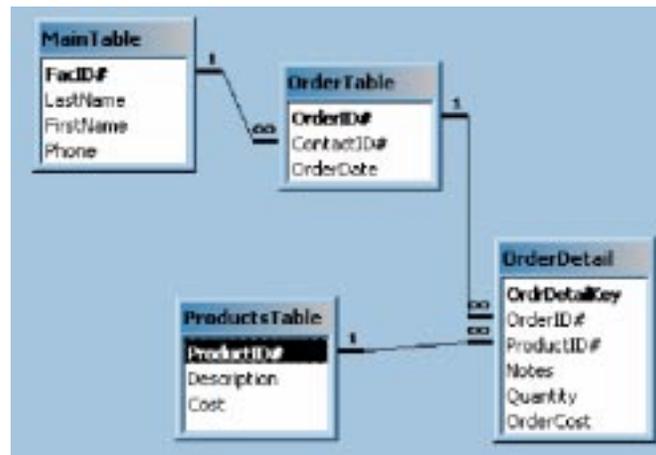


Access 2000 for the Somewhat Befuddled

What is a relational database?

A relational database is a family of tables that talk to each other. Unlike in real life, you (as the database designer) determine which data-parties communicate with each other. If only raising teen-agers were so simple! Why use multiple tables? Wouldn't one long table be simpler? Well, yes and no. Let's say you have a database with contact information for several customers. Some customers would have only one phone number and others five. If your database is one contiguous spreadsheet, you would have to have a separate records for the same person to account for every new phone number. Not only is this a data entry nightmare, but it makes information less "access"ible, wastes a LOT of space, and drastically slows down even basic searches. Once a relational database is set up properly, it is far more efficient... really.

Below is a model of how database tables are wired to talk to one another. In this example, the Underwater Basketweaving Dept of State U. is tracking their expenditures. Despite all rumor and high enrollment, Underwater Basketweaving is a rather poor department, so faculty do their own supplies ordering. Each faculty member has a unique ID# to prevent confusion with other faculty with similar names. Each faculty member is then wired to a table tracking all their orders. Each order is linked to a table of various products, etc. Don't dismay, this will make more sense soon.



Is Access like Excel?

No. Access is designed for handling enormous amounts of data; Excel is ideal for budget spreadsheets, grade sheets, etc. Access lacks the intuitive interface, helpful help menus, and extensive number-crunching capabilities of Excel. Instead, it offers a mind-boggling interface, help menus written in Greek, and limited calculation ability. That aside, Excel and Access think differently. Excel is like Tic Tac Toe, whereas Access is more like a Rubik's Cube. They share some similarities, but Access offers far more options, challenges, and learning adventures.

How much data can Access handle?

About 2 gigabytes, when properly organized. However, like Excel, Access is limited to 255 fields (i.e. columns). Coincidentally, Access also has a limit of 255 concurrent users. 255 seems to be a magical number. Excel is limited to 65,536 rows. For more information on size parameters in Access and Excel, go to the respective help menus (paperclips), and type "Access specifications."

In spite of that, I'm ready to start.

Excellent! Access has several different "nodes:" tables, forms, queries, reports, macros, & modules. Ignore macros and modules for now; they involve programming. Data is stored in tables. Typically, however, database designers create forms for easy, eye-soothing data entry. Forms are essentially a GUI (Gee, my dog can Use It) interface to a table enabling even the most nascent Access users to enter or edit data without (hope-

fully) messing things up. All data entered into forms goes directly into the table you (i.e. the designer) specify.

In summary:

Tables: Store raw data in spreadsheet-like format

Forms: Sleek, GUI interface for data entry and editing. Although forms aren't necessary, and are a pain to set up, they will save much time later on. Remember: a little pain now saves extensive agony later. A single form can enter data in several different tables (with the use of subforms). Forms can also include photos and pictures.

Queries: Imagine you have 10 tables, but only want to display 2 fields from each of them. A query enables you to specify the information you want displayed. ****NOTE: QUERY DATA IS LIVE**, that is, if you edit data in a query, you edit that data EVERYWHERE in the database. Thus, if you delete records in a query, they will disappear permanently from the entire database. There is no return. There is no "undo" key. You're toast, burnt crisp. In other words, a query is NOT a copy of the data you requested, but a magic window to it; it only appears as though it's in one place. Danger, Will Robinson!

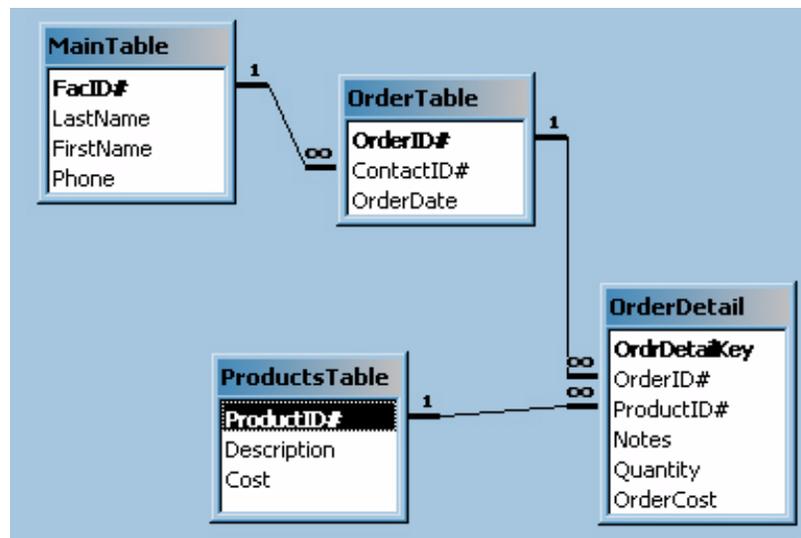
Reports: Reports are presentation-style displays of your data. You choose the format, and you can include graphics and pictures. Beware, though, reports are no Power Point. Reports require time and patience to design; I rarely use them.

Key/Relationship Overview

Every related table should have a primary key. Simply put, a primary key is an index identifier, like a call # on a library book. A primary key gives each record a unique ID code, so it can be distinguished from all the other records quickly and easily. Without a primary key, Access cannot distinguish records easily, especially if they look identical. Names make lousy keys; they change and recur too frequently. Product numbers, vendor numbers, etc., student ID#'s, social security #'s, etc., can all change. Be very careful with your choice of primary key. Once the database is set up, there is no return. I highly recommend the AutoNumber field built into Access. In the Underwater Basketweaving database, the primary keys in each table are: FacID# (MainTable), OrderID#(OrderTable), OrderDetailKey(OrderDetail), and ProductID#(ProductsTable).

There are three types of relationships: one to one, one to many, and many to many. This handout will cover only one to many relationships, as they are the most common.

As mentioned earlier, relationships determine which tables communicate. No table should contain repeating information, that is, no poor data-entry person should ever have to type in someone's name more than once. For example, since one person can have many phone numbers, if you want to track more than one of them per person, you should have a separate table for phone numbers. In the Basketweaving Dept's database, there are four tables. It begins with contact information, as that seems most intuitive. Note that in this database, you only want to track office phone numbers. Each faculty member has multiple orders, so their orders appear in the Recordable, and are linked by FacultyID# (this field is named "ContactID#" in the OrderTable, but the two are identical ID#s). For your convenience, here is the Underwater Basketweaving database again:



So, how do these tables communicate (aka: What's a Secondary Key)?

Once you've designated primary keys, you must include secondary keys. In other words, the primary key of the original table must have a match in the related table so that the database knows which phone number belongs to whom. In the Underwater Basketweaving Dept example, the MainTable and OrderTable are related. FacID# is the primary key in the main table; it matches its number with ContactID# (the secondary key) in the OrderTable (don't be confused by the different names; contactID# and FacID# are the exact same number). Likewise, OrderID# is the primary key in the OrderTable. It matches up with its secondary key (OrderID#) in the OrderDetail table, and so on.

Wait a minute... so will I have to type in ID#s more than once?

Well, ideally, some poor data entry person would do it for you. But, yes, you will have to type in secondary keys in each table. Using the Underwater Basketweaving example, in the "main table", FacID# is the primary key. This is an autonumber field, so as each name is entered, Access automatically assigns it an ID#. Since each one faculty member will have many orders, the "main table" is related to OrderTable in a one to many relationship. ContactID# is the secondary key in the OrderTable, and Order# is the primary key in the OrderTable. When adding orders, the contact ID# must be typed in or else Access won't know who to hold accountable for excessive string purchases. However, since the order# is an AutoNumber field, Access will fill it in automatically as orders are added.

This key stuff seems like a pain.

You may think so now, but remember, a little pain now saves much agony down the road.

Could I see this with actual data instead of mini-models?

Sure. It's all below and on the following page.



MainTable : Table					
		FacID#	LastName	FirstName	Phone
▶	+	1	Easter	Anna	123-4544
	+	2	Apple	Bob	234-5678
	+	3	Needles	Cindy	345-6789
	+	4	Whet	Dave	456-7890
*		(AutoNumber)			

This table tracks each faculty members and their phone numbers.

OrderTable : Table				
		OrderID#	ContactID#	OrderDate
▶	+	1	1	01-Jan-01
	+	2	2	02-Feb-01
	+	3	3	03-Mar-01
	+	4	4	04-Apr-01
	+	5	2	03-Feb-01
*		(AutoNumber)	0	

This table matches orders to faculty. As you can see, ContactID# 2 (Bob Apple) has two orders; the remaining faculty have only one each.

OrderDetail : Table					
	OrdrDetailKey	OrderID#	ProductID#	Notes	Quantity
▶	1	1	1	for 101 class	10
	2	1	2	for 101	8
	3	1	4	for 101 class	15
	4	2	1	for 201 class	10
	5	2	3	for 201 class	3
	6	2	4	for 201 class	2
	7	3	1	for 301 class	50
	8	3	2	for 301 class	20
	9	4	1	for 401 class	25
	10	4	4	for 401 class	23
*	(AutoNumber)	0	0		0

This table probably appears most complex. Since each one order contains many items, this table is necessary. Hence, there is a one to many relationship between the Order table and the OrderDeatil table. Here you can see exactly which product number is going where (for product descriptions, see the related Products table). Order #1 contains three products, as does order #2, and so on.

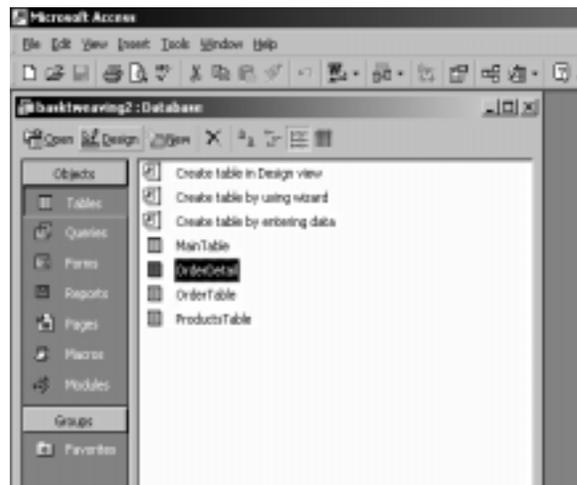
Those tables seem really confusing

Yes, they do... this is why virtually no one in their right mind uses tables for data entry if the database contains more than one table. Forms present the data in a nice, eyes- and brain-friendly manner.

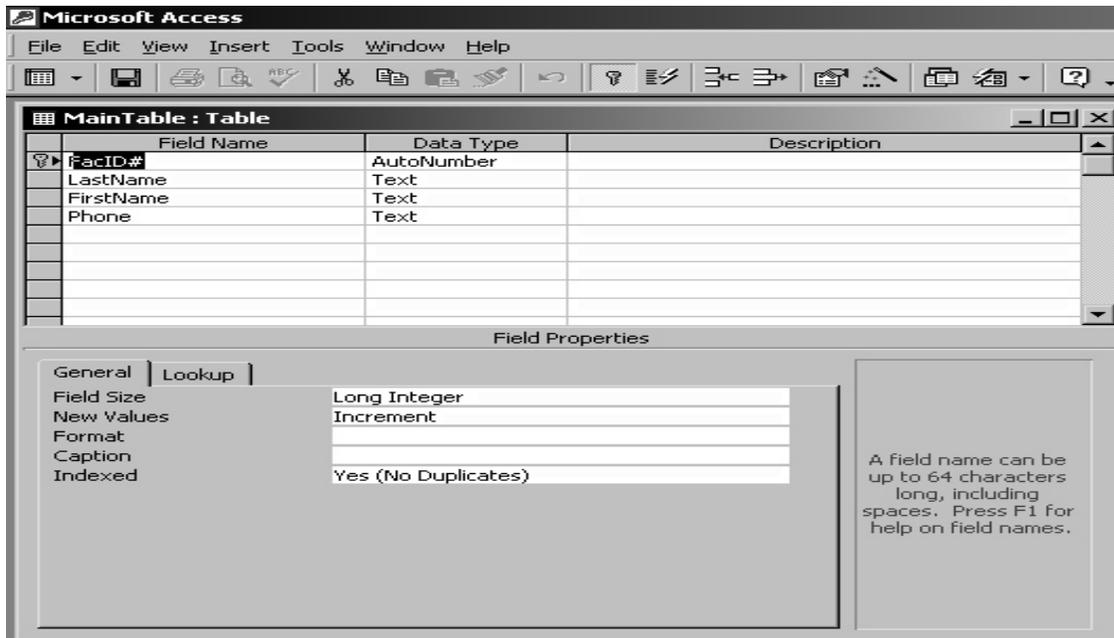
Uh, where do I start?

Four Steps to set up your Access database:

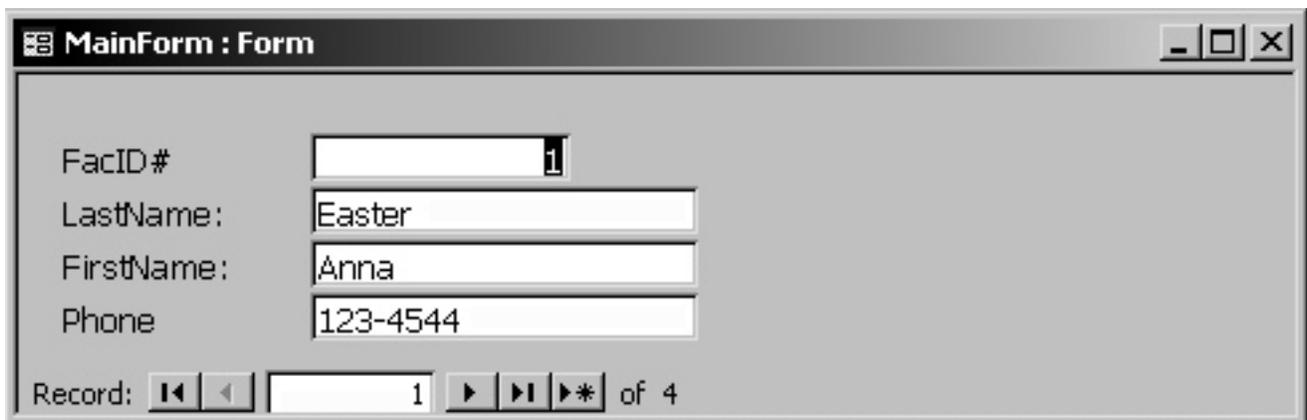
1. Plan your database.
Start with plenty of scratch paper and a pencil. Write down the types of fields you'll want, i.e. what kind of information you wish to track, etc. Then, consider which fields belong in which tables. Any time you encounter one field that could have many entries per record, you should create a separate table linked with a one to many relationship.
2. Design individual tables.
When you open a database, be sure the "tables" tab on the left is selected, and doubleclick the "Create table in Design view" option. The table wizard may sound simpler, but to do any real customizing, you need to know how to use design view.



Enter field names, data types, and an optional description. Details on data types are provided in blue print in the lower right section of your window.



3. Establish Relationships.
Click on the Tools menu, and select Relationships.
4. Create Forms.
Here is an example of a form in the Underwater Basketweaving Dept database:



The buttons along the bottom of the form are called “navigation buttons” and enable you to scroll through your records one by one.

Creating a Form

You have two options: the form wizard or doing it yourself, bit by bit. You might want to use the form wizard to start; you can always make changes in design view later on. Starting in design view may overwhelm your circuitry, especially if you’re a first-timer.

In the database window, click the forms tab, and then click on either “create a form using the form wizard” or “create a form in design view.”

If you have a field that contains repeatable data, then using combo or list box may enhance the data entry processes. For example, let’s say you are creating a database for new students admitted to your graduate school and want to create a field that contains their declared majors, such as sociology, education, or geography. Access can create a combo or list box that contains all majors so that you can click on the appropriate major without having to type it for all students. In order to create a combo or list box, follow these steps:

- 1) Click on the Control Wizard and make sure the button is depressed (shaded in gray).

- 2) Click on either the combo icon or list box icon and Access will walk you through the process.
- 3) For the best results, choose the button labeled, “I will type the values that I want” and manually enter each major name in the column that appears on the screen.
- 4) When prompted to choose between “Remember the values for later use” and “Store the value in this field,” choose the latter.
- 5) Then click on the down arrow key and choose the field “Major” which should have been created in your Table Design module.

When you go back to the Form View section, you should see a combo or list box that contains all the majors you specified in the Wizard.

There are many, many options available for forms. For a more complete “how to” guide to them, consult a good book. NOTE: anything published by Microsoft might make a “quality coaster,” “darn-good doorstep,” or “balanced bookend,” but a lousy reference manual. I recommend:

Access 2000 Programming From the Ground Up by Whil Hentzen

(Note: don’t be intimidated by the title. This book is written for novices).

The Access Bible

Or anything else you find that is written in clear, concise English. Sift through a book and see whether its explanations make sense.

Queries

Queries enable you to specify which data you want at a specific time. Queries magically (or not so magically) can sift through all your tables and/or other queries to locate the data you want. Often, you’ll create a query to gather all the information you want to place on a report.

THE MOST IMPORTANT THING ABOUT QUERIES:

YOU MUST READ THIS!!! FAILURE TO FOLLOW THIS RULE CAN RESULT IN UTTER IRREVERSIBLE CATASTROPHE!!!

As mentioned previously, all data in Access is stored in only ONE place (i.e. in a table). Although a query LOOKS LIKE a table, it is actually only a window to a table. What does this mean? Query data is LIVE data... in other words: ANY CHANGES YOU MAKE TO DATA IN A QUERY WILL PERMANENTLY CHANGE THAT DATA EVERYWHERE IN THE DATABASE!!! If you delete a record in a query, that record will disappear from the database! This is BAD. Your work life will be miserable. Your colleagues will heckle you more than Statler and Waldorf (the grumpy old men in the balcony on The Muppet Show). You’ll have to find someone willing to perform rote data entry for hours, and some information may be irreplaceable. Queries are wonderful, but they require CAUTION (i.e. keep them away from highly intelligent problem-solvers hoping to learn/use Access through the “trial and error” method.

Queries allow you to select data from multiple tables according to the criteria you specify. To design a query, click on the Queries tab in the main database window and click on the New button.

Choose the Simple Query Wizard if you want Access to help you with each step in the Query procedure. If you wish to design your own query, choose Design View from the Option Group from the toolbox (See previous page).

A table containing all the names of your tables will appear. Highlight the table(s) you want used in your query, and click Show Table the Add button. You can also build queries from other queries (or tables AND queries) in this manner. Note that as you “add” tables, any relationships between your chosen tables will be illustrated with black lines and “1” and infinity symbols. This is an opportunity to verify that your relationships are pointed in the right direction (if only life were so easy).

You have now selected your data sources for your query; now, you need to select your fields. Highlight the fields you want in your query, then drag and drop them into the “field” row in the query design table. Each field will automatically be placed in its own column.

Once your fields are in the query, you can specify your criteria. For example, you can use the Sort row to list data in ascending or descending order. In the Criteria line, you can specify exactly which range of information you want. For example, if you want to view all orders totalling more than \$100, you would enter >100 on the criteria line. For more help on syntax, go to the paperclip (or click the ? icon on your toolbar) and type “define criteria”.

AND vs. OR searches:

To specify an AND search across criteria, e.g. you want a list of items which cost more than \$5/unit which were ordered after June 15, 2002, both criteria must appear in the “criteria” row. If you wanted a list of all items which EITHER cost more than \$5 OR were ordered after June 15, 2002, then enter the second criterion in the “Or” row.

The screenshot shows the Query Design View for 'Query1 : Select Query'. It displays four tables: MainTable, OrderDetail, OrderTable, and ProductsTable. Relationships are shown between them. Below the design view is a grid for field selection and criteria.

Field:	LastName	OrderDate	Cost		
Table:	MainTable	OrderTable	ProductsTable		
Sort:					
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Criteria:		>#6/15/2002#			
or:			>5		

Reports

Reports are graphical displays of data from tables and queries. Designing them requires a lot of mouse clicking, but it's relatively simple. Designing a report in design view is much like designing a form in design view. Very simple reports and forms can be designed using the Wizards. Reports are NOT live, so anyone willing to invest time and wrist muscle can play around with them without risk.