



PLUG IT IN 3

# Fundamentals of Relational Database Operations

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1. Query Languages
  2. Entity–Relationship Modeling
  3. Normalization and Joins





1. Understand the process of querying a relational database.
2. Understand the process of entity–relationship modeling.
3. Understand the process of normalization and the process of joins.

# PI3.1 Query Languages

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- Primary Key
  - Secondary Key
  - Foreign Key
  - Structured Query Language (SQL)
  - Query By Example (QBE)
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# PI3.2 Entity-Relationship Modeling

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- Entity Relationship Modeling
  - Entity Relationship Diagram (ERD)
  - Business Rules
  - Data Dictionary
  - Relationships (Unary, Binary, Ternary)
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# PI3.2 Entity-Relationship Modeling (Continued)

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- Connectivity
- Cardinality
- Attributes

# Cardinality Symbols

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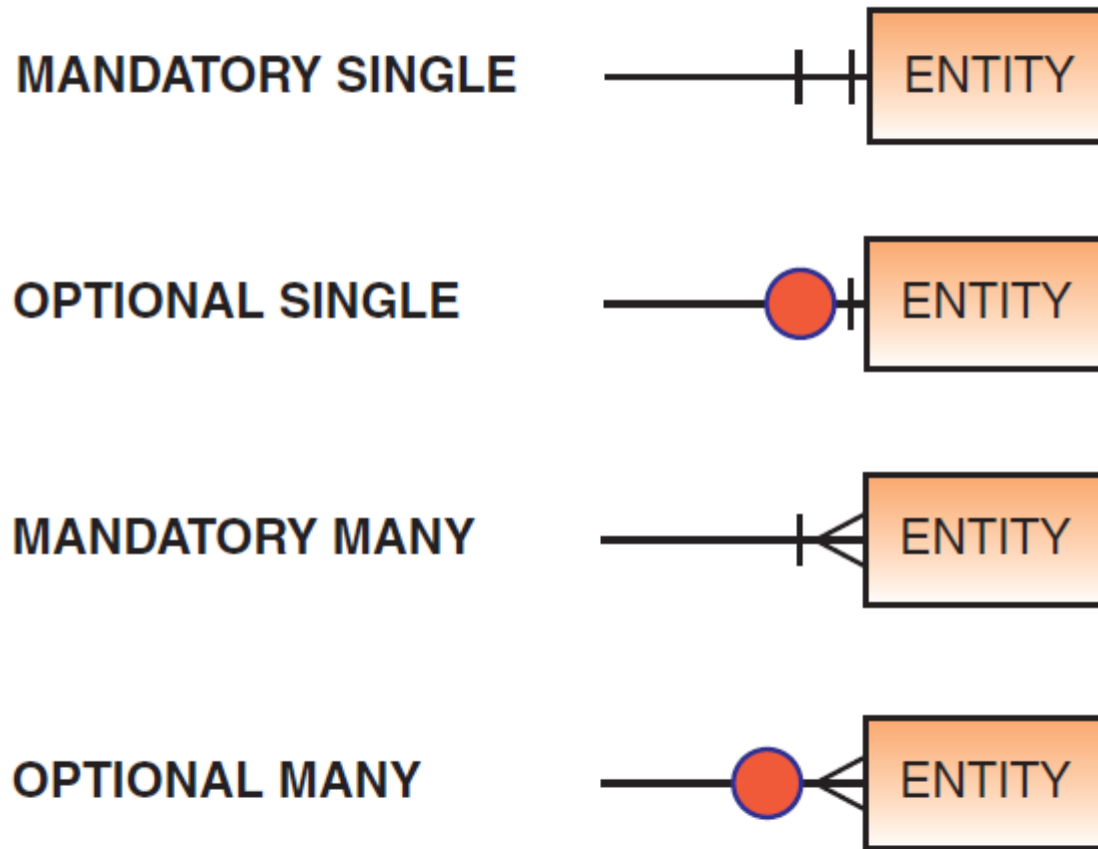


Figure PI3.1 Cardinality symbols.

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# One-to-One Relationship

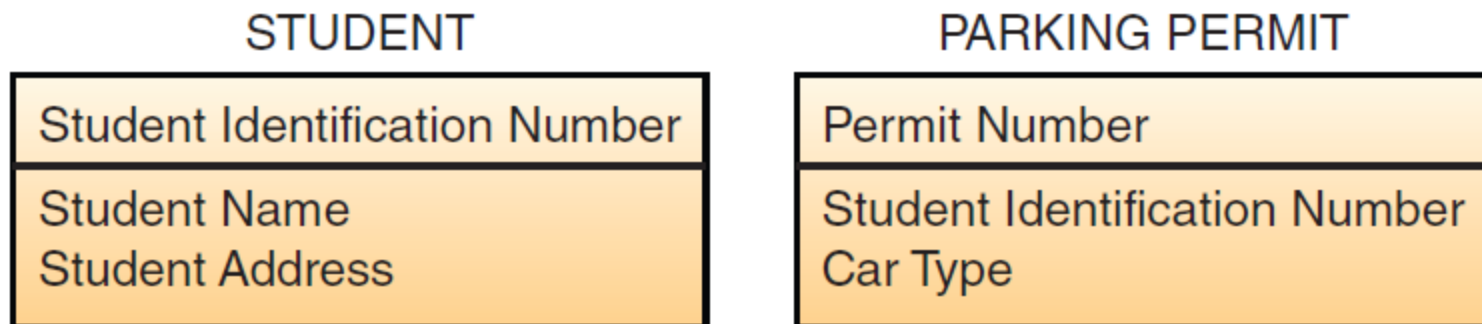
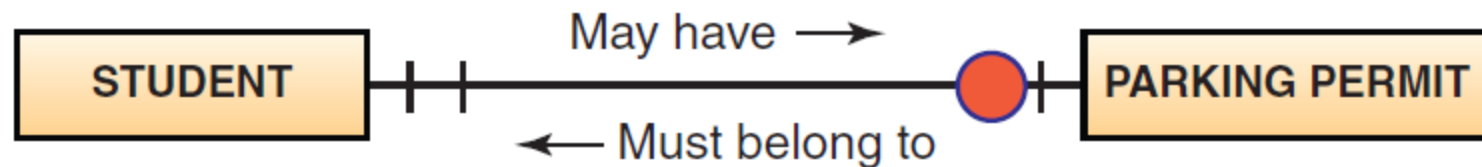


Figure PI3.2 One-to-one relationship.



# One-to-Many Relationship

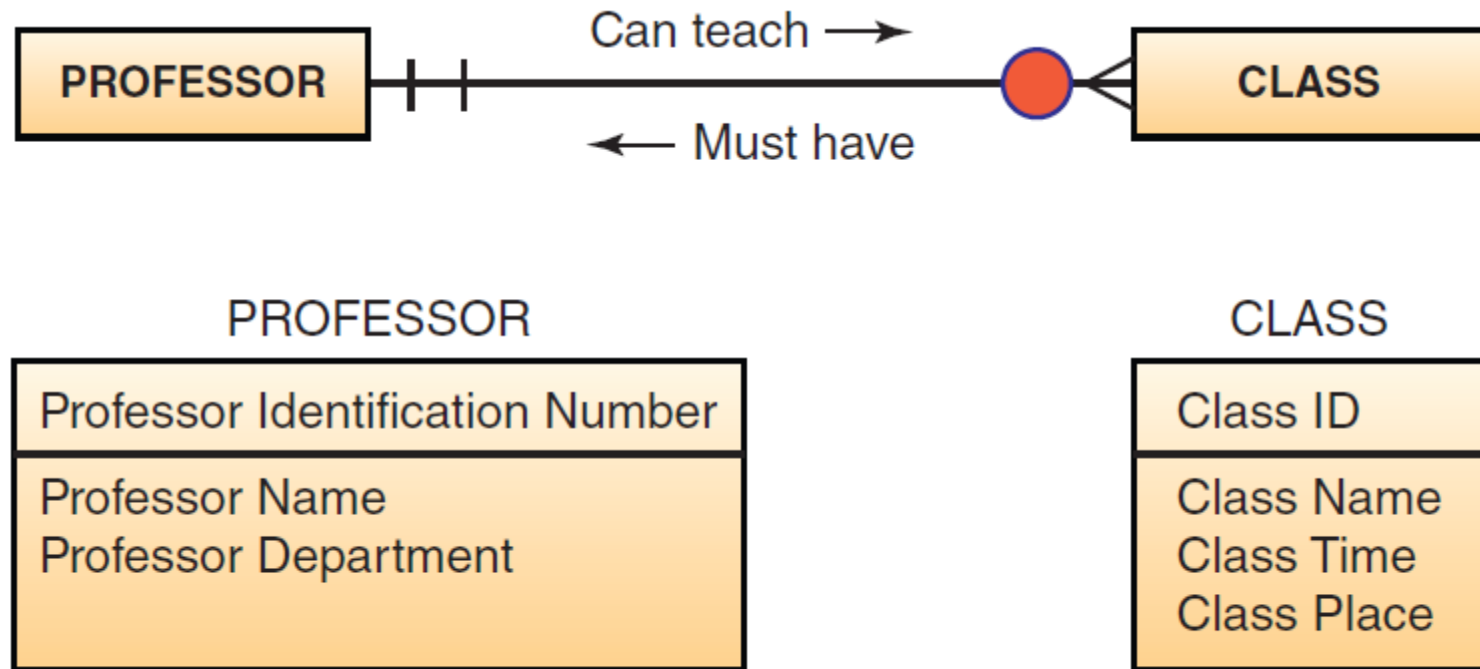


Figure PI3.3 One-to-many relationship.

# Many-to-Many Relationship

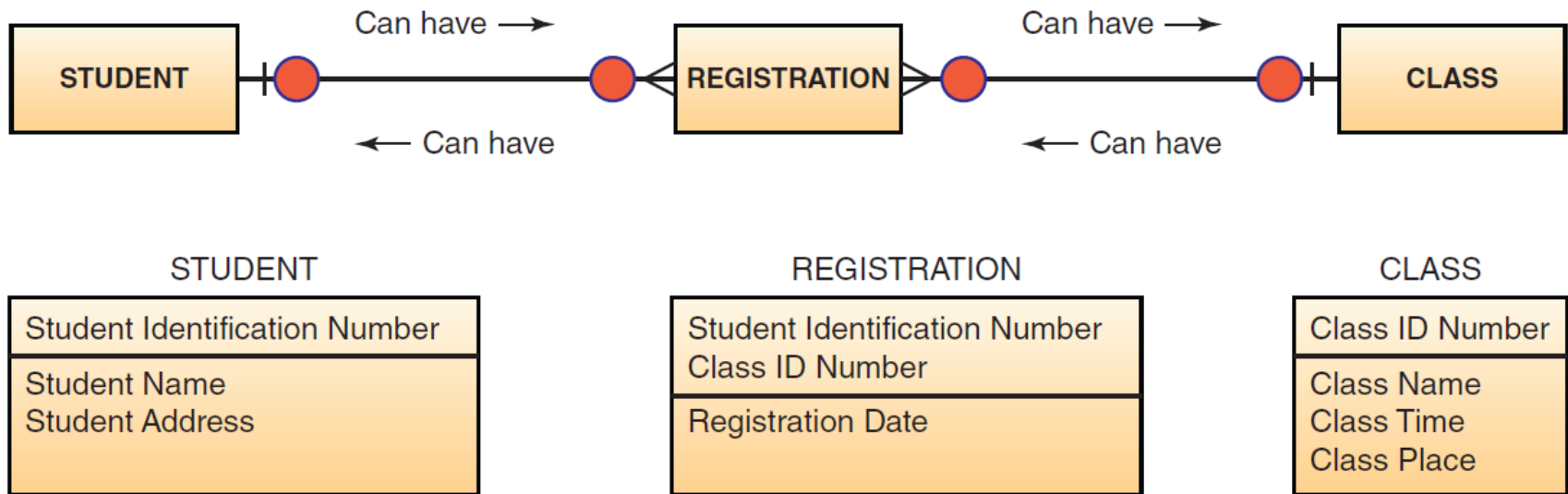


Figure PI3.4 Many-to-many relationship.

# PI3.3 Normalization and Joins

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- Normalization
  - 1<sup>st</sup> Normal Form
  - 2<sup>nd</sup> Normal Form
  - 3<sup>rd</sup> Normal Form
- Functional Dependencies
- Join Operation

# Raw Data Gathered from Pizza Shop Orders

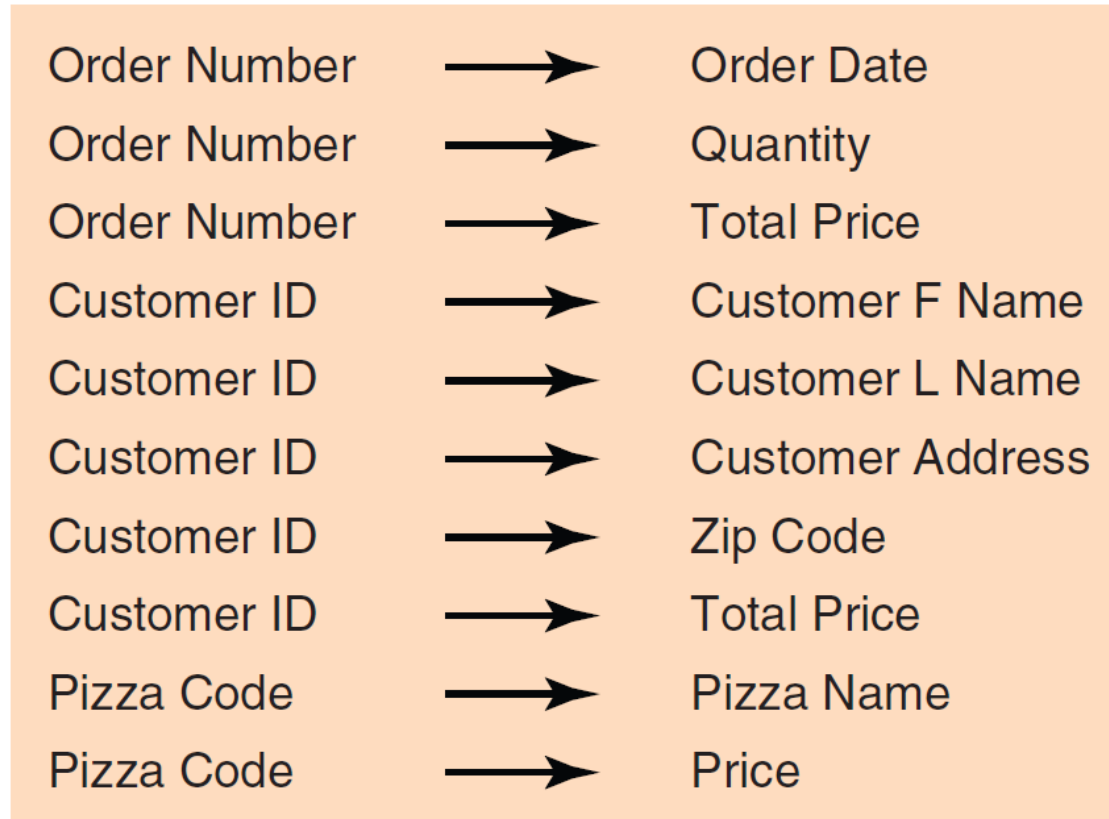
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Order Number	Order Date	Customer ID	Customer F Name	Customer L Name	Customer Address	Zip Code	Pizza Code	Pizza Name	Quantity	Price	Total Price
1116	9/1/14	16421	Rob	Penny	123 Main St.	37411	P	Pepperoni	1	\$11.00	\$41.00
							MF	Meat Feast	1	\$12.00	
							V	Vegetarian	2	\$9.00	
1117	9/2/14	17221	Beth	Jones	41 Oak St.	29416	HM	Ham and Mushroom	3	\$10.00	\$56.00
							MF	Meat Feast	1	\$12.00	
							TH	The Hawaiian	1	\$14.00	

Figure PI3.5 Raw data gathered from orders at the pizza shop.

# Functional Dependency from Pizza Shop

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**Figure PI3.6** Functional dependencies in pizza shop example.

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# 1<sup>st</sup> Normal Form for Pizza Shop Database

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<u>Order Number</u>	Order Date	<u>Customer ID</u>	Customer F Name	Customer L Name	Customer Address	Zip Code	<u>Pizza Code</u>	Pizza Name	Quantity	Price	Total Price
1116	9/1/14	16421	Rob	Penny	123 Main St.	37411	P	Pepperoni	1	\$11.00	\$41.00
1116	9/1/14	16421	Rob	Penny	123 Main St.	37411	MF	Meat Feast	1	\$12.00	\$41.00
1116	9/1/14	16421	Rob	Penny	123 Main St.	37411	V	Vegetarian	2	\$9.00	\$41.00
1117	9/2/14	17221	Beth	Jones	41 Oak St.	29416	HM	Ham and Mushroom	3	\$10.00	\$56.00
1117	9/2/14	17221	Beth	Jones	41 Oak St.	29416	MF	Meat Feast	1	\$12.00	\$56.00
1117	9/2/14	17221	Beth	Jones	41 Oak St.	29416	TH	The Hawaiian	1	\$14.00	\$56.00

Figure PI3.7 First normal form for data from pizza shop.

# 2<sup>nd</sup> Normal Form for Pizza Shop Database

<u>Order Number</u>	Order Date	<u>Customer ID</u>	Customer F Name	Customer L Name	Customer Address	Zip Code	Total Price
1116	9/1/14	16421	Rob	Penny	123 Main St.	37411	\$41.00
1116	9/1/14	16421	Rob	Penny	123 Main St.	37411	\$41.00
1116	9/1/14	16421	Rob	Penny	123 Main St.	37411	\$41.00
1117	9/2/14	17221	Beth	Jones	41 Oak St.	29416	\$56.00
1117	9/2/14	17221	Beth	Jones	41 Oak St.	29416	\$56.00
1117	9/2/14	17221	Beth	Jones	41 Oak St.	29416	\$56.00

<u>Order Number</u>	<u>Pizza Code</u>	Quantity
1116	P	1
1116	MF	1
1116	V	2
1117	HM	3
1117	MF	1
1117	TH	1

<u>Pizza Code</u>	Pizza Name	Price
P	Pepperoni	\$11.00
MF	Meat Feast	\$12.00
V	Vegetarian	\$9.00
HM	Ham and Mushroom	\$10.00
TH	The Hawaiian	\$14.00

Figure PI3.8 Second normal form for data from pizza shop.

# 3<sup>rd</sup> Normal Form for Pizza Shop Database

ORDER

<u>Order Number</u>	Order Date	Customer ID	Total Price
1116	9/1/14	16421	\$41.00
1117	9/2/14	17221	\$56.00

CUSTOMER

<u>Customer ID</u>	Customer F Name	Customer L Name	Customer Address	Zip Code
16421	Rob	Penny	123 Main St.	37411
17221	Beth	Jones	41 Oak St.	29416

ORDER-PIZZA

<u>Order Number</u>	<u>Pizza Code</u>	Quantity
1116	P	1
1116	MF	1
1116	V	2
1117	HM	3
1117	MF	1
1117	TH	1

PIZZA

<u>Pizza Code</u>	Pizza Name	Price
P	Pepperoni	\$11.00
MF	Meat Feast	\$12.00
V	Vegetarian	\$9.00
HM	Ham and Mushroom	\$10.00
TH	The Hawaiian	\$14.00

Figure PI3.9 Third normal form for data from pizza shop.



# Join Process with Tables of 3<sup>rd</sup> Normal Form for Pizza Orders

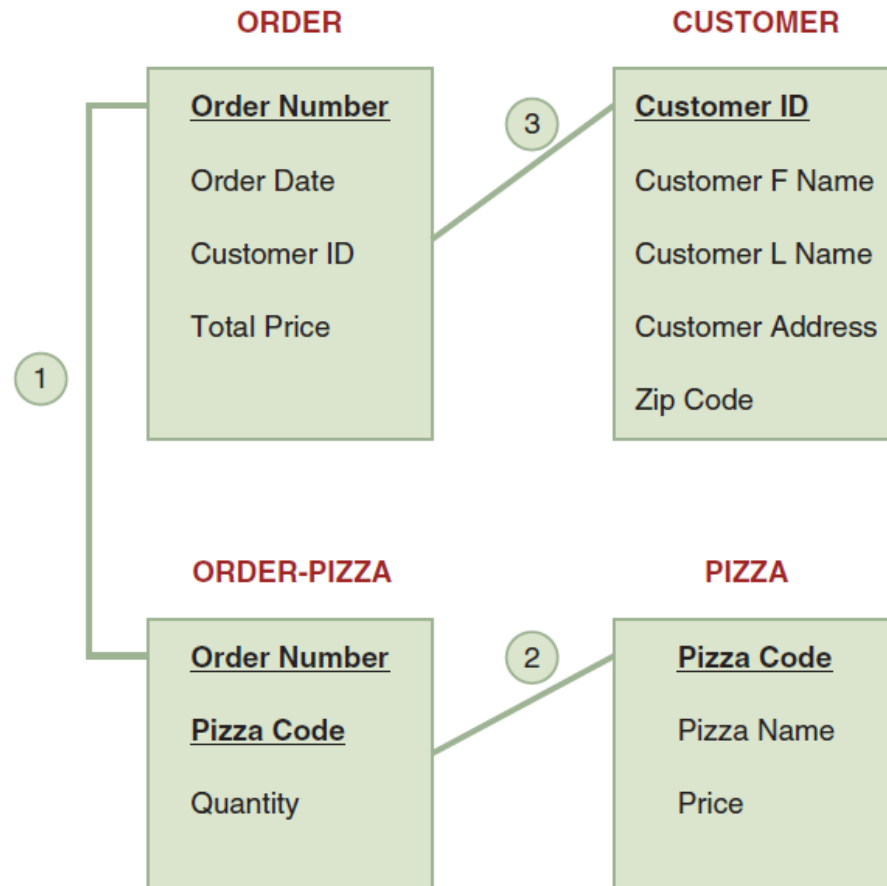


Figure PI3.10 The join process with the tables of third normal form to produce an order.