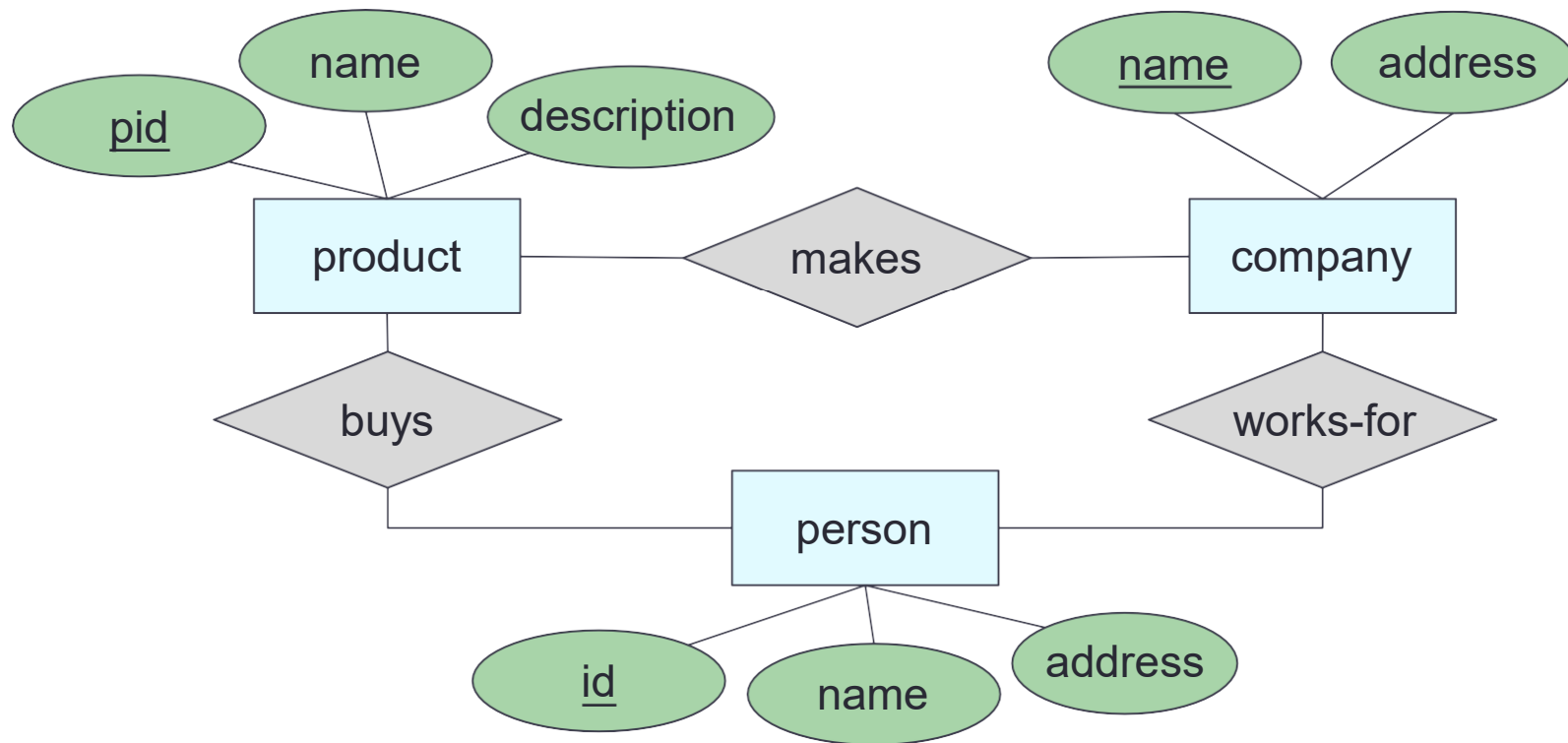


Entity-Relationship Model

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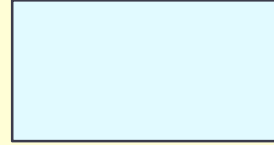
Entity-Relationship Model

- **E-R diagram** – high-level design model representing a database as a **collection of entities and relationships** among entities

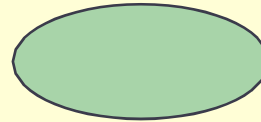


E-R Diagram: Building Blocks

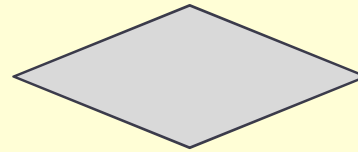
(strong) Entity set



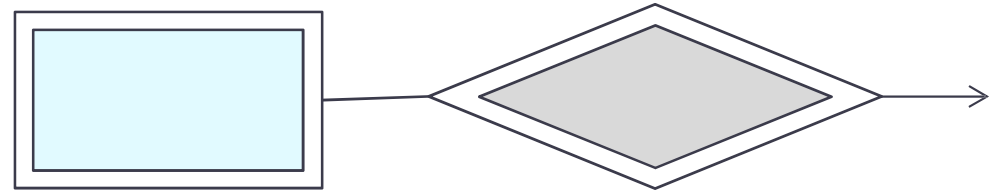
Attribute



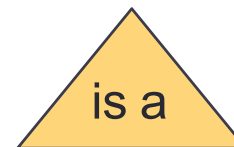
Relationship



Weak entity



Subclass

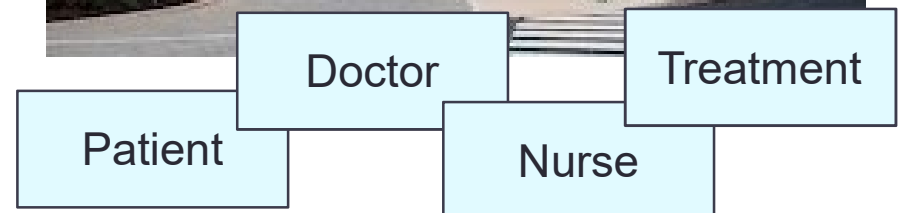
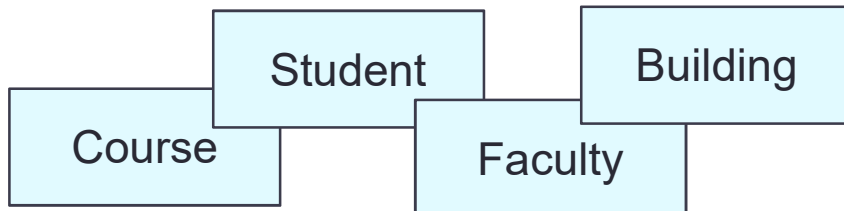


Note: colors are not part of E-R Diagram. They simply are used to increase readability.

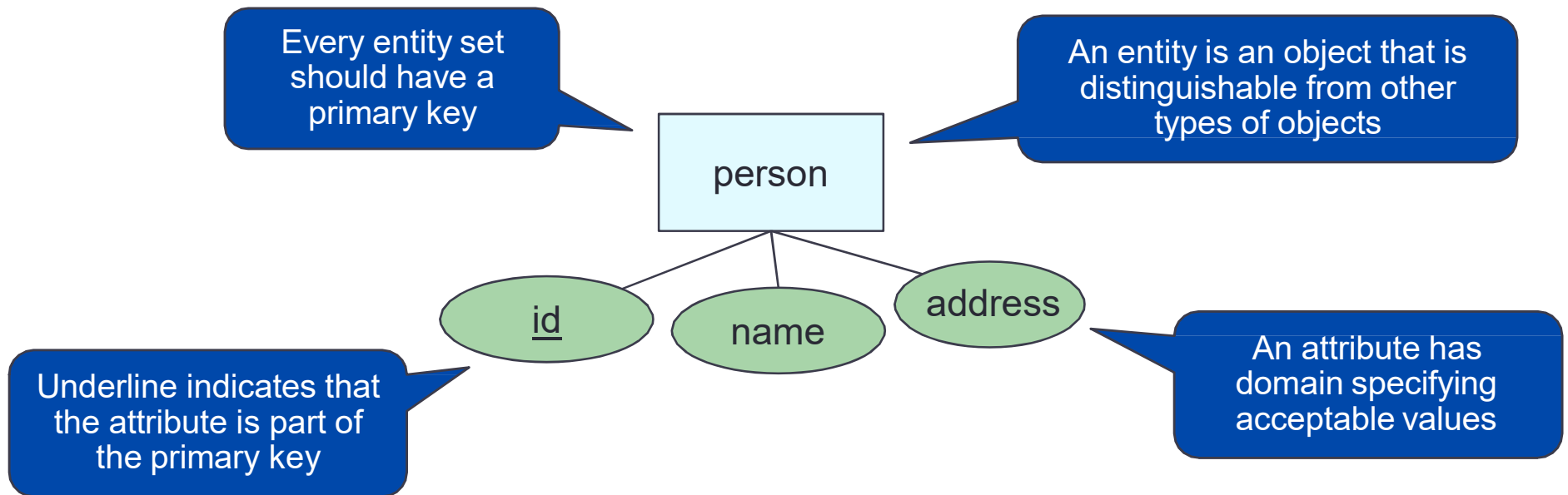
Entity and Entity Sets

- **Entity** ~an object (thing to keep track to run the business)
- **Entity set** ~a class (~table, a collection of things of the same kind)

Some entity set examples



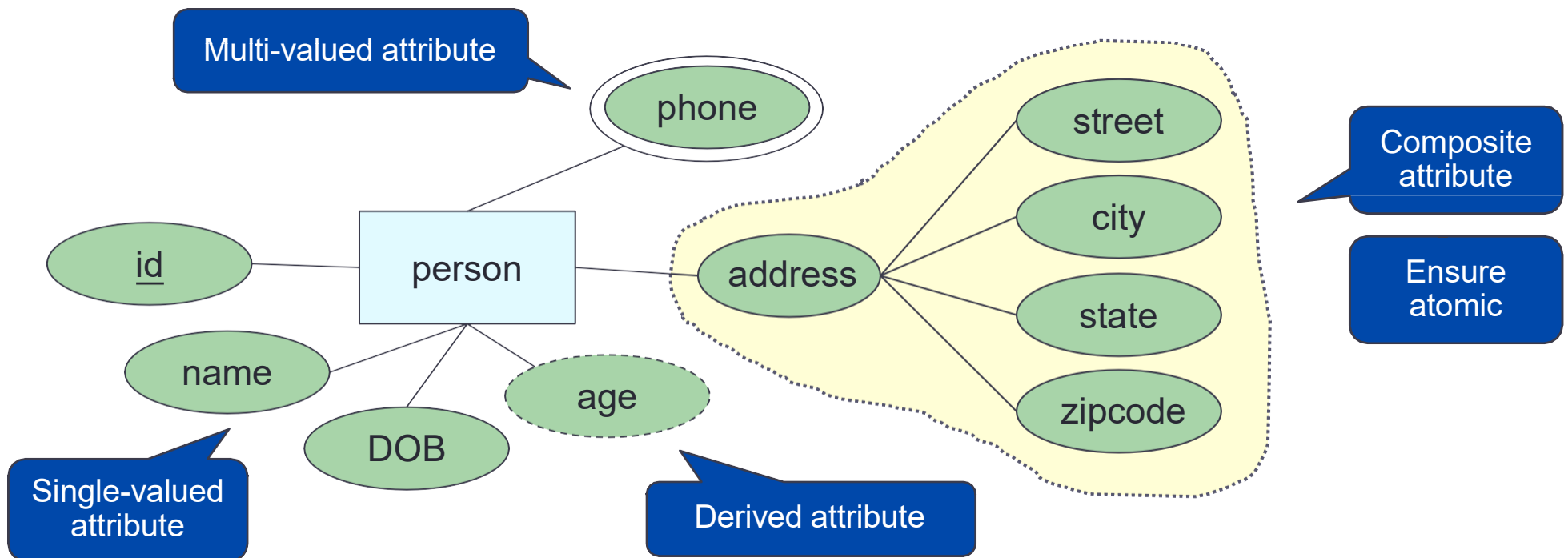
Entity Sets and Attributes



E-R model is a static concept, involving the structure of data and not the operations on data.
Thus, no methods associated with an entity set

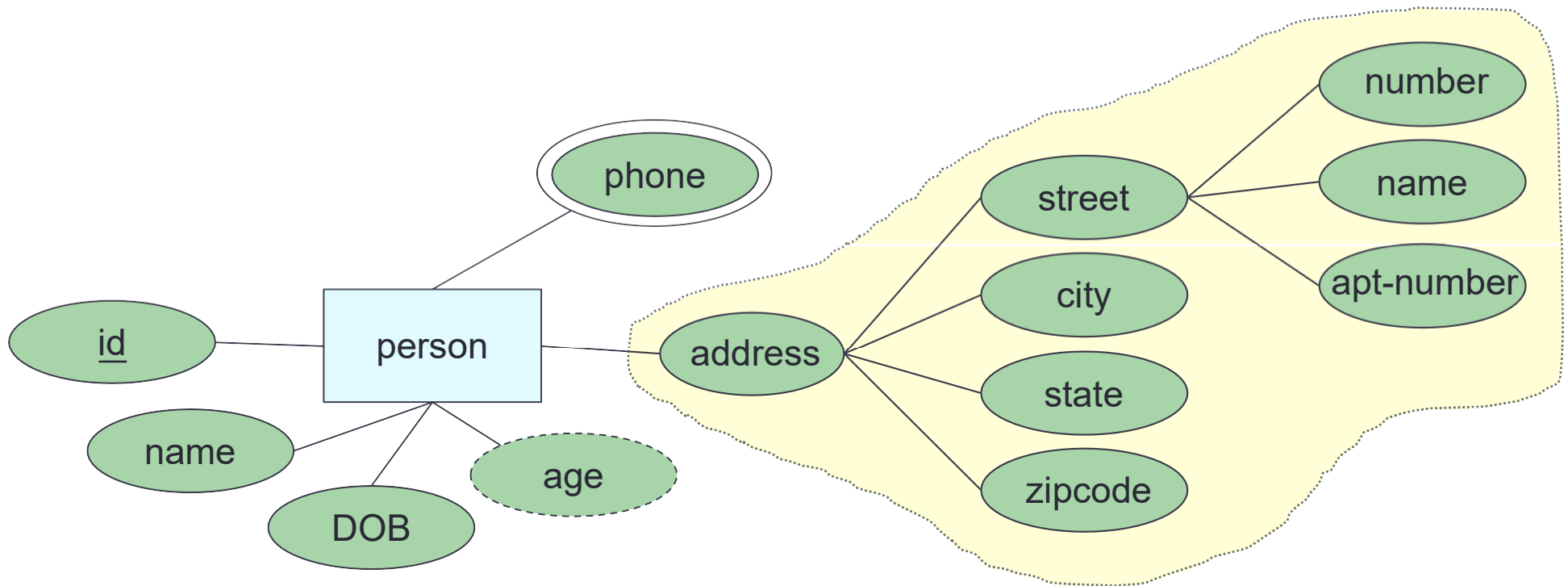
Attributes

- **Single-valued attribute** – allows a single value
- **Multi-valued attribute** – allows multiple values at the same time
- **Derived attribute** – can be calculated from one or more attributes
- **Composite attribute** – consists of multiple values



Attributes

- **Composite attribute** – can have as many levels as needed



Relationships

- Connections among two or more entity sets
- **Binary relationships** – connections between two entity sets
- **Multi-way relationships (u-ary)** – connections involving more than two entity sets

Binary Relationships

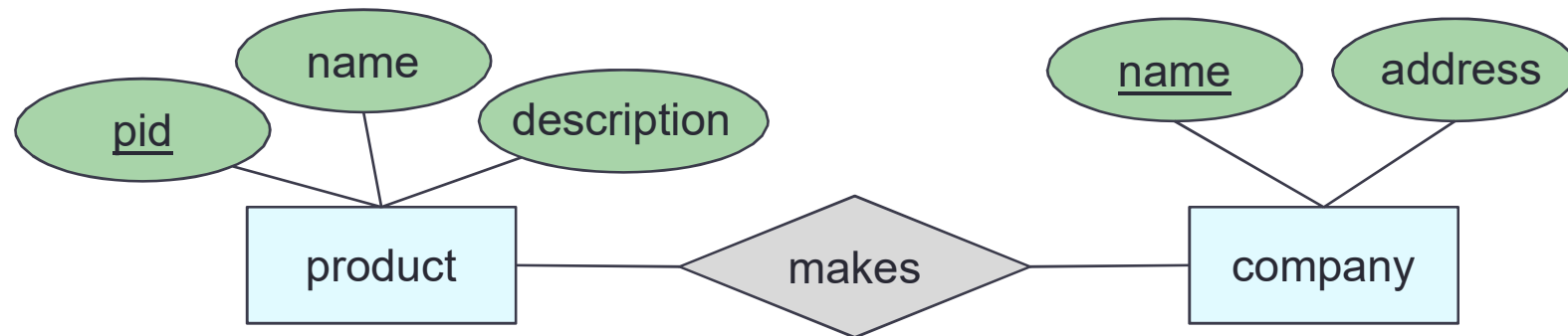
If A and B are sets, a relationship R is a subset of $A \times B$

product

pid	name	description
11	Beyblade	...
22	Trolls	...
...

company

name	address
Dreamwork	...
Hashbro	...
Nyform	...

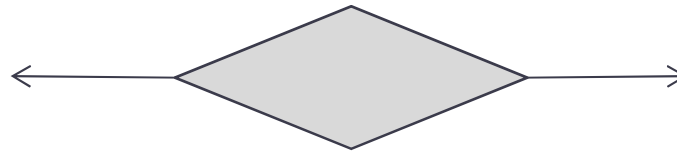


Note: instances do not exist in E-R. These tables are only to help visualize the database being designed.

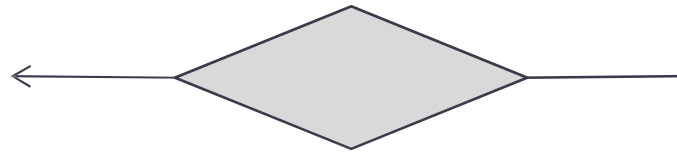
Cardinality (or Multiplicity)

A binary relationship can connect any member of one of its entity sets to any number of members of the other entity set

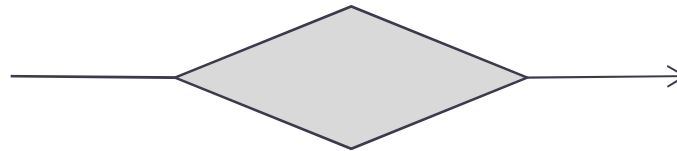
- One-to-one



- One-to-many



- Many-to-one



- Many-to-many

