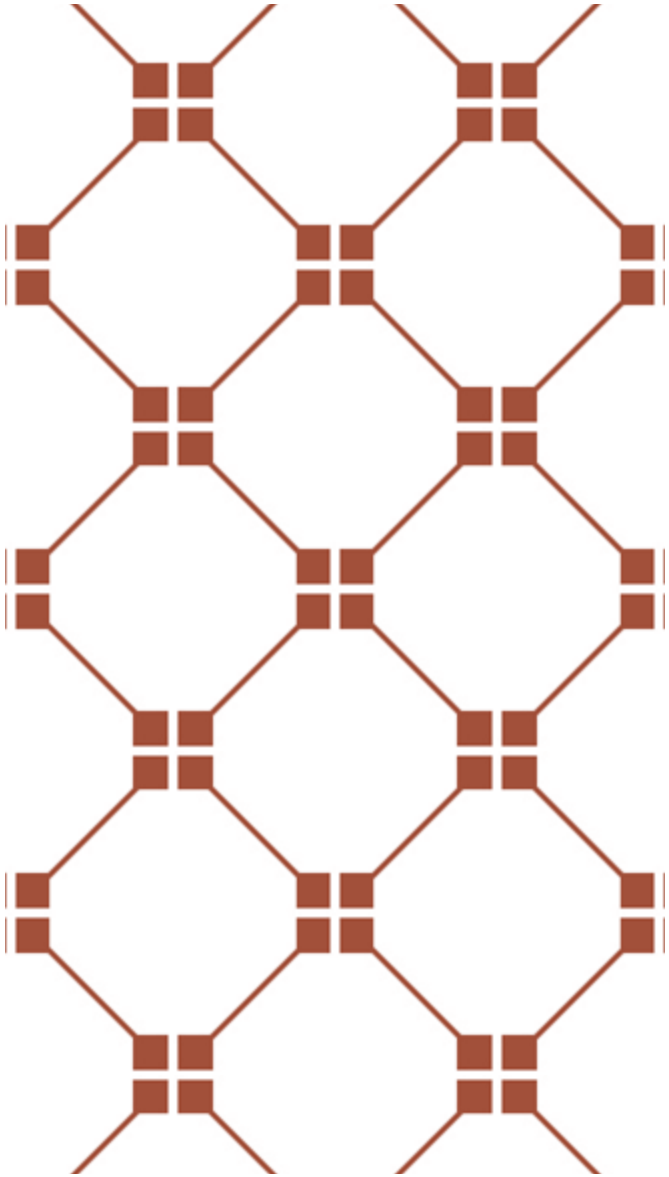


MANCHESTER 1824
The University of Manchester

RELATIONAL MODEL (PART 1)

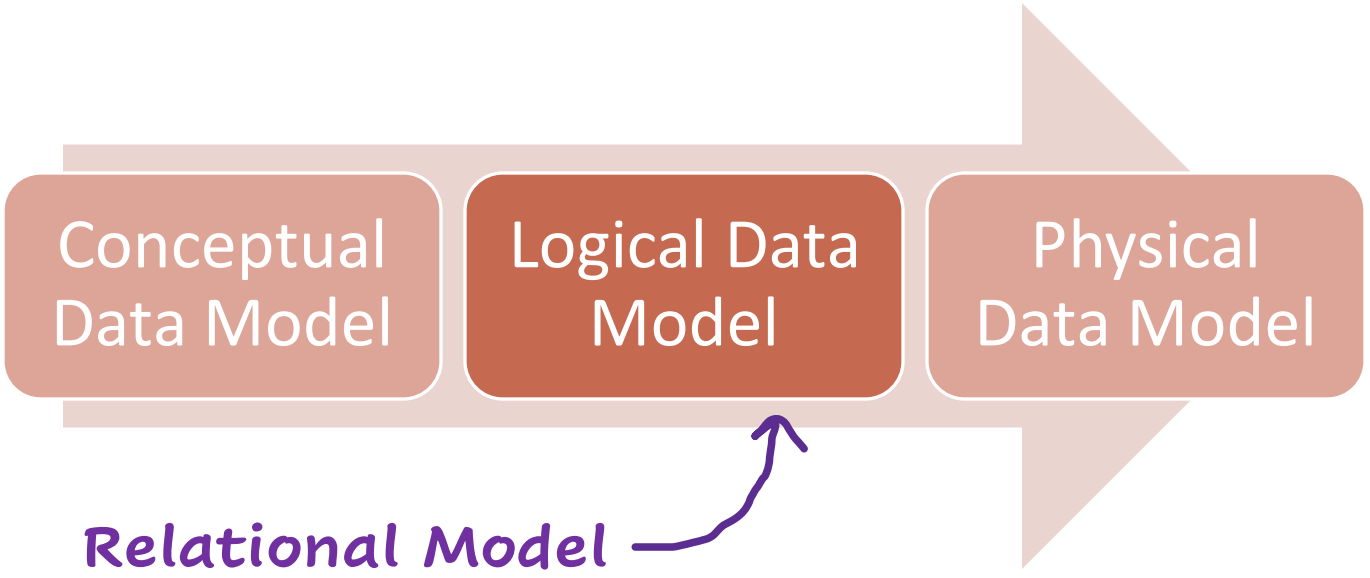
COMP23111 – Database Systems

OUTLINE

Relational Model

Logical Data Model (via ER Diagram)

DATABASE APPLICATION DESIGN PHASES - *DATA MODELLING*



- Entity-Relationship Diagram (ERD)

RELATIONAL M

Order Table

Order_ID	Customer_ID	Shipping address	Shipping Date
2675124	2812	21 Lever St., M1 3PL	17/2/2022
8897651	9322	48 Oxford Rd., WL2 5ZY	28/4/2022
8907871	2324	122 Radford Blvd, NG7 3BL	30/4/2022
5536728	2812	21 Lever St., M1 3PL	12/3/2022
2422315	1122	86 Radcliffe Av., OX8 4MK	12/2/2022
1478659	3167	32 Strefford Rd., SL1 2BL	22/3/2022

Customer Table

Customer_ID	Name	Tel. number	Delivery address
2812	Mary Smiths	7786554389	21 Lever St., M1 3PL
9322	John Caroll	7877346312	21 Lever St., M1 3PL
2324	Anna Ivanova	7823252311	48 Oxford Rd., WL2 5ZY
7890	Pablo Fernadez	7765321561	122 Radford Blvd, NG7 3BL
1122	Mary Smiths	7798339812	32 Strefford Rd., SL1 2BL
3167	Maria Garcia	7712871265	86 Radcliffe Av., OX8 4MK

Relation (**table** of values)

Database (a **collection** of relations)

Accessed by, and linked with, keys

RELATIONAL MODEL – TABLE *(RELATION)*

Customer
*Customer id
Name
Tel. number
Delivery address

Customer

Customer_id	Name	Tel. number	Delivery address
integer	string	integer	string

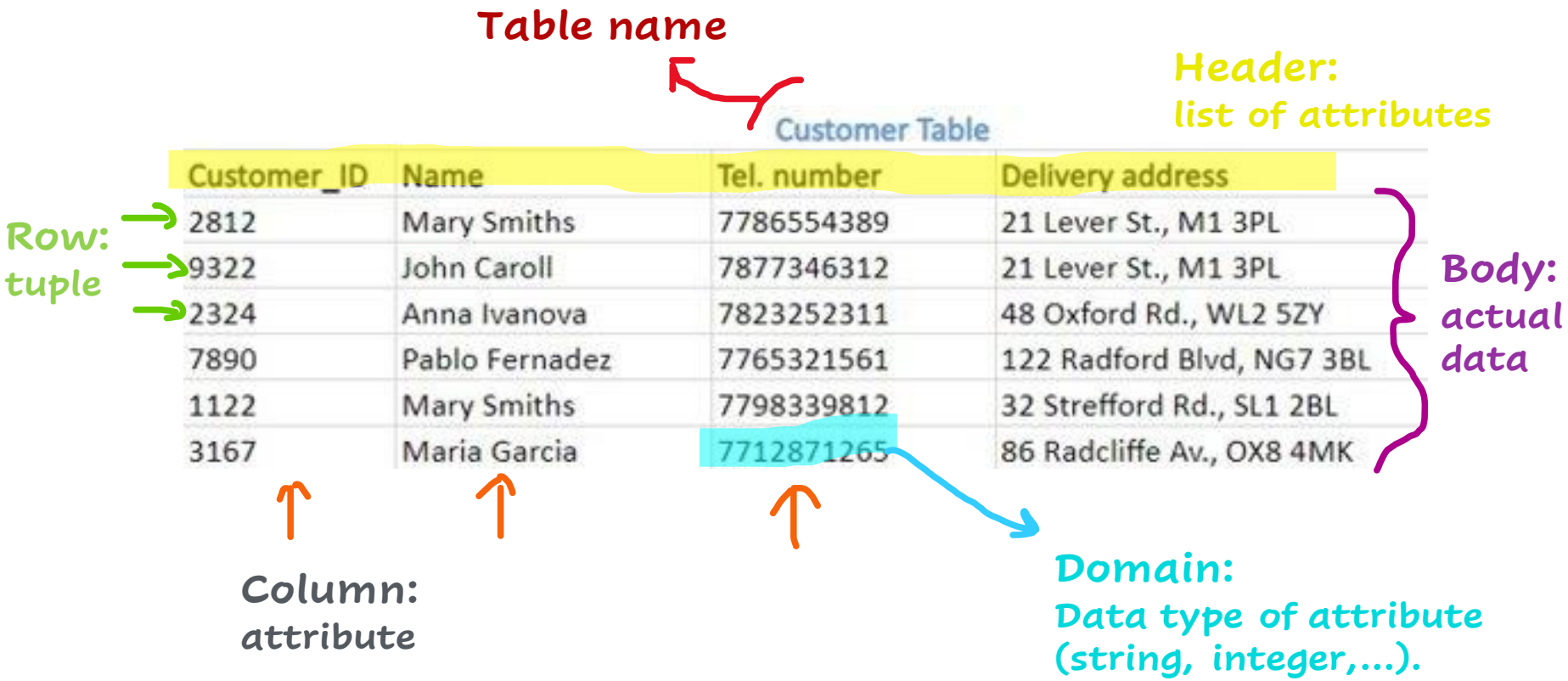
A Relation R is defined as: $R(A_1, A_2, \ldots, A_n)$.

Relation name

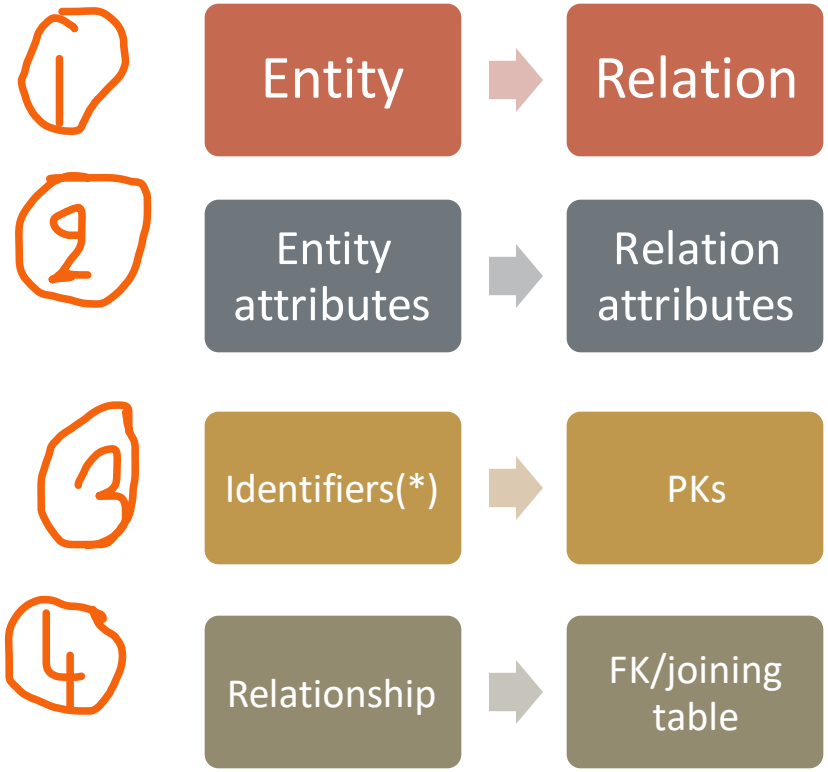
Attributes of R

```
Customer(Customer_id, Name, Tel. number, Delivery address)
```

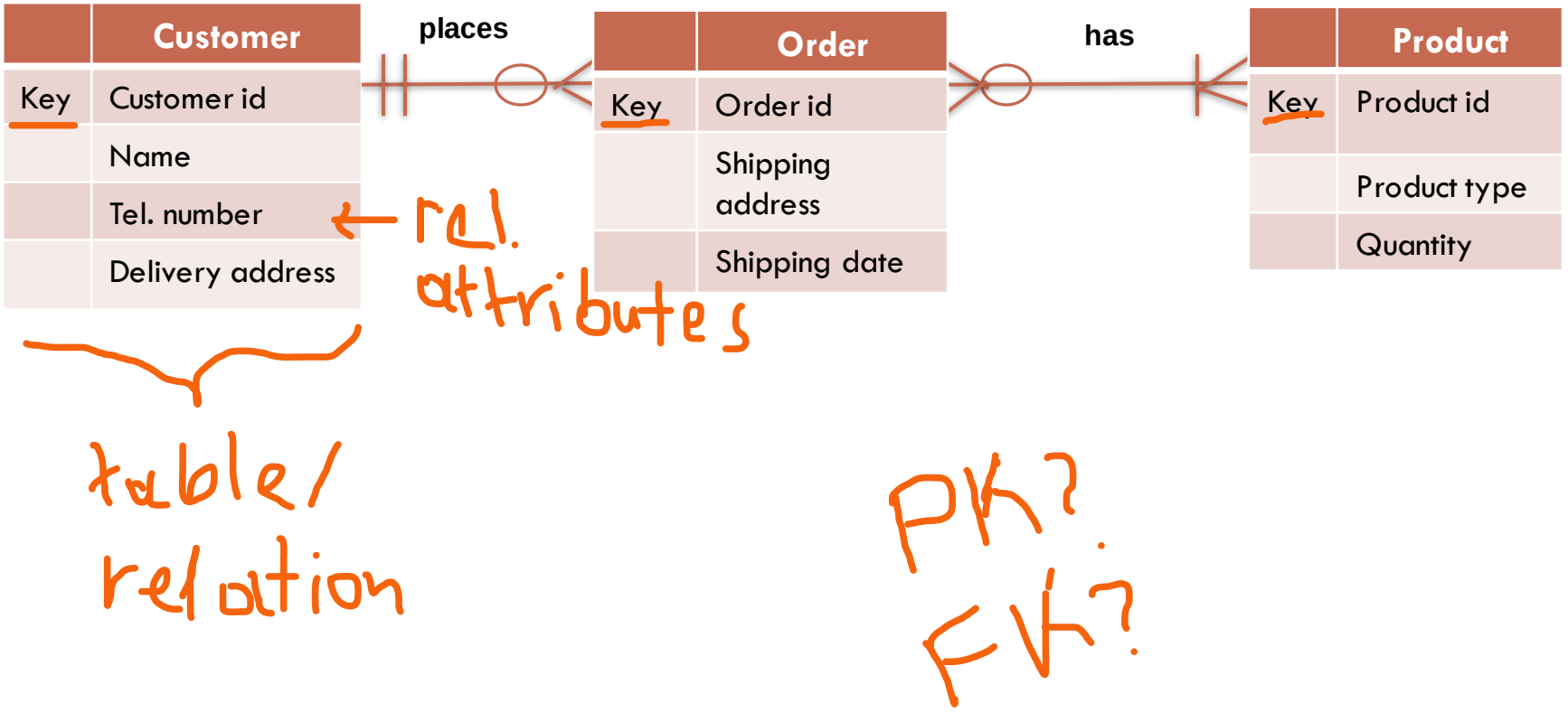
RELATIONAL MODEL – TABLE *(RELATION)*



ER CONCEPTS TO RELATIONAL CONCEPTS



LOGICAL (RELATIONAL) DATA MODEL



RELATIONAL MODEL – THE KEY CONCEPT

Key (an attribute or a set of attributes)

1. Uniquely **identifies** a row in a table
2. **Joins** tables (creates a relationship)

Three types:

1. Primary Key (PK)
2. Candidate Key
3. Foreign Key (FK)

RELATIONAL MODEL – PRIMARY KEY

Primary Key – PK:

- Uniquely identifies a row in a table
- Is underlined when we model the schema

Customer_id	Name	Tel. number	Delivery address
2812	Mary Smiths	7786554389	21 Lever St., M1 3PL
9322	John Caroll	7877346312	21 Lever St., M1 3PL
2324	Anna Ivanova	7823252311	48 Oxford Rd., WL2 5ZY

RELATIONAL MODEL – PRIMARY KEY

*How do we choose a PK**?***

1. Identify a set of **candidate** keys
2. Select a PK from these

A set of attributes that uniquely identifies a row.

RELATIONAL MODEL – CANDIDATE KEY

1. Customer id ✓
2. Name ✓
3. Tel. Number ✓
4. Delivery address
5. {Name, Tel. number}
6. {Name, Delivery address}
7. {Tel. number, Delivery address}
8. {Customer id, name}... ✓

Customer_id	Name	Tel. number	Delivery address
2812	Mary Smiths	7786554389	21 Lever St., M1 3PL
9322	John Caroll	7877346312	21 Lever St., M1 3PL
2324	Anna Ivanova	7823252311	48 Oxford Rd., WL2 5ZY

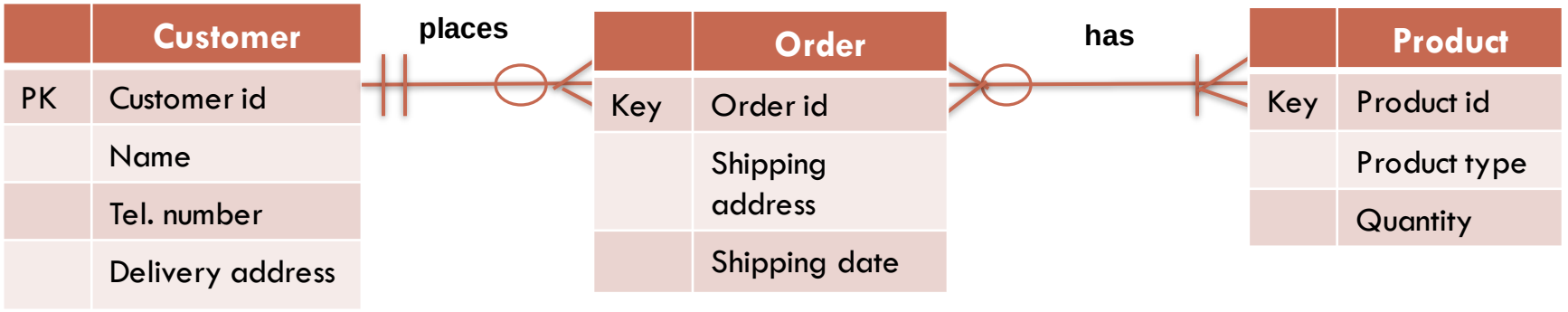
Depends on the data requirements given and the use of the database.

RELATIONAL MODEL – PRIMARY KEY SELECTION

From the candidate keys, choose the one that:

- ✓Is unique
- ✓Non-null
- ✓Never changing
- ✓Is simple (better one attribute only)
- ✓Is a number (faster than strings)

LOGICAL DATA MODEL – *PK SELECTION (STRONG ENTITY)*



Customer Table

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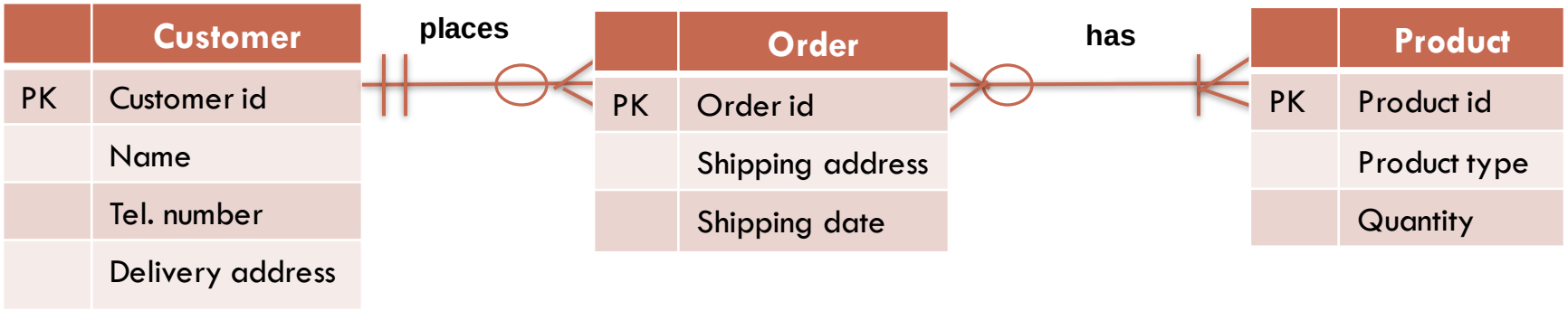
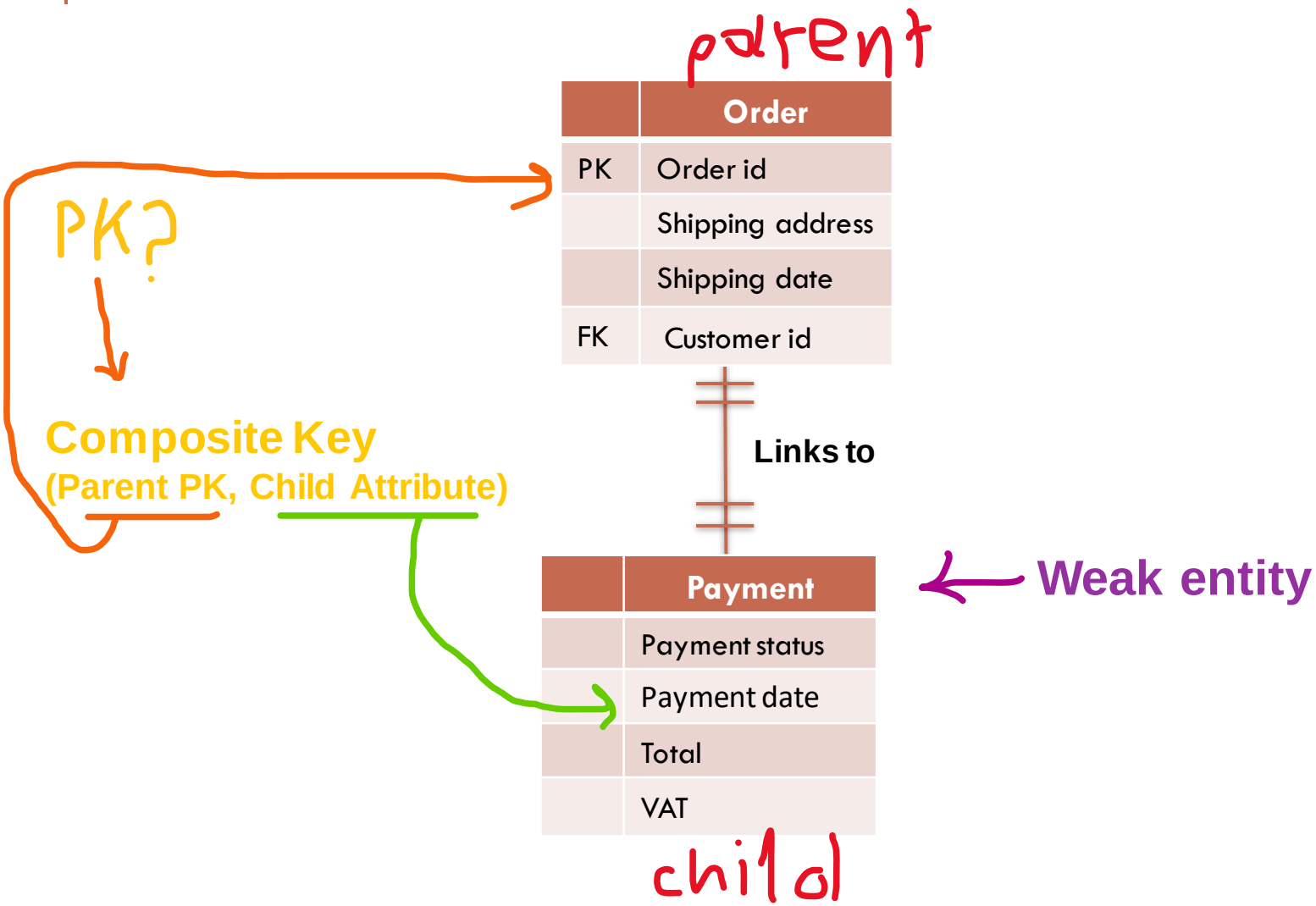
7890	Pablo Fernadez	7765321561	122 Radford Blvd, NG7 3BL
1122	Mary Smiths	7798339812	32 Strefford Rd., SL1 2BL
3167	Maria Garcia	7712871265	86 Radcliffe Av., OX8 4MK

LOGICAL DATA MODEL – *PK SELECTION (STRONG ENTITY)*



LOGICAL DATA MODEL – *PK SELECTION (WEAK ENTITY)*



RELATIONAL MODEL – FOREIGN KEY

Foreign Key – FK:

- An attribute in one table (parent) which is used as the PK to another table (child).

Customer Table

Customer_ID	Name	Tel. number	Delivery address
2812	Mary Smiths	7786554389	21 Lever St., M1 3PL
9322	John Caroll	7877346312	21 Lever St., M1 3PL
2324	Anna		
7890	Pablo		
1122	Mary		
3167	Maria		

Order Table

Order_ID	Customer_ID	Shipping address	Shipping Date
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2422315	1122	86 Radcliffe Av., OX8 4MK	12/2/2022
1478659	3167	32 Strefford Rd., SL1 2BL	22/3/2022

RELATIONAL MODEL – FOREIGN KEY

1. For each row of the FK in parent, value must be the same in child.
2. Careful when deleting or updating tables.

Customer Table

Customer_ID	Name	Tel. number	Delivery address
2812	Mary Smiths	7786554389	21 Lever St., M1 3PL
9322	John Caroll	7877346312	21 Lever St., M1 3PL
2324	Anna		
7890	Pablo		
1122	Mary		
3167	Maria		

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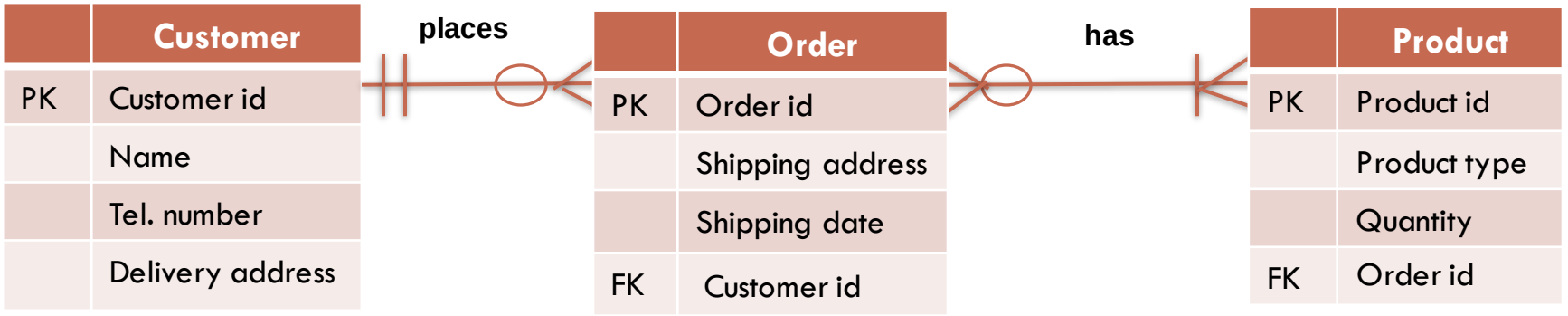
5536728	2812	21 Lever St., M1 3PL	12/3/2022
2422315	1122	86 Radcliffe Av., OX8 4MK	12/2/2022
1478659	3167	32 Strefford Rd., SL1 2BL	22/3/2022

LOGICAL DATA MODEL – *FK ADDITION*



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2324	Anna Ivan		
7890	Pablo Fer		
1122	Mary Smi		
3167	Maria Gal		

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