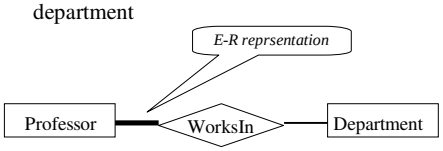
Participation Constraint

- If every entity participates in *at least* one relationship, a *participation constraint* holds:
  - A participation constraint of entity type E having role ρ in relationship type R states that for *e* in E there is an *r* in R such that ρ(*r*) = *e*.
  - e.g., every professor works in *at least* one department



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Representing Participation Constraints

- *Inclusion dependency*: Every professor works in *at least* one dep't.
  - in relational model: (easy)
    - Professor (*Id*) references WorksIn (*ProfId*)
  - in SQL:
    - Special case: Every professor works in *exactly one* dep't. (easy)
      - FOREIGN KEY *Id* REFERENCES WorksIn (*ProfId*)
    - General case (not so easy):

```
CREATE ASSERTION ProfsInDepts
  CHECK ( NOT EXISTS (
    SELECT * FROM Professor P
    WHERE NOT EXISTS (
      SELECT * FROM WorksIn W
      WHERE P.Id = W.ProfId ) ) )
```

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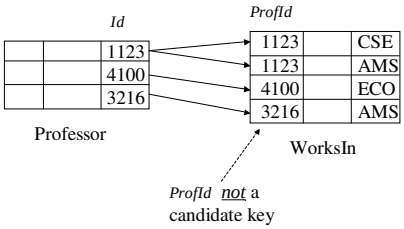
Participation Constraint in Relational Model

- Example (can't use foreign key in Professor)



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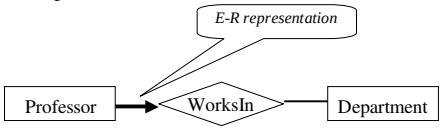
Participation *and* Key Constraint

- If every entity participates in *exactly* one relationship, both a participation and a key constraint hold:
  - e.g., every professor works in *exactly one* department



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Participation *and* Key Constraint in SQL

- If both participation and key constraints apply, use foreign key constraint in entity table (but beware: if candidate key in entity table is not primary, presence of nulls violates participation constraint).

```
CREATE TABLE Professor (
  Id INTEGER,
    ……
  PRIMARY KEY (Id),      -- Id can't be null
  FOREIGN KEY (Id) REFERENCES WorksIn (ProfId)
                         --all professors participate
)
```

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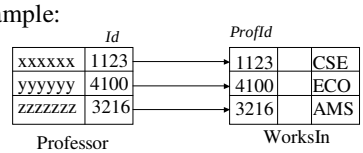
Participation *and* Key Constraint in Relational Model

- Example:



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Participation *and* Key Constraint in Relational Model (again)

- Alternate solution if both key and participation constraints apply: merge the tables representing the entity and relationship sets
  - Since there is a 1-1 and onto relationship between the rows of the entity set and the relationship sets, might as well put all the attributes in one table

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Participation *and* Key Constraint in Relational Model

- Example

xxxxxxx	1123		CSE
yyyyyyy	4100		ECO
zzzzzzzz	3216		AMS

Prof_WorksIn

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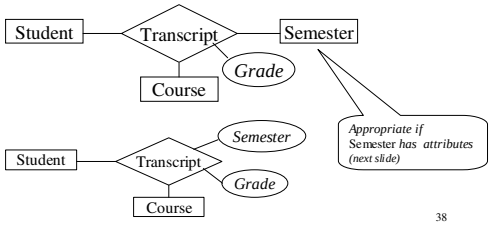
Entity or Attribute?

- Sometimes information can be represented as either an entity or an attribute.



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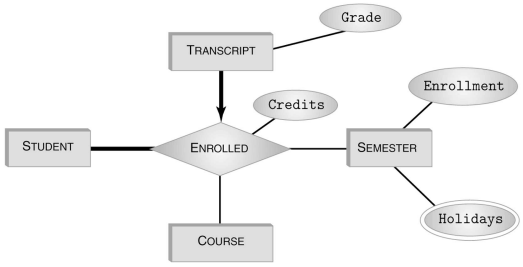
Entity or Relationship?



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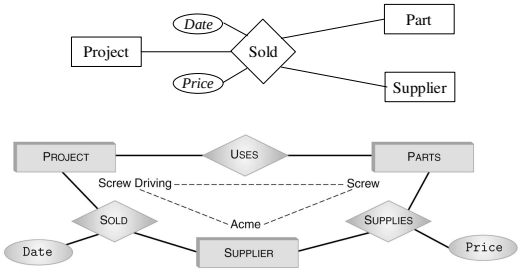
(Non-) Equivalence of Diagrams

- Transformations between binary and ternary relationships.



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