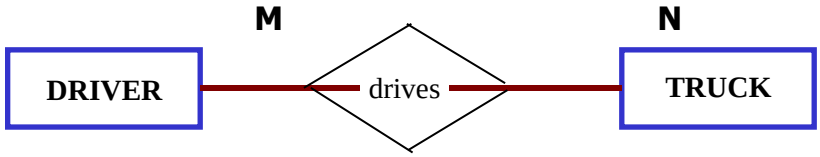
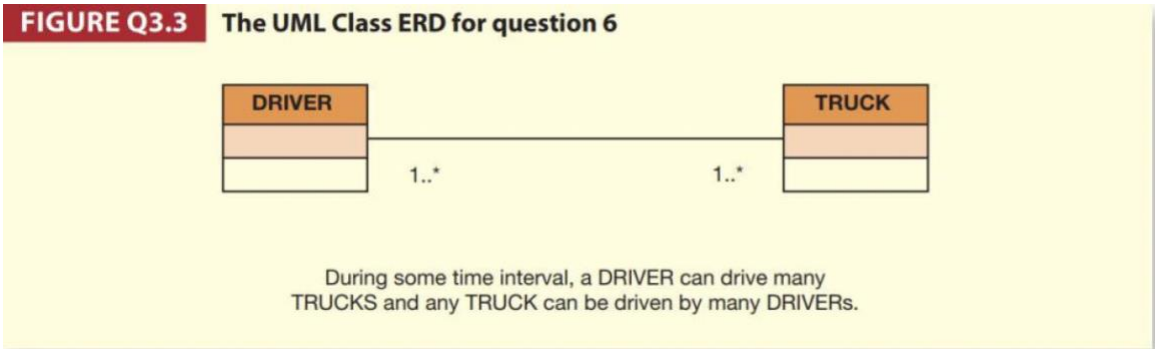
ANSWERS TO REVIEW QUESTIONS 4

1. **Suppose that you have the entity relationship model shown in figure below. How would you convert this model into an entity relationship model that displays only 1:M relationships? (Make sure that you draw the revised entity relationship model.)**



During some time interval, a DRIVER can drive many different TRUCKs and any TRUCK can be driven by many DRIVERs



Because the relational database model does not support the M:N relationship between entities, we must convert the M:N relationship into a set of 1:M relationships that are linked through a composite or bridge entity. The name *composite entity* is based on the fact that the linking table contains *at least* the primary keys of each of the tables that it connects.

The Chen model will look like this:

2. **How would you implement a 1:M relationship in a database composed of two tables? Give an example. (Make sure that you draw the E-R model and relational schema)**

Suppose that we have a car entity and an owner entity. Further suppose that it is reasonable to assume that:

- a car is owned just by one person (owner)
- a person can own more than one car.

The relationships we have just described may be represented by the following E-R model:

Chen model

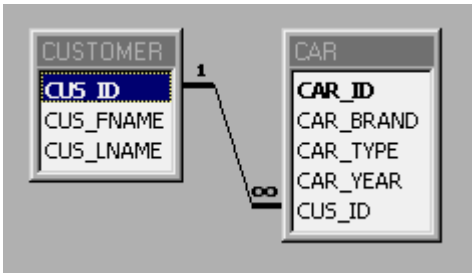
An example of this relationship is shown next. Note that the "many" side of the relation (the CAR entity) contains the foreign key, which is the CUSTOMER entity's primary key.

	CUS_ID	CUS_FNAME	CUS_LNAME
▶	111-22-3333	Sally	Roberts
	234-56-7890	Jerome	Wostila
	345-67-4567	Khalil	Gibran
	789-12-3456	Annelise	Rembarger

Table name: CUSTOMER

	CAR_ID	CAR_BRAND	CAR_TYPE	CAR_YEAR	CUS_ID
▶	1234560016	Ford	4-door	1999	111-22-3333
	1345679803	Chrysler	4-door	1995	789-12-3456
	1543452118	Ford	station wagon	1998	345-67-4567
	1767786799	Chevrolet	2-door	1998	789-12-3456
	2113245665	Toyota	2-door	1994	234-56-7890
	3111345330	Nissan	4-door	1999	345-67-4567

Table name: CAR



3. Identify and describe the components of the database table shown in figure below, using correct terminology. Use your knowledge of the naming conventions to identify the table's probable foreign key(s).

Table name: EMPLOYEE

EMP_NUM	EMP_LNAME	EMP_INITIAL	EMP_FNAME	DEPT_CODE	JOB_CODE
11234	Friedman	K	Robert	MKTG	12
11238	Zulu	D	Cela	MKTG	12
11241	Fontein		Juliette	INFS	5
11242	Theron	J	Emma	ENG	9
11245	Smithson	B	Bernard	INFS	6
11248	Washington	G	Oleta	ENGR	8
11256	McBride		Randall	ENGR	8
11257	Mazibuko	D	Fikile	MKTG	14
11258	Smith	W	William	MKTG	14
11260	Ratula	A	Katrina	INFS	5

- **one entity (or one entity set):** EMPLOYEE.
- **six attributes:** EMP_NUM, EMP_LNAME, EMP_INIT, EMP_FNAME, DEPT_CODE and JOB_CODE.
- **ten records (or ten tuples) :** the workers Friedman, Olansky, Fontein, and Cruazona.
- **one primary key:** the attribute EMP_NUM because it identifies each row uniquely.
- **two foreign keys:** the attribute DEPT_CODE, which probably references a department to which the employee is assigned and the attribute JOB_CODE which probably references another table in which you would find the description of the job and perhaps additional information pertaining to the job.

ANSWERS TO PROBLEMS 4

PART I. Use the database shown in figure below to work problems 1 through 7. Note that the database is composed of four tables and reflects these relationships:

- **An EMPLOYEE has only one JOB_CODE, but a JOB_CODE can be held by many EMPLOYEEs.**
- **An EMPLOYEE can have many PLANs, and any PLAN can be assigned to many EMPLOYEEs.**

Note that the M:N relationship has been decomposed into two 1:M relationships for which the BENEFIT table serves as the composite or bridge entity.

Database name: Ch03_BeneCo

Table name: EMPLOYEE

EMP_CODE	EMP_LNAME	JOB_CODE
14	Rudell	2
15	Arendse	1
16	Ruellardo	1
17	Smith	3
20	Smith	2

Table name: JOB

JOB_CODE	JOB_DESCRIPTION
1	Clerical
2	Technical
3	Managerial

Table name: BENEFIT

EMP_CODE	PLAN_CODE
15	2
15	3
16	1
17	1
17	3
17	4
20	3

Table name: PLAN

PLAN_CODE	PLAN_DESCRIPTION
1	Term life
2	Stock purchase
3	Long-term disability
4	Dental

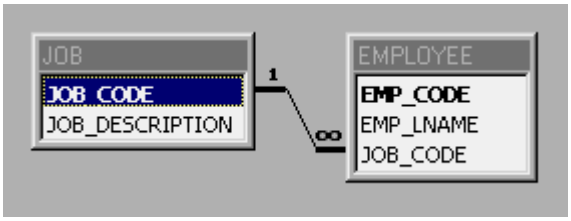
1. For each table in the database, identify the primary key and the foreign key(s). If a table does not have a foreign key, write NONE in the assigned space.

Table	Primary key	Foreign Key(s)
EMPLOYEE	EMP_CODE	JOB_CODE
BENEFIT	EMP_CODE + PLAN_CODE	EMP_CODE, PLAN_CODE
JOB	JOB_CODE	NONE
PLAN	PLAN_CODE	NONE

2. Draw the entity relationship diagram for the relationship between EMPLOYEE and JOB.

Note: The JOB_CODE = 1 occurs twice in the EMPLOYEE table, as does the JOB_CODE = 2, thus providing evidence that a JOB can be assigned to many EMPLOYEEs. But each EMPLOYEE has only one JOB_CODE, so there exists a 1:M relationship between JOB and EMPLOYEE.

3. Draw the Relational Schema for the relationship between EMPLOYEE and JOB.


JOB
JOB_CODE
JOB_DESCRIPTION
1
∞
EMPLOYEE
EMP_CODE
EMP_LNAME
JOB_CODE

4. Do the tables exhibit entity integrity? Answer Yes or No, then explain your answer.

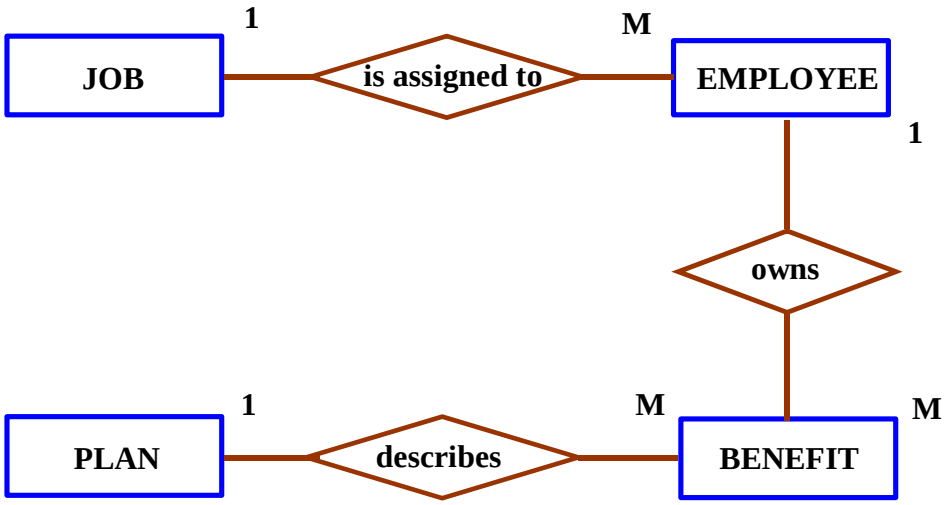
Table	Entity Integrity?	Explanation
EMPLOYEE	Yes	Each EMP_CODE value is unique and there are no nulls
BENEFIT	Yes	Each ***combination*** of EMP_CODE and PLAN_CODE values is unique and there are no nulls
JOB	Yes	Each JOB_CODE value is unique and there are no nulls
PLAN	Yes	Each PLAN_CODE value is unique and there are no nulls

5. Do the tables exhibit referential integrity? Answer Yes or No, then explain your answer. Write NA (Not Applicable) if the table does not have a foreign key.

Table	Referential Integrity?	Explanation
EMPLOYEE	Yes	Each JOB_CODE value in EMPLOYEE points to an existing JOB_CODE value in JOB.
BENEFIT	Yes	Each EMP_CODE value in BENEFIT points to an existing EMP_CODE value in EMPLOYEE and each PLAN_CODE value in BENEFIT points to an existing PLAN_CODE value in PLAN.
JOB	NA	
PLAN	NA	

6. Draw the Entity Relationship diagram to show the relationships among EMPLOYEE, JOB, BENEFIT, and PLAN.

The Chen ERD



7. Draw the Relational Schema to show the relationships among EMPLOYEE, JOB, BENEFIT, and PLAN.