IS220
Database Management System

Lab 1: Intro. to Database

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Practical Course Contents

- Introduction to Database
- SQL Basics
- DDL
- DML
- Joining Tables
- Grouping & Sorting Data

Assessment Methods

- Lab Tasks
- Home Assignments
- Final Practical Exam

Marks Distribution

- Lab Attendance (5 Marks)
- Final Practical Exam (25 Marks)

Lab Agenda

- Basic Definitions
- Database Structure
- ER Modeling

Basic Definitions

Basic Definitions

- **Database**
  A Collection of related data.
- **Database Management System (DBMS)**
  Software package / system to facilitate the creation and management of computerized database.
- **Database System**
  Refers to a system that manages databases, including the software, hardware, and procedures involved in storing, retrieving, and manipulating data typically includes the (DBMS).

Relational DB Structure

Relational Database Structure

- A **database** is a collection of tables
- A **table** is a collection of records (record or tuple or rows)
- A **record** is a collection fields (attributes or columns)

Table Example

Customer ID	First Name	Last Name	Zip	Email
MOR9117	James	Morgan	98310	jmorgan@cti.net
PIC3760	Kate	Picadilly	64068	picadillyk@monet.com
BEL2456	Rex	Bell	59701	rexbell@xyz.com

Table Example

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MOR9117	James	Morgan	98310	jmorgan@cti.net
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Records

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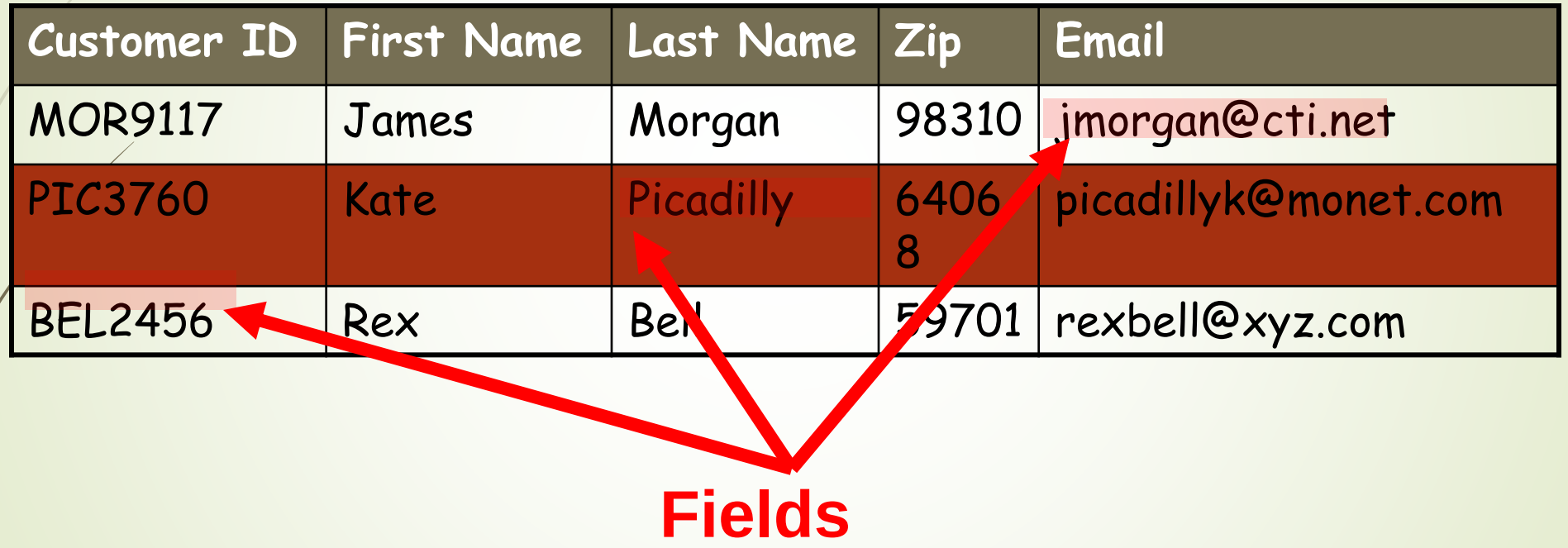

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Database - collection of related tables

Donation ID	Customer ID	Amount
455	MOR9117	$100.56
456	PIC3760	$200.56
457	MOR9117	$365.00

Customer ID	First Name	Last Name	Zip	Email
MOR9117	James	Morgan	98310	jmorgan@cti.net
PIC3760	Kate	Picadilly	64068	picadillyk@monet.com
BEL2456	Rex	Bell	59701	rexbell@xyz.com

Primary key - identifies unique row

Donation ID	Customer ID	Amount
455	MOR9117	$100.56
456	PIC3760	$200.56
457	MOR9117	$365.00

Customer ID	First Name	Last Name	Zip	Email
MOR9117	James	Morgan	98310	jmorgan@cti.net
PIC3760	Kate	Picadilly	64068	picadillyk@monet.com
BEL2456	Rex	Bell	59701	rexbell@xyz.com

Why isn't

- First name a primary key of top table

- Customer ID a primary key of bottom table

Donation ID	Customer ID	Amount
455	MOR9117	$100.56
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457	MOR9117	$365.00

Customer ID	First Name	Last Name	Zip	Email
MOR9117	James	Morgan	98310	jmorgan@cti.net
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BEL2456	Rex	Bell	59701	rexbell@xyz.com

Foreign key - usually identifies primary key of related table - links the tables

Donation ID	Customer ID	Amount
455	MOR9117	$100.56
456	PIC3760	$200.56
457	MOR9117	$365.00

ER Modeling

Entity-Relationship (ER) Modeling

- **ER Modeling** is a *top-down* approach to database design.
- Entity Relationship (ER) Diagram
  - Identifies information required by the business by displaying the relevant entities and the relationships between them.

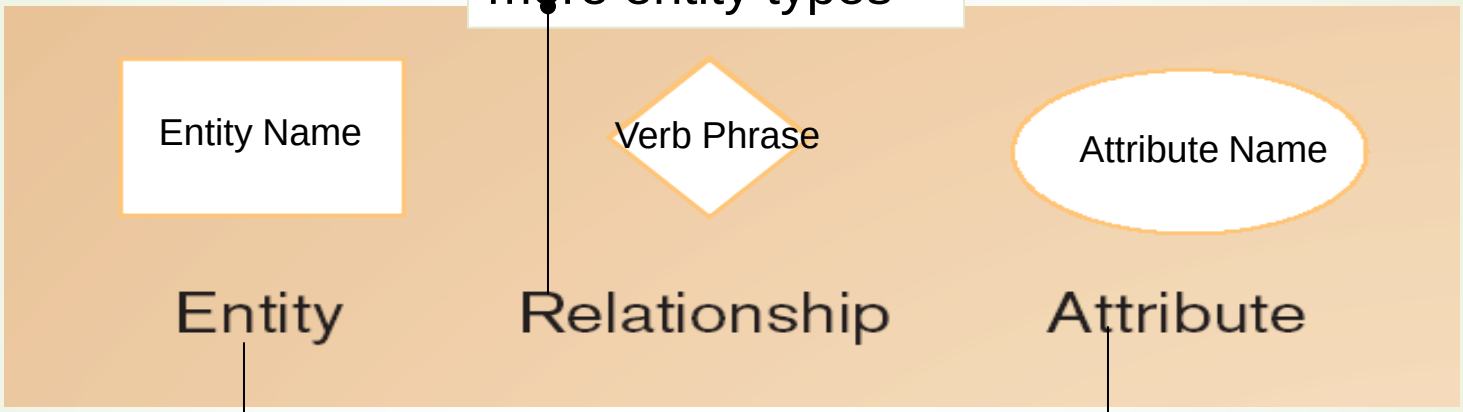
Notation uses three main constructs

- Entities
- Relationships
- Attributes

Chen Model &
Crow's Foot Model

Entity-Relationship Diagram Notations

Association between the instances of one or more entity types



Person, place, object, event or concept about which data is to be maintained

named property or characteristic of an entity

Represents a set or collection of objects in the real world that share the same properties

Entities

- **Entity**
  - Refers to a "thing" or "object" in a database that is distinguishable from others and typically has properties or attributes

- **Examples of entities:**
  - Person: EMPLOYEE, STUDENT, PATIENT
  - Place: STORE, WAREHOUSE
  - Object: MACHINE, PRODUCT, CAR
  - Event: SALE,REGISTRATION, RENEWAL
  - Concept: ACCOUNT, COURSE

- **Guidelines for naming and defining entity types:**
  - An entity type name is a singular noun
  - An entity type should be descriptive and specific
  - An entity name should be concise

Attributes

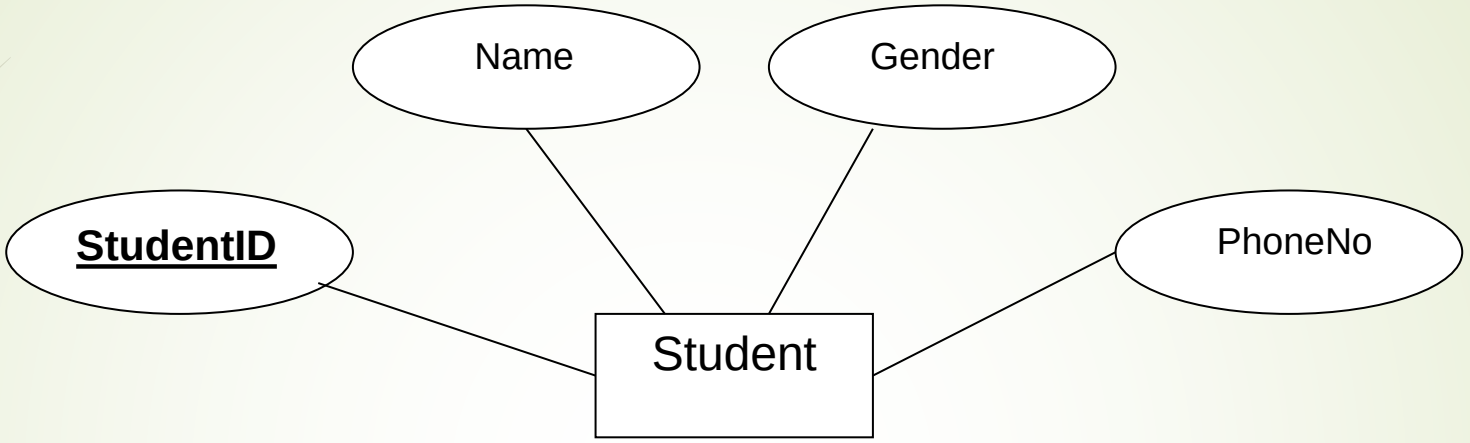
- **Attribute**
  - the properties or fields that define an entity.

- **Example of entity types and associated attributes:**

  STUDENT: Student_ID, Student_Name, Home_Address, Phone_Number, Major

- **Guidelines for naming attributes:**
  - An attribute name is a noun.
  - An attribute name should be unique
  - To make an attribute name unique and clear, each attribute name should follow a standard format
  - Similar attributes of different entity types should use similar but distinguishing names.

Example



Student	
PK	**StudentID**
	Name Gender PhoneNo

Relationships

→ Associations between instances of one or more entity types that is of interest

→ Given a name that describes its function.

- relationship name is an active or a passive verb.

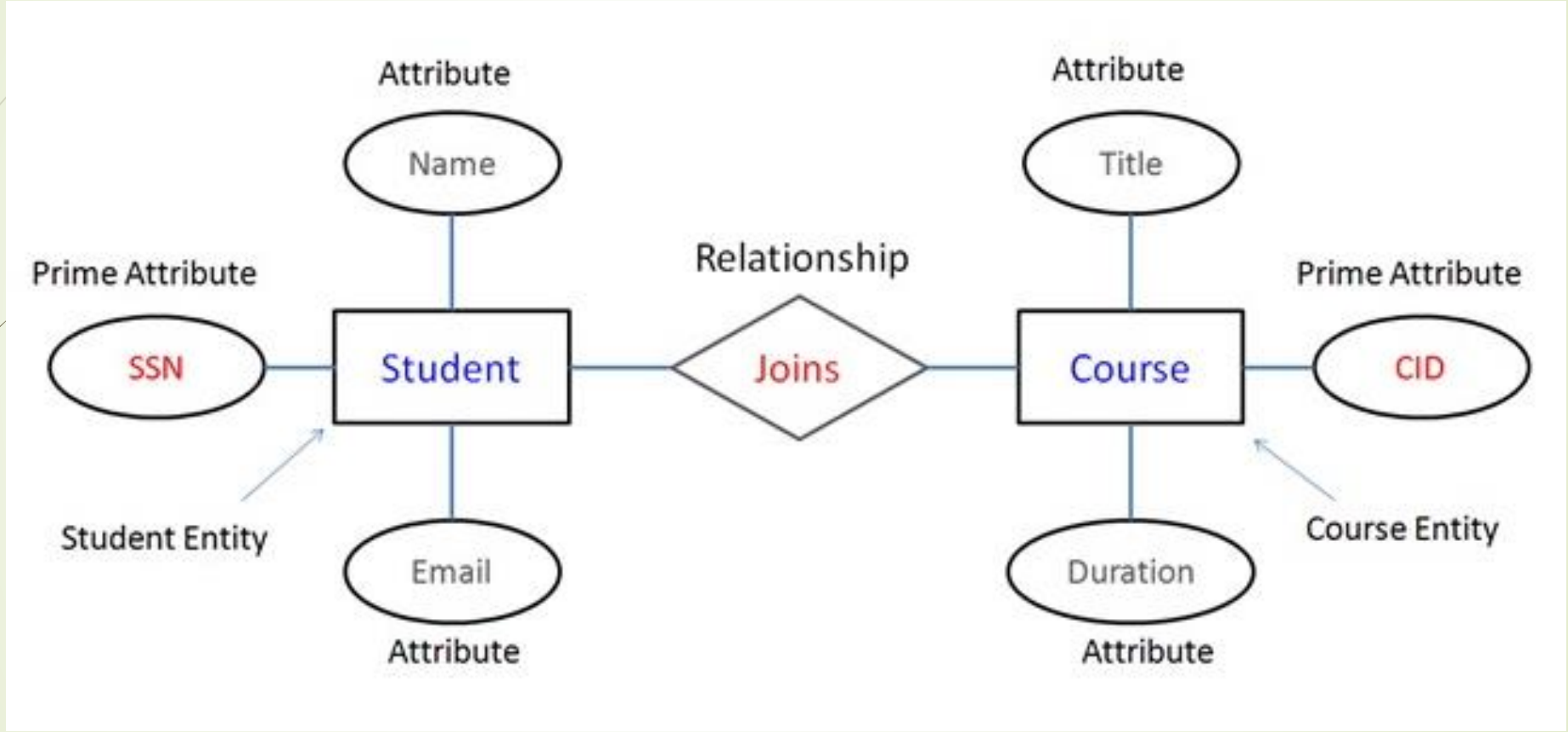
Relationship name:
writes

Author

Book

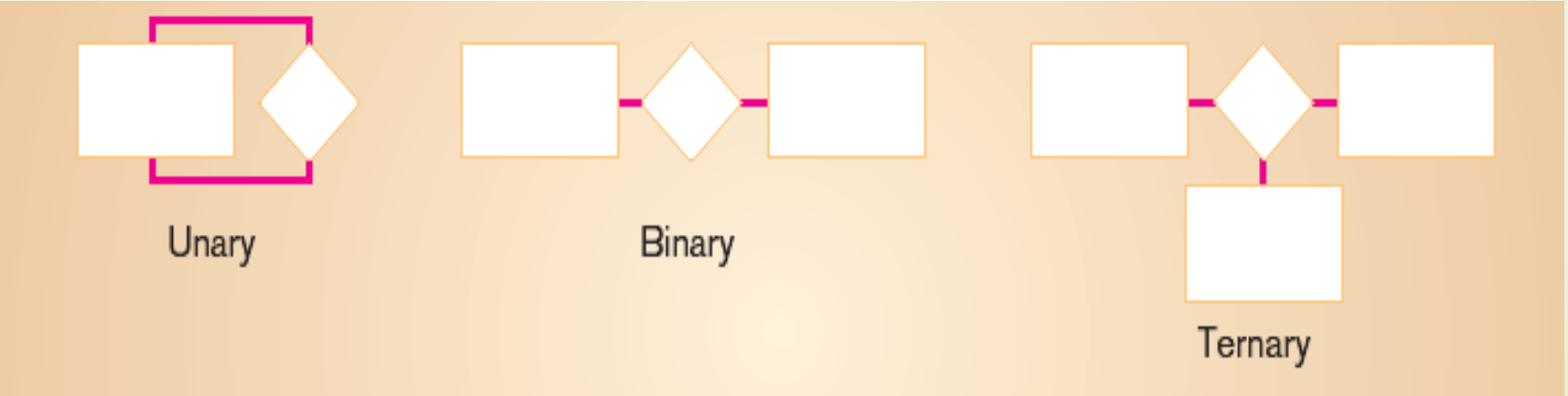
An author writes one or more books
A book can be written by one or more authors.

Example


Attribute
Name
Attribute
Title
Relationship
Prime Attribute
SSN
Student
Joins
Course
Prime Attribute
CID
Student Entity
Email
Duration
Course Entity
Attribute
Attribute

Degree of Relationships

- **Degree**: number of entity types that participate in a relationship
- **Three cases**
  - **Unary:** between two instances of one entity type
  - **Binary:** between the instances of two entity types
  - **Ternary:** among the instances of three entity types



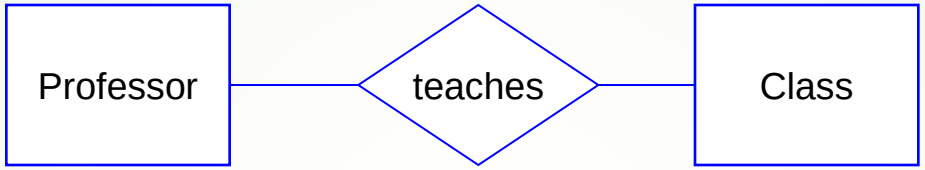
Cardinality and Connectivity

- Relationships can be classified as either
  - one – to – one
  - one – to – many
  - many – to –many

  } **Connectivity**

- ***Cardinality*** : minimum and maximum number of instances of Entity B that can (or must be) associated with each instance of entity A.

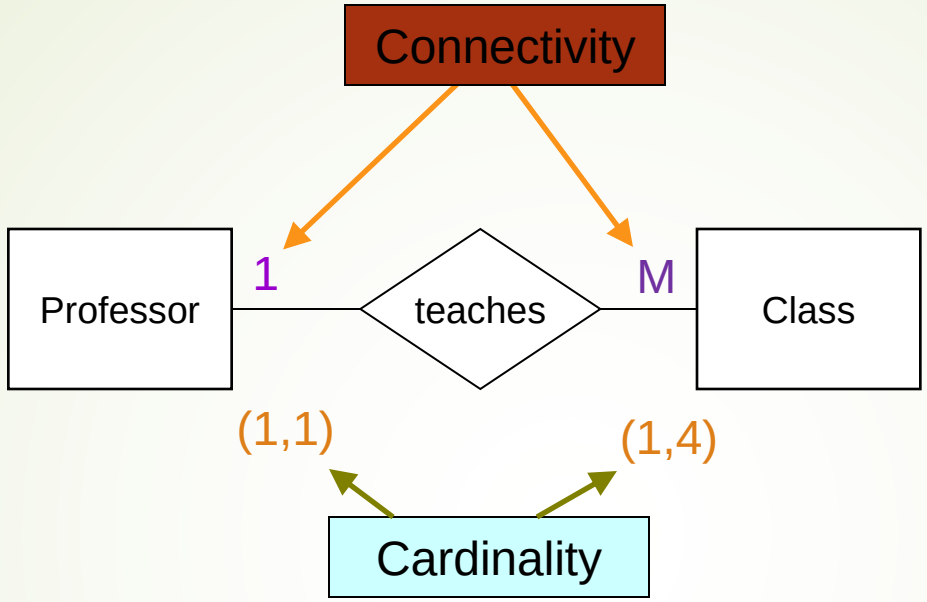
Cardinality and Connectivity



A professor teaches class OR
A class is taught by professor

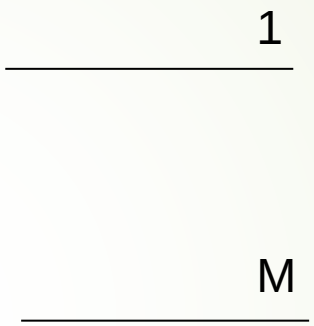
How Many??

Cardinality and Connectivity



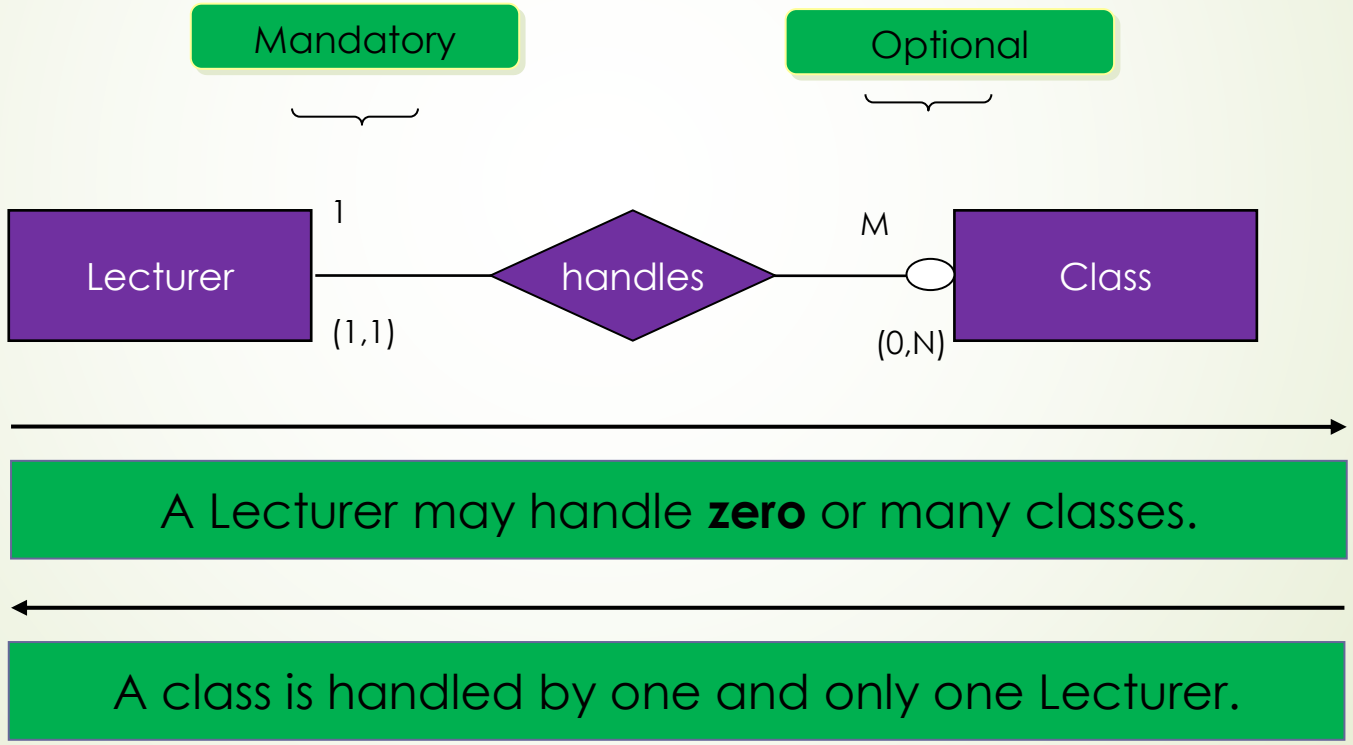
Connectivity

- **Chen Model**
  - 1 to represent one
  - M to represent many



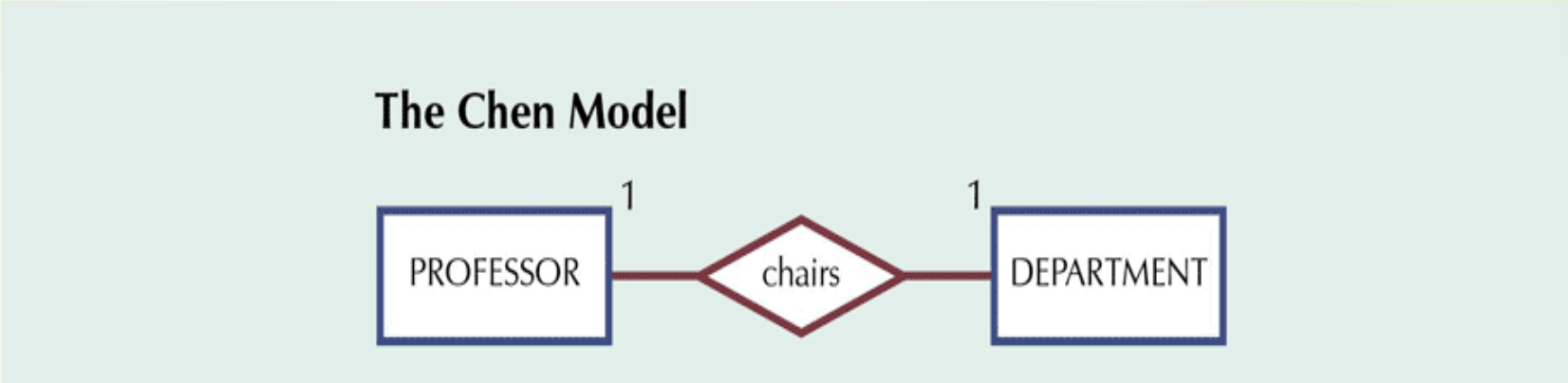
Mandatory VS. Optional Cardinalities

Specifies whether an instance must exist or can be absent in the relationship



Binary Relationships

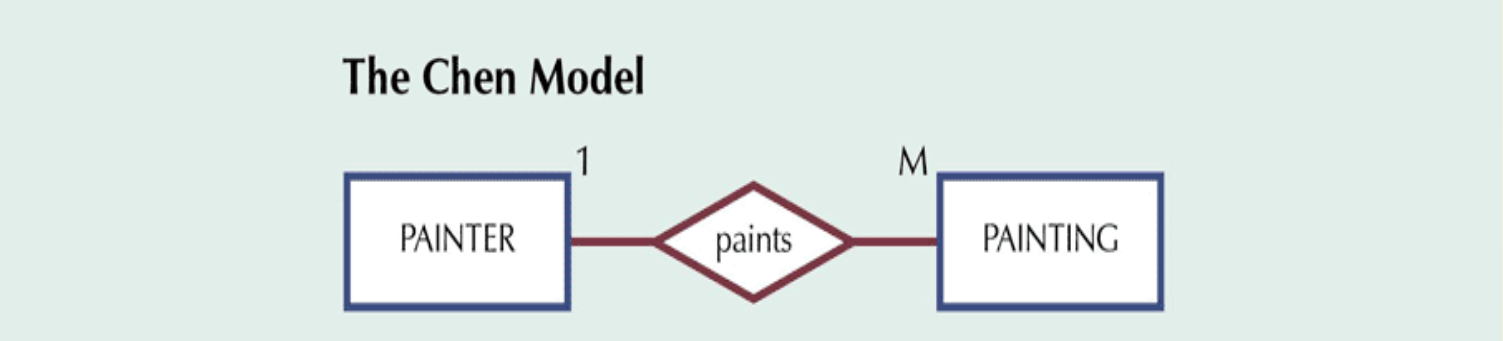
- **1 : 1 Relationship**



The 1: 1 relationship between PROFESSOR and DEPARTMENT

Binary Relationships

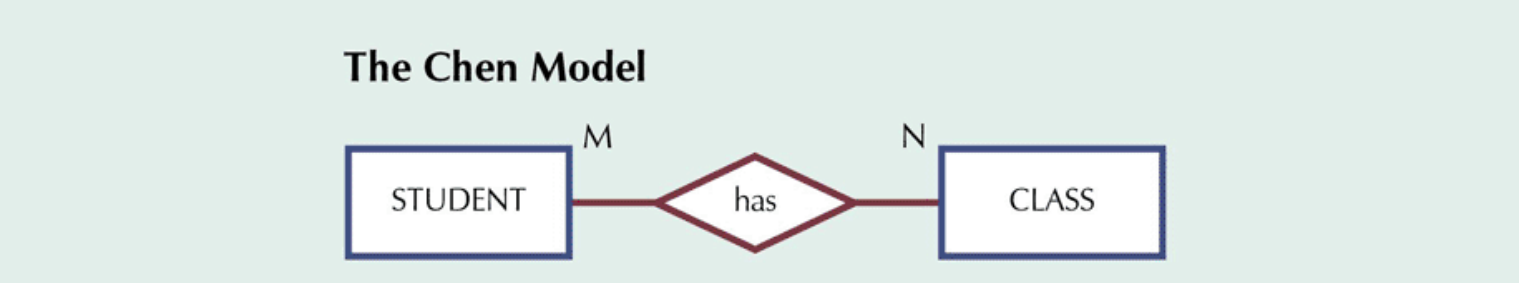
- **1 : M Relationship**



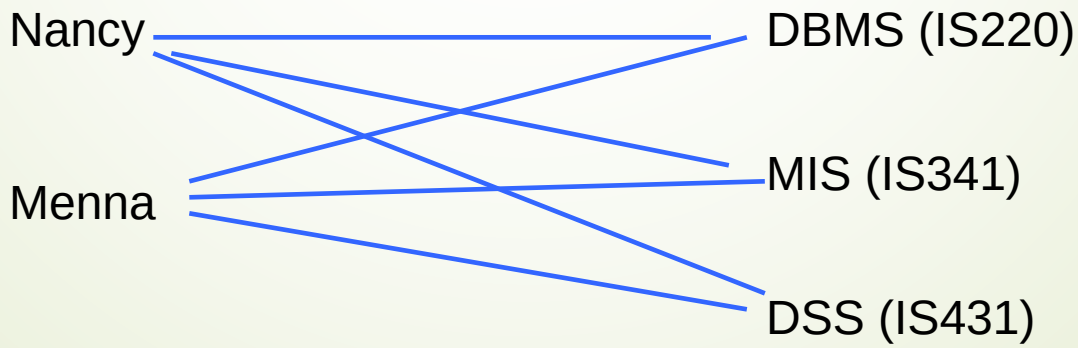
The 1: M relationship between PAINTER and PAINTING

Binary Relationships

- **M : N Relationship**

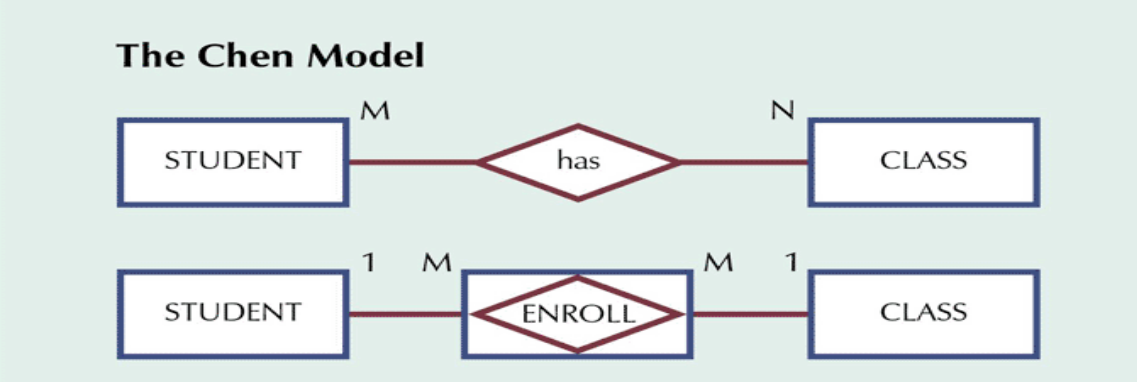


The M:N Relationship Between STUDENT and CLASS



Binary Relationships

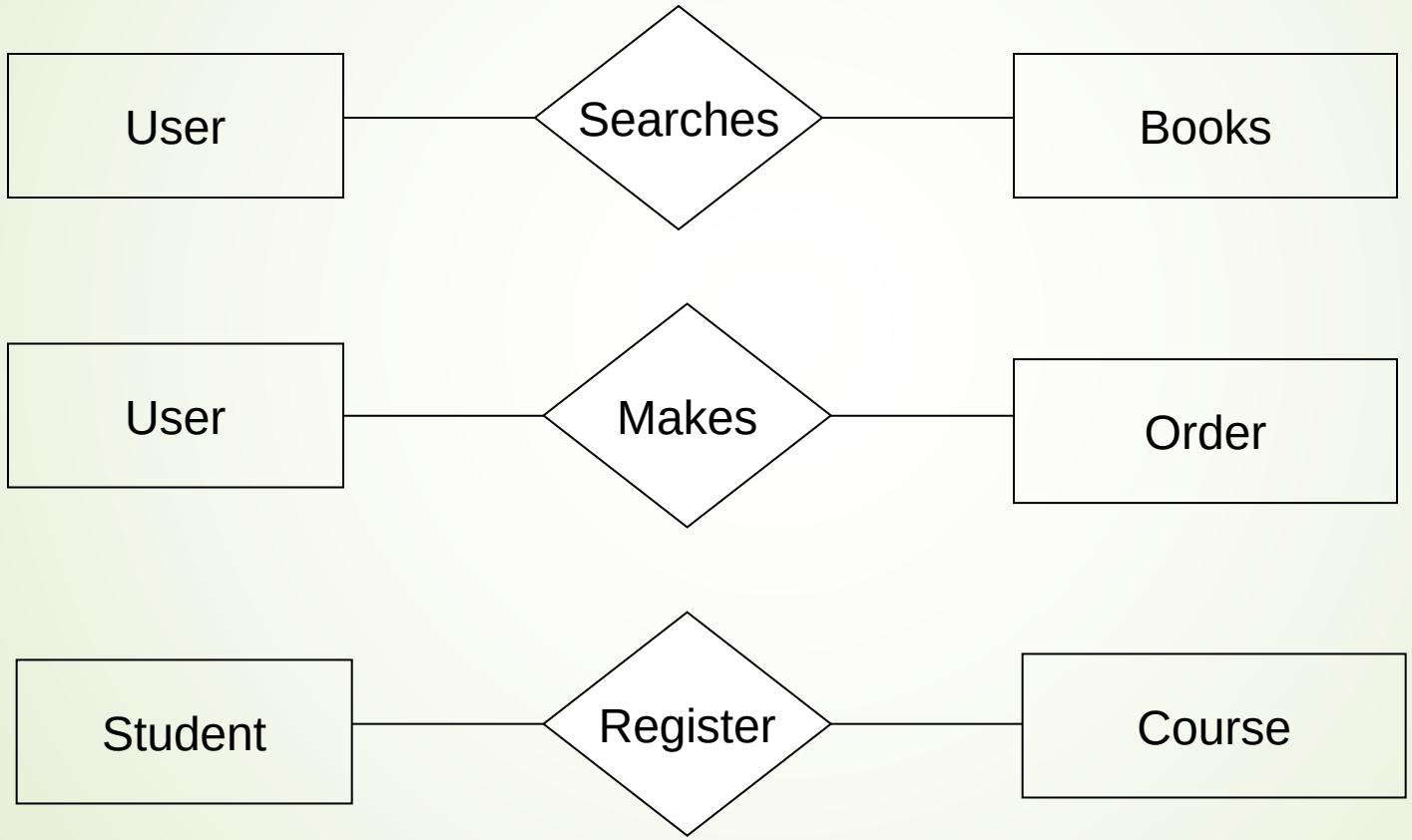
- **M : N Relationship**



Changing the M:N relationship to TWO 1:M relationships

Lab Task

- **Show The relationship connectivity between the following entities:**



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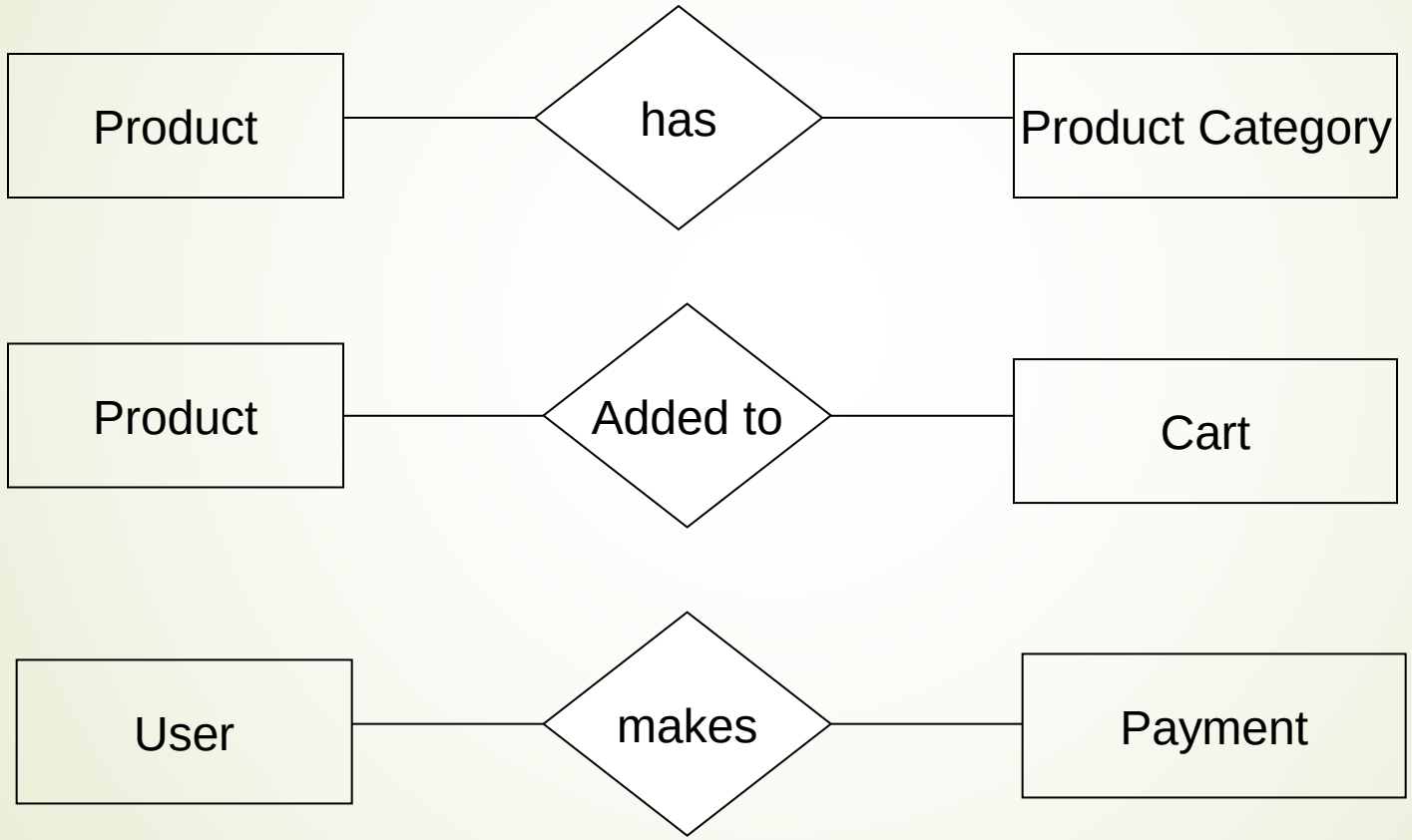
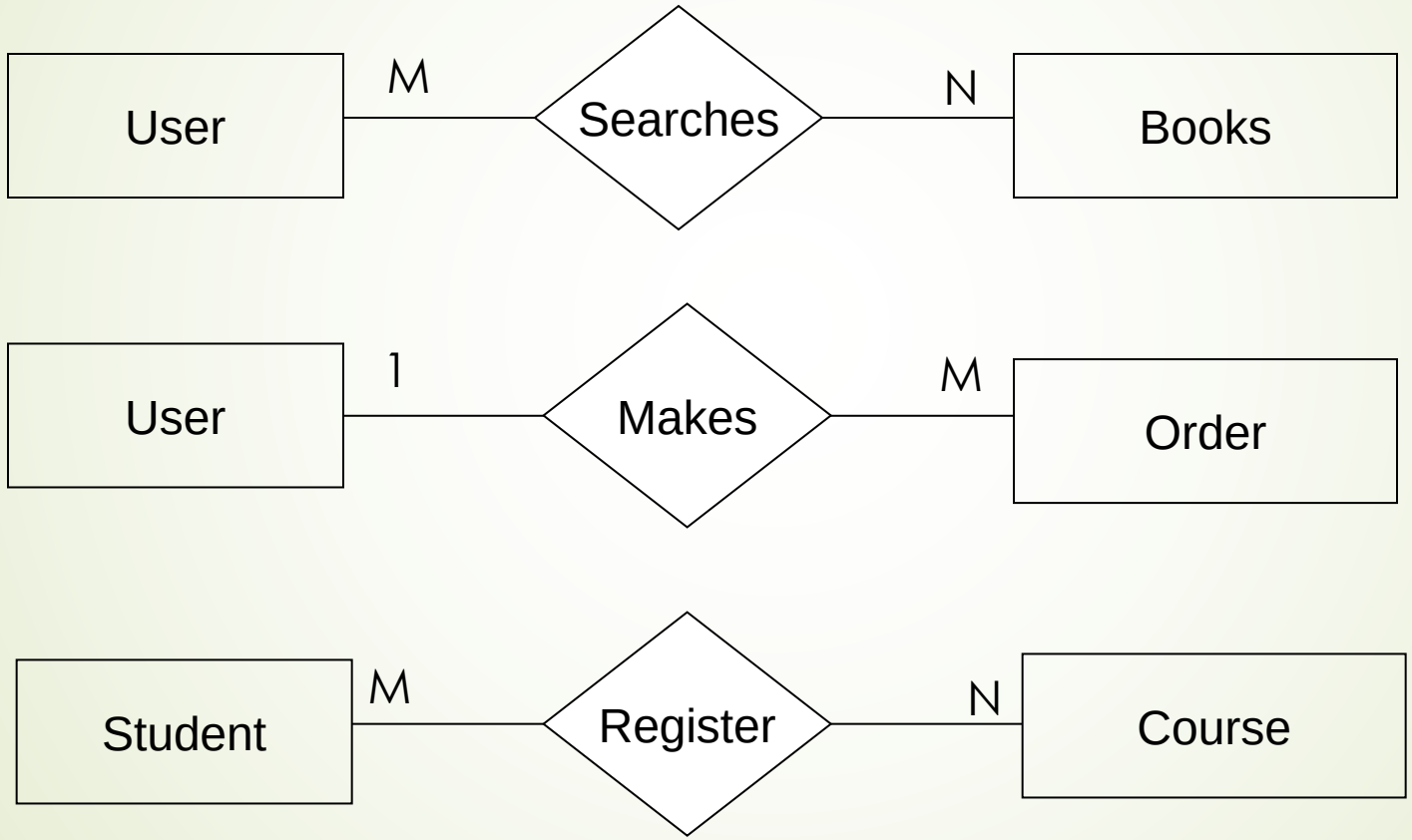


Lab Task (Solution)

- **Show The relationship connectivity between the following entities:**



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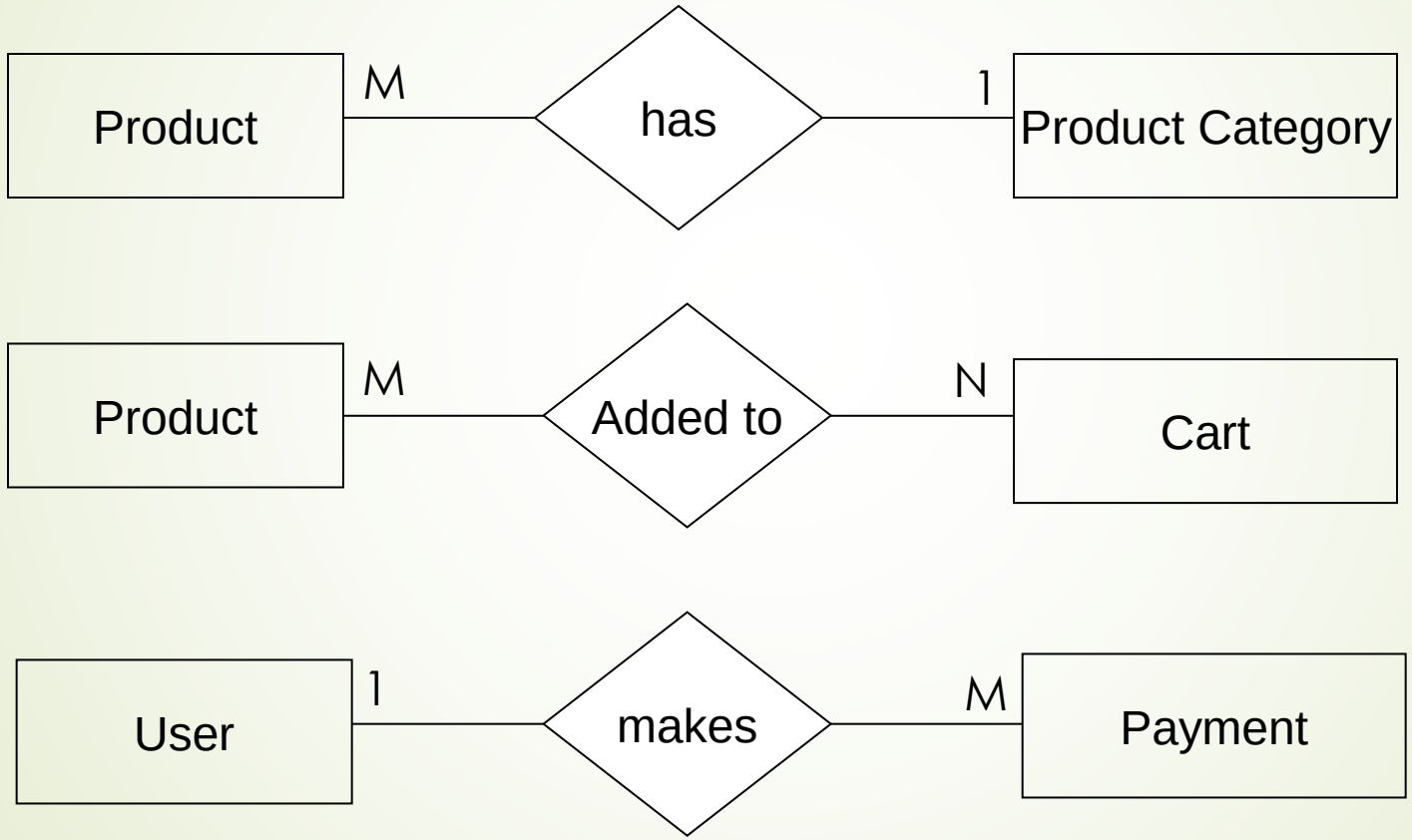

Next Lab

- Intro. to SQL
- Database Creation
- SQL Data Types
- SQL Constraints
- Table Creation
- Implementing 1 : 1 , 1 : M and M : N relations

Communication Channels

- Facebook Group
  https://www.facebook.com/groups/is220

Communication Channels

- Messenger Chat Group
  Click Here

Communication Channels

- WhatsApp Group
  Click Here

Communication Channels

- My Facebook Account
  Click Here

Communication Channels

- My Linkedin Account
  Click Here

Any Questions ?

Thank You!