Databases

INTRODUCTION TO SQL

SQL

Izzy Weber
Curriculum Manager, DataCamp

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Course goals

1. Understand databases and their structure → Chapter 1
2. Extract information from databases using SQL → Chapter 2

Introducing databases

patrons

card_num	name	member_year	total_fine
54378	Izzy	2012	9.86
94722	Maham	2020	0
45783	Jasmin	2022	2.05
90123	James	1989	0

books

id	title	author	genre	pub_year
638	Being Mortal	Atul Gawande	Non-Fiction	2015
912	Educated	Tara Westover	Non-Fiction	2018
322	Night	Elie Wiesel	Non-Fiction	1956
156	Where the Wild Things Are	Maurice Sendak	Childrens	1963

checkouts

id	start_date	due_date	card_num	book_id
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Introducing databases

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Relational databases

- Define relationships between tables of data inside the database

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Database advantages

- More storage than spreadsheet applications
- Storage is more secure

Database advantages

SQL

- Short for Structured Query Language
- The most widely used programming language for databases

```
SELECT *
FROM patrons
LIMIT 30
```

Let's practice!

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A seat at the table

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Good table manners

Table names should...

- be lowercase
- have no spaces—use underscores instead
- refer to a collective group or be plural

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A field is a column that holds one piece of information about all records

a field

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patrons

unique identifier

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The more the merrier

patrons

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patron_checkouts

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Let's practice!

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SQL data types

all one data type

all one data type

all one data type

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- Different types of data are stored differently and take up different space
- Some operations only apply to certain data types

Strings

a string field

patrons

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- `VARCHAR` is a flexible and popular string data type in SQL

Integers

an integer field

patrons

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- Integers store whole numbers
- `INT` is a flexible and popular integer data type in SQL

Floats

a float field

patrons

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Schemas

patrons
card_num INT
name VARCHAR
member_year INT
total_fine NUMERIC
checkouts
id INT
start_date DATE
due_date DATE
card_num INT
book_id INT
books
id INT
title VARCHAR
author VARCHAR
genre VARCHAR
pub_year INT

Database storage

Let's practice!

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card_num INT
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books
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Database storage

Let's practice!

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books
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title VARCHAR
author VARCHAR
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Database storage

Let's practice!

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Introducing queries

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What is SQL useful for?

patrons

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Best for large datasets

Keywords

Keywords are reserved words for operations

Common keywords: `SELECT` , `FROM`

```
SELECT name
```

```
FROM patrons
```

patrons

card_num	name	member_year	total_fine
54378	Izzy	2012	9.86
94722	Maham	2020	0
45783	Jasmin	2022	2.05
90123	James	1989	0

Our first query

```
SELECT name
FROM patrons;
```

```
| name   |
|--------|
| Izzy   |
| Maham  |
| Jasmin |
| James  |
```

patrons

card_num	name	member_year	total_fine
54378	Izzy	2012	9.86
94722	Maham	2020	0
45783	Jasmin	2022	2.05
90123	James	1989	0

- Query results often called *result set*

Selecting multiple fields

```sql
SELECT card_num, name
FROM patrons;
```

```
| card_num | name   |
|----------|--------|
| 54378    | Izzy   |
| 94722    | Maham  |
| 45783    | Jasmin |
| 90123    | James  |
```

```sql
SELECT name, card_num
FROM patrons;
```

```
| name   | card_num |
|--------|----------|
| Izzy   | 54378    |
| Maham  | 94722    |
| Jasmin | 45783    |
| James  | 90123    |
```

Selecting multiple fields

```
SELECT name, card_num, total_fine
FROM patrons;
```

```
| card_num | name   | total_fine |
|----------|--------|------------|
| 54378    | Izzy   | 9.86       |
| 94722    | Maham  | 0          |
| 45783    | Jasmin | 2.05       |
| 90123    | James  | 0          |
```

Selecting all fields

```
SELECT *
FROM patrons;
```

```
| card_num | name    | member_year | total_fine |
|----------|---------|-------------|------------|
| 54378    | Izzy    | 2012        | 9.86       |
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```

Let's practice!

INTRODUCTION TO SQL

Writing queries

INTRODUCTION TO SQL

SQL

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Aliasing

Use *aliasing* to rename columns

```
SELECT name AS first_name, year_hired
FROM employees;
```

```
| first_name | year_hired |
|------------|------------|
| Darius     | 2020       |
| Raven      | 2017       |
| Eduardo    | 2022       |
| Maggie     | 2021       |
| Amy        | 2020       |
| Meehir     | 2021       |
```

Selecting distinct records

```sql
SELECT year_hired
FROM employees;
```

```
| year_hired |
|------------|
| 2020       |
| 2017       |
| 2022       |
| 2021       |
| 2020       |
| 2021       |
```

```sql
SELECT DISTINCT year_hired
FROM employees;
```

```
| year_hired |
|------------|
| 2020       |
| 2017       |
| 2022       |
| 2021       |
```

DISTINCT with multiple fields

employees

id	name	dept_id	job_level_id	year_hired
54378	Darius	1	3	2020
94722	Raven	2	3	2017
45783	Eduardo	2	1	2022
90123	Maggie	3	2	2011
67284	Amy	2	2	2009
26148	Meehir	3	3	2021

```
SELECT dept_id, year_hired
FROM employees;
```

```
| dept_id | year_hired |
|---------|------------|
| 1       | 2020       |
| 2       | 2017       |
| 2       | 2022       |
| 3       | 2021       |
| 2       | 2020       |
| 3       | 2021       |
```

DISTINCT with multiple fields

```
SELECT DISTINCT dept_id, year_hired
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```
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|---------|------------|
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```

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- A *view* is a virtual table that is the result of a saved SQL `SELECT` statement
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```
CREATE VIEW employee_hire_years AS
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Using views

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```
| id     | name     |
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| 54378 | Darius   |
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| 90123 | Maggie   |
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Let's practice!

INTRODUCTION TO SQL

SQL flavors

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SQL flavors

- Both free and paid
- All used with relational databases
- Vast majority of keywords are the same
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Comparing PostgreSQL and SQL Server

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```
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LIMIT 2;
```

```
| id     | name    |
|--------|---------|
| 54378  | Darius  |
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```

- Example: limiting number of results

SQL Server:

```
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```

```
| id     | name    |
|--------|---------|
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```

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INTRODUCTION TO SQL

Congratulations!

INTRODUCTION TO SQL

SQL

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What you've learned

What you've learned

What you've learned

```
SELECT DISTINCT genre AS unique_genre
FROM books
LIMIT 15;
```

Where to go next

The next step is to learn more keywords and to choose which flavor you'll learn them in!

Learn PostgreSQL on DataCamp:

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Thank you!

INTRODUCTION TO SQL

Introducing queries

INTRODUCTION TO SQL

SQL

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What is SQL useful for?

patrons

card_num	name	member_year	total_fine
54378	Izzy	2012	9.86
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45783	Jasmin	2022	2.05
90123	James	1989	0

books

id	title	author	genre	pub_year
638	Being Mortal	Atul Gawande	Non-Fiction	2015
912	Educated	Tara Westover	Non-Fiction	2018
322	Night	Elie Wiesel	Non-Fiction	1956
156	Where the Wild Things Are	Maurice Sendak	Childrens	1963

checkouts

id	start_date	due_date	card_num	book_id
567	2022-05-13	2022-05-27	54378	638
568	2022-06-10	2022-06-24	54378	322
569	2022-06-27	2022-07-11	45783	156
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patrons

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Selecting multiple fields

```sql
SELECT card_num, name
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```

```
| card_num | name   |
|----------|--------|
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| 94722    | Maham  |
| 45783    | Jasmin |
| 90123    | James  |
```

```sql
SELECT name, card_num
FROM patrons;
```

```
| name   | card_num |
|--------|----------|
| Izzy   | 54378    |
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| Jasmin | 45783    |
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Selecting multiple fields

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```

Let's practice!

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Writing queries

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Aliasing

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SELECT name AS first_name, year_hired
FROM employees;
```

```
| first_name | year_hired |
|------------|------------|
| Darius     | 2020       |
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```

Selecting distinct records

```sql
SELECT year_hired
FROM employees;
```

```
| year_hired |
|------------|
| 2020       |
| 2017       |
| 2022       |
| 2021       |
| 2020       |
| 2021       |
```

```sql
SELECT DISTINCT year_hired
FROM employees;
```

```
| year_hired |
|------------|
| 2020       |
| 2017       |
| 2022       |
| 2021       |
```

DISTINCT with multiple fields

employees

id	name	dept_id	job_level_id	year_hired
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```
SELECT dept_id, year_hired
FROM employees;
```

```
| dept_id | year_hired |
|---------|------------|
| 1       | 2020       |
| 2       | 2017       |
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| 3       | 2021       |
| 2       | 2020       |
| 3       | 2021       |
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DISTINCT with multiple fields

```
SELECT DISTINCT dept_id, year_hired
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Let's practice!

INTRODUCTION TO SQL

SQL flavors

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SQL flavors

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```

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```

- Example: limiting number of results

SQL Server:

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```

```
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INTRODUCTION TO SQL

Congratulations!

INTRODUCTION TO SQL

SQL

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What you've learned

What you've learned

What you've learned

```
SELECT DISTINCT genre AS unique_genre
FROM books
LIMIT 15;
```

Where to go next

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Thank you!

INTRODUCTION TO SQL

Introducing queries

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What is SQL useful for?

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card_num	name	member_year	total_fine
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books

id	title	author	genre	pub_year
638	Being Mortal	Atul Gawande	Non-Fiction	2015
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322	Night	Elie Wiesel	Non-Fiction	1956
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```
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Our first query

```
SELECT name
FROM patrons;
```

```
| name   |
|--------|
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| James  |
```

patrons

card_num	name	member_year	total_fine
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Selecting multiple fields

```sql
SELECT card_num, name
FROM patrons;
```

```
| card_num | name   |
|----------|--------|
| 54378    | Izzy   |
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```

```sql
SELECT name, card_num
FROM patrons;
```

```
| name   | card_num |
|--------|----------|
| Izzy   | 54378    |
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Selecting multiple fields

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Selecting all fields

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SELECT *
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```

Let's practice!

INTRODUCTION TO SQL

Writing queries

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Aliasing

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```
SELECT name AS first_name, year_hired
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```
| first_name | year_hired |
|------------|------------|
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```

Selecting distinct records

```sql
SELECT year_hired
FROM employees;
```

```
| year_hired |
|------------|
| 2020       |
| 2017       |
| 2022       |
| 2021       |
| 2020       |
| 2021       |
```

```sql
SELECT DISTINCT year_hired
FROM employees;
```

```
| year_hired |
|------------|
| 2020       |
| 2017       |
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| 2021       |
```

DISTINCT with multiple fields

employees

id	name	dept_id	job_level_id	year_hired
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```
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FROM employees;
```

```
| dept_id | year_hired |
|---------|------------|
| 1       | 2020       |
| 2       | 2017       |
| 2       | 2022       |
| 3       | 2021       |
| 2       | 2020       |
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```

DISTINCT with multiple fields

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INTRODUCTION TO SQL

SQL flavors

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INTRODUCTION TO SQL

Congratulations!

INTRODUCTION TO SQL

SQL

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What you've learned

What you've learned

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INTRODUCTION TO SQL

Introducing queries

INTRODUCTION TO SQL

SQL

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```

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|--------|
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| James  |
```

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| card_num | name    | member_year | total_fine |
|----------|---------|-------------|------------|
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```

Let's practice!

INTRODUCTION TO SQL

Writing queries

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| first_name | year_hired |
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Selecting distinct records

```sql
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```

```
| year_hired |
|------------|
| 2020       |
| 2017       |
| 2022       |
| 2021       |
| 2020       |
| 2021       |
```

```sql
SELECT DISTINCT year_hired
FROM employees;
```

```
| year_hired |
|------------|
| 2020       |
| 2017       |
| 2022       |
| 2021       |
```

DISTINCT with multiple fields

employees

id	name	dept_id	job_level_id	year_hired
54378	Darius	1	3	2020
94722	Raven	2	3	2017
45783	Eduardo	2	1	2022
90123	Maggie	3	2	2011
67284	Amy	2	2	2009
26148	Meehir	3	3	2021

```
SELECT dept_id, year_hired
FROM employees;
```

```
| dept_id | year_hired |
|---------|------------|
| 1       | 2020       |
| 2       | 2017       |
| 2       | 2022       |
| 3       | 2021       |
| 2       | 2020       |
| 3       | 2021       |
```

DISTINCT with multiple fields

```
SELECT DISTINCT dept_id, year_hired
FROM employees;
```

```
| dept_id | year_hired |
|---------|------------|
| 1       | 2020       |
| 2       | 2017       |
| 2       | 2022       |
| 3       | 2021       |
| 2       | 2020       |
```

Views

- A *view* is a virtual table that is the result of a saved SQL `SELECT` statement
- When accessed, views automatically update in response to updates in the underlying data

```
CREATE VIEW employee_hire_years AS
SELECT id, name, year_hired
FROM employees;
```

Using views

```
SELECT id, name
FROM employee_hire_years;
```

```
| id     | name     |
|--------|----------|
| 54378 | Darius   |
| 94722 | Raven    |
| 45783 | Eduardo |
| 90123 | Maggie   |
| 67284 | Amy      |
| 26148 | Meehir   |
```

Let's practice!

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SQL flavors

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SQL flavors

- Both free and paid
- All used with relational databases
- Vast majority of keywords are the same
- All must follow universal standards
- Only the additions on top of these standards make flavors different

[1] Table flatlay photo created by freepik www.freepik.com

Two popular SQL flavors

PostgreSQL

- Free and open-source relational database system
- Created at the University of California, Berkeley
- "PostgreSQL" refers to both the PostgreSQL database system and its associated SQL flavor

SQL Server

- Has free and paid versions
- Created by Microsoft
- T-SQL is Microsoft's SQL flavor, used with SQL Server databases

Comparing PostgreSQL and SQL Server

- Like dialects of the same language

PostgreSQL:

```
SELECT id, name
FROM employees
LIMIT 2;
```

```
| id     | name    |
|--------|---------|
| 54378  | Darius  |
| 94722  | Raven   |
```

- Example: limiting number of results

SQL Server:

```
SELECT TOP(2) id, name
FROM employees;
```

```
| id     | name    |
|--------|---------|
| 54378  | Darius  |
| 94722  | Raven   |
```

Choosing a flavor

Just like with ice cream, any flavor is probably a good choice!

Let's practice!

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Congratulations!

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What you've learned

What you've learned

What you've learned

```
SELECT DISTINCT genre AS unique_genre
FROM books
LIMIT 15;
```

Where to go next

The next step is to learn more keywords and to choose which flavor you'll learn them in!

Learn PostgreSQL on DataCamp:

- Intermediate SQL Queries

Learn SQL Server on DataCamp:

- Introduction to SQL Server

Thank you!

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