



Database Design II  
Assignment Project Exam Help  
Modelling

FIT2094

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# 程序代写代做 CS编程辅导

## Revisit - Week 3 Conceptual Model

Keys only



TRAINING	
Key	training_code

TEAM	
Key	team_no



# Revisit - Week 3 Conceptual Model



All attributes

TRAINING	
Key	training_code
	training_name

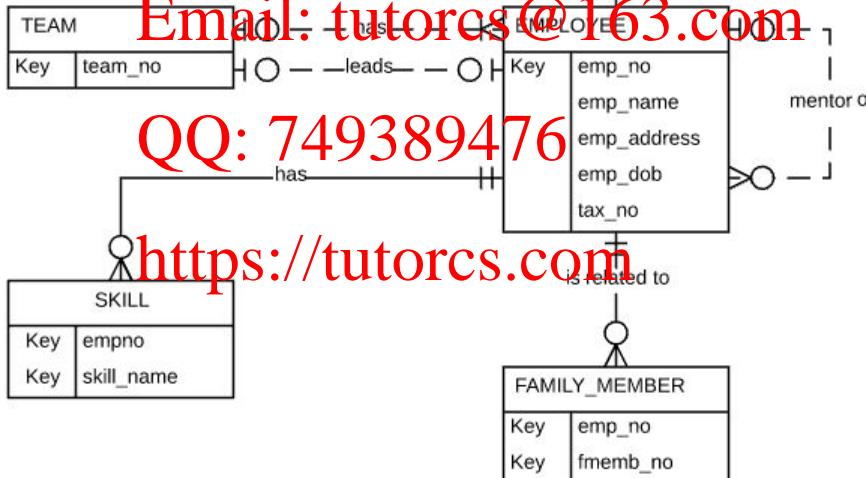
completed\_by

EMPLOYEE_TRAINING	
Key	training_code
Key	empno
Key	et_date_completed

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## Summary of Terminologies at Different Levels



Conceptual	Relational	Physical
Entity	Assignment Project Exam Help	Table
Attribute	WeChat: cstutorcs <a href="https://powcoder.com">https://powcoder.com</a>	Column
Instance	Tuple	Row
Identifier	Assignment Project Exam Help	Primary Key
Relationship	Add WeChat powcoder Email: tutorcs@163.com	Primary Key
---	Foreign Key QQ: 749389476	Foreign Key

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## Properties of Relations



- Some properties to consider:

- Each relation has a unique name in the database.
- Each row is unique - i.e. duplicate tuples are not allowed.
- Each column has a (meaningful) name.
- The order of attributes is immaterial.
- The order of tuples is immaterial.
- The entries are single-valued (**atomic**) - each cell contains a single entry.

- **Multi-valued and composite attributes???**

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# Transforming ER diagrams into relations (mapping conceptual level to logical level)



## ■ The steps are:

- Map strong (regular) entities
- Map weak entities
- Map binary relationships
- Map associative entities
- Map unary relationships
- Map ternary relationships
- Map supertype/subtype relationships (is not part of this unit).

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**Q1. The relational model requires that each cell in a relation is single-valued (atomic). Considering this requirement, what entity object in an ER diagram cannot be implemented directly (without adding further entities) in the relational model (logical level)?**



- a. Composite key.
- b. Composite attribute.
- c. Multi-valued attribute.
- d. Dependent attribute.
- e. More than one option is correct.

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## Map Regular Entities



### ▪ Composite Attributes

- When the regular entity type contains a **composite attribute**, only the simple component attributes of the composite attribute are included in the new relation.
- Compared to composite attributes, simple attributes not only improve data accessibility but also help in maintaining data quality

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## Mapping a Composite Attribute



CUSTOMER
P * cust_id * cust_name * cust_street * cust_city * cust_state * cust_zip

EMPLOYEE
P * emp_no emp_fname emp_lname * emp_street * emp_town * emp_pcode * emp_dob emp_taxno

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## Map Regular Entities

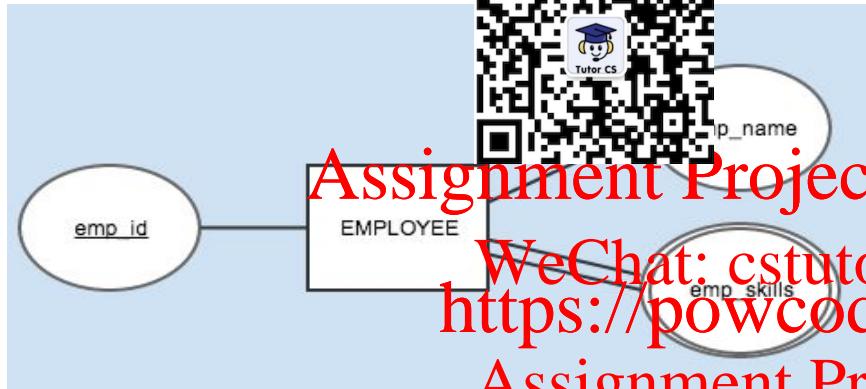


### ■ Multivalued Attributes

- When the regular entity type contains a **multivalued attribute**, two new relations are created.
- The first relation contains all the attributes of the entity type except the multivalued attribute itself.
- The second relation contains two attributes that form the PK. One of the attributes is the PK from the first relation, which becomes the FK in the second relation and the other is the multivalued attribute.
- There can also be non key attributes in the second relation depending upon the data requirements.

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# Mapping a Multi valued Attribute



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Is there a better solution than the one shown above?

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## Revisit - Week 3 Conceptual Model - IMPROVED



TRAINING	
Key	training_code
	training_name

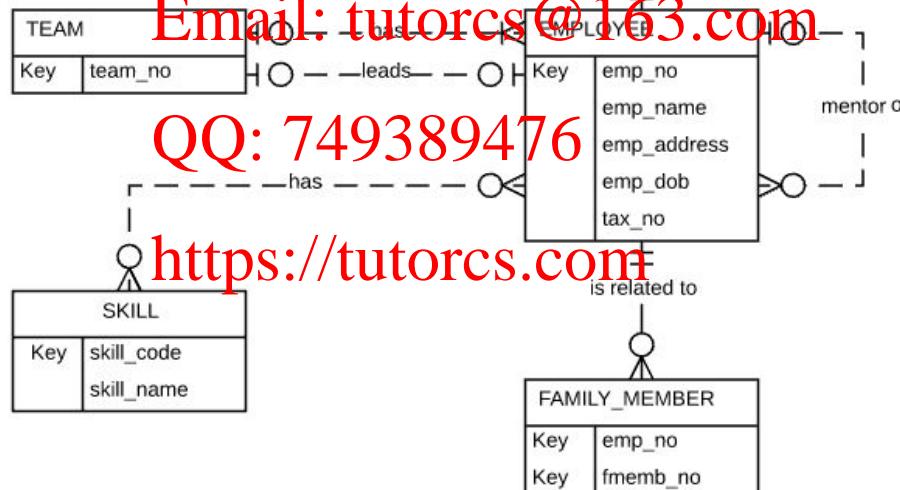
completed\_by

EMPLOYEE_TRAINING	
Key	training_code
Key	empno
Key	et_date_completed

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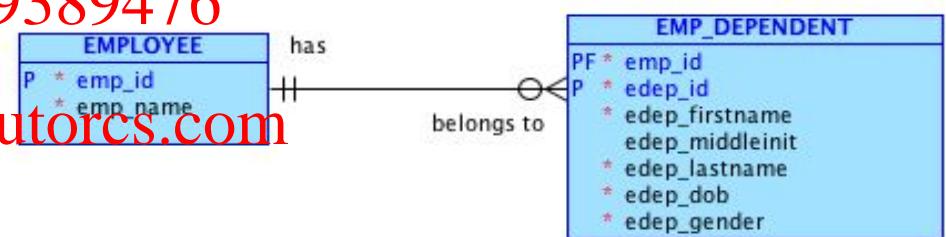
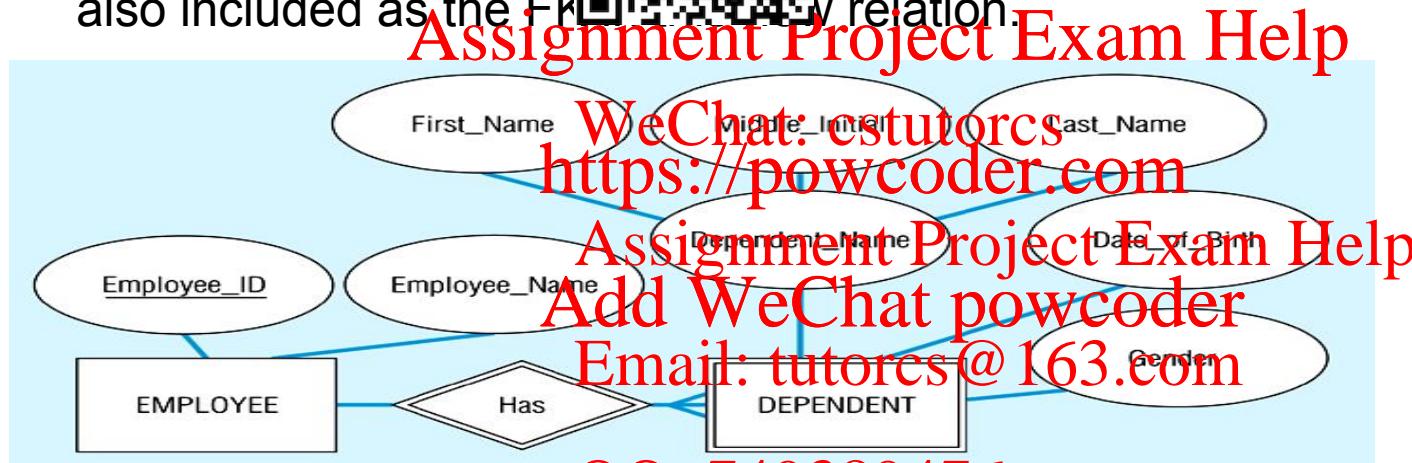
All attributes

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## Mapping a Weak Entity



- For each weak entity type, create a new relation and include all of the simple attributes as attributes in the new relation. The PK of the identifying relation is also included as the Fk in the new relation.



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Conceptual



Logical

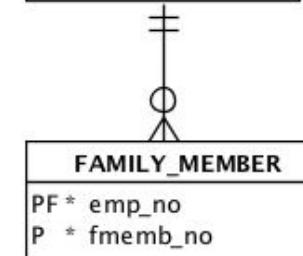
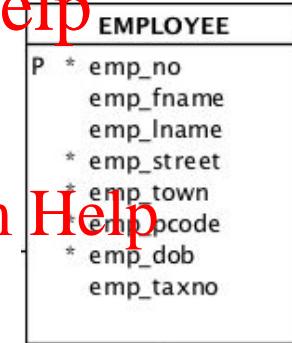
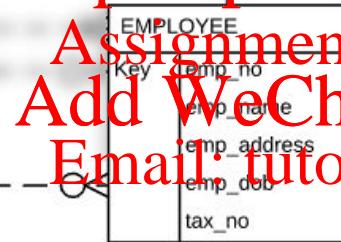
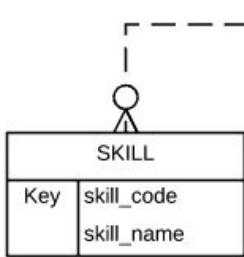
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# Mapping a 1:M Binary Relationship



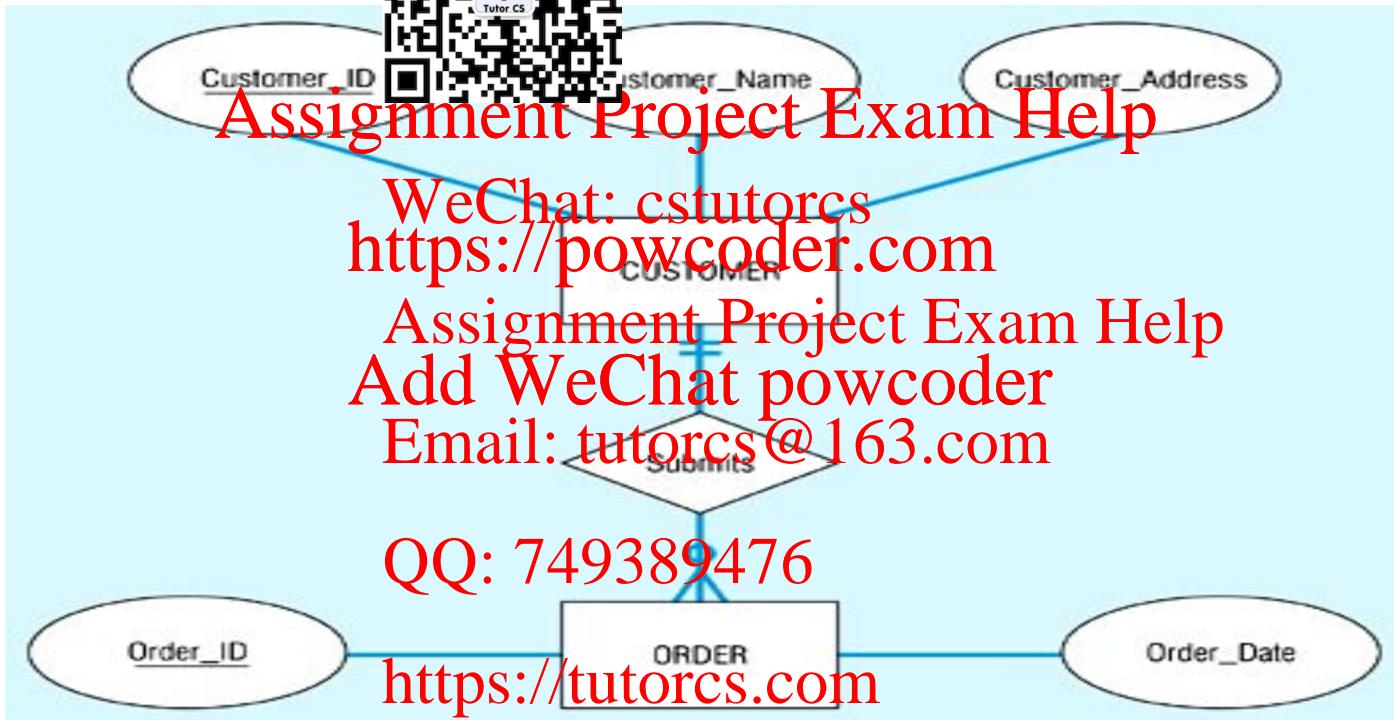
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## 程序代写代做 CS编程辅导

**Q2. Where would you place the Foreign Key when you map this ER diagram to the relational model?**



CUSTOMER

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ORDER

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- a. CUSTOMER
- b. ORDER
- c. Both CUSTOMER and ORDER.
- d. None, no FK is needed.

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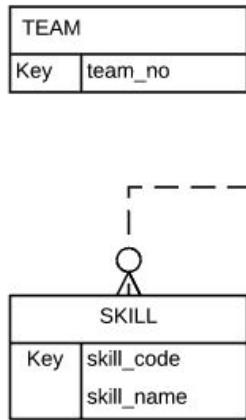
## Map Binary Relationships (1:M)



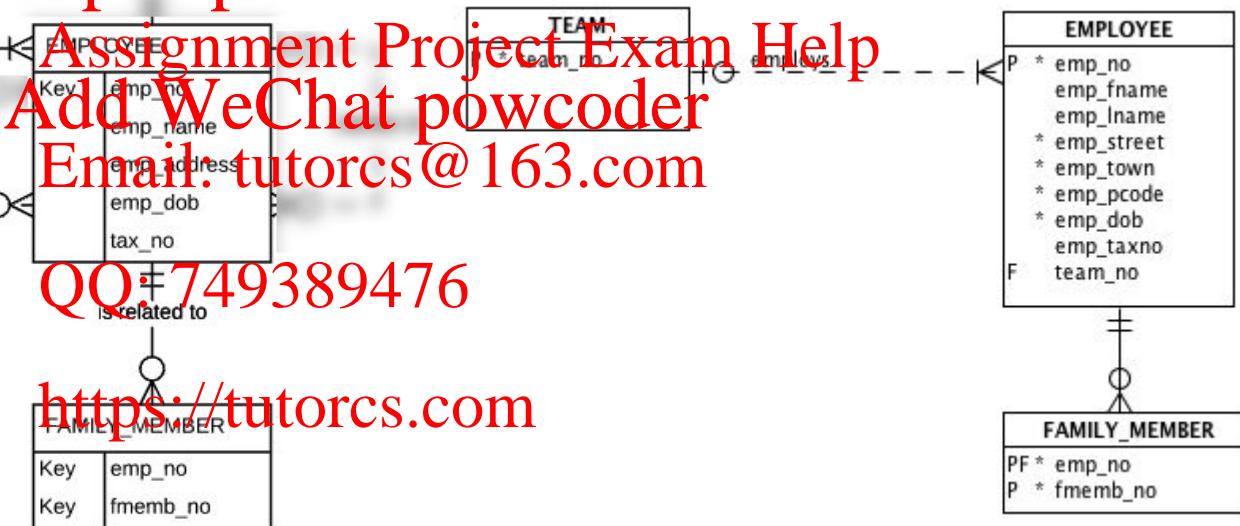
For each 1:M binary relationship, first create a relation for each of the two entity types participating in the relationship. Then include the PK attribute (or attributes) of the entity on the one-side of the relationship as the FK on the many-side of the relationship.

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Conceptual



Logical



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# Mapping a M:N Binary Relationship



ORDER

Order\_ID  
Order\_date

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PRODUCT

Product\_ID  
Unit\_price

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Q3. What will be the Primary Key of the new created relation resulting from dropping this ER model at the conceptual level?



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ORDER

Order\_ID

Order\_date

PRODUCT

Product\_ID

Unit\_price

- a. The primary key of the ORDER table.
- b. The primary key of the PRODUCT table.
- c. The combination of primary keys of ORDER and PRODUCT.

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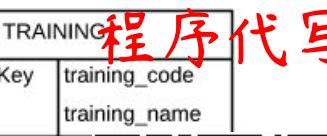
## Map Binary Relationship (M:N)



- For a M:N binary relationship:
  - First create a relation for each of the two entity types participating in the relationship.
  - Then create a new relation and include as foreign key attributes, the PK attribute (or attributes) for each of the two participating entity types. These attributes become the PK of the new relation.
  - If there are any nonkey attributes associated with the M:N relationship, they are also included in the new relation.

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Conceptual



Logical

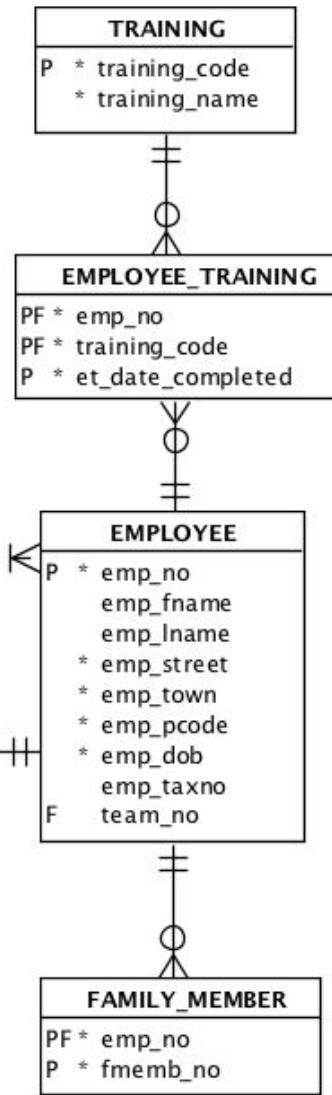
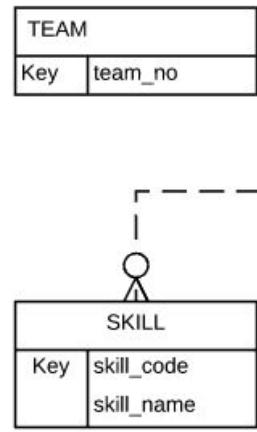
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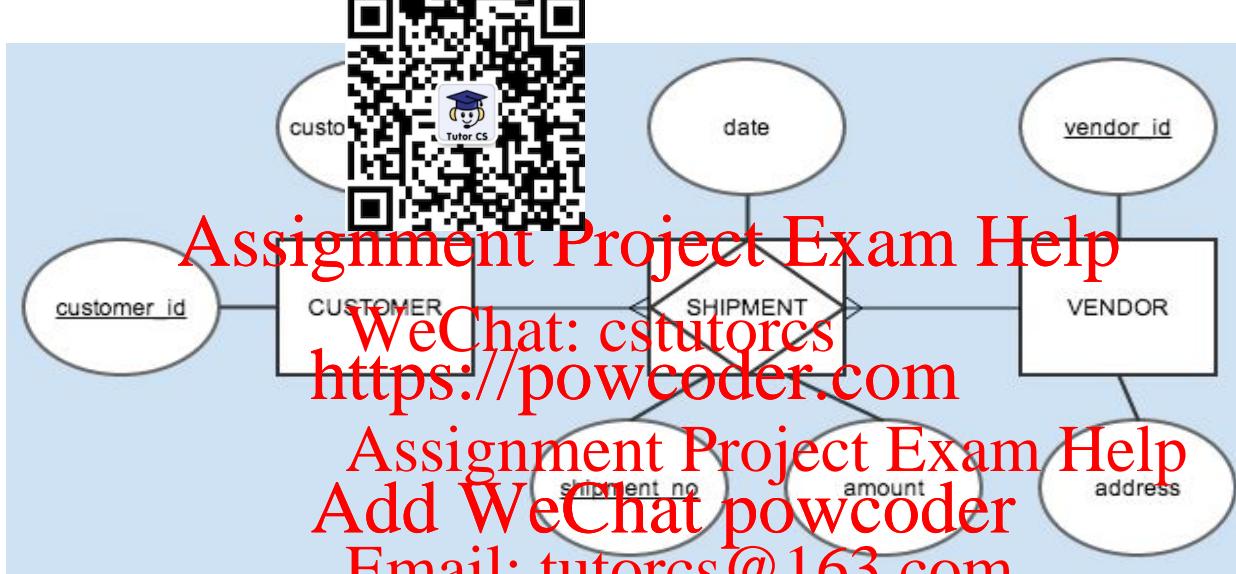
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# Mapping an associative entity with an Identifier



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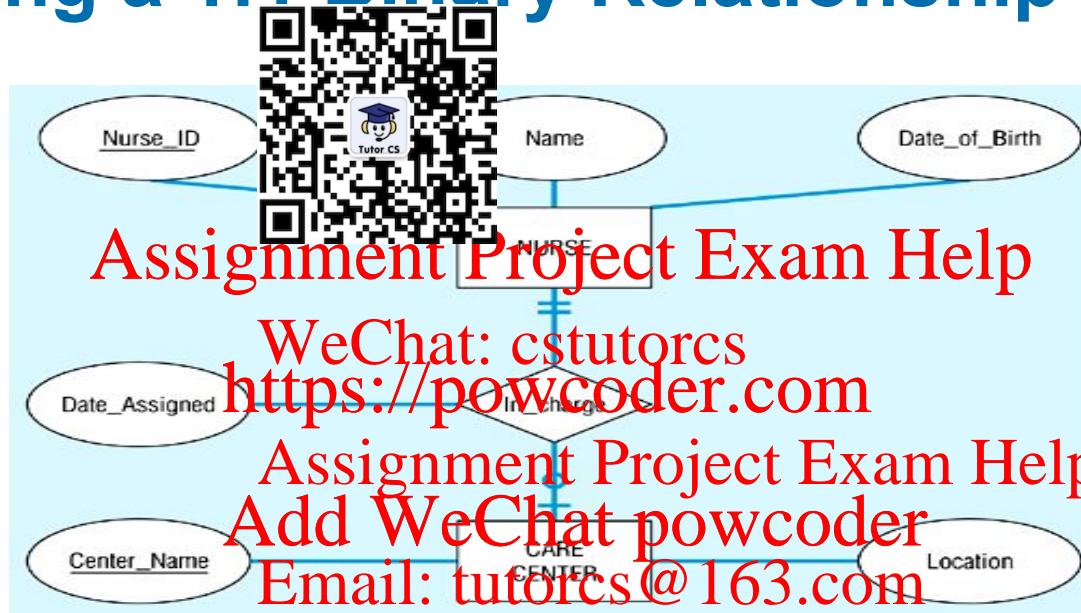
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# Mapping a 1:1 Binary Relationship



NURSE

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Nurse\_ID

Date\_of\_Birth

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CARE CENTRE

Centre\_Name

Location

## 程序代写代做 CS编程辅导

**Q4. Where would you place the Foreign Key when mapping this ER diagram into a relational model?**



NURSE CARE CENTRE  
**Assignment Project Exam Help**

Nurse\_ID

Date\_of\_Birth

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Centre\_Name

Location

- A. NURSE Email: tutorcs@163.com
- B. CARE CENTRE QQ: 749389476
- C. Both NURSE and CARE CENTRE
- D. No FK is needed. <https://tutorcs.com>

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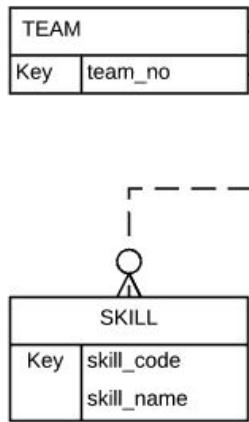
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## Map Binary Relationship (1:1)



- Create two relations, one for each of the participating entity types.
  - The primary key (PK) on the mandatory side of the relationship becomes the foreign key (FK) on the optional side of the relationship.
  - where both are optional place the FK on the side which causes the fewest nulls
  - Special case: 1:1 total relationship (mandatory participation on both sides)
    - Consider consolidating the two entity types into one relation

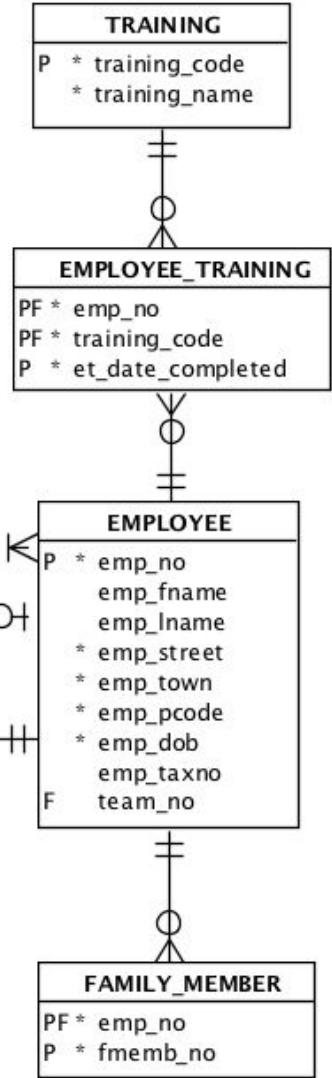
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Logical



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## Map unary relationships

- Unary Relationship – A relationship between the instances of a single entity type.
- **Unary 1:M Relationship** – A relation is created for the entity type. Add a FK within the same relation that references the PK of the relation. A recursive foreign key is a FK in a relation that references the PK values of the same relation.
- **Unary M:N Relationship** – Two relations are created, one for the entity type in the relationship and the other as the associative relation to represent the M:N relationship itself. The PK of the associative relation consists of two attributes (with different names) taking their values from the PK of the other relation.



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## Mapping a 1:M Unary Relationship



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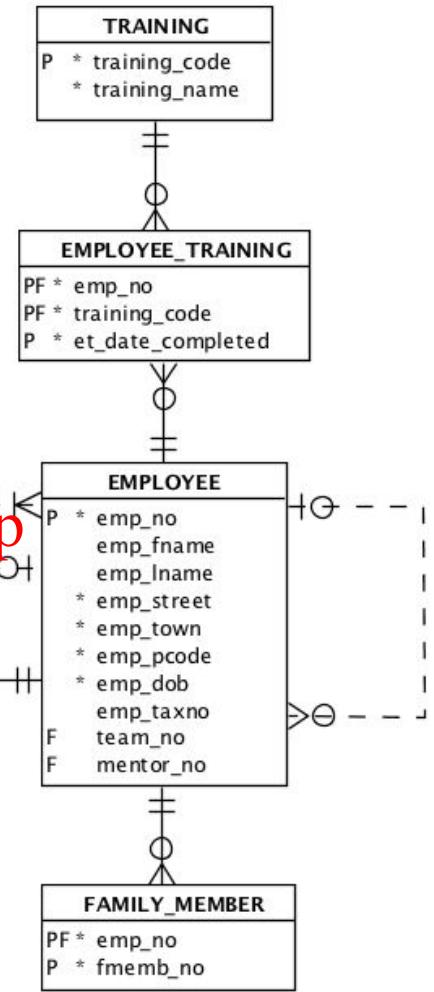
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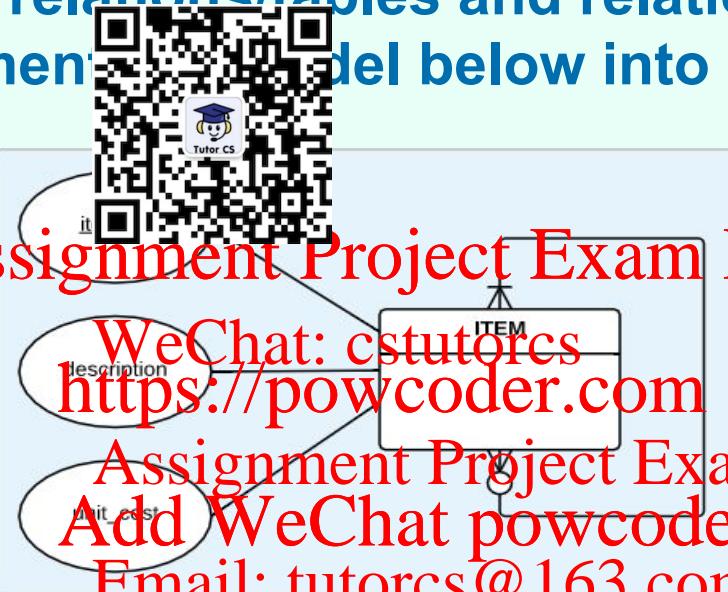
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Q5. How many relations/tables and relationships do we need to implement the model below into a relational model?



- a. 2 tables, 1 relationship  
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- b. 2 tables, 2 relationships
- c. 3 tables, 2 relationships  
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- d. 4 tables, 3 relationships

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# Mapping a M:N Unary Relationship



# SQL Developer Data Modeler 程序代写代做CS编程辅导

The screenshot shows the Oracle Database 11g interface with a DDL File Editor and a Data Modeler window. The DDL File Editor contains the following SQL code:

```
7 8 DROP TABLE employee CASCADE CONSTRAINTS;
9
10 DROP TABLE employee_skill CASCADE CONSTRAINTS;
11
12 DROP TABLE employee_training CASCADE CONSTRAINTS;
13
14 DROP TABLE family_member CASCADE CONSTRAINTS;
15
16 DROP TABLE skill CASCADE CONSTRAINTS;
17
18 DROP TABLE team CASCADE CONSTRAINTS;
19
20 DROP TABLE training CASCADE CONSTRAINTS;
21
22 CREATE TABLE employee (
23   emp_no NUMBER(2) NOT NULL,
24   emp_fname VARCHAR2(30),
25   emp_lname VARCHAR2(30),
26   emp_street VARCHAR2(30) NOT NULL,
27   emp_town VARCHAR2(30) NOT NULL,
28   emp_code CHAR(3) NOT NULL,
29   emp_dob DATE NOT NULL,
30   emp_taxno VARCHAR2(20),
31   emp_fbor_no NUMBER(3),
32   emp_mentors_emp(mentor_no),
33   team_employee(team_no)
34 );
35 COMMENT ON COLUMN employee.emp_no IS
36   'Employee identifier';
37
38 COMMENT ON COLUMN employee.emp_fname IS
39   'Employees first name';
40
41 COMMENT ON COLUMN employee.emp_lname IS
42   'Employees last name';
43
44 COMMENT ON COLUMN employee.emp_street IS
45   'Employee home street name and number';
46
47 COMMENT ON COLUMN ...
```

The Data Modeler window displays several tables: TEAM, EMPLOYEE\_SKILL, SKILL, EMPLOYEE\_TRAINING, and FAMILY\_MEMBER. A QR code is also present in the center of the interface.

Red text overlays provide contact information:

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# Adding surrogate keys

EMPLOYEE_TRAIN	
PF * emp_no	NUMBER (5)
PF * training_code	CHAR (5)
P * et_date_completed	DATE
EMPLOYEE_TRAINING_PK (training_code, e	
emp_emptraining (emp_no, et_no)	
training_emptraining (training_code)	



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Surrogate PK's may be added  
**ONLY** on the logical model provided  
they are justified (include in  
documentation/assumptions)



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Potential problem:

Need to ensure that the identified  
key from the conceptual model  
(emp\_no, training\_code, et\_date\_completed)  
will still remain unique

- define a unique index on attributes of  
key

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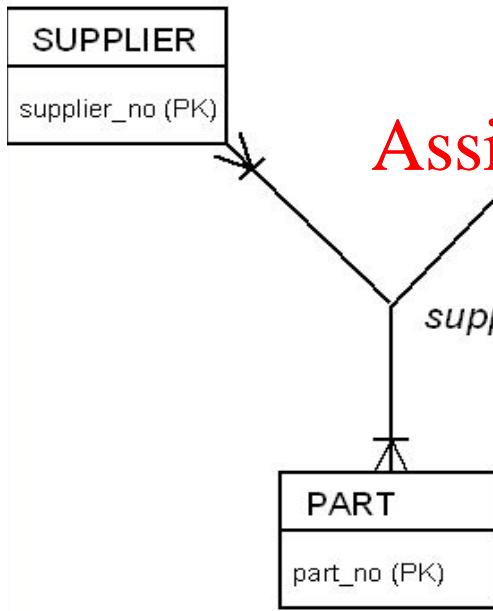
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et_no	emp_no	training_code	et_date_completed
1	101	ORA00	1-Oct-2016
2	101	ORA01	1-Oct-2016
3	101	ORA01	1-Oct-2016

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## Ternary Relationships

Ternary



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modelled as binary:

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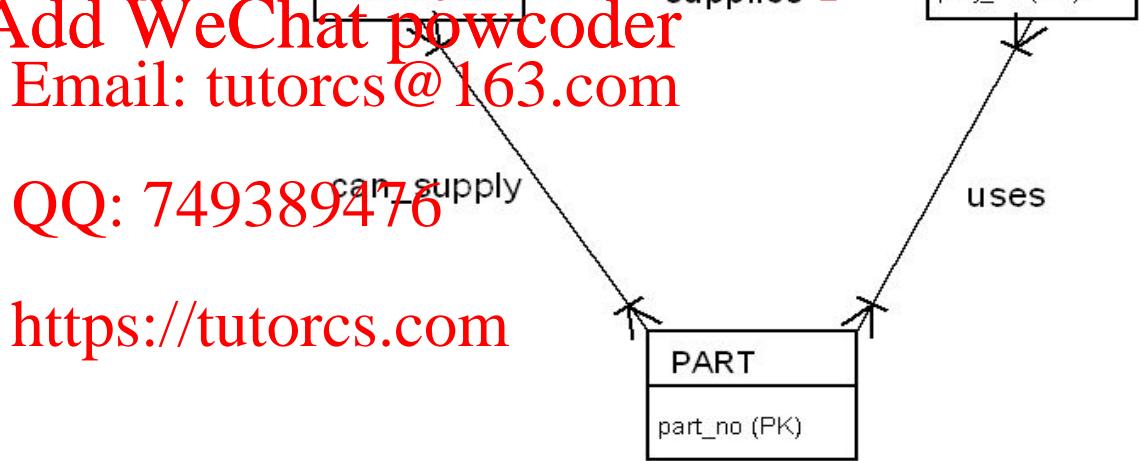
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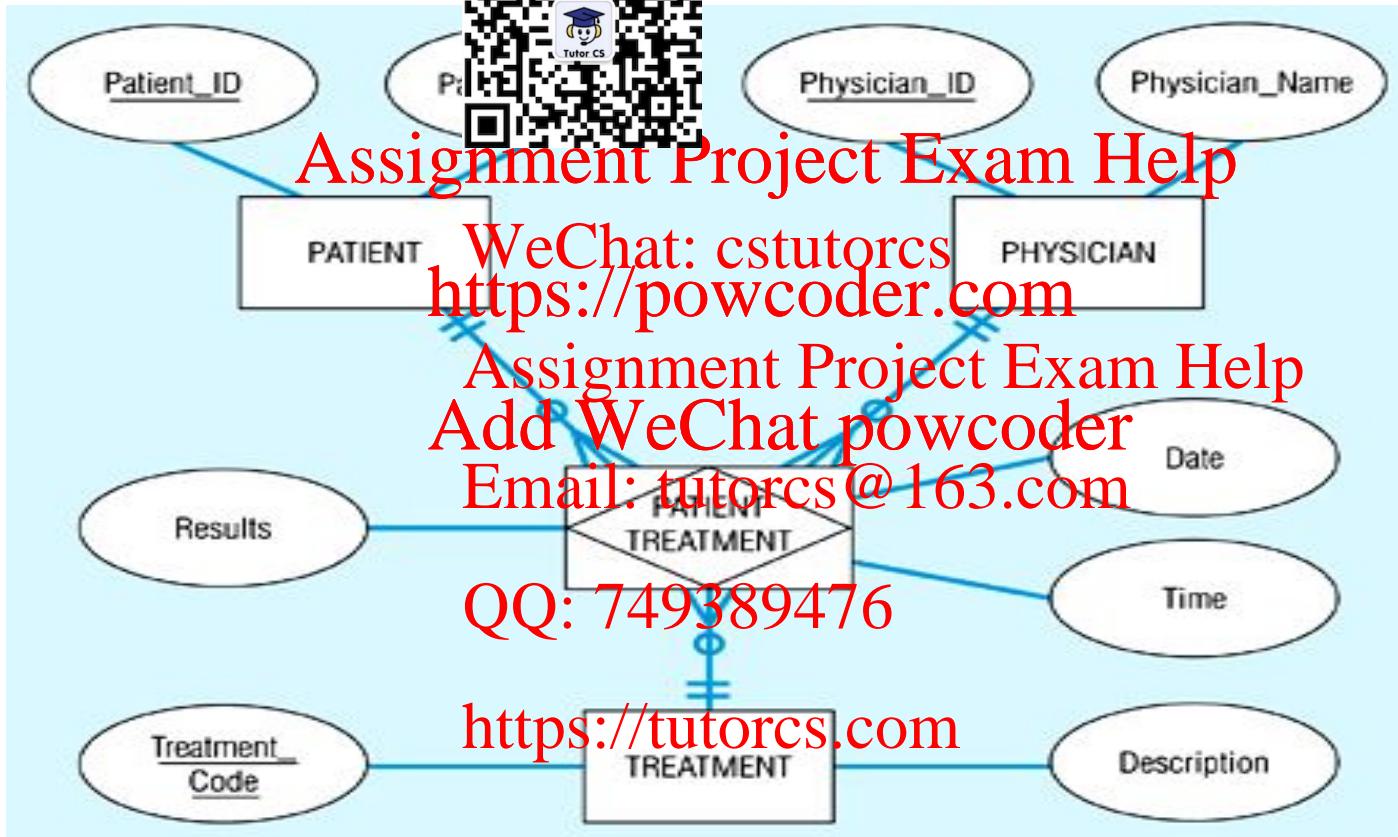
## Ternary Relationships – model as binary relationships



- Ternary represents more information than three binary relationships
- For example - Supplier 1 supplies Project 2 with Part 3 -
  - ternary
    - instance (supplier1, project2, part3) exists
  - binaries
    - instances
      - (supplier1, project2) (project2, part3) (supplier1, part3)
    - BUT does <https://tutorcs.com> (supplier1, project2, part3)
- How then do we map such relationships?

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# Mapping a Ternary Relationship



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## Map Ternary (and n-ary) Relationships



- Ternary relationships can be converted to an associative entity.

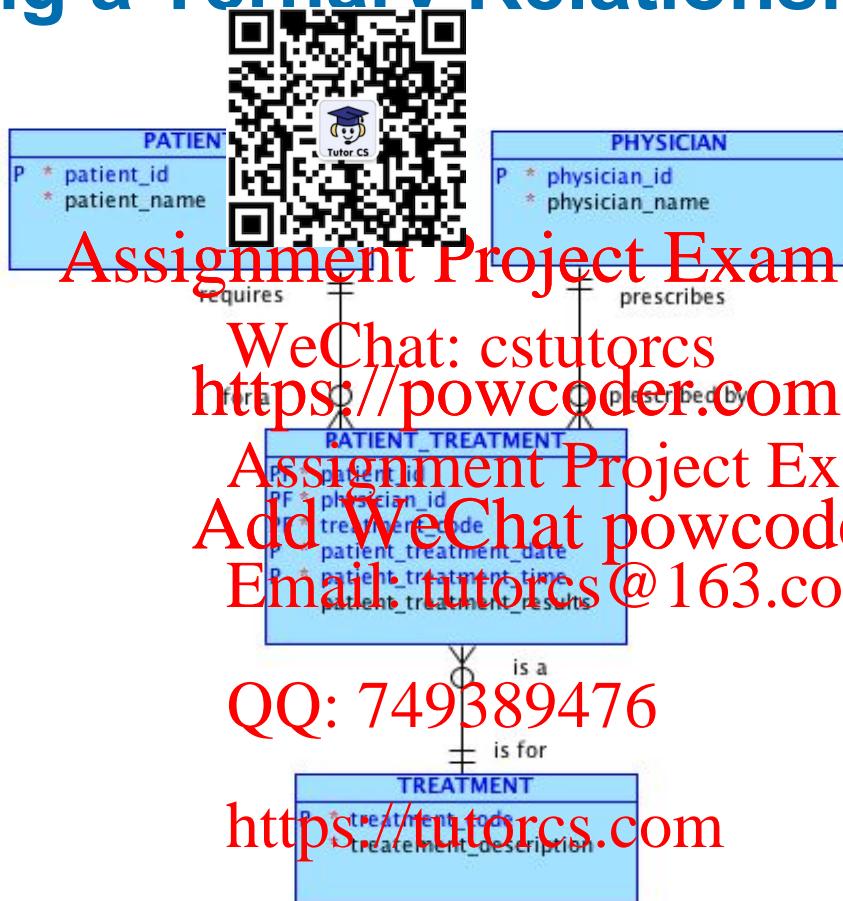
- To map an associative entity type that links three regular entity types, an associative relation is created.
  - The default PK of this relation consists of the three PK attributes for the participating entity types.
  - Any attributes of the associative entity type become attributes of the new relation.

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## Mapping a Ternary Relationship



# Reference

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Hoffer, J. A. , Prescott, S. J. , McFadden, F. R.

“Modern Database Management”



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