**Database Normalization: Customer Orders Table**

**Unnormalized Form (UNF)**

The given table is not normalized as it contains multi-valued attributes in the ItemsPurchased column.

| **OrderID** | **CustomerName** | **CustomerPhone** | **ItemsPurchased** | **TotalAmount** |
| --- | --- | --- | --- | --- |
| 1 | John Doe | 555-1234 | "Laptop - $1000, Mouse - $20" | $1020 |
| 2 | Jane Smith | 555-5678 | "Keyboard - $50, Monitor - $300" | $350 |
| 3 | John Doe | 555-1234 | "Headphones - $80" | $80 |

**First Normal Form (1NF)**

**Issue:** ItemsPurchased contains multiple values in one cell.  
**Solution:** Convert multi-valued attributes into separate rows.

**Orders Table (1NF)**

| **OrderID** | **CustomerID** | **TotalAmount** |
| --- | --- | --- |
| 1 | 1 | $1020 |
| 2 | 2 | $350 |
| 3 | 1 | $80 |

**Customers Table (1NF)**

| **CustomerID** | **CustomerName** | **CustomerPhone** |
| --- | --- | --- |
| 1 | John Doe | 555-1234 |
| 2 | Jane Smith | 555-5678 |

**OrderItems Table (1NF)**

| **OrderID** | **ItemName** | **Price** |
| --- | --- | --- |
| 1 | Laptop | $1000 |
| 1 | Mouse | $20 |
| 2 | Keyboard | $50 |
| 2 | Monitor | $300 |
| 3 | Headphones | $80 |

**Second Normal Form (2NF)**

**Issue:** Partial dependency in OrderItems (Item details depend on ItemName instead of OrderID).

**Solution: Move ItemName and Price to a separate Items table.**

**Items Table (2NF)**

| **ItemID** | **ItemName** | **Price** |
| --- | --- | --- |
| 1 | Laptop | $1000 |
| 2 | Mouse | $20 |
| 3 | Keyboard | $50 |
| 4 | Monitor | $300 |
| 5 | Headphones | $80 |

**OrderItems Table (2NF)**

| **OrderID** | **ItemID** |
| --- | --- |
| 1 | 1 |
| 1 | 2 |
| 2 | 3 |
| 2 | 4 |
| 3 | 5 |

**Third Normal Form (3NF)**

The tables are already in 3NF after 2NF, as all attributes depend only on their respective primary keys.

**Final Normalized Schema (3NF)**

1. **Customers Table** (CustomerID is primary key)
2. **Orders Table** (OrderID is primary key, references CustomerID)
3. **Items Table** (ItemID is primary key)
4. **OrderItems Table** (Composite primary key: OrderID, ItemID)

**The database is fully normalized to 3NF.**