

# Database Design

## 6-4: Third Normal Form

### Practice Solutions

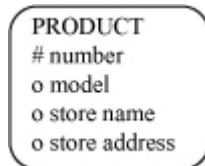
#### Vocabulary

Directions: Identify the vocabulary word for each definition below.

Third Normal Form or 3NF	The form of database normalization where all non-key fields are dependent on the key, the whole key, and nothing but the key.
Transitive dependency	A condition that exists when any attribute in an entity is dependent upon any other non-UID attribute in that entity.

#### Try It / Solve It

1. Identify the transitive dependency in the model below. State which attributes violate Third Normal Form.



**Solution:** Store name and store address violates 3<sup>rd</sup> NF, and they are not dependent on the Key of Product, which is Number.

2. Define the rule of Third Normal Form.

**Solution:** All attributes must be dependent on the key, the whole key, and nothing but the key.

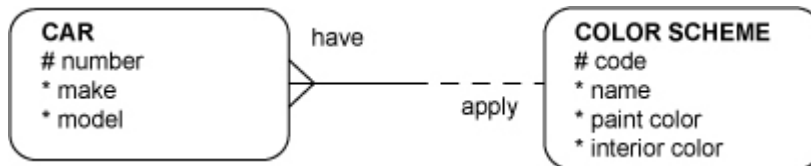
3. A color scheme for a car includes specifications for paint color for the body and the interior colors and materials. For example: The “Desert” color scheme includes silver paint and gray leather interior; the “Sunburst” color scheme includes gold paint and cream leather interior. Does the model below follow the rules of Third Normal Form? If you spot a violation, correct it.



**Solution:**

Paint color and interior color are attributes of color scheme.

Create a new entity for color scheme and create a relationship to CAR.



4. Assume the following business rules:

An athlete employs one agent.  
 An agent may work for one or more athletes.  
 An athlete may play for one team.  
 A team may have one or more players

Does the model below contain one or more transitive dependencies? Identify the attributes involved in the transitive dependencies.



**Solution:** This can be tricky because there are two transitive dependencies: team coach depends on team, and agent commission depends on agent. Two new entities have to be created.

Team coach is an attribute of team. Agent commission is an attribute of agent. Create an entity TEAM and an entity AGENT, both with relationships to ATHLETE.

5. Now that you have an idea of what makes a good UID, you need to be aware of the controversy, benefits, and difficulty of uniquely identifying someone. Consider the idea of a national ID card. What kinds of problems would the card create and what kinds of problems would it solve? If your country already uses a national ID card, what are the benefits and issues associated with this? In your opinion, could DNA mapping become the national ID card? Why or why not?

**Solution:** The goal of this activity is to have students think about the issue of personal identification and its implementation in a database. This issue could be a “hot” button for some students. The Internet has many articles about national ID cards and DNA profiling (use the keywords: “identity cards,” “national ID cards,” “DNA profiling”). Encourage students to find data instead of just voicing unsubstantiated opinions. Possible responses for pros/cons might include:

- **CONS**
  - Potential loss of personal freedom
  - Use of database for other purposes, such as tracking buying patterns (e.g., book purchases) of individuals who belong to certain religious groups (this is a violation of privacy)
- **PROS**
  - Reduce identity theft
  - Reduce the number of pieces of identification one would need