Advanced Database Models
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Practical 5 - $N^F_2$, $eN^F_2$ and Type Constructors

1. $N^F_2$

The following $N^F_2$ schema for a car retailer is given:

```plaintext
CarSales(
    Model,
    Manufacturer,
    Car(
        BuildYear,
        Kilometers,
        ListPrice,
        InterestedCustomers (Name,
                             LastOffer,
                             Telephones(Telephone)
    )
))
```

- Give an example relation with 2 tuples!
- What is the fully unnested relation? Is this relation in PNF?
- What could be an equivalent relational schema?
- What would the following queries be in an extended relational algebra and SQL:2003?
  - What are the list prices of Citroen’s?
  - What were the offers for a VW Beetle?
  - What are the phone numbers of Mr. Stuart, who was interested in the Ford Fiesta?

2. $eN^F_2$ and Type Constructors

Design a relational and an $eN^F_2$ schema of a database for an on-line auction:

Items are sold in an auction (title, description, startprice) by members (name, email). For each auction there is a possibly infinite number of bids (price) by other members. A member may take part in many auctions as a seller or buyer. For each member, there are ratings (date, score, comment) by other members. Furthermore, for each auction there may be up to 3 images depicting the offered item.

How could the $eN^F_2$ schema be implemented using a SQL:2003 database or Oracle 10g.