

# Databases

## INTRODUCTION TO SQL



**Izzy Weber**

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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
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
570	2022-08-14	2022-08-28	90123	912

# Introducing databases

patrons

card_num	name	member_year	total_fine
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# Relational databases

- Define relationships between tables of data inside the database

patrons

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54378	Izzy	2012	9.86
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45783	Jasmin	2022	2.05
90123	James	1989	0

books

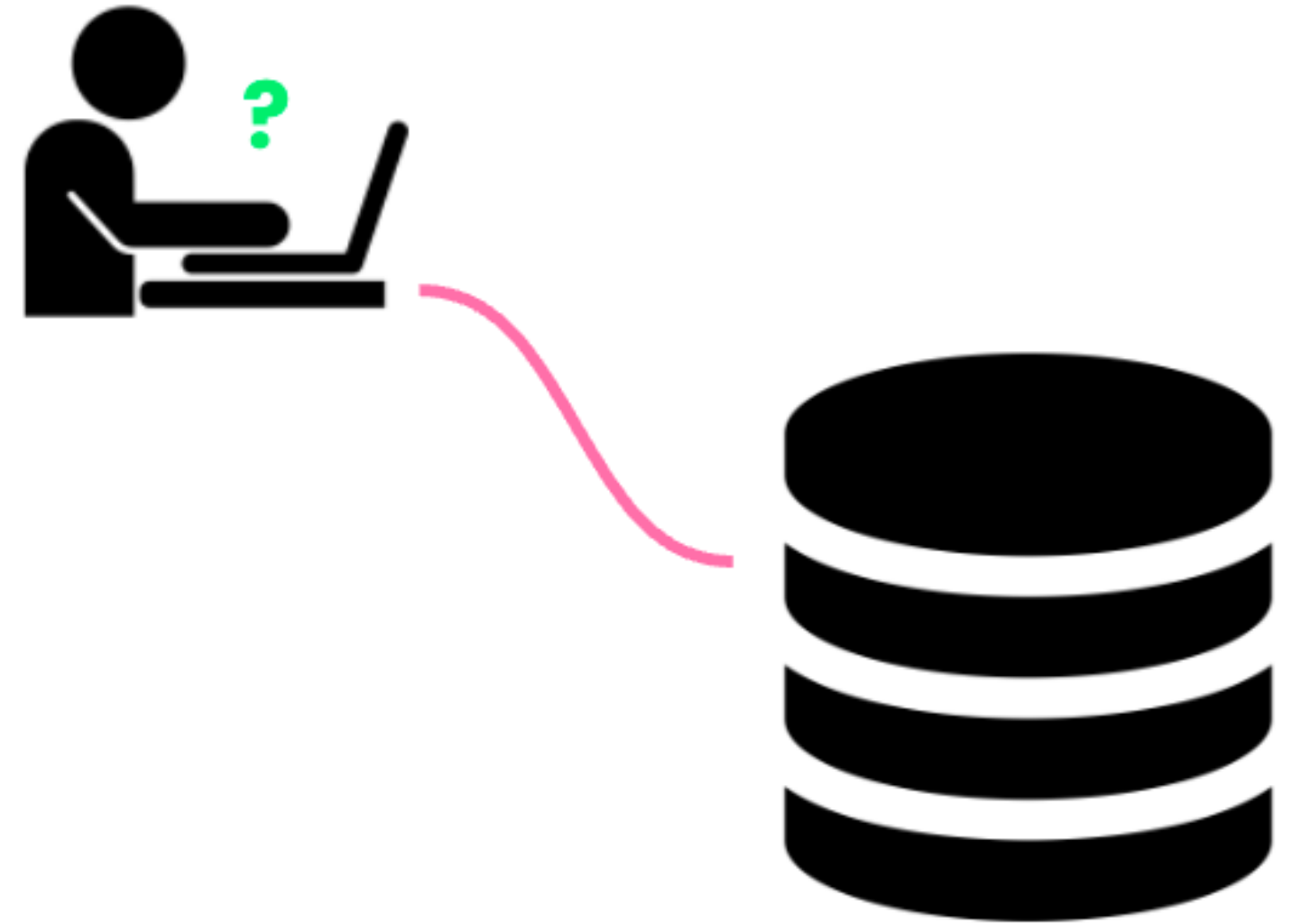
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# Database advantages

- More storage than spreadsheet applications
- Storage is more secure



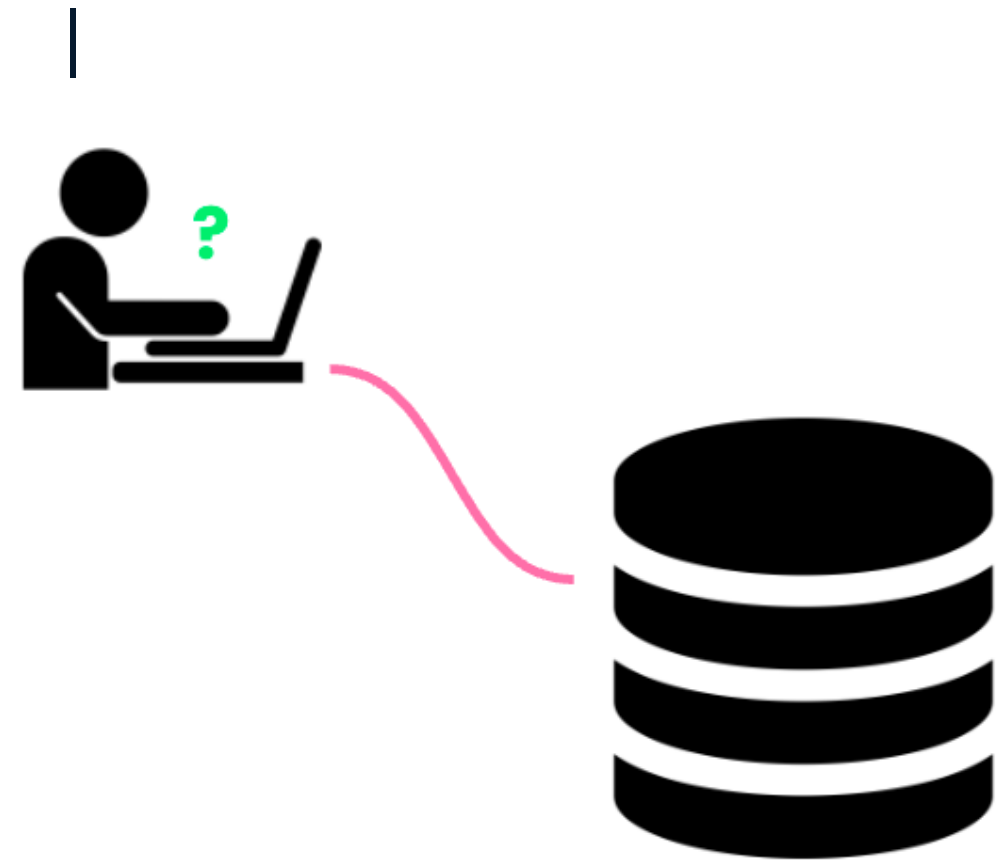
# Database advantages



# 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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# Tables

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# A seat at the table

- Table rows and columns are referred to as *records* and *fields*
- Fields are set at database creation; there is no limit to the number of records

patrons

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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



patrons

card_num	name	member_year	total_fine
54378	Izzy	2012	9.86
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# Laying the table: records

A record is a row that holds data on an individual observation

patrons

card_num	name	member_year	total_fine
54378	Izzy	2012	9.86
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a record

# Laying the table: fields

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

a field

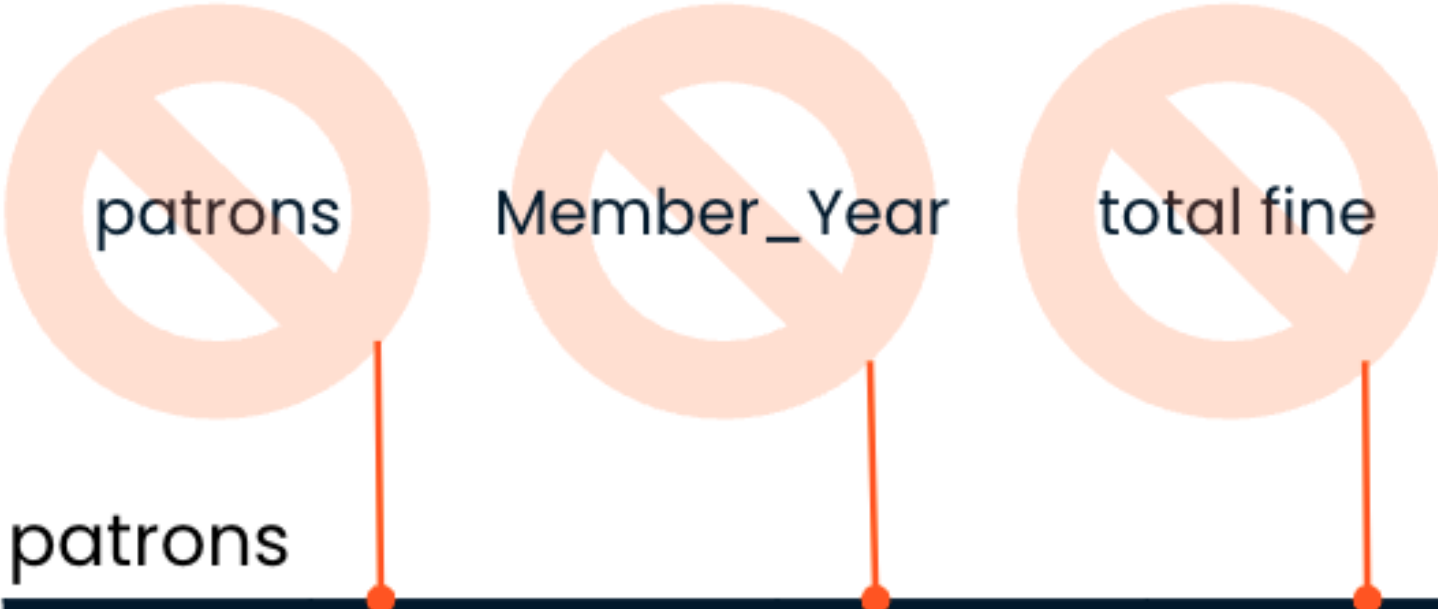
patrons

card_num	name	member_year	total_fine
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94722	Maham	2020	0
45783	Jasmin	2022	2.05
90123	James	1989	0

# More table manners

Field names should...

- be lowercase
- have no spaces
- be singular
- be different from other field names
- be different from the table name



The diagram shows three examples of bad field names, each inside a light orange circle with a diagonal slash (prohibition sign). The names are 'patrons', 'Member\_Year', and 'total fine'. Red lines connect these names to the corresponding columns in the table below.

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

# Assigned seats

- *Unique identifiers* are used to identify records in a table
- They are unique and often numbers

unique identifier

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



# The more the merrier

## patrons

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## checkouts

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569	2022-06-27	2022-07-11	45783	156
570	2022-08-14	2022-08-28	90123	912

## patron\_checkouts

card_num	name	member_year	total_fine	checkout_id	start_date	due_date	book_id
54378	Izzy	2012	9.86	567	2022-05-13	2022-05-27	638
54378	Izzy	2012	9.86	568	2022-06-10	2022-06-24	322
94722	Maham	2020	0				
45783	Jasmin	2022	2.05	2022-06-27	2022-07-11	45783	156
90123	James	1989	0	570	2022-08-14	2022-08-28	912

# Let's practice!

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# Data

## INTRODUCTION TO SQL



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# SQL data types

all one data type

all one data type

all one data type

all one data type

patrons

card_num	name	member_year	total_fine
54378	Izzy	2012	9.86
94722	Maham	2020	0
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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

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

- A string is a sequence of characters such as letters or punctuation
- `VARCHAR` is a flexible and popular string data type in SQL

# Integers

an integer field

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

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

# Floats

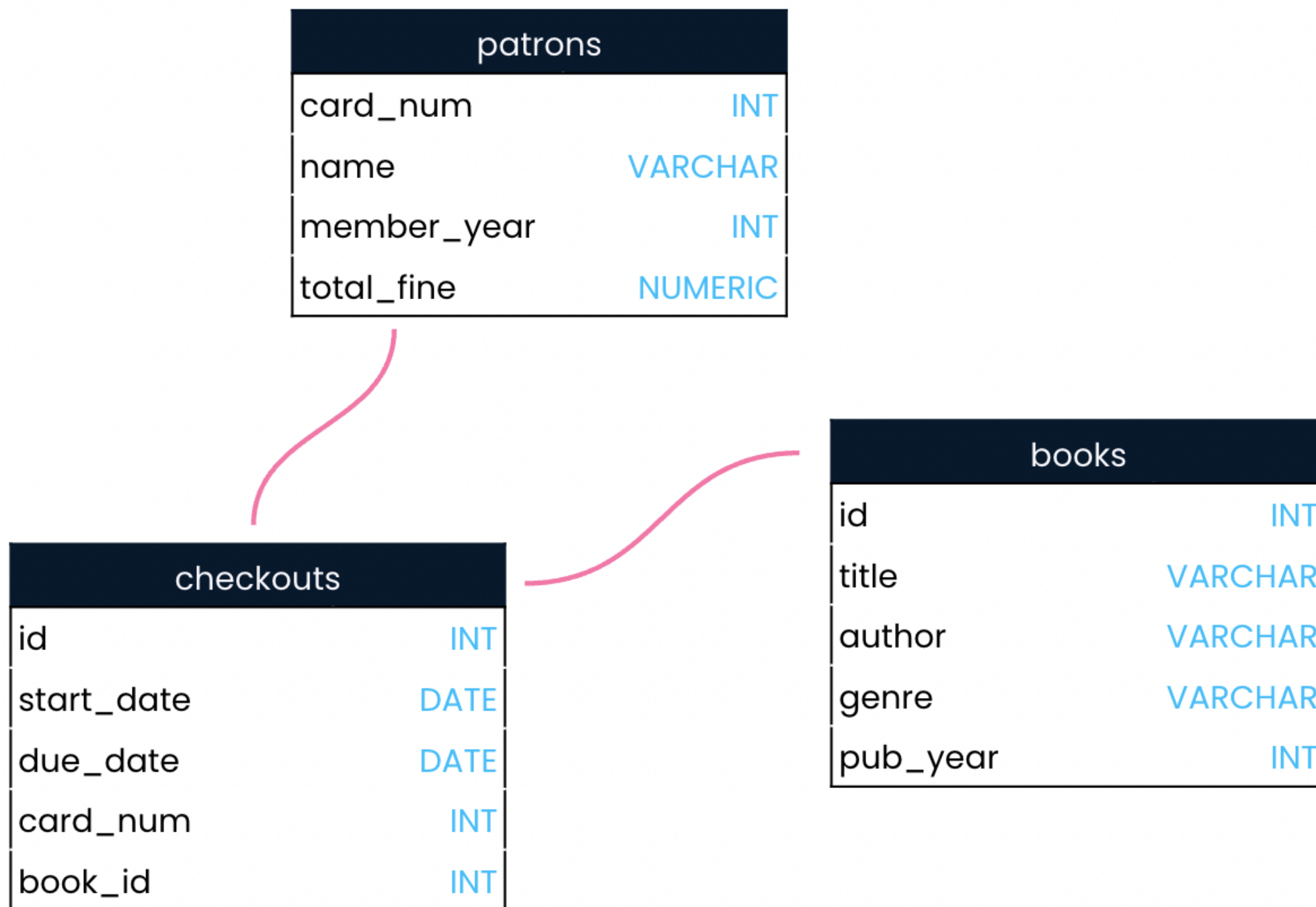
a float field

patrons

card_num	name	member_year	total_fine
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45783	Jasmin	2022	2.05
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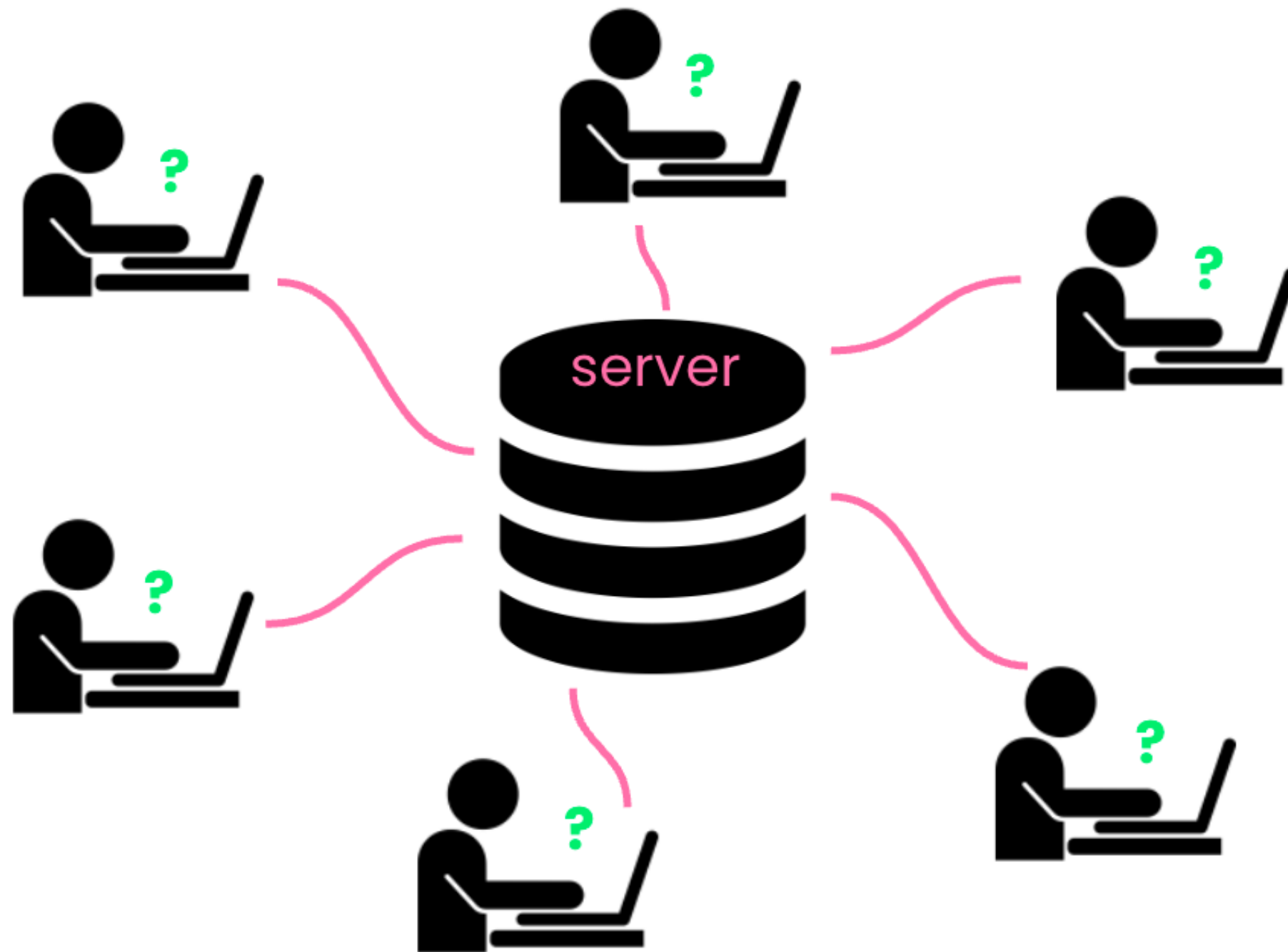
- Floats store numbers that include a fractional part
- `NUMERIC` is a flexible and popular float data type in SQL

# Schemas





# Database storage



# Let's practice!

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