

Database Creation and Management

ER Model

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Outline

- E/R Model
- Conceptual data modeling
- motivation, various types of attributes
- E/R diagram notation
- Examples
- Entities, Entity types
- Relationships, relationship types

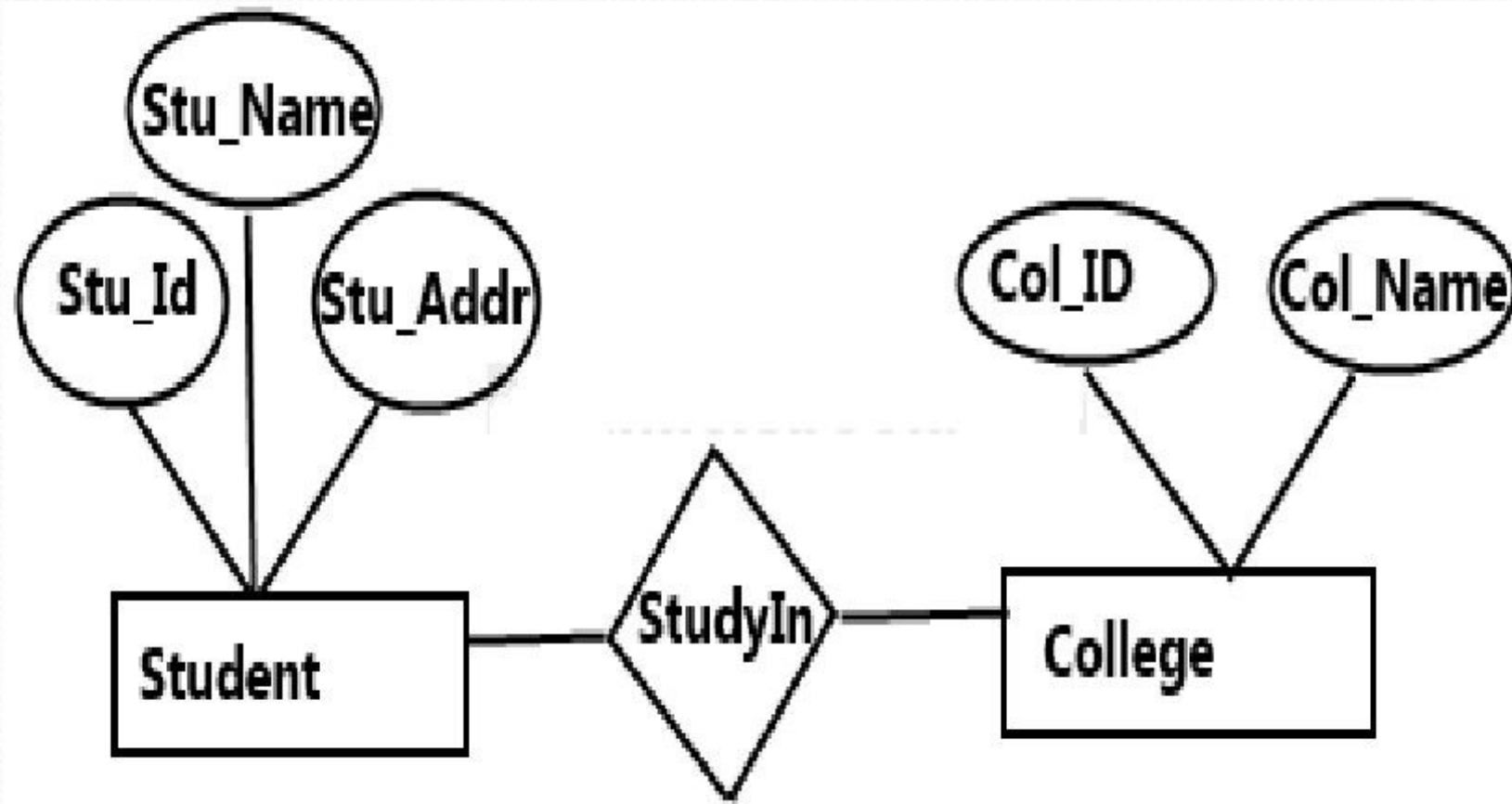
ER MODEL

- ER Model is plain and simple for designing the structure.
- It saves time.
- Cannot make a database structure & write production code, Without ER diagrams .
- It displays the clear picture of the database structure.
- An ER diagram is the complete logical structure of a database, shows the relationship among entity sets.
- An entity set is a group of similar entities and these entities can have attributes.

ER DIAGRAMS

- ERD stands for Entity Relationship diagram.
- It is a graphical representation of an information system used for solving the design problems.
- ER diagram shows the relationship between objects, places, people, events etc. within that system.
- It is a data modeling technique which helps in defining the business process.

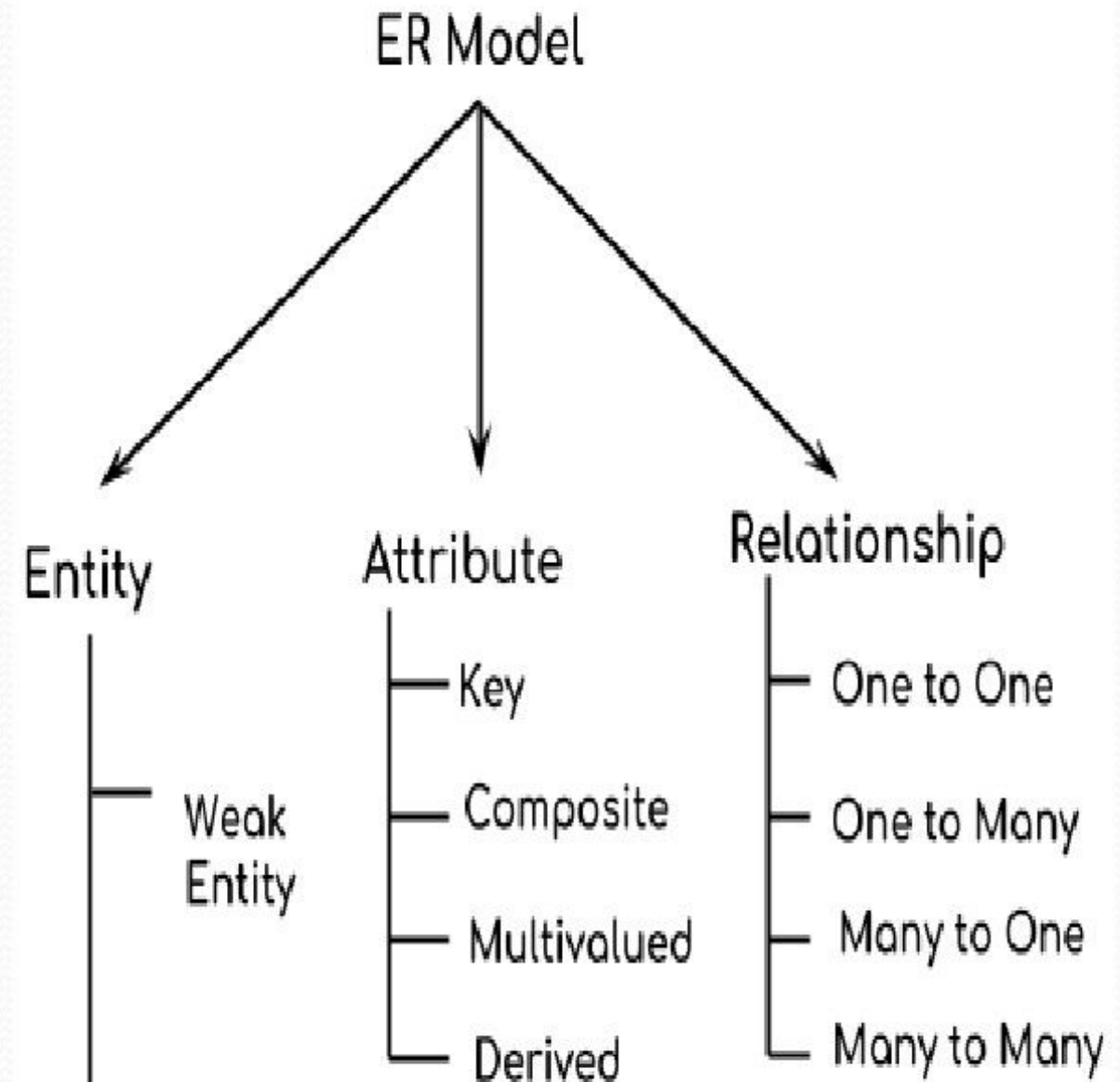
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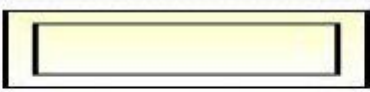
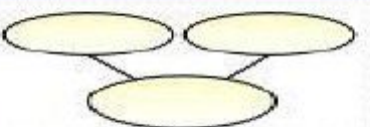
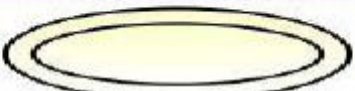


Sample ER diagram

COMPONENTS OF AN ER DIAGRAM

- An ER diagram has three main components.
 1. Entity
 2. Attribute
 3. Relationship

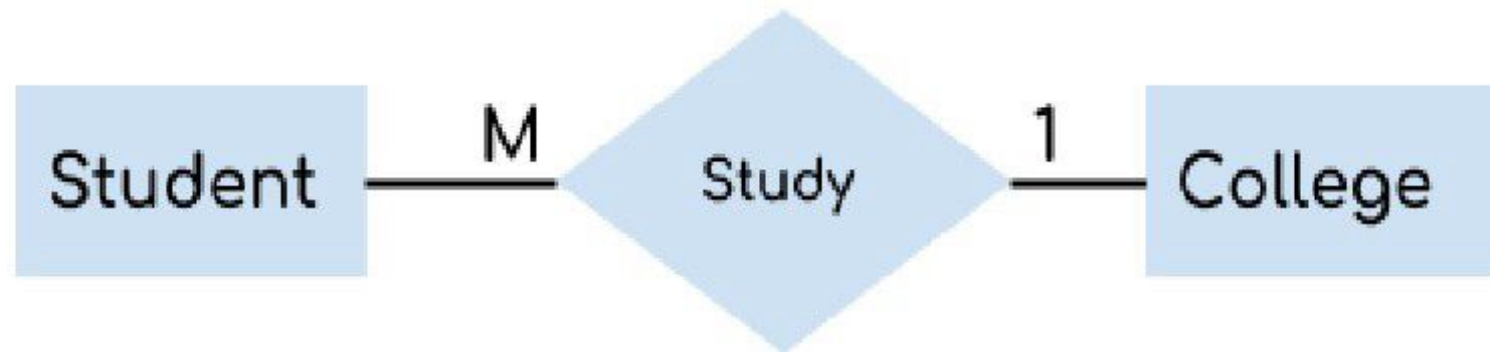


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Notations	Representation	Description
	Rectangle	It represents the Entity or Entity sets
	Ellipse	It represents the Attribute.
	Diamond	It represents the Relationship set.
	Line	It represents the link between attribute and entity set to relationship set.
	Double Rectangle	It represents the weak entity.
	Composite Attribute	It represents composite attribute which can be divided into subparts. For eg. Name can be divided into First Name and Last Name
	Multi valued Attribute	It represents multi valued attribute which can have many values for a particular entity. For eg. Mobile Number.
	Derived Attribute	It represents the derived attribute which can be derived from the value of related attribute.
	Key Attribute	It represents key attribute of an entity which have a unique value in a table. For eg. Employee → EmpId (Employee Id is Unique).

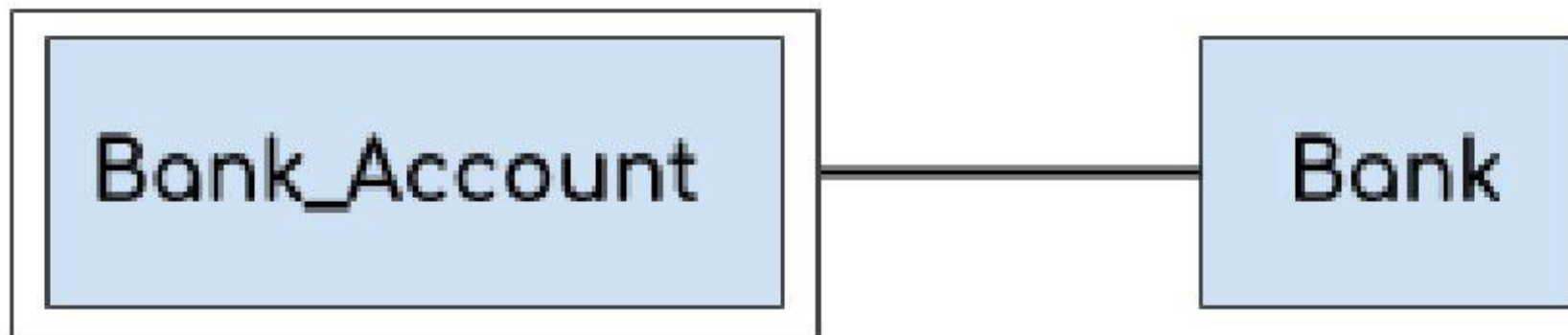
ENTITY

- An entity is an object or component of data.
- An entity is represented as rectangle in an ER diagram.
- For example: Consider two entities Student and College and these two entities have many to one relationship as many students study in a single college.



Weak Entity

- An entity that cannot be uniquely identified by its own attributes and relies on the relationship with other entity is called weak entity.
- The weak entity is represented by a double rectangle.
- For example: a bank account cannot be uniquely identified without knowing the bank to which the account belongs, so bank account is a weak entity .

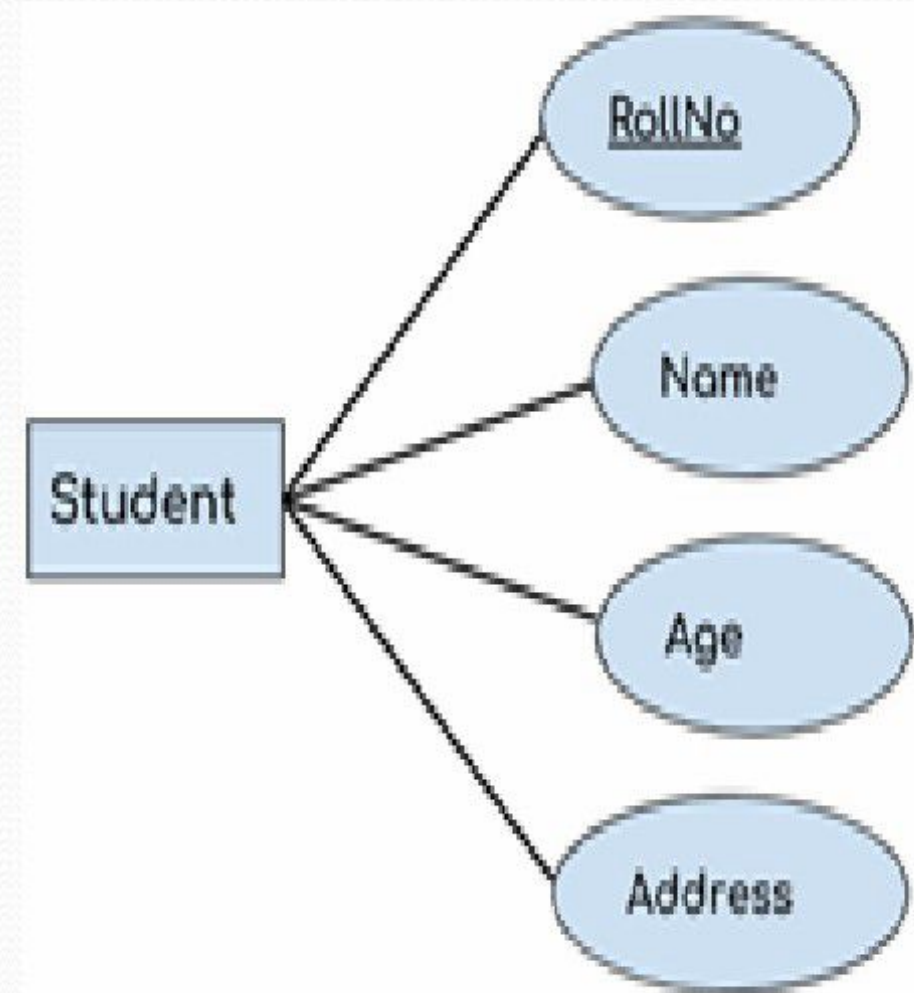


ATTRIBUTE

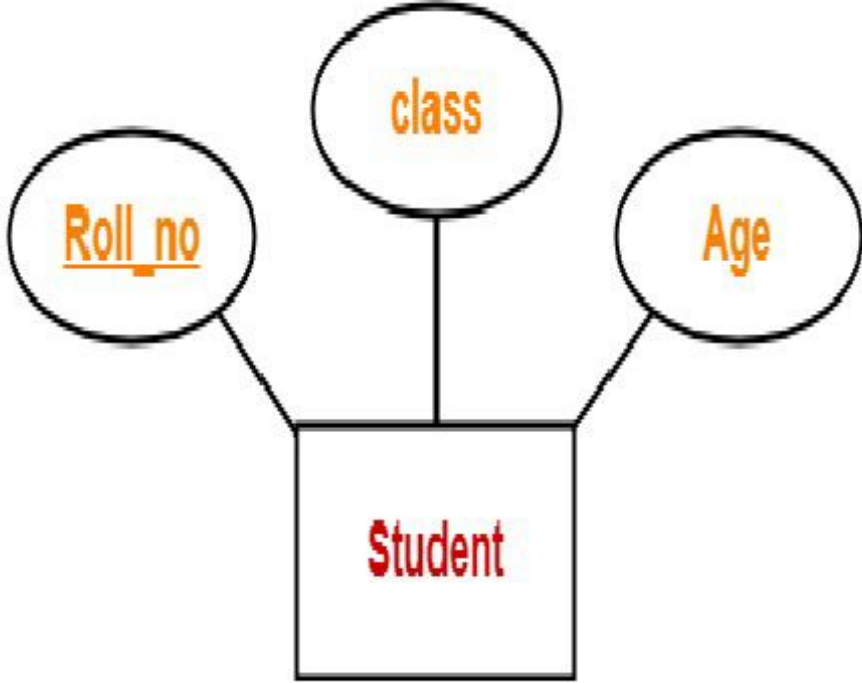
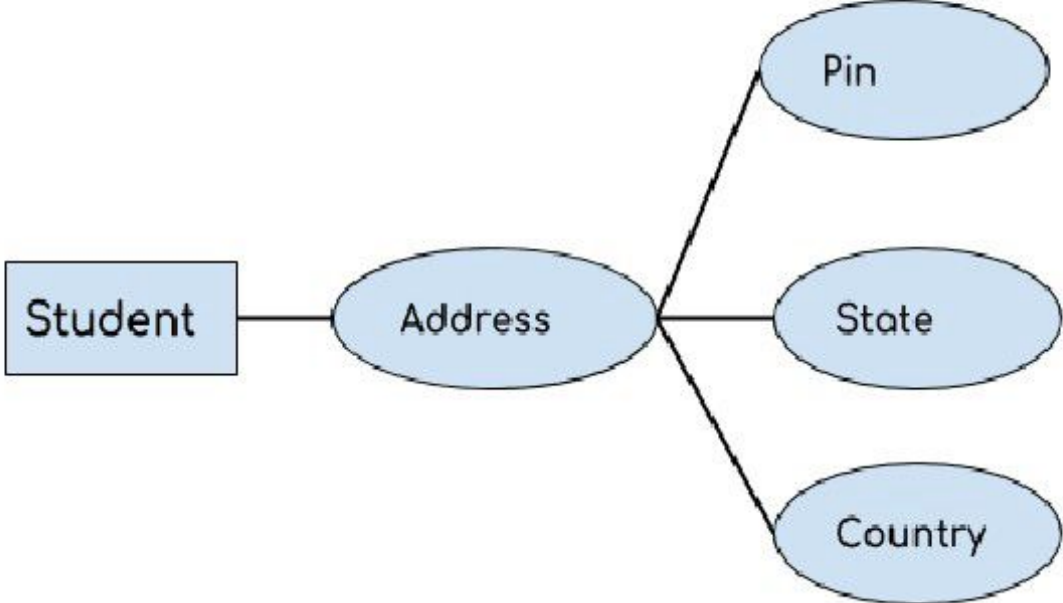
- An attribute describes the property of an entity. An attribute is represented as Oval in an ER diagram.
- The types of attributes are as follows:
 - Key attribute
 - Simple (atomic) versus Composite attributes
 - Single-valued versus multivalued attributes
 - Stored versus Derived attributes
 - NULL value attribute
 - Complex attributes

Key attribute

- A key attribute can uniquely identify an entity from an entity set.
- Key attribute is represented by oval same as other attributes however the **text of key attribute is underlined**.
- For example, student roll number can uniquely identify a student from a set of students.



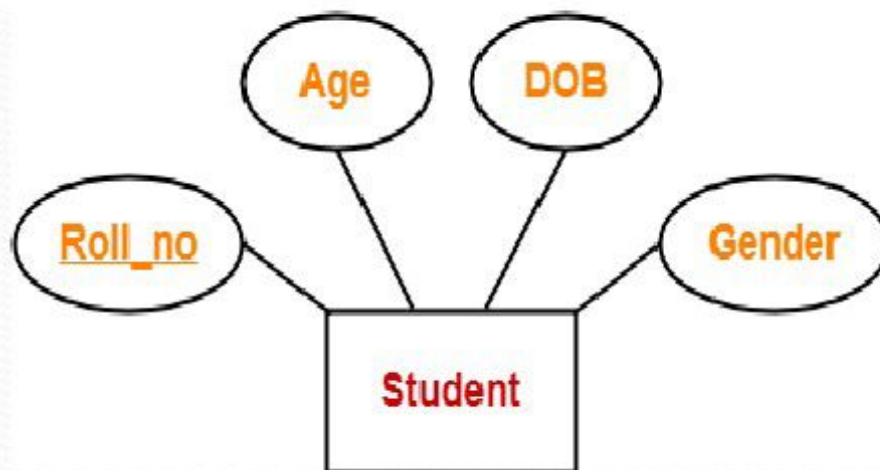
Simple vs. Composite attributes

Simple (atomic) attributes	Composite or compound attributes
<ul style="list-style-type: none">• Simple attributes are those attributes which cannot be divided further.• All the attributes are simple attributes as they cannot be divided further.  <p>The diagram shows a rectangular entity box labeled 'Student' in red. Three lines connect it to three circular attribute boxes: 'Roll_no' (underlined), 'class', and 'Age', all in orange text.</p> <p data-bbox="435 1461 837 1525">Simple Attribute</p>	<ul style="list-style-type: none">• An attribute that is a combination of other attributes is known as composite attribute.• In student entity, the student address is a composite attribute as an address is composed of other attributes such as pin code, state, country.  <p>The diagram shows a rectangular entity box labeled 'Student' connected to an oval attribute box labeled 'Address'. The 'Address' attribute is further connected to three other oval attribute boxes: 'Pin', 'State', and 'Country'.</p> <p data-bbox="1514 1466 2003 1530">Composite Attribute</p>

Single-valued vs. multivalued attributes

Single-valued attributes

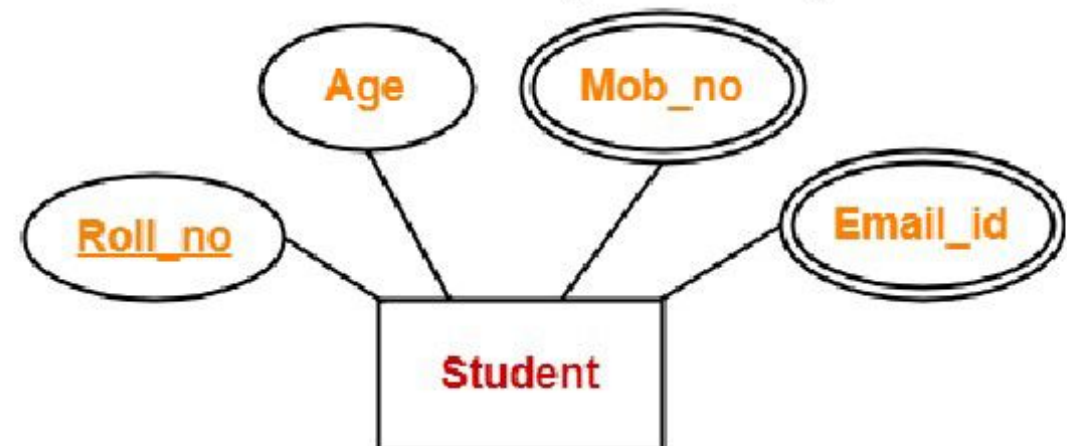
- Single valued attributes are those attributes which can take only one value for a given entity from an entity set.
- all the attributes are single valued attributes as they can take only one specific value for each entity.



Single-valued Attribute

Multivalued attributes

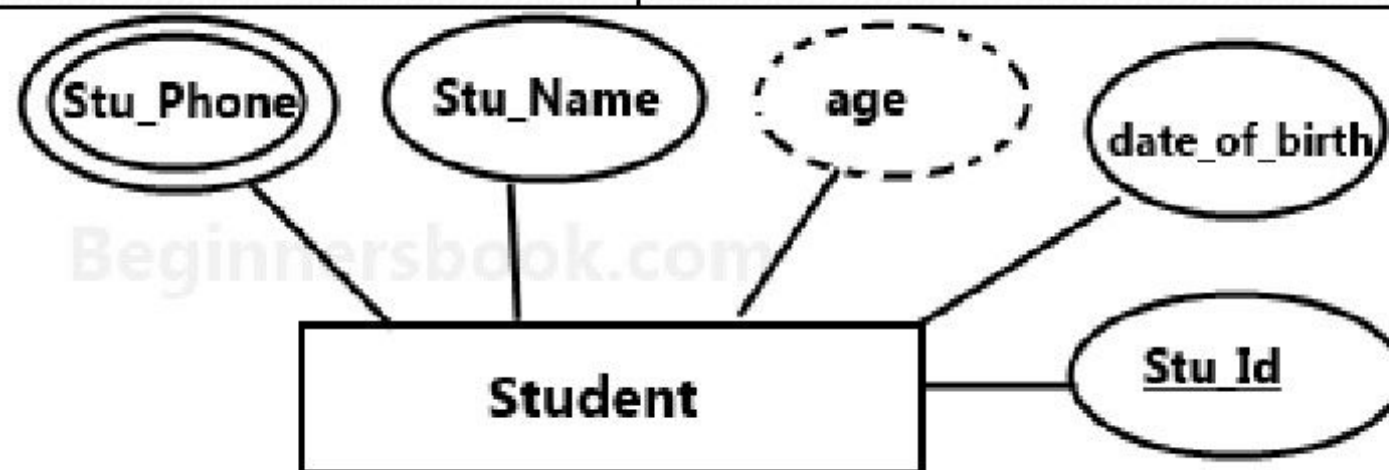
- Multi valued attributes are those attributes which can take more than one value for a given entity from an entity set.
- the attributes "Mob_no" and "Email_id" are multi valued attributes as they can take more than one values for a given entity.



Single-valued Attribute

Stored vs. Derived attributes

<u>Stored attribute</u>	<u>Derived attributes</u>
<ul style="list-style-type: none">• An attribute that cannot be derived from another attribute is known as stored attribute.• For example, birth date cannot derive from age of student.	<ul style="list-style-type: none">• A derived attribute is one whose value is dynamic and derived from another attribute.• For example – Person age is a derived attribute as it changes over time and can be derived from another attribute (Date of birth).



Stored versus Derived attributes

NULL value attribute

- An attribute, which has not any value for an entity is known as null valued attribute.
- For example, assume Student is an entity and its attributes are Name, Age, Address and Phone no. There may be chance when a student has no phone no. In that case, phone no is called null valued attributes.

Complex Attributes

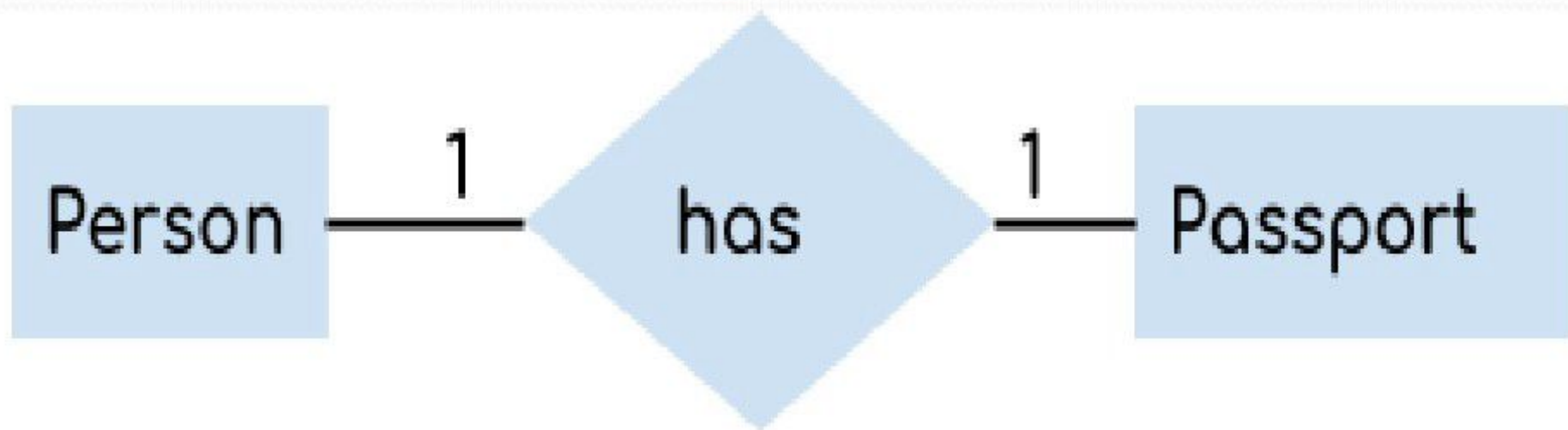
- For an entity, if an attribute is made using the multi valued attributes and composite attributes then it is known as complex attributes.
- Example: A person can have more than one residence; each residence can have more than one phone.

RELATIONSHIP or CARDINALITY

- Cardinality Defines the numerical attributes of the relationship between two entities or entity sets.
- A relationship is represented by diamond shape in ER diagram; it shows the relationship among entities.
- There are four types of relationships:
 - One to One
 - One to Many
 - Many to One
 - Many to Many

One to One Relationship

- When a single instance of an entity is associated with a single instance of another entity then it is called one to one relationship.
- For example, a person has only one passport and a passport is given to one person



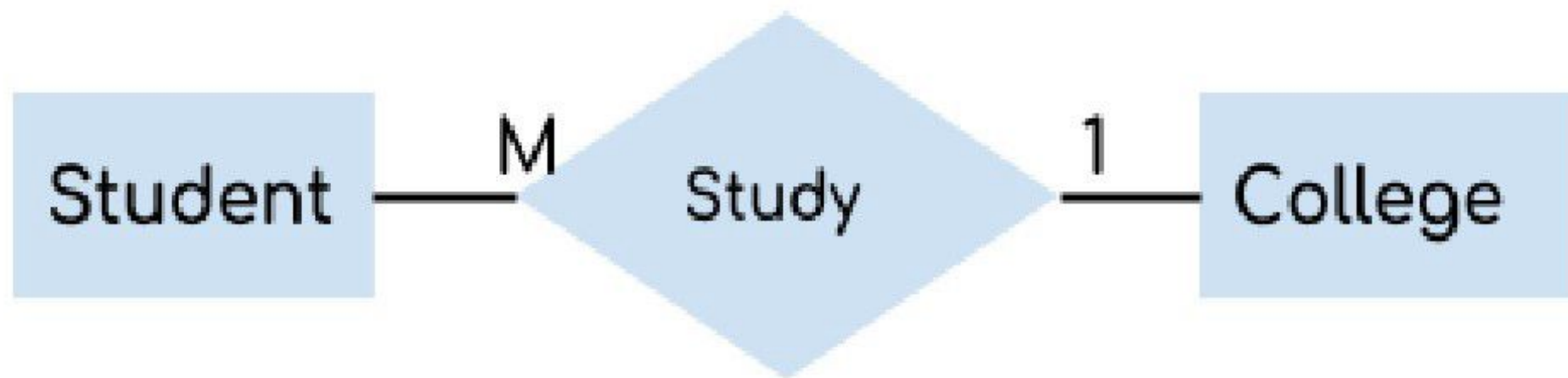
One to Many Relationship

- When a single instance of an entity is associated with more than one instances of another entity then it is called one to many relationship.
- For example, a customer can place many orders but an order cannot be placed by many customers



Many to One Relationship

- When more than one instances of an entity is associated with a single instance of another entity then it is called many to one relationship.
- For example – many students can study in a single college but a student cannot study in many colleges at the same time



Many to Many Relationship

- When more than one instances of an entity is associated with more than one instances of another entity then it is called many to many relationship.
- For example, a student can be assigned to many projects and a project can be assigned to many students

