



Access 1

Tables and Database Design

Office XP version

CAL People and Computer Training
University of California, Berkeley

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Use this
space for notes

Introduction

Access 1 is a course created for CAL PACT participants to learn more about the features of Microsoft Access. The course covers introductory material to provide you with the fundamental knowledge to create a database using Access. It also serves as a future reference for you as you continue to gain experience on your own. Some topics may not be covered in as much detail during the course session as they are in this document. Documentation is available for previous versions of Access for Windows on the CAL PACT website: <http://calpact.berkeley.edu>.

Skills you need for this course

- How to use the mouse
- Familiarity with the Windows operating system
- Familiarity with other applications in the Microsoft Office suite

Skills and concepts you will learn in this course

- What is Access
- What is a database
- Creating new databases
- All about tables
- Data entry and manipulation
- Locating Records
- Table Properties
- Relationships

Conventions used in this document

Menus and menu commands are separated by a vertical bar (|). In the document they will appear as **Menu|Command**. An example of this is: “Select **File|New...**”

What is a Database?

A database is a collection of information on a particular subject. A Database Management System (DBMS), like Access, provides an easy way to store, retrieve, and organize information. Using Access allows you to store, access, and manipulate information in many different ways. Access is one of many database programs including File Maker Pro, Oracle, IBM DB2, and Microsoft SQL Server.

The foundation of Access is based upon the following categories:

- Tables** allow you to store information
- Queries** are lists which allow you to ask questions about specific information
- Forms** allow for individual records of data to be viewed one at time
- Reports** give better control of the visual look/setup of information for printing purposes

A database can be created manually or by using the **Database Wizard**. The Database Wizard provides template databases on common subjects like address books, order form entries, and employee lists.

Creating New Databases

To begin, open Access, and choose **File|New...** The task window appears on the right side of the screen, giving you several options of where to begin. Choose **Blank Database** under the “New” section, name your database, and create it.

Tables

Tables are the backbone of your database. All information is stored here. They contain all the information about the desired topic such as names, addresses, phone numbers, and budgets. Queries, Forms, and Reports refer to these tables allowing the user to manipulate and customize data to fit their desired questions.

Employee_ID	Lastname	Firstname
14909426	Shah	Apurva
12341251	Green	Paul
1232		

Tables are essentially a set of rows and columns, where each row is an individual record and each column represents an attribute of that record, called a **field**. In the image above, we see three different fields (Employee_ID, Lastname, and Firstname), and two complete records (Shah, Apurva and Green, Paul)

When starting a database, it is important to plan out your tables correctly before you have entered in any information. By planning your database correctly you can make your database more efficient, user-friendly, safe, and maintainable. First, you must consider what information you want to store and what you want to be able get out of the information.

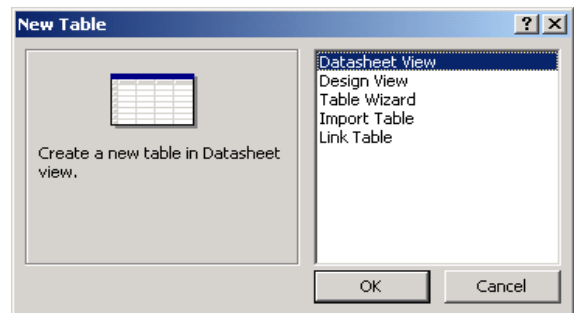
For instance, if you are designing an Address book of all employees in a Department, what information would you want to store about each contact? Work, phone, cell, fax number? And for each number there are a few issues: Do we want to store Campus phone numbers like “(510) 642-1234” or will “2-1234” be enough?

What about department, building, floor, room number, Mail Code? Would it be necessary to store the City, considering most employees work in Berkeley?

These are the types of issues that one must consider before creating a table. Although you can change the design of your table after it has been created, it can be tricky to do so because it can be possible to make changes that cause a loss of information!

Creating a Table

Tables can be created using the **Table Wizard** or by manually entering the data into a datasheet. Datasheets allow you to organize information by assigning fields to hold specific types of information. Each column within the datasheet is assigned to contain a specific type of data, assigned by the field. The rows in a datasheet are used, like a listing, to store information on the subjects of your topic.



To create a new table, first make sure the **Tables** tab is selected from the objects window. Then click the **New** button in the objects window toolbar. This will display the **New Table** dialog box. Select either **Datasheet View** or **Table Wizard** from the list on the right and click **OK**. For the purposes of this course, we'll discuss Datasheet View first and then move on to the Table Wizard.

Datasheet View

The main purpose of this view is to enter and update data once field categories have been designated. If you create a new table using Datasheet View, field headers will appear as Field1, Field2, Field3, etc. Only the columns you modify will be contained in your table when you finish the initial setup by saving the table.

Once you have organized how data will be stored in your database, names can be given to the field headers. Rename field headers by double-clicking the field header name. When the cursor appears, you can type the new name. This name can include spaces if you wish, but it's a good idea to avoid using spaces if possible. Rename several fields to Employee_ID, FirstName, and LastName. When you close the table for the first time, you will be asked to name and save the table. But what should you call it?

Although it's not necessary, it's wise to develop a naming scheme for all of your objects. If your database gets very large, you will probably have multiple tables, queries, forms, and reports. One way to distinguish between all of them is to have them each begin with t_ (for tables), q_ (for queries), f_ (for forms), and r_ (for reports). That way, when you are looking at a long list of all your objects, you'll quickly know which objects are a certain type (table, query, etc.). So, for this object with Employee_ID, FirstName, and LastName, we might call it t_contact_info.

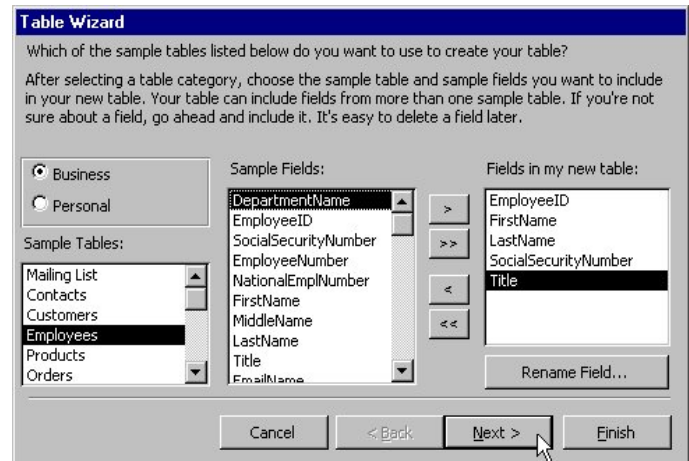
FYI



Avoid using spaces for field names. You can use uppercase letters to separate words instead. (Ex. Quarterly Financial Reports should be entered as QuarterlyFinancialReports)

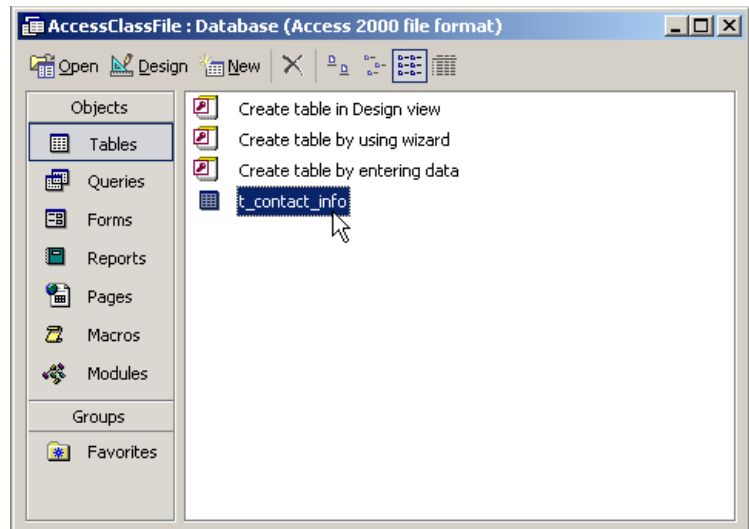
Table Wizard

Instead of creating a table using datasheet view, you might use the Table Wizard. The Table Wizard allows you to create a table using predefined categories. It's a great way to "get started." Sample tables and fields from the business and personal categories can be included in your table, and you need not choose all the fields from a particular template. The Table Wizard gives you the flexibility to choose only those fields that apply to your database.



Opening Tables

Once a Table has been created and saved, it can be opened from the main Database navigation menu that appears once you have opened a database. Choose the **Table** button on the left, and then double-click the table that you want to open.



Entering Information

Opening a table will automatically put you in Datasheet View, where you can view all of the data currently stored and enter or modify records. Once a table is created, only enough rows will be displayed to show the information currently stored. A new row will appear at the bottom of the document to allow you to enter in new records. To edit a record, simply click on the field of the record you want to edit, and type in the new information that you wish to store. By default, once you click in the field, the entire contents of that field will be highlighted, therefore, any thing you type will overwrite the current information. To only edit the information that is already inside, click once again inside that cell at the place you wish to edit.

Tip



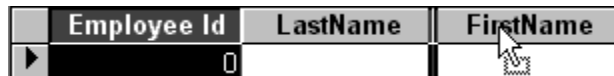
Think of the *Caption* as the name for display purposes. The *Field Name* serves as the "real" name for the purposes of compatibility.

When editing and deleting information, there may be instances where the data you enter has to conform to rules that the database design has specified. For instance, if you have a database with Employee_ID numbers, the database may only allow you to enter unique numbers so that no two records have the same ID. Access will prevent you from making these mistakes and will not allow you to edit the table any further until correct data has been entered. (We'll learn how to do this later!)

The data you enter and edit in Datasheet View is automatically saved, therefore there is no need to specifically save the table again.

Moving/Deleting Records and Fields

In Datasheet View, fields can be rearranged by clicking on a field header, highlighting the entire column and then dragging the header to its new location.



Employee Id	LastName	FirstName
0		

Fields can be removed by clicking within any of the records in the desired field and then selecting **Edit|Delete Column**. Likewise, records can be deleted by clicking any cell inside the record or the gray button in the corresponding row and selecting **Edit|Delete Record**.

Using Spell Check

The Spell Check option can be used for Tables, Queries, Forms, or Reports. This option can be accessed by clicking on the **Spell Check** button in the toolbar once a particular object is opened or selected from any of the above-mentioned objects. Spell Check in Access works the same way as in other applications in the Microsoft Office suite.

Finding Records

You can search for records by selecting **Edit|Find**. This function will work only if an existing object (say, a particular table) is currently open. The Find command can be applied to either specific fields or all fields. Field selection can be accomplished by either selecting the field name or any cell within that field.

Replacing Records


Replacing records is a useful tool to make uniform changes to multiple records. For example, you might change the 415 area code to 510. This option can be accessed by selecting **Edit|Replace**. Similar to finding records, this function will work only if the object (for example, the table) is currently open. Normally, Access will replace an entire field of data. However, the Replace command can be customized to replace only specific instances within records by deselecting the **Match Whole Field** checkbox. This can be useful in such instances such as changing the area code on phone lists.

Design View

Besides Datasheet view, there are other views to work with Tables:

Design View allows you to customize tables to meet your specific needs. The entire layout and setup of the Table can be modified here.

PivotChartView and **PivotTable View** allow you to generate pivot charts and tables easily. This will be discussed in more detail later in the Access Series.

To switch to these views after you have opened a Table, click on the down arrow on this button  in the top left corner. Then select Design View.

In Design View you are presented with three different columns at the top of the window. The first column contains the names of the fields that are used in the Table. The second corresponds to the Datatype for each field. For instance, you can choose text, simple text, or Currency for dollar amounts. The third column allows comments for each field. Leaving a description is not required but is helpful in case someone else besides the creator needs to make sense of the database.

Employee Info : Table	
Field Name	Data Type
EmployeeID	Number
LastName	Text
FirstName	Memo
Department	Number
PhoneNumber	Date/Time
DateHired	Currency
SSN	AutoNumber
PrimarySkill	Yes/No
SecondarySkill	OLE Object
	Hyperlink
	Lookup Wizard...

At the bottom of the screen, there are **Field Properties** which correspond to the currently selected Field. This list and type of properties that can be adjusted are determined by the Data type for each field.

Tip



Think of the *Caption* as the name for display purposes. The *Field Name* serves as the "real" name for the purposes of compatibility.

Field Name

Field names are used to distinguish between the different "categories" you have chosen to include in your table. It is recommended that you **not** include spaces. This is to allow compatibility with other database applications. If you want to change the field name, click within the appropriate cell and edit the name once the cursor bar has appeared. Field names also appear as the field header names within the **Datasheet View** unless otherwise modified. This can be accomplished by entering the field header name under **Caption** in the **General** menu located at the bottom of the window. The name entered within the Caption area will now appear as the field header instead of the field name. Note that names entered within the Caption field *can* include spaces.

Data Type


The Data Type allows you to define the way records are stored and displayed for each field. Click within the **Data Type** cell of a field and then select the pull down menu in the field to change the type of data stored in that field. Records can be preset to include useful symbols for structured data entry and to save time. Examples of Data Types are Auto Numbering, Yes/No check boxes, and adding in " / / " for dates. More detailed information about dealing with these data types will be provided further in the document. The next page contains a table describing some useful data types.

Data Type	Usage	Size
Text	Alphanumeric data	255 characters
Memo	Alphanumeric data	64,000 characters
Number	Numeric data	1, 2, 4, or 8 bytes
Date/Time	Dates and times	8 bytes
Currency	Monetary data	8 bytes (4 decimal places)
AutoNumber	Automatically generated unique number	4 bytes
Yes/No	true/false data	1 bit

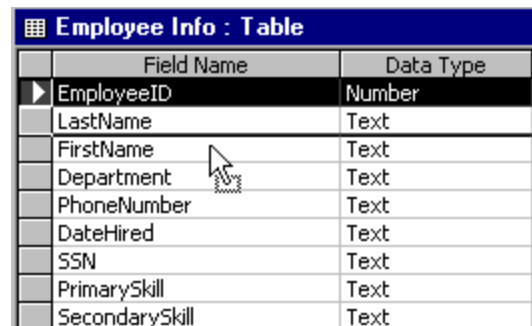
Creating and Editing Fields

It is extremely important to design your database well before entering data! If you decide to switch data types after the fact, you risk losing some or all of your data for that particular field.

To add a new field to your table there are several options. One way is to simply type in a new name for a field and select the appropriate datatype. This will create a new field in your table that will be of the datatype you specified.

New fields can also be added by using the **Build** button () located in the menu bar. The **Field Builder** allows for new field entries using built-in templates based on common topics (similar to the Table Wizard). Simply browse through the sample fields and highlight the one that applies to your topic and click **OK**. The field button uses preset input masks to format the entered data. An example of this is automatically inputting "() - " in a phone number field.

Since Design View only allows you to set up your table, records cannot be deleted. To move fields, click on the gray button to the left of the corresponding Field Name. The entire row should be highlighted and a black arrow will appear. Click and drag to drop the field in its new location. Fields can be removed by highlighting the entire row or by selecting a cell within the field and selecting **Edit|Delete Row**.



Field Name	Data Type
EmployeeID	Number
LastName	Text
FirstName	Text
Department	Text
PhoneNumber	Text
DateHired	Text
SSN	Text
PrimarySkill	Text
SecondarySkill	Text

Enhancing & Customizing Your Table Design

Enhancing and customizing a table's design can help make data entry easier and more accurate by setting default values and parameters for a table's fields. This can help save time by specifying default values and format data a specific way be default. Depending on which data type you choose for a particular field, there will be a different set of properties you can choose from for that particular field. Here is a general list for field properties (we will take a more detailed look at these features a bit later):

Field Size	Text: limits the size of the field to the specified number of characters
Numeric	Allows specification of a numeric type
Format	Changes the way data appears after you enter it
Input Mask	Used for data entry into a predefined and validated format (Phone Numbers, Zip Codes, Employee ID)
Decimal Places	Specifies the number of decimal places
Caption	Optional Label, that replaces the field name in Tables, Forms, and Reports
Default Value	The value filled in automatically for new data entry into the field
Validation Rule	Validates data based on rules created through expressions
Required	Specifies that you must enter a value into a field
Allow Zero Length	Determines whether you may enter the value "" into a text field to distinguish it from a null value
Indexed	Speeds up data access, and if desired limits data to unique values

Most people find formatting their data to be the most important part of their table, and it can be the most confusing. The reason for that is that there are two options - using the **format** property or the **input mask** property. Below we will give a basic overview on the two and help you understand the difference.

The Format Property

The format property affects how the data is displayed. When data is entered, it is formatted so that to the user, it appears in the specified form. However, to the computer, the data is stored in the same format as you typed it in. Some data types have pre-defined formats, while others allow for user defined formats.

Format option for Text and Memo Data types

There are two main formatting symbols for text and memo fields. Using "@" means a text character or space is required, and "&" means no text character is required. For instance when a phone number is a part of your field, using the format: "(&&&) @@@-@@@@@" would allow users to type in numbers with area codes or without area codes. The user would only have to type in the numbers and the formatting would be completed by Access.

You can also force characters to be uppercase or lowercase using ">" and "<" respectively. Using the format ">@" would require the field to be at least one letter long, and it would be entirely uppercase.

Format options for Number and Currency Data types

Using a "0" means a digit entry is required, and using a "#" means digit or space not required. If you were to always input percentages, "00%" would be useful.

Format options for Date/Time Data types

Access gives you a set of predefined Formats for Date and time. Here is a brief list of these different types with examples.

General Date (default)	11/29/03, 05:34:00 PM
Long Date	Saturday, November 29, 2003
Medium Date	29-Nov-03
Short Date	11/29/03
Long Time	5:34:23 PM
Medium Time	5:34 PM
Short Time	17:34

Input Masks

Input masks control how data is entered and formats existing data. Input masks have more features than the format option, and can also affect how data is stored. Therefore it is generally unnecessary to use the Format option if you are already using an Input Mask. If you do use both the Format option, and an Input Mask, the format option will take precedence. One would use Input Masks when the data entered is of a fixed format and the length is going to be the same everytime. For example, this applies to Employee ID numbers, Social Security Numbers, and Zip Codes. But for data with values that are of variable length, such as numbers, dollar amounts, or email addresses, the format option would be more suitable.

There are three parts to the Input Mask, each separated by semi-colons. Here's a look at each part, below.

First part Actual Input Mask. Specifies how the data is represented

Second Part Specifies how data is to be stored.

“0” in this position indicates that all characters will be stored in the database including the characters specified in the input mask.

“1” or blank indicates that only the data actually typed in will be stored in the database.

Third Part Specifies the character that will be used for place holders when you are typing in your data.

With a mask like this for a phone number: (999)000-0000;0;"-"

Your field would look like this: () 643-2000 or (510) 643-2000

Validation Rules

To automatically double-check data entries, Access can designate validation rules and error messages. These enhancements are made available in a table's **Design View**. Each field is assigned property values which may be customized to fit your needs. Properties for each field will appear in the **General** tab once you have clicked inside any of the field name cells.

If you track pay rates in your database, you may want to ensure that entered data (and pay rates themselves???) do not exceed \$40. At right is an example of a pay rate field which, when data is entered would require the rate to be below \$40. The < symbol included in this validation rule ensures that values larger than 40 cannot be entered. Notice also the **Validation Text**. This is the message that will appear for a user if he tries to enter an amount greater than 40 in this field. The error message will show “Pay rate cannot be more than \$40” and the user will not be allowed to continue until the amount entered was less than \$40.

Property	Value
Format	
Decimal Places	Auto
Input Mask	
Caption	
Default Value	
Validation Rule	<40
Validation Text	Pay rate cannot be more than \$40.
Required	No
Indexed	No

Lookup Wizard

When entering data into a table, for some fields it may be easier to choose from a list of possible choices rather than typing a new value every time. Also by limiting users to choose from a list of values, the user cannot enter incorrect data.

To setup this feature, choose **Lookup wizard** as the datatype for the field (let's choose “department”)

you want to have a list of values you want to choose from. Once you have selected the Lookup Wizard as the datatype, this wizard will appear.

You must now decide where you want the list of values to come from. They can come from a table that already exists or you can type in the values now. When choosing the values from an existing table, choose the table and the fields that you want to get the values from.

For now, we will create our own value list for this field. Select “I will type in the values that I want” and click **Next**. Type in the first value for the list in the small table shown, then hit the tab key on your keyboard to go to the next cell and enter another value. When you are finished, click **Next**.

This wizard creates a lookup column, which displays a list of values you can choose from. How do you want your lookup column to get its values?

I want the lookup column to look up the values in a table or query.

I will type in the values that I want.

Buttons: Cancel, < Back, Next >, Finish

What values do you want to see in your lookup column? Enter the number of columns you want in the list, and then type the values you want in each cell.

To adjust the width of a column, drag its right edge to the width you want, or double-click the right edge of the column heading to get the best fit.

Number of columns: 1

Col1
Chemistry
Economics
Math
Physics
*

Buttons: Cancel, < Back, Next >, Finish

Finally, give a label for the data that you just created (“department” is one idea) and then click **Finish**.

Working With Relationships

As you continue thinking about the design of your table, you will likely come across the topic of relationships. Relationships provide a useful tool by creating links between two or more separate tables. By using relationships, the user can avoid making databases that contain multiple instances of the same information. This option also allows you to create queries that pull information from multiple tables into one query.

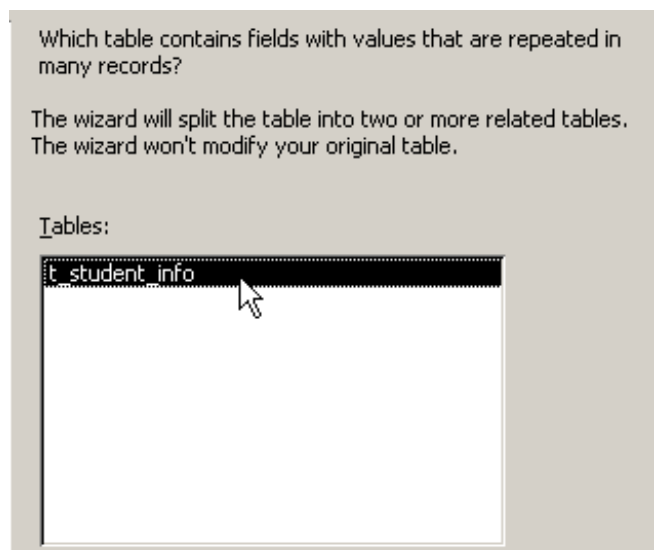
Relationships can be created between multiple tables by highlighting an existing table and clicking on the **Relationships** button (🔗). A new screen appears, revealing relationships by showing each table and what field has been chosen as the common link between the tables. Links/Relationships between tables appear as lines connecting tables, where the start and end points reveal the fields that form the basis for the link.

Tables can be added to a relationship by clicking on the **Show Table** button (➕📄), which allows you to select an additional table to add to the relationship. Once the table has been added, select the common field to link between the table(s) and click and drag the field from one table to the other. Next, click on the **Create** button of the **Relationships** window to create the relationship. You should now notice a link between the two fields. Likewise, relationships or tables can be deleted by selecting the link between tables or the table and selecting **Edit|Delete**.

Table Analyzer

If you do not already have two or more tables to relate, it is easier and faster to use the **Table Analyzer** to create your relationships. Select **Tools|Analyze|Table**. The Table Analyzer Wizard will look through the data you already have entered in a specific table, and then make a suggestion for splitting the table into one or more tables. But be careful! Sometimes Access comes up with the craziest table splits, so it's a good idea to know your data and be ready to “fix” the split that Access creates. After some introductory pages, you can select the table you wish to analyze and then click **Next**.

If you let the wizard decide how to split your table, be ready to make some changes! Or, just decide to split the table yourself and click on **Next**.

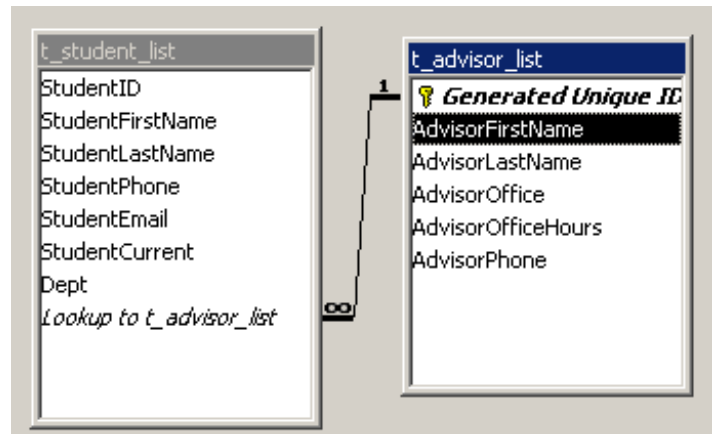


For our example, we are looking for two tables in the end. Access may have split them up into four or five tables, but that's not what we want! We want all of the student information in one table, and related to one table of advisor information.

To accomplish this, drag all the information related to the Advisor into one

table. If you are doing this yourself, just drag AdvisorFirstName into the grey area and a new table will begin for you. Or, if you had Access decide for you, click and drag on the Advisor fields until they are all contained in one table.

To change the names of the tables, double click on the table names (probably Table1 and Table2 right now). Click Next to finish the table analyzer wizard, and then select Yes to have Access create a query for you, then Finish!



But I didn't use the Table Analyzer Wizard...

If you didn't use the Table Analyzer to create relationships (and you did it yourself), then you might want to create a query yourself to show you the information from both tables at once. But what's a query?? Here is a very quick, sneak peak at what we will discuss about queries in Access 2. Select **New** from the **Queries** tab and choose **Design View**. Select the tables you wish to include in the query from the **Show Table** window. Once you add the appropriate tables, close the window and you should see the tables and relationships between them on the upper portion of the Design Window. Finally, select the fields to be included in the query by double-clicking the field or selecting the field from the pull-down menu in the field cell and click on the **Run** button to run the query.

See you next week!

Now you should be quite familiar with the building blocks of an Access database - tables! Before next week, try to practice on your own by creating a table to track names, addresses, and information for holiday cards sent and received... or think of a project which would be beneficial for use in your department and work on that. By next week, you'll be a table expert and ready for pulling information back out of those tables by creating queries. See you then!