



Prifysgol Cymru
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University of Wales
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200
1822 - 2022

Relational Keys

Man Geni Addysg Uwch yng Nghymru
Where Higher Education Began in Wales

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Objectives

- Relational Keys
- Constraints
- ERD to relational table- mapping

Relational data model

- based on the concept of mathematical relations.
- In the relational model, data and relationships are represented as tables, each of which has a number of columns with a unique name.

The diagram illustrates a table in the relational model. Above the table, the word "Attributes" is centered, with four arrows pointing down to the column headers: "branchNo", "street", "city", and "postcode". To the left of the table, the word "Branch" is positioned, with a vertical double-headed arrow indicating the rows. To the right of the table, the word "Cardinality" is written vertically, with a vertical double-headed arrow indicating the height of the table.

branchNo	street	city	postcode
B005	22 Deer Rd	London	SW1 4EH
B007	16 Argyll St	Aberdeen	AB2 3SU
B003	163 Main St	Glasgow	G11 9QX
B004	32 Manse Rd	Bristol	BS99 1NZ
B002	56 Clover Dr	London	NW10 6EU

Domain

- A domain is the set of allowable values for one or more attributes.

Attribute	Domain Name	Meaning	Domain Definition
branchNo	BranchNumbers	The set of all possible branch numbers	character: size 4, range B001–B999
street	StreetNames	The set of all street names in Britain	character: size 25
city	CityNames	The set of all city names in Britain	character: size 15
postcode	Postcodes	The set of all postcodes in Britain	character: size 8
sex	Sex	The sex of a person	character: size 1, value M or F
DOB	DatesOfBirth	Possible values of staff birth dates	date, range from 1-Jan-20, format dd-mmm-yy
salary	Salaries	Possible values of staff salaries	monetary: 7 digits, range 6000.00–40000.00

Figure 4.2

Domains for some attributes of the Branch and Staff relations.

Keys

- Candidate Key
 - Minimal set of attributes that uniquely identifies each occurrence of an entity type.
- Primary Key
 - Candidate key selected to uniquely identify each occurrence of an entity type.

Employee

EMP_NI	Emp_id	Emp_name	<u>Emp_email</u>
41201	1	Carl	carl@email.com
98653	2	Riddle	riddle@email.com
47652	3	Mary	mark@email.com
46378	4	John	john@email.com

Rules for defining Primary key:

- Two rows can't have the same primary key value
- It's must for every row to have a primary key value.
- The primary key field cannot be null.
- The value in a primary key column can never be modified or updated if any foreign key refers to that primary key.

Keys

Order

Identify the following keys from this Order table

- Candidate Key?
- Primary Key?

OrderID	CustomerID	OrderDate	Invoice Number	ShippingAddress
301	501	2023-10-15	12345	123 Main St, City1
302	502	2023-10-16	54321	456 Elm St, City2
303	503	2023-10-17	98765	789 Oak St, City3

Keys

- Composite Key
 - A candidate key that consists of two or more attributes.

Sales

SalesPersonID	SaleAmount	SalesDate
101	£500	2023-10-23
102	£750	2023-10-23
101	£600	2023-10-24

Identify the composite key from this viewing table

Viewing

clientNo	propertyNo	viewDate	comment
CR56	PA14	24-May-13	too small
CR76	PG4	20-Apr-13	too remote
CR56	PG4	26-May-13	
CR62	PA14	14-May-13	no dining room
CR56	PG36	28-Apr-13	

Foreign key

- key in a database table that links to the primary key in another table
- It's like a reference that helps connect related information in different tables.

Branch

branchNo	street	city	postcode
B005	22 Deer Rd	London	SW1 4EH
B007	16 Argyll St	Aberdeen	AB2 3SU
B003	163 Main St	Glasgow	G11 9QX
B004	32 Manse Rd	Bristol	BS99 1NZ
B002	56 Clover Dr	London	NW10 6EU

Primary key

Foreign key

Staff

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000	B005

Representing Relational Database Schemas

- A relational database consists of any number of normalized relations. The relational
- schema for part of the *DreamHome* case study is:

Branch (branchNo, street, city, postcode)

Staff (staffNo, fName, IName, position, sex, DOB, salary, branchNo)

PropertyForRent (propertyNo, street, city, postcode, type, rooms, rent, ownerNo, staffNo, branchNo)

Client (clientNo, fName, IName, telNo, prefType, maxRent, eMail)

PrivateOwner (ownerNo, fName, IName, address, telNo, eMail, password)

Viewing (clientNo, propertyNo, viewDate, comment)

Registration (clientNo, branchNo, staffNo, dateJoined)

Entity integrity

- It refers to the condition in which each row in a database table is uniquely identified by a primary key and has a non-null value for that primary key

For example,

Customer

CustomerID	CustomerName	Email
101	John Doe	john@example.com
102	Jane Smith	jane@example.com
103	Alice Johnson	alice@example.com

Referential integrity

- Referential integrity, also known as referential integrity constraint, ensures that relationships between tables are maintained
- For example,

Order

OrderID	CustomerID	OrderDate
201	101	2023-10-15
202	102	2023-10-16
203	103	2023-10-17

General Constraints

- Additional rules specified by the users or database administrators of a database that define or constraint some aspect of the enterprise.

Few examples:

Check Constraint,
default constraint,
data validation

Tutorial

The following tables form part of a database held in a relational DBMS:

- Hotel (hotelNo, hotelName, city)
- Room (roomNo, hotelNo, type, price)
- Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)
- Guest (guestNo, guestName, guestAddress)

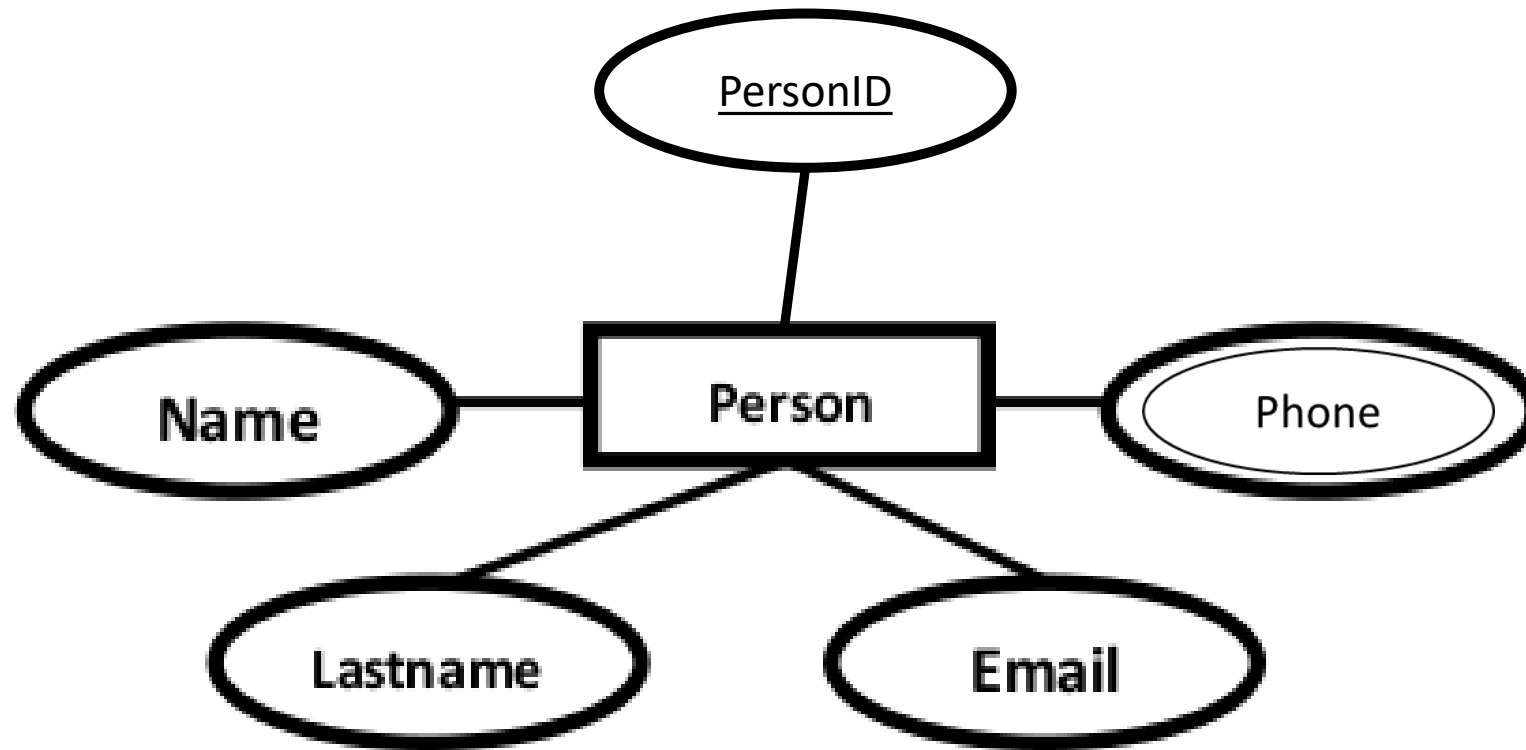
1. Identify the primary key and foreign keys in this schema.
2. Produce some sample tables for these relations that observe the relational integrity rules.
3. Suggest some general constraints that would be appropriate for this schema.

ERD to Relational Table – Mapping Algorithm

Mapping Algorithm - Entities and Simple Attributes

Person(personid , name, lastname, email)

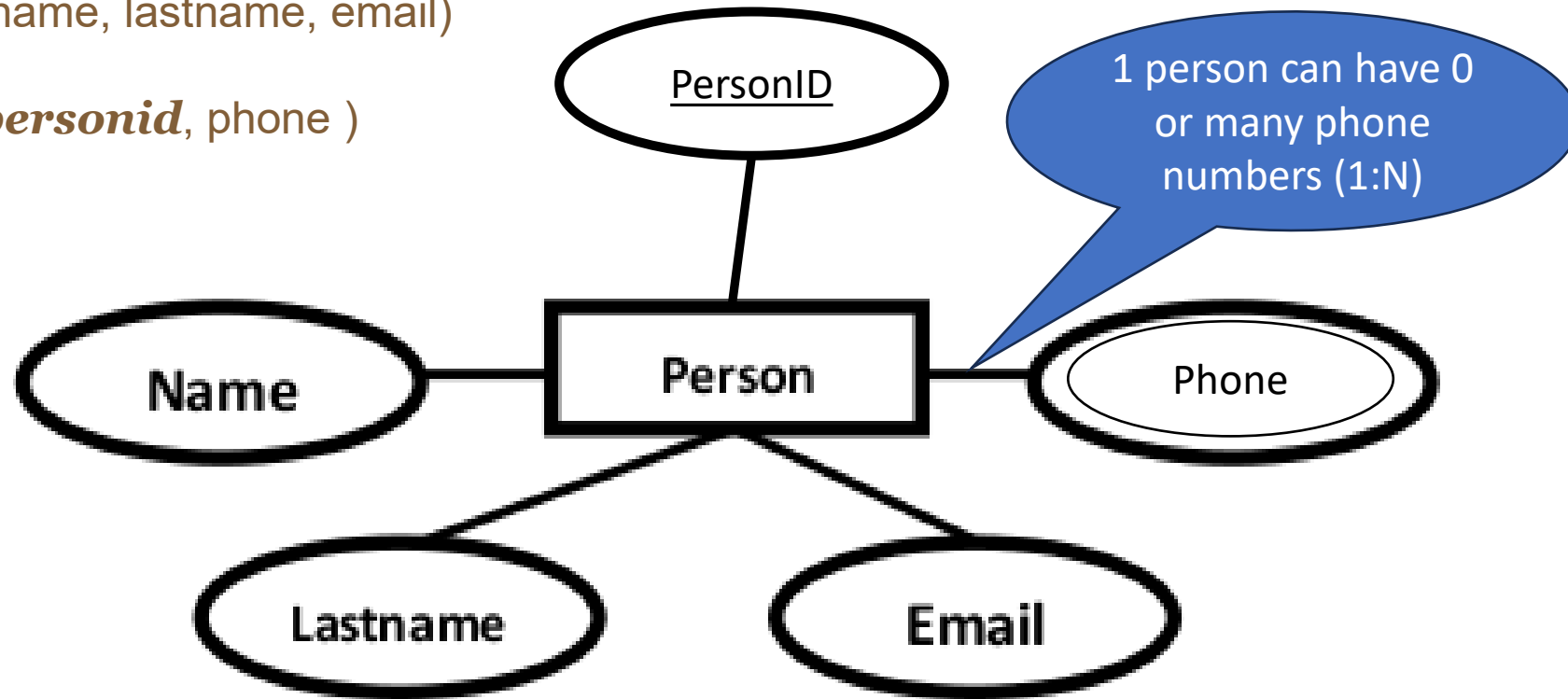
What happens to Phone-multivalued attribute?



Mapping Algorithm – Multivalued attribute

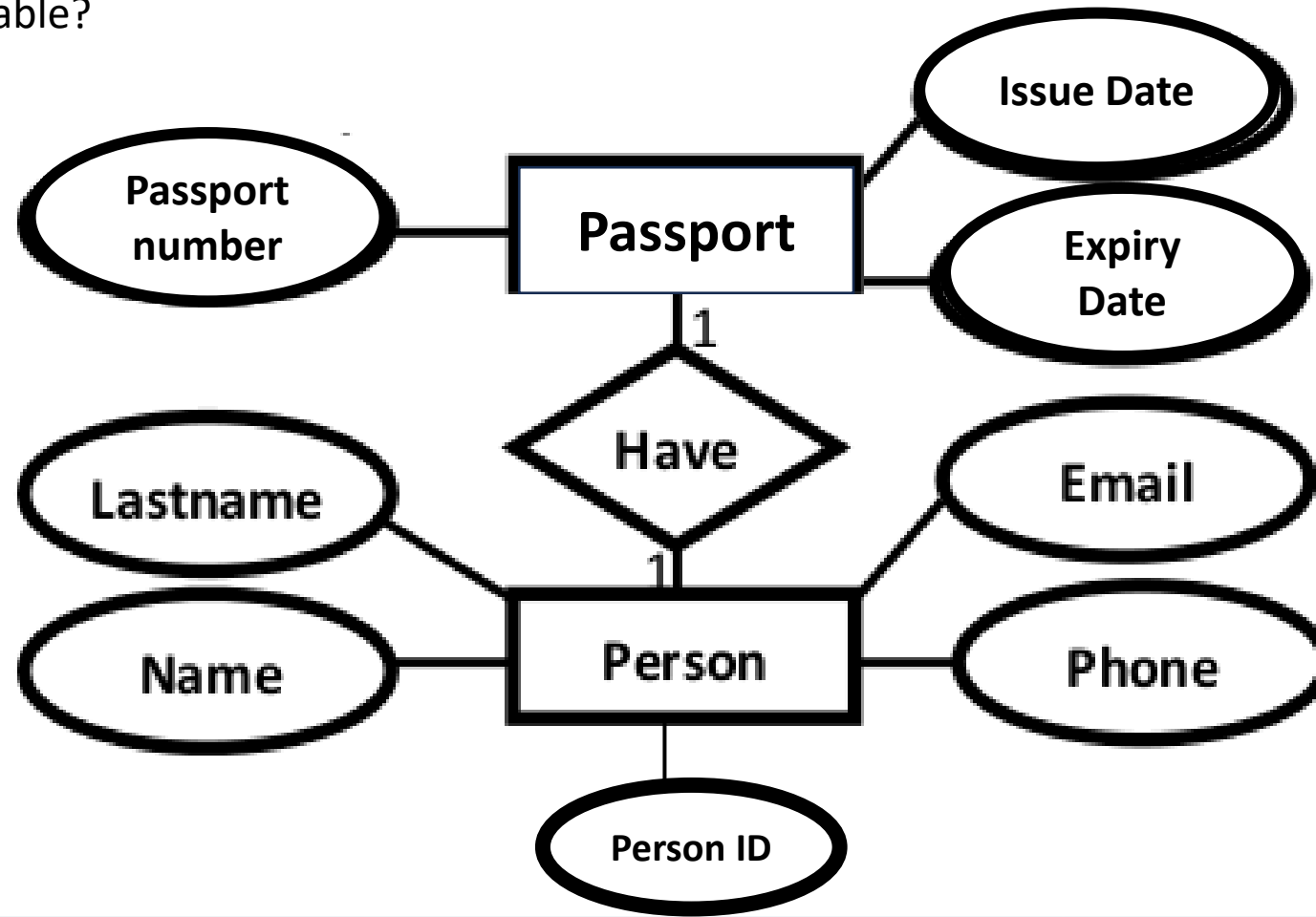
Person(personid , name, lastname, email)

Phone (phoneid , *personid*, phone)

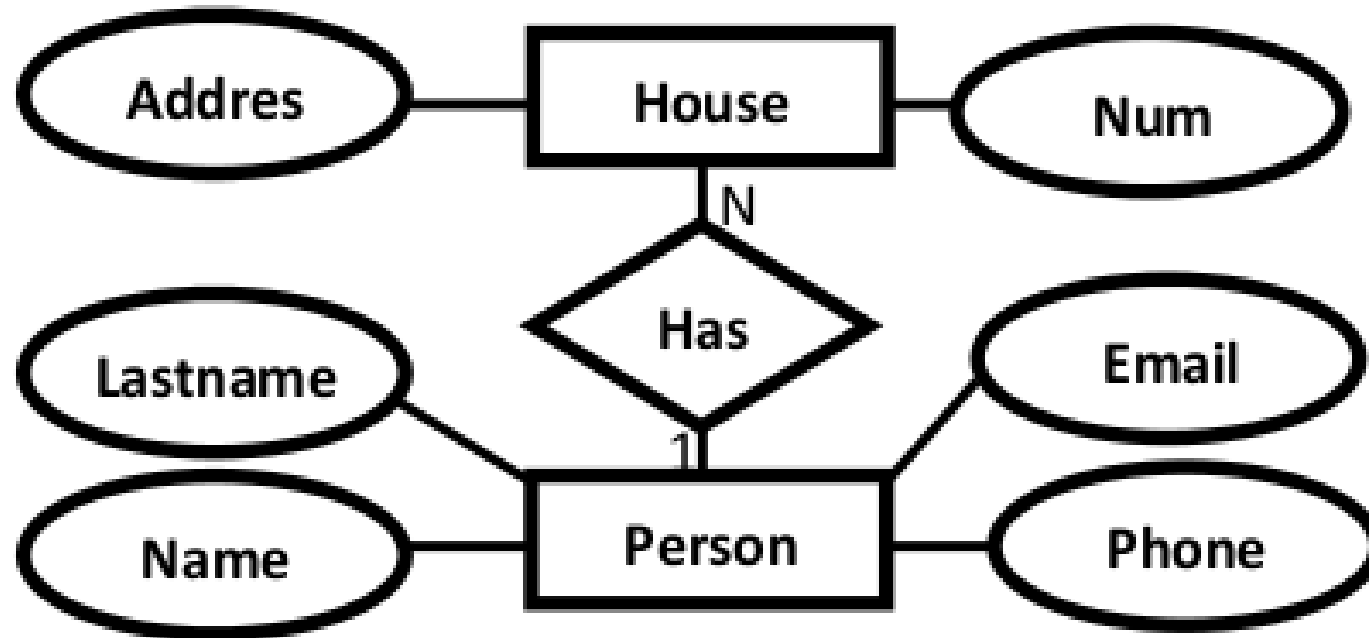


Mapping Algorithm – 1:1 Relationships

which will be the foreign key creating a reference between Persons and passport table?

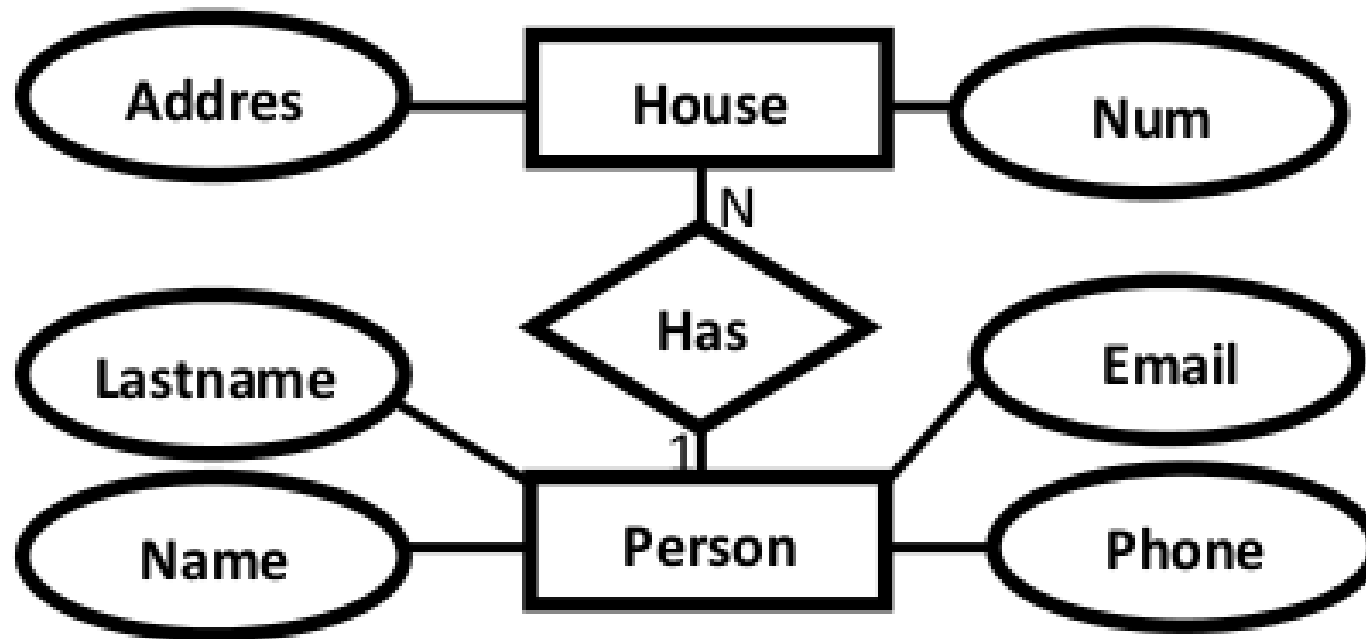


Mapping Algorithm – 1:N Relationships



How is this converted to?
Give a try...

Mapping Algorithm – 1:N Relationships



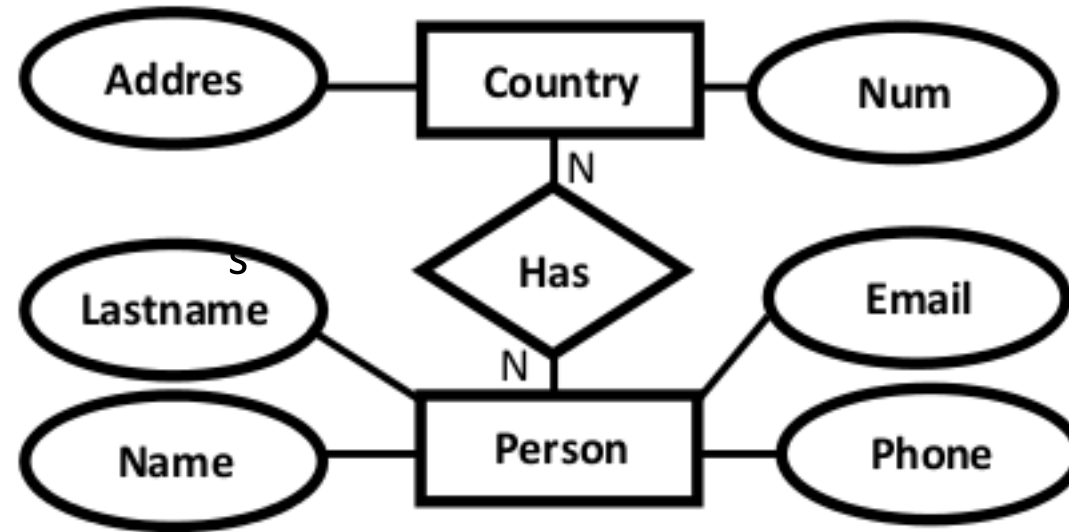
House

houseid	personid
H1	1
H2	2
H3	1

person

personid	houseid
1	H1,H3
2	H2
3	<null>

Mapping Algorithm – N:N Relationships

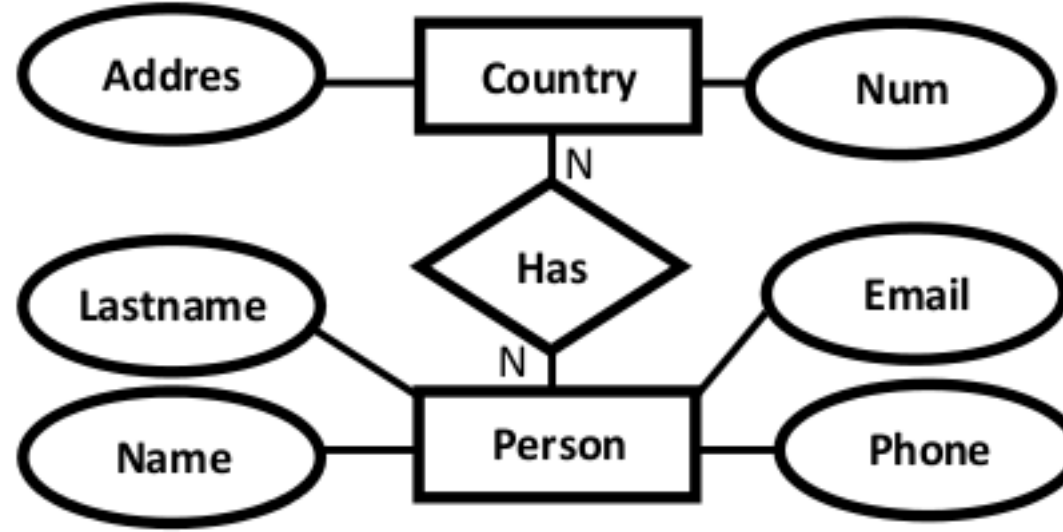


How is this converted?

Give a try...

Mapping Algorithm – N:N Relationships

The Person can live or work in many countries. Also, a country can have many people.



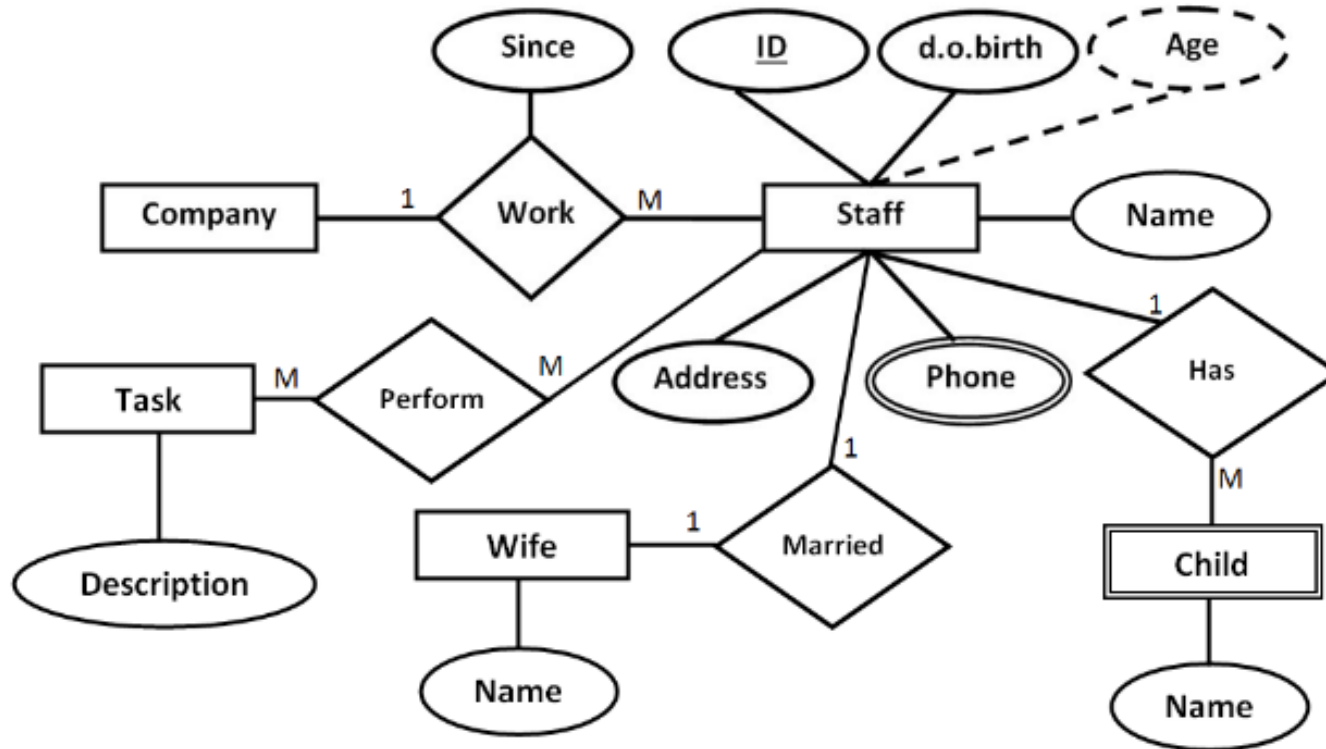
Person

Country

personid	countryid
p1	c1
p2	c1
p3	c1,c2

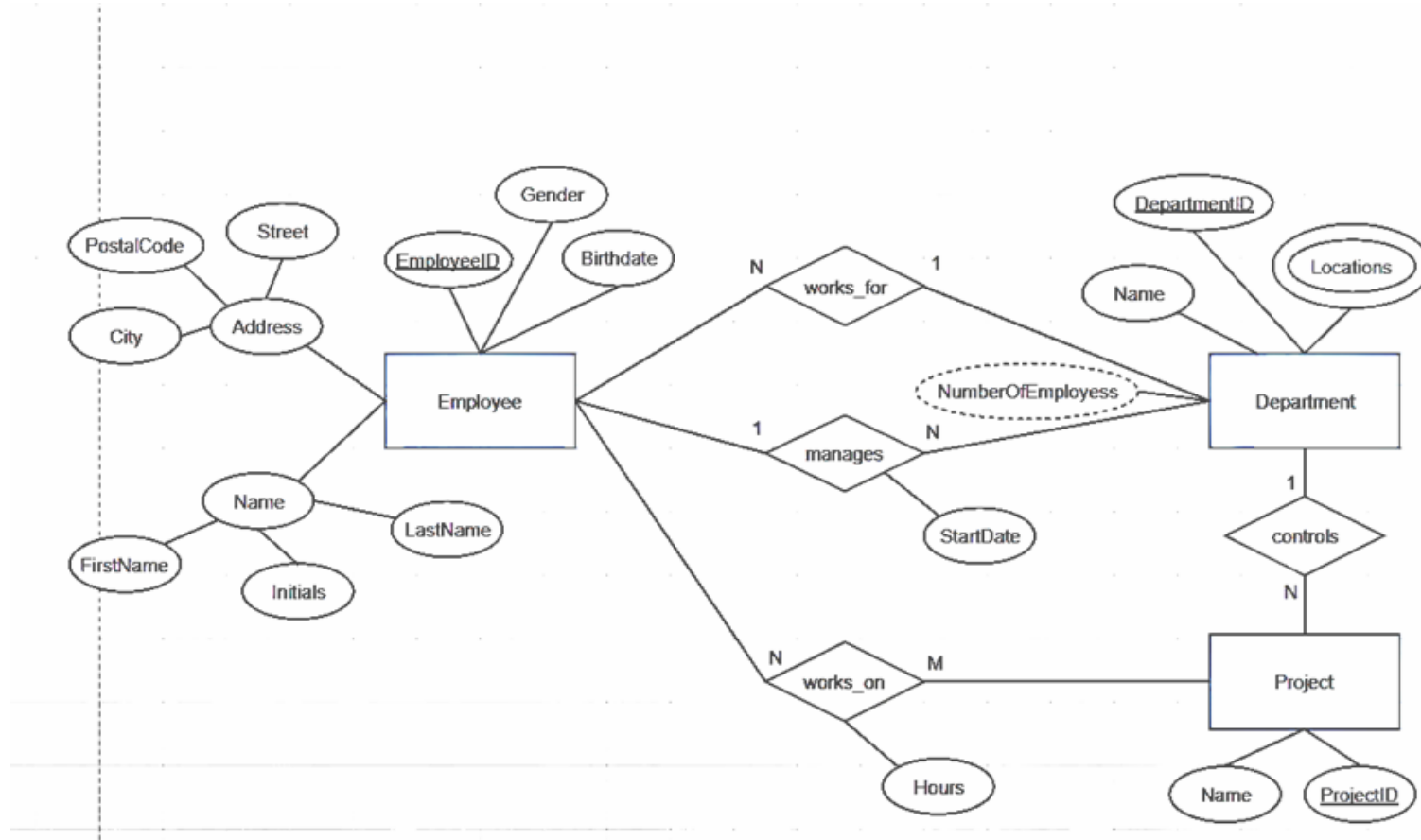
countryid	personid
c1	p1,p2,p3
c2	p3
c3	-

Mapping Algorithm – Activity 1



<https://forms.office.com/e/3Dzw97CRvA>

Mapping Algorithm – Activity 2



<https://forms.office.com/e/nZnGcYpCEn>

ERD to Relational Tables: Mapping Algorithm

Correspondence between ER and Relational Models

ER MODEL	RELATIONAL MODEL
Entity type	<i>Entity</i> relation
1:1 or 1:N relationship type	Foreign key (or <i>relationship</i> relation)
M:N relationship type	<i>Relationship</i> relation and <i>two</i> foreign keys
<i>n</i> -ary relationship type	<i>Relationship</i> relation and <i>n</i> foreign keys
Simple attribute	Attribute
Composite attribute	Set of simple component attributes
Multivalued attribute	Relation and foreign key
Value set	Domain
Key attribute	Primary (or secondary) key