Module 3 : Database

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Introduction

Database - any collection of related information. E.g. – amazon user database, banking services, auto industry etc.

Database Management Systems (DBMS) – a special software program that helps user create, maintain and secure a database.

- Makes it easy to manage large amounts of information
- Handles security
- Backups
- Importing/exporting data
- Concurrency
- Interacts with other software applications

C. R. U. D. operations

There are generally four main operations that a database management systems perform, and they are:

- **Create** – Creation of a database
- **Read** – Reading of a database
- **Update** – Updating a database
- **Delete** – Deleting a database

In a database - Data is organized into one or more tables.

- Each table has columns and rows
- A unique key identifies each row
- Structured Query Language (SQL) is used for interacting with these database management systems

Intuition & Imp. terms

PK	**Primary Key**
FK	**Foreign Key**
	Attributes

PK FK

NUID	First name	Last name	Department Code
94849311	John	Wick	BSE
64895674	Bruce	Wayne	CSE
32158463	Peter	Parker	ECE

Student table

PK FK

Department Code	Department name	Location
BSE	Biological Systems Engg.	East
CSE	Computer Science Engg.	City
ECE	Electrical & Computer Engg.	City
STAT	Statistics	East

Department table

PK

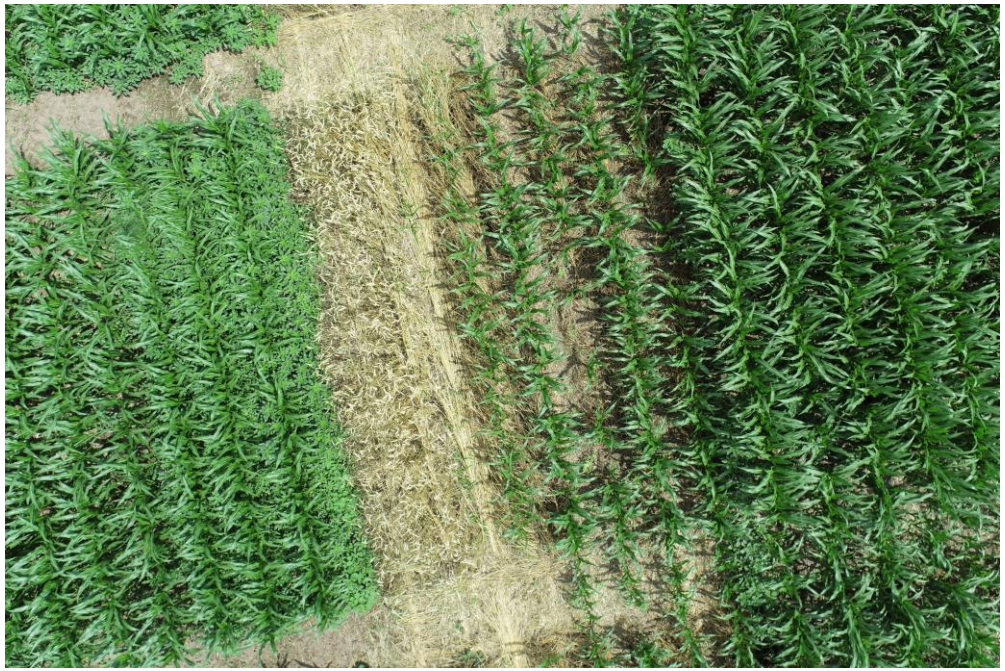
Location	Pantry Location	Opening time	Closing time
East	Dairy store	16:00:00	17:00:00
City	Health center	12:00:00	16:00:00

Pantry information table

Problem description – Field Scouting Logs

Assume you are hired to maintain field scouting logs in a company, following tasks could be done -

- You need to maintain the record for people who went for data collection on different dates
- Maintain logs for which vehicles were taken on specific days
- Maintain record of drones with the company
- Personal details of employees
- …



https://www.potatopro.com/products/agroscout-crop-scouting-package-drone-software

Original dataset :

A	B	C	D	E	F	G	H	I	J	K	L	M
Flight No	**Date**	**NU ID**	**Drone_id**	**Truck_id**	**First_name**	**Last_name**	**Phone_number**	**Drone_name**	**Date_purchase**	**Truck_name**	**Truck_plate**	
1	5/1/2022	100	1	1	John	Wick	3526520474	DJI Matric 300 RTK	8/14/2021	Ford 150	UAV129	
2	5/8/2022	110	2	2	Peter	Parker	4319997713	DJI Phantom 4	4/5/2019	Ford 250	OIG896	
3	5/15/2022	120	2	3	Dwayne	Johnson	4024053487	DJI Phantom 4	4/5/2019	Ford 350	PII200	
4	5/22/2022	130	2	1	James	Bond	8872131333	DJI Phantom 4	4/5/2019	Ford 150	UAV129	
5	5/29/2022	100	1	2	John	Wick	3526520474	DJI Matric 300 RTK	8/14/2021	Ford 250	OIG896	
6	6/5/2022	130	2	3	James	Bond	8872131333	DJI Phantom 4	4/5/2019	Ford 350	PII200	
7	6/12/2022	120	1	1	Dwayne	Johnson	4024053487	DJI Matric 300 RTK	8/14/2021	Ford 150	UAV129	
8	6/19/2022	120	2	2	Dwayne	Johnson	4024053487	DJI Phantom 4	4/5/2019	Ford 250	OIG896	
9	6/26/2022	100	2	1	John	Wick	3526520474	DJI Phantom 4	4/5/2019	Ford 150	UAV129	
10	7/3/2022	110	2	3	Peter	Parker	4319997713	DJI Phantom 4	4/5/2019	Ford 350	PII200	
11	7/10/2022	100	1	1	John	Wick	3526520474	DJI Matric 300 RTK	8/14/2021	Ford 150	UAV129	
12	7/17/2022	110	1	2	Peter	Parker	4319997713	DJI Matric 300 RTK	8/14/2021	Ford 250	OIG896	
13	7/24/2022	120	2	3	Dwayne	Johnson	4024053487	DJI Phantom 4	4/5/2019	Ford 350	PII200	
14	7/31/2022	130	1	2	James	Bond	8872131333	DJI Matric 300 RTK	8/14/2021	Ford 250	OIG896	
15	8/7/2022	100	2	2	John	Wick	3526520474	DJI Phantom 4	4/5/2019	Ford 250	OIG896	
16	8/14/2022	130	2	1	James	Bond	8872131333	DJI Phantom 4	4/5/2019	Ford 150	UAV129	
17	8/21/2022	120	2	2	Dwayne	Johnson	4024053487	DJI Phantom 4	4/5/2019	Ford 250	OIG896	
18	8/28/2022	120	2	3	Dwayne	Johnson	4024053487	DJI Phantom 4	4/5/2019	Ford 350	PII200	
19	9/4/2022	100	1	1	John	Wick	3526520474	DJI Matric 300 RTK	8/14/2021	Ford 150	UAV129	
20	9/11/2022	110	2	1	Peter	Parker	4319997713	DJI Phantom 4	4/5/2019	Ford 150	UAV129	

Data converted to a relational Database

Flights_record

Flight_No	Date	NUID	Drone_id	Truck_id
1	5/1/2022	100	1	1
2	5/8/2022	110	2	2
3	5/15/2022	120	2	3
4	5/22/2022	130	2	1
5	5/29/2022	100	1	2
6	6/5/2022	130	2	3
7	6/12/2022	120	1	1
8	6/19/2022	120	2	2
9	6/26/2022	100	2	1
10	7/3/2022	110	2	3
11	7/10/2022	100	1	1
12	7/17/2022	110	1	2
13	7/24/2022	120	2	3
14	7/31/2022	130	1	2
15	8/7/2022	100	2	2
16	8/14/2022	130	2	1
17	8/21/2022	120	2	2
18	8/28/2022	120	2	3
19	9/4/2022	100	1	1
20	9/11/2022	110	2	1

NAMES TABLE

NUID	First_name	Last_name	Phone_number
100	John	Wick	3526520474
110	Peter	Parker	4024053487
120	Dwayne	Johnson	4319997713
130	James	Bond	8872131333

DRONE TABLE

Drone_id	Drone_name	Date purchased
1	DJI Phantom 4	1-May
2	Matrice 300 R	8-Aug

TRUCK TABLE

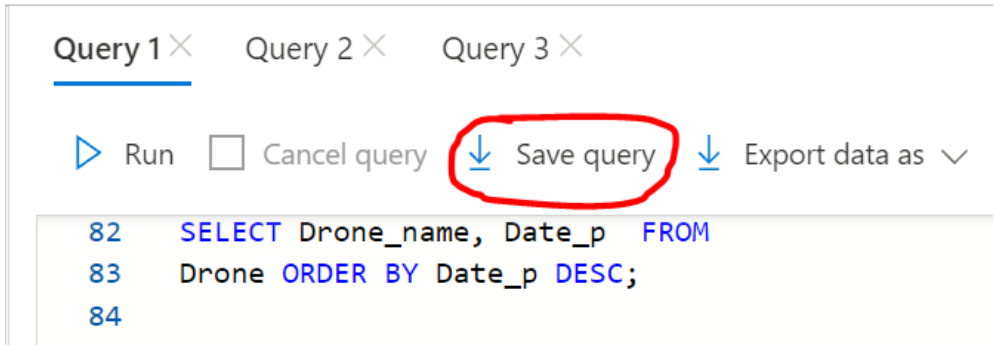
Truck_id	Truck_name	Truck_plate
1	Ford150	UAV123
2	RAM 200	GHI877
3	Chevorlet	POI900

Today's lab

At the end of today's lab, you will be able to:

1. Create a mini database with this dataset on Microsoft Azure;

2. Be able to run a few basic queries on the database with the SQL code provided.



.sql file will be downloaded when you click on this button on Azure SQL editor

Database Assignment 1, due 5:00 pm, April 11:

1. Download and submit the mini database you create on Azure with the flight dataset;

2. Turn in your .sql file with the five queries assigned on page 8 of this document)

Database Assignment *(Due – April 11)*

Write SQL queries to create a database then extract the following from the defined tables in your query editor –

1. Insert the name of a new person into the *Names* table besides the names already provided in the slides and return/display all the names on the table. *(20 points)*
2. Return/display only the NUID and Drone_id in the *Flights_record* table. *(20 points)*
3. Return/display when ‘DJI Phantom 4’ was purchased. *(25 points)*
4. Update the name of ‘DJI Matrice 300 RTK’ to ‘DJI 300’ in the *Drone_table*. *(25 points)*
5. Bonus: Return/display NUID, Drone_id, Truck_id for all the dates in July month *(30 bonus points)*
6. Comments: include extensive comments for your code to explain your thinking process. *(10 points)*

Due Date:

5 PM, Monday, April 11th in Canvas

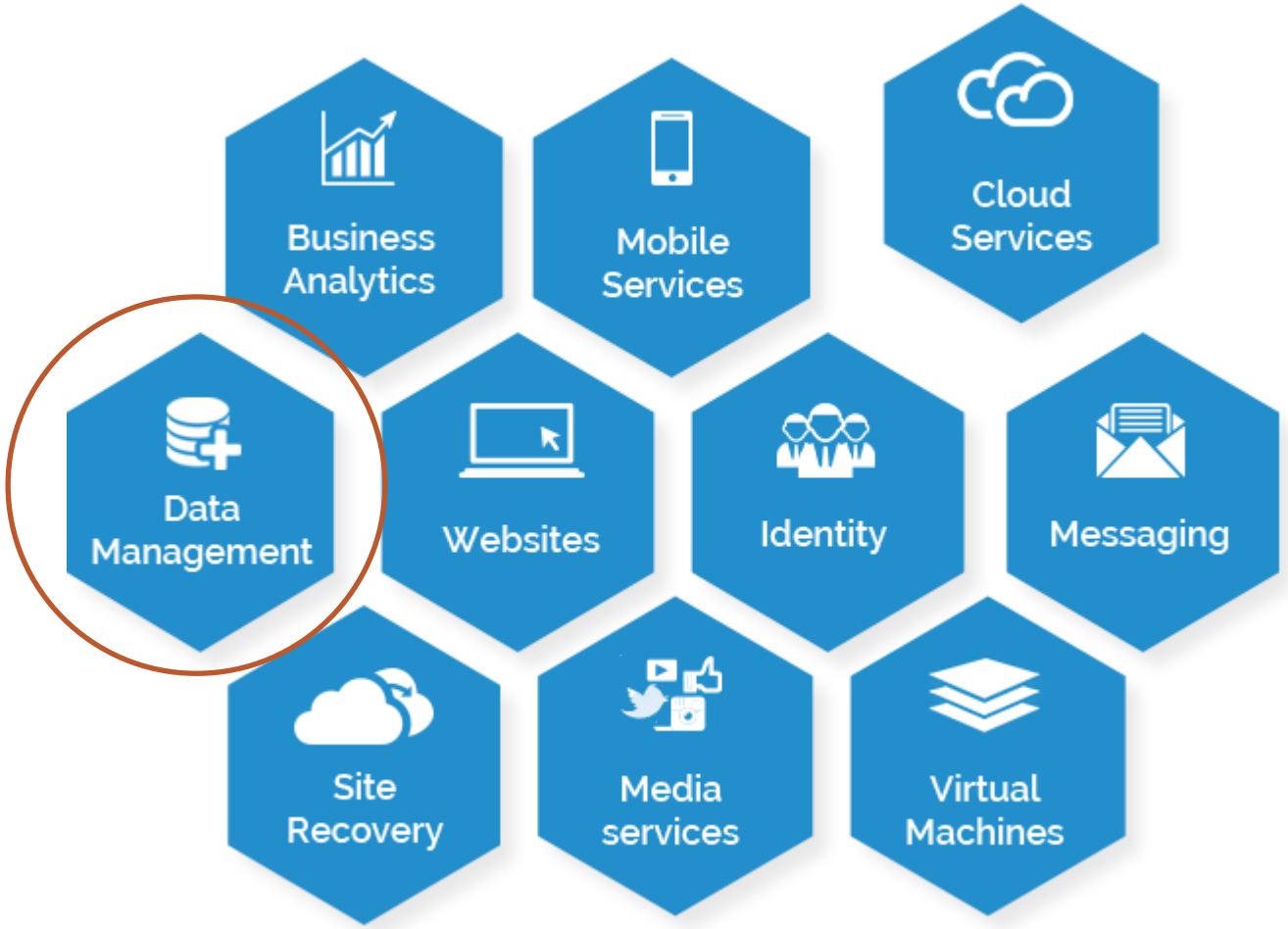
Microsoft Azure Services

Azure is a cloud computing platform and an online portal that allows you to access and manage cloud services and resources provided by Microsoft.

…

Azure SQL Database

…

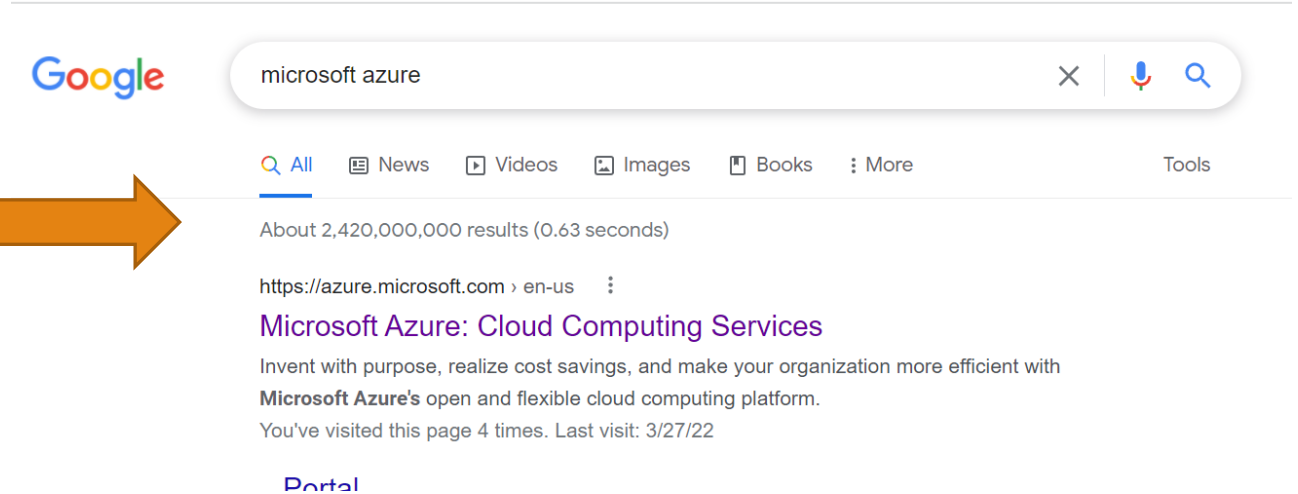


Open browser and follow the steps

1. Search Microsoft azure

2. You can do the following google search or use this link to open Microsoft Azure in your browser

Link - https://azure.microsoft.com/en-us/?exp=175071&adobe_mc_sdid=SDID%3D3AF4519F95387A4C-0B212557B10650A9%7CMCORGID%3DEA76ADE95776D2EC7F000101%40AdobeOrg%7CTS%3D1648423877&adobe_mc_ref=https%3A%2F%2Fwww.google.com%2F



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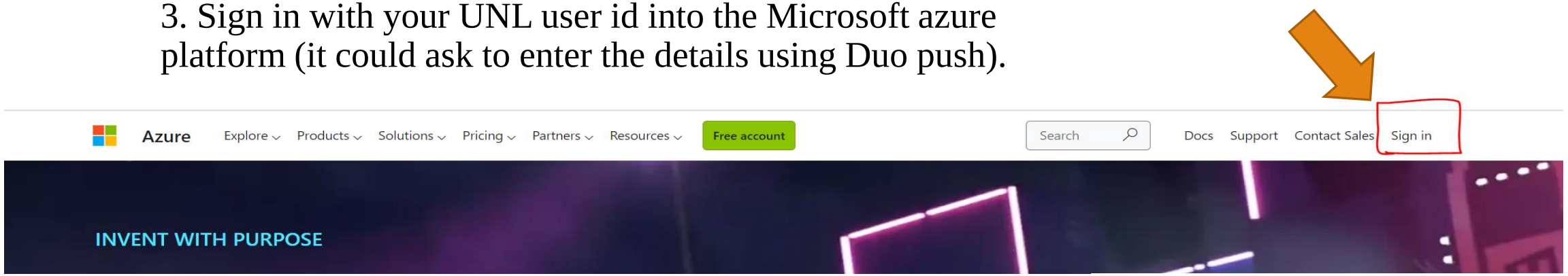
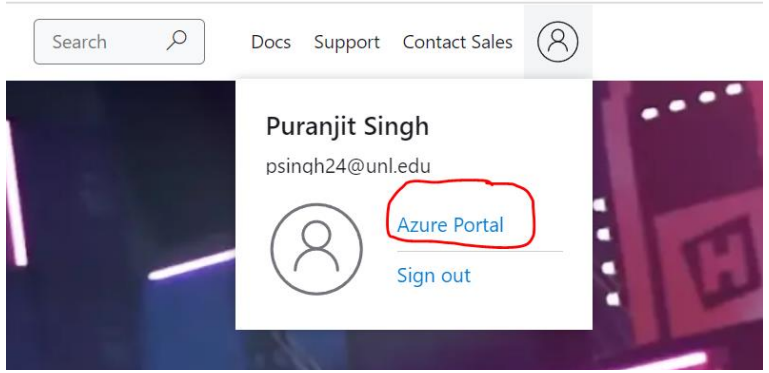
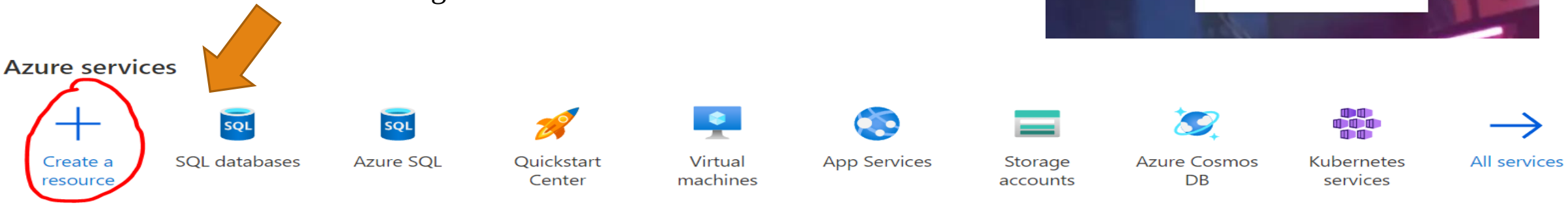
3. Sign in with your UNL user id into the Microsoft azure platform (it could ask to enter the details using Duo push).



4. After logging in : Select Azure portal

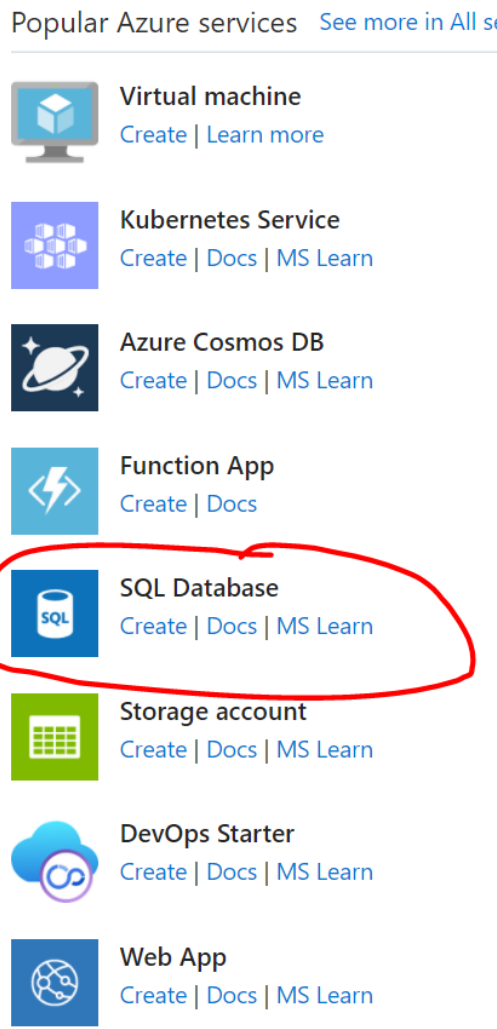


5. Azure services page would open up :
   - Select the following – Create a resource

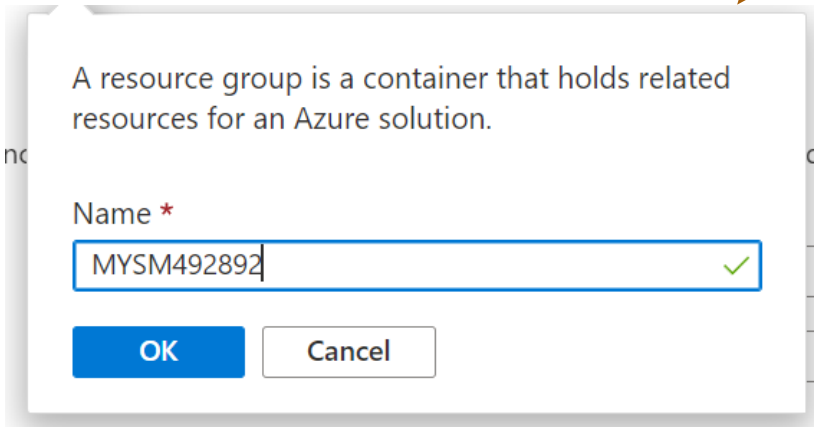


Continued:

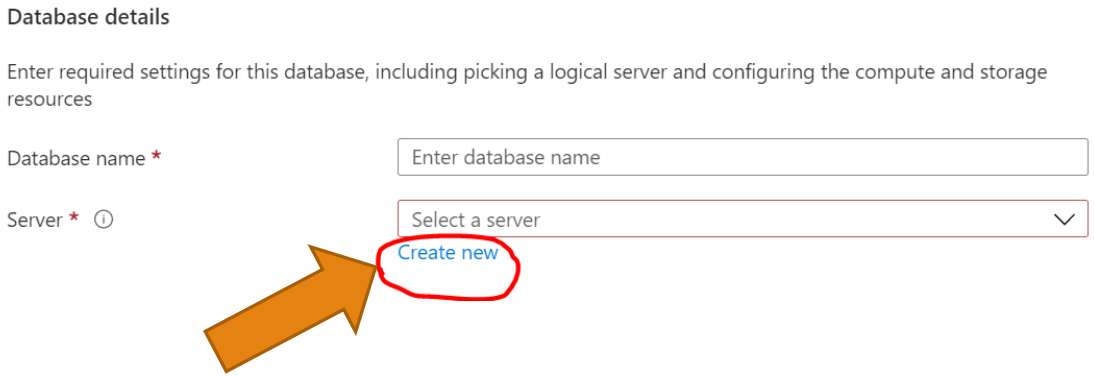
6. Select SQL Database under Popular Azure services section



7. Section - Project details
   - Subscription : Azure for students (by default)
   - Resource group : Click on Create New
     - Enter name of your choice (E.g. – MYSM492892)
     - Click Ok

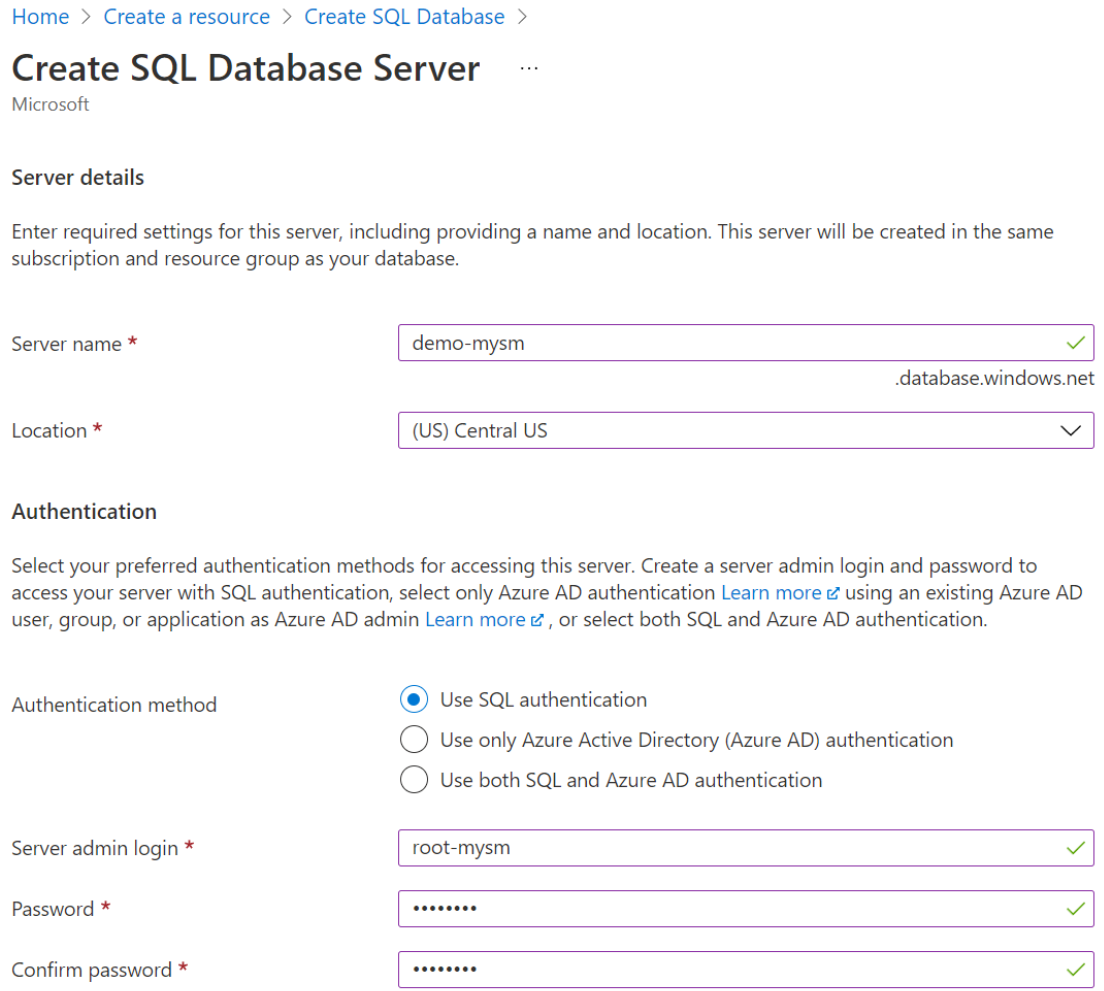


8. Section – Database details
   - Select : Create new
   - Make sure – the values under these sections are not clear

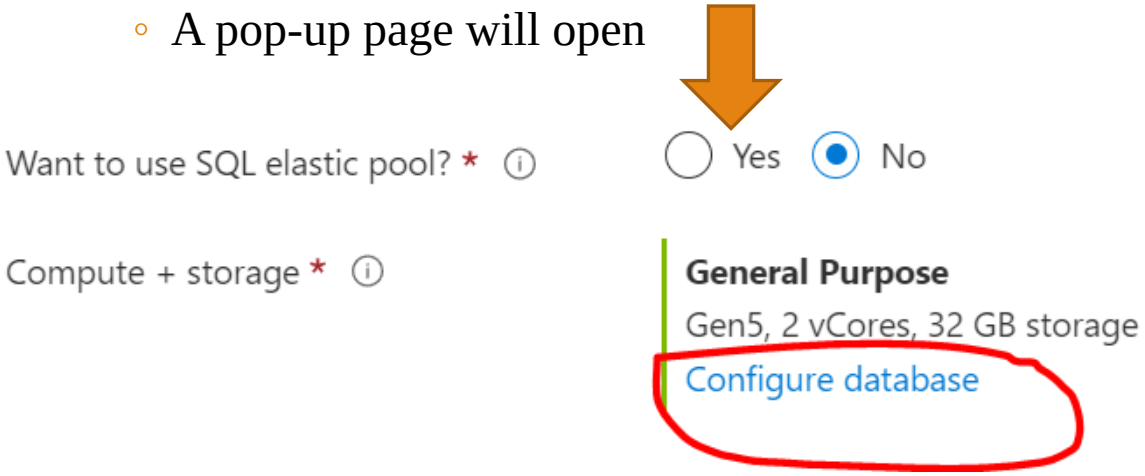


Continued:

9. A pop-up page –
   - Title : Create SQL Database Server will open-up
   - Put in the details as shown in the image
   - Create password on your own and remember it for further use
   - Click OK at the bottom of the page

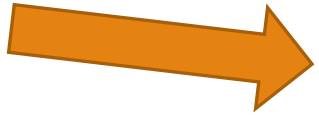


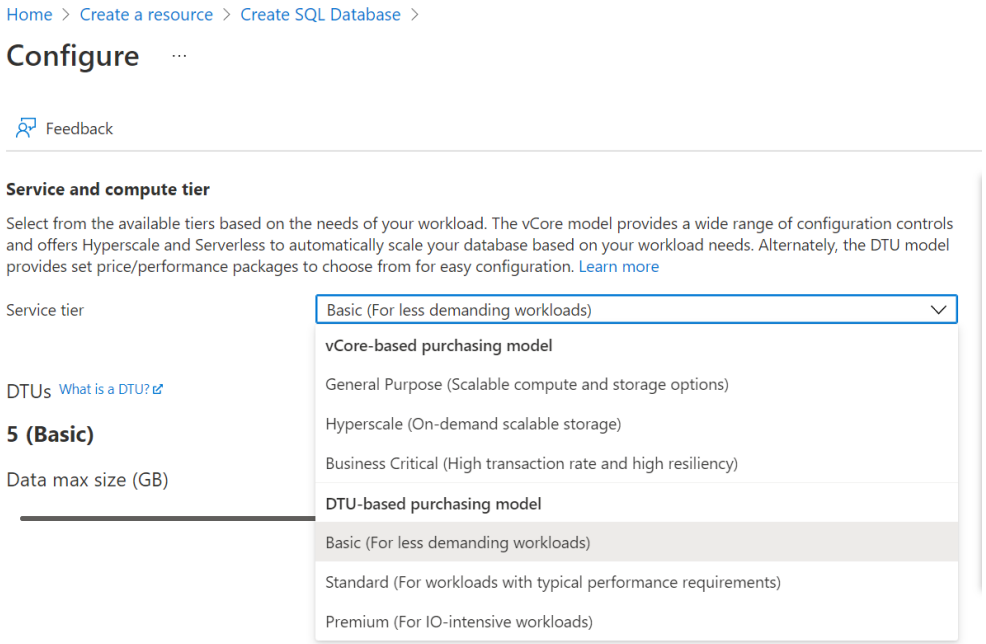
10. Click on configure database
    - A pop-up page will open



Continued :

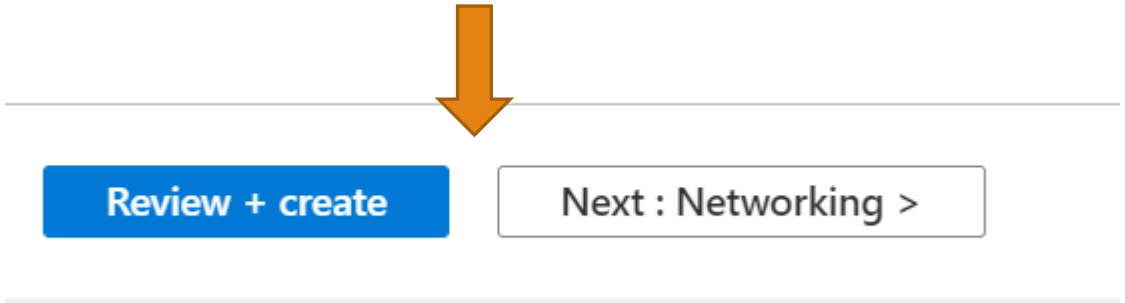
11. Select the following option from the available ones
    - Basic (for less demanding workloads)





12. Click on : Apply
    - (Bottom-left of the page)

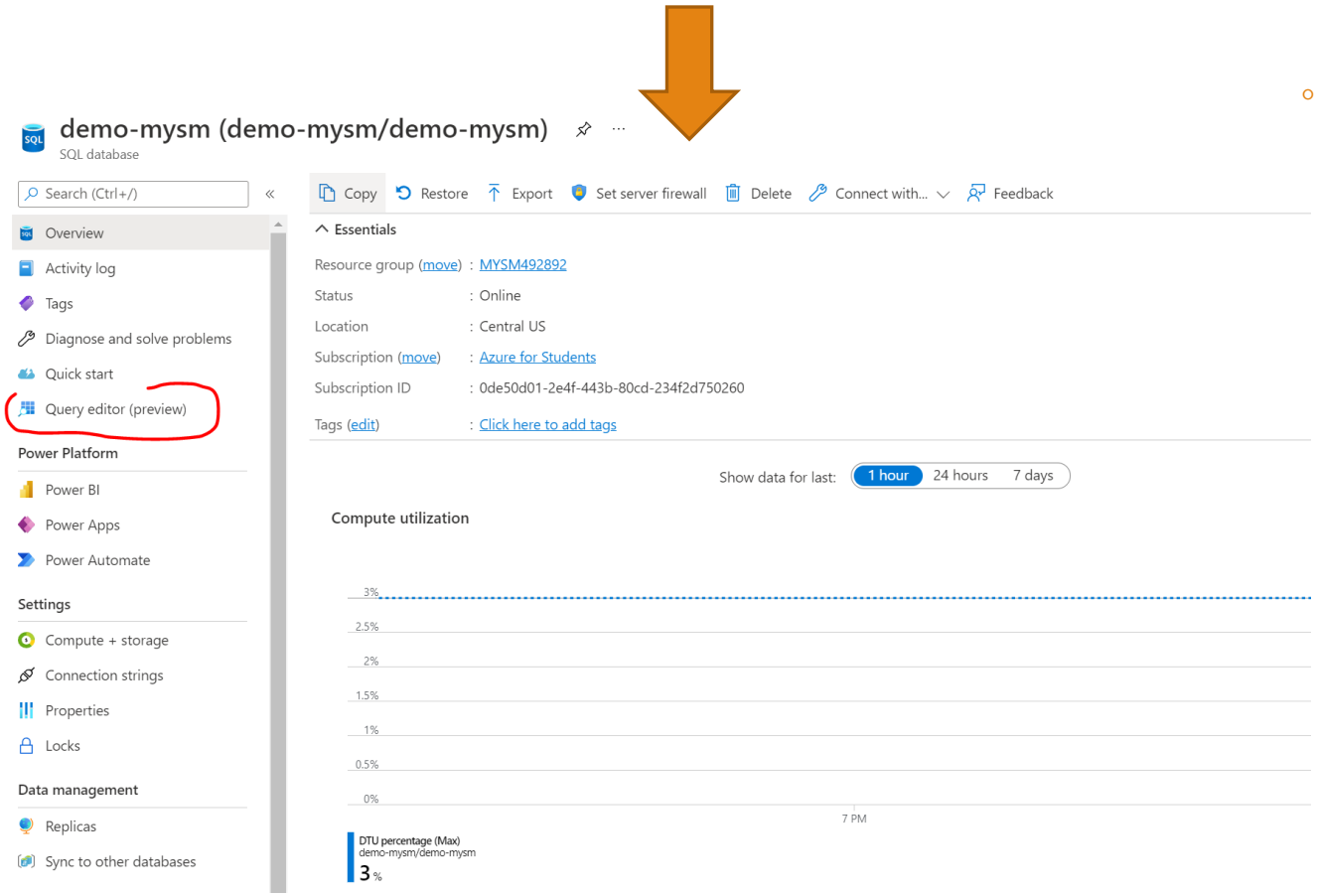
13. Select : Review + create
    - Deployment is in progress (window will pop-up)



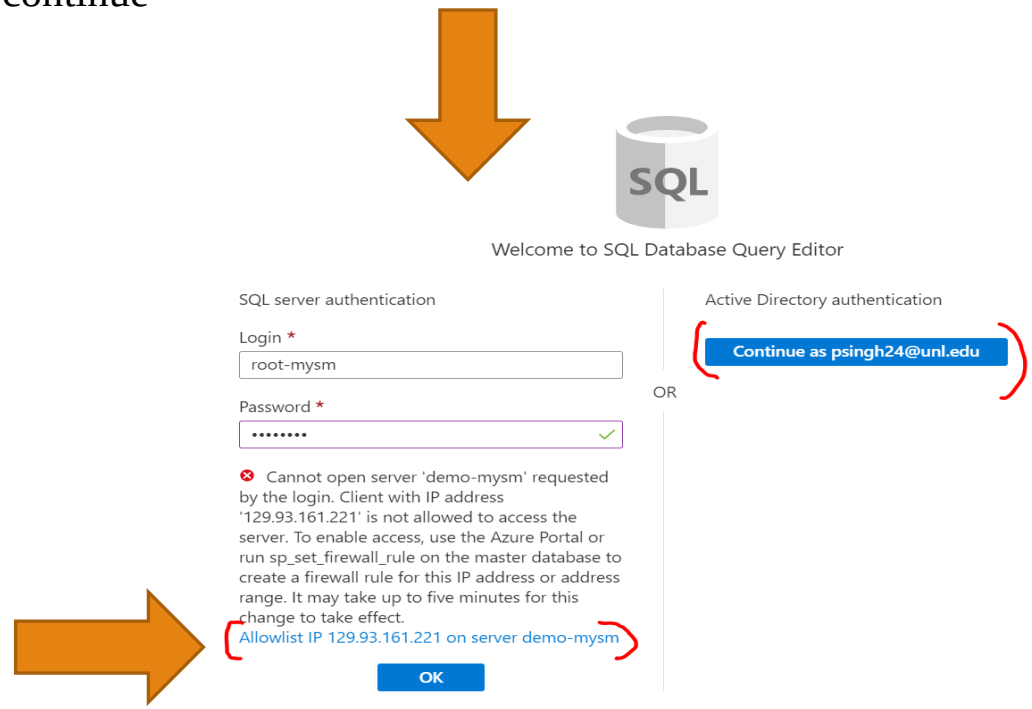
14. After completion : Go to resource

Continued :

15. Select : Query editor (preview)

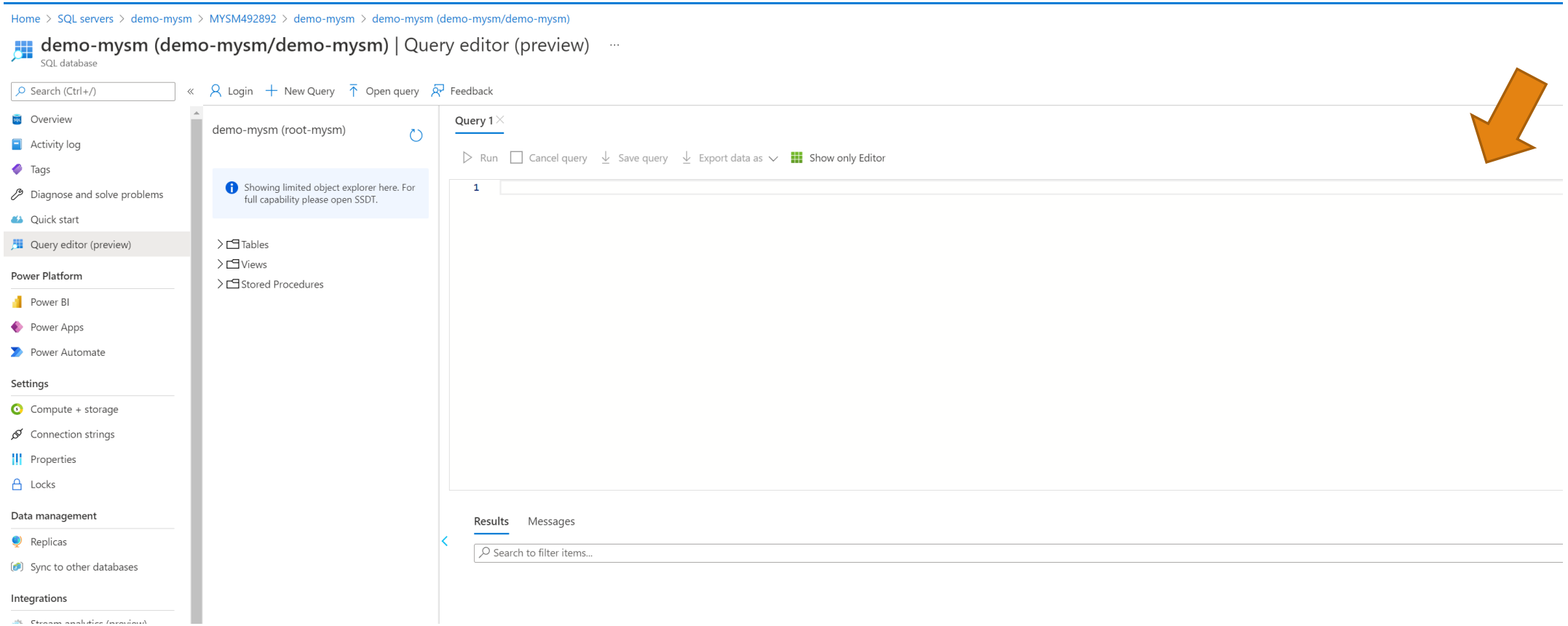


16. SQL server authentication windows will open –
    - Enter your registered username and password here that you have set
    - Select : Allowlist IP _____ on server demo-mysm to continue



Continued :

17. SQL editor will open-up where you can run SQL queries to create your first database.



Guidelines for completion of the assignment:

1. Firstly, we will define the schema for all the tables that are to be included in the database.

2. Than we will alter the Flights record table and add the foreign keys to it (in order to relate the tables with others) – **Imp**. -*This step is to be done before insertion of any data into the table*

3. Insert the values into the table in a sequence – Names table, Drone table, Truck table, Flight record table.

4. Once all the data is inserted – Run queries to fetch the information asked in the class assignment

Hands on session

1. -- Creating tables in the DB
   - CREATE TABLE *Table_name*(*Defining attributes*);
2. -- Defining the foreign keys
   - ALTER TABLE *Table_name* ADD FOREIGN KEY(Attribute) REFERENCES *Table_name(Attribute)*
3. – Insert values into the table
   - INSERT INTO *Table_name* VALUES(*insert values in correct order*)
4. Drop/Deleting a table from DB
   - DROP TABLE *Table_name*;
5. Running queries
   - SELECT keyword, functions etc.
   - Functions in SQL
6. Assignment related doubts

Running queries

- **SELECT** keyword –
  - SELECT * FROM (*Table_name*); **--Display all the entries in a table**
  - SELECT (*Col_name*) FROM (*Table_name*); **--Display only specific columns**
  - SELECT * FROM (*Table_name*) ORDER BY (*Col_name*); **--Display all the entries in a table in a specific order**
  - SELECT * FROM (*Table_name*) LIMIT *n*; **-- Display all the attributes in a table with a Limit**
  - SELECT DISTINCT (*Col_name*) FROM (*Table_name*); **--Display all the distinct entries of an attribute in a table**

- Functions in SQL -
  - SELECT COUNT(Col_name) FROM (Table_name);
  - SELECT (*Col_name*) AS (_____) FROM (*Table_name*);
  - SELECT * FROM (*Table_name*) WHERE (*Col_name*) (*define condition*);
  - UPDATE (*Table_name*) SET (*Col_name*) = (*New_value*) WHERE (Col_name) = (*Old_value*)
  - SELECT (*Col_name*) FROM (*Table_name*) WHERE (Col_name) > CONDITION

Datatypes and syntax for SQL

```
-- We need to define variable datatype whenever we create attributes in a table
INT             -- Whole Numbers
DECIMAL(M, N)   -- Decimal Numbers - Exact value
VARCHAR(1)      -- String of text of length 1, this can be variable
DATETIME        -- 'YYYY-MM-DD HH:MM:SS' used for recoding exact time
-- Any query that you type in SQL needs to end with a semi-colon (;) in order to be valid
-- 1. Creation of a table
CREATE TABLE (Table_name1)(
    (Attribute_name1) (Data_type1) PRIMARY KEY,
    (Attribute_name2) (Data_type2),
    (Attribute_name3) (Data_type3)
```

```
-- Actual Query to be run in editor
CREATE TABLE Student(
    NUID INT PRIMARY KEY,
    First_name VARCHAR(12),
    Last_name VARCHAR(12),
    Drone_id INT
    );
```

```
-- 2. Inserting/Deleting an attribute in a table
ALTER TABLE (Table_name) ADD (Attribute_name) (Data_type);
```

```
ALTER TABLE Student ADD Age INT;
ALTER TABLE Student DROP COLUMN Age;
```

Continued:

Actual Query

```
-- 3. DELETING A TABLE

DROP TABLE (Table_name)
```

```
DROP TABLE Student
```

```
-- 4. INSERTING DATA INTO A TABLE (enter elements in the correct order)

INSERT INTO (Table_name) VALUES()
```

```
INSERT INTO Student
VALUES(9489312, 'Puranjit', 'Singh', 2);
```

```
--5. DISPLAY THE TABLE

SELECT * FROM (Table_name)

SELECT Attribute_name(multiple) FROM (Table_name)
```

```
SELECT * FROM Student;
SELECT NUID, Last_name FROM Student;
```

```
-- 6. UPDATE VALUES IN A TABLE

a. UPDATE (Table_name) SET (Attribute_name) = '__' or

b. UPDATE (Table_name) SET (Attribute_name) = '__'

WHERE (Attribute_name) = '____'
```

```
-- This will update all the attributes

UPDATE Truck_table SET Truck_name = 'Ford'

-- This will update selected attributes
UPDATE Truck_table SET  Truck_name = 'Ford'

WHERE Truck_name = 'Ford 150';
```

Continued:

```
-- 7. DELETING ROWS IN A TABLE

a. DELETE FROM (Table_name); --delete all entries

b. DELETE FROM (Table_name)

WHERE (Attribute_name) = '____'
```

Actual Query

```
a. DELETE FROM Drone;
b. DELETE FROM Drone
   WHERE Drone_id = 2;
```

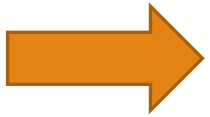
--- --- --- --- --- --- ---

```
-- 8. FILTERING IN A DATABASE

 a. SELECT (Attribute_name)
    FROM (Table_name) WHERE (Attribute_name) <= 3;

 b. SELECT (Attribute_name) FROM
    (Table_name)
    ORDER BY (Attrbiute_namr) ASC/DESC

 -- MULTIPLE CONDITIONS
 c. SELECT  (Attribute_name1), (Attribute_name2) FROM
    FROM (Table_name) WHERE NUID <= 3 AND Drone_id= 1;
```



```
a. SELECT First_name, Drone_id
    FROM Student WHERE NUID <= 3;

b. SELECT Drone_name, Date_p  FROM
   Drone ORDER BY Date_p ASC/DESC

c. SELECT First_name, Drone_id
   FROM Student
   WHERE NUID <= 3 AND Drone_id = 1;

d. SELECT * FROM Student

WHERE First_name IN ('Jack', 'Nancy', 'Paul');
```