Assignment Week 4

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Group 10

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Exercise 6: Retail Sales

Step 1: First Normal Form (1NF)

Rule (1NF)

- All attributes must be atomic (single value).
- No repeating groups or multi-valued attributes.

Issue

- The table has repeating products per order (e.g., order 3462 with 3 products).
- Fields like Total_sale, Sales_tax, Total_amount are derived (calculated values).
- Customer address is not atomic (street and number in same column).

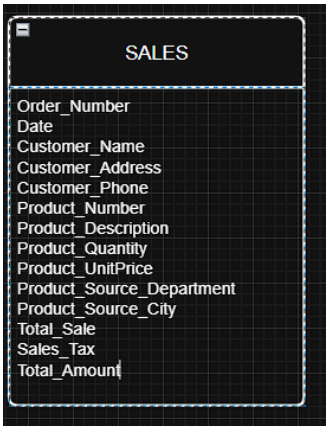
Solution

- Split orders and products into Order and OrderLine (order details).
- Keep one row per product per order.
- Break customer address into separate fields if needed (Street, HouseNo).
- Remove calculated attributes (can be computed later).

Tables after 1NF

- CUSTOMER(Customer_ID, Name, Street, HouseNo, Phone)
- ORDER(Order_ID, Date, Customer_ID)
- ORDER_LINE(Order_ID, Product_ID, Quantity, UnitPrice)
- PRODUCT(Product_ID, Description, Dept_ID)
- DEPARTMENT(Dept_ID, DeptName, City)

Before (Unnormalized (raw SALES table):



AFTER (1NF) (Tables)

CUSTOMER				
Customer_ID	Name	Street	HouseNo	Phone
1	Antony Duncan	Main Street	125	813-5834466
2	Ray Curtis	North Blvd	223	813-5468888

PRODUCT		
Product_ID	Description	Dept_ID
203322	Crockpot	10
215099	Multicooker	10
220510	Rice cooker	10
445566	Washing Mach.	20
456789	Iron	20
324532	Refrigerator	20

ORDER					
Order_ID	Date	Customer_ID	TotalSale	Tax	TotalAmount
3462	12/09/2015	1	605.00	97.00	702.00
3597	15/09/2015	2	2190.00	350.00	2540.00

DEPARTMENT		
Dept_ID	DeptName	City
10	Kitchen	Utrecht
20	Home Appliances	Amsterdam

ORDER_LINE			
Order_ID	Product_ID	Quantity	UnitPrice
3462	203322	3	85.00
3462	215099	2	100.00
3462	220510	5	30.00
3597	445566	2	550.00
3597	456789	3	70.00
3597	324532	1	880.00

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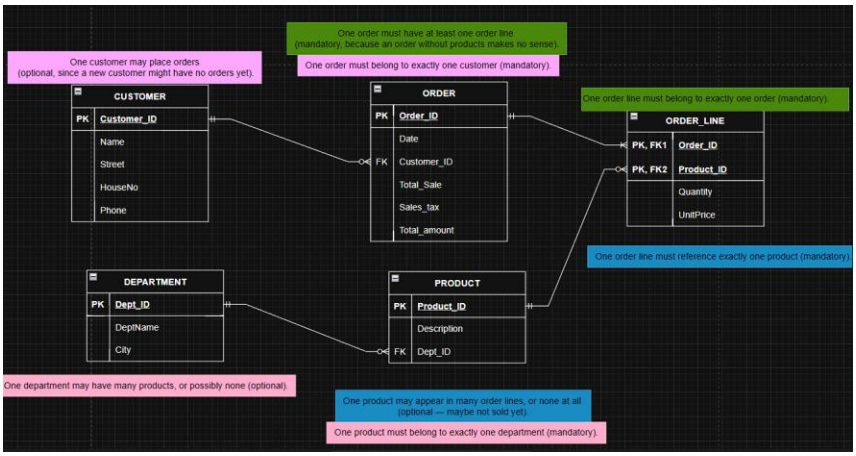

Step 2: Second Normal Form (2NF)

Rule (2NF)

- Table must be in 1NF.
- All non-key attributes must depend on the whole primary key (no partial dependency). That means: In a table with a composite key, every non-key attribute must depend on the whole key, not just part of it.

Issue

- In ORDER_LINE, UnitPrice depends only on Product_ID, not on the full key {Order_ID, Product_ID}.
- Keeping UnitPrice in ORDER_LINE causes redundancy.

Solution

- Move UnitPrice to the PRODUCT table.
- Keep only {Order_ID, Product_ID, Quantity} in ORDER_LINE.

(Tables) (remove partial dependency → move UnitPrice into PRODUCT)

ORDER_LINE		
Order_ID	Product_ID	Quantity
3462	203322	3
3462	215099	2
3462	220510	5
3597	445566	2
3597	456789	3
3597	324532	1

PRODUCT			
Product_ID	Description	UnitPrice	Dept_ID
203322	Crockpot	85.00	10
215099	Multicooker	100.00	10
220510	Rice cooker	30.00	10
445566	Washing Mach.	550.00	20
456789	Iron	70.00	20
324532	Refrigerator	880.00	20

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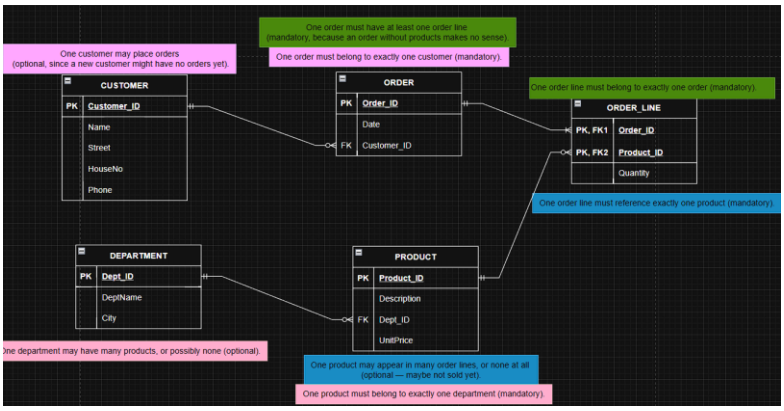


Step 3: Third Normal Form (3NF)

Rule (3NF)

- Table must be in 2NF.
- No transitive dependencies: non-key attributes cannot depend on other non-key attributes.

Issue

- In DEPARTMENT, City depends on Dept_ID, but if multiple departments share a city, we'll repeat city names.
- In CUSTOMER, address details (street, number, city) could also be split further, but that's an assumption.

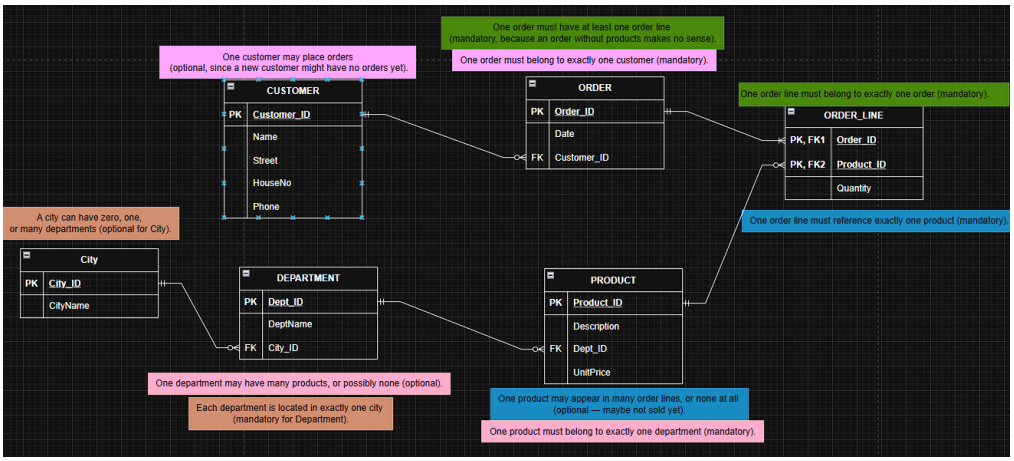
Solution

- Create a CITY table.
- Let DEPARTMENT reference it by City_ID.
- Keep CUSTOMER as is (unless address normalization is required).

Final Tables (3NF)

1. CUSTOMER(Customer_ID, Name, Street, HouseNo, Phone)
2. ORDER(Order_ID, Date, Customer_ID)

3. ORDER_LINE(Order_ID, Product_ID, Quantity)
4. PRODUCT(Product_ID, Description, UnitPrice, Dept_ID)
5. DEPARTMENT(Dept_ID, DeptName, City_ID)
6. CITY(City_ID, CityName)



(Tables) (remove transitive dependency → City into separate table)

DEPARTMENT		
Dept_ID	DeptName	City_ID
10	Kitchen	1
20	Home Appliances	2

CITY	
City_ID	CityName
1	Utrecht
2	Amsterdam