



ER to Relational schema

Conversion of ER diagram to Tables

Strong entity sets

Composite attributes

Multivalued attributes

Relationships sets

Weak entity sets



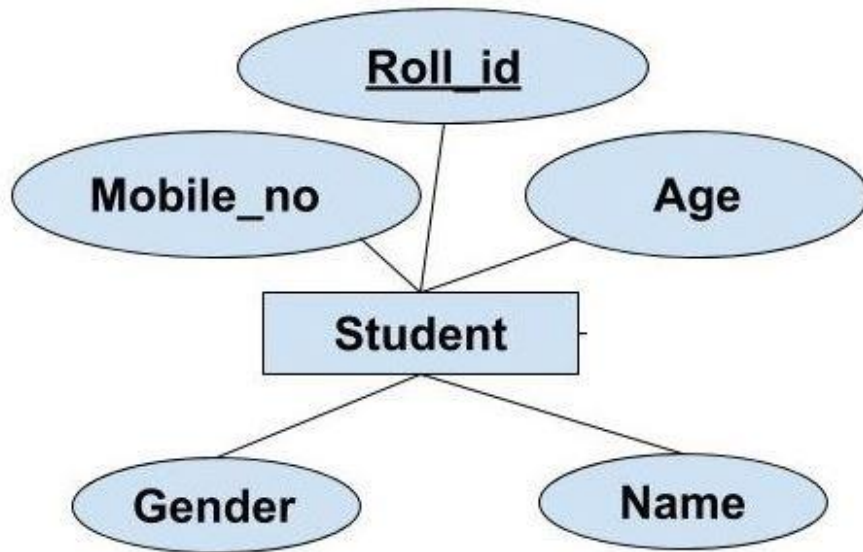
Components of conversion process

- Three components of conversion process: –
 - Specify schema of relation itself
 - Specify primary key on the relation
 - Specify any foreign key references to other relations

Strong entity sets

- Strong entity-set E with simple and single-valued attributes ($a_1, a_2, \dots a_n$)
- Create a relational schema with same name E, and same attributes.
- Primary key of relational schema is same as primary key of entity-set.
- No foreign key references for strong entity-sets

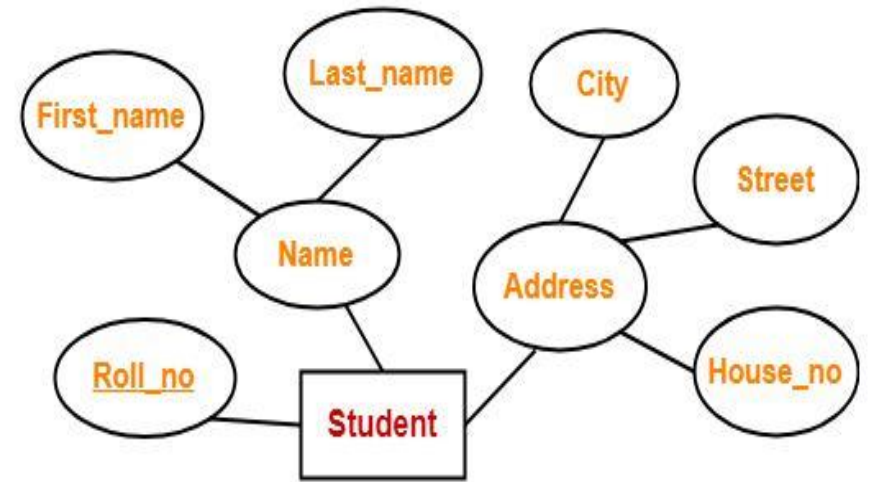
Strong entity sets to Table



Student Table

Roll_id	Name	Gender	Mobile_no	Age

Composite attribute to Table



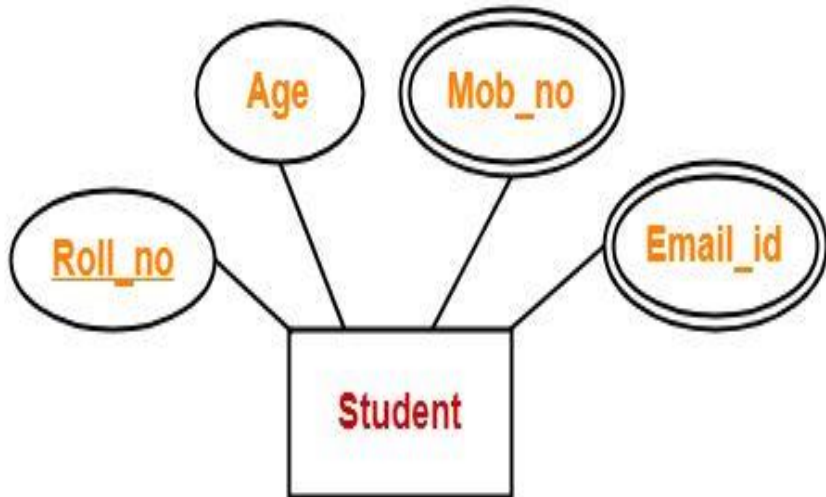
Student Table

Roll_no	First_name	Last_name	City	Street	House_no

Multivalued attribute

- Separate table for each multivalued attribute
- For multivalued attribute M in entity-set E
 - Create a relation schema R to store M, with attribute A (single valued) corresponding to M
 - Attributes of R are: A U primary_key (E)
 - Primary key of R includes all attributes of R
 - Foreign key constraint from R to E, on primary_key (E) attributes

Multivalued attribute to Table

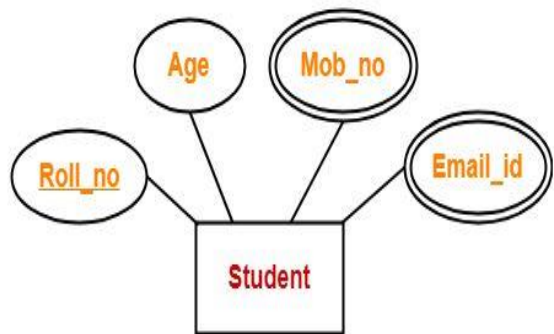


Rollno	AGE	MOB_NO	EMAILID
1	24	9877249515	Abhay@gmail.com
1	24	7877249515	NULL

WRONG SOLUTION RELATIONAL TABLE

SOLUTION 1

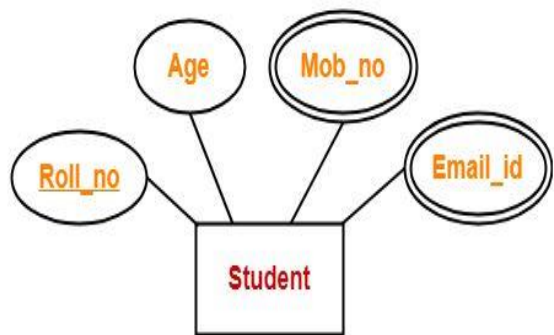
FIND A
STUDENT
WHOSE MOB
NO IS:
8877249515



Rollno	AGE	MOB_NO_1	MOB_NO_2	MOB_NO_3	EMAILID1	EMAILID2
1	24	9877249515	8877249515	9877242215	Abhay@gmail.com	Abhay@BENNETT.com
2	22	7877249515	NULL	NULL	ROHAN@gmail.com	NULL
3	21	7877249512	NULL	NULL	ROY@gmail.com	NULL
4	21	7877249511	NULL	NULL	KRISHIV@gmail.com	NULL
5	21	7877249522	NULL	NULL	NULL	NULL

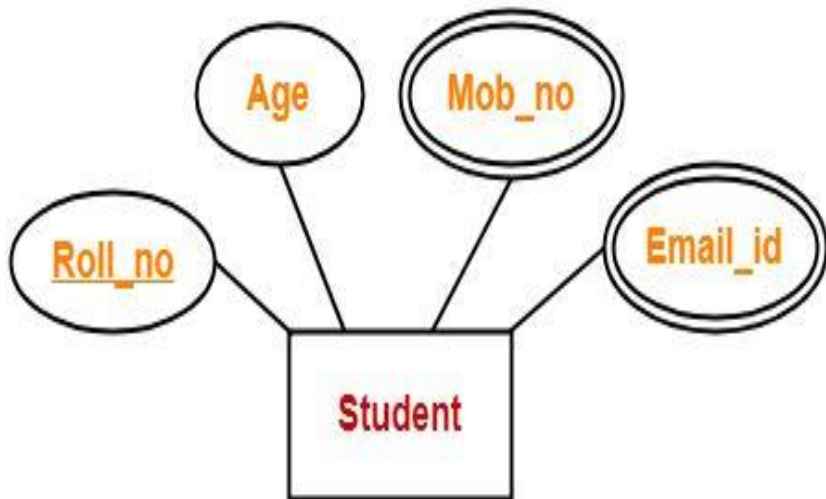
SOLUTION 2

SIMPLICITY IS LOST
WHILE
PERFORMING,
DELETE, UPDATE AND
SELECT



Rollno	AGE	MOB_NO_1	EMAILID1
1	24	9877249515, 8877249515, 9877242215	Abhay@gmail.com, Abhay@BENNETT.com
2	22	7877249515	ROHAN@gmail.com
3	21	7877249512	ROY@gmail.com
4	21	7877249511	KRISHIV@gmail.com
5	21	7877249522	NULL

Multivalued attribute to Table



Student Table

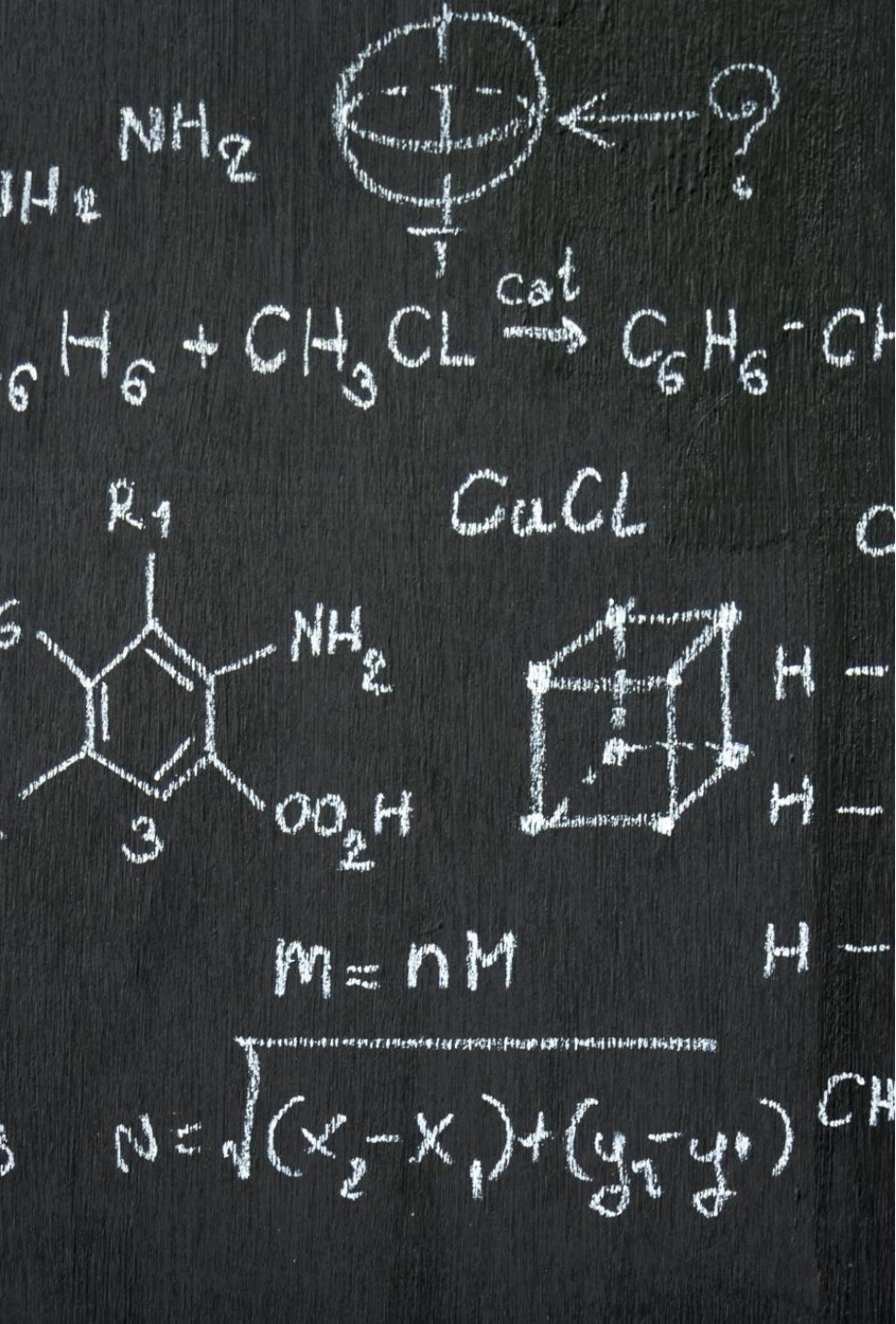
<u>Roll_no</u>	Age
1	
2	

Mobile Table

<u>Roll_no</u>	<u>Mob_no</u>
3	

Email Table

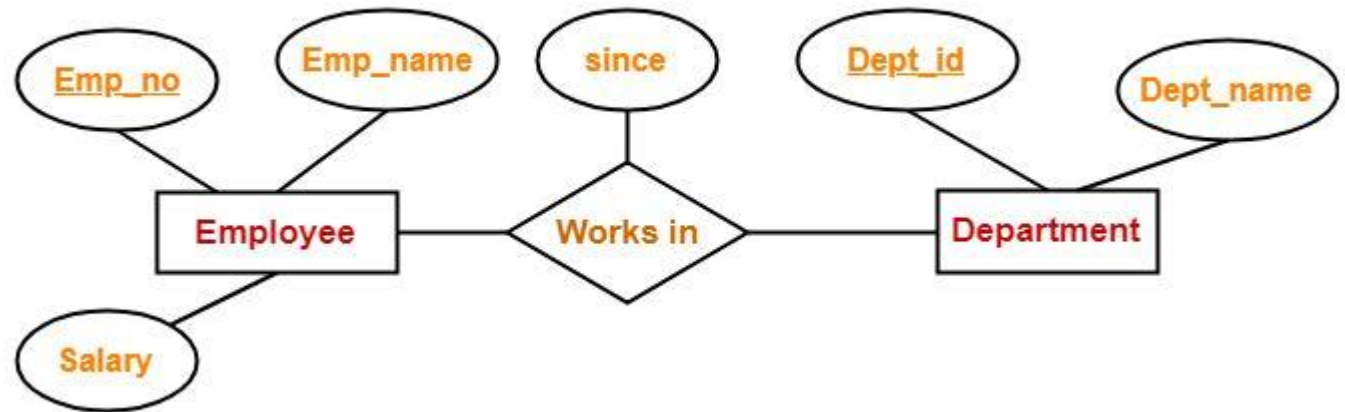
<u>Roll_no</u>	<u>Email_id</u>



Relationship set

- Relationship-set R
 - Assume all participating entity-sets are strong entity sets
 - a_1, a_2, \dots, a_m is the union of all participating entitysets' primary key attributes
 - b_1, b_2, \dots, b_n are descriptive attributes on R (if any)
- Relational schema for R is:
- $\{a_1, a_2, \dots, a_m\} \cup \{b_1, b_2, \dots, b_n\}$
 - Primary key of R depends on R's mapping cardinality

Relationship set to Table

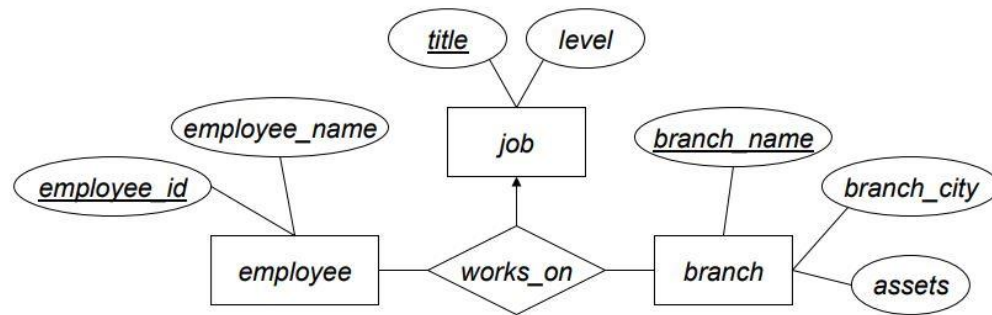


Works_in Table

<u>Emp_no</u>	<u>Dept_id</u>	since
1	2	

Task for students

Convert into relational
schema



Binary relationship with cardinality ratio

Case-01: Binary relationship with cardinality ratio $m:n$

Case-02: Binary relationship with cardinality ratio $n:1$

Case-03: Binary relationship with cardinality ratio $1:n$

Case-04: Binary relationship with cardinality ratio $1:1$

Case-01: Binary relationship with cardinality ratio m:n

- **Tables:**

- **Table 1**

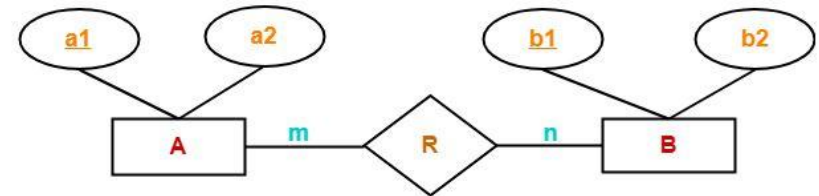
- A (a1, a2)

- **Table 2**

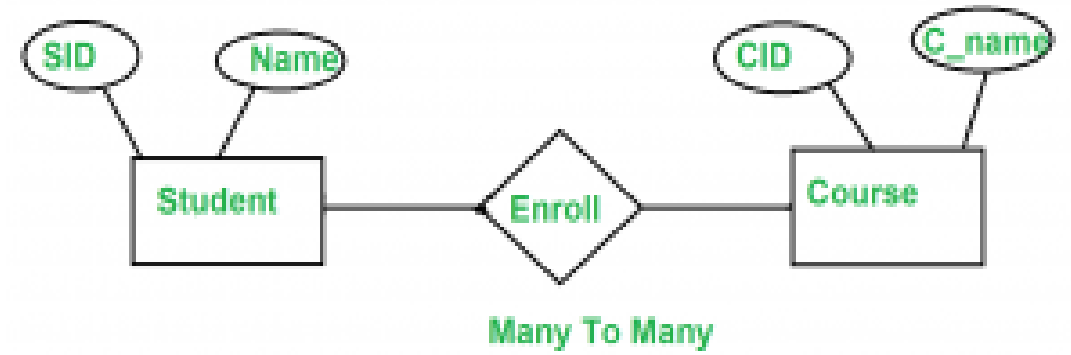
- B (b1, b2)

- **Table 3**

- R(a1, b1)



Example on cardinality ratio m:n



Student Table

<u>SID</u>	Name
S1	Ram
S2	David
S3	Mohan
S4	Shyam
S5	John

Enroll Table

<u>SID</u>	CID
S1	C1
S2	C1
S3	C2
S1	C2
S5	C1

Courses Table

<u>CID</u>	C_name
C1	DBMS
C2	OS

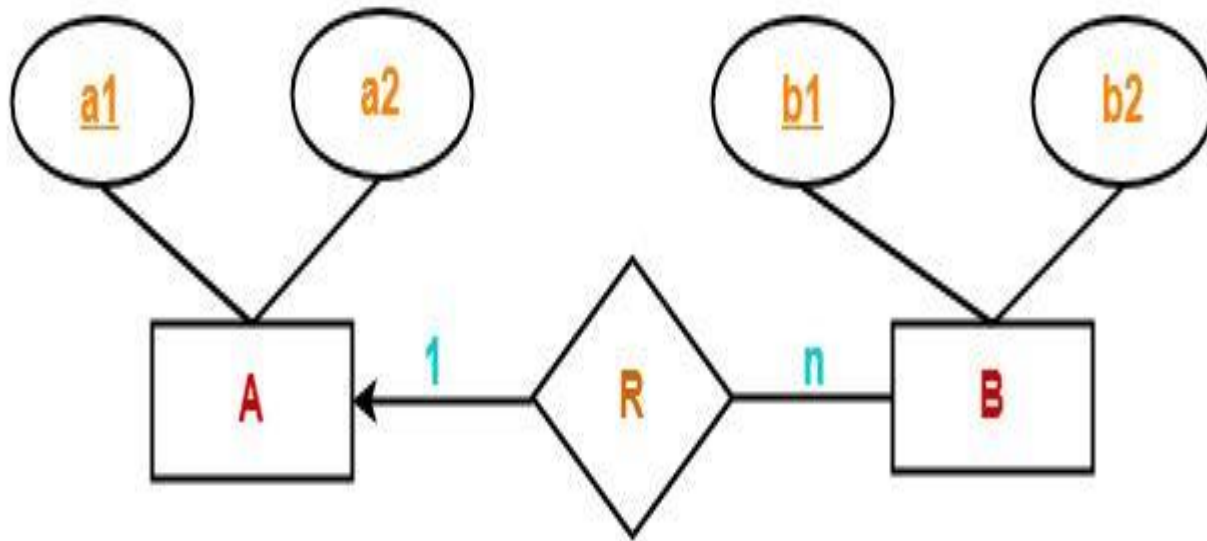
After minimization of Tables

Student (SID, Name)

Enroll (SID, CID)

Course (CID, C_name)

Case-02: Binary relationship with cardinality ratio 1:n



Tables:

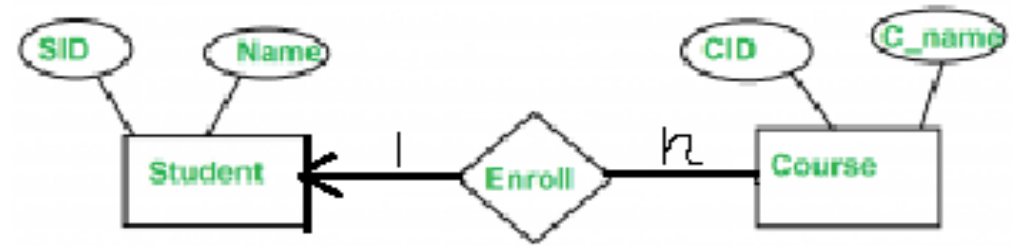
Table 1

A ($a1$, $a2$)

Table 2

BR ($a1$, $b1$, $b2$)

Example on cardinality ratio 1:n



Student Table

<u>SID</u>	Name
S1	Ram
S2	David
S3	Mohan
S4	Shyam
S5	John

Enrolls Table

<u>SID</u>	CID
S1	C1
S2	C3
S1	C2
S2	C4
S3	C5

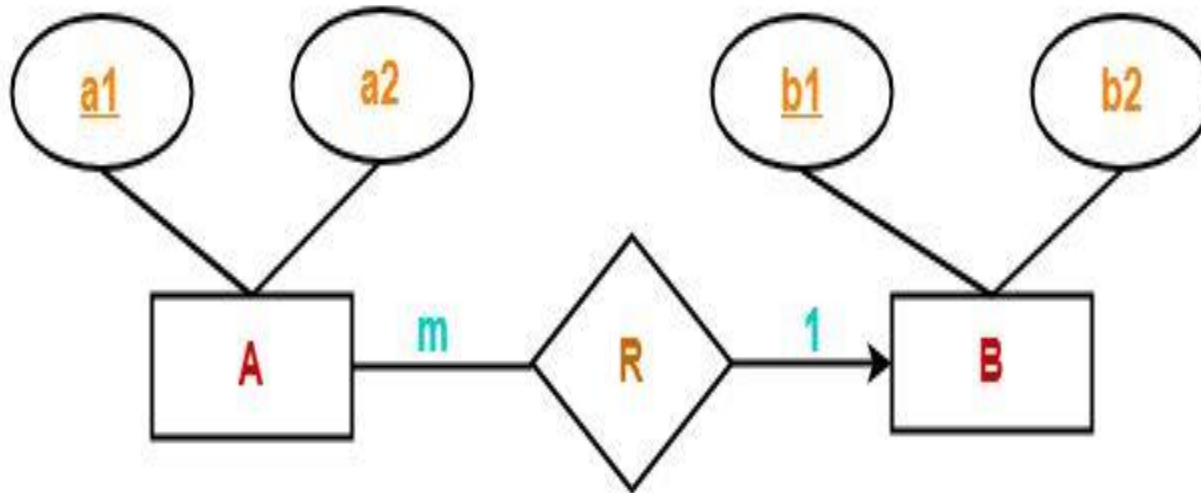
Courses Table

<u>CID</u>	C_name
C1	DBMS
C2	OS
C3	DS
C4	NS
C5	IMS

After minimization of Tables

Students (SID, Name)
Course_Enroll (CID, SID, C_name)

Case-03: Binary relationship with cardinality ratio m:1



Tables:

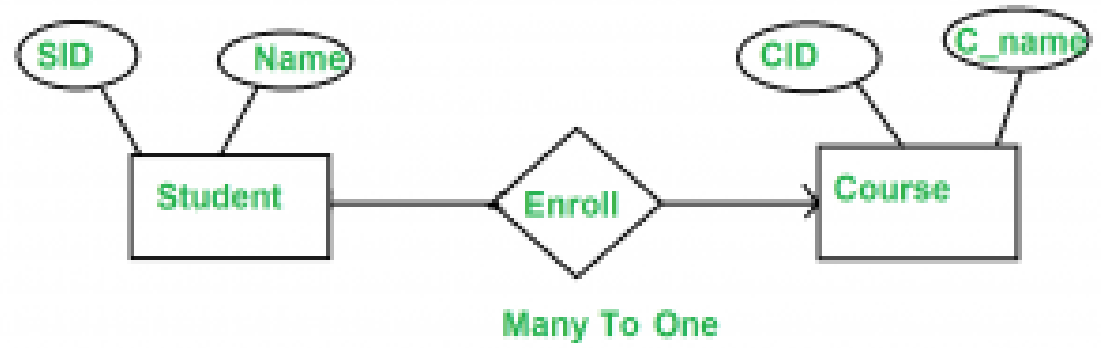
Table 1

AR (a1, b1, a2)

Table 2

B (b1, b2)

Example on cardinality ratio m:1



Student Table

<u>SID</u>	Name
S1	Ram
S2	David
S3	Mohan
S4	Shyam
S5	John

Enroll Table

<u>SID</u>	CID
S1	C1
S2	C1
S3	C2
S4	C1
S5	C2

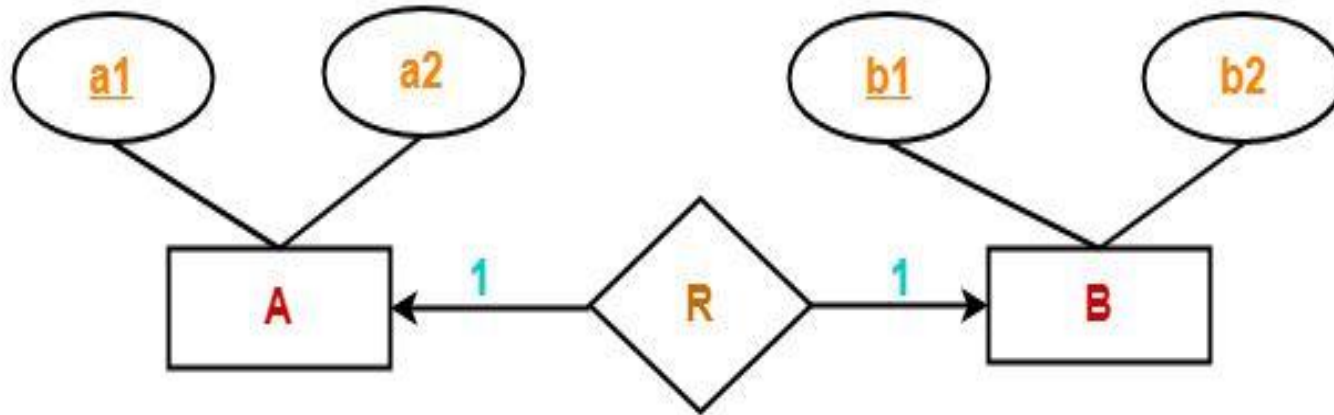
Course Table

<u>CID</u>	C_name
C1	DBMS
C2	OS

After minimization of Tables

Student_Enroll (SID, CID, Name)
Course (CID, C_name)

Case-04: Binary relationship with cardinality ratio 1:1



Tables:

Table 1

AR (a1, b1, a2)

Table 2

B (b1, b2)

Or

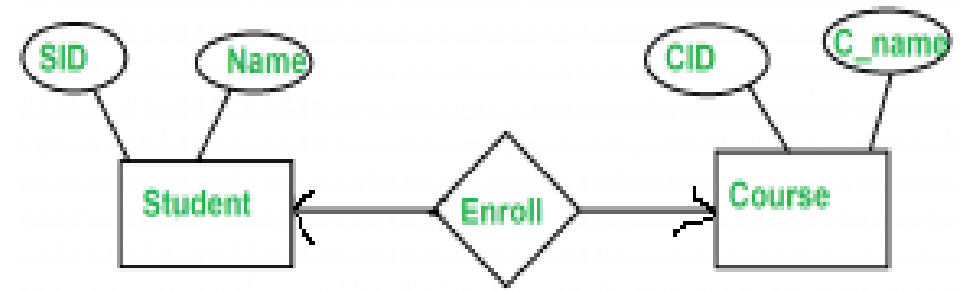
Table 1

A (a1, a2)

Table 2

BR (a1, b1, b2)

Example on cardinality ratio 1:1



Student Table

<u>SID</u>	Name
S1	Ram
S2	David
S3	Mohan
S4	Shyam
S5	John

Enroll Table

<u>SID</u>	CID
S1	C1
S2	C3
S3	C2
S4	C5
S5	C4

Course Table

<u>CID</u>	C_name
C1	DBMS
C2	OS
C3	DS
C4	NS
C5	IMS

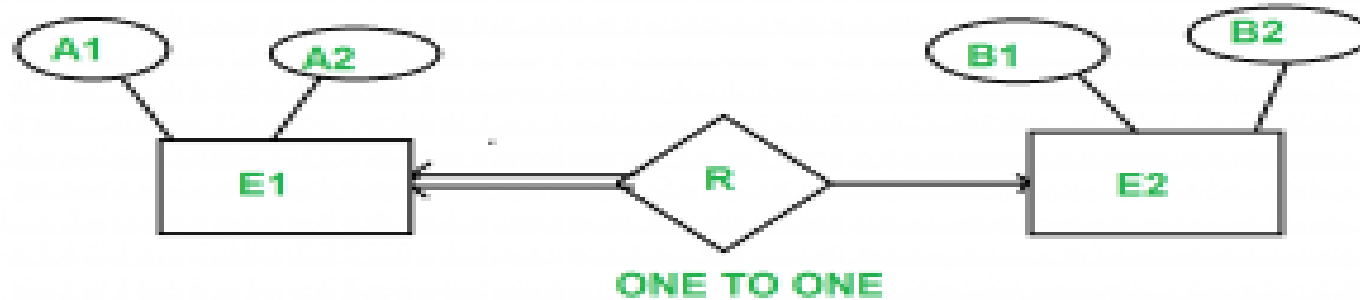
After minimization of Tables

Student_Enroll (SID, CID, Name)
Course (CID, C_name)

Or

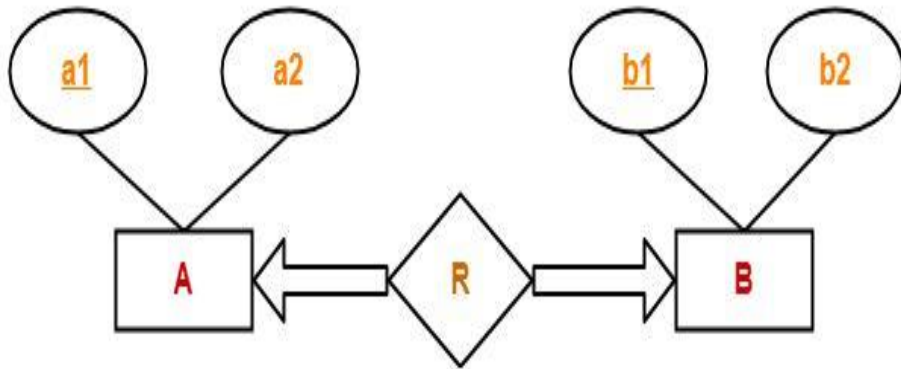
Student (SID, Name)
Course_Enroll (CID, SID C_name)

One to One relationship with total participation at one end



- A1 and B1 are primary keys of E1 and E2 respectively.
- Since E1 is in total participation, each entry in E1 is related to only one entry in E2, but not all entries in E2 are related to an entry in E1.
- The primary key of E1 should be allowed as the primary key of the reduced table, since if the primary key of E2 is used, it might have null values for many of its entries in the reduced table.

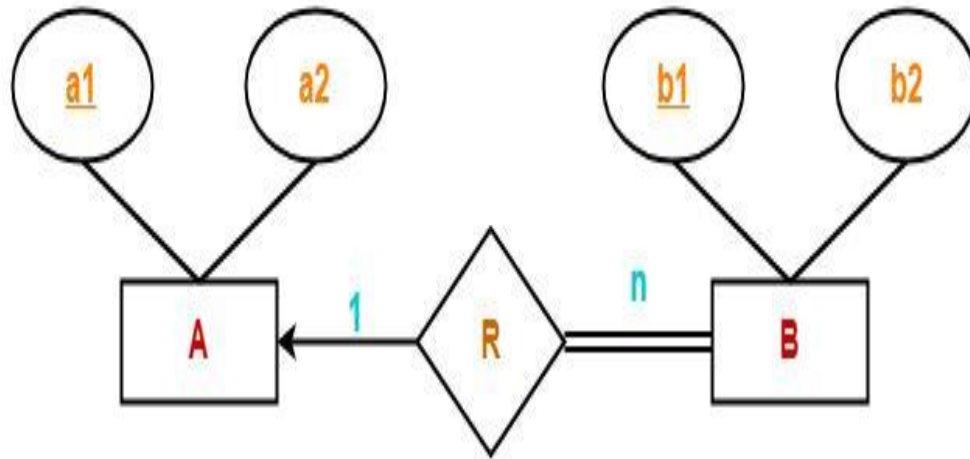
One to One relationship with total participation at both end



Only one table is required.

- ARB (a1 , a2 , b1 , b2)

one to many relationship with total participation at many end



- Weak entity set always appears in association with identifying relationship with total participation constraint
- Here, two tables will be required-
 - 1.A (a1 , a2)
 - 2.BR (a1 , b1 , b2)

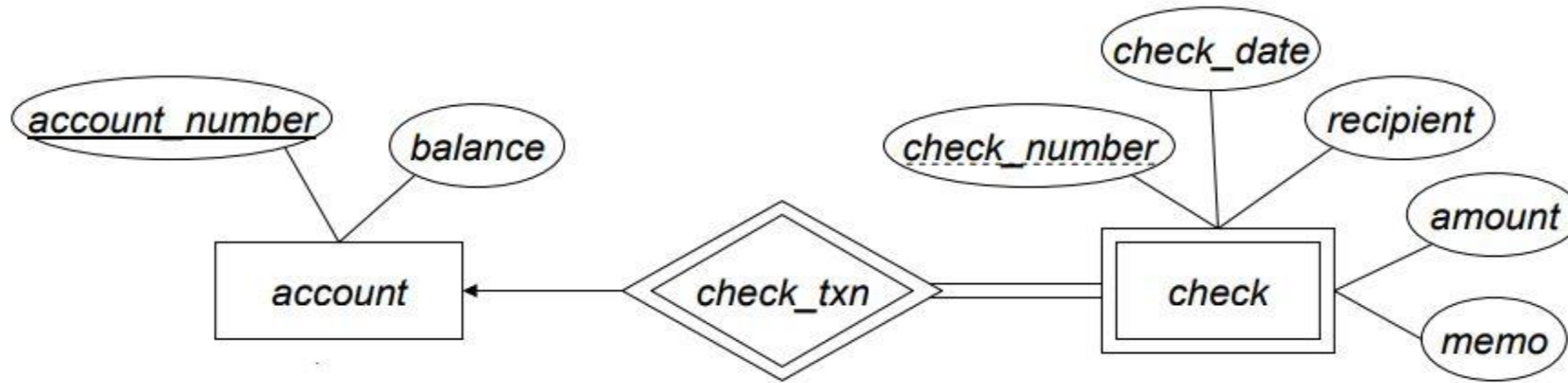
Weak entity set

- Weak entity-sets depend on at least one strong entity-set
 - Identifying entity-set, or owner entity-set
 - Relationship between the two called the identifying relationship
- Weak entity-set A owned by strong entity-set B
 - Attributes of A are $\{ a_1, a_2, \dots, a_m \}$
 - $\text{primary_key} (B) = \{ b_1, b_2, \dots, b_n \}$
 - Relational schema for A: $\{ a_1, a_2, \dots, a_m \} \cup \{ b_1, b_2, \dots, b_n \}$
 - Primary key of A is $\text{discriminator}(A) \cup \text{primary_key} (B)$
 - A has foreign key constraint on $\text{primary_key} (B)$

Identifying Relationship

- Identifying relationship is many-to-one, with no descriptive attributes
- Relational schema for weak entity-set includes primary key for strong entity-set
 - Foreign key constraint imposed, too
 - No need to create relational schema for identifying relationship.

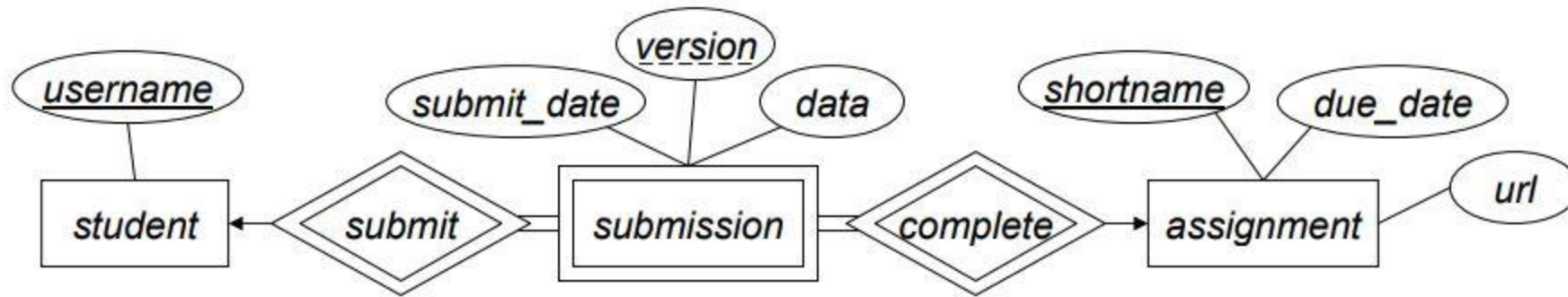
Weak entity set to table



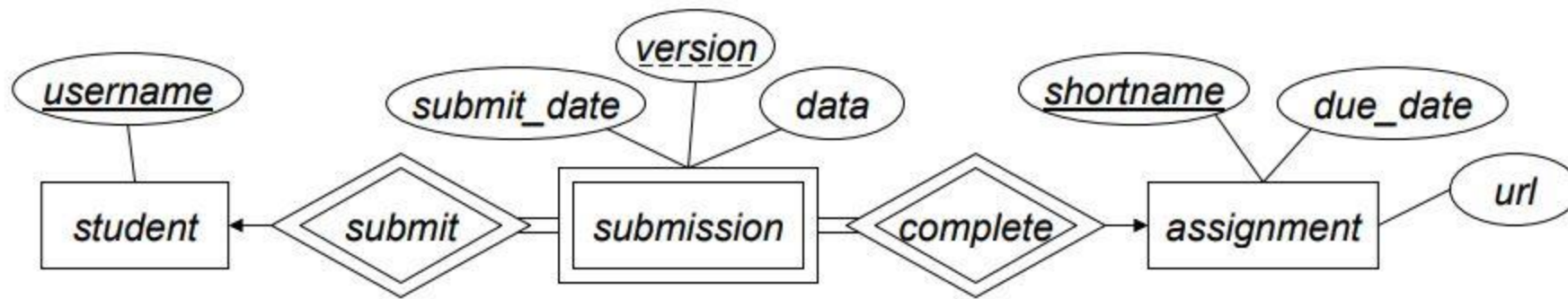
account (account number, balance)

check (check number, check_date, recipient, amount, memo)

Weak entity set to table contd...



Weak entity set to table contd...



student (username)

assignment (shortname, *due_date*, *url*)

submission (username, version, shortname, *submit_date*, *data*)

MCQ

What is the min and max number of tables required to convert an ER diagram with 2 entities and 1 relationship between them with partial participation constraints of both entities?

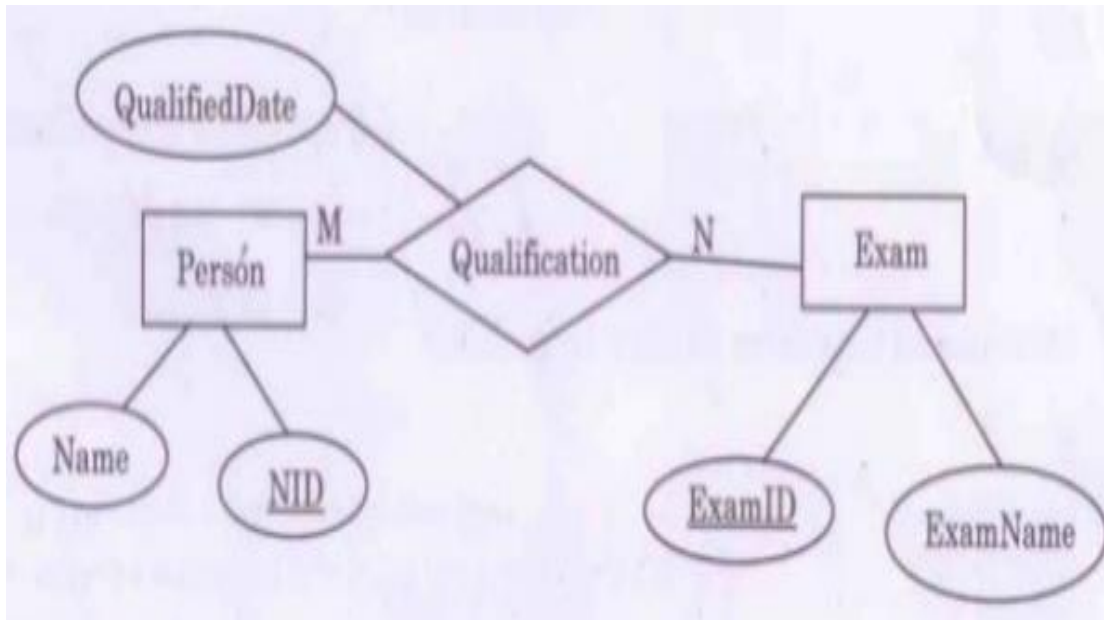
- Min 1 and Max 2
- Min 1 and Max 3
- Min 2 and Max 3
- Min 2 and Max 2

MCQ

What is the min and max number of tables required to convert an ER diagram with 2 entities and 1 relationship between them with partial participation constraints of both entities?

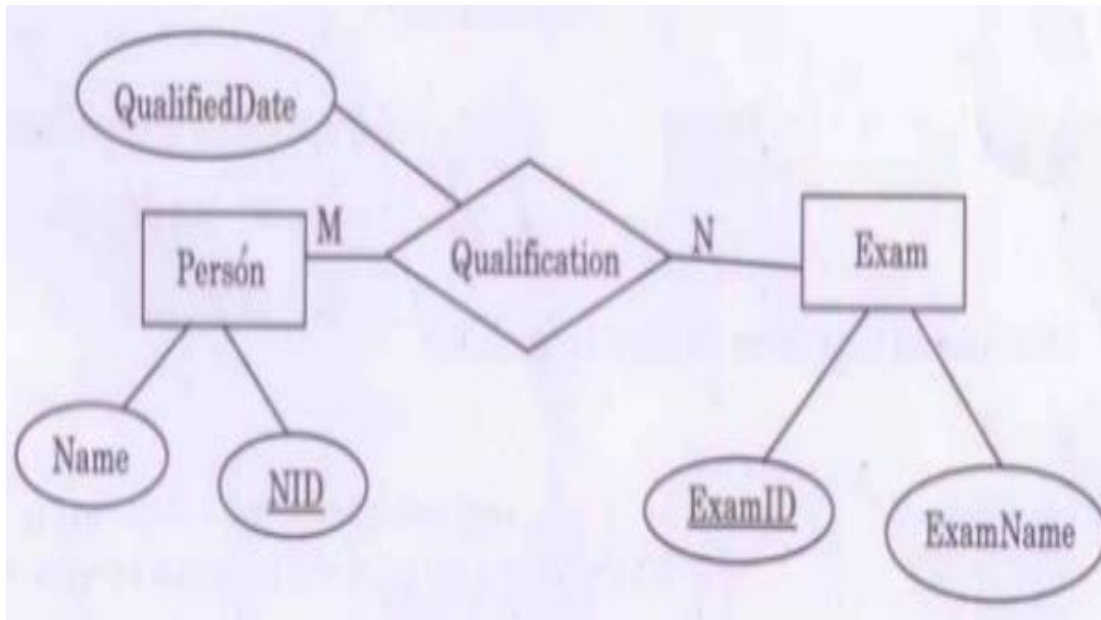
- Min 1 and Max 2
- Min 1 and Max 3
- **Min 2 and Max 3**
- Min 2 and Max 2

MCQ



- Which of the following possible relations will not hold if the ERD is mapped into a relation model?
 - Person (NID, Name)
 - Qualification (NID, ExamID, QualifiedDate)
 - Exam (ExamID, NID, ExamName)

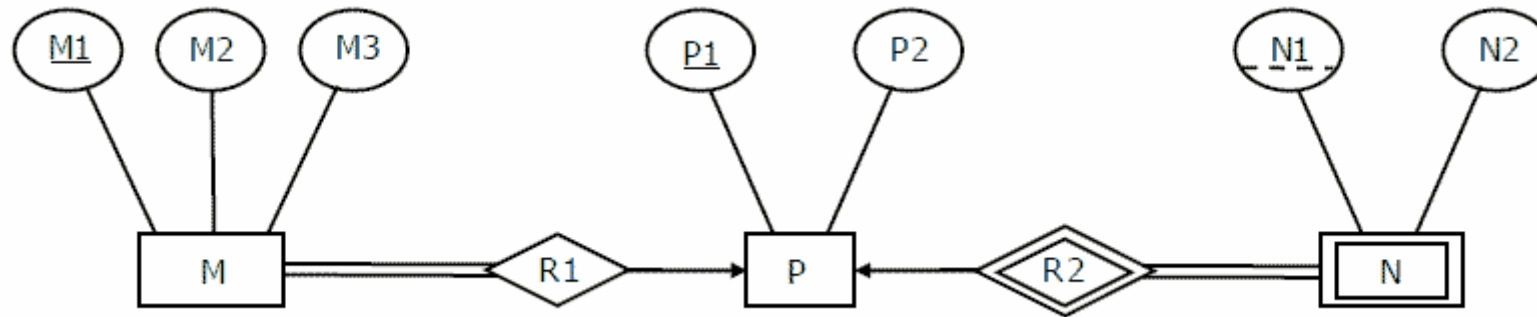
MCQ



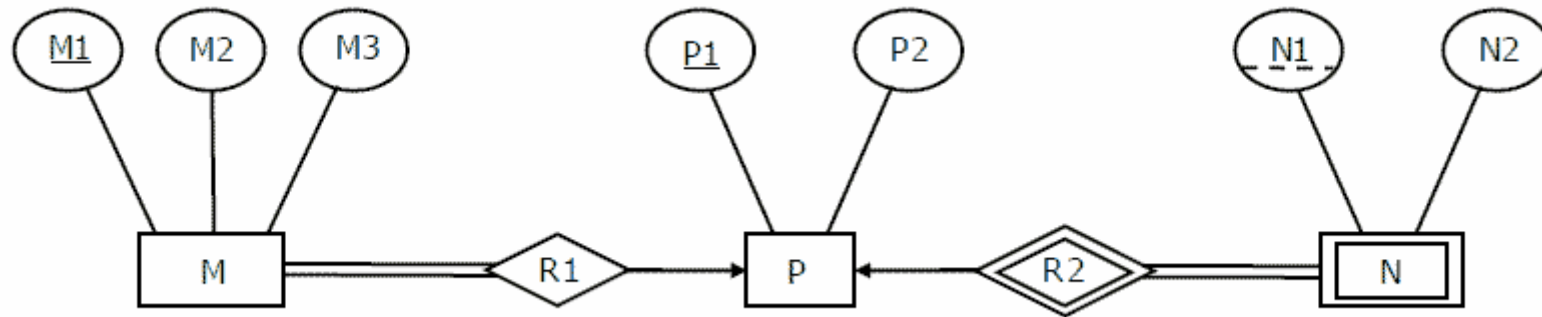
Which of the following possible relations will not hold if the ERD is mapped into a relation model?

- Person (NID, Name)
- Qualification (NID, ExamID, QualifiedDate)
- **Exam (ExamID, NID, ExamName)**

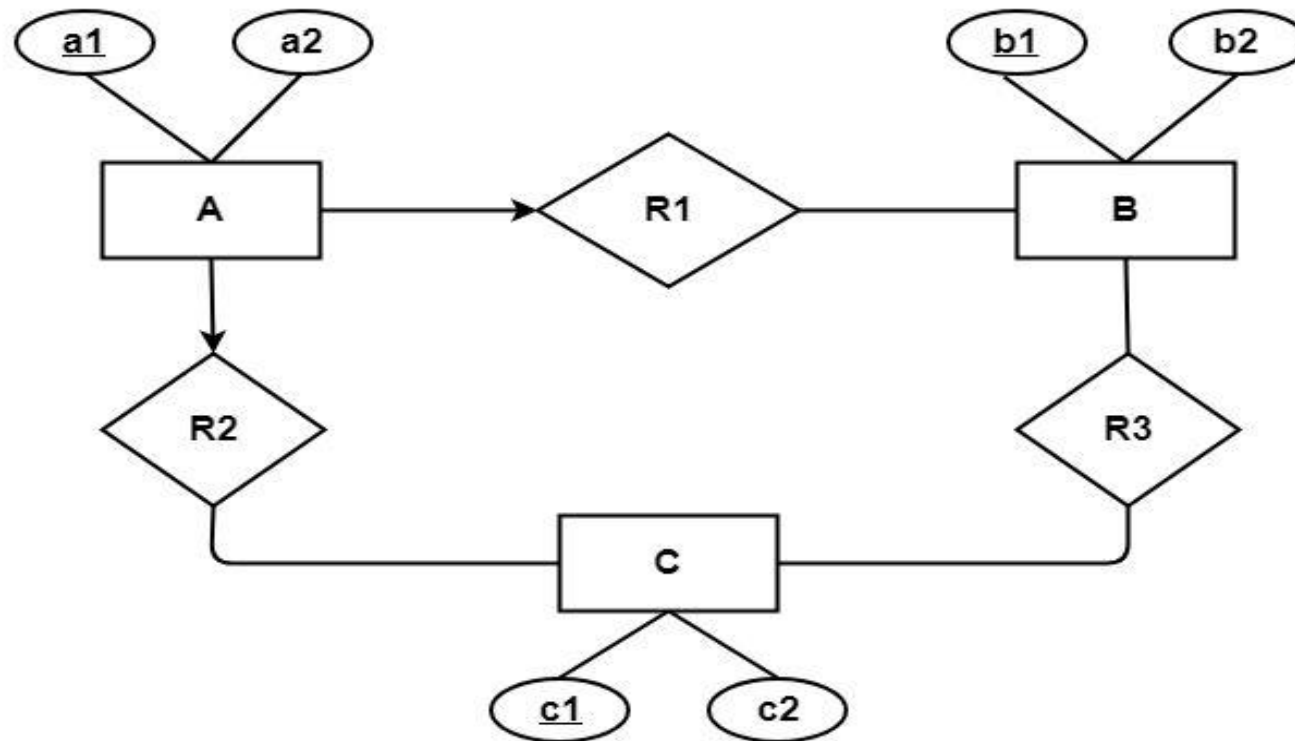
Over to You



- Minimum number of tables needed to represent the entity relationship diagram is _____.



- Find the attribute sets of the minimized table.



- Find the minimum number of tables required to represent the given ER diagram in relational model

- <https://www.gatevidyalay.com/er-diagrams-to-tables-practice-problems/>
- <https://www.gatevidyalay.com/er-diagrams-to-tables-practice-problems/>
- <http://homepages.inf.ed.ac.uk/libkin/teach/dbs14/ER-lecture.pdf>
- <https://www.geeksforgeeks.org/mapping-from-er-model-to-relational-model/>