

# CMPSC 174A: Section 6

## ER and Database design

February 17th, 2021



# Outline

ER review  
Database Design

## Why database design is necessary?

- Long term use of database
- Expensive update

## ER Diagram

Entity ?

Attribute ?

Relationship ?

## Relationship

- One-to-one
- Many-to-one
- Many-to-many

# Conceptual Design

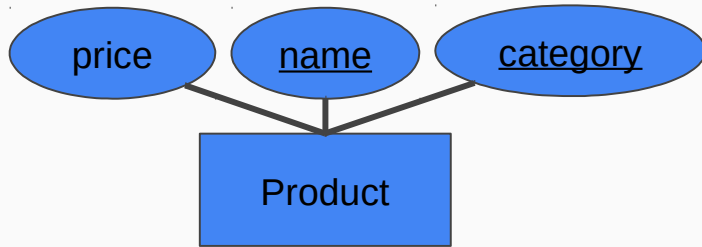


- | Name | <u>SSN</u>  | <u>PhoneNum</u><br><u>ber</u> | City      |
|------|-------------|-------------------------------|-----------|
| Fred | 123-45-6789 | 206-555-1234                  | Seattle   |
| Fred | 123-45-6789 | 206-555-6543                  | Seattle   |
| Joe  | 987-65-4321 | 908-555-2121                  | Westfield |

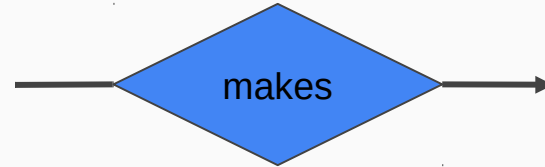
# Conceptual Design

- **Anomalies:**
  - Redundancy: repeated data for Fred
  - Update anomalies: what if Fred moves to “Bellevue”?
  - Deletion anomalies: what if Joe deletes his phone number?

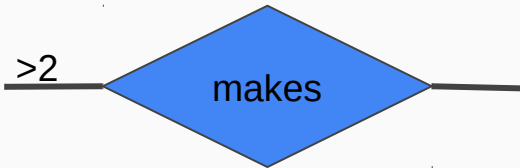
# Integrity Constraints in ER Diagrams



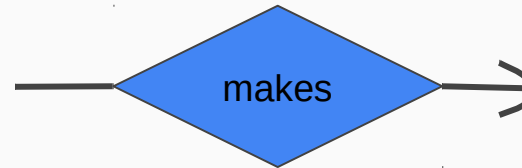
Keys



Single Value Constraints (many-one) [possibly none]



Other Constraints



Referential Integrity Constraints (many-one) [exactly one]



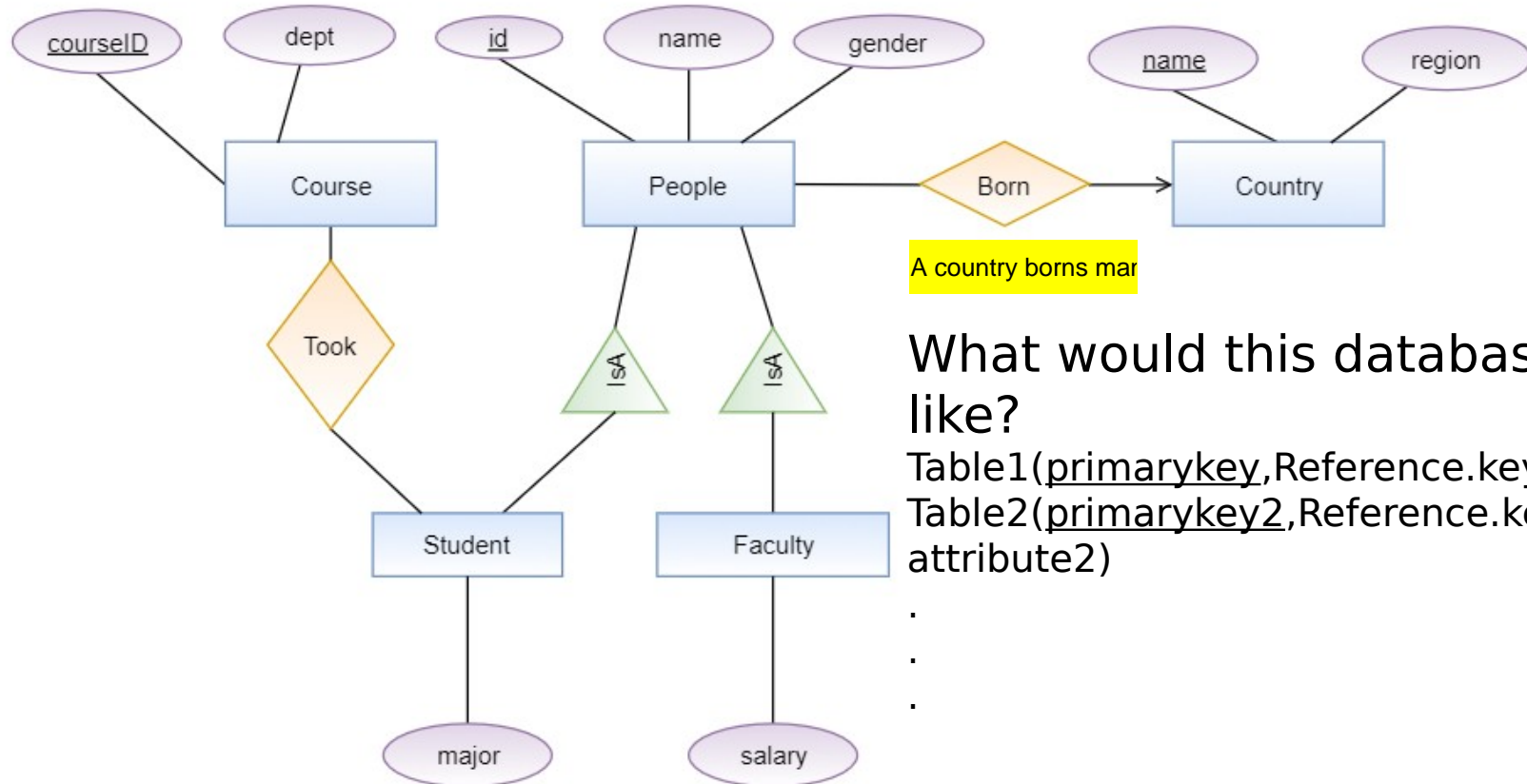
# Examples of Relationships

- one-one: ssn - student id
- one-many: ssn - phone#
- many-many: store - product
- is-a: computer - PC and computer - Mac
- has-a: country - city
- What country does the city of Cambridge belong to?
- exactly-one: a city belongs to exactly one country

# Ex: Creating an ER diagram

- Create an ER diagram containing the following information:
- The **id**, **name**, **gender**, **name of country** of birth, and **region** of world (continent) for ***students*** and ***faculty***
- The **major** of students
- The **salary** of faculty
- The **courses** that each student takes(identified by course\_id)
- The **department** each course is offered in

# Ex: ER diagram to Table declarations



A country births mar

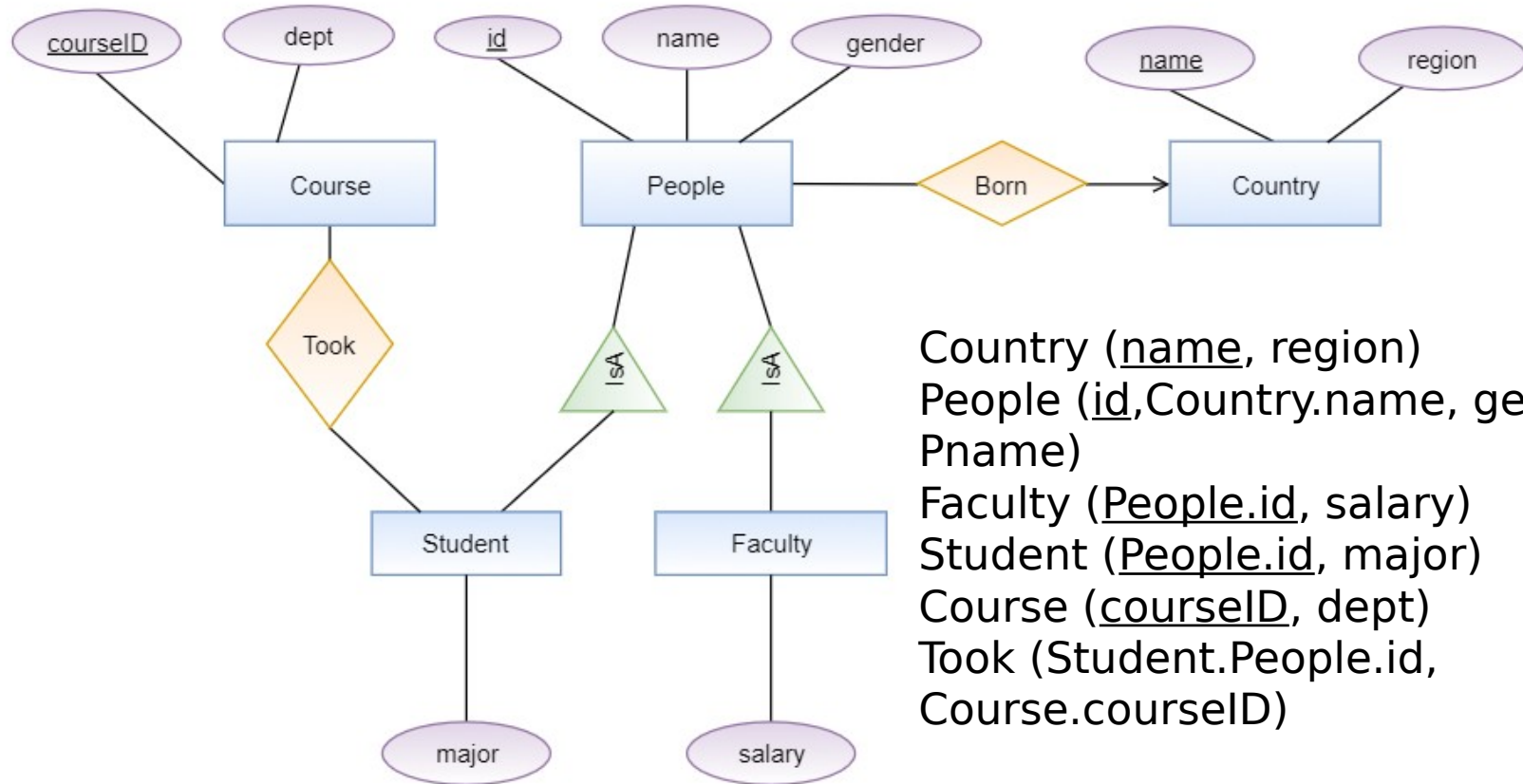
What would this database look like?

Table1(primarykey,Reference.key, attribute)

Table2(primarykey2,Reference.key, attribute2)

.  
. .  
.

# Ex: ER diagram to Table declarations



Country (name, region)  
People (id, Country.name, gender, Pname)  
Faculty (People.id, salary)  
Student (People.id, major)  
Course (courseID, dept)  
Took (Student.People.id, Course.courseID)