Entity Relationship Diagrams
(Section 15.1)

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Entity Relationship Diagram

Entity Set - set of persons, objects, or concepts that form a major focus of the database. In the entity relationship diagram, entity sets are represented by rectangles.

Relationship - some interaction or other connection between two entity sets or among more entity sets. In the entity relationship diagram, relationships are represented by diamonds and line connections to all the entity sets involved in the relationship.

Attributes - describe specific features or characteristics of the entities or the relationships. In the entity relationship diagram, attributes are represented by ovals.

Relationship Types

A binary relationship between two entity sets A and B is:

One-to-one - if each entity in A participates in the relationship with at most one entity in B and vice versa. One-to-one relationships are represented by a pair of arrows. Both arrows run from the relationship to the entity sets.

One-to-many - if each entity in A may participate in the relationship with several entities in B, but each entity in B participates in the relationship with at most one entity in A. A one-to-many relationship between A and B is represented by an arrow from the relationship R to A.

Many-to-many - if each entity in A may participate in the relationship with several entities in B, and vice versa. Many-to-many relationships are represented by a pair of plain lines.

Insurance Company Database

What needs to be represented?

- Persons
- Disasters
- Hit
- Name
- Type

Insurance Company Database

What components are these in the diagram?

Persons – Entity Set

Disasters – Entity Set

Hit – Relationship between Persons and Disasters

What type of relationship?

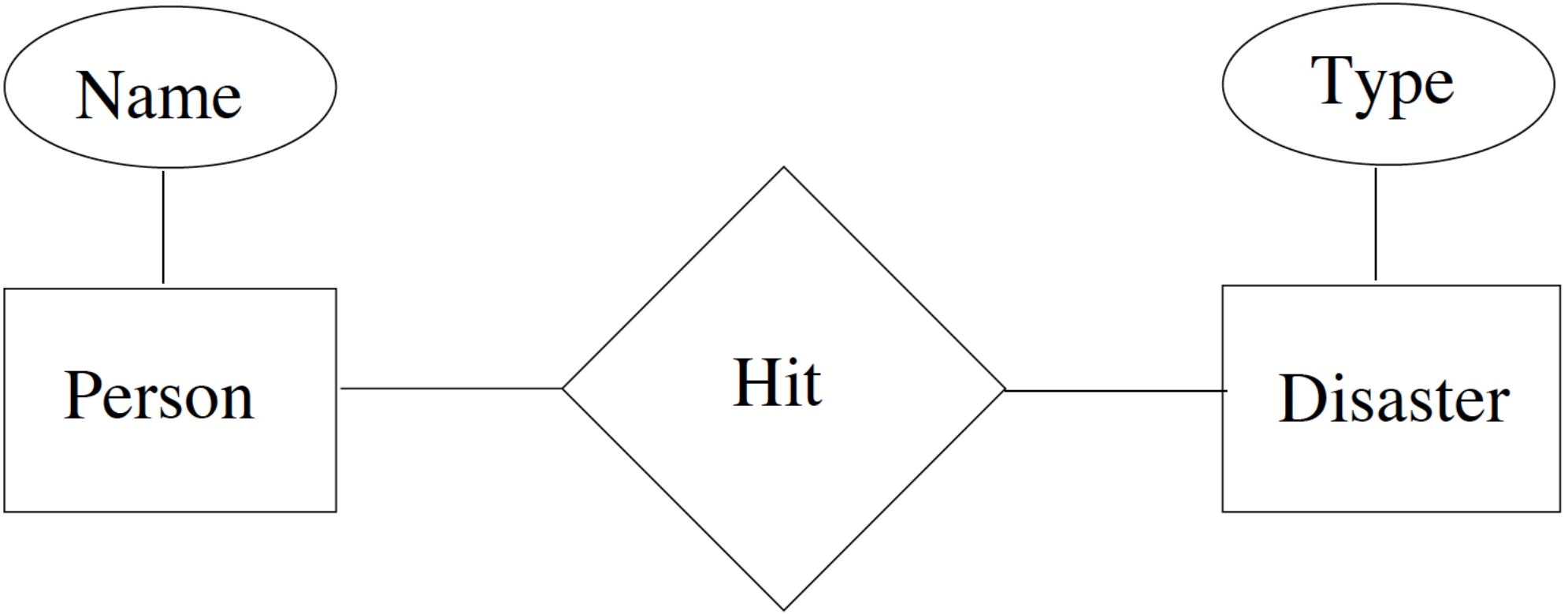
Many-to-many

Name – Attribute of Persons

Type – Attribute of Disasters

Insurance Company Database

Draw the Entity Relationship Diagram.



Exercise: Draw the Entity Relationship Diagram for a Gallery Database

What needs to be represented?

Exercise: Draw the Entity Relationship Diagram for a Gallery Database

What needs to be represented?

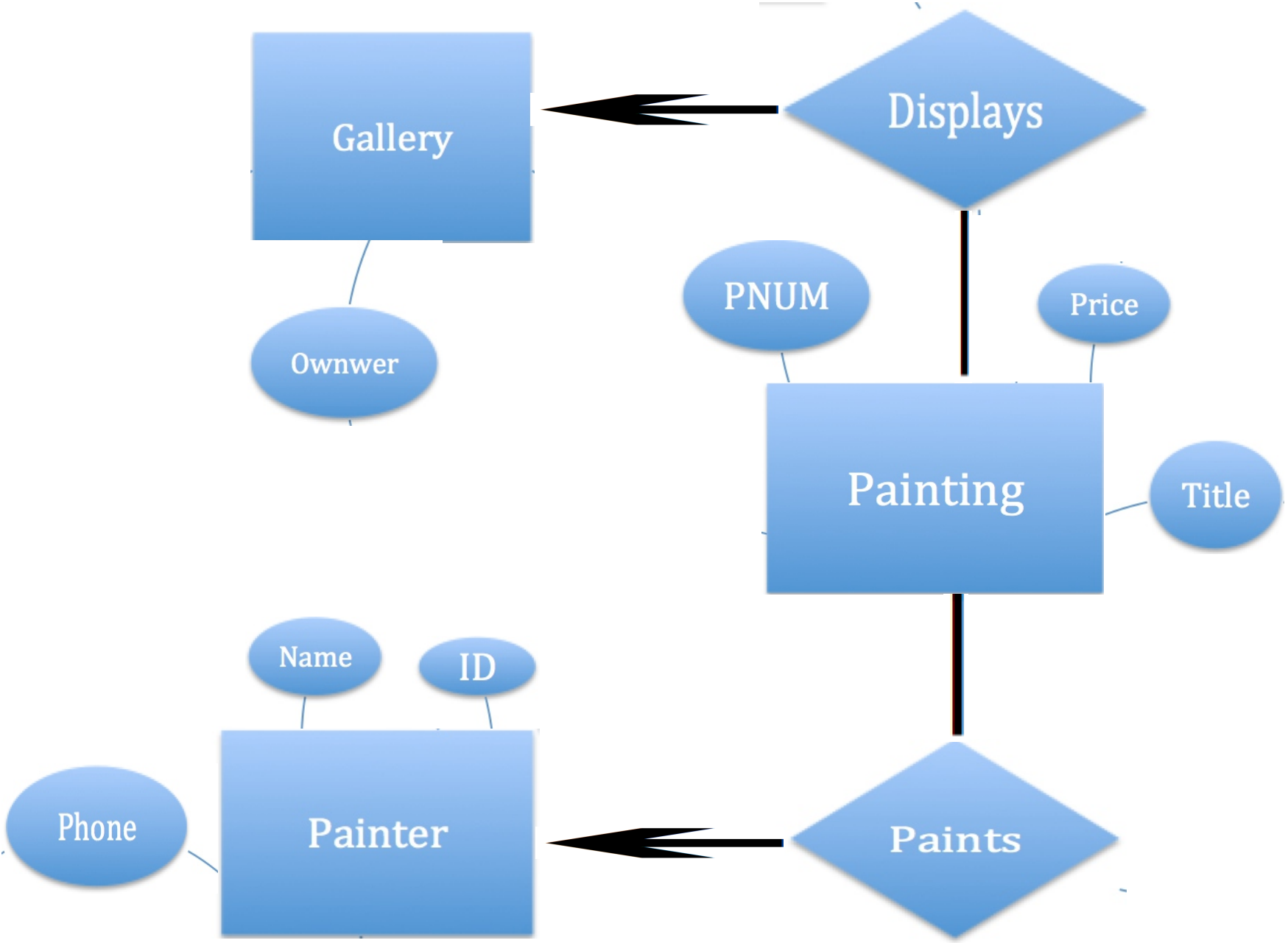
Displays
Gallery
ID
Name
Owner
Painters
Paintings
Paints
Phone
PNUM
Price
Title

Exercise: Draw the Entity Relationship Diagram for a Gallery Database

What components are these in the diagram?

Displays – Relationship between Painting and Gallery
Gallery – Entity Set
ID – Attribute of Painter
Name – Attribute of Painter
Owner – Attribute of Gallery
Painters – Entity Set
Painting – Entity Set
Paints – Relationship between Painting and Painter
Phone – Attribute of Painter
PNUM – Attribute of Gallery
Price – Attribute of Painting
Title – Attribute of Painting

Entity Relationship Diagram for Gallery Database



An instance of the Gallery Database

Gallery

Pnum	Owner
2345	Johnson
6666	Johnson
4536	McCloud
7878	McCloud
6789	Palmer
7896	Palmer
9889	Palmer

Painting

Pnum	Title	Price	Id
2345	Wild Waters	245.00	126
4536	Sea Storm	8359.00	335
6666	Wild Waters	6799.00	234
6789	Paradise	590,000.00	234
7878	High Tide	98,000.00	456
7896	Faded Rose	145.00	123
9889	Sunset	975,000.00	234

Painter

Id	Name	Phone
123	Ross	888-4567
126	Pollock	345-1122
234	Picasso	456-3345
335	O'Keefe	567-8999
456	Wharhol	777-7777

Translating an Entity Relationship Diagram to a Relation Scheme: Each entity is a table. Each many-to-many relationship is a table that contains the primary keys of its associated entities. One-to-many and one-to-one relationships do not need a separate table. They can be implemented by adding the primary key of one entity to another entity. Here Painter ID is added to Painting, and Painting PNUM is added to Gallery to implement many-to-one relationships.

```
MariaDB [revesz]> select * from painter;
+-----+---------+----------+
| ID  | NAME    | PHONE    |
+-----+---------+----------+
| 123 | Ross    | 888-4567 |
| 126 | Pollock | 345-1122 |
| 234 | Picasso | 456-3345 |
| 335 | OKeefe  | 567-8999 |
| 456 | Wharhol | 777-7777 |
+-----+---------+----------+
5 rows in set (0.00 sec)

MariaDB [revesz]> select * from gallery;
+------+---------+
| PNUM | OWNER   |
+------+---------+
| 2345 | Johnson |
| 6666 | Johnson |
| 4536 | McCloud |
| 7878 | McCloud |
| 6789 | Palmer  |
| 7896 | Palmer  |
| 9889 | Palmer  |
+------+---------+
7 rows in set (0.00 sec)

MariaDB [revesz]> select * from painting
    -> ;
+------+-------------+----------+------+
| PNUM | TITLE       | PRICE    | ID   |
+------+-------------+----------+------+
| 2345 | Wild Waters |   245.00 |  126 |
| 4536 | Sea Storm   |  8359.00 |  335 |
| 6666 | Wild Waters |  6799.00 |  234 |
| 7878 | High Tide   | 98000.00 |  456 |
| 6789 | Paradise    |590000.00 |  234 |
| 7896 | Faded Rose  |   145.00 |  123 |
| 9889 | Sunset      |975000.00 |  234 |
+------+-------------+----------+------+
7 rows in set (0.00 sec)
```

← An Instance of the Gallery Database Created in MySQL

Exercise: Find the name of the painter who painted the most expensive painting.

```
MariaDB [revesz]> SELECT painter.NAME
    ->            FROM painter, painting
    ->            WHERE painter.ID = painting.ID AND painting.PRICE >= ALL
    ->            (SELECT PRICE
    ->             FROM   painting);
+---------+
| NAME    |
+---------+
| Picasso |
+---------+
1 row in set (0.00 sec)
```

Drawing an Entity Relationship Diagram using www.draw.io