What is an ER Model?

An Entity-Relationship Model represents the structure of the database with the help of a diagram.

Examples of entities:

- ❖Person: Employee, Student, Patient
- ❖Place: Store, Building
- ❖Object: Machine, Car, etc

ER Diagrams: It mainly contains three basic symbols which are rectangle, oval and diamond to represent relationships between elements, entities and attributes.

Following are the main components and its symbols in ER Diagrams:

- ❖**Rectangles:** This Entity Relationship Diagram symbol represents entity types
- ❖**Ellipses :** Symbol represent attributes
- ❖**Diamonds:** This symbol represents relationship types
- ❖**Lines:** It links attributes to entity types and entity types with other relationship types
- ❖**Primary key:** attributes are underlined
- ❖**Double Ellipses:** Represent multi-valued attributes
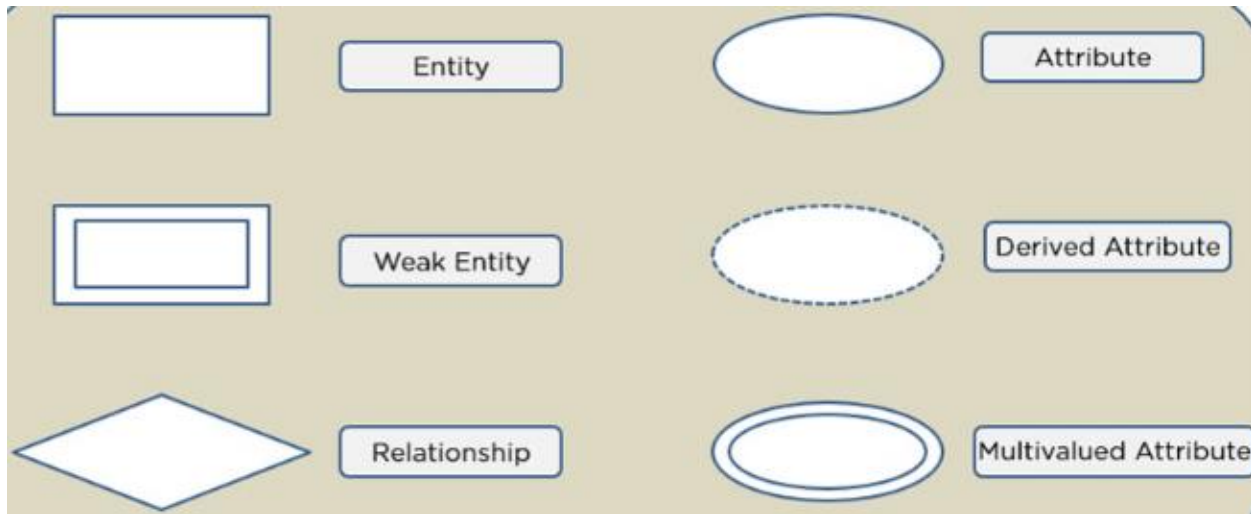
Components of ER Diagram

- Entities
    - Strong Entity
    - Weak Entity
- **Attributes**
    - Key Attribute
    - Composite Attribute

- ➢ Multivalued Attribute
- ➢ Derived Attribute

- **Relationships**

  - ➢ **One-to-One Relationships**

  - ➢ **One-to-Many Relationships**

  - ➢ **Many-to-One Relationships**

  - ➢ **Many-to-Many Relationships**

Entities are of two types:

1. **Strong Entity** – A strong entity is an entity type that has a key attribute. It doesn't depend on other entities in the schema.

   Example – roll_number

   2.Weak Entity – Weak entity type doesn't have a key attribute and so we cannot uniquely identify them by their attributes alone.

For example - the address can't be used to uniquely identify students as there can be many students from the same locality.

1. Key Attribute

The attribute which uniquely identifies each entity in the entity set is called the key attribute. For example, **Roll_No** will be unique for each student. In ER diagram, the key attribute is represented by an oval with underlying lines.

2. Composite Attribute

An attribute composed of many other attributes is called a composite attribute. For example, the Address attribute of the student Entity type consists of Street, City, State, and Country. In ER diagram, the composite attribute is represented by an oval comprising of ovals.
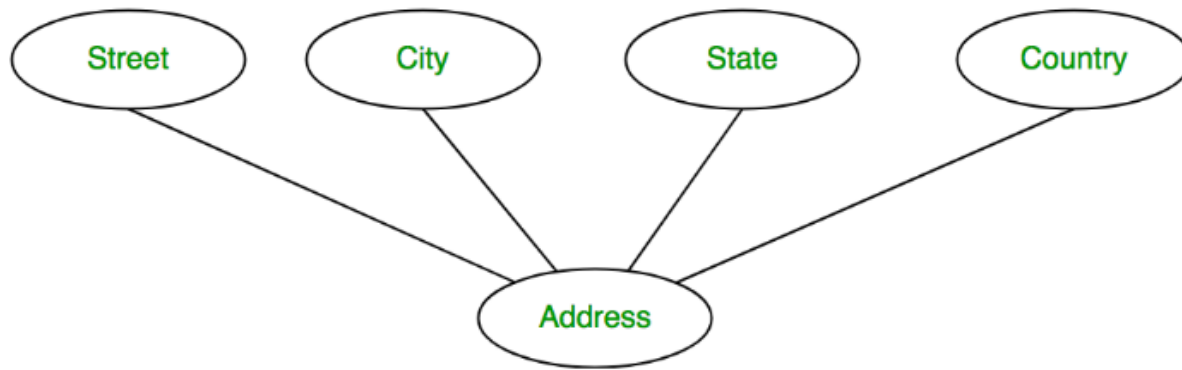
3. Multivalued Attribute

An attribute consisting of more than one value for a given entity. For example, **Phone_No** (can be more than one for a given student). In ER diagram, a multivalued attribute is represented by a double oval.

4. Derived Attribute

An attribute that can be derived from other attributes of the entity type is known as a derived attribute. e.g.; Age (can be derived from DOB). In ER diagram, the derived attribute is represented by a dashed oval.
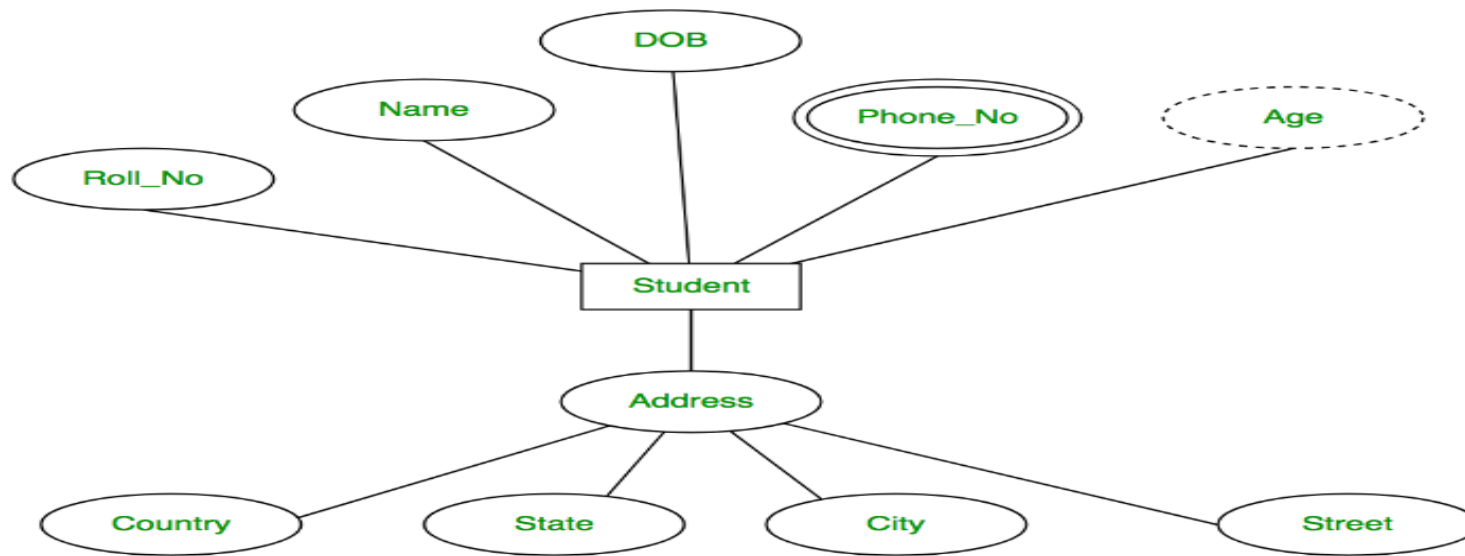
Relation:

1. One to one (1:1) relationship

2. One to many (1:N) relationship

| Scientist | —1— | Invents | —M— | Invention |
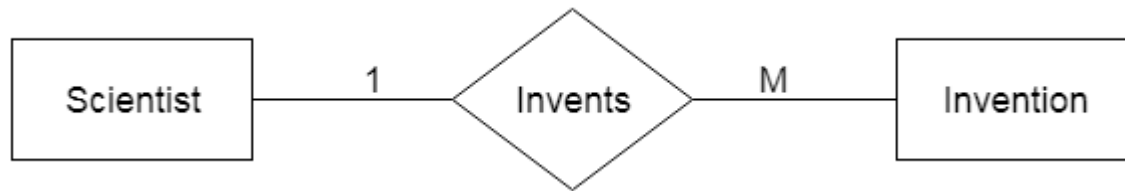
3. Many to one (M:1) relationship

| Student | M | enroll | 1 | Course |

4. Many to many (M:N) relationship:

| Student | M | enrolls | N | Course |

| Employee | M | is assigned | M | Project |

For example, Student enrolls for only one course, but a course can have many students.

Student —— M —— enroll —— 1 —— Course

Patient entity with attributes: PName, PDiagnosis, Pat-id, PAddress

Hospital entity with attributes: Hosp-id, Hos-Name, HAddress, HCity

Patient —— N —— Admitted In —— 1 —— Hospital

Patient —— 1 —— has —— N —— Medical record

Medical record attributes: Record-id, Date_of_examination

Hospital —— 1 —— has —— N —— Doctor

Doctor attributes: Salary, Qualification, Doc-id