# Practice problems

Draw Entity Relationship Diagram for the following problems:

1. A company database needs to store information about employees (identified by *ssn,* with *salary and phone* as attributes), departments (identified by *dno,* with *dname and budget as attributes), and children of employees (with *name and age* as attributes). Employees *work in departments; each department is managed by an* employee; a child must be identified uniquely by *name when the parent (who is an* employee; assume that only one parent works for the company) is known. We are not interested in information about a child once the parent leaves the company. Draw an ER diagram that captures this information.
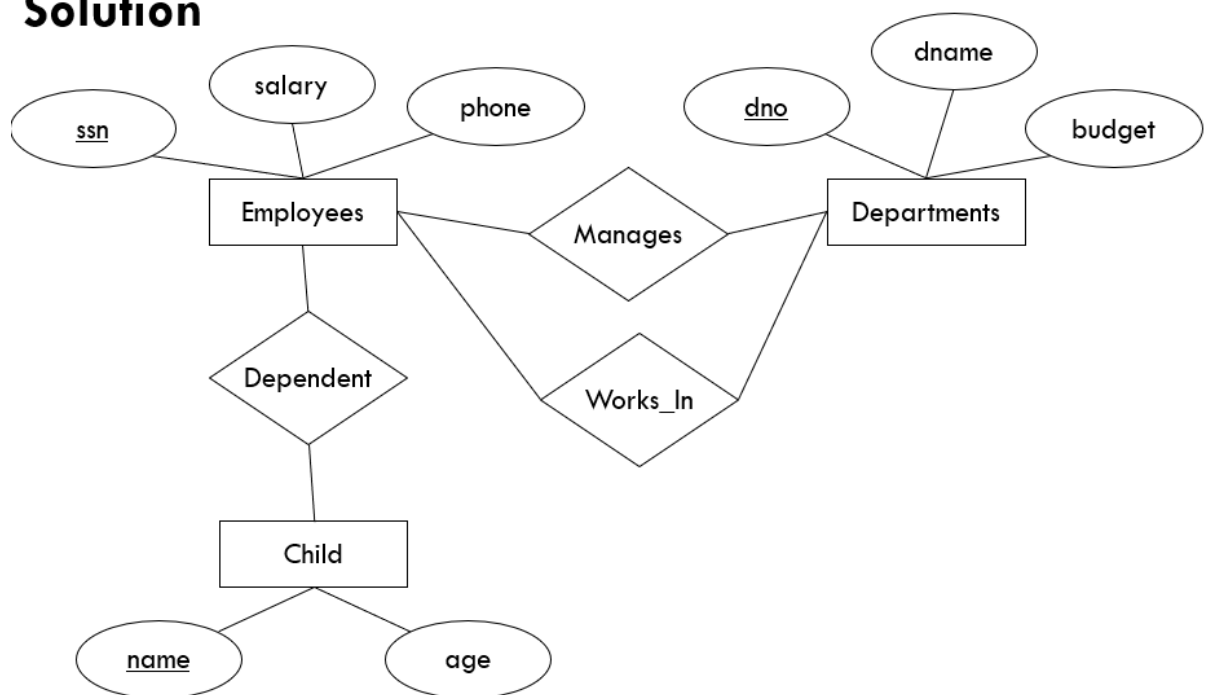
2. Although you always wanted to be an artist, you ended up being an expert on databases because you love to cook data and you somehow confused *database* with *data baste. Your old love is still there, however, so you set up a database company,* ArtBase, that builds a product for art galleries. The core of this product is a database with a schema that captures all the information that galleries need to maintain. Galleries keep information about artists, their names (which are unique), birthplaces, age,and style of art. For each piece of artwork, the artist, the year it was made, its unique title, its type of art (e.g., painting, lithograph, sculpture, photograph), and its price must be stored. Pieces of artwork are also classified into groups of various kinds, for example, portraits, still lives, works by Picasso, or works of the 19th century; a given piece may belong to more than one group. Each group is identified by a name (like those just given) that describes the group. Finally, galleries keep information about customers. For each customer, galleries keep that person's unique name, address, total amount of dollars spent in the gallery (very important!), and the artists and groups of art that the customer tends to like. Draw the ER diagram for the database.

Solution
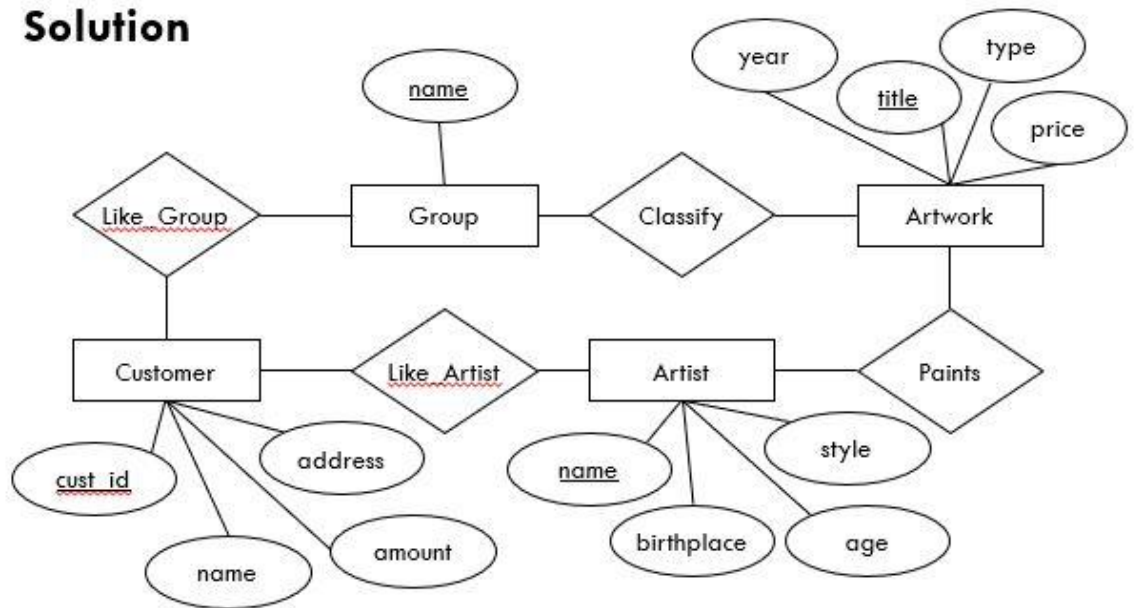
3. A publishing company produces scientific books on various subjects. The books are written by authors who specialize in one particular subject. The company employs editors who, not necessarily being specialists in a particular area, each take sole responsibility for editing one or more publications. A publication covers essentially one of the specialist subjects and is normally written by a single author. When writing a book, each author works with on editor, but may submit another work for publication to be supervised by other editors. To improve their competitiveness, the company tries to employ a variety of authors, more than one author being a specialist in a subject.
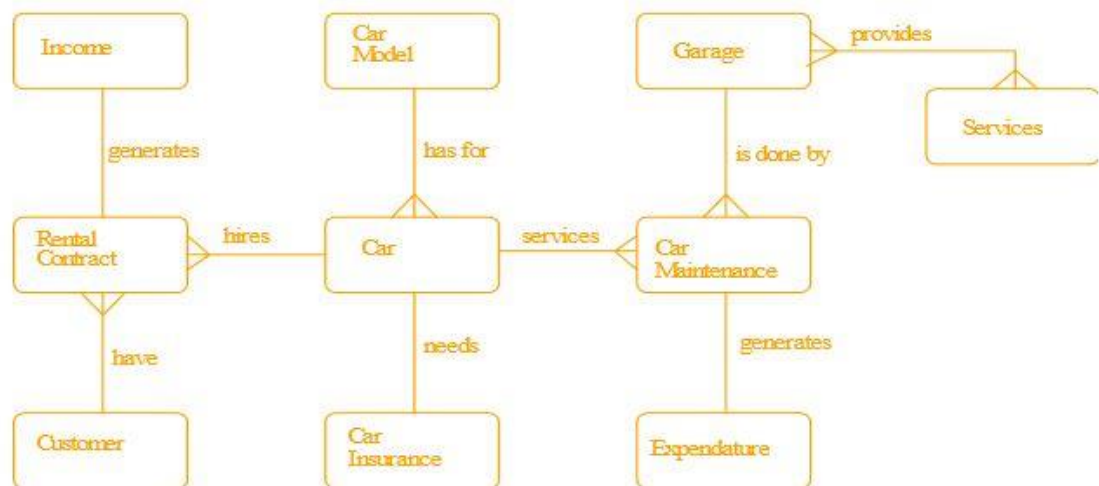

4. A General Hospital consists of several specialized wards (such as Maternity, Paediatric, Oncology, etc). Each ward hosts several patients, who were admitted on the recommendation of their own GP and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded. A separate

register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. Several tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for several patients, not necessarily from the same ward.
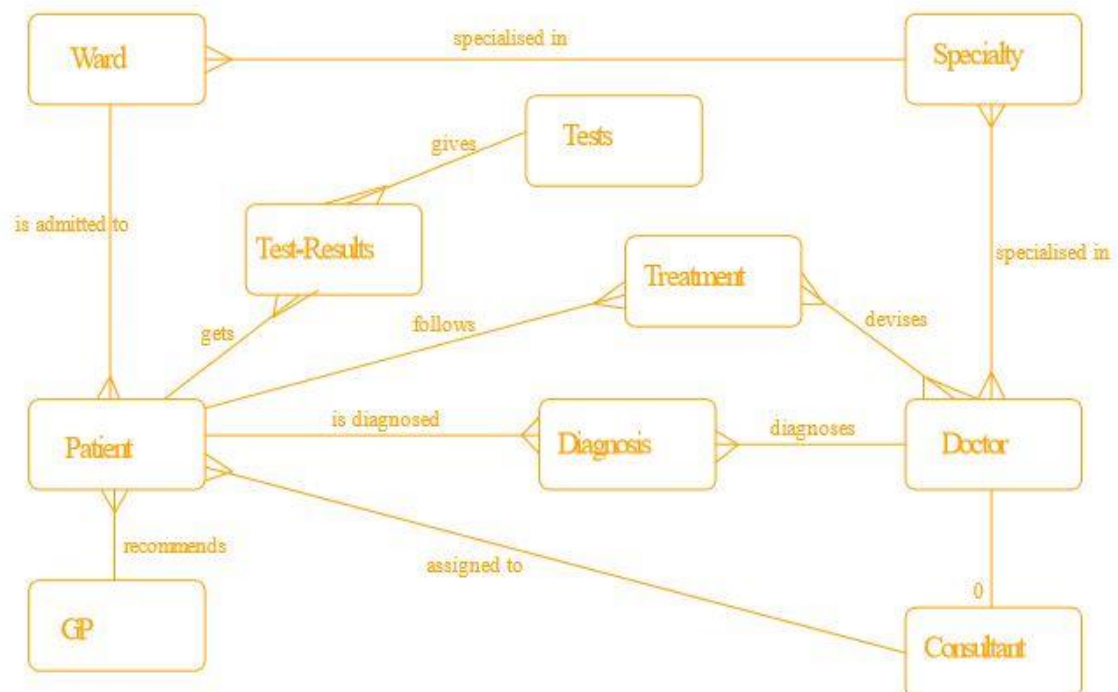
5. A database is to be designed for a Car Rental Co. (CRC). The information required includes a description of cars, subcontractors (i.e. garages), company expenditures, company revenues and customers. Cars are to be described by such data as: make, model, year of production, engine size, fuel type, number of passengers, registration number, purchase price, purchase date, rent price and insurance details. It is the company policy not to keep any car for a period exceeding one year. All major repairs and maintenance are done by subcontractors (i.e. franchised garages), with whom CRC has long-term agreements. Therefore, the data about garages to be kept in the database includes garage names, addresses, range of services and the like. Some garages require payments immediately after a repair has been made; with others CRC has decided for credit facilities. Company expenditures are to be registered for all outgoings connected with purchases, repairs, maintenance, insurance etc. Similarly, the cash inflow coming from all sources - car hire, car sales, insurance claims - must be kept of file. CRC maintains a reasonably stable client base. For this privileged category of customers special credit card facilities are provided. These customers may also book in advance a particular car. These reservations can be made for any period of time up to one month. Casual customers must pay a deposit for an estimated time of rental unless they wish to pay by credit card. All major credit cards care accepted. Personal details (such as name, address, telephone number, driving licence, number) about each customer are kept in the database.

Income   Car Model   Garage —provides→ Services

generates   has for   is done by

Rental Contract —hires— Car —services— Car Maintenance

have   needs   generates

Customer   Car Insurance   Expendature

6. A database is to be designed for a college to monitor students' progress throughout their course of study. The students are reading for a degree (such as BA, BA(Hons) MSc, etc) within the framework of the modular system. The college provides several modules, each being characterised by its code, title, credit value, module leader, teaching staff and the department they come from. A module is coordinated by a module leader who shares teaching duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module. Students are free to choose any module they wish but the following rules must be observed: some modules require pre-requisites modules and some degree programmes have compulsory modules. The database is also to contain some information about students including their numbers, names, addresses, degrees they read for, and their past performance (i.e. modules taken and examination results).

Department —employs— lecturer

module leader

offers   presents

prerequisit — Module —consists of— lecture plan

has grades   compultory

Grade —attains— student —enrols— Course