

**Data Technician**

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| Course Date: 28/04/2025 |
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# Day 1: Task 1

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

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| What is a primary key? | The primary is a column in the table that uniquely identifies each record in rows in the table and cannot be empty and must be unique. The reason why it important it ensure there is no duplicates in records and can quickly search any row and can be used to support other relationships table as a foreign key.  Here is an example and the link for it <https://www.google.com/url?sa=i&url=http%3A%2F%2Frdbms.opengrass.net%2F2_Database%2520Design%2F2.1_TermsOfReference%2F2.1.2_Keys.html&psig=AOvVaw2edJWhN5HY8z37PNL9R_Uf&ust=1745927177583000&source=images&cd=vfe&opi=89978449&ved=0CBQQjRxqFwoTCPix-tvT-owDFQAAAAAdAAAAABAJ> |
| How does this differ from a secondary key? | A primary key is a field that uniquely identifies each record in a database table whereas secondary key is any field that can be used to search for records but does not have to be unique. The secondary key also does not need to be uniquely identify a row which make it great for supports searching and organizing data. |
| How are primary and foreign keys related? | A primary key and a foreign key are both used to create relationships between tables in a database. Foreign key a is field in one table that refers to primary key in another table which establishes a relationship between the two tables by linking them together. |
| Provide a real-world example of a one-to-one relationship | A one-to-one relationship exists between an employee and a company issued laptop. Each employee receives only one laptop.    The EmployeeID is the Primary Key in the Employee table.  The EmployeeID is a Foreign Key in the Laptop table creating a one-to-one link. |
| Provide a real-world example of a one-to-many relationship | A one-to-many relationship exists between a teacher and students each student is taught by one main teacher.    TeacherID is the Primary Key in the Teachers table.  TeacherID is a Foreign Key in the Students table. |
| Provide a real-world example of a many-to-many relationship | A many-to-many relationship exists between students and courses at university. One student can enrol in many courses and one course can have many students enrolled.    StudentID is linked to Enrollments.  CourseID is linked to Enrollments.  Enrollments links both tables together. |

# Day 1: Task 2

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

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| What is the difference between a relational and non-relational database? | A relational database stores data in tables with rows and columns where relationships between data are maintained using primary keys and foreign keys and it requires a fixed schema and is ideal for structured, consistent data. Whereas A non-relational database stores the data different flexible formats like documents, wide column, and graph. And, the data is not required to be strict structured table. Also, the non-relational database is mostly called NOSQL. |
| What type of data would benefit off the non-relational model?  Why? | The types of data that would benefit of the non-relational database are data that is unstructured, and semi structured data. Examples are social media posts and user profiles also large volume of changing data like content management system. Real-time data is also best used for NOSQL which are like messages app, recommendation engines. |

# 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.

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| Self-join | Self-join is when the table is joined to itself. Its purpose is to compare rows withing the same table.  An example is employee table where each row has an employee and their manager’s ID, a self-join can show employee–manager relationships.  SELECT A.EmployeeName, EmployeeName AS ManagerName  FROM Employees A  JOIN Employees B ON A.ManagerID = B.EmployeeID; |
| Right join | Right join returns all rows from the right table and the matching rows from the left table if there is no match, NULLs are returned for the left table columns.  An example List all products and any matching sales. Even if a product hasn’t been sold, it will still appear in the result.  SELECT Products.ProductName, Sales.Quantity  FROM Sales  RIGHT JOIN Products ON Sales.ProductID = Products.ProductID; |
| Full join | Full join returns all records from both tables and where there is a match data is shown from both tables and where there are no match NULLs are returned.  An example Compare a list of all current customers and all people who have made orders, whether they match or not.  SELECT Customers.CustomerName, Orders.OrderID  FROM Customers  FULL OUTER JOIN Orders ON Customers.CustomerID = Orders.CustomerID; |
| Inner join | Inner join returns only the rows where there is a match in both tables. An example is a Display all orders that have a matching customer.  SELECT Customers.CustomerName, Orders.OrderID  FROM Customers  INNER JOIN Orders ON Customers.CustomerID = Orders.CustomerID; |
| Cross join | Cross join returns the Cartesian product of both tables – all possible combinations of rows. An example is Creating all combinations of pizza toppings and crust types.  SELECT Topping.Name, Crust.Type  FROM Topping  CROSS JOIN Crust; |
| Left join | Left join returns all rows from the left table and the matching rows from the right table and if there’s no match NULLs are returned from the right table. An example List all customers, and any orders they may have made – including those with no orders.  SELECT Customers.CustomerName, Orders.OrderID  FROM Customers  LEFT JOIN Orders ON Customers.CustomerID = Orders.CustomerID; |

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

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| Please write your 500-word essay here | Designing a Database System for a Small Retail Business:  The first we have to do is understanding the business requirements example the data base must be able to store several types of data. The data types we need are inventory data, sales data, customer information, and loyalty program. The users of data base will include cashiers, shop managers, and operational manager. The users can view reports, keep track inventory and being able to analyse sales.  The second thing we have to do is the designing schema this will help us manage the data effectively and these will be following table created.   * Product table: it will store all the item information like productid, name, price, category, and stock. * Sales table it will keep all the transaction record like saleID, date, and customerID. * Customers table: it will keep all customers info like customerID, name, email, phone, and loyaltystatus. * Saleitems table: it will keep track all products sold like saleID, productID, and quantity. * Loyalty table: it will keep track of customer points like customerID, joindate, and pointsbalance.   The third thing we ganna do is building and implementing the data base. Here is data base SQL commands  CREATE TABLE Customers (  CustomerID INT PRIMARY KEY,  Name VARCHAR(100),  Email VARCHAR(100),  Phone VARCHAR(20),  LoyaltyStatus BOOLEAN);    CREATE TABLE Products (  ProductID INT PRIMARY KEY,  Name VARCHAR(100),  Category VARCHAR(50),  Price DECIMAL(5,2),  Stock INT);    CREATE TABLE Sales (  SaleID INT PRIMARY KEY,  Date DATE,  CustomerID INT,  FOREIGN KEY (CustomerID) REFERENCES Customers(CustomerID));    CREATE TABLE SaleItems (  SaleID INT,  ProductID INT,  Quantity INT,  PRIMARY KEY (SaleID, ProductID),  FOREIGN KEY (SaleID) REFERENCES Sales(SaleID),  FOREIGN KEY (ProductID) REFERENCES Products(ProductID));    CREATE TABLE Loyalty (  CustomerID INT PRIMARY KEY,  PointsBalance INT,  JoinDate DATE,  FOREIGN KEY (CustomerID) REFERENCES Customers(CustomerID));  The fourth step is populating the data with information and here is an example how to insert information into the tables.  INSERT INTO Products VALUES (1, 'Milk', 'Dairy', 2.50, 80);  INSERT INTO Customers VALUES (1, 'Sandy Pearce', 'sandy@email.com', '07125453789', TRUE);  INSERT INTO Sales VALUES (1, '2025-05-02', 1);  INSERT INTO SaleItems VALUES (1, 1, 2);  INSERT INTO Loyalty VALUES (1, 50, '2025-01-15');  The final step is maintaining the data base which will ensure that everything is up to date and accurate information. I would implement data validation were it prevents negative stock, secondly, I would make schedule regular backups to make sure no data is lost, thirdly I set up automated reports to monitor stocks level and how well the sales are doing. |

# 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.

**Setting up the database:**

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.

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1. **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.

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1. **"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.

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1. **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.

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1. **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.

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1. **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.

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1. **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.

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1. **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.

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1. **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.

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1. **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.

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1. **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.

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1. **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.

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1. **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.

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1. **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.

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1. **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.

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1. **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.

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1. **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.

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1. **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.

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1. **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.

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1. **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.

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| **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:

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| **Additional Information** |

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.**