Relational databases and SQL

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Relational databases

- Consists of tables

- Each table contains a primary key

  - Database will not allow insertion of two records with same primary key

Products tbl

ProductId	ProductName	ProductCount
1001	ABC	10

Customer tbl

CustomerId	CustomerName	CustomerAddr
9001	XYZ	CDEF

Order tbl

OrderId	CustomerId	ProductId
110001	9001	1001

**UCDAVIS**

Structured query language (SQL)
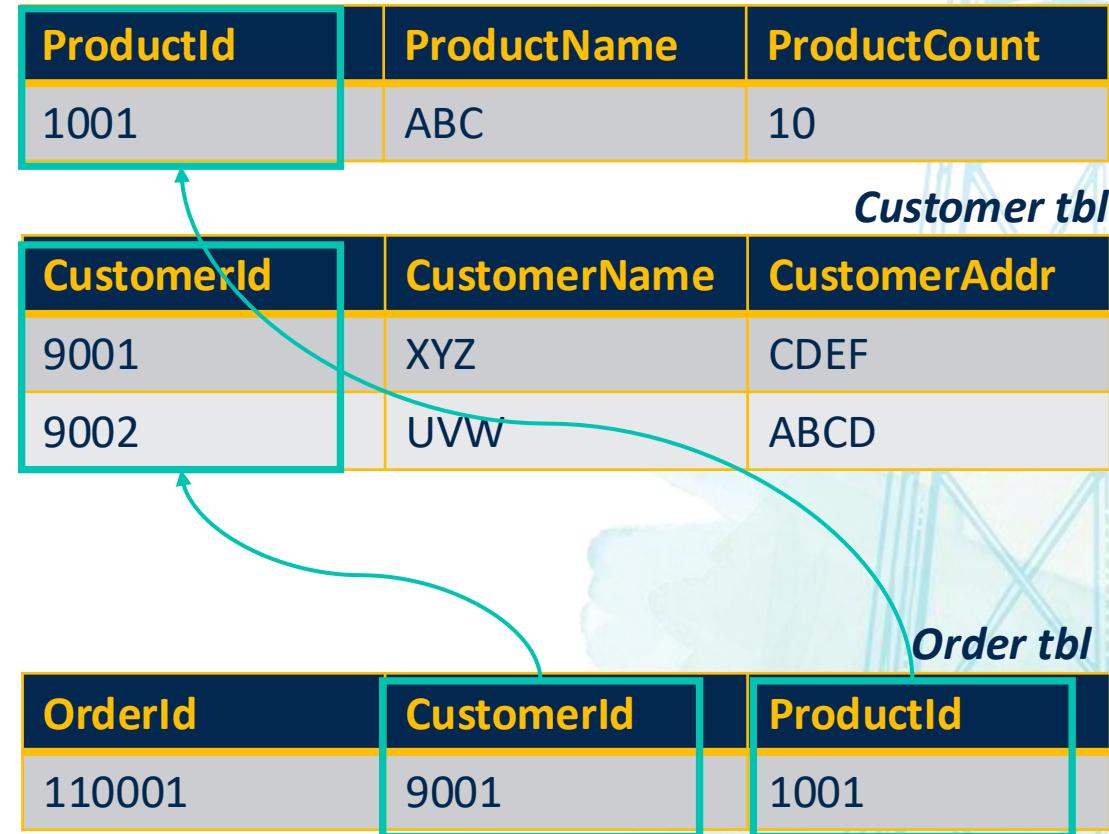
- SQL used to interface between application and database

- CREATE TABLE Products (
    ProductId INT PRIMARY KEY,
    ProductName VARCHAR(100) NOT NULL,
    ProductCount INT NOT NULL);

- INSERT INTO Products (ProductId, ProductName, ProductCount) VALUES (1001, 'ABC', 10);

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Structured query language (SQL)

- SELECT * FROM Products; // returns all rows

- SELECT ProductId, ProductName FROM Products; // returns only the two columns

- SELECT * FROM Products WHERE ProductName = "XYZ"; // returns only the rows where product name is XYZ
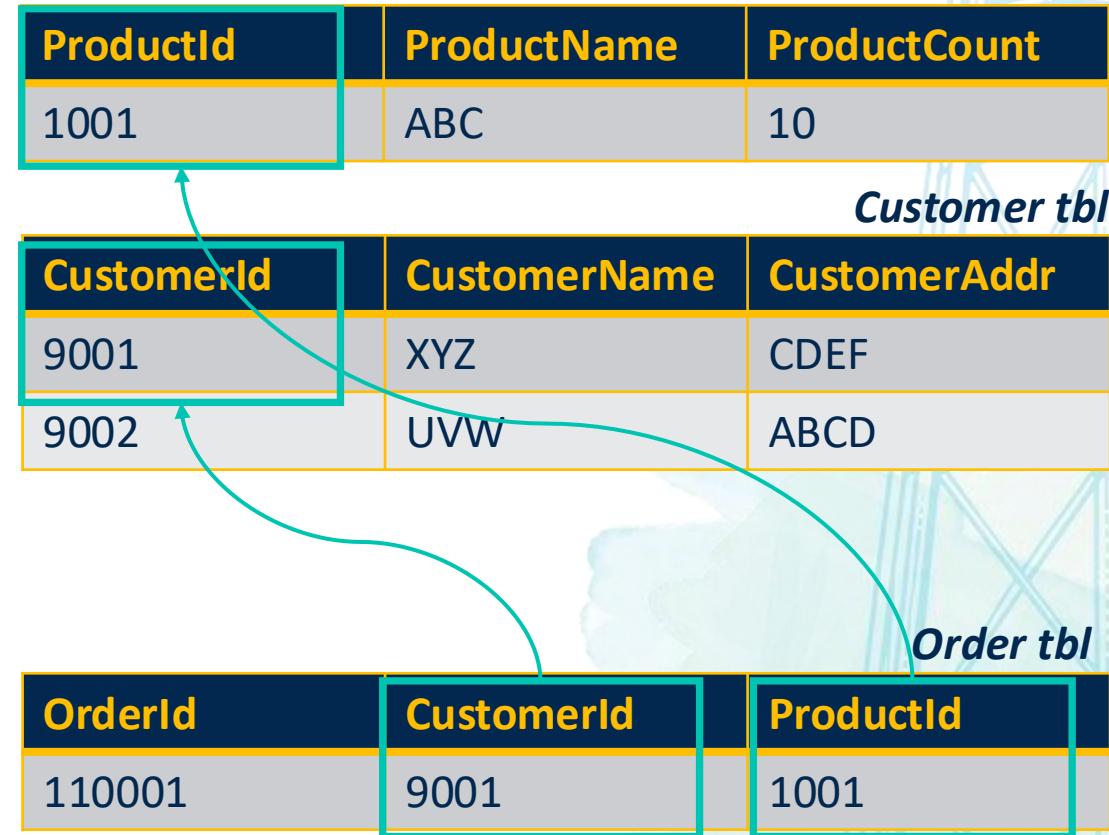
Foreign keys

- Relational databases maintain relations through foreign keys

- Foreign keys **must refer** to primary keys of other tables

  - Enforce referential integrity

- A table can contain one or more foreign keys

Products tbl

ProductId	ProductName	ProductCount
1001	ABC	10

Customer tbl

CustomerId	CustomerName	CustomerAddr
9001	XYZ	CDEF
9002	UVW	ABCD

Order tbl

OrderId	CustomerId	ProductId
110001	9001	1001

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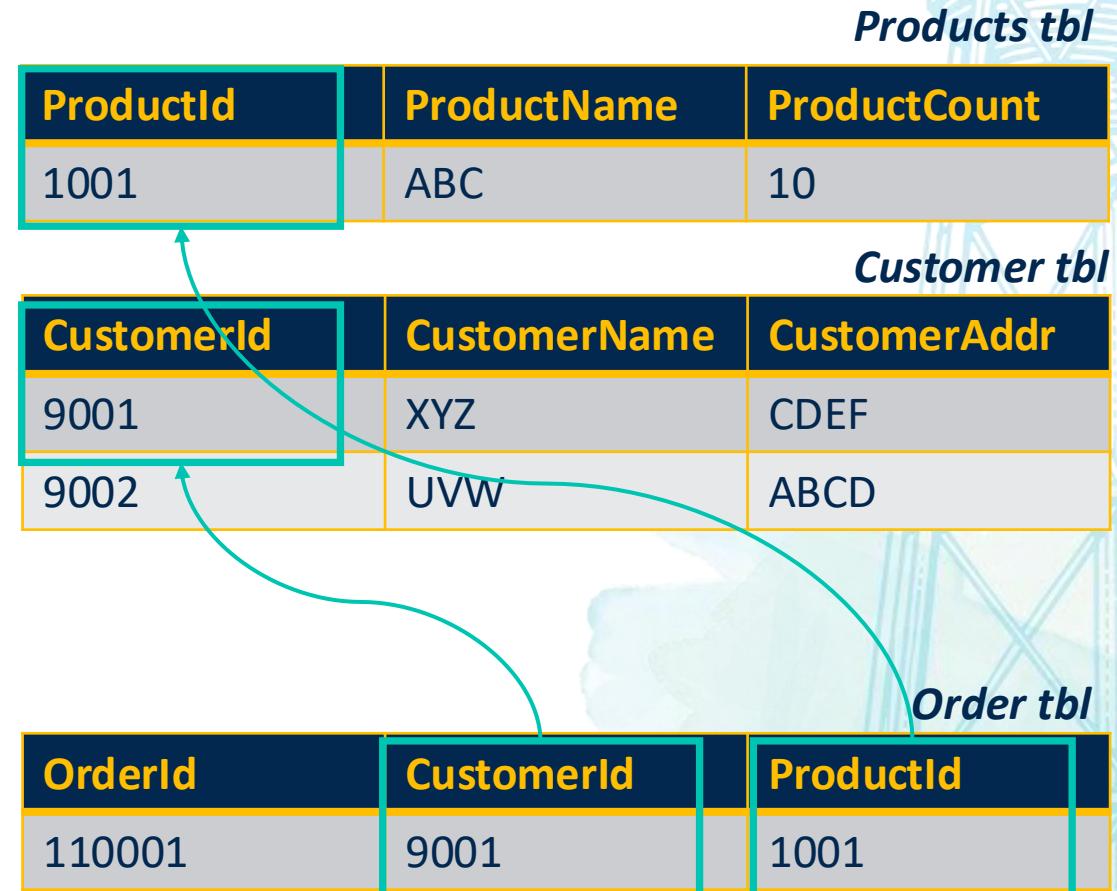
SQL joins

- Allows table joins

- For e.g. find order details for shipping, including product name, customer name, and address

Products tbl

ProductId	ProductName	ProductCount
1001	ABC	10

Customer tbl

CustomerId	CustomerName	CustomerAddr
9001	XYZ	CDEF
9002	UVW	ABCD

Order tbl

OrderId	CustomerId	ProductId
110001	9001	1001

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SQL joins

```
SELECT
    o.OrderId,
    p.ProductName,
    c.CustomerName,
    c.CustomerAddr
FROM Orders o
JOIN Products p
    ON o.ProductId = p.ProductId
JOIN Customers c
    ON o.CustomerId =
c.CustomerId;
```

Products tbl

ProductId	ProductName	ProductCount
1001	ABC	10

Customer tbl

CustomerId	CustomerName	CustomerAddr
9001	XYZ	CDEF
9002	UVW	ABCD

Order tbl

OrderId	CustomerId	ProductId
110001	9001	1001

Java database connectivity interface (JDBC)

- Interface for talking to SQL databases from Java

- PreparedStatement API to create a new query

- ResultSet API to retrieve query results

```java
Connection connection =
DriverManager.getConnection("jdbc:sqlite:" +
dbPath);

String sql = "INSERT INTO Post (cid,
    author_handle) " + "VALUES (?, ?)";

try {
    PreparedStatement pstmt =
        connection.prepareStatement(sql));
    pstmt.setString(1, post.getCid());
    pstmt.setString(2,
                post.getAuthorHandle());
    pstmt.executeUpdate();
} catch (Exception e) {//-- snip }
```