# Introduction:

A database designer has been assigned the task of designing and implementing a simple database for an automobile dealer that sells only new automobiles and trucks. During the requirements-acquisition phase, the analyst works with the employees (users) to determine that the following questions must be answerable for the new database to be useful:[[1]](#footnote-1)

1. Which automakers are providing automobiles to the dealership?
2. What are the car models offered by the automakers?
3. Specifically, what are the Vehicle Identification Numbers (VINs) for the specific cars and trucks purchased from which automakers over time?
4. What are all the possible features of these new vehicles that can be included in the vehicle description sheet attached to the windows of the vehicles?
5. What are the features for each particular vehicle that has been on the lot (i.e., sold) or is still on the lot (i.e., for sale)
6. How much does each specific vehicle on the lot cost?
7. Who are the customers that the dealership deals with (including past customers and walk-ins)?
8. Which customer bought which vehicle when & at what price? [Not all customers have bought anything yet. Notice that I haven’t added anything about the employees at the dealership – I’m keeping the example simple.]

# Determining the Entities

There are many ways of working on the analysis. Here’s what your prof has been doing since 1981, when he started designing databases:

Highlight the entities in one color.[[2]](#footnote-2) You don’t have to highlight the entities more than once in the list even if they occur more than once. Here, I have highlighted all the entities (once) in green:

1. Which automakers are providing automobiles to the dealership?
2. What are the car models offered by the automakers?
3. Specifically, what are the Vehicle Identification Numbers (VINs) for the specific cars and trucks purchased from which automakers over time?
4. What are all the possible features of these new vehicles that can be included in the vehicle description sheet attached to the windows of the vehicles?
5. What are the features for each particular vehicle that has been on the lot (i.e., sold) or is still on the lot (i.e., for sale)?
6. How much does each specific vehicle on the lot cost?
7. Who are the customers that the dealership deals with (including past customers and walk-ins)?
8. Which customer bought which vehicle when & at what price? [Not all customers have bought anything yet.]

# Highlight the characteristics (attributes) of the entities that are mentioned

There may be more characteristics, but this will do for a start. The characteristics are highlighted below in blue:

1. Which automakers are providing automobiles to the dealership?
2. What are the car models offered by the automakers?
3. Specifically, what are the Vehicle Identification Numbers (VINs) for the specific cars and trucks purchased from which automakers?
4. What are all the possible features of these new vehicles that can be included in the vehicle description sheet attached to the windows of the vehicles?
5. What are the features for each particular vehicle that has been on the lot (i.e., sold) or is still on the lot (i.e., for sale)
6. How much does each specific vehicle on the lot cost?
7. Who are the customers that the dealership deals with (including past customers and walk-ins)?
8. Which customer bought which vehicle when & at what price? [Not all “customers” have bought anything yet.]

# Design the structures of the tables that will represent the entities

You don’t have to put ALL the features in at once; features can be added as needed as the analysis develops. Don’t worry about relationships at this point, but you can put it things like unique identifiers when you know they will be needed later. You can add notes to explain things (e.g., “truck, car” in the MODELS table).

**AUTOMAKERS**

Automaker-ID

Company Name

Contact info

Dealership’s own ID for working with automaker

**MODELS**

Model-name

Type (truck, car)

Year model ended

**FEATURES OF VEHICLES IN GENERAL**

Feature-ID

Feature name for all vehicles (e.g., number of wheels, size of wheels, number of doors, number of seats etc.)

**FEATURES FOR TRUCKS ONLY**

Feature-ID

Feature names for trucks (e.g., # of axles, winches, carrying-capacity, size of cargo bay etc.)

**FEATURES FOR CARS ONLY**

Feature-ID

Feature names for cars (e.g., type of seat [bucket, flat], in-car entertainment, etc.)

**VEHICLES**

VIN

Type (see MODELS)

Bought-date

Purchase-price

**CUSTOMERS**

Customer-ID

Contact info fields (Name, address etc.)

# Describe the relations among the entities and their cardinalities

This is a preliminary version; additional details can be added later.

1. Here are the entities so far:
2. AUTOMAKERS
3. MODELS
4. FEATURES OF VEHICLES IN GENERAL
5. VEHICLES
6. CUSTOMERS
7. Here are relations identifiable so far:
8. One automaker can make at least one or many models
9. One model can be made by at least one or many automakers
10. One vehicle can be of only exactly one and only one model
11. One model can be assigned to none to many vehicles
12. One vehicle can have many features
13. One feature can pertain to none or many vehicles
14. One customer can buy none or many vehicles
15. One new vehicle can be bought by none or only one customer (we’re arbitrarily not allowing multiple buyer names on one vehicle sale)

# Create the preliminary entity-relationship diagram using crow’s foot notation showing relations among the entities

Your prof uses PowerPoint because it’s easy to draw with. He creates the symbols first, groups the elements of the symbols so they are single objects, and creates copies with copy/paste and rotation to have the symbols ready for use in different orientations.

It's not necessary to put all the attributes in every table at this point; it’s enough to have those that are needed in the relationships.

The PowerPoint file is included in this material as a separate file. The image of the entity-relationship diagram is on the next page because of its size.

1. These are by NO MEANS all the questions that would actually be raised for a real dealership; the questions are being kept simple to avoid overloading the perplexed with excessive detail. For example, there are no questions listed here about personnel, such as employee information, which employee is responsible for which type of vehicle, who sold a particular vehicle, and so on. There are also no questions here about the repair shop, even though that would usually be part of the dealership because it is so profitable and ensures long-term relationships with customers. [↑](#footnote-ref-1)
2. Let the prof know if you are color blind – will provide a different way of highlighting stuff. [↑](#footnote-ref-2)