Intro to Database and SQL

Why Do We Need Databases?

Scenario: Managing Sales Data in a Growing Company

- You’re running a small business with 5 product lines.
- Each month, every branch sends you its sales report as an **Excel file**.
- After one year, you now have **60 spreadsheets** from 12 branches.

“Which customer bought Product A on January?”

To answer this, you’d need to:

- Open and merge dozens of spreadsheets manually.
- Check for inconsistent column names and duplicate records.
- Risk errors whenever someone updates an old file.

Databases to the Rescue

- Store all sales records in **one structured place**.
- Query data instantly using SQL:

```
SELECT customer_name
FROM sales
WHERE product = 'A' AND month = 'January';
```

What Is a Database?

> A **structured collection of data** that's easy to **store, update, and search.**

> Database =
> 🧠 **organized data + ⚙️ software that manages it (DBMS)**

Why Use a Database?

- **Grows with you (Scalable):**
  Start small on a laptop → scale to millions of users.
- **Works for everyone (Shared access):**
  Multiple people or apps can use the same data safely.
- **Keeps data clean and accurate:**
  Built-in rules prevent errors and duplicates.
- **Fast answers:**
  Query huge data sets in seconds instead of hours.

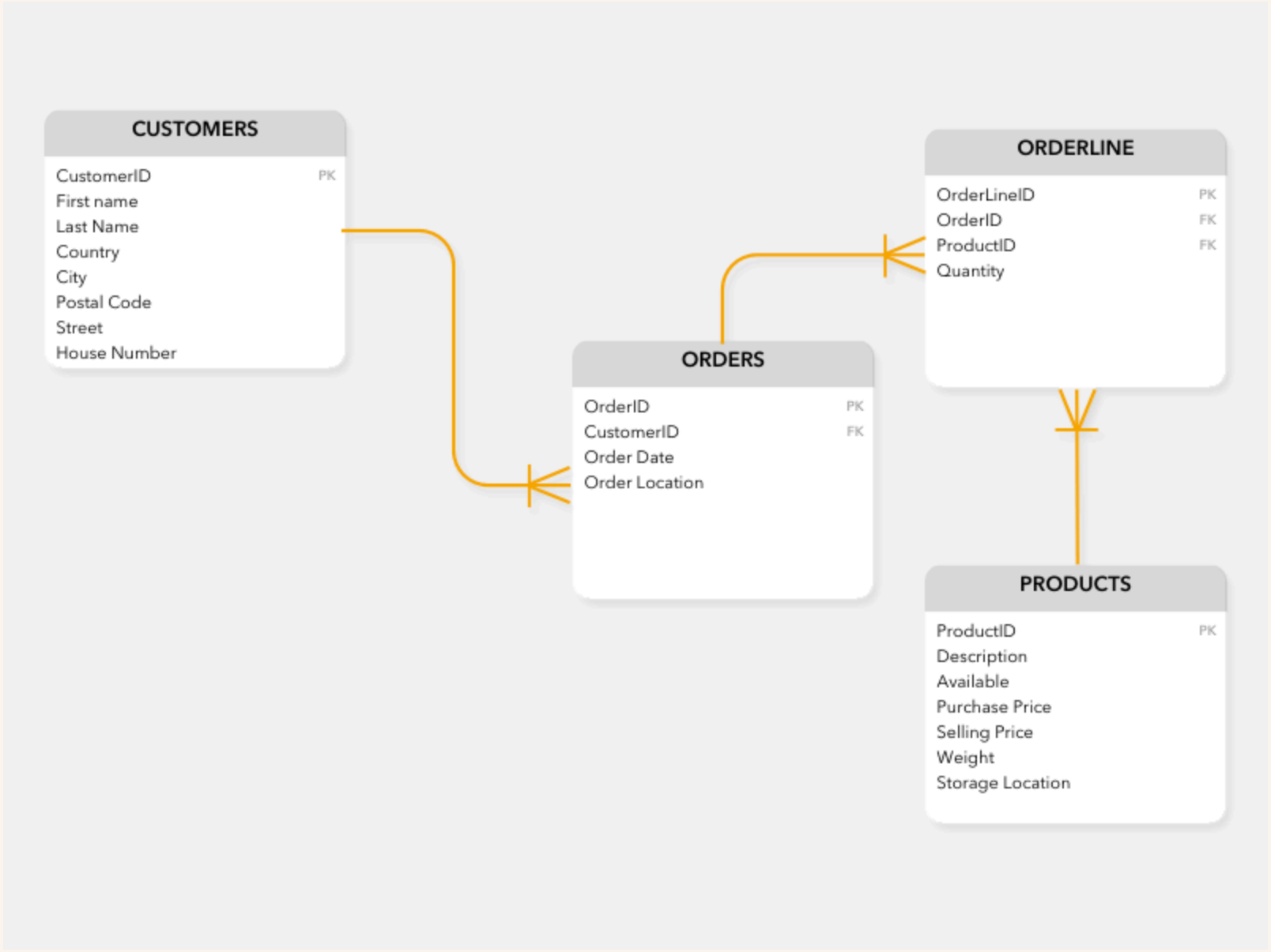
Two Key Concepts to Understand Databases

- **Entity Relationship Diagram (ERD)**
- **Structured Query Language (SQL)**

Entity Relationship Diagram (ERD)

A **blueprint** of a database—it shows how data is organized and connected

- **Entity (noun):**
  Something we store data about
  → e.g., `Student`, `Course`, `Instructor`
- **Relationship (verb):**
  How entities are linked
  → e.g., `Student` ***"enrolls in"*** `Course`


CUSTOMERS
CustomerID PK
First name
Last Name
Country
City
Postal Code
Street
House Number
ORDERS
OrderID PK
CustomerID FK
Order Date
Order Location
ORDERLINE
OrderLineID PK
OrderID FK
ProductID FK
Quantity
PRODUCTS
ProductID PK
Description
Available
Purchase Price
Selling Price
Weight
Storage Location

Structured Query Language (SQL)

To interact with databases

```
SELECT [ALL/DISTINCT] column_list
FROM table_list
[WHERE conditional expression]
[GROUP BY group_by_column_list]
[HAVING conditional expression]
[ORDER BY order_by_column_list]
```

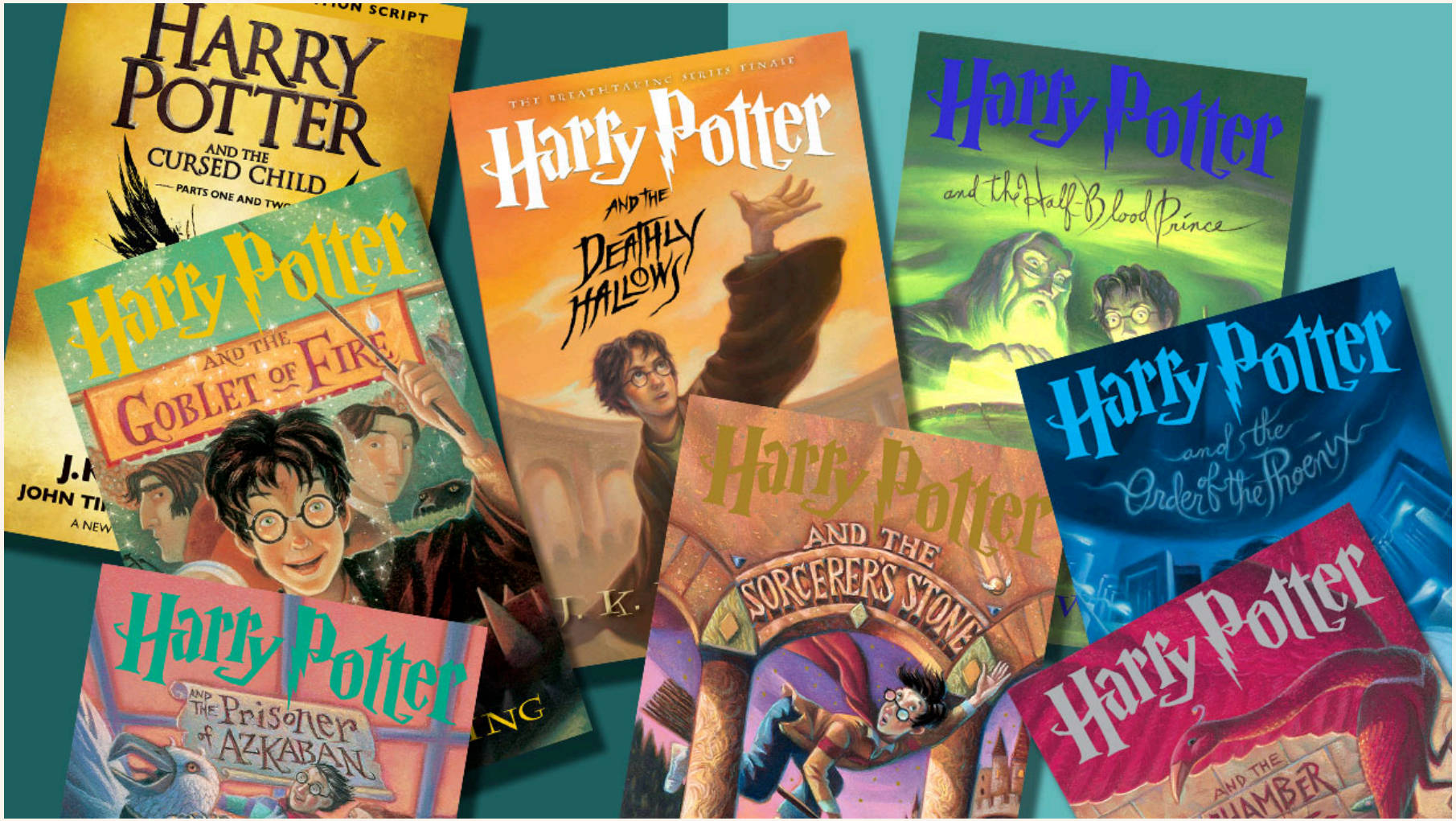

Essentials of Database Management, 1st ed., Pearson.

How Do We Build a Database?

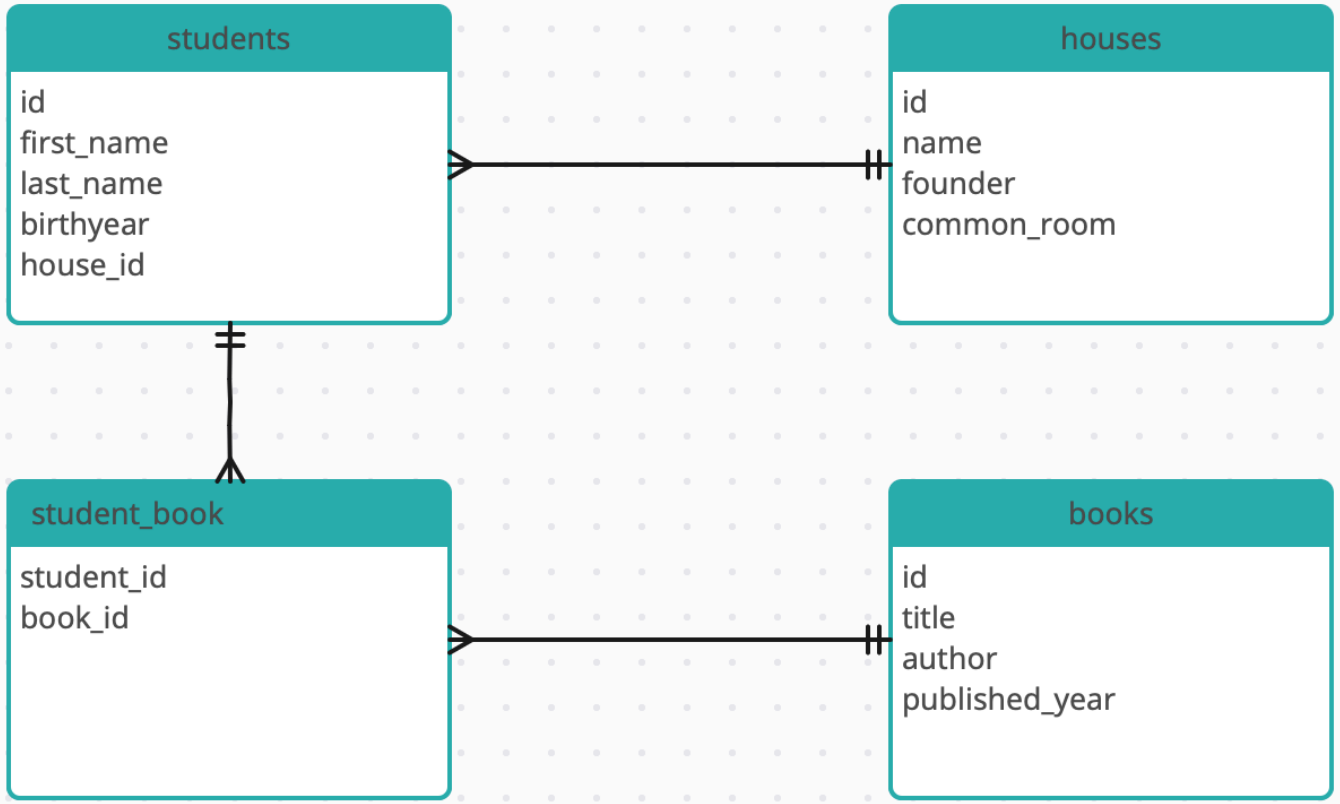
1️⃣ What do you want to store data about? (→Entities)

2️⃣ How are they related to each other? (→Relationships)

Harry Potter Database



Harry Potter Database - ERD



`SELECT` columns `FROM` a table

SELECT `column_name` FROM `table_name`

```
SELECT first_name FROM students;
SELECT first_name, last_name FROM students;
SELECT * FROM students;
```

`LIMIT` the number of records returned

SELECT `column_name` FROM `table_name` LIMIT `number`

```
SELECT * FROM students LIMIT 10;
```

`--` is used to add comments in SQL

dash dash space `--`, not ***dash dash*** `--`

`;` is used to indicate the end of a SQL statement

Optional if you have only one statement.

`SELECT` columns `FROM` a table `WHERE` conditions are true

SELECT `column_name` FROM `table_name` WHERE `condition`

```
-- select all students with house_id = 1
SELECT first_name, last_name FROM students WHERE house_id = 1;

-- select all students with birthyear = 1980
SELECT first_name, last_name FROM students WHERE birthyear = 1980;

-- select all students with birthyear >= 1980
SELECT first_name, last_name FROM students WHERE birthyear >= 1980;
```

💻 Write SQL queries to answer the following questions

1. What year was Harry Potter born?
2. What is the name of the student who was born in 1980?
3. Who is the founder of Gryffindor?