



## **Relational Databases**

### **Model Answer Approach**

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# Auto-graded task

## 1. What is normalisation?

Normalisation is a technique used to organise a database efficiently. The goal is to minimise data redundancy and reduce the potential for data anomalies. It involves breaking down a database into smaller, related tables and defining relationships between them. This process improves data consistency and integrity.

## 2. When is a table in 1NF?

A table is in the First Normal Form (1NF) if:

- Each cell contains only one value.
- Each row is unique and identifiable by a primary key.

## 3. When is a table in 2NF?

A table is in the Second Normal Form (2NF) if:

- It meets all the rules of 1NF.
- All non-key attributes are fully dependent on the entire primary key. This means no column depends only on a part of a composite primary key.

## 4. When is a table in 3NF?

A table is in the Third Normal Form (3NF) if:

- It meets all the rules of 2NF.
- All non-key attributes depend only on the primary key and not on other non-key attributes. This removes transitive dependencies.

## 5. INVOICE dependency diagram

The relational scheme for the INVOICE table structure is as shown below:

INVOICE (INV\_NUM, PROD\_NUM, SALE\_DATE, PROD\_LABEL, VEND\_CODE, VEND\_NAME,  
QUANT SOLD, PROD\_PRICE)

The primary key for the table INVOICE is {INV\_NUM, PROD\_NUM}.

The functional dependencies are as follows: 1NF

$\{INV\_NUM, PROD\_NUM\} \rightarrow \{SALE\_DATE, PROD\_LABEL, VEND\_CODE, VEND\_NAME, QUANT\_SOLD, PROD\_PRICE\}$

$\{INV\_NUM\} \rightarrow \{SALE\_DATE\}$

$\{PROD\_NUM\} \rightarrow \{PROD\_LABEL, PROD\_PRICE, VEND\_CODE, VEND\_NAME\}$

$\{VEND\_CODE\} \rightarrow \{VEND\_NAME\}$

Among the dependencies, the partial dependencies are as follows:

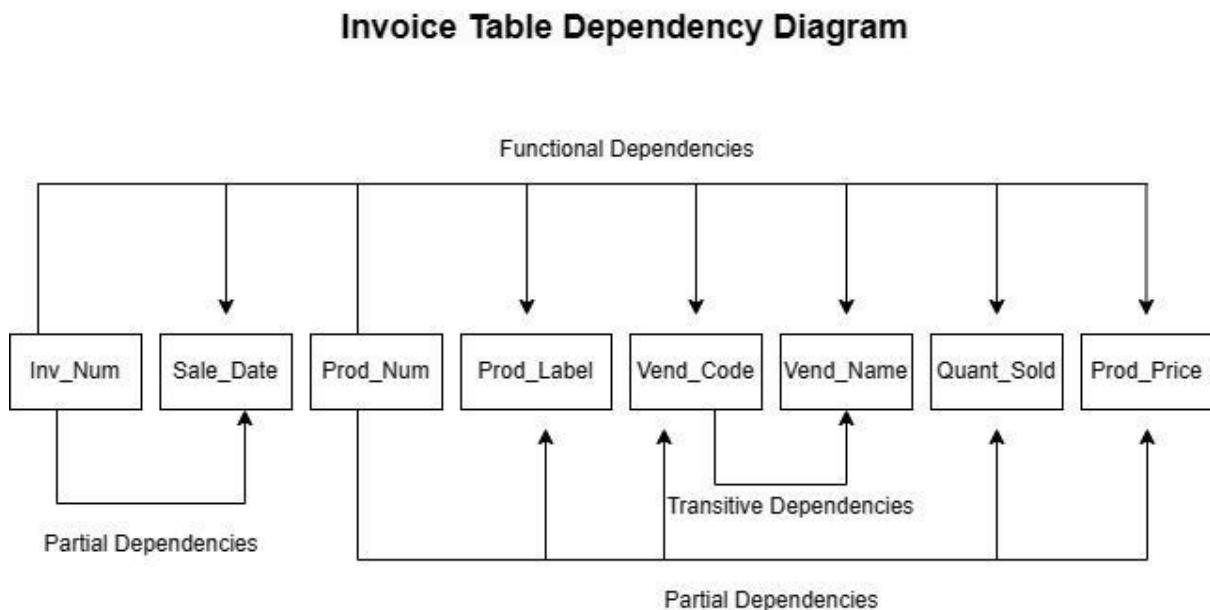
$\{INV\_NUM\} \rightarrow \{SALE\_DATE\}$

$\{PROD\_NUM\} \rightarrow \{PROD\_LABEL, PROD\_PRICE, VEND\_CODE, VEND\_NAME\}$

Among the dependencies, the transitive dependencies are as follows:

$\{VEND\_CODE\} \rightarrow \{VEND\_NAME\}$

The dependency diagram is as follows:



## 6. Remove all partial dependencies and draw the new dependency diagrams

The functional dependencies are as follows: 2NF

$\{INV\_NUM, PROD\_NUM\} \rightarrow \{QUANT\_SOLD\}$

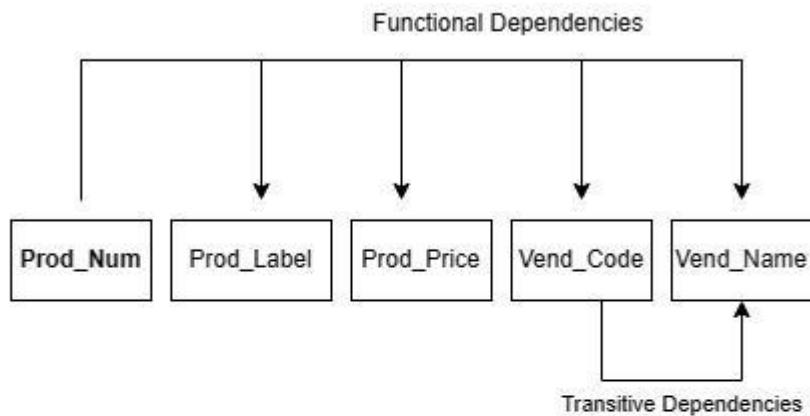
$\{INV\_NUM\} \rightarrow \{SALE\_DATE\}$

{PROD\_NUM} → { PROD\_LABEL, PROD\_PRICE, VEND\_CODE, VEND\_NAME }

Among the dependencies, the transitive dependencies are as follows:

{VEN\_CODE} → {VEN\_NAME}

### Invoice Table Dependency Diagram



## 7. Remove all transitive dependencies and draw the new dependency diagrams

The functional dependencies are as follows: 3NF

$$\{ \text{INV\_NUM}, \text{PROD\_NUM} \} \rightarrow \{ \text{QUANT\_SOLD} \}$$

$$\{ \text{INV\_NUM} \} \rightarrow \{ \text{SALE\_DATE} \}$$

$$\{ \text{PROD\_NUM} \} \rightarrow \{ \text{PROD\_LABEL}, \text{PROD\_PRICE}, \text{VEND\_CODE} \}$$

$$\{ \text{VEN\_CODE} \} \rightarrow \{ \text{VEN\_NAME} \}$$

**Invoice Table Dependency Diagram**

Functional Dependencies

