

The world of SQL and relational databases in My5QL



175 H

HOURS

15

LESSONS

In this module, we delve into the world of **SQL** (**Structured Query Language**) to equip us with the necessary skills for **managing** and **extracting valuable insights** from data. SQL is a powerful tool used for **data manipulation** and **retrieval** in **relational databases**, making it a fundamental language for data professionals.

Throughout this course, we will explore the core principles of SQL and learn how to query relational databases efficiently, perform data transformations, and gain proficiency in designing complex queries.

We'll use real-world data and examples related to the United Nations Sustainable Development Goals to contextualise the concepts and demonstrate the practical application of using SQL to solve problems.

Module objectives

Introduction to SQL

Learn the fundamentals of databases and SQL.

Master working with databases using queries to calculate, aggregate, sort, and group data.

Database manipulation

Master the fundamentals of data transformation by cleaning and analysing data, working with various SQL data types, and identifying data anomalies.

Relational database design

Gain a fundamental understanding of SQL schemas and entity relationships. Learn how to use primary, foreign, and composite keys, normalise databases, and create views.

SQL in practice

Learn the foundational principles of set theory, set operations, and SQL joins. Gain a fundamental understanding of SQL in practice and how we can improve query performance.

SQL in Jupyter notebooks

Master the fundamentals of using Jupyter notebooks to interact with SQL and SQL databases in a way that allows us to combine code, documentation, and visualisation for improved data analysis.

Table normalisation

Master the fundamentals of table normalisation and data anomaly detection. Learn how to design a well-structured database that minimises redundancy and addresses data irregularities and inconsistencies.

Learning activities

By engaging with different types of learning activities, we will develop a deeper understanding of querying data with SQL and build a range of skills that will help us succeed in our coursework and beyond.

We learn by doing. We'll work on practical problem-solving and real-world projects.

Learn

Watch animated videos and read practical slide decks to learn SQL concepts and operations.



Animated videos



Slide decks



Reference cards

Apply

Practise SQL queries and operations during step-by-step guides and apply them to real-world scenarios.



Walk-throughs



Integrated project



Notebooks

This integrated project spans the entire module. Each week, we'll delve into a specific part of the project and you'll have to complete corresponding multiple-choice questions (MCQs) based on that week's learning. In this way, we build on our SQL skills cumulatively!

Assess

Test and track your data, SQL, and problem-solving proficiency.



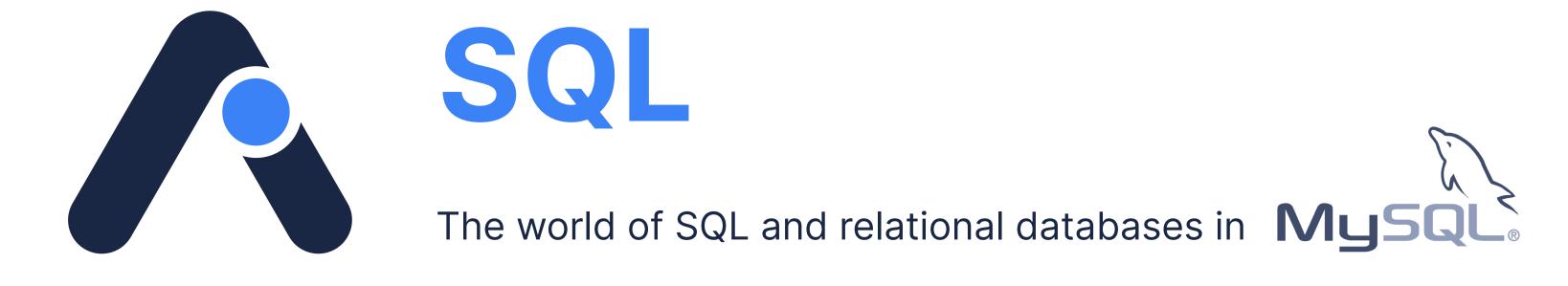
KQ assessments



Exercises



MCQ assessments



Week 1



Lesson: Database concepts

In this lesson, we take a look at **fundamental database concepts** and explore how we can **interact** with databases using a **Database Management System (DBMS)**.



Understand the basic concepts of data structures, databases, and relational DBMSs.



Know how to navigate a DBMS tool and how to use it to interact with a database.



Lesson: SQL basics

In this lesson, we'll introduce the **five principal SQL sublanguages** and their respective commands. We will focus on **DDL commands** to learn how to define data structure and **DML commands** to learn to manipulate data.



Understand the fundamentals of SQL, its significance in relational databases, and the principal SQL sublanguages.



Know how to define data structure using **DDL** (Data Definition Language) commands, including CREATE, ALTER, TRUNCATE, and DROP.



Know how to manipulate data structure using DML (Data Manipulation Language) commands, including INSERT, UPDATE, and DELETE.



Lesson: Querying with SQL

In this lesson, we take a deep dive into querying with SQL. We search and retrieve data from a database using various SQL keywords.



Retrieve data with **SELECT statements**.



Understand the usage of the WHERE clause to filter data and the LIKE operator with wildcards for string matching/search.



Know how to use **comparison** and **logical operators** to get/exclude specific values in a table, combine multiple conditions with logical operators, and understand the **order of operations** in SQL.



Integrated project: Beginning our data-driven journey in Maji Ndogo

In this first part of the integrated project, we dive into Maji Ndogo's expansive database containing 60 000 records spread across various tables. As we navigate this trove of data, we'll use basic queries to **familiarise** ourselves with the **content of each table**. Along the way, we'll also **refine some data using DML**.



Demonstrate the ability to create and modify basic queries.



Demonstrate the ability to use operators to create conditional filters.



Demonstrate an understanding of operators to filter data with multiple criteria.



Demonstrate how to use DML and the risks associated with changing a database.



Lesson: SQL in production

In this lesson, we take a look at **how organisations use SQL in production environments** and how technology stacks, application architectures, and business requirements **influence how we use SQL**. We also take a look at how we can **write SQL queries in Python notebooks**.



Understand how technology stacks, application architectures, and business requirements influence how we use SQL.

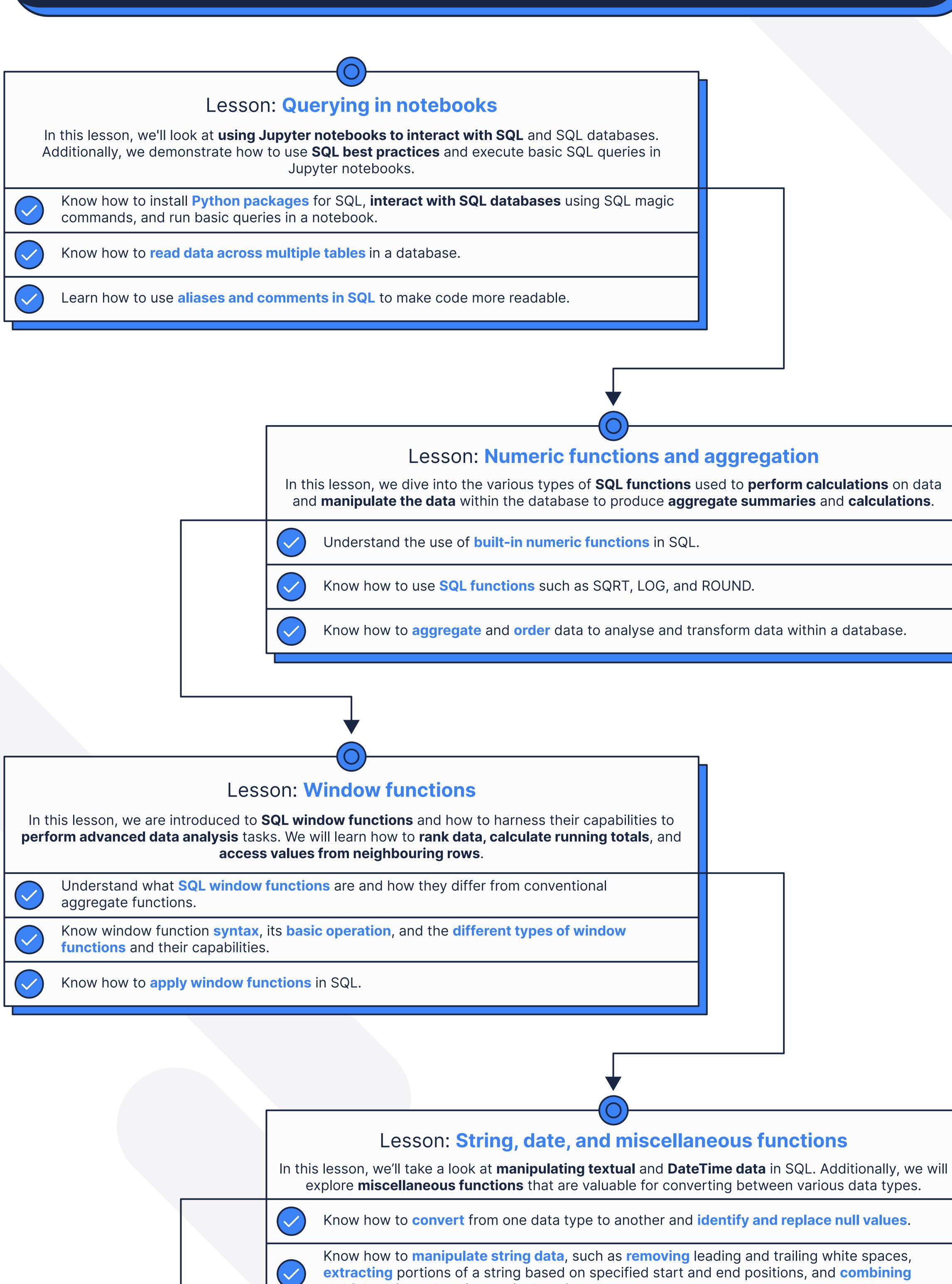


Understand virtual environments and Python, and why data professionals use them to solve data problems.



Know the different tools we can use to write and execute Python code.

Week 2





multiple string values into a single string.



In this lesson, we'll introduce two main control flow functions, the CASE and IF statements. We will focus on the syntax and practical applications of these functions to learn how to categorise and conditionally manipulate data.



Understand the syntax and application of the CASE and IF statements and know how to implement conditional logic in queries for data classification and manipulation.



Know how to integrate control flow functions with other SQL features, such as aggregate functions and the GROUP BY clause.

Understand nested logic for complex data scenarios using nested IF and CASE statements.



Integrated project: Clustering data to unveil Maji Ndogo's water crisis

In this second part of the integrated project, we gear up for a deep analytical dive into Maji Ndogo's water scenario. Harness the power of a wide range of functions, including intricate window functions, to tease out insights from the data tables.



Demonstrate an understanding of SQL functions and window functions.

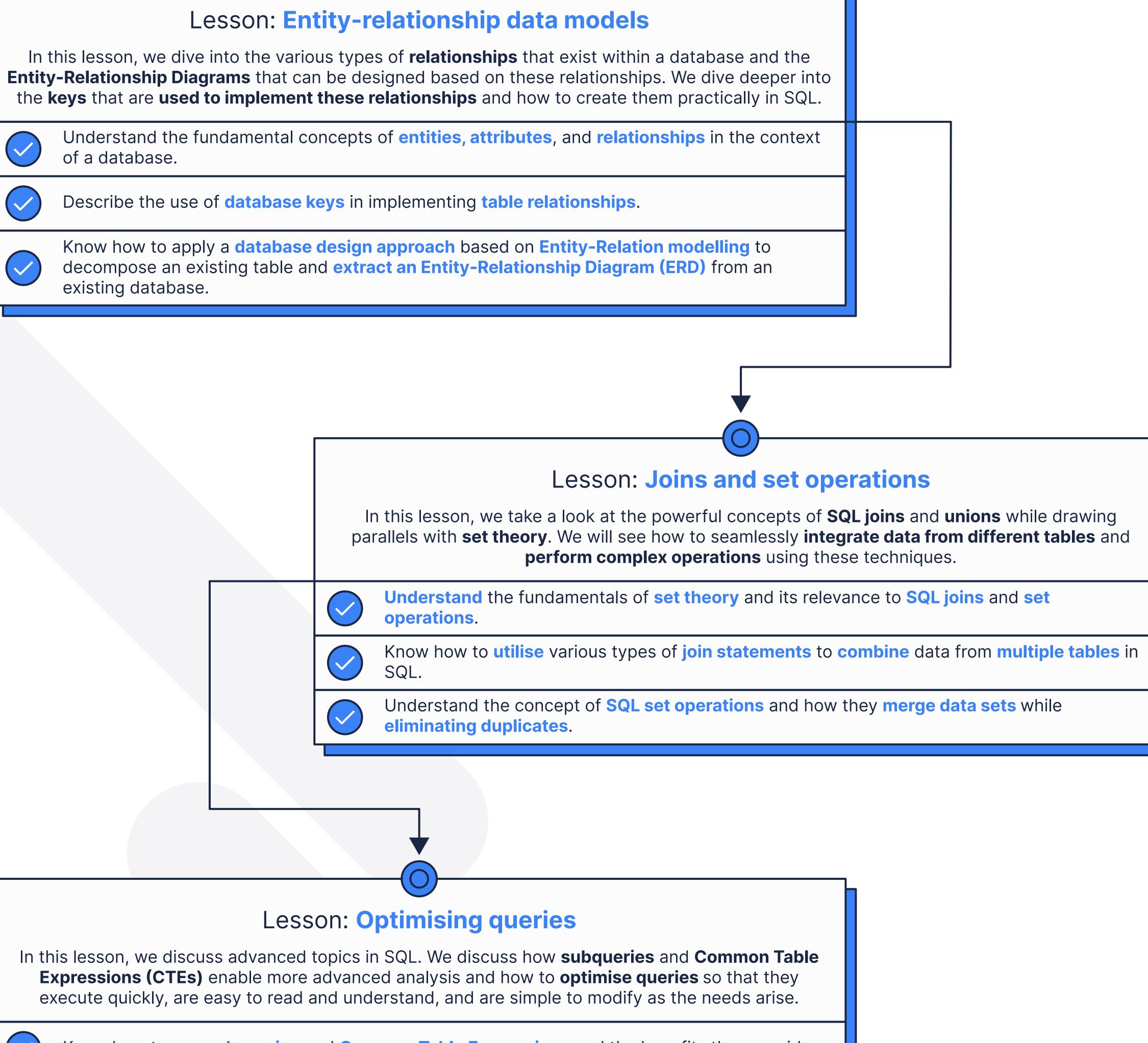


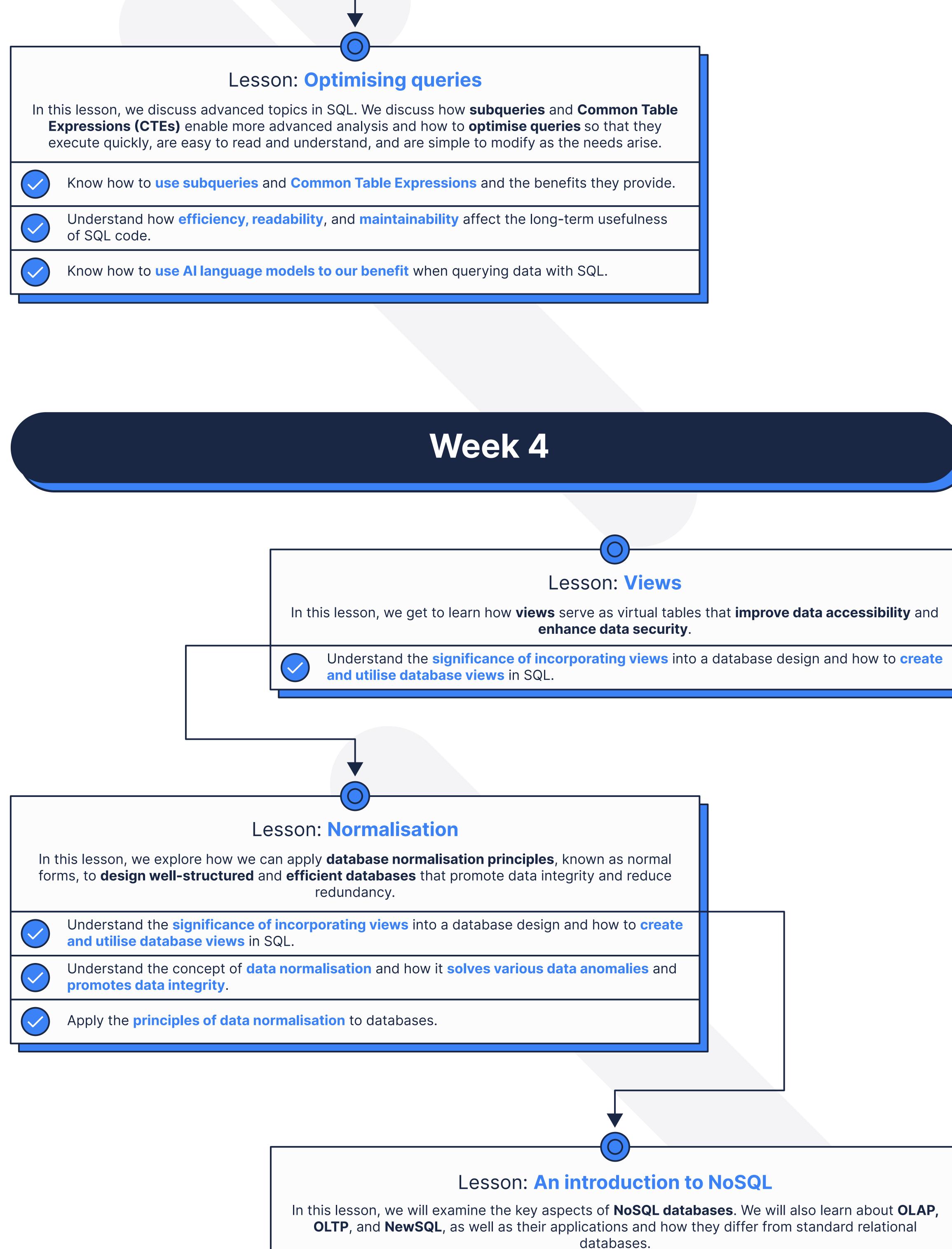
Demonstrate the ability to use various functions to clean and analyse data.

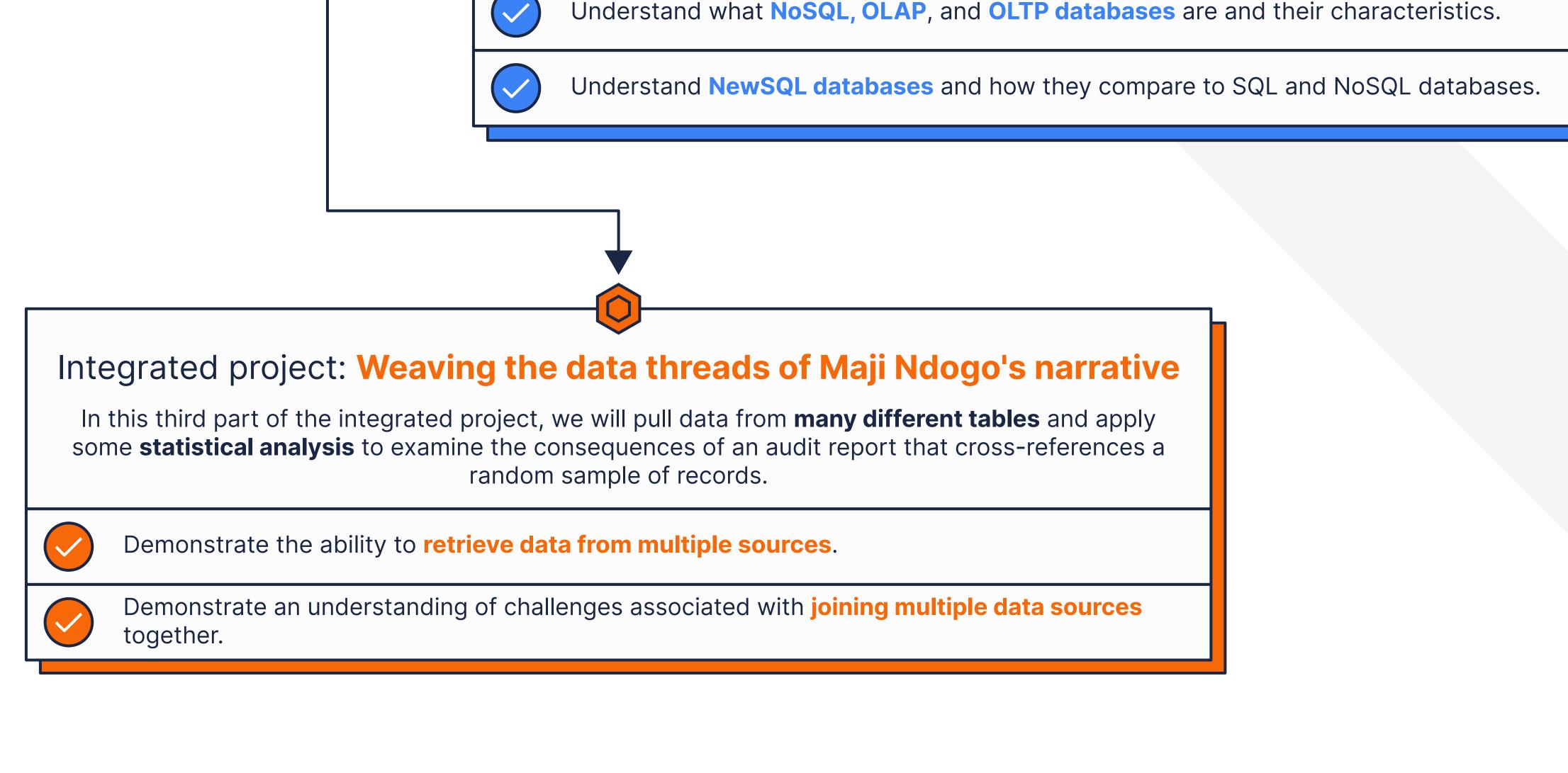


Demonstrate an understanding of data aggregation techniques.

tionship data models relationships that exist within a database and the ed based on these relationships. We dive deeper into ionships and how to create them practically in SQL.







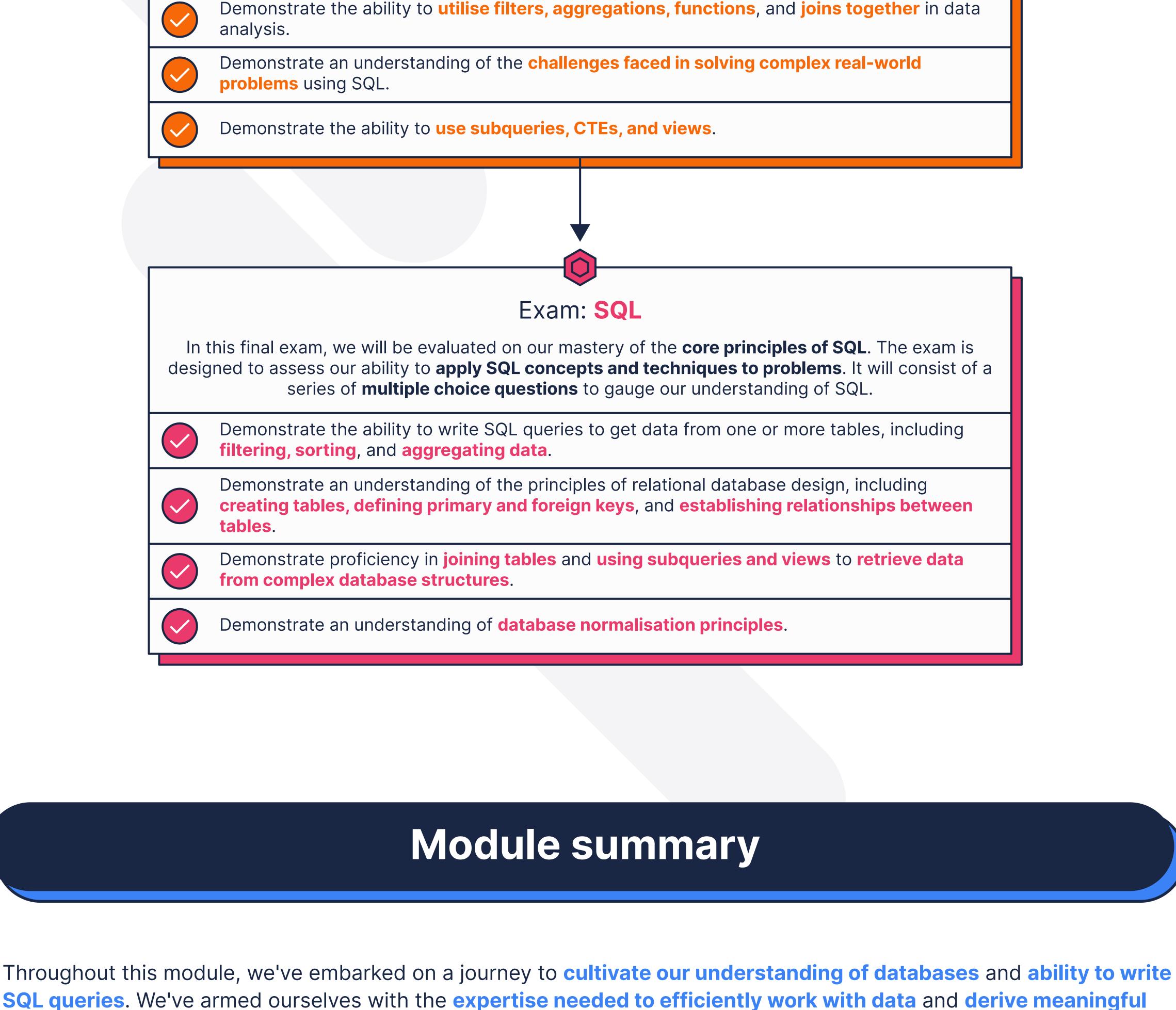


In this final part of the project, we finalise our data analysis using the full suite of SQL tools. We will

gain our final insights, use these to classify water sources, and prepare relevant data for our

engineering teams.

Week 5



and analysis to unlock their true potential. By completing this module, we've not only become **proficient in SQL** but also built on our **data-driven analysis** and

insights. Our exploration focused on databases, relational databases, and SQL, delving into data retrieval, manipulation,

decision-making foundation that will be key in our data career path.

What's next?

foundations we've laid so far. We'll learn how to transform our raw data into compelling narratives to drive insights and influence decisions.

We'll take these newfound skills forward as we explore other data tools and technologies and expand on our capabilities in data-driven analysis, storytelling, and problem solving.

It's important to recognise that our journey into the world of data is far from over. In the next module, we'll build on the

business strategies, or fuel innovation, your ability to work with data will always be an invaluable asset on your path to success.

Remember, the data landscape is vast and ever evolving. Stay curious, keep practising, and apply the knowledge and

skills you've gained in real-world scenarios. Whether you aspire to shape sustainable development policies, optimise

