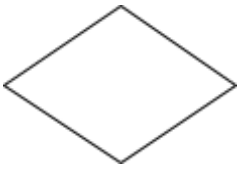
Relationships

It defines how two or more entities are connected with each other. It is an association among two or more entities.
It is represented by a diamond operator in the ER diagram.

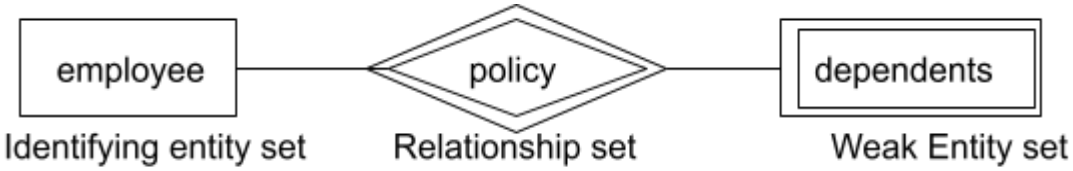


It is of two types:

1. **Strong Relationship**
   The relationship between two independent entities is a strong relationship.
2. **Weak Relationship**
   When a relationship exists between a weak entity and its owner entity, then it is called a weak relationship.

Example
Assume we have an Insurance database and in that we have two entities Employee and dependents. In this both entities will be connected with **Policy** relationships.

Treat policy as a special relationship that provides extra information (an attribute like 'id') required to identify entities in dependents uniquely
An entity in employee has a **policy** covering his dependents



A weak entity set is one whose existence is dependent on another entity, called its identifying entity set (or owner entity set)

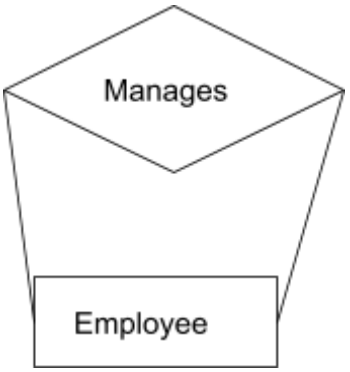
In ER model different types of geometrical shapes are used to represent different things.

Entity Sets	Rectangle
Weak Entity Sets	Double Rectangle
Links attributes to entity set and entity sets to relationship set	Lines
Total participation of an entity in a relationship set	Double Lines
Relationship	Diamond
Weak Relationship	Double Diamond
Attributes	Ellipse
Multivalued attributes	Double Ellipse
Derived attributes	Dashed Ellipse

Degree of Relationship

Number of entities participating in a single relationship is known as the degree of that relationship.
Relationships can be classified according to how many entities are participating into a particular relationship.

1. **Unary Relationship**
   It exists when only one entity participates in a relationship.
   Example

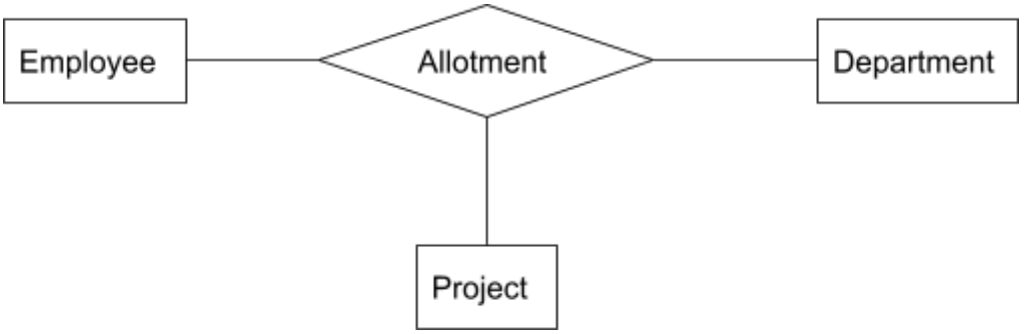


In the above example, an employee could be a manager also, so the manager manages other employees, and all types of employees are in a single entity. Therefore the relationship here is unary relationship.

2. **Binary Relationship**
   When two entities participate in a relationship then it is known as binary relationship. (degree two)
   Example

In the above example ‘Enrolled in’ relationship is connected only with two entities, therefore, ‘Enrolled in’ relationship is binary.

3. **Ternary Relationship**
   It exists when there is an association among three entities. (degree three)



In the above example Allotment is connected with three entities, therefore the relationship here is ternary.

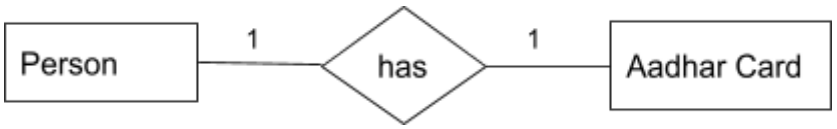
Note: Relationships between more than two entity sets are rare. Most relationships are binary.

Cardinality Ratio

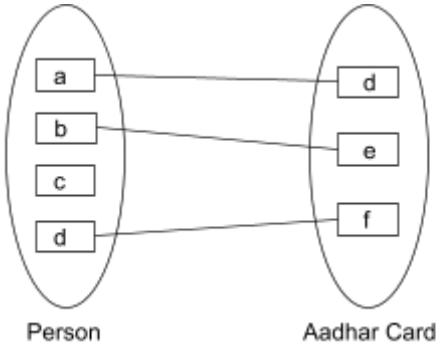
In binary relationship cardinality ratio represents how many times the entity/instance of an entity set can participate in a relationship.
OR
It refers to the number of entities to which another entity can be associated through a relationship set.

For Binary Relationship set is of four types: –

1. **One to One –**
   If only one instance of an entity is associated with only one instance of another entity then it is one to one relationship.

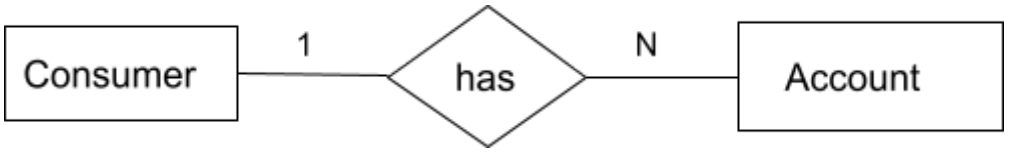


   In the above example one person could only have one Aadhar Card, therefore it is one to one relation.
   To further visualise it:-

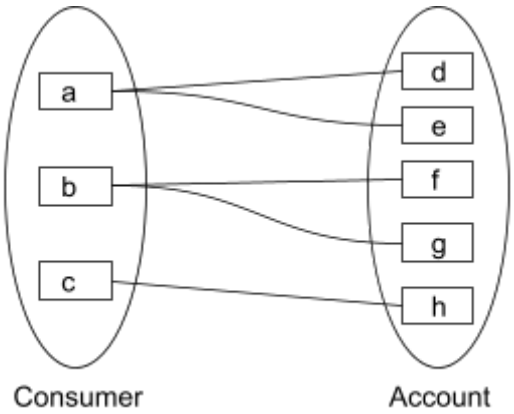


   An entity in Person is associated with at most one entity in Aadhar Card and an entity in Aadhar Card is associated with at most one entity in Person.

2. **One to Many –**
   If a single instance of an entity set is associated with more than one instance of another entity then it is one to many relationships.

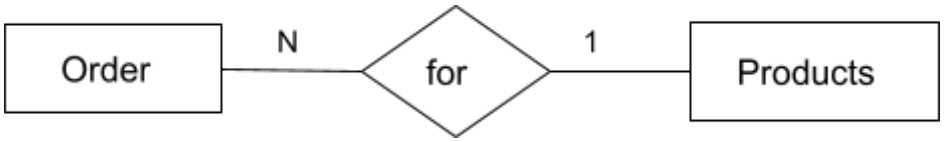


In the above example one customer can have multiple bank accounts. So the relationship here is one to many.
To further visualise it:-

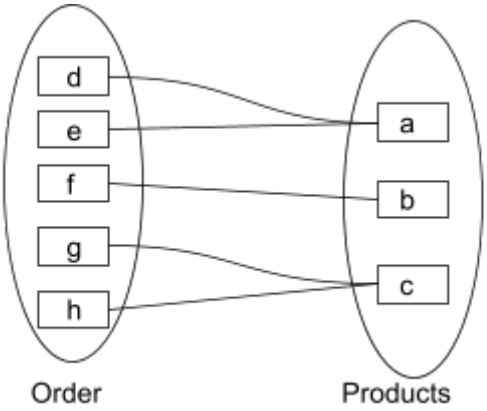


An entity in Consumer is associated with zero or more entities in Account. An entity in Account is associated with at most one entity in Consumer.

3. **Many to One –**
   If more than one instance of an entity is associated with a single instance of another entity then it is called many to one relationship.



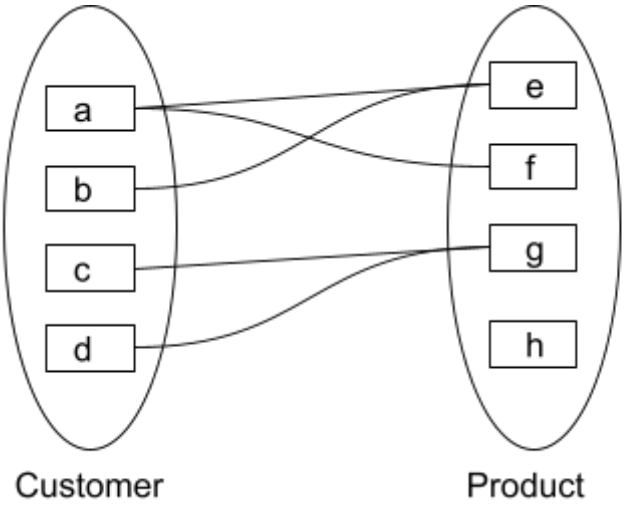
In the above example one product could have multiple orders, so that relationship here is many to one.
To further visualise it:-



An entity in Order is associated with at most one entity in Product. An entity in Product is associated with one or more entities in Order.

4. **Many to Many –**
   If more than one instance of an entity set is associated with more than one instance of another entity then it is many to many relationship.

In the above example one customer can place many orders and one product can be ordered by multiple customers. Therefore the relationship here is many to many.
To further visualise it:

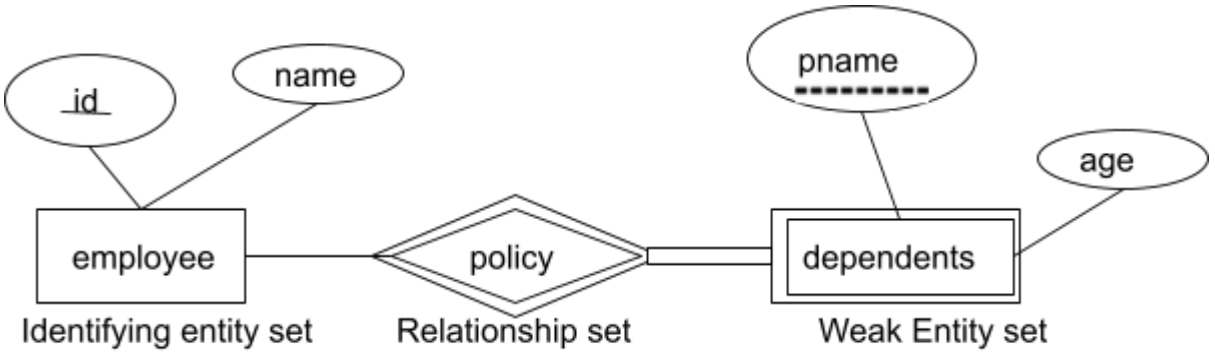


An entity in Customer is associated with one or more entities in Product. An entity in Product is associated with zero or more entities in Customer.

Participation Constraints

It is also called minimum cardinality constraint.

1. **Partial Participation –**
   - It specifies that not all entities are involved in the relationship instance.
   - It is shown by using a single line between the entity set and relationship set in the ER diagram.
2. **Total Participation –**
   - It specifies that each entity must be involved in at least one relationship instance, therefore it is also called as mandatory participation.
   - It is shown by using a double line between the entity set and relationship set



In In this example, An entity in employee has a policy covering his dependents
Here, a given employee's dependents are likely to have unique names.
And In dependents, each entity is distinct but enough attributes are not present to identify a dependent uniquely.
So here we Treat policy as a special relationship that provides extra information (id) required to identify entities in dependents uniquely.
Note1: pname could be made unique – but conceptually, a dependent is still dependent on an employee, so not a good way to model

Note2: Here, id in employee is a primary key and pname in dependents is a partial key/discriminator.
Therefore, dependents have total participation because it can not exist without an employee entity and the employee has partial participation.