CSC343 Worksheet 15 Solution (Final)

July 15, 2020

1.
   - E/R Diagram

   - UML

```
┌─────────────────────┐                                    ┌─────────────────────┐
│      Customer       │                                    │       Account       │
├─────────────────────┤                                    ├─────────────────────┤
│ Name                │                                    │ Number   PK         │
│ Phone      PK       │ 0..*                        0..1   │ Types               │
│ Address    PK       │                                    │ Balance             │
│ SSN        PK       │                                    │                     │
│                     │                                    │                     │
└─────────────────────┘                                    └─────────────────────┘

                        ┌─────────────────────┐
                        │   Account Record    │
                        ├─────────────────────┤
                        │                     │
                        │                     │
                        │                     │
                        └─────────────────────┘
```

Notes:

- UML
    - Was developed originally as a graphical notation for describing software designs in an object-oriented style
    - Offers the same as E/R model, with the exception of multiway relationship

UML	E/R Model
Class	Entity set
Association	Binary relationship
Association Class	Attributes on a relationship
Subclass	Isa hierarchy
Aggregation	Many-one relationship
Composition	Many-one relationship with referential integrity

- UML Class

```
Relation Name ──────────┐
                        │         ┌──────────────────┐
Primary Key ────────────┤         │     Movies       │
                        │         ├──────────────────┤
                        │         │ title  PK        │
attributes ─────────────┘         │ year   PK        │
                                  │ length           │
                                  │ genre            │
                                  ├──────────────────┤
                                  │ <place for methods> │
                                  └──────────────────┘
```

2

- Associations

Multiplicity in UML

Multiplicity	Option	Cardinality
0..0	0	Collection must be empty
0..1		No instances or one instance
1..1	1	Exactly one instance
0..*	*	Zero or more instance
5..5	5	Exactly 5 instances
$m..n$		At least m but no more than n instances

Example:

References:

1) uml-diagrams, UML Multiplicity and Collections, link

- Referential Integrity
  - Means that a value appearing in one context must also appear in another

3

1 upper bound
1 lower bound

Movies — Owns — Studios — Runs — Presidents

Movies
title PK
year PK
length
genre

1..* — 1..1
Owns

Studios
name PK
address

1..1 — 0..1
Runs

Presidents
cert# PK
name
address

0 lower bound
1 upper bound

Means studio can have **at most one** president
but it could not have a president at some time

many upper bound

Movies — Owns — Studios — Runs — Presidents

Movies
title PK
year PK
length
genre

1..* — 1..1
Owns

Studios
name PK
address

1..1 — 0..1
Runs

Presidents
cert# PK
name
address

1 lower and upper bound
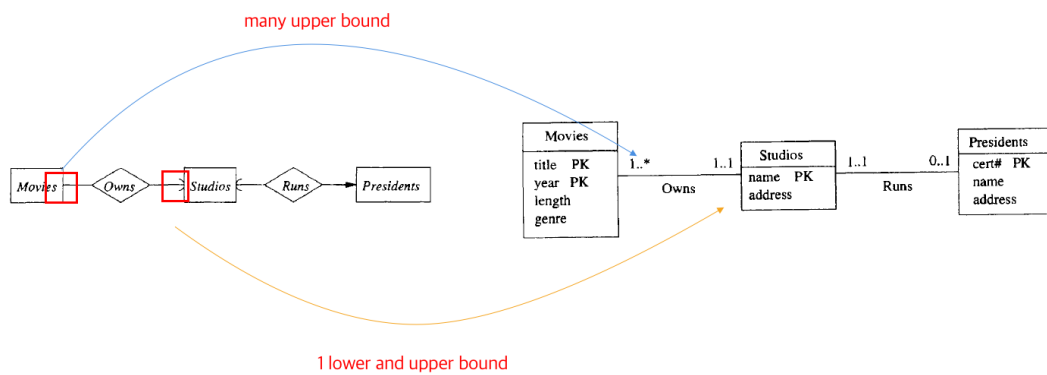
Means one studio can have **at least one** movies
and there could have many more (to infinity!)

- Self-Assoiations

Original

Sequel-of   Movies

Sequel

Movies
title   PK
year   PK
length
genre

0..1   TheOriginal

0..*   TheSequel

is the same

- Assoiations

Compensation (name, year, pk, salary, residuals)

Stars
name   PK
address

0..*   Stars-in   0..*

Movies
title   PK
year   PK
length
genre

Compensation
salary
residuals

behaves the same

title   year   name   address

salary

Movies

compensation   Stars

length   genre

residuals

2. a) **Solution:**

Customer	
Name	
Phone	**PK**
Address	**PK**
SSN	**PK**

Account	
Number	**PK**
Types	
Balance	

0..1   0..*

Account Record

b) **Solution:**

Customer	
Name	
Phone	**PK**
Address	**PK**
SSN	**PK**

Account	
Number	**PK**
Types	
Balance	

0..1   0..1

Account Record

3.   • E/R Diagram

- UML

4.   • E/R Diagram
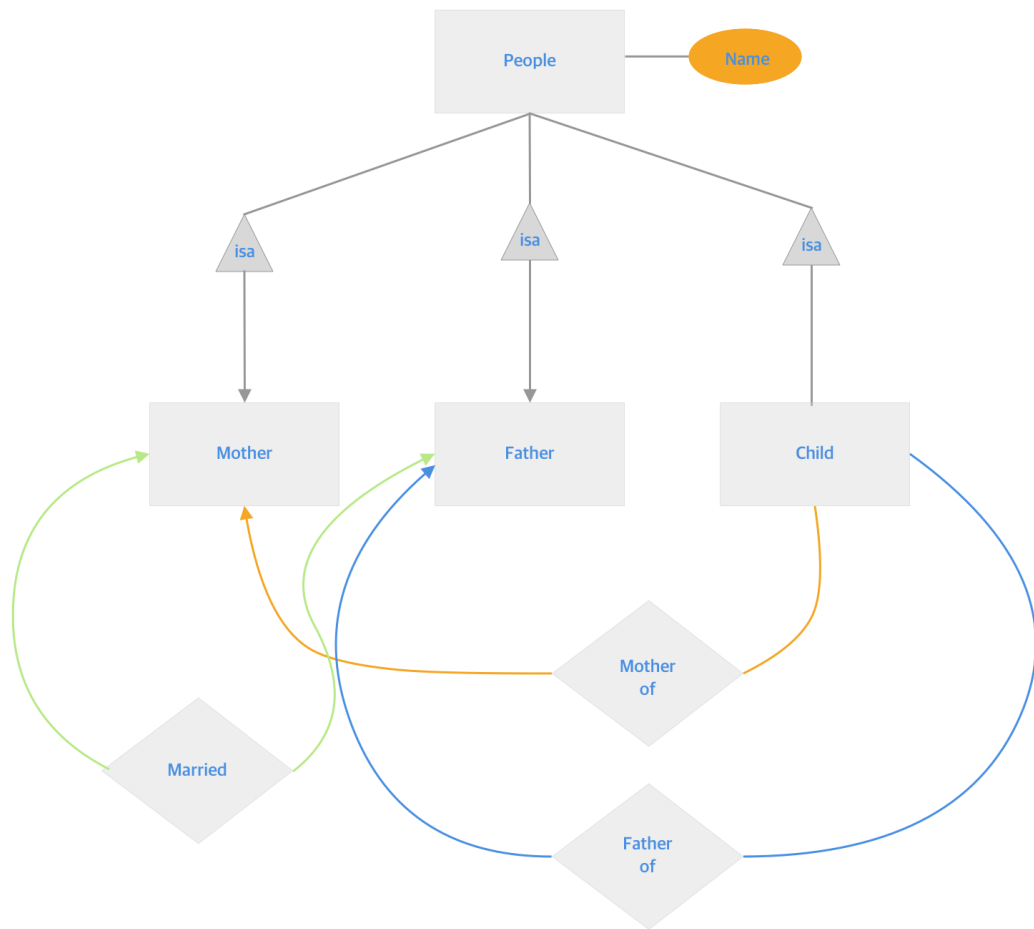
- UML
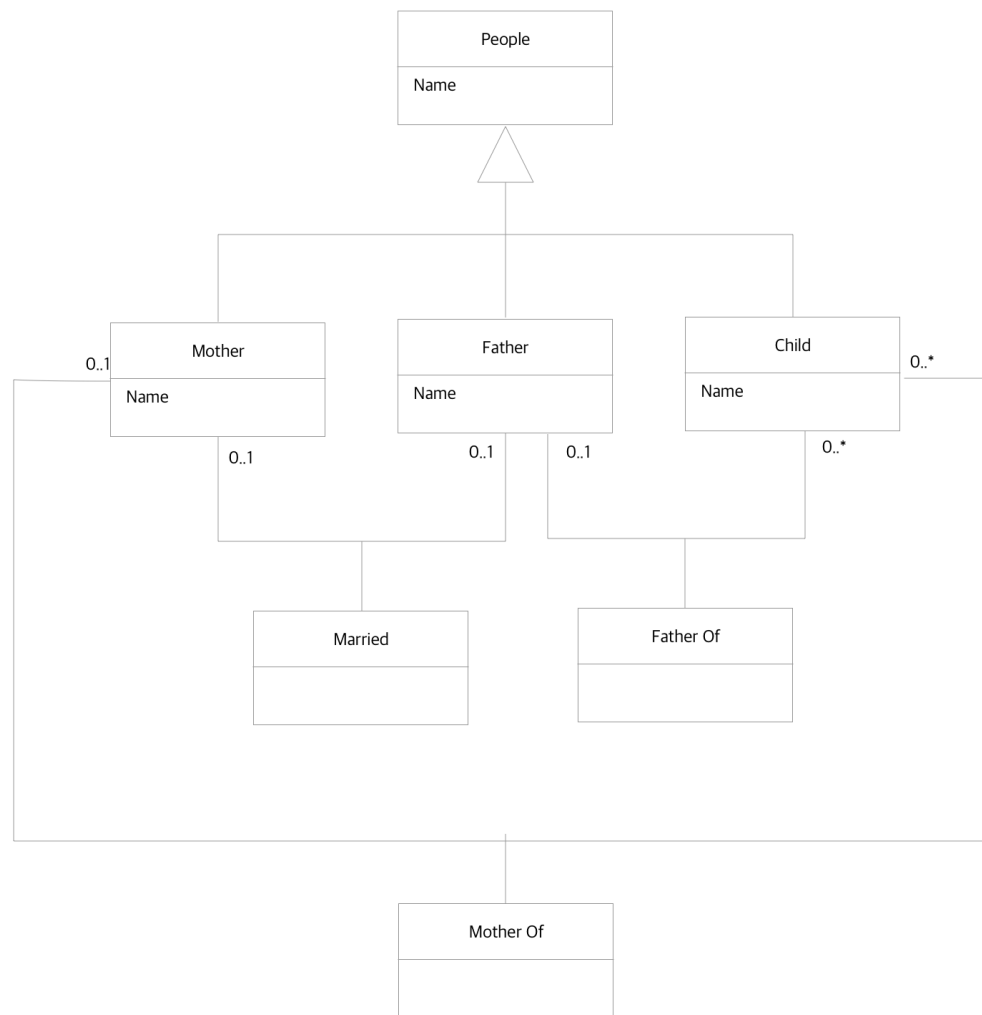
5.   • E/R Diagram
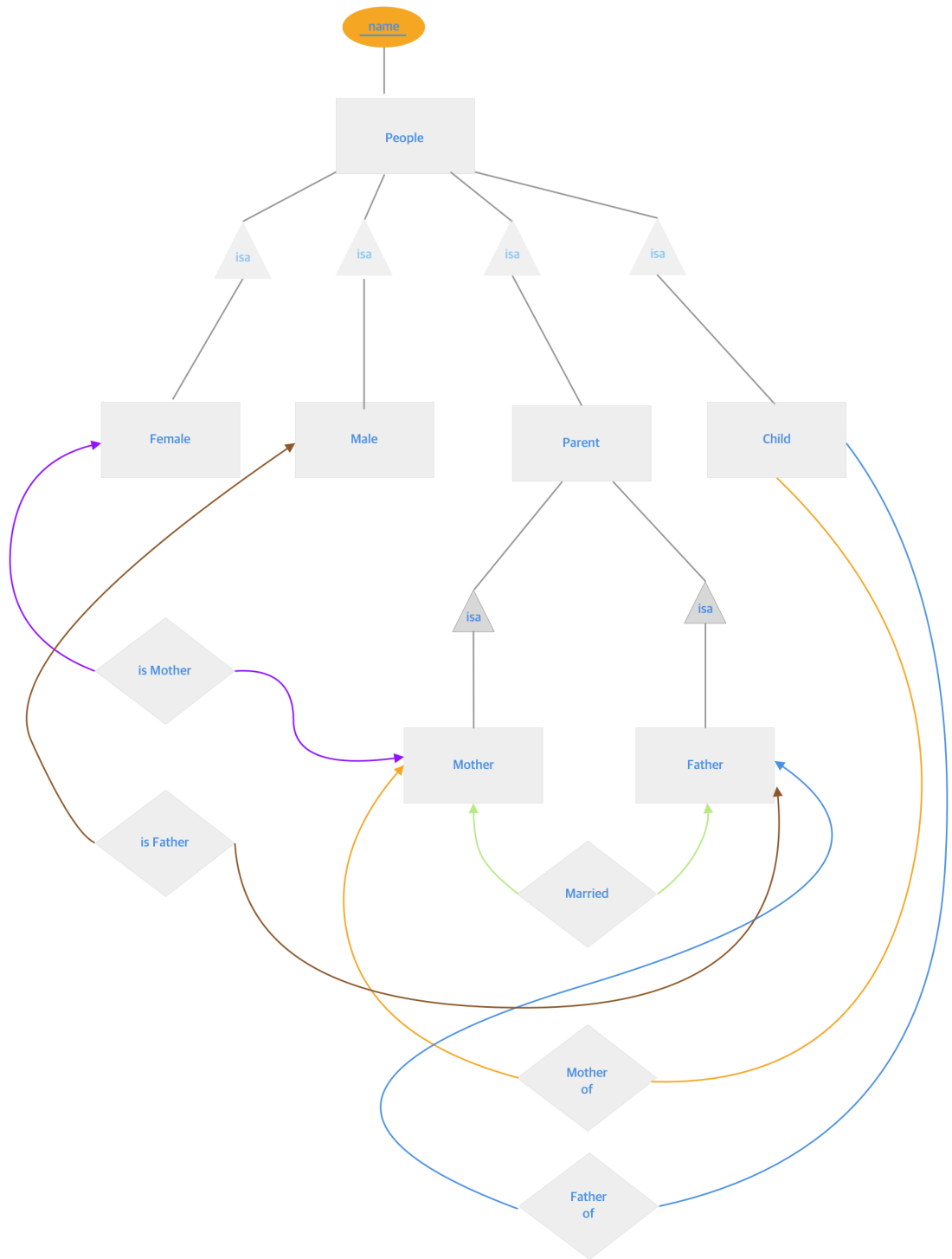
- UML
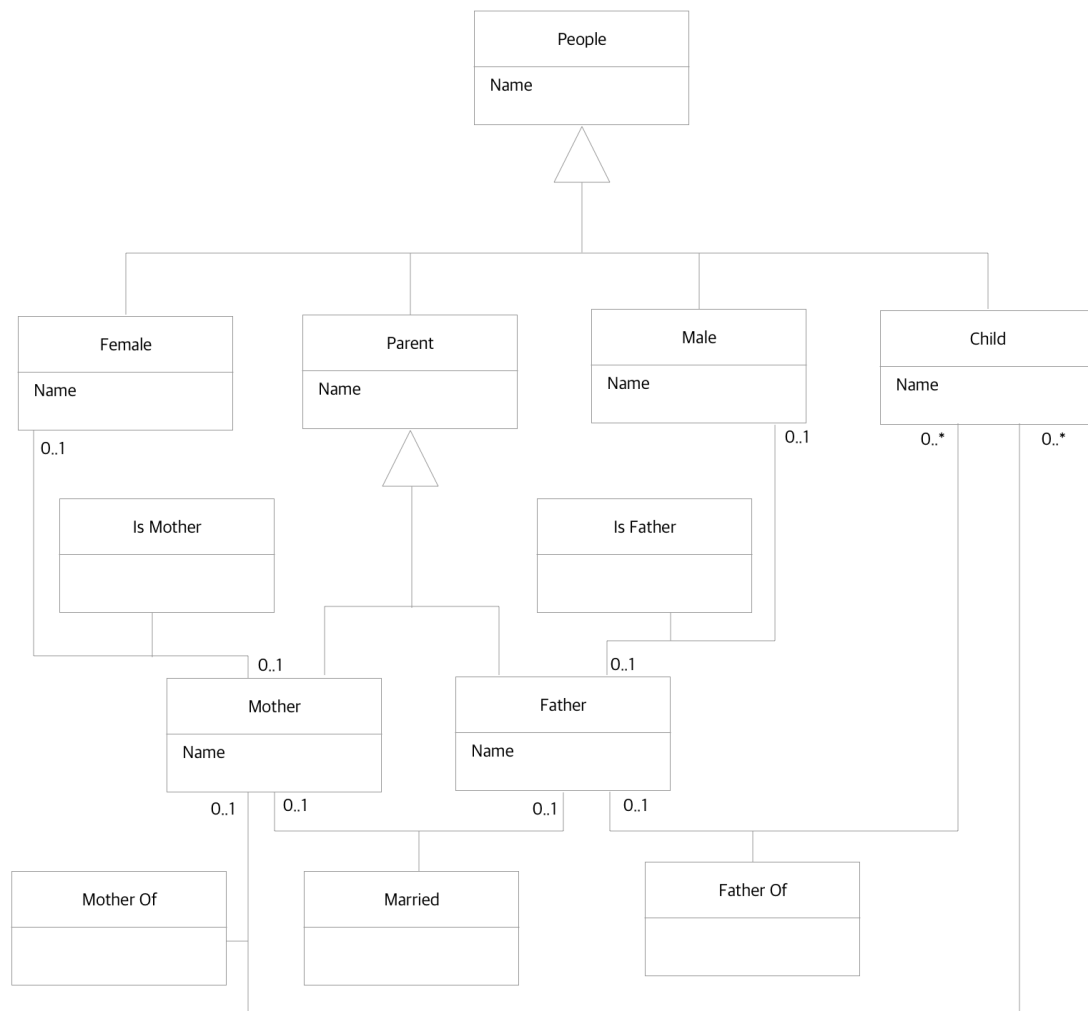
6. • E/R Diagram

- UML

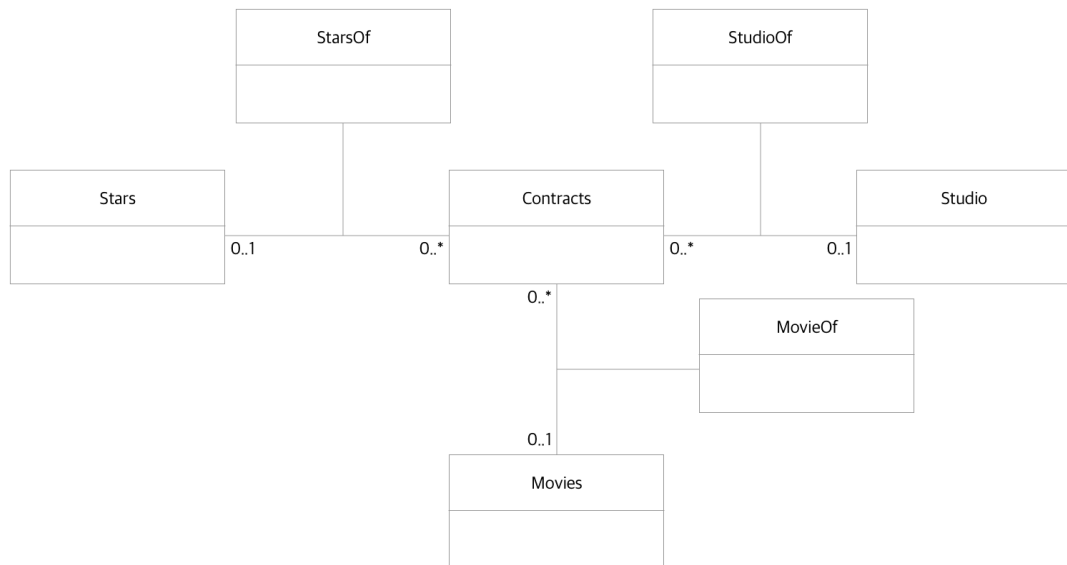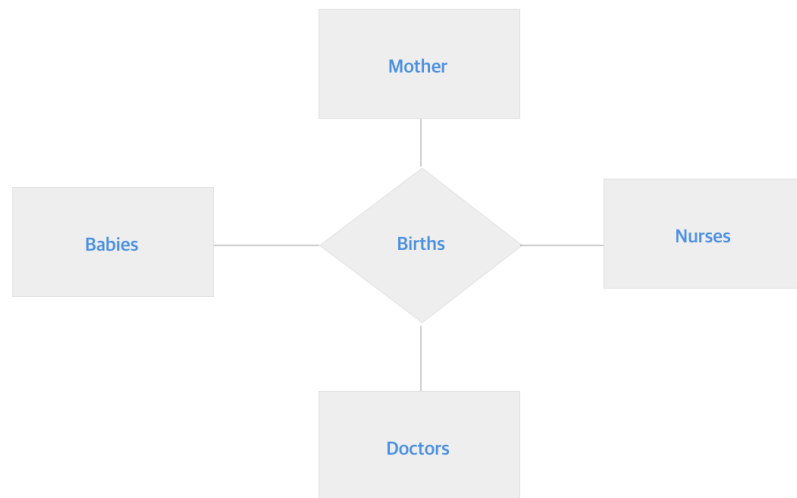7.   • E/R Diagram

• UML

Parent

Name   PK
yearLaunched

0..*   0..*

Sister Of

8.   • UML

StarsOf

StudioOf

Stars

Contracts

Studio

0..1   0..*   0..*   0..1
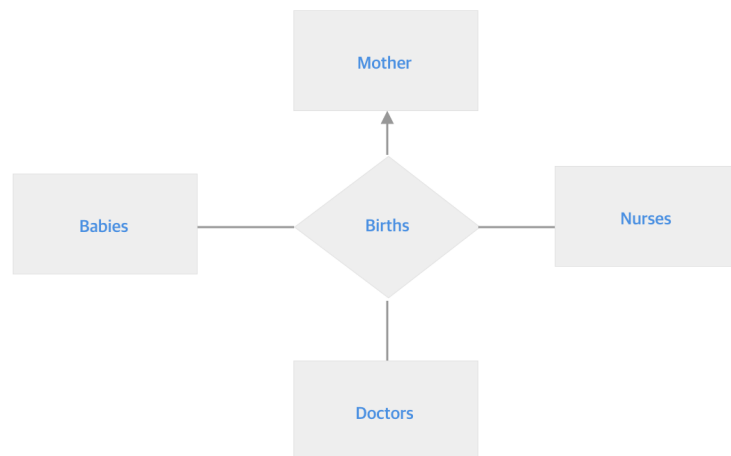
0..*

MovieOf

0..1

Movies
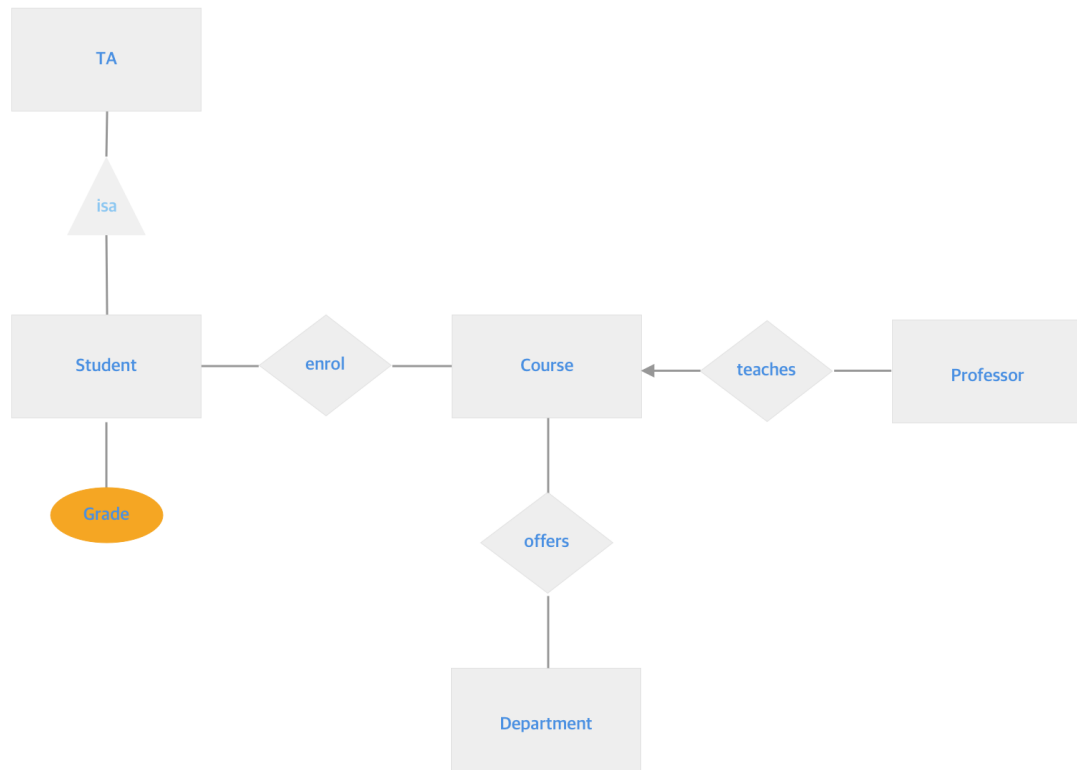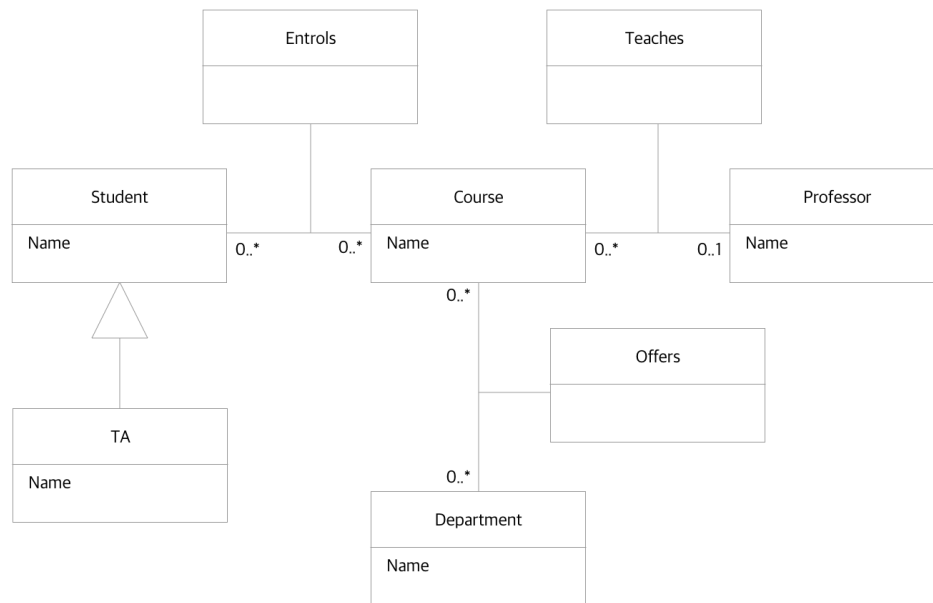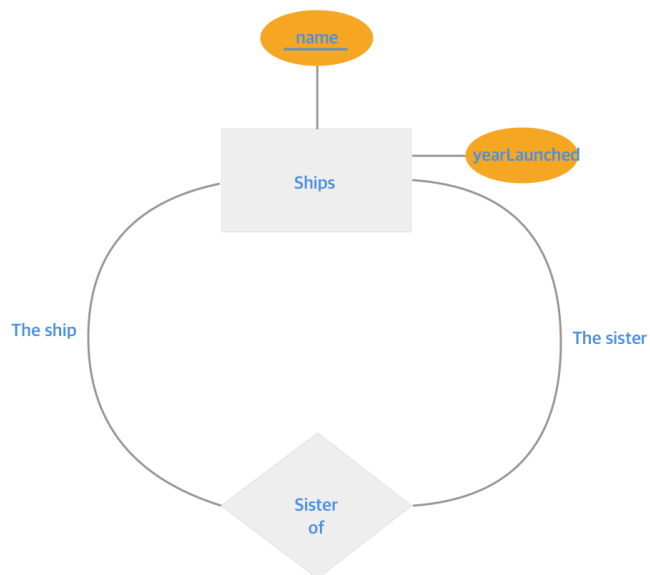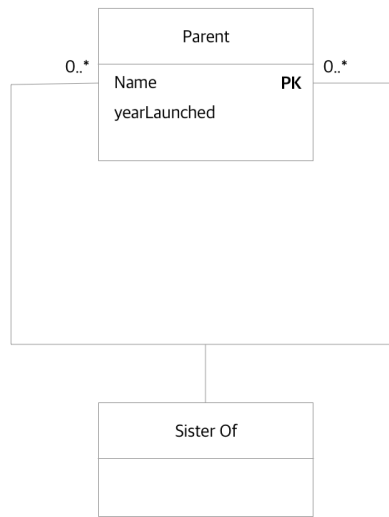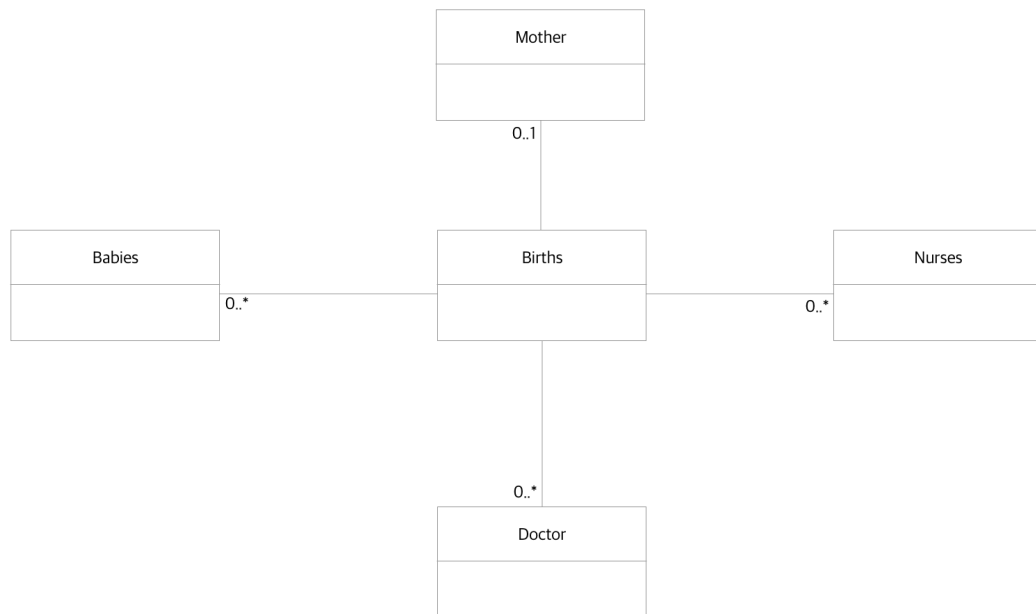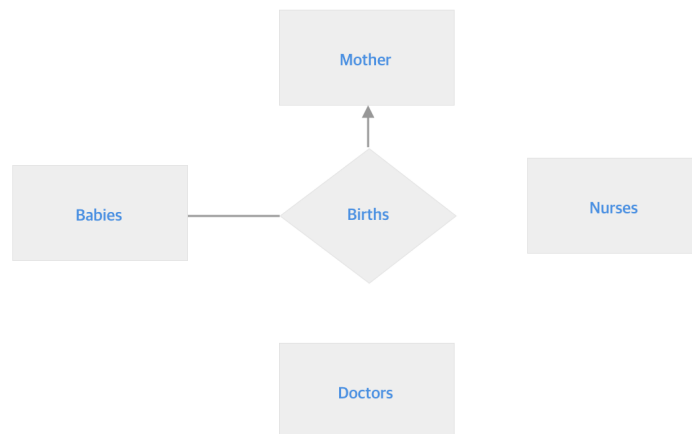
9.

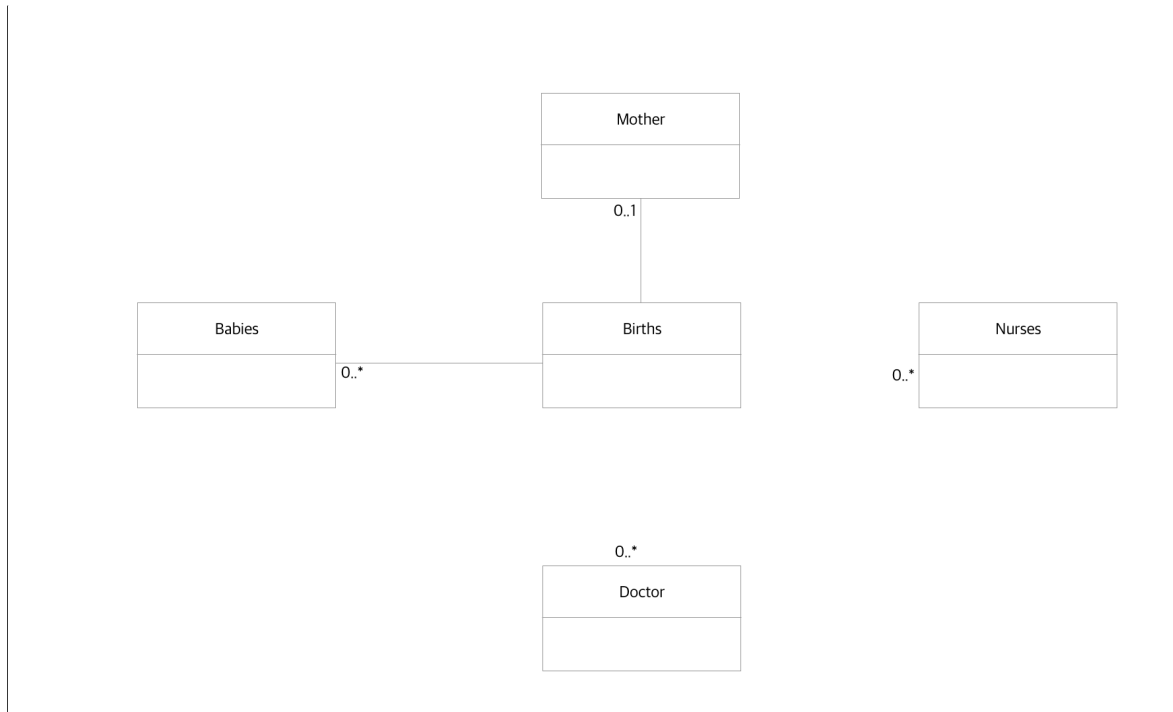   a) **<u>Solution:</u>**

      • E/R Model

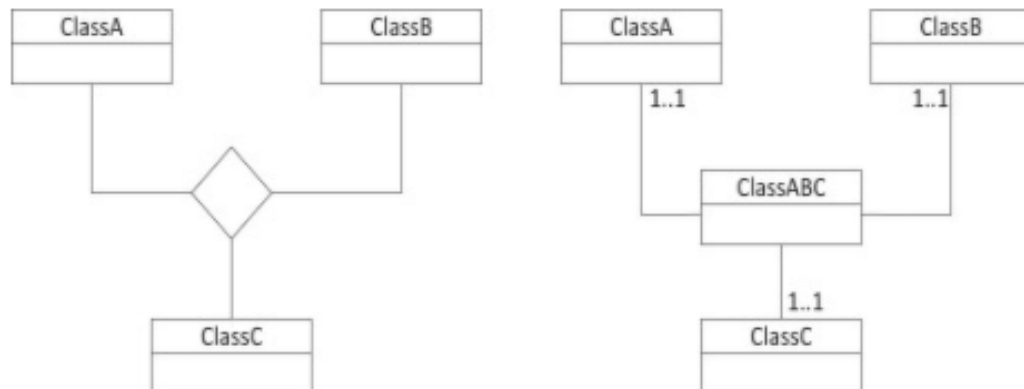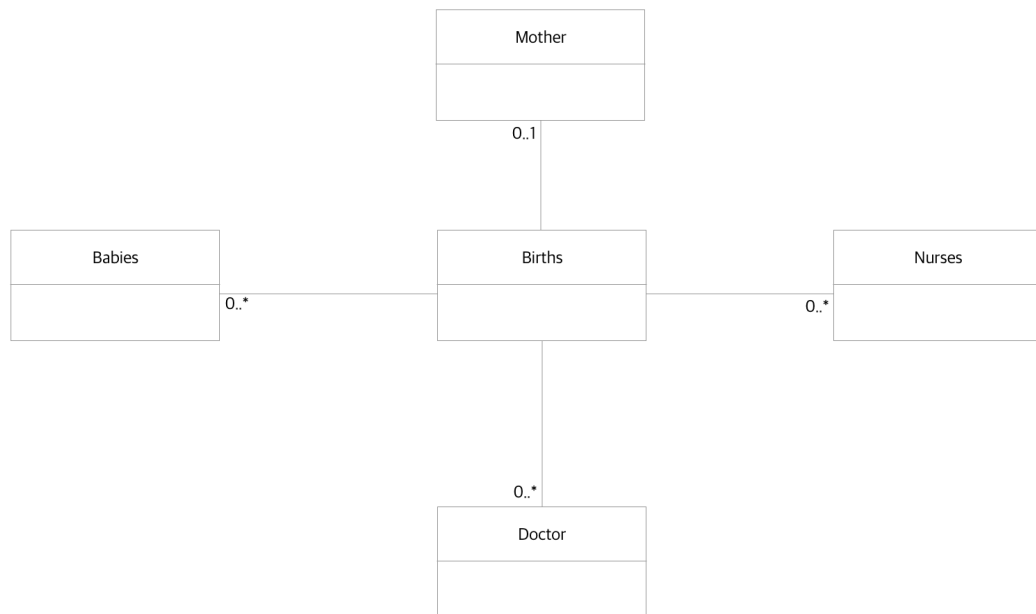   • UML

Correct Solution:
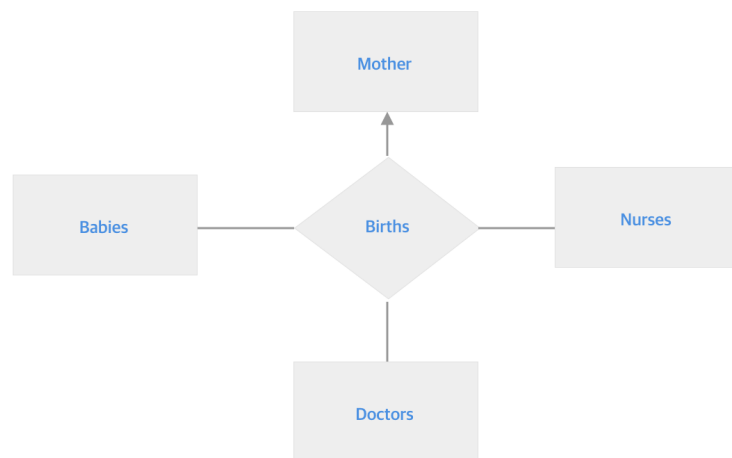
- E/R Model

- UML

Notes:

- An N-ary association is equivalent to one "central" class and N binary associations connecting the central class to the participant classes of the N-ary association
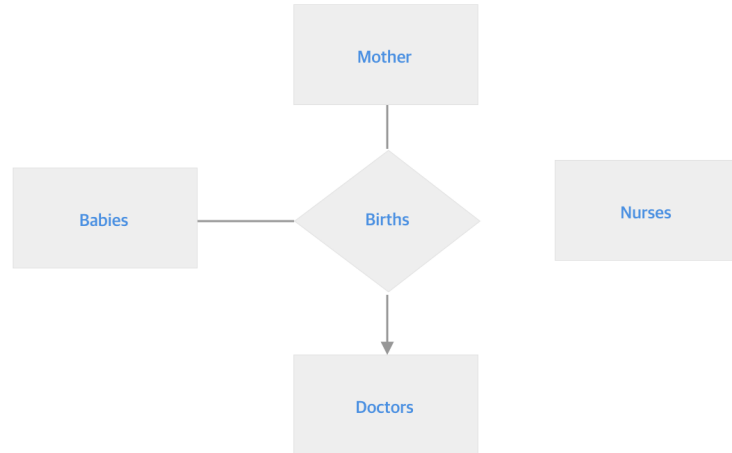

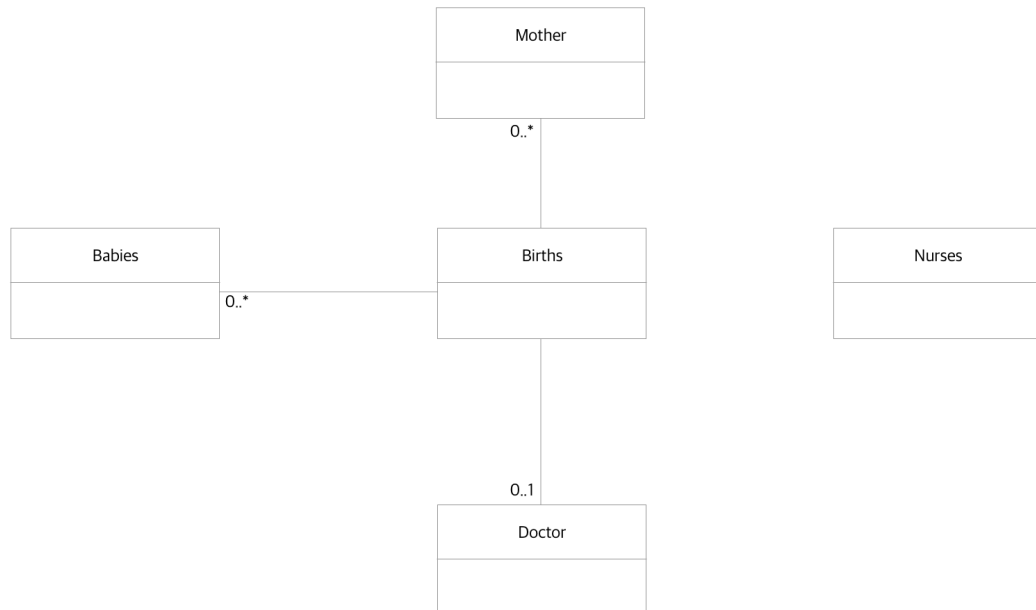b) **Solution:**

- E/R Model

- UML

c) **Solution:**

- E/R Model

```
                              ┌─────────┐
                              │ Mother  │
                              └─────────┘
                                   │
  ┌─────────┐              ◇───────────────◇          ┌─────────┐
  │ Babies  │──────────────│    Births     │          │ Nurses  │
  └─────────┘              ◇───────────────◇          └─────────┘
                                   │
                                   ▼
                              ┌─────────┐
                              │ Doctors │
                              └─────────┘
```

- UML

```
                              ┌─────────┐
                              │ Mother  │
                              ├─────────┤
                              │         │
                              └─────────┘
                                 0..*
                                   │
  ┌─────────┐              ┌─────────────┐          ┌─────────┐
  │ Babies  │              │   Births    │          │ Nurses  │
  ├─────────┤       0..*    ├─────────────┤          ├─────────┤
  │         │──────────────│             │          │         │
  └─────────┘              └─────────────┘          └─────────┘
                                   │
                                 0..1
                              ┌─────────┐
                              │ Doctor  │
                              ├─────────┤
                              │         │
                              └─────────┘
```

10. **Notes:**

   - Weak Entity sets in UML

   Example: