

# 4

## Introduction to Database Software

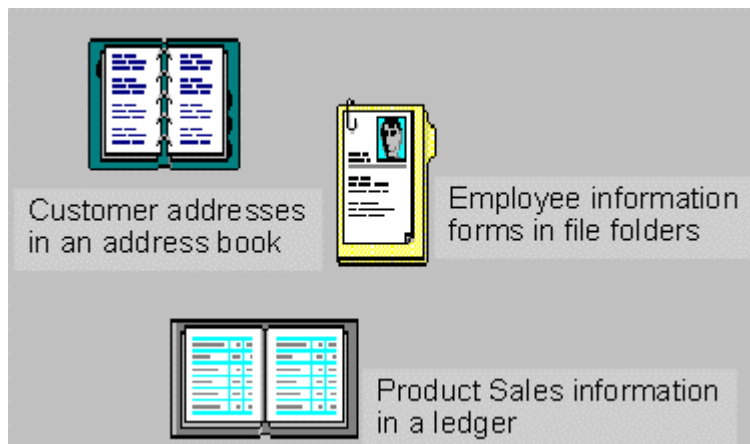
This edition of the *Solve it!* database cases was developed for Microsoft Access 2000 and Access 97.

This chapter describes the elements of a computerised database and how to use database software. The name "database" sounds formidable, but all of us have used databases before.

Some examples of common manual databases we all use every day are a telephone book, an address book, and the card catalog in a library.

In the business world some common manual databases are a list of customers and customer addresses, a list of suppliers, a list of products sold and their respective prices, a list of products in inventory, and a filing cabinet which contains invoices arranged in numerical or date order.

**Figure 4.1**



#### 4.1 What is a Database?

These examples of common manual databases can help provide an initial definition of a database as any organised list or *file* of information pertaining to people, places, or things (see Figure 4-1).

For spreadsheet software the central metaphor is that of a matrix where quantitative information is organised in rows and columns, but in a database the central metaphor is that of a list or file where information is organised in rows (records) and columns.

Any problem in the real world which can be expressed as a problem of lists or files is potentially amenable to solution by a computerised database.

There are three basic types of databases: hierarchical, network, and relational. The student should consult a textbook for a detailed description of the various kinds of databases. Here we will describe only *relational databases*.

A simple example of a database file is a customer file:

Record #	Field 1	Field 2	Field 3
	Last Name	First Name	Address
2			
3			
...			
...			

As you can see, in a database file all the information you have on an entry is called a *record*. Each record is composed of a number of *fields* which constitute the information stored on each entry. A collection of records is called a *file*. Below you will learn how to create a computerised database file. But modern database packages offer much more than just computerised files.

Two excellent Microsoft whitepapers on relational database basics and why businesses use databases can be downloaded from the World Wide Web at:

<ftp://www.mbs.unimelb.edu.au/pub/slides/solveit/dbback.ppt>  
<ftp://www.mbs.unimelb.edu.au/pub/slides/solveit/whyuse.ppt>

#### 4.2 What is a Database Management System?

A database management system (DBMS) is a software package which, at a minimum, allows the user to create several different database files *and* relate information in one file to information in another file. Second, a modern DBMS provides a number of related tools needed to develop complete information systems.

One important advantage of *relational* database management systems over a manual filing cabinet is the ability to easily combine specific pieces of information (*fields*) from several different database files into a new file.

For instance, what if you wanted to determine a daily inventory which was calculated by deducting daily sales of all products from a beginning inventory?

Here, you would want to find out from the invoice file at the end of each day exactly which items were sold. You would then want to go to the inventory file and debit the existing inventory. In a truly sophisticated system you might want to go into a third file which contained the names and addresses of your suppliers and generate a purchase order and mailing label for those products where inventory was low.

In a manual record system stored in the traditional filing cabinet, a lengthy search process would be required to solve this problem. In a contemporary relational database management system, the job can be done in minutes.

A second feature of a relational DBMS is a set of powerful tools which can be used to develop a complete information management system. Included here are facilities to create and store memos and notes, data entry screens (forms in Access), reports, labels, and programs. These features are controlled through a powerful fourth generation language or menus which require little or no programming knowledge.

Briefly, a contemporary DBMS for the PC is a system development tool which permits the user to create complete management systems suitable for a small business or for an office within a large business organisation.

### 4.3 Comparative Advantages of Database Packages

Once students learn a relational database package, they often find it more powerful and useful than spreadsheet packages. Yet the programs really have quite different strengths (and weaknesses).

Spreadsheet programs are very good at manipulating quantitative data, but they are poor at storing and manipulating lists or extracting parts of files from a larger data set. They generally are quite poor at combining information from several different files, and they typically have very limited macro or programming languages, although recent releases of popular spreadsheets defy this.

Database packages are very good at creating and manipulating lists of information, especially text information. Contemporary relational database packages all have very friendly, easy-to-learn, menu-driven command systems which permit the novice to accomplish many if not all of the program's functions.

In addition, relational database packages are accompanied by powerful fourth generation languages which are easy to learn and which permit intermediate users to build complete information systems suitable for a small business or an office within a larger business.

However, database software is comparatively weak at manipulating quantitative data. This gap is however rapidly closing with the advent of recent interactive Windows-based database products such as Microsoft Access.

To operate a contemporary business, both kinds of packages are needed. Data can be exchanged between the packages so that the most appropriate software is used.

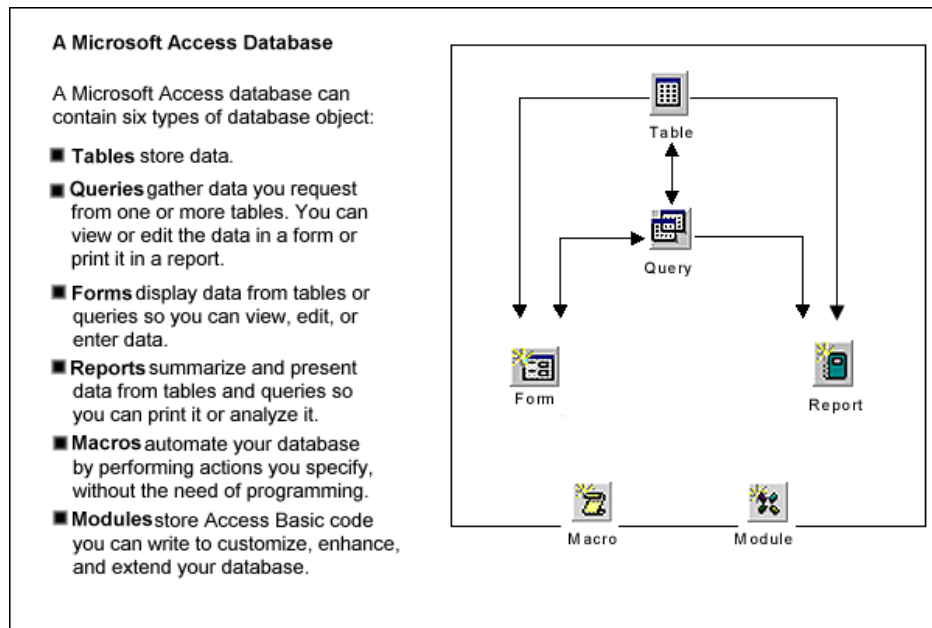
#### **4.4 Windows-based Databases**

Database products developed for the graphical, Windows environment such as Borland's dBase for Windows, or Microsoft's Access for Windows utilise a user friendly, non-programming approach for many tasks which would have required programming in DOS-based (ie:non-Windows) database packages. For Access users, none of the cases in this edition of *Solve it!* will require explicit programming (although plenty of code will be generated in background).

#### **4.5 Introducing Microsoft Access for Windows**

An Access database is represented as a collection of objects. One .MDB file encloses all the tables, queries, forms, reports and other objects associated with a particular database. A brief description of these objects, the relationships between them within the database envelope, and the graphical buttons that identify them is shown in Figure 4-2

**Figure 4-2**



Access object names are not subject to DOS file-naming conventions which limit file names to 8 characters. Access object names (and field names in tables) can be up to 64 characters in length, and can include spaces as well as a mixture of upper and lowercase letters. Access is also not case sensitive, and will find data within a field (as long as the spelling is correct !) regardless of the case used to originally enter it.



### Toolbar Buttons

Access makes extensive use of Toolbar buttons. Each object view in Access has one or more toolbars associated with it by default. A segment of the Table object toolbar is shown above. The buttons on these toolbars provide shortcuts to menu commands, enabling the user to carry out frequently performed tasks on the click of a button. Another nice feature is that as the mouse pointer is positioned over a toolbar button, Access will display a short label describing the button's purpose.

Access 2000 Users:	Access '97 Users:
Press the F1 function key and from the INDEX, type in the word <i>toolbar</i> for more information about using toolbars.	Press the F1 function key and from the INDEX, type in the word <i>toolbar</i> for more information about using toolbars.

### Get Help At Any Time!

Access 2000 Users:

| Access 97 Users:

<i>(Office Assistant, Help System and Wizards)</i>	<i>(Office Assistant, Help System and Wizards)</i>
<p>The Office Assistant is a feature included with Access and other Office 2000 applications which provides tips, and attempts to interpret the help information you may need based on your current actions.</p> <p>Access 2000 also includes two other interactive help tools: an extensive context sensitive help system (press the F1 key anywhere, at any time), and a series of Wizards which offer help in creating Access objects such as tables, queries, forms, reports and macros. Unlike the main help system, which you need to search or browse to find answers to questions, wizards ask you relevant questions and actually create a customised version of the object in question according to your responses. A summary of the wizards used in this edition of <i>Solve it!</i> is presented in Figure 4-3 below.</p>	<p>Access 97's help features also include Office Assistant, which provides tips, and attempts to interpret the help information you may need based on your current actions.</p> <p>Access 97's help features also include context sensitive help (using the F1 key), and wizards. A summary of the wizards used in this edition of <i>Solve it!</i> is presented in Figure 4-3 below.</p>

**Figure 4-3**

<b>Table Wizard</b>	walks the user through table setup and design. Users can choose from dozens of predefined sample tables, and hundreds of sample fields which can then be used to generate tables.
<b>Query Wizard</b>	helps users construct complex queries for common database management tasks such as the merging two tables or performing crosstabulations
<b>Form Wizard</b>	a tool for creating forms in a variety of predefined formats and presentation styles
<b>Report Wizard</b>	a tool for creating reports in a variety of predefined formats and presentation styles
<b>Macro Wizard</b>	a tool used for creating or editing a macro from within an event procedure in a form or report
<b>Control Wizard</b>	creates code behind command buttons, option groups, list and combo boxes used in forms or reports

**Access Setup Requirements**

<b>Access 2000 Users</b>	<b>Access 97 Users</b>
To use Access 2000 you will need:	To use Access 97 you will need:

- 
- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>• a personal computer with Pentium 133-MHz or faster processor</li><li>• available hard-disk space usage will vary depending on configuration (167 MB recommended minimum)</li><li>• 64mb of RAM</li><li>• a Microsoft mouse or compatible pointing device</li></ul> <p>Operating Systems:</p> <ul style="list-style-type: none"><li>• Microsoft Windows NT (Server or Workstation) version 4.0 or later operating system, with Service Pack 4 or later Windows Version 3.1 or later</li></ul> | <ul style="list-style-type: none"><li>• an IBM compatible 486-based PC or better (a Pentium is strongly recommended)</li><li>• Microsoft Win95 operating system or Windows NT 3.51 or later</li><li>• minimum of 12 mb of RAM for use on Win95; 16mb is recommended for Windows NT</li><li>• a hard disk with at least 28-60 mb of free disk space. A typical installation requires 40 mb</li><li>• a Microsoft mouse or compatible pointing device</li></ul> |
|--|---|

**Terminology and Conventions Used in the Access Tutorials:**

- *Double-click* means to press the left mouse button twice in rapid succession.
- *Click* means to press the left mouse button once only.
- *Right-click* means to click the right mouse button once.
- New terms, new filenames, key concepts and action words appear in *italics*.
- Menu choices and new object names are shown in capitals (eg: FILE/SAVE or FRIENDS.MDB).
- Toolbar buttons are shown next to or within the paragraph in which they are first described.

To Start Access 2000	To Start Access 97
<ol style="list-style-type: none"> <li>1. From Windows , click on the <i>Start</i> button at bottom left of the screen, and then select the <i>Programs</i> option.</li> <li>2. Within Programs, select the <i>Microsoft Access</i> option. This last action will load the Access program.</li> </ol>	<ol style="list-style-type: none"> <li>1. From Windows , click on the <i>Start</i> button at bottom left of the screen, and then select the <i>Programs</i> option.</li> <li>2. Within Programs, select the <i>Microsoft Access</i> option. This last action will load the Access program.</li> </ol>

### Access 2000 Users - Creating a Database

Practice: Create a new Access database called *CONTACTS*.


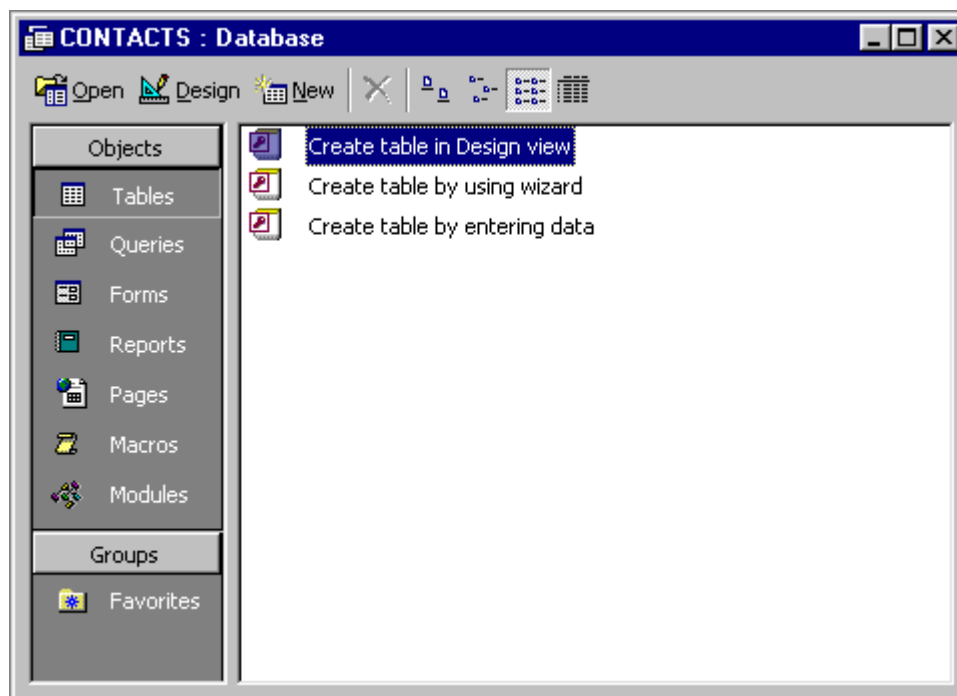
1. Click the *New Database* toolbar button  or select FILE/NEW DATABASE from the menu. Access displays the New Database dialog box.
2. In the File Name box, type a name for your database (eg: CONTACTS) after selecting the appropriate path (eg: a:\CONTACTS). Click OK. Access creates a new database file, and opens the *Database Window* (see Figure 4-4).



Figure 4-4



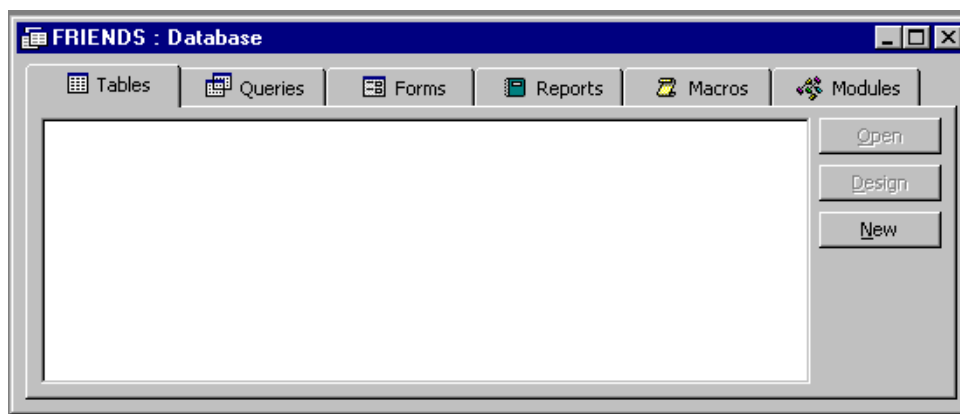
### Access 97 Users – Creating a Database

Practice: Create a new Access database called *CONTACTS*.



1. After loading the Access program, you will be confronted with a dialog box asking if you would like to create a new database. Click OK and give the database a name (eg: CONTACTS).
2. Access creates the new database, and opens the *Database Window* (see Figure 4-5).

Figure 4-5



### Access 2000 and Access 97 Users - Building a Database Structure

Access allows you to create a structure for storing your data in three different ways:

- by *creating Tables*, and entering data into the table structure
- by *Importing Data* from another application or database file
- by *Linking Data* from an application other than Access

#### Access 2000 Users

Access 2000 allows exporting, importing or linking from a number of different formats, as well as other Access databases (version 2.0, 7.0/95, 8.0/97, 9.0/2000). These include:

- fixed width text files
- a dBase III, III+, IV, and 5 files
- Microsoft Excel spreadsheet 2.9 Millennium, 4.0, 5.0, 7.0/95, 8.0/97, and 9.0/2000
- Paradox and Paradox for Windows files
- Btrieve tables

#### Access 97 Users

Access 97 can export, import or link table data from other Access databases (version 1.x, 2.0, 7.0/95, and 8.0/97), as well as data from other programs and file formats. It is also possible to import or link HTML tables and lists, which can reside on your local computer, a network server, or an Internet server.

Access 97:

- directly *imports*, *exports*, and *links* to:
  - Microsoft Excel version 2.9 Millennium or later, Foxpro

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• SQL tables, Microsoft Visual FoxPro, and data from other programs and databases that support the ODBC protocol</li> <li>• Lotus 1-2-3 files</li> </ul> | <ul style="list-style-type: none"> <li>• version 2.x or later, SQL Server, dBase III+, dBase IV, dBase 5, Paradox versions 2.9 Millennium to 5.0, ASCII text, and all ODBC-compliant databases</li> <li>• directly <i>imports</i> and <i>exports</i> to:             <ul style="list-style-type: none"> <li>• Microsoft Visual Foxpro version 2.9 Millennium and Lotus 1-2-3</li> </ul> </li> </ul> |
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If you have data in dBase or Paradox databases, and you want to leave your data in its original format, choose the *Linking* option in Access. This way, files can still be used in their original application. If you plan to use your data only in Access from now on, you should choose the *Import Data* function.

Importing data creates a copy of the information in a new table in your Access database. The original source table or file is not altered in this process. *Linking data* enables you to read and in most cases update data in the external data source without importing. The external data source's format is not altered so that you can continue to use the file with the program that originally created it, but you can add, delete, or edit its data using Microsoft Access as well.


Access uses different icons to represent linked tables and tables that are stored in the current database. If you delete the icon for a linked table, you delete the link to the table, not the external table itself.

### Creating Tables in Access


You can create tables in two different ways:

- via the *Table Wizard*. The Table Wizard is the easiest way and most usual way for creating tables
- create one from scratch. You may want to do this if you plan to store unusual information in your table

**Tip:**

To return directly to the Database Window at any time, click the  button on the toolbar or press the F11 key.

### To create a Table using a Wizard/Adding Records

1. From an open Database Window, click the *Tables* button  **Tables** in the Database Window.

2. Click the *New* button. In the New Table dialog box, click the Table Wizards option. The Table Wizard presents a listing of sample table templates which are already set up with fields. Toggle between the Business and Personal radio buttons to get a flavour of the type of tables the Table wizard can automatically create for you. The Table Wizard works as a series of dialog boxes. Follow the instructions to create a table to suit your purpose.


***Practice:** Create a simple table within the CONTACTS database using the Table Wizards. The scenario is as follows. You are a Phd student who has collected a number of business cards as a result of attending conferences and visiting organisations in the course of your research. On the back of each business card, you have made rough notes about where and when you met the person in question, and what you talked about. You would like to compile a simple database of professional contacts who you think may be useful people to know.*

*The fields you might need in your table could include:*

First Name	State	Last Meeting Date
Last Name	Zip	Action Items
Organisation Name	Work Phone	Notes
Address	Fax Number	

*Create this table now. (Hint: use the Contacts table sample under the Business listing in the wizard. Call your new table Contacts). Add five new records to your new table by following the instructions provided in the Access Tutorial for database Case 1 in Chapter 5 of Solve it!*

### To Create a Table from Scratch/Adding Records

1. From the Database Window, click the *Table* button  and then click *New*.

2. In the New Table dialog box, select the *Design View* option and then click OK. Access will open the new table in table design view. Create fields for your table (refer Access Tutorial in database Case 1 for details on how to do this). Save your table by selecting FILE/SAVE from the menu, or clicking on the *Save* toolbar button. Add records to your new table following the instructions provided in the Access Tutorial for database Case 1.

### Access Field Data Types


A data type defines the type and range of values you can enter in a field. For example, Access will not allow you to enter text in a field which is set to a Currency data type. Access 2000 and Access 97 use the following data types:

<b>Text</b>	Use for text, or combinations of text and numbers, (such as an address), or for numbers you don't intend to perform calculations on (such as phone numbers or part numbers)
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<b>Memo</b>	Use for longer text, such as notes and comments
<b>Number</b>	Use for data you might want to perform calculations on, unless it's money
<b>Date/Time</b>	Use for dates and times
<b>Currency</b>	Use for large numbers requiring rapid calculation, or for numbers that require highly accurate rounding, such as money
<b>Counter</b>	Use to automatically assign consecutive or unique values, such as invoice numbers
<b>Yes/No</b>	Use for true/false, yes/no, or on/off values
<b>OLE Object Hyperlink</b>	Use for graphical objects such as pictures and charts, and for Excel spreadsheets Use to store text or combinations of text and numbers as a hyperlink address. This is typically used for connection to data stored on the public World Wide Web or a firm's internal Intranet.
<b>Lookup Wizard</b>	Use to create a field that allows selection of a value from another Access table or from a list of values.

<p><b>Note:</b> If you change the data type of a field that contains data, you may lose some data. If you attach tables from an external application rather than importing them, Access will not allow you to change the data types.</p>
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To set or change the data type of a field:


1. In Table design view, click the Data Type box
2. Click the  button to the right of the box
3. From the drop down list that appears, select a data type from the list

<p><b>Tip:</b> Access object (tables, queries, reports, forms, etc) names, are not restricted by the usual 8 character DOS file-naming rule. Names can be up to 64 characters long and can include spaces between words. After attaching or importing a table, you can rename your new Access table with a more expressive title.</p>
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### Modify a Table Structure

After you create a Table with the Table Wizard or import or attach a file from an external application, you may want to change its structure by adding or deleting fields, setting primary


keys, creating indexes to speed up data searches, or setting field or table properties to determine the types of data stored in the table and their method of storage.

Modifications of this nature are done in table design view. Press the *Table Design*  button on the toolbar to change to this view. The Access tutorial for Case 1 contains instructions for working in Table design view. We will be looking at creating primary keys in the next section of this tutorial, and at other table structure modifications in later *Solve it!* tutorials.

### Setting a Primary Key

Access uses a unique tag called a *primary key* to identify each record in a table. As a licence plate is unique to car, or a fingerprint is unique to an individual, the primary key uniquely identifies each record. Every table should have at least one primary key. Not all fields are good candidates for primary keys. For instance, if you chose a LastName field as a primary key, your table would not be able to contain two records with the LastName “Jones”. Some number fields make good primary keys. For example, an Employee ID number would uniquely identify each record in an Employee table.

To set a Primary Key:

1. In *Table Design* view  click the *field selector* (refer Figure 4-6) for the intended primary key field. (If you need more than one primary key, select the wanted fields by holding down your Ctrl key as you click on the field selectors).


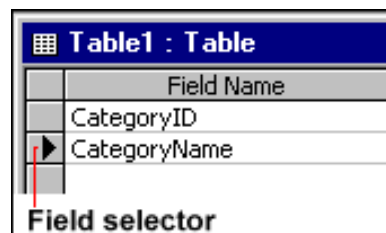
2. Click the Primary Key button  on the toolbar. (A key symbol will appear on the field selector of every primary key field you highlight).

Figure 4-6




**Note:** If you attempt to save a new table without creating a primary key, Access will prompt you to create one.

### Creating Relationships Between Tables

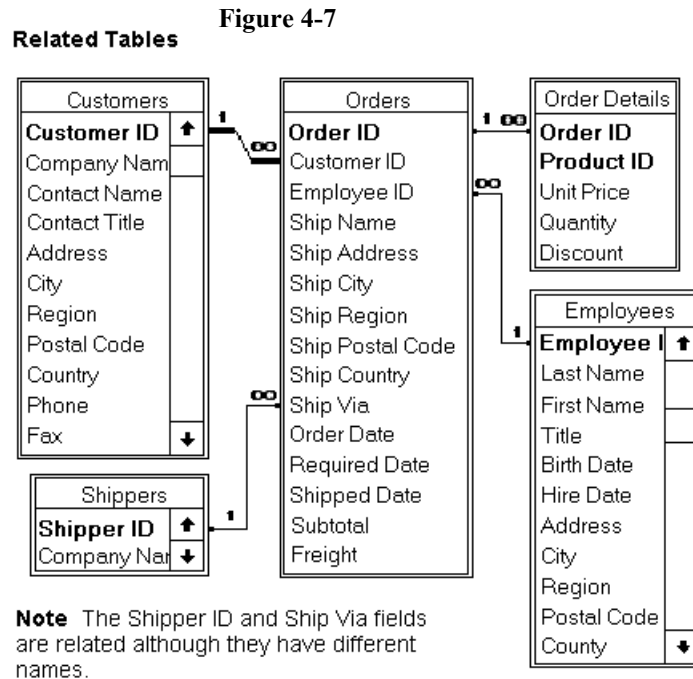
Once you have created or attached or imported the tables that you want in your database, it's a good idea to establish relationships between them. You create relationships so you can view data from more than one table in the same report or form. (To create a relationship, you will need to have at least two tables in your database).

To Create Relationships:

1. From the Database Window, click the *Relationships* button  on the toolbar. Access displays the Relationships window. If you are creating relationships for the first time, Access will display the Show Table dialog box. If this does not occur, click the Show Table button on the toolbar. In the Table/Query box, double click on the table or query you want, and Access will add the table to the Relationships window. Click Close.

2. Click a field in the first table. This will usually be the primary key (always displayed in bold). Hold down the left mouse button, and drag the field to a field containing the same type of data in another table. Access displays the Relationships dialog box with the field names filled in. Click the Create button, and Access draws a line to join the two related tables (see for example, Figure 4-7).

Note that relationships between tables can also be created at query design level. We will be doing this in a later tutorial.



### Exiting from Access

To exit from Access, press the F11 key to return to the database window, and then select FILE/EXIT from the menu.