



What is a Database

- A database describes a collection of data organized to allow storage, access, retrieval and the use of data.
- Contains at least one **table**
- Thought of like a manual file cabinet
- In large organizations it is the job of the DBA to administer the database.



What is Microsoft Access?

- A database management system.
- A DBMS is a software tool that allows you to use a computer to create databases, add, change, and delete data in a database.
- Other DBMS's include DB2, Oracle, SQL Server, Sybase

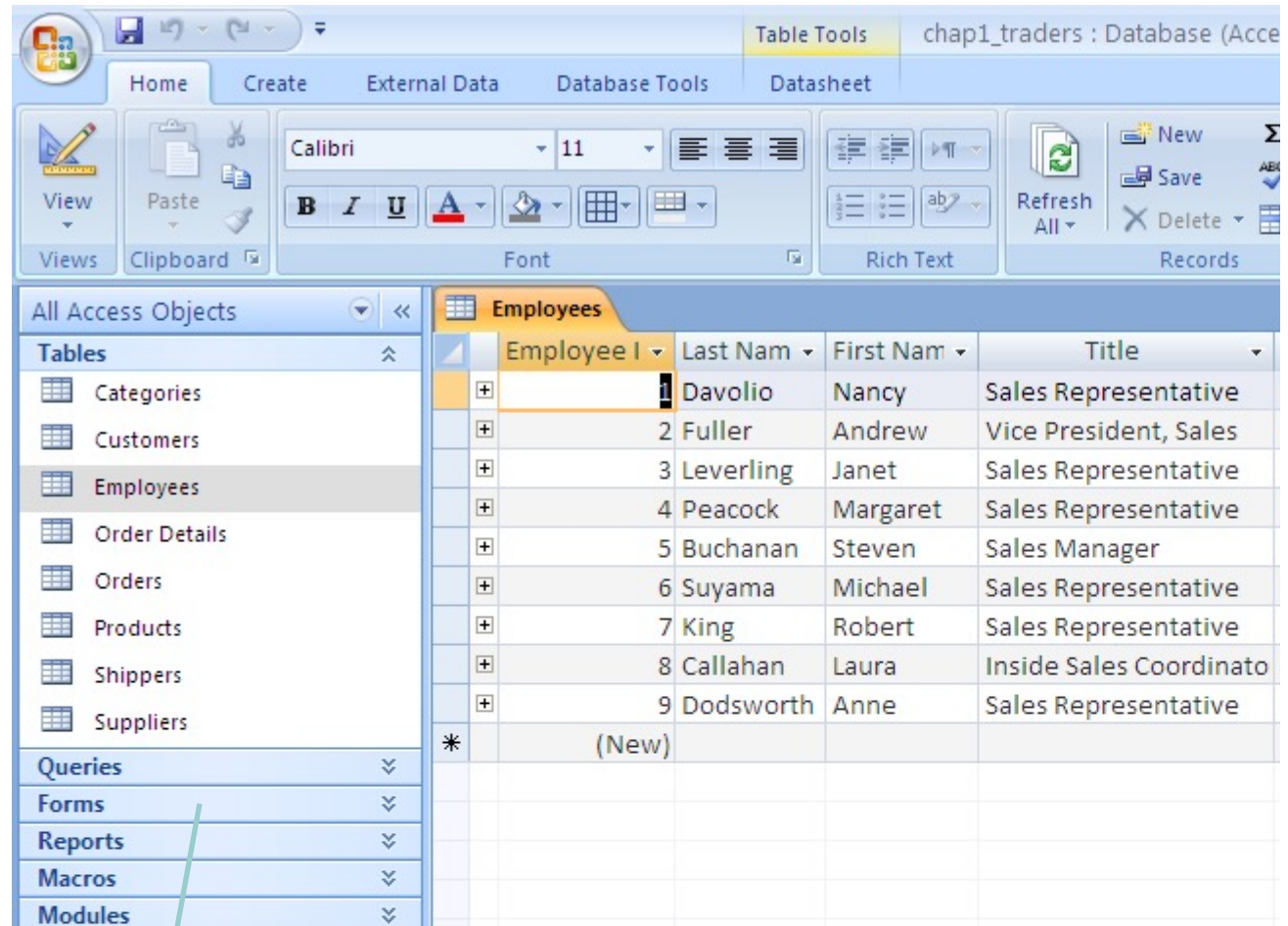


Why Access

- Easy to learn
- Low cost
- Readily available
- Design principles we will learn can also be applied to enterprise level database management systems.

Objects in MS Access DB

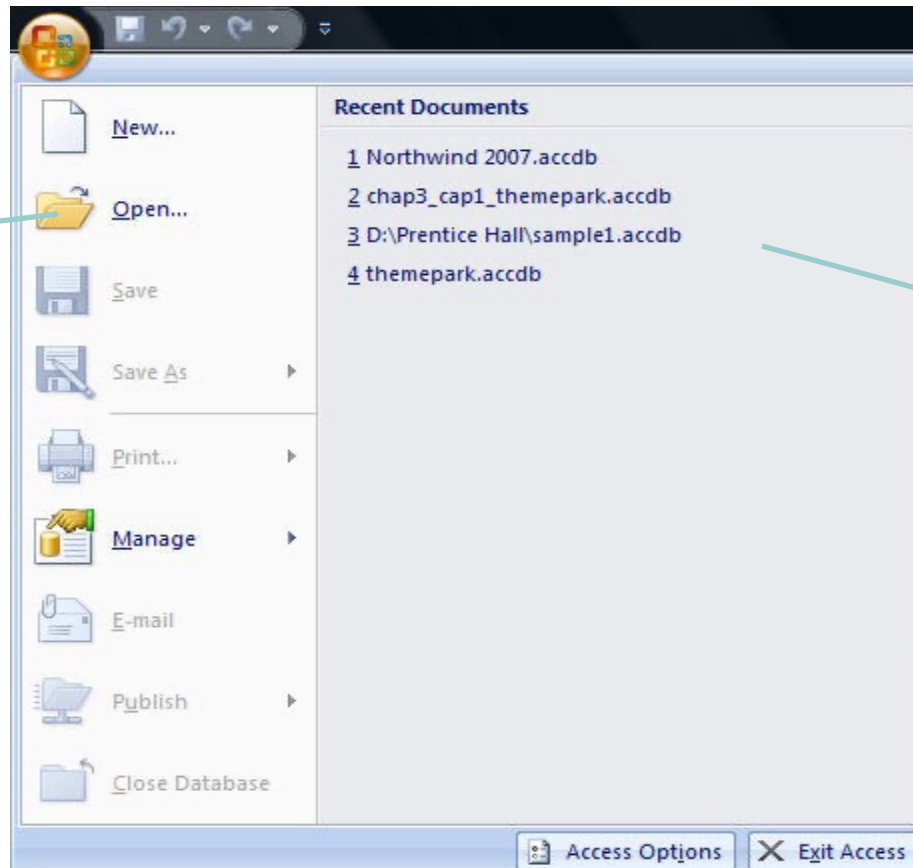
- Tables
- Queries
- Reports
- Forms



Objects

Open a Database

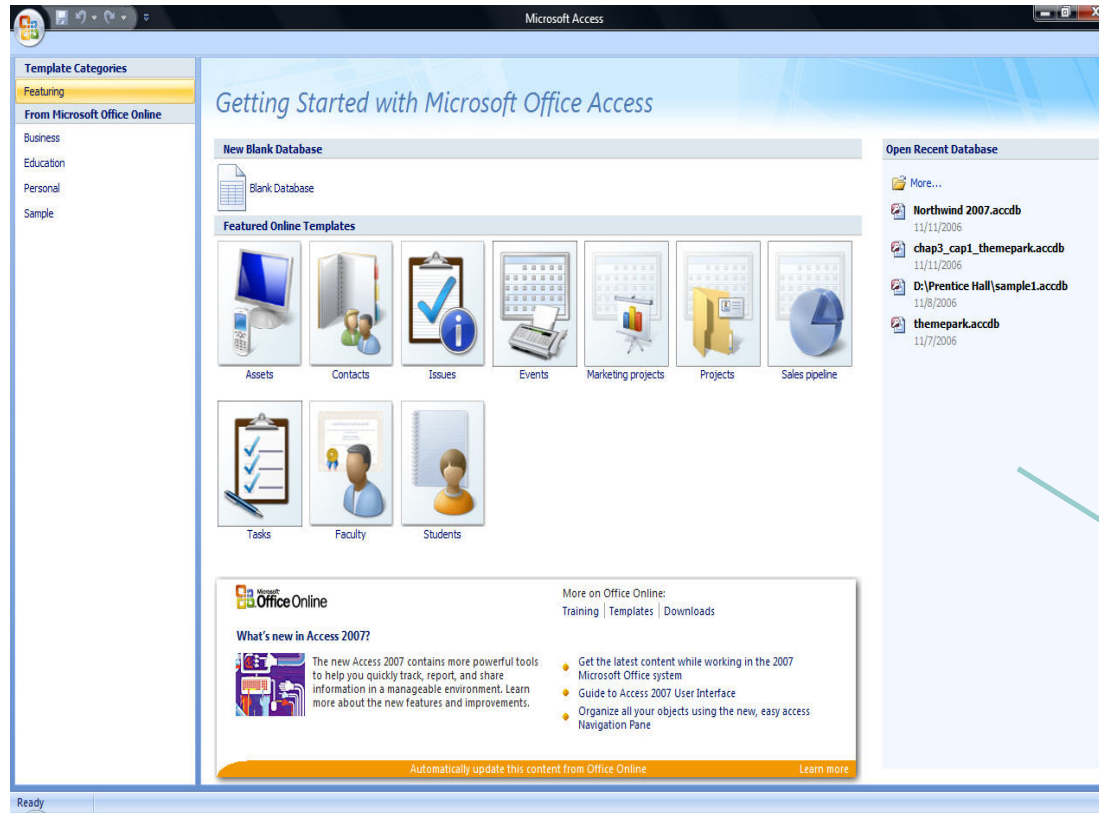
Open



Recent Documents list

- Choose Open to browse for a file or choose a database from the Recent Documents list

Open a Database



- Choose a database from the Open Recent Database List or click More to browse for other databases

Database Terminology

- Field
- Record
- Table
- Database

A database is made up of one or more tables

Individual fields

Individual tables in a database

| Employee ID | Last Name | First Name | Title |
|-------------|-----------|------------|--------------------------|
| 1 | Davolio | Nancy | Sales Representative |
| 2 | Fuller | Andrew | Vice President, Sales |
| 3 | Leverling | Janet | Sales Representative |
| 4 | Peacock | Margaret | Sales Representative |
| 5 | Buchanan | Steven | Sales Manager |
| 6 | Suyama | Michael | Sales Representative |
| 7 | King | Robert | Sales Representative |
| 8 | Callahan | Laura | Inside Sales Coordinator |
| 9 | Dodsworth | Anne | Sales Representative |
| * | (New) | | |

- A database consists of one or more tables. Each table consists of records which contain information about a single entity. An example of one complete record would be the name, author, isbn#, published date and publisher of textbooks. Each set of information regarding one book is considered to be one record. The name, author isbn#, published data and publisher in the above example are the individual fields that make up one record.



What is a Table

- A set of records.
- Different Views of tables:
 1. Design view used to create fields
 2. Datasheet view used to add, edit, or delete records
 3. Pivot table view used to summarize data about groups of records.
 4. PivotChart view creates a chart from the associated PivotTable view.

Work with Table Views

Design View

| Field Name | Data Type | Description |
|----------------------|------------|-------------|
| ID | AutoNumber | |
| Company | Text | |
| Last Name | Text | |
| First Name | Text | |
| E-mail Address | Text | |
| Job Title | Text | |
| Business Phone | Text | |
| Home Phone | Text | |
| Mobile Phone | Text | |
| Fax Number | Text | |
| Address | Memo | |
| City | Text | |
| State/Province | Text | |
| Zip/City/Postal Code | Text | |

Datasheet View

| ID | Company | Last Name | First Name | E-mail Address | Job Title |
|-------|-------------------|----------------|------------|------------------------------|-----------------------|
| 1 | Northwind Traders | Freehafer | Nancy | nancy@northwindtraders.com | Sales Representative |
| 2 | Northwind Traders | Cencini | Andrew | andrew@northwindtraders.com | Vice President, Sales |
| 3 | Northwind Traders | Kotas | Jan | jan@northwindtraders.com | Sales Representative |
| 4 | Northwind Traders | Sergienko | Mariya | mariya@northwindtraders.com | Sales Representative |
| 5 | Northwind Traders | Thorpe | Steven | steven@northwindtraders.com | Sales Manager |
| 6 | Northwind Traders | Neipper | Michael | michael@northwindtraders.com | Sales Representative |
| 7 | Northwind Traders | Zare | Robert | robert@northwindtraders.com | Sales Representative |
| 8 | Northwind Traders | Giussani | Laura | laura@northwindtraders.com | Sales Coordinator |
| 9 | Northwind Traders | Hellung-Larsen | Anne | anne@northwindtraders.com | Sales Representative |
| (New) | | | | | |

- Datasheet View – used to add, modify, delete and view records
- Design View – used to create and modify the fields in a table

Datasheet View

Primary key field

Table Tools Northwind 2007 : Database (Access 2007 (Beta)) - Microsoft Access

Database Tools Datasheet

Font Rich Text Records Sort & Filter Find

base has been disabled Options...

| ID | Company | Last Name | First Name | E-mail Address | Job Title | Business Phone | Home Phone |
|----|---------------------------|----------------|------------|------------------------------|-----------------------|----------------|---------------|
| 1 | Northwind Trading Company | Freehafer | Nancy | nancy@northwindtraders.com | Sales Representative | (123)456-7890 | (123)456-7890 |
| 2 | Northwind Trading Company | Cencini | Andrew | andrew@northwindtraders.com | Vice President, Sales | (123)456-7890 | (123)456-7890 |
| 3 | Northwind Trading Company | Kotas | Jan | jan@northwindtraders.com | Sales Representative | (123)456-7890 | (123)456-7890 |
| 4 | Northwind Trading Company | Sergienko | Mariya | mariya@northwindtraders.com | Sales Representative | (123)456-7890 | (123)456-7890 |
| 5 | Northwind Trading Company | Thorpe | Steven | steven@northwindtraders.com | Sales Manager | (123)456-7890 | (123)456-7890 |
| 6 | Northwind Trading Company | Neipper | Michael | michael@northwindtraders.com | Sales Representative | (123)456-7890 | (123)456-7890 |
| 7 | Northwind Trading Company | Zare | Robert | robert@northwindtraders.com | Sales Representative | (123)456-7890 | (123)456-7890 |
| 8 | Northwind Trading Company | Giussani | Laura | laura@northwindtraders.com | Sales Coordinator | (123)456-7890 | (123)456-7890 |
| 9 | Northwind Trading Company | Hellung-Larsen | Anne | anne@northwindtraders.com | Sales Representative | (123)456-7890 | (123)456-7890 |
| * | (New) | | | | | | |

Records: 1 of 9 No Filter Search

Navigation bar

Navigation buttons

Scroll bar

Design View

Key symbol identifies primary key field

| Field Name | Data Type |
|----------------|------------|
| ID | AutoNumber |
| Company | Text |
| Last Name | Text |
| First Name | Text |
| E-mail Address | Text |
| Job Title | Text |
| Business Phone | Text |
| Home Phone | Text |
| Mobile Phone | Text |
| Fax Number | Text |
| Address | Memo |
| City | Text |
| State/Province | Text |

| Field Properties | |
|------------------|---------------------|
| General | |
| Field Size | Long Integer |
| New Values | Increment |
| Format | |
| Caption | |
| Indexed | Yes (No Duplicates) |
| Smart Tags | |
| Text Align | General |

Set field properties in the lower pane



Primary & Foreign Keys

- **Primary Key (PK)**- is the Field that Uniquely identifies each record in a table. It is needed for searching the database.
- Some times if there is no unique value in a table the database designer may use a auto number in Access to use a unique serialized number as the primary key.
- Examples: SIN, Student Number, heath card number.



Primary & Foreign Keys

- **Foreign Key (FK)**- A field in one table that is a primary key in another table. It is with these values we can build relationships between tables.
- The values of an FK must satisfy one of two conditions:
 - any FK-value is a value appearing in the referenced table.
- **Non Key**- a regular field in a database.



Data Types

- AutoNumber – automatically increment numeric numbers
- Text – for text/words type of data
- Number – for numeric data
- Date/Time
- Currency
- OLE Objects, Hyperlink, Attachment, Memo, Yes/No

Forms, Queries, and Reports

Employee Phone Book

Employee Name Business Phone

| | |
|-----------------|---------------|
| Andrew Cencini | (123)456-7890 |
| Nancy Freehafer | (123)456-7890 |
| Laura Giussani | (123)456-7890 |

Report

Query

Form

Employees Query

| Last Name | First Name | Job Title |
|-----------|------------|-----------------------|
| Freehafer | Nancy | Sales Representative |
| Cencini | Andrew | Vice President, Sales |
| Kotas | Jan | Sales Representative |
| Sergienko | Mariva | Sales Representative |
| Thorpe | | |
| Neipper | | |
| Zare | | |
| Giussani | | |
| Hellung-L | | |
| * | | |

Sales Analysis Form

| | |
|---------------|------------------------|
| Product Name | Northwind Traders Beer |
| Employee | Anne Hellung-Larsen |
| Customer Name | Company AA |
| Sales | \$1,400.00 |
| Order Date | 1/15/2006 |

- Forms, queries, and reports are all based upon data contained in a table

Forms

Sales Analysis Form

Product Name: Northwind Traders Beer

Employee: Anne Hellung-Larsen

Customer Name: Company AA

Sales: \$1,400.00

Order Date: 1/15/2006

Form

First record from table visible in form

Underlying table

| Order ID | Order Date | Employee | Customer Name | Product Name | Sales | Employee |
|----------|------------|---------------------|---------------|--------------------------------|------------|----------|
| 30 | 1/15/2006 | Anne Hellung-Larsen | Company AA | Northwind Traders Beer | \$1,400.00 | |
| 30 | 1/15/2006 | Anne Hellung-Larsen | Company AA | Northwind Traders Dried Plums | \$105.00 | |
| 31 | 1/20/2006 | Jan Kotas | Company D | Northwind Traders Dried Pears | \$300.00 | |
| 31 | 1/20/2006 | Jan Kotas | Company D | Northwind Traders Dried Apples | \$530.00 | |
| 31 | 1/20/2006 | Jan Kotas | Company D | Northwind Traders Dried Plums | \$35.00 | |

- Forms allow us to create an interface that can be more user friendly and attractive than Datasheet View

Queries

| ID | Last Name | First Name | Job Title |
|--------|----------------|------------|----------------------|
| 1 | Freehafer | Nancy | Sales Representative |
| 3 | Kotas | Jan | Sales Representative |
| 4 | Sergienko | Mariya | Sales Representative |
| 6 | Neipper | Michael | Sales Representative |
| 7 | Zare | Robert | Sales Representative |
| 9 | Hellung-Larser | Anne | Sales Representative |
| *(New) | | | |

Query results showing only employees who are Sales Representative

Sales Analysis Form Sales Analysis Employees Employees Query1

Employees

ID Company

Criterion restricting dataset to show records that have a job title of Sale Representative

| | | | | |
|-----------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Field: | ID | Last Name | First Name | Job Title |
| Table: | Employees | Employees | Employees | Employees |
| Sort: | | | | |
| Show: | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Criteria: | | | | "Sales Representative" |
| or: | | | | |

- Queries allow us to question data
- The answer to the query is a **dataset**
- The question asked is formed using **criteria** – the rules or norm that is the basis for making judgments



Filters

- Create a subset of records based on criteria.
- Do not change underlying table data
- Two types
 - Filter by Selection
 - Filter by Form

Filter by Selection

The image illustrates the 'Filter by Selection' feature in Microsoft Access. It consists of three main components:

- Table before filter by selection:** A table with columns ID, Last Name, First Name, and Job Title. The data includes records for Nancy Freehafer (Sales Representative), Andrew Cencini (Vice President, Sales), Jan Kotas (Sales Representative), Mariya Sergienko (Sales Representative), Steven Thorpe (Sales Representative), Michael Neipper (Sales Representative), Robert Zare (Sales Representative), Laura Giussani (Sales Representative), and Anne Hellung-Larsen (Sales Representative).
- Results of filter:** The same table after applying the filter, showing only records where the Job Title is 'Sales Representative'. The records are: Nancy Freehafer, Jan Kotas, Mariya Sergienko, Steven Thorpe, Michael Neipper, Robert Zare, Laura Giussani, and Anne Hellung-Larsen.
- Filter by selection being applied from pre-determined criteria:** A dialog box titled 'Filter by Selection' showing a list of job titles. 'Sales Representative' is selected, and 'Vice President, Sales' is also listed.

Table before filter by selection

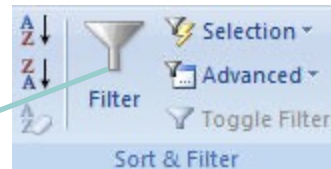
Results of filter

Filter by selection being applied from pre-determined criteria

- Selects only the records that match pre-selected criteria

Applying and Removing a Filter

Filter icon in the Sort and Filter group



Toggle Filter icon

- Once a filter is applied, the Toggle Filter icon will be available
- The Toggle Filter icon can be used to apply and remove the current filter as many times as desired

Sorting Table Data

| Employees | | | | |
|-----------|----|----------------|------------|-----------------------|
| | ID | Last Name | First Name | Job Title |
| + | 2 | Cencini | Andrew | Vice President, Sales |
| + | 1 | Freehafer | Nancy | Sales Representative |
| + | 8 | Giussani | Laura | Sales Coordinator |
| + | 9 | Hellung-Larsen | Anne | Sales Representative |
| + | 3 | Kotas | Jan | Sales Representative |
| + | 6 | Neipper | Michael | Sales Representative |
| + | 4 | Sergienko | Mariya | Sales Representative |
| + | 5 | Thorpe | Steven | Sales Manager |
| + | 7 | Zare | Robert | Sales Representative |

Last Name field
sorted ascending

| Employees | | | | |
|-----------|----|----------------|------------|-----------------------|
| | ID | Last Name | First Name | Job Title |
| + | 7 | Zare | Robert | Sales Representative |
| + | 5 | Thorpe | Steven | Sales Manager |
| + | 4 | Sergienko | Mariya | Sales Representative |
| + | 6 | Neipper | Michael | Sales Representative |
| + | 3 | Kotas | Jan | Sales Representative |
| + | 9 | Hellung-Larsen | Anne | Sales Representative |
| + | 8 | Giussani | Laura | Sales Coordinator |
| + | 1 | Freehafer | Nancy | Sales Representative |
| + | 2 | Cencini | Andrew | Vice President, Sales |

Last Name field
sorted descending

- Lists records in ascending or descending order according to one or more fields



Access or Excel?

Use Excel when:

- Your data is of a manageable data size
- There is no need for relationships between data
- You are primarily creating calculations and statistics

Use Access when:

- You are working with large amounts of data
- You need to create relationships between your data
- You rely on creating reports to analyze data

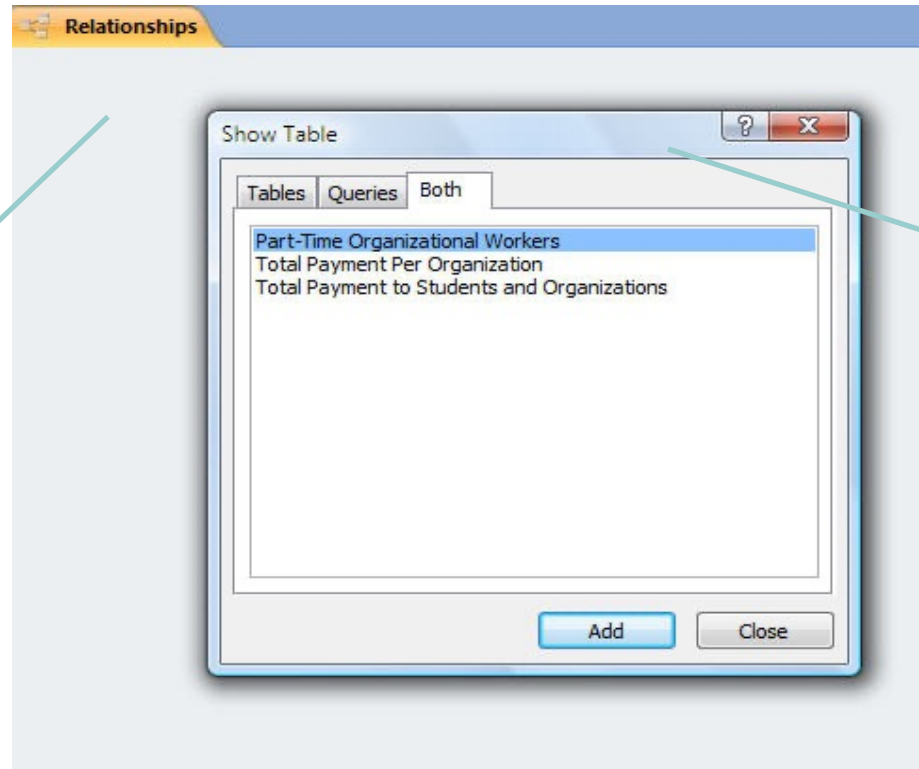


Relational Database - RDBMS

- Relational database management systems allow data to be grouped into tables and relationships created between the tables
- This is much more efficient than the opposite of an RDBMS which is a flat file. Flat files store data in one single file with no special groupings or collections

Using the Relationship Window

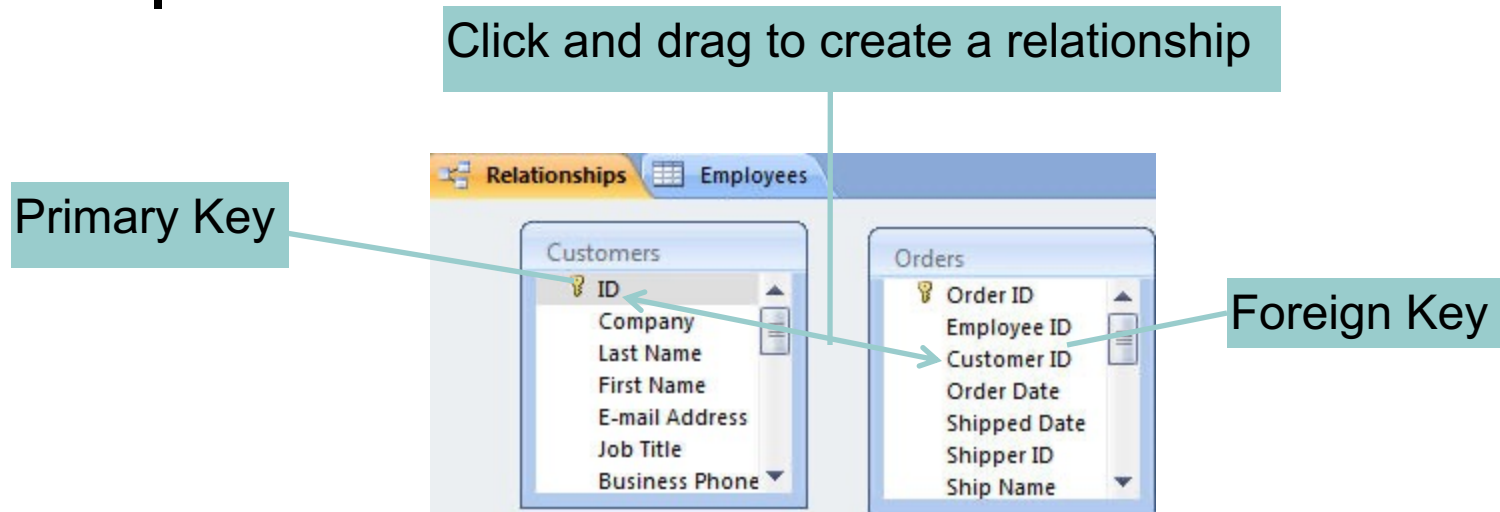
Relationship window



Show Table dialog box

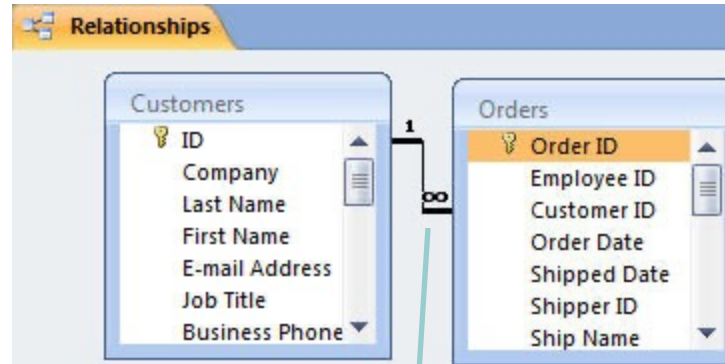
- Add the tables or queries from the Show table dialog box

Establishing Relationships



- In the Relationship window, click and drag a field name from one table to a field name in a related table

Establishing Relationships

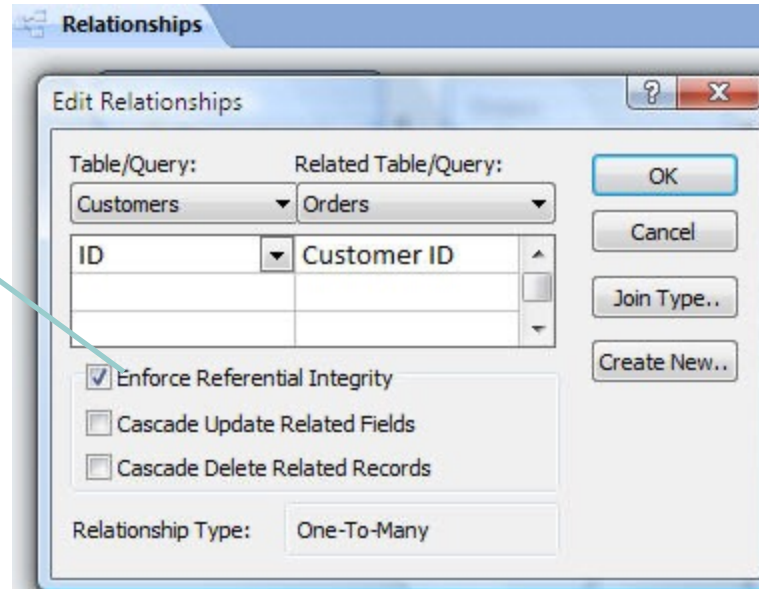


Infinity symbol notes referential integrity has been applied

- Enter the appropriate settings in the Edit relationships dialog box
- Click Create
- A join line will appear when one table is joined to another

Referential Integrity

Enforce Referential Integrity



- Referential integrity ensures that the data in a relational database maintains consistency when the data changes



TYPES OF RELATIONSHIPS

1. ONE TO ONE

2. ONE TO MANY

3. MANY TO MANY



CREATE A DATABASE NAMED LIBRARY

TABLES



```
graph TD; TABLES --> BOOKS; TABLES --> CUSTOMERS; TABLES --> ORDERS;
```

BOOKS

- BookID
- Title
- Author_First_Name
- Author_Last_Name
- Price

CUSTOMERS

- CustomerId
- First_Name
- Last_Name
- Phone
- Email

ORDERS

- OrderId
- BookId
- CustomerId
- Order_Date



QUERY

Pull information from more than one table at a time under specified conditions

Answers to Questions on your Database..

Which customers ordered technology books ?



Query Design Basics

To make any query work you need to know the following:

1. What **FIELDS** do you want to see in the results?
2. Which **TABLES** or queries hold the information you need?
3. What **CONDITIONS** do you want the data to meet?

