Just IT

B2W group

Apprenticeships | Training | Recruitment

Data Technician

Name:

Course Date:

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Day 1: Task 1

Please research and complete the below questions relating to key concepts of databases.

What is a primary key?	A primary key is a column that can identify and distinguish between each record in a database. Source - [Primary key - Wikipedia]
How does this differ from a secondary key?	A secondary key is a column that can also identify and distinguish between each record in a database but is not selected as the primary key. The differences between them is that the secondary key can have null values but the primary key cannot and there can be zero or multiple secondary keys but every must have only one primary key. Source - [What is a Secondary Key in DBMS? - Scaler Topics]
How are primary and foreign keys related?	A foreign key is a column or columns in a database that links to a primary key of another table. Source - [What is a foreign key? (with SQL examples)]
Provide a real-world example of a one-to-one relationship	In most websites that allow users to create accounts, there is a one-to-one relationship between the user accounts and email addresses. Most websites will only allow each account to have one email address associated to it (they may allow a backup email but there will still be a primary email address) and will only allow one account to be associated with each email address.
Provide a real-world example of a one-to-many relationship	There is a one-to-many relationship between customers of a shop and products bought by the customer. This is because a customer can buy multiple items, but each item can only be bought by a single customer.
Provide a real-world example of a many-to-many relationship	There is a many-to-many relationship between clothing item and clothes brands. For example, Adidas, Levi’s and Next all make shirts and shirts are made by multiple brands.

Day 1: Task 2

Please research and complete the below questions relating to key concepts of databases.

What is the difference between a relational and non-relational database?	Relational databases are always stored in columns and rows whilst non-relational databases can use many different data models. The schemas of non-relational databases are flexible and more easily changed whilst the schemas for relational databases are more fixed. Non-relational databases can have higher performance and availability than relational databases whilst relational databases are more consistent.
What type of data would benefit off the non-relational model? **Why?**	Non-relational databases are more flexible and so can more easily accommodate data that does not easily fit into a relational database such as data no clear structure e.g. a JSON file. Since it also can have high performance and availability, this also makes it suitable for large data and data that requires rapid processing.

Day 3: Task 1

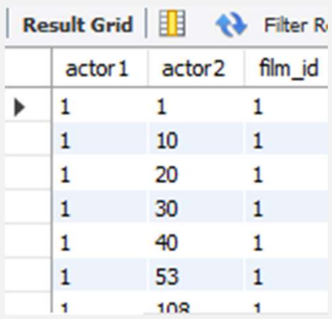
Please research the below 'JOIN' types, explain what they are and provide an example of the types of data it would be used on.

Self-join

Returns the table joined with itself.

Example: In the sakila database we can join the film_actor table to match the actors who appeared in the same film.

```
SELECT A.actor_id AS actor1, B.actor_id AS actor2, A.film_id

FROM film_actor A, film_actor B

WHERE A.film_id = B.film_id;
```



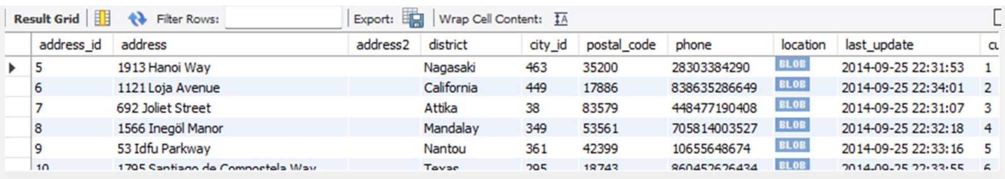
actor1	actor2	film_id
1	1	1
1	10	1
1	20	1
1	30	1
1	40	1
1	53	1
1	108	1

Right join

Returns all the records from the right table and the records from the left table that match with the right table.

Example: In the sakila database, the address and customer tables share the address_id column. If we right join the address and customer tables, it will show all the customers and join the customers that have an address in the address table.

```
SELECT *
FROM address
RIGHT JOIN customer ON address.address_id = customer.address_id;
```



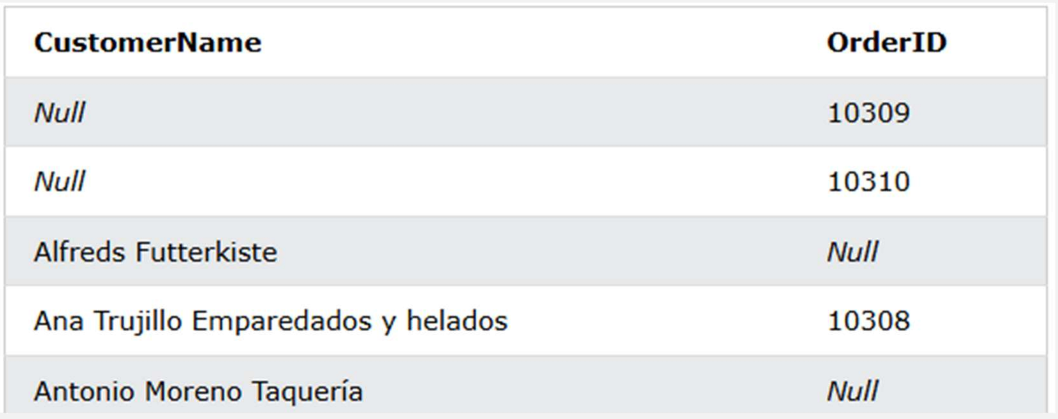
	address_id	address	address2	district	city_id	postal_code	phone	location	last_update	cu
▶	5	1913 Hanoi Way		Nagasaki	463	35200	28303384290	BLOB	2014-09-25 22:31:53	1
	6	1121 Loja Avenue		California	449	17886	838635286649	BLOB	2014-09-25 22:34:01	2
	7	692 Joliet Street		Attika	38	83579	448477190408	BLOB	2014-09-25 22:31:07	3
	8	1566 Inegöl Manor		Mandalay	349	53561	705814003527	BLOB	2014-09-25 22:32:18	4
	9	53 Idfu Parkway		Nantou	361	42399	10655648674	BLOB	2014-09-25 22:33:16	5
	10	1795 Santiago de Compostela Way		Texas	295	18743	860452626434	BLOB	2014-09-25 22:33:55	6

Full join

Returns all the records which have a match in either the left or right table. This not available in SQL but not in MySQL.

Example: In the W3Schools SQL database, the customers and the orders table both contain the OrderID column. If we full join the tables, it will return all the customers and the orders regardless of if they match or not.

```
SELECT Customers.CustomerName, Orders.OrderID
FROM Customers
FULL OUTER JOIN Orders ON Customers.CustomerID=Orders.CustomerID
ORDER BY Customers.CustomerName;
```



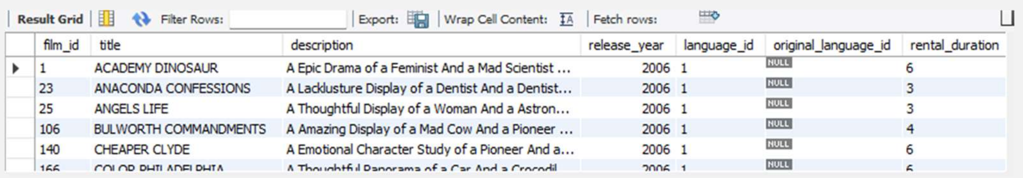
CustomerName	OrderID
Null	10309
Null	10310
Alfreds Futterkiste	*Null*
Ana Trujillo Emparedados y helados	10308
Antonio Moreno Taquería	*Null*

Inner join

Returns the records that have matching values in both tables.

Example: In the Sakila database there is a film_actor and a film table both containing the film_id column. We can do an inner join with the film_id column to which films are in both the film_actor table and film table.

```
SELECT *
FROM film
INNER JOIN film_actor ON film.film_id = film_actor.film_id
ORDER BY film_actor.actor_id;
```



Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

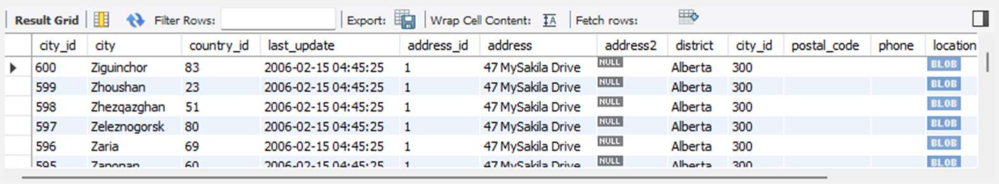
film_id	title	description	release_year	language_id	original_language_id	rental_duration
1	ACADEMY DINOSAUR	A Epic Drama of a Feminist And a Mad Scientist ...	2006	1	NULL	6
23	ANACONDA CONFESSIONS	A Lackluster Display of a Dentist And a Dentist...	2006	1	NULL	3
25	ANGELS LIFE	A Thoughtful Display of a Woman And a Astron...	2006	1	NULL	3
106	BULWORTH COMMANDMENTS	A Amazing Display of a Mad Cow And a Pioneer ...	2006	1	NULL	4
140	CHEAPER CLYDE	A Emotional Character Study of a Pioneer And a...	2006	1	NULL	6
166	COLOR PHILADELPHIA	A Thoughtful Panorama of a Car And a Crocodil	2006	1	NULL	6

Cross join

Returns all records from both tables.

Example – In the Sakila database, if we cross join the address and the city tables we get every record from both tables, including the ones that do not match.

```
SELECT *
FROM city
CROSS JOIN address;
```



Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

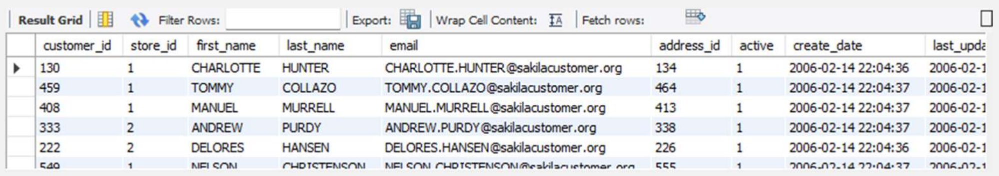
city_id	city	country_id	last_update	address_id	address	address2	district	city_id	postal_code	phone	location
600	Ziguinchor	83	2006-02-15 04:45:25	1	47 MySakila Drive	NULL	Alberta	300			BLOB
599	Zhoushan	23	2006-02-15 04:45:25	1	47 MySakila Drive	NULL	Alberta	300			BLOB
598	Zhezqazghan	51	2006-02-15 04:45:25	1	47 MySakila Drive	NULL	Alberta	300			BLOB
597	Zeleznogorsk	80	2006-02-15 04:45:25	1	47 MySakila Drive	NULL	Alberta	300			BLOB
596	Zaria	69	2006-02-15 04:45:25	1	47 MySakila Drive	NULL	Alberta	300			BLOB
595	Zapopan	60	2006-02-15 04:45:25	1	47 MySakila Drive	NULL	Alberta	300			BLOB

Left join

Returns all the records from the left table and the records from the right table that match with the left table.

Example: In the Sakila database there is a customer and a rental table both containing the customer_id column. If we left join the customer table to the rental table it will give us all the customers and join the customers that have a rental in the rental table.

```
SELECT *
FROM customer
LEFT JOIN rental ON customer.customer_id = rental.customer_id
ORDER BY rental_id;
```



Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

customer_id	store_id	first_name	last_name	email	address_id	active	create_date	last_upda
130	1	CHARLOTTE	HUNTER	CHARLOTTE.HUNTER@sakilacustomer.org	134	1	2006-02-14 22:04:36	2006-02-1
459	1	TOMMY	COLLAZO	TOMMY.COLLAZO@sakilacustomer.org	464	1	2006-02-14 22:04:37	2006-02-1
408	1	MANUEL	MURRELL	MANUEL.MURRELL@sakilacustomer.org	413	1	2006-02-14 22:04:37	2006-02-1
333	2	ANDREW	PURDY	ANDREW.PURDY@sakilacustomer.org	338	1	2006-02-14 22:04:37	2006-02-1
222	2	DELORES	HANSEN	DELORES.HANSEN@sakilacustomer.org	226	1	2006-02-14 22:04:36	2006-02-1
549	1	NELSON	CHRISTENSON	NELSON.CHRISTENSON@sakilacustomer.org	555	1	2006-02-14 22:04:37	2006-02-1

Day 4: Task 1: Written

In your groups, discuss and complete the below activity. You can either nominate one writer or split the elements between you. Everyone however must have the completed work below:

Imagine you have been hired by a small retail business that wants to streamline its operations by creating a new database system. This database will be used to manage inventory, sales, and customer information. The business is a small corner shop that sells a range of groceries and domestic products. It might help to picture your local convenience store and think of what they sell. They also have a loyalty program, which you will need to consider when deciding what tables to create.

Write a 500-word essay explaining the steps you would take to set up and create this database. Your essay should cover the following points:

1. ***Understanding the Business Requirements**:*
   a. *What kind of data will the database need to store?*
   b. *Who will be the users of the database, and what will they need to accomplish?*
2. ***Designing the Database Schema**:*
   a. *How would you structure the database tables to efficiently store inventory, sales, and customer information?*
   b. *What relationships between tables are necessary (e.g., how sales relate to inventory and customers)?*
3. ***Implementing the Database**:*
   a. *What SQL commands would you use to create the database and its tables?*
   b. *Provide examples of SQL statements for creating tables and defining relationships between them.*
4. ***Populating the Database**:*
   a. *How would you input initial data into the database? Give examples of SQL INSERT statements.*
5. ***Maintaining the Database**:*
   a. *What measures would you take to ensure the database remains accurate and up to date?*
   b. *How would you handle backups and data security?*

Your essay should include specific examples of SQL commands and explain why each step is necessary for creating a functional and efficient database for the retail business.

Please write your 500-word essay here

1. Understanding the Business Requirements:

We need to consider what data we want in our table. An example of the data we would the following:

- Inventory – Product Name: Bread, Category: Bakery, Price: £0.90, Stock Level: 50.
- Sales – Customer: Jane Doe, Product: Bread, Date: 15/01/2025 Quantity: 2.
- Customer Information – Name: Jane Doe, Email: Jane.doe@gmail.com, Loyalty Points: 50.

Some examples of the type of people who would use this database:

- Store Managers – Allows them to see the sales, the number of customers and their loyalty points.
- Store workers – Allows them to check the inventory of the store.
- IT Staff – They will check that the database has no issues and fix any security problems with the database.

2. Designing the Database Schema:

a. Structuring the Database Tables:

To efficiently store inventory, sales, and customer information, the database should include three tables: Products Table, Customers Table, and Sales Table.

1. **Products Table**: Stores details of all products in inventory.

- **Product ID (Primary Key)**: Unique identifier for each product.
- **Product Name**: Name of the product.
- **Category**: Category to which the product belongs.
- **Price**: Price of the product.
- **Stock Level**: Current quantity of the product in stock.

Product ID	Product Name	Category	Price	Stock Level
1	Milk	Dairy	£1.50	100
2	Bread	Bakery	£0.90	50
3	Eggs	Dairy	£2.00	75
4	Apples	Fruits	£2.50	60
5	Juice	Beverages	£3.00	40

2. Customers Table: Stores information about customers.

- **Customer ID** (Primary Key): Unique identifier for each customer.
- **Name:** Name of the customer.
- **Email**: Contact email of the customer.
- **Loyalty Points**: Points earned by the customer as part of the loyalty program.

Customer ID	Name	Email	Loyalty Points
1	Jane Doe	jane.doe@example.com	50
2	John Smith	john.smith@example.com	30
3	Alice Brown	alice.brown@email.com	100
4	Bob White	bob.white@mail.com	70
5	Lucy Green	lucy.green@abc.com	20

3. Sales Table: Tracks sales transactions.

- **Sale ID** (Primary Key): Unique identifier for each sale.
- **Product ID** (Foreign Key): Links to **Product ID** in the **Products Table** to identify the product sold.
- **Customer ID** (Foreign Key): Links to **Customer ID** in the **Customers Table** to associate the sale with a customer.
- **Date**: Date of the sale.
- **Quantity**: Number of units sold in the transaction.

Sale ID	Product ID	Customer ID	Date	Quantity
1	1	1	15/01/2025	2
2	3	2	16/01/2025	2
3	2	3	16/01/2025	3
4	5	4	13/01/2025	1
5	4	5	13/01/2025	2

b. **Products and Sales**:

- **Relationship**: A sale must reference a product to track which item was sold.The **Product ID** column in the **Sales Table** serves as a foreign key that links to the **Product ID** in the **Products Table**. This ensures that the product sold exists in the inventory.

Customers and Sales:

- **Relationship**: Each sale should reference a customer, especially for loyalty programs or customer-specific analysis.The **Customer ID** column in the **Sales Table** serves as a foreign key that links to the **Customer ID** in the **Customers Table**. This ensures that each sale can be tied to a specific customer.

3. Implementing the Database:

a) For us to create a database and the tables in SQL we need to use the create database command

"CREATE DATABASE RetailStoreDB;"

b) Then we proceed to use the **create table** function, for each of our tables (Products, Customers, and Sales)

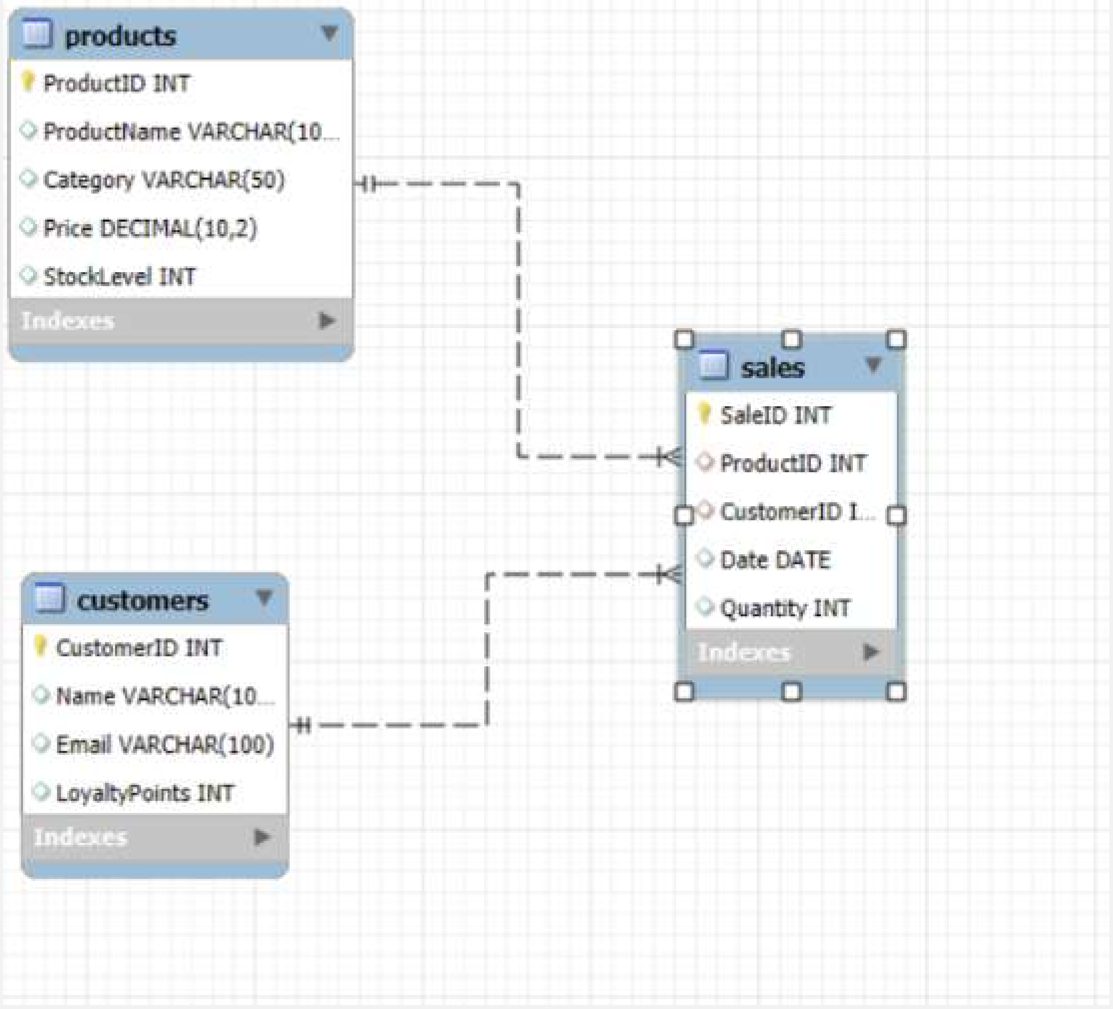
I.E:

```
  CREATE TABLE Products
 (       ProductID INT PRIMARY KEY,
         ProductName VARCHAR(100),
         Category VARCHAR(50),
         Price DECIMAL(10, 2),
         StockLevel INT );
```

c) Then we insert all of our data into the newly made tables using the **insert into** command.

I.E:

```
INSERT INTO Products (ProductID, ProductName, Category, Price,
StockLevel) VALUES
(1, 'Milk', 'Dairy', 1.50, 100),
(2, 'Bread', 'Bakery', 0.90, 50),
(3, 'Eggs', 'Dairy', 2.00, 75),
(4, 'Apples', 'Fruits', 2.50, 60),
(5, 'Juice', 'Beverages', 3.00, 40);
```



4. Populating the Database:

Once the schema is established, the next step is to populate the tables with initial data. For instance, to add a new product, we would use the following SQL statement:

INSERT INTO Products (Product ID, Name, Description, Price, Stock Level)
VALUES (1, 'Milk', '1L of Full Cream Milk', 1.50, 100);

Similarly, to add a new customer:

INSERT INTO Customers (Customer ID, Name, Email, Phone, Loyalty Points)
VALUES (1, 'John Doe', 'johndoe@example.com', '1234567890', 50);

Alternatively, most databases allow you to import data from existing files or from other spreadsheets.

5.Maintaining Database:

Regular Updates :-

Ensure that all transactions are promptly recorded in the database to keep the data accurate and up to date.
Use the UPDATE statement to modify data based on transactions.
Example: After selling 2 bottles of milk, reduce the stock.

Query :-
```
Update Products
Set StockLevel = StockLevel - 2
Where Productname  = 'Milk';
```

Monitor Data Quality :-

Regularly audit the database to identify and correct any data quality issues. Implement validation rules to prevent incorrect data entry .
a. Check for duplicate entries:
Find duplicate customer records:
Query :-
```
SELECT CustomerID, COUNT(*)
FROM Customers
GROUP BY CustomerID
HAVING COUNT(*) > 1;
```

b. Check for missing data:
Find products with missing price values:
Query:-
```
SELECT *
FROM Products
WHERE Price IS NULL;
```

Backups:-
Schedule regular backups to ensure that data can be restored in case of accidental loss or corruption. Store backups in a secure location.
Use SQL commands or database tools to export the database.
Example: Backup to a file in MySQL:

Data Security:-
Implement Access control measures to ensure that only trusted members of staff have access to the database. Use encryption to protect

	sensitive data and parameterized queries to prevent SQL injection attacks. By following these guidelines, you can ensure that your database remains accurate, up to date, and secure.

Day 4: Task 2: SQL Practical

In your groups, work together to answer the below questions. It may be of benefit if one of you shares your screen with the group and as a team answer / take screen shots from there.

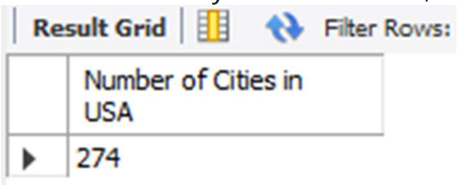
<u>Setting up the database:</u>

1. **Download world_db(1)**
2. **Follow each step to create your database**

For each question I would like to see both the syntax used and the output.

1. **Count Cities in USA:** *Scenario:* You've been tasked with conducting a demographic analysis of cities in the United States. Your first step is to determine the total number of cities within the country to provide a baseline for further analysis.

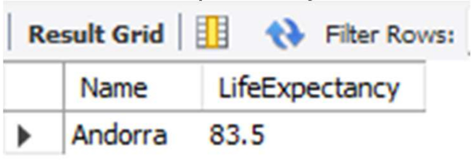
```
SELECT COUNT(Name) AS "Number of Cities in USA"
FROM city
WHERE CountryCode = "USA";
```



Number of Cities in USA
274

2. **Country with Highest Life Expectancy:** *Scenario:* As part of a global health initiative, you've been assigned to identify the country with the highest life expectancy. This information will be crucial for prioritising healthcare resources and interventions.

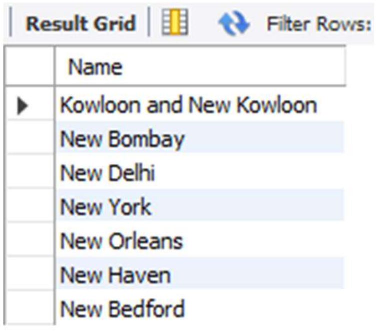
```
SELECT Name, LifeExpectancy
FROM country
WHERE LifeExpectancy = (SELECT MAX(LifeExpectancy) FROM country);
```



Name	LifeExpectancy
Andorra	83.5

3. **"New Year Promotion: Featuring Cities with 'New:** *Scenario:* In anticipation of the upcoming New Year, your travel agency is gearing up for a special promotion featuring cities with names including the word 'New'. You're tasked with swiftly compiling a list of all cities from around the world. This curated selection will be essential in creating promotional materials and enticing travellers with exciting destinations to kick off the New Year in style.

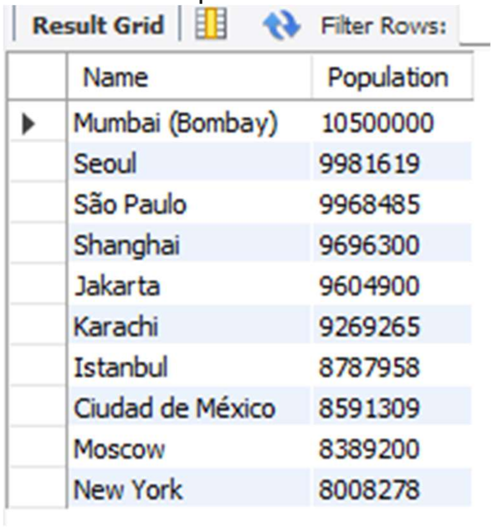
```
SELECT Name
FROM city
WHERE Name LIKE '%New %';
```



```
Name
Kowloon and New Kowloon
New Bombay
New Delhi
New York
New Orleans
New Haven
New Bedford
```

4. **Display Columns with Limit (First 10 Rows):** *Scenario:* You're tasked with providing a brief overview of the most populous cities in the world. To keep the report concise, you're instructed to list only the first 10 cities by population from the database.

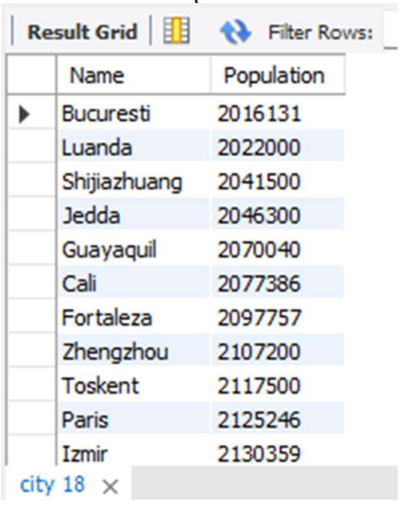
```
SELECT Name, Population
FROM city
ORDER BY Population DESC LIMIT 10;
```



```
Name               Population
Mumbai (Bombay)    10500000
Seoul              9981619
São Paulo          9968485
Shanghai           9696300
Jakarta            9604900
Karachi            9269265
Istanbul           8787958
Ciudad de México   8591309
Moscow             8389200
New York           8008278
```

5. **Cities with Population Larger than 2,000,000:** *Scenario:* A real estate developer is interested in cities with substantial population sizes for potential investment opportunities. You're tasked with identifying cities from the database with populations exceeding 2 million to focus their research efforts.

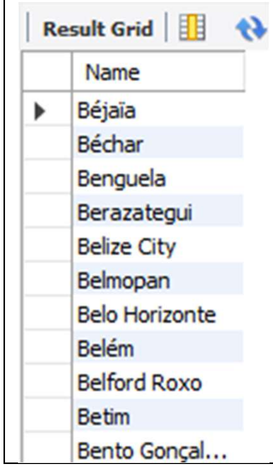
```
SELECT Name, Population
FROM city
WHERE Population > 2000000
ORDER BY Population;
```



Name	Population
Bucuresti	2016131
Luanda	2022000
Shijiazhuang	2041500
Jedda	2046300
Guayaquil	2070040
Cali	2077386
Fortaleza	2097757
Zhengzhou	2107200
Toskent	2117500
Paris	2125246
Izmir	2130359

6. **Cities Beginning with 'Be' Prefix:** *Scenario:* A travel blogger is planning a series of articles featuring cities with unique names. You're tasked with compiling a list of cities from the database that start with the prefix 'Be' to assist in the blogger's content creation process.

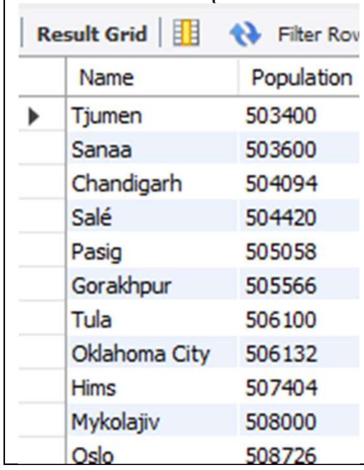
```
SELECT Name
FROM city
WHERE Name LIKE 'Be%';
```



Name
Béjaïa
Béchar
Benguela
Berazategui
Belize City
Belmopan
Belo Horizonte
Belém
Belford Roxo
Betim
Bento Gonçal...

7. **Cities with Population Between 500,000-1,000,000:** *Scenario:* An urban planning committee needs to identify mid-sized cities suitable for infrastructure development projects. You're tasked with identifying cities with populations ranging between 500,000 and 1 million to inform their decision-making process.

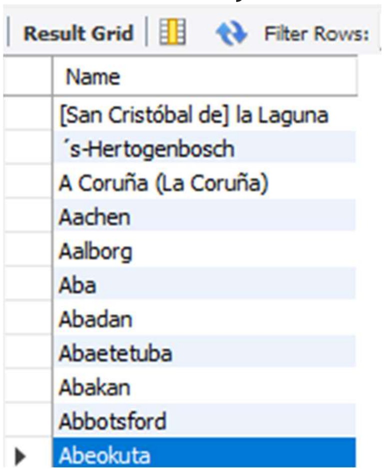
```
SELECT Name, Population
FROM city
WHERE Population > 500000 AND Population < 1000000
ORDER BY Population;
```



```
Name            Population
Tjumen          503400
Sanaa           503600
Chandigarh      504094
Salé            504420
Pasig           505058
Gorakhpur       505566
Tula            506100
Oklahoma City   506132
Hims            507404
Mykolajiv       508000
Oslo            508726
```

8. **Display Cities Sorted by Name in Ascending Order:** *Scenario:* A geography teacher is preparing a lesson on alphabetical order using city names. You're tasked with providing a sorted list of cities from the database in ascending order by name to support the lesson plan.

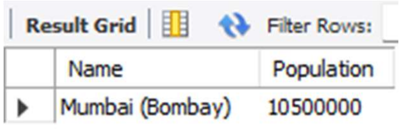
```
SELECT Name
FROM city
ORDER BY Name;
```



```
Name
[San Cristóbal de] la Laguna
´s-Hertogenbosch
A Coruña (La Coruña)
Aachen
Aalborg
Aba
Abadan
Abaetetuba
Abakan
Abbotsford
Abeokuta
```

9. **Most Populated City:** *Scenario:* A real estate investment firm is interested in cities with significant population densities for potential development projects. You're tasked with identifying the most populated city from the database to guide their investment decisions and strategic planning.

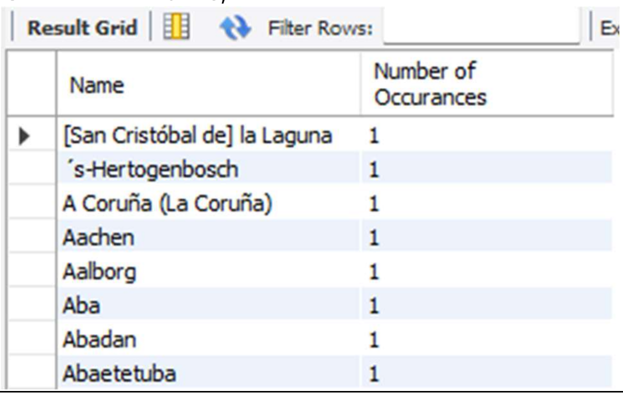
```
SELECT Name, Population
FROM city
WHERE Population = (SELECT MAX(Population) FROM city);
```



Name	Population
Mumbai (Bombay)	10500000

10. **City Name Frequency Analysis: Supporting Geography Education** *Scenario*: In a geography class, students are learning about the distribution of city names around the world. The teacher, in preparation for a lesson on city name frequencies, wants to provide students with a list of unique city names sorted alphabetically, along with their respective counts of occurrences in the database. You're tasked with this sorted list to support the geography teacher.

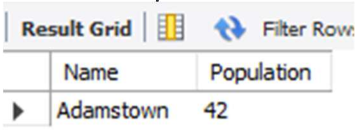
```
SELECT DISTINCT Name, COUNT(Name) AS "Number of Occurances"
FROM city
GROUP BY Name
ORDER BY Name;
```



Name	Number of Occurances
[San Cristóbal de] la Laguna	1
´s-Hertogenbosch	1
A Coruña (La Coruña)	1
Aachen	1
Aalborg	1
Aba	1
Abadan	1
Abaetetuba	1

11. **City with the Lowest Population:** *Scenario:* A census bureau is conducting an analysis of urban population distribution. You're tasked with identifying the city with the lowest population from the database to provide a comprehensive overview of demographic trends.

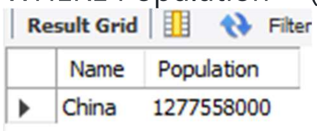
```
SELECT Name, Population
FROM city
WHERE Population = (SELECT MIN(Population) FROM city);
```



```
Result Grid | Filter Rows
  Name        Population
▶ Adamstown   42
```

12. **Country with Largest Population:** *Scenario:* A global economic research institute requires data on countries with the largest populations for a comprehensive analysis. You're tasked with identifying the country with the highest population from the database to provide valuable insights into demographic trends.

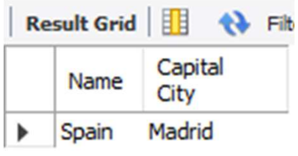
```
SELECT Name, Population
FROM country
WHERE Population = (SELECT MAX(Population) FROM country);
```



```
Result Grid | Filter
  Name    Population
▶ China   1277558000
```

13. **Capital of Spain:** *Scenario:* A travel agency is organising tours across Europe and needs accurate information on capital cities. You're tasked with identifying the capital of Spain from the database to ensure itinerary accuracy and provide travellers with essential destination information.

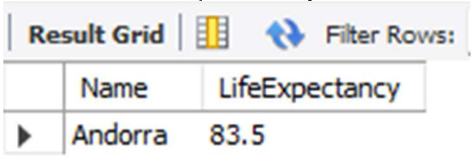
```
Select country.Name, city.Name AS "Capital City"
FROM country
INNER JOIN city ON country.Capital = city.ID
WHERE country.Name = "Spain";
```



```
Result Grid | Filt
  Name    Capital
          City
▶ Spain   Madrid
```

14. **Country with Highest Life Expectancy:** *Scenario:* A healthcare foundation is conducting research on global health indicators. You're tasked with identifying the country with the highest life expectancy from the database to inform their efforts in improving healthcare systems and policies.

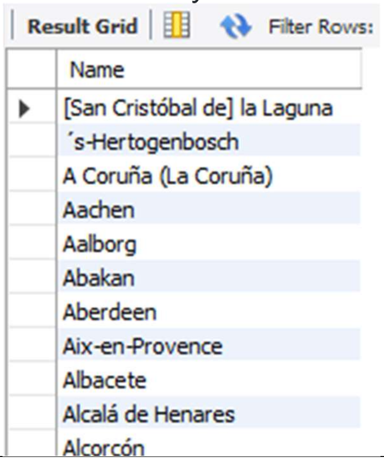
```
SELECT Name, LifeExpectancy
FROM country
WHERE LifeExpectancy = (SELECT MAX(LifeExpectancy) FROM country);
```



Name	LifeExpectancy
Andorra	83.5

15. **Cities in Europe:** *Scenario:* A European cultural exchange program is seeking to connect students with cities across the continent. You're tasked with compiling a list of cities located in Europe from the database to facilitate program planning and student engagement.

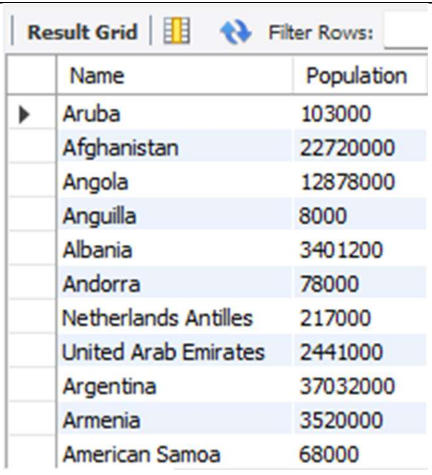
```
Select city.Name
FROM country
INNER JOIN city ON country.Code = city.CountryCode
WHERE country.Continent = "Europe"
ORDER BY city.Name;
```



Name
[San Cristóbal de] la Laguna
´s-Hertogenbosch
A Coruña (La Coruña)
Aachen
Aalborg
Abakan
Aberdeen
Aix-en-Provence
Albacete
Alcalá de Henares
Alcorcón

16. **Average Population by Country:** *Scenario:* A demographic research team is conducting a comparative analysis of population distributions across countries. You're tasked with calculating the average population for each country from the database to provide valuable insights into global population trends.

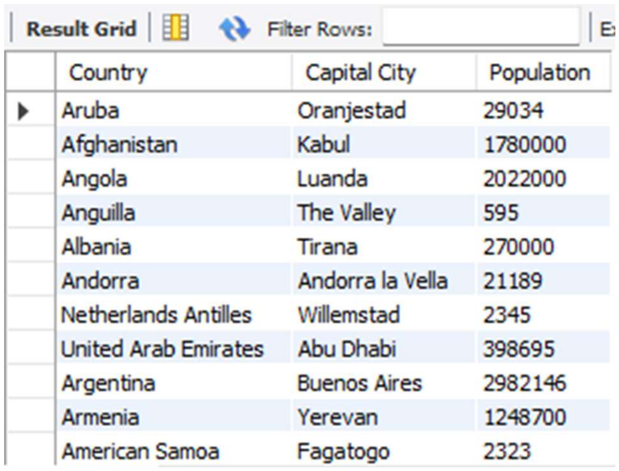
```
SELECT Name, Population
FROM country;
```


Result Grid | Filter Rows:

Name	Population
Aruba	103000
Afghanistan	22720000
Angola	12878000
Anguilla	8000
Albania	3401200
Andorra	78000
Netherlands Antilles	217000
United Arab Emirates	2441000
Argentina	37032000
Armenia	3520000
American Samoa	68000

17. **Capital Cities Population Comparison:** *Scenario:* A statistical analysis firm is examining population distributions between capital cities worldwide. You're tasked with comparing the populations of capital cities from different countries to identify trends and patterns in urban demographics.

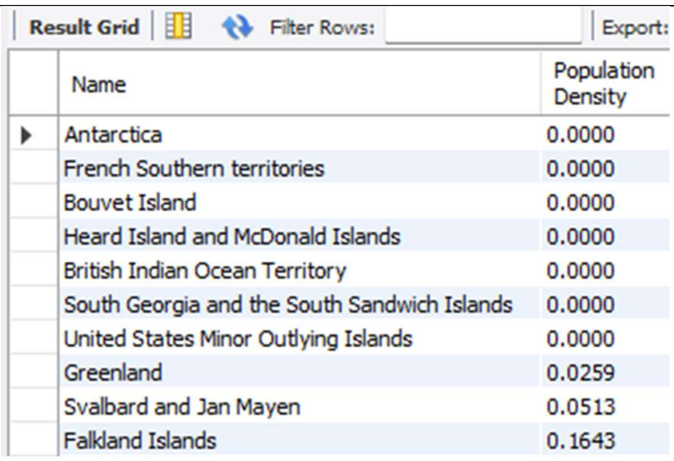
```
Select country.Name AS "Country", city.Name AS "Capital City",
city.Population AS "Population"
FROM country
INNER JOIN city ON country.Capital = city.ID;
```


Result Grid | Filter Rows:

Country	Capital City	Population
Aruba	Oranjestad	29034
Afghanistan	Kabul	1780000
Angola	Luanda	2022000
Anguilla	The Valley	595
Albania	Tirana	270000
Andorra	Andorra la Vella	21189
Netherlands Antilles	Willemstad	2345
United Arab Emirates	Abu Dhabi	398695
Argentina	Buenos Aires	2982146
Armenia	Yerevan	1248700
American Samoa	Fagatogo	2323

18. **Countries with Low Population Density:** *Scenario:* An agricultural research institute is studying countries with low population densities for potential agricultural development projects. You're tasked with identifying countries with sparse populations from the database to support the institute's research efforts.

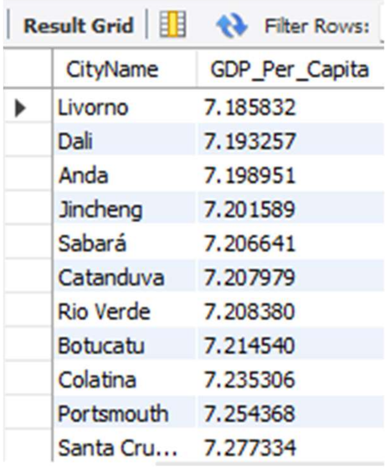
```
SELECT Name, Population/SurfaceArea AS "Population Density"
FROM country
ORDER BY Population/SurfaceArea;
```



Name	Population Density
Antarctica	0.0000
French Southern territories	0.0000
Bouvet Island	0.0000
Heard Island and McDonald Islands	0.0000
British Indian Ocean Territory	0.0000
South Georgia and the South Sandwich Islands	0.0000
United States Minor Outlying Islands	0.0000
Greenland	0.0259
Svalbard and Jan Mayen	0.0513
Falkland Islands	0.1643

19. **Cities with High GDP per Capita:** *Scenario:* An economic consulting firm is analysing cities with high GDP per capita for investment opportunities. You're tasked with identifying cities with above-average GDP per capita from the database to assist the firm in identifying potential investment destinations.

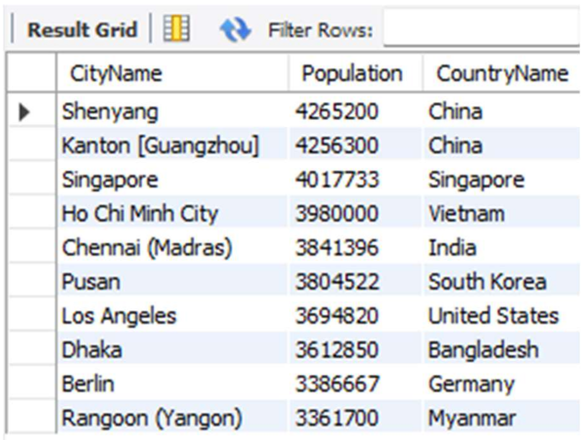
```
SELECT city.Name AS CityName,
       (country.GNP / city.Population) AS GDP_Per_Capita
FROM city
JOIN country ON city.CountryCode = country.Code
WHERE (country.GNP / city.Population) > (
    SELECT AVG(country.GNP / city.Population)
    FROM city
    JOIN country ON city.CountryCode = country.Code
    WHERE city.Population > 0
)
AND city.Population > 0
ORDER BY GDP_Per_Capita;
```



CityName	GDP_Per_Capita
Livorno	7.185832
Dali	7.193257
Anda	7.198951
Jincheng	7.201589
Sabará	7.206641
Catanduva	7.207979
Rio Verde	7.208380
Botucatu	7.214540
Colatina	7.235306
Portsmouth	7.254368
Santa Cru...	7.277334

20. **Display Columns with Limit (Rows 31-40):** *Scenario:* A market research firm requires detailed information on cities beyond the top rankings for a comprehensive analysis. You're tasked with providing data on cities ranked between 31st and 40th by population to ensure a thorough understanding of urban demographics.

```
SELECT city.Name AS CityName,

    city.Population,

    country.Name AS CountryName

FROM city

JOIN country ON city.CountryCode = country.Code

ORDER BY city.Population DESC

LIMIT 10 OFFSET 30;
```



CityName	Population	CountryName
Shenyang	4265200	China
Kanton [Guangzhou]	4256300	China
Singapore	4017733	Singapore
Ho Chi Minh City	3980000	Vietnam
Chennai (Madras)	3841396	India
Pusan	3804522	South Korea
Los Angeles	3694820	United States
Dhaka	3612850	Bangladesh
Berlin	3386667	Germany
Rangoon (Yangon)	3361700	Myanmar

Course Notes

It is recommended to take notes from the course, use the space below to do so, or use the revision guide shared with the class:

We have included a range of additional links to further resources and information that you may find useful, these can be found within your revision guide.

END OF WORKBOOK

Please check through your work thoroughly before submitting and update the table of contents if required.

Please send your completed work booklet to your trainer.