CustomerID = 2;
Query OK, 1 row affected (0.01 sec)
Rows matched: 1  Changed: 1  Warnings: 0
```

- DELETE FROM: Deletes data from a table in the database.

```
mysql> DELETE FROM Customers
    -> WHERE CustomerID = 2;
Query OK, 1 row affected (0.01 sec)

mysql> SELECT * FROM Customers;
+------------+----------+--------------------+--------------+---------+
| CustomerID | Name     | Email              | Phone        | Address |
+------------+----------+--------------------+--------------+---------+
|          1 | Jane Doe | janedoe@example.com | 555-555-5555 | NULL    |
+------------+----------+--------------------+--------------+---------+
1 row in set (0.00 sec)
```

3) DCL (Data Control Language)

- GRANT: Gives a user permission to perform a specific action.

```
mysql> CREATE USER 'newuser'@'localhost' IDENTIFIED BY 'password';
Query OK, 0 rows affected (0.02 sec)

mysql> GRANT SELECT, INSERT ON Customers TO 'newuser'@'localhost';
Query OK, 0 rows affected (0.01 sec)
```

- REVOKE: Removes a user's permission to perform a specific action.

```
mysql> REVOKE SELECT ON Customers FROM 'newuser'@'localhost';
Query OK, 0 rows affected (0.01 sec)
```

8. Create a database of new users with different privileges. Connect to the database as a new user and verify that the privileges allow or deny certain actions.

```
mysql> CREATE DATABASE mydb;
Query OK, 1 row affected (0.01 sec)

mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| homework           |
| information_schema |
| mydb               |
| mysql              |
| performance_schema |
| sys                |
+--------------------+
6 rows in set (0.00 sec)
```

```
mysql> CREATE USER 'user11'@'localhost' IDENTIFIED BY 'password';
Query OK, 0 rows affected (0.02 sec)

mysql> GRANT CREATE, SELECT, INSERT, UPDATE ON mydb.* TO 'user11'@'localhost';
Query OK, 0 rows affected (0.01 sec)

mysql> exit
Bye
```

```
ubuntu@ip-172-31-91-211:~
mysql -u user11 -p mydb
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 15
Server version: 8.0.31-0ubuntu0.22.04.1 (Ubuntu)

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affiliates. Other names may be trademarks of their respective
owners.

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

```
mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mydb               |
| performance_schema |
+--------------------+
3 rows in set (0.00 sec)

mysql> CREATE TABLE Customers (
    ->     CustomerID INT AUTO_INCREMENT PRIMARY KEY,
    ->     Name VARCHAR(255) NOT NULL,
    ->     Email VARCHAR(255) NOT NULL,
    ->     Phone VARCHAR(255) NOT NULL
    -> );
Query OK, 0 rows affected (0.02 sec)
```

```
mysql> SELECT * FROM Customers;
+------------+----------+--------------------+--------------+
| CustomerID | Name     | Email              | Phone        |
+------------+----------+--------------------+--------------+
|          1 | Jane Doe | janedoe@example.com | 555-555-5555 |
+------------+----------+--------------------+--------------+
1 row in set (0.00 sec)

mysql> UPDATE Customers SET Phone = "555-555-5556" WHERE CustomerID = 1;
Query OK, 1 row affected (0.01 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> SELECT * FROM Customers;
+------------+----------+--------------------+--------------+
| CustomerID | Name     | Email              | Phone        |
+------------+----------+--------------------+--------------+
|          1 | Jane Doe | janedoe@example.com | 555-555-5556 |
+------------+----------+--------------------+--------------+
1 row in set (0.00 sec)

mysql> DROP TABLE Customers;
ERROR 1142 (42000): DROP command denied to user 'user11'@'localhost' for table 'Customer
s'
mysql> SHOW GRANTS FOR 'user11'@'localhost';
+-----------------------------------------------------------------------+
| Grants for user11@localhost                                           |
+-----------------------------------------------------------------------+
| GRANT USAGE ON *.* TO `user11`@`localhost`                            |
| GRANT SELECT, INSERT, UPDATE, CREATE ON `mydb`.* TO `user11`@`localhost` |
+-----------------------------------------------------------------------+
2 rows in set (0.00 sec)
```

9. Make a selection from the main table DB MySQL.

```
mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| homework           |
| information_schema |
| mydb               |
| mysql              |
| performance_schema |
| sys                |
+--------------------+
6 rows in set (0.00 sec)

mysql> use mysql;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> show tables;
+---------------------------------------------------+
| Tables_in_mysql                                   |
+---------------------------------------------------+
| columns_priv                                      |
| component                                         |
| db                                                |
| default_roles                                     |
| engine_cost                                       |
```

```
mysql> select * from db where user = 'user11' \G
*************************** 1. row ***************************
                 Host: localhost
                   Db: mydb
                 User: user11
          Select_priv: Y
          Insert_priv: Y
          Update_priv: Y
          Delete_priv: N
          Create_priv: Y
            Drop_priv: N
           Grant_priv: N
      References_priv: N
           Index_priv: N
           Alter_priv: N
Create_tmp_table_priv: N
     Lock_tables_priv: N
     Create_view_priv: N
       Show_view_priv: N
  Create_routine_priv: N
   Alter_routine_priv: N
         Execute_priv: N
           Event_priv: N
         Trigger_priv: N
1 row in set (0.00 sec)
```

PART 2

10.Make backup of your database.

```
ubuntu@ip-172-31-91-211:~ (6.136s)
mysqldump -u admin -p homework >bkup.sql
Enter password:

ubuntu@ip-172-31-91-211:~ (0.144s)
ls *.sql
bkup.sql
```

11.Delete the table and/or part of the data in the table.

Here are our tables in homework database. Let`s delete one.

```
mysql> use homework;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> show tables;
+--------------------+
| Tables_in_homework |
+--------------------+
| Orders             |
| Products           |
| Users              |
+--------------------+
3 rows in set (0.00 sec)
```

```
mysql> DROP TABLE Orders;
Query OK, 0 rows affected (0.03 sec)

mysql> show tables;
+--------------------+
| Tables_in_homework |
+--------------------+
| Products           |
| Users              |
+--------------------+
2 rows in set (0.00 sec)
```

12.Restore your database.

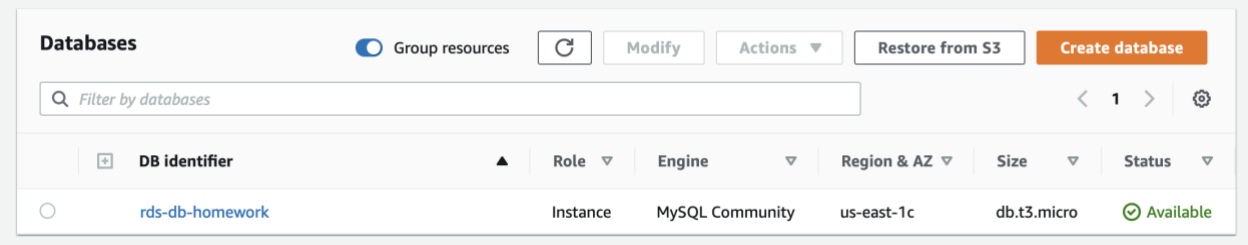
```
ubuntu@ip-172-31-91-211:~ (5.929s)
mysql -u admin -p homework <bkup.sql
Enter password:
```

```
mysql> use homework;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> show tables;
+--------------------+
| Tables_in_homework |
+--------------------+
| Orders             |
| Products           |
| Users              |
+--------------------+
3 rows in set (0.00 sec)
```

13.Transfer your local database to RDS AWS.

First, let`s create a RDS instance.



Next we have to create a new MySQL database homework on the RDS instance.

```
ubuntu@ip-172-31-91-211:~
mysql -h 'rds-db-homework.c0g27oez06pg.us-east-1.rds.amazonaws.com' -P 3306 -u maxim -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 19
Server version: 8.0.31 Source distribution

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affiliates. Other names may be trademarks of their respective
owners.

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

mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mysql              |
| performance_schema |
| sys                |
+--------------------+
4 rows in set (0.00 sec)
```
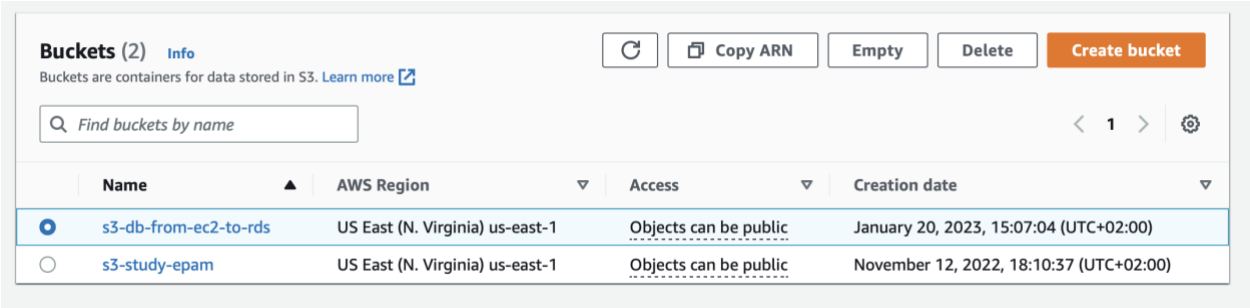

```
mysql> CREATE DATABASE homework;
Query OK, 1 row affected (0.00 sec)

mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| homework           |
| information_schema |
| mysql              |
| performance_schema |
| sys                |
+--------------------+
5 rows in set (0.00 sec)
```

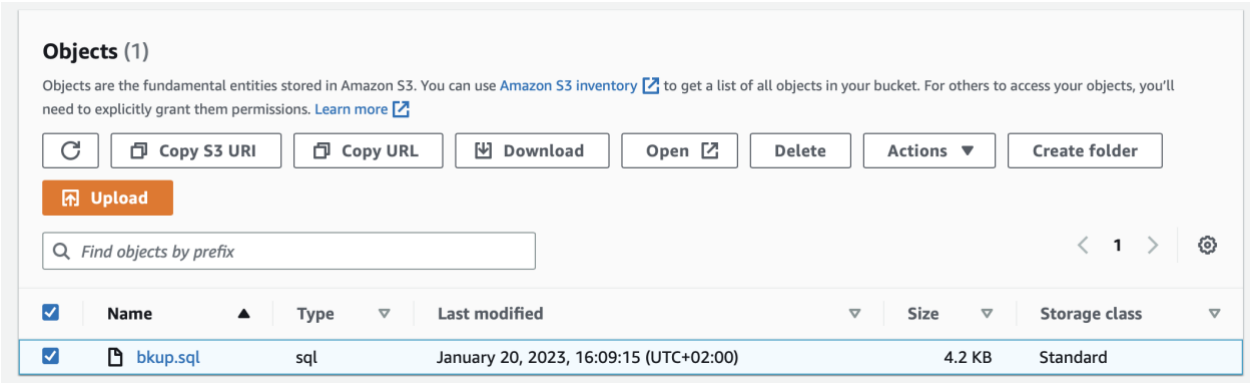
Then create a S3 bucket to copy our bkup.sql from EC2 instance to S3.



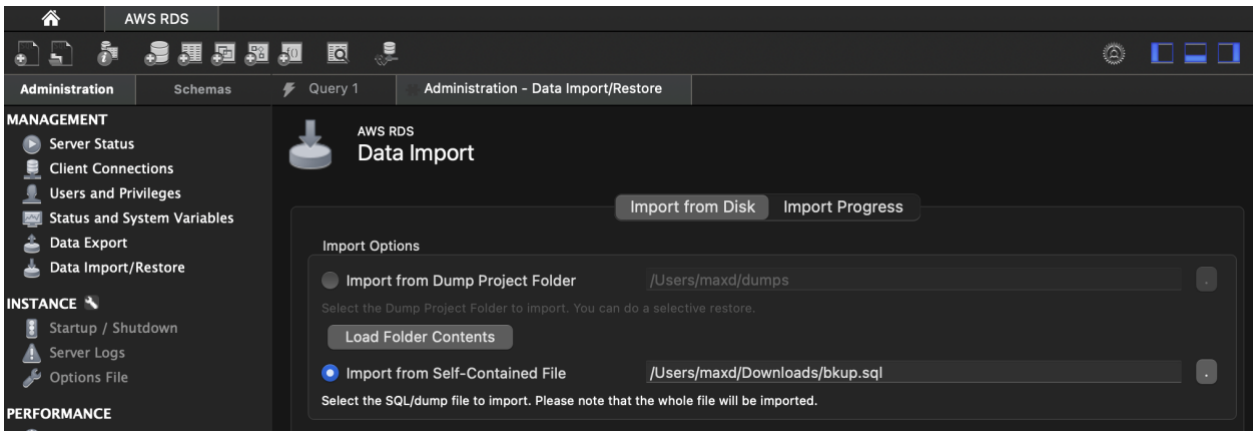
Copy bkup.sql to S3 with the help of AWS CLI installed on our EC2 instance.

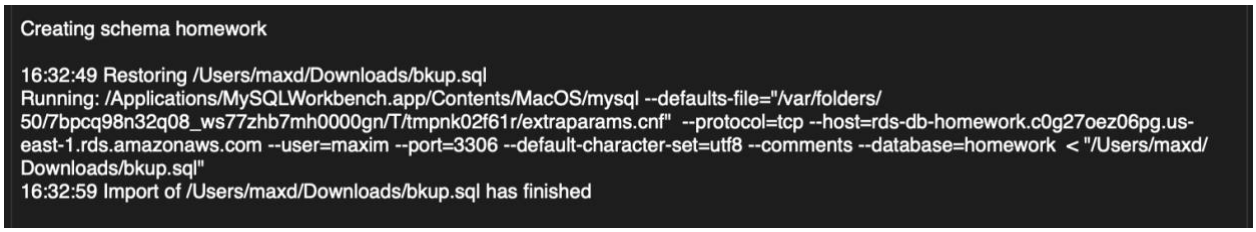
```
ubuntu@ip-172-31-91-211:~ (0.956s)
aws s3 cp ~/bkup.sql s3://s3-db-from-ec2-to-rds/
upload: ./bkup.sql to s3://s3-db-from-ec2-to-rds/bkup.sql
```

Download the bkup.sql to the local machine.

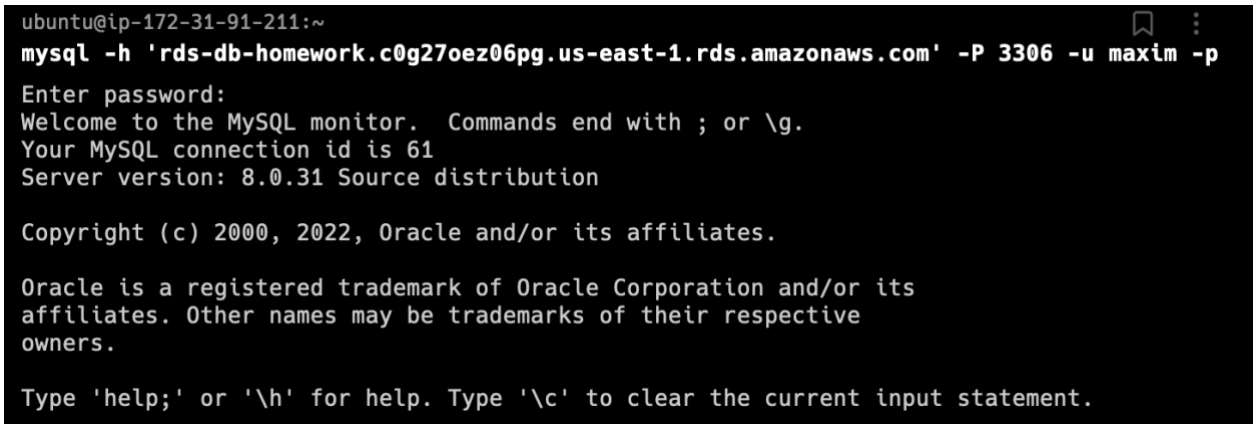


Upload bkup.sql to RDS through the import feature of mySQLWorkbench.





14.Connect to your database.



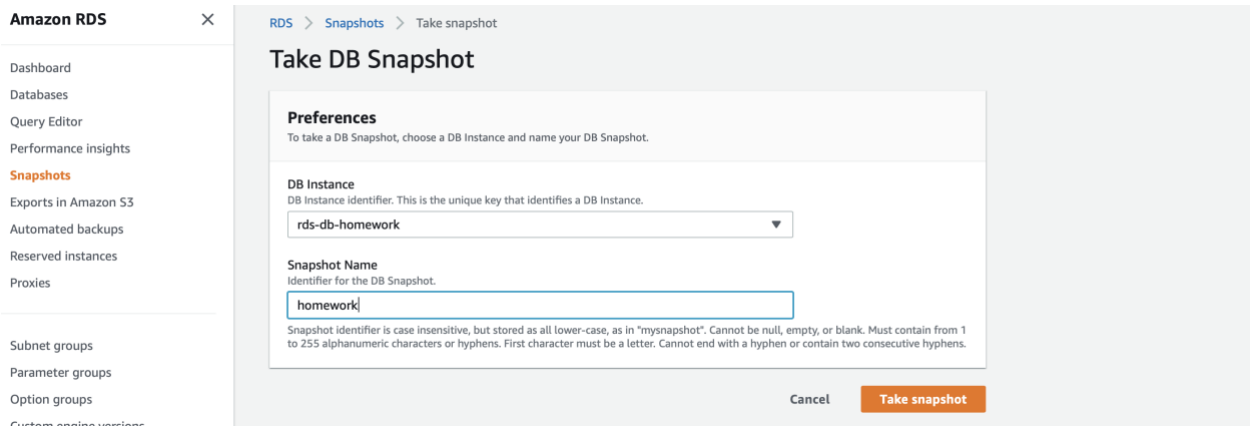
```
mysql> show databases
    -> ;
+--------------------+
| Database           |
+--------------------+
| homework           |
| information_schema |
| mysql              |
| performance_schema |
| sys                |
+--------------------+
5 rows in set (0.00 sec)

mysql> use homework;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> show tables;
+--------------------+
| Tables_in_homework |
+--------------------+
| Orders             |
| Products           |
| Users              |
+--------------------+
3 rows in set (0.00 sec)
```

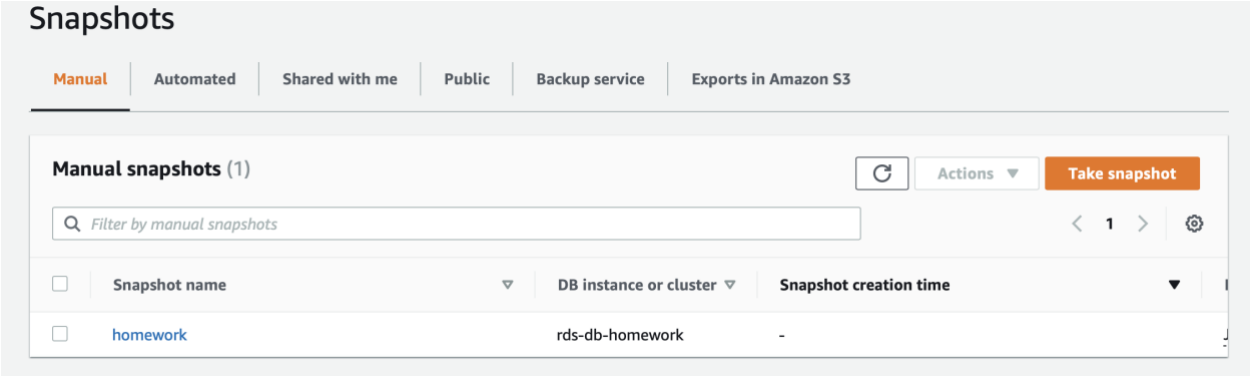
15.Execute SELECT operator similar step 6.

```
mysql> SELECT * FROM Orders
    -> WHERE UserID = (SELECT UserID FROM Users WHERE Email = "johnsmith@example.com")
    -> ORDER BY OrderDate;
+---------+--------+-----------+----------+------------+------------+
| OrderID | UserID | ProductID | Quantity | TotalPrice | OrderDate  |
+---------+--------+-----------+----------+------------+------------+
|       1 |      1 |         1 |        1 |      19.99 | 2022-01-01 |
+---------+--------+-----------+----------+------------+------------+
1 row in set (0.00 sec)
```

16.Create the dump of your database.

The dump of our database we can make through the Snapshot feature in the RDS Console.





PART 3 – MongoDB

17. Create a database. Use the use command to connect to a new database (If it doesn't exist, Mongo will create it when you write to it).

Installing MongoDB was a nightmare but I managed to do it))).

```
test> show dbs
admin   40.00 KiB
config  12.00 KiB
local   40.00 KiB
test> use homework;
switched to db homework
homework>
```

18. Create a collection. Use db.createCollection to create a collection. I'll leave the subject up to you. Run show dbs and show collections to view your database and collections.

```
homework> db.createCollection("demo")
{ ok: 1 }
```

```
homework> show dbs
admin     40.00 KiB
config    72.00 KiB
homework   8.00 KiB
local     40.00 KiB
```

```
homework> show collections
demo
```

19. Create some documents. Insert a couple of documents into your collection. I'll leave the subject matter up to you, perhaps cars or hats.

```
homework> db.demo.insertMany([
...     { name: "John", age: 25 },
...     { name: "Jane", age: 30 },
...     { name: "Bob", age: 35 }
... ])
{
  acknowledged: true,
  insertedIds: {
    '0': ObjectId("63c9b3ccc7b8ba5da26195ff"),
    '1': ObjectId("63c9b3ccc7b8ba5da2619600"),
    '2': ObjectId("63c9b3ccc7b8ba5da2619601")
  }
}
```

20. Use find() to list documents out

```
homework> db.demo.find()
[
  { _id: ObjectId("63c9b3ccc7b8ba5da26195ff"), name: 'John', age: 25 },
  { _id: ObjectId("63c9b3ccc7b8ba5da2619600"), name: 'Jane', age: 30 },
  { _id: ObjectId("63c9b3ccc7b8ba5da2619601"), name: 'Bob', age: 35 }
]
```