



Microsoft Access

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George W. Rumsey
 Computer Resource Center, Inc.
 1525 East 53rd Street, Suite 902
 Chicago, IL 60615
 Tel 773-955-4455
 Email Rumsey@aol.com
<http://www.computer-resource.com>

What Is a Database?

A database is a collection of related information. Databases are defined through:

Fields (columns) Fields are the units of information you are trying to keep track of. The combined information in these fields provides all the information for that particular reference. Fields are also used to sort (alphabetize) and select your information.

Records (rows) A record is what a database tracks: all fields for *one* entry. Records are what print.

The combination of fields and records creates a *table*. Below is an example of a simple database table, which gives some information about various people.

<u>First Name</u>	<u>Last Name</u>	<u>Middle Name</u>	<u>Street Address</u>	<u>Apt. #</u>	<u>City</u>	<u>State</u>	<u>Zip Code</u>	<u>Phone Number</u>	<u>Fax Number</u>
Joe	Peters	Robert	123 North Ave.	3-B	Chicago	IL	60645		
Jane	Adams	Elizabeth	44 N. State		Peoria	IL	67854	222-5678	345-2543
Fred	Lamar	Ansell	2309 Peach St.		Charleston	SC	23462	879-6548	
Tammy	Reynolds		333 Broadway	33-S	New York	NY	10198	334-5464	344-1234

The advantage of a database is that tables can contain millions of records with hundreds of fields — and you have immediate access to all this information, in any order and any format you choose.

Database Management

Once you have compiled your information, what can you do with it? Microsoft Access provides not only the means of assembling and organizing all of your information, but it also has a wide array of tools to manipulate, analyze, and report all or parts of your data. A typical database model could be the telephone company.

A telephone company has an enormous database of all its customers: names, addresses, phone numbers, etc. All the records are sorted in ascending alphabetical order, according to the field “Last Name.” What about all the Smiths (duplicate last names)? The database is again sorted by “First Name,” then “Middle Name,” etc. *Sorting* arranges all the records in an order by multiple fields.

When someone calls an operator for a particular person’s phone number, the operator performs a “*query*” or a question: Display the record(s) for Smith, John, on Racine. A query filters out (finds) those records that match the given criteria.

Your telephone bill is a “*report*” that displays (and calculates) various services and costs charged to a specific customer (record) for a particular period of time (query). It will print in the order of your sort, and will contain all the data for a specified query.

What does an operator look at on his or her end of the phone? A *form*. Forms allow data-entry operators to key in data in easy-to-understand and user-friendly screens, or even to perform basic queries or sorts.

A Brief Tour of Access

When you open an existing database, on the left side of the screen is a “Navigation Pane,” which can be expanded or collapsed. At the top of the navigation pane is a dropdown that controls how your data components are listed. The fullest is to set your display by “Object Type” (such as tables, queries, forms, reports), then display “All Access Objects.” This makes everything in your database visible for selection.

At the top of the screen is the Office Ribbon, with tabs for Home (standard operations such as formatting, cut and paste, delete, sort, and filter), Create (for making new tables, queries, forms, reports), External Data (importing and exporting options), and Database Tools (relationships and properties, switchboards, passwords, users and permissions).

In the upper left corner is the round Office Button, which has the open, save, convert, and print options. On the “Manage” listing are useful tools such as “compact and repair.” At the bottom is the Access Options, where you set defaults.

Database Tools

Table: Also called a “datasheet,” this is the building block of a database. Access allows one to have multiple tables within a database file (something older database programs did not allow). **Tables hold all the data.**

Query: A query is a tool for asking database questions, and for analyzing the information in your table. It allows you to search for particular records or particular data within those records, or answer general questions about the records: “How many people from Pennsylvania bought this item?” “List all the women from Florida who subscribe to these magazines, who are over 40, and who make more than \$100,000 per year.” Queries are crucial. They do not hold data. You should always remember that, when working within a query, if you make changes to the data, you’ve changed what’s in the table. If you add or delete someone to a query, you’ve added or deleted them in the table.

Form: Forms are screen displays that allow you to enter, view, and look up data in a user-friendly fashion. They do not hold data.

Report: Reports allow you to print or preview data or query results in a variety of ways:

Mailing Label	Invoices
Envelopes	Lists
Form Letters	

Macro: Macros are step-saving devices or sets of instructions that automate frequently performed tasks. You can create macros that will open specific databases, run queries, and send the results to a report.

Modules: Modules are like macros, but more complex. They are written in programming language such as Visual Basic.

Note 1: All of these parts with their respective tools are packaged into *one* .ACCDB file. In other database programs, you’d have them in *multiple* files, but Access stores everything together under a common file name (which means that Access files get huge in a hurry).

Note 2: A query is based on a table. Forms and reports can be based on a table or a query. However, you cannot always switch a form or report from one table to another, or from one query to another.

Note 3: Whatever mode or “View” you are in, the Ribbon and Tabs change.

Getting Started

When you open Access, the first screen that appears is “Getting Started with Microsoft Office Access.” This screen shows you multiple templates you can create databases from, as well as recently used databases on your computer. If you click “Blank Database” (small icon at the top), you will be prompted to enter a file name that ends in the letters .accdb (for Access database). You can also select the folder where you want the database to reside; “My Data Sources” (or something similar, depending on your Windows version) is the preferred “trusted site”; if you put the file in others folders, whenever you open them, you will get a warning that the file is in an untrusted location. This message will persist until you either move it to a “trusted” folder, or add your folder to the list of trusted sites.

Once you press “Create,” you have a database shell, which will contain one generic Table1.

Creating the Table

Before any data can be input, a table must first be designed. Access automatically gives you one generic table, with a heading “Add New Field.” If you look at the ribbon, you’ll find a new tab for “Datasheet.” Here you’ll find the commands to add new fields, add existing fields, create a lookup column, insert and delete columns, and format your data.

Click on “New Field” to see the field templates (pre-set commonly used categories). Most of these are preformatted and have “data types” pre-selected. Double-clicking puts the fields into your table. If you then click within the field column, the “Data Type” tab will show you the kind of field you selected.

Since this is a somewhat hit-or-miss way of defining a table, a better choice might be the very first button, “View,” which gives you four options:

1. Datasheet View—See your data.
2. PivotTable View—Display your data in an Excel pivot table.
3. PivotChart View—Display data in an Excel pivot chart.
4. Design View—See the details of your fields.

The **Design View** is extremely important, as it shows you the options for how to construct your table:

Field Name Each column of information you wish to enter (Field) must be given a unique name. It can be up to 64 characters long; can contain letters, numbers, spaces, or punctuation; and it must begin with a letter or number (not a space or a symbol). It’s often smart to use easy-to-remember field names, as you may be re-entering them in other parts of your database. After you type your field name, press tab to move to or click in the cell next to Field Name.

Data Type This determines what kinds of data your table will accept. There are many field types:

Text Any kind of data (up to 255 characters).

Memo Large blocks of data or text (comments, notes, etc., up to 32,000 characters); automatically permits word wrap for multi-line entry, and allows Rich Text formatting.

Number For numbers that can be used for calculations.

Currency Numbers pre-set in dollar format.

Date/Time A valid date or time (see properties for formats).

Autonumber A numeric field that is assigned automatically, is unique to each record, and cannot be changed; it can be sequential or random.

Yes/No Often called “Logical,” and can be set to True/False, Yes/No, or On/Off (checkboxes).

OLE Object Stores pictures, sounds or other program documents (Object Linking and Embedding). [Note that Access has a really stupid quirk that says pictures show up only if you have Microsoft Photo Editor installed on your computer.]

Hyperlink Stores data as hypertext (clickable to launch a web site), and useful if you’re going to post data onto websites.

Attachment Similar to OLE, allows you to store files from other programs, which are then displayed as paperclip icons to be double-clicked, which opens the Attachment Manager (so you can have multiple attachments in one record’s field).

Lookup A “wizard” that creates pull-down menus containing values you set.

Calculated A field to carry out a calculation, based on an expression (such as [fieldname]-[fieldname2]).

In the Data Type box, click the ▼ arrow to select your choice. Think carefully before making your choice; 80% of all fields are text. For example, many people would set a zip code field to numeric; however, what if your mailing list contained someone in Canada? Canadian zip codes contain letters (such as Ottawa, K2C 2N3), but if the field is

numeric, you can only enter numbers. It is often wise to ask yourself questions such as: "Would I want to add up (sum, or total) this field?" If the answer is yes, it must be numeric or currency. Would you want to get a total of your zip codes or telephone numbers?

Description Whatever text you type under description will appear on the status bar at the bottom of the screen whenever your cursor is in that field. It is an on-screen reminder or help prompt.

Field Properties

Field Properties define the characteristics, operations, and appearance of all data in that field. Different Field Properties are available for different fields types. Following are the most common:

- Field Size** The maximum amount of text or numbers. The automatic setting for text is 255; you can have a minimum of 1.
- Format** How data will appear (such as 6/22/98 or June 22, 1998 for dates, or 23.5 for numbers).
- Input Mask** A pattern for data that is entered (see section on Input Masks symbols, below, for details and examples).
- Caption** An alternative name for that field (for reports, forms, etc.).
- Default Value** An automatic value for a field if nothing is manually input; for example, if most of your mailing list resides in Chicago, then set "Chicago" as the default value and you don't have to type it unless the person lives somewhere else.
- Decimal Value** The number of decimal places allowed in a field (for numeric fields; note, the field format must be a non-integer opt
- Validation Rule** Tests data as it is entered to determine if it can be accepted (it prevents you from entering inappropriate data). For example, a validation rule of >100 means you must enter a number larger than 100.
- Validation Text** Defines the error message that appears on screen when input data isn't accepted by the Validation Rule.
- Required** If set to "Yes," this field *must* contain *something* before that record can be saved.
- Allow Zero Length** Allows you to put nothing, zilch, nada in that field.
- Indexed** Constantly updates the sorted order of your records—not on-screen, but in the background. This speeds up searches and queries. Each new record is added to the end of your datasheet, but if you set index to Yes, Access remembers the appropriate location for your data, and can then move you to that point quicker. But if you set everything to "Index Yes," the computer has to hold so much in active memory that it slows down your computer. Only index key or frequently used fields. If you set the option to "Yes, No Duplicates," then you cannot have the same data used in the same field of two separate records (for example, you could not have two people whose first name is George); it's not duplicate records, it prevents duplication within fields.
- Text Format** Plain or Rich Text (includes bullets, numbers, and indents); only available in Memo fields.

Symbols for Input Masks

- 0 Digit (entry required)
- 9 Digit only (entry not required)
- # Digit, + or -, or space (entry not required)
- L Letter (entry required)
- ? Letter (entry not required)
- A Letter or digit (entry required)

a	Letter or digit (entry not required)
&	Any character or space (entry required)
C	Any character or space (entry not required)
. , ; - /	Decimal point, thousands, date, time separators
<	Characters to the right in lower case
>	Characters to the right in upper case
!	Display data on the right side, instead of the left
\	Show as literal (when you want one of the above symbols to show)

Sample Input Masks:	Accepted Values:
(000) 000-0000	(206) 555-0248
(999) 000-0000	(206) 555-0248 or () 555-0248
(000) AAA-AAAA	(206) 555-TELE
000-000 a99	555-7000 x201555-0248
000-00-0000	539-88-3736
#999	-20 or 2000
>L??L?000LO	GREENGR339M3

Setting a Primary Key

A primary key is a field that *uniquely* identifies that record. What this means is that **no other record** can have the same value in that particular field. This field also sorts the records. Tables don't have to have primary key fields, but as a general rule, always use a primary key until you know Access inside and out. (Primary keys also serve a principal role in setting up relationships across tables, so they can share data.) The default for the primary key, since it must be unique, is "AutoNumber."

The primary key is set by clicking the Primary Key button on the Ribbon. You can have multiple primary keys, if needed.

Note: Remember some basic rules. If it isn't in a separate field, it can't be easily sorted or queried. Sorting works left to right. Saving the design maintains the sort order, even if the fields are re-arranged.

Saving

Whenever you make changes to the design of any Access component (such as adding new fields), the design changes must be saved. As you enter data, you never have to save, as Access saves data automatically, when you leave the field or record. If you sort or re-arrange your columns, you must save, as that is a design change.

Viewing the Data

Use the first button "View" to toggle between Design and Data views. In the data view screen, the Home tab of the ribbon provides you with the following options:

- Clipboard**Cut, copy, paste, paste special, paste append, format painter
- Font**.....Font, size, alignment, etc. for table content. Note that these options apply to all fields and records in the table, and cannot be applied to individual columns or rows.
- Rich Text**Slightly more sophisticated formats (such as bullets and indents) for text.
- Records**.....Refresh, New (entry), Save, Delete, Total (average, count), Spelling, row and column formats.
- Sort & Filter**Sort A-Z or Z-A, Filter (temporary selections).
- Find**Find, replace, go to.

Although Access permits simple math calculation in a table, they can only be performed at the bottom of a column; when you hit the Totals button, a new row is added at the bottom of your table. Click on the bottom cell

in any field to find a dropdown with the math options, based on that field type (for example, count your text or sum your numbers). You cannot do math across columns in a table, although you can in queries, forms, and reports.

Manipulating Data

These are some common commands people frequently find themselves using in a table:

Move Column..... Shift position of columns for data entry, by dragging the name of the column and releasing where you want it positioned.

Freeze Column Lock a column on the screen (right click or Records/More/Freeze).

Hide Column..... Don't show a column (right click or Records/More/Freeze).

Sort and Quick Filter . At the end of each column heading is a dropdown arrow ▼, with quick options for sorting and filtering.

Other Ways to Create Tables

On the Create tab of the ribbon are commands to create a blank table, a table from commonly used templates (such as tables for Contacts, Tasks, Issues, Events, or Assets), a table from Microsoft SharePoint, or in Table Design. (SharePoint is a Microsoft service that you have to sign up for.)

Forms

Entering data in the datasheet view is not only boring, it can be confusing. Often your table is wider than the screen, and the constant scrolling left to right can make you lose your location in the table. An alternative for data entry is to create a form. With forms, you design the screen in a variety of arrangements with all sorts of graphical attributes to make data input more coherent. Just remember that when entering data into a form, you are actually putting it *in the table*. *If you delete a record from your form, you've deleted it from your table (and queries and reports).*

Forms can be created in several ways. First click on (select) the table or query for which you wish to make a form. Then, on the Ribbon, click the Create tab, where you will find several options for creating forms.

The first "Form" button creates an automatic generic "Stacked" form, and displays it in "Layout View." In layout view, you can adjust the width, height, and formats for the various fields, but you cannot do data entry. Switch the "View" button to "Form View" in order to type. Use your tab key to move through fields (always better and safer than clicking the mouse).

The button called "Multiple Items" under Create/Form creates a tabular form that reads across your screen instead of down (like a table). "Pivot Chart" displays your data in a chart format (no data entry allowed). "Blank Form" gives you a blank templates, to which you can add your fields. "More Forms" provides the Pivot Table, a datasheet form (just like a table), and a Form Wizard.

The Wizard walks you through designing your own custom form. It gives you "Styles" (based on Microsoft Themes) to base your form format on, along with the following layouts:

Columnar..... Displays the records in a column with the field labels next to them (most popular).

Tabular Displays record data in a row with field heading labels at the top (similar to a table view, but can be much nicer).

Datasheet..... Looks just like a table.

Justified Data are justified (spread) across the screen from left to right.

Finally, "Form Design" lets you make custom forms from scratch.

Form Design

The Form Design window provides you with a blank grid on which to layout your fields. The fields are located on the Form Design Tools/Design/Add Existing Fields button. (If your fields aren't visible in the pane that appears, use the Property Sheet to re-select your source table or query.) Drag your fields where you would like them positioned on the grid. You will actually be dragging two parts: a data entry field and a name or label, so be sure to leave room for both parts (don't get too close to either edge).

Once the fields are on the form, you can use the Design tab to format their Font characteristics, Gridlines to create lines and borders, and Controls to create useful shortcuts.

In the Controls Ribbon, you will find a series of buttons, many of which are designed for Reports, not Forms (such as page numbers and headers/footers). But there will also be useful buttons such as:

Text box..... Creates boxes for holding text such as instructions or captions.

Button Create macro-like buttons for shortcuts (such as Add New Record).

Combo/List Boxes Create lookups with drop-down choices or scroll bars.

On the Arrange tab are very useful commands for lining up your fields, instead of having to manually position them on your grid. At the end of the Arrange ribbon are buttons to show or hide the grid, the ruler, the form header/footer space, and the page header/footer space (more used in Reports).

Remember that your form data actually go into the table.

Note: Once you have created and saved a form, you can still make changes. Toggle to the Design View via the "View" button on the Ribbon.

Reports

Reports are how we print data, or analysis of data. They can be based on tables or on queries (that are, of course, based on tables), and they can be sent to the printer, to Word or Excel, or to PDF. They cannot be sent via email as they are not separate files.

Reports are located on the Create tab, and just like Forms, can be created with Auto Report, through the Report Wizard, with a blank Report, or manually through Report Design. There is an extra options for Reports called "Labels," for doing mailing labels.

Report design is based on objects, or containers of data or text or graphics. It is vital to understand sections

Report Header.....Appears at the beginning of the report.

Page HeaderAppears at the top of every page and below any report header.

Group Header.....Appears before the detail section of the first record of every group.

DetailRepeats for each record in the report.

Group Footer.....Appears after the detail section of the last record of every group.

Page FooterAppears at the bottom of every page.

Report Footer.....Appears at the end of the report.

Controls

Access offers lots of *controls*. Some work better in forms than reports. Other control types are chosen because they work better in displaying specific data. Here are the types of controls you can add to forms and reports, along with some ideas about when to use them.

Label Adds text that doesn't change from record to record. You can use labels to add fixed information such as a company or department name, or to label data.

- Text Box**..... Accepts or displays text that changes from record to record. This type of control is commonly used to display and enter data. The control displays the contents of a single field, just as you would see it in the table's datasheet; it can also create calculations.
- Option Group** Contains a group of toggle buttons, option buttons, or check boxes. Option groups hold other types of controls, such as toggle buttons or option buttons.
- Toggle Button**..... Shows a button that can look pressed or released just like the Design View and Datasheet View buttons. Toggle buttons are usually used with Yes/No type fields. Toggle buttons, option buttons, or check boxes can be used interchangeably. Use these controls to show a field's contents when there are limited possible entries.
- Option Button** Shows a round option button that can be selected. Option buttons usually show the selected entry when a limited set exists. They can also be used with Yes/No type fields.
- Check Box** Shows a square box that contains an X when selected. Check boxes frequently display the setting of a Yes/No type field. However, you can also use them in place of option buttons or toggle buttons to show the entry for a field.
- Combo Box**..... Shows a drop-down list box like the ones in dialog boxes. Forms frequently use them to give you a choice of typing an entry or selecting one from a list. They also save space because they use less space than a list box. Reports seldom use this type of control. List Box-Shows a list box with the current selection highlighted. List boxes work well in forms when a user can only select from a predefined set of choices.
- Graph**..... Shows a graph based on data from a table or query. The graph is created using the Microsoft Graph application that comes with Access. The Graph Wizard guides you through creating the graph.
- Subform/Subreport** .. Adds a control representing another form or report. This subform or subreport appears in the form or report you are designing. Use subforms and subreports to show records from a related table that are associated to the record currently displayed in the main form or report.
- Object Frame**..... Adds a control that contains an OLE object. Use this control when you paste data from another application into your form or report design.
- Bound Object Frame** . Adds a placeholder that displays the contents of OLE Object fields. Use this control to see embedded and linked pictures.
- Line** Adds a line. Use lines to divide or decorate the form or report.
- Rectangle**..... Adds a box. Add boxes to your design to visually group controls.
- Page Break** Adds a page break. Divide a form into multiple pages when you have lots of data to show or enter. Breaking it into smaller chunks makes it easier to understand. Divide reports into pages when you have more data than can fit on one page and you want to control where the page break occurs. Reports have several
- Page Break** You can place page breaks by section properties instead of with a control.
- Command Button**..... Adds a button that does something when selected, such as executing a macro or module.

Sorting and Grouping Reports

Lots of records may share common values. If you want to group those records by that common value, Group & Sort (on the Design tab) provides the solution. By sorting on a specific field and then adding group headers and footers, one can isolate and keep together groups of data. For example, if you wanted to break your customers' data down by city, group on city; you can then subgroup on customer, and even sub-subgroup on purchase or date.

Group headers and footers are also essential if you need to get subtotals or other calculations within your report. When you click the button, a pane appears that allows you to first add a group (or more than one), then add a sort.

When you add a group, a panel appears with options for group sort order, with or without totals, with group header and footer, and whether or not the group should be kept together on a page (if it doesn't all fit). You can then add another group, and then another, to create a layered report.

Remember that grouping is the command to eliminate duplicates in the printout without actually deleting them from the table.

Control Calculations across Groups

Once Group headers and footers have been put into place, calculations across the groups can be made. For instance, summing or counting values for a given group may be informative; these calculations would read:

=sum([Income])

=count([ID])

You can also place a sum function in the *report header or footer* to generate a total for the entire report.

Tip: Work with Wizards until you get really comfortable with all the "issues" of report design.

Queries

In many ways, queries are the key to Access. Queries are a way of looking at the contents of your table, but where you can specify *what information* you are trying to locate, edit, update, or print. It's important to remember that the entire time you are working with a query, you are actually still using the data in your table. (If you delete a record from your query, it is also deleted from the table.)

Queries are where databases use their own language, and you must learn the way they talk and think. Here are some types of queries you can perform.

Select Selects records based on specified criteria (such as city = Chicago).

Action/Calculation Performs a mathematical operation.

Parameter Prompts you to enter criteria.

CrossTab Groups data in categories, displaying values in a spreadsheet format, with summary data (sum, average, count).

Total Groups information by a specified field, then totals or counts, by grouped field.

Make-Table Creates a new table with the data resulting from the query.

Append Adds records that meet specific criteria to another table.

Update Use this to make big sweeping changes in an existing table (i.e. increase the value of all the numbers in a field by 25%).

Delete Deletes records from a table or tables that meet specific criteria.

Relational Multiple queries, tied together on the basis of a shared (primary key) field.

To create a query, select the Create tab on the Ribbon, then choose Query Design. This will prompt you to select the table(s) or query(ies) upon which you are basing the new query. You are then thrown into Query Design mode.

The Design mode has two parts. In the blank area above, you should see the table or query with its list of field names in a box. This is called the "Tables Area." In the bottom part of the screen is the "Query Design Grid," where you add your field names, see the source name, specify which fields to sort by, specify whether or not a field should show in the results, and set the criteria.

First, you must tell Access which fields you want to see. Select a field in the Fields List Box, then either drag that field to the appropriate column in the grid, or double-click —it will go down automatically to the next available column.

If you want all the fields to display in the dynaset, double-click the star (*) at the top of the Field List box.

Field:	Field Name ▼	Next Field
Table:	Table Name	
Sort:	Ascending/Descending	
Show:	<input type="checkbox"/>	
Criteria:		
Or:		

Field Where to display the field.

Table Name of the source table or query.

Sort Select Ascending or Descending order.

Show Select the box to show the field, if deselected, that field won't display.

Criteria Where you make your argument.

Or Where you make a second argument (or third or fourth!). Action Queries.

Datasheets vs. Dynasets

When you open a table, you are looking at what is called the “Datasheet View.” But running a query presents what’s called a “Dynaset”. For all intents and purposes, they look and act alike. However, a dynaset contains *no* information—it is only a way of viewing a limited set of what’s in your table. Thus, if you delete someone from a query, they are also deleted from the table; if you add someone to a query, you have also added them to the table. But both tables and queries look alike. As you’ll soon see, an important consequence of this is that queries can be based on queries.

This is a datasheet that reflects the table “Everyone I Know”:

ID	First	Last	Status	Address	City	State	Zip	Gender	Date of Birth	Alive	Income
1	Fritz	Huegger	foe	37River Street	Baltimore	MA	55545	female	5/15/37	Yes	\$18,750.00
2	Jane	Doe	Family	111 S. State	Baltimore	MA	55545	female	4/19/67	Yes	\$31,250.00
3	Cynthia	Perry	Friend	76 Joe	Chicago	IL	60455	female	9/15/58	Yes	\$50,000.00
4	Karen	Fortune	Friend	56 Circle	Flossmoor	IL	60555	male	8/15/85	No	\$75,000.00
5	James	Nichols	foe	13 Avery	Hazelcrest	IL	60888	male	5/5/57	Yes	\$25,000.00
6	Denise	Brown	Family	145 Green	Detroit	MI	87871	female	5/4/53	Yes	\$41,875.00
7	Glenn	Cutts	Friend	56 Sangamon	Los Angeles	CA	45451	female	4/1/57	No	\$50,000.00
8	Benetta	Thomas	foe	25 Troy Street	Detroit	MI	87871	male	7/15/59	Yes	\$75,000.00
9	felix	adams	foe	1500 main street	Minn	MD	20401	male	8/19/67	Yes	\$47,500.00
10	mary	fortune	Friend	3400 N. Hampton Ct	Atlanta	GA	34522	male	1/15/98	No	\$45,666.00
11	Jack	Ripper	foe	1243 Lincoln Ln.	London	OH	66666	male	10/13/59	No	\$39,000.00
12	Ane	Smith	Friend	1414 E. 22nd	Cleveland	OH	60612	female	12/12/81	No	\$52,000.00

You may create a query that displays only those people from Illinois — this is a dynaset:

ID	First	Last	Status	Address	City	State	Zip	Gender	Date of Birth	Alive	Income
3	Cynthia	Perry	Friend	76 Joe	Chicago	IL	60455	female	9/15/58	Yes	\$50,000.00

4	Karen	Fortune	Friend	56 Circle	Flossmoor	IL	60555	male	8/15/85	No	\$75,000.00
5	James	Nichols	foe	13 Avery	Hazelcrest	IL	60888	male	5/5/57	Yes	\$25,000.00

A query can be based on the above query. Of those people from Illinois, show only friends, and display only the first, last, status, city, and gender fields:

First	Last	Status	City	Gender
Cynthia	Perry	Friend	Chicago	female
Karen	Fortune	Friend	Flossmoor	Male

Operators and Wildcards:

Wildcard Characters

?	Any single character	Sm?th	matches Smith, Smyth, Smoth, etc.
*	Any characters	S*	matches Smith, Sampson, Sorenson, etc
#	Any numeric digit	5##	matches 500 to 599
[]	Any characters in bracket	Sm[iy]th	matches Smith or Smyth, but not Smoth
-	Any characters within the range (must be in brackets)	J[N-Z]nes	matches Jones but not Janes
!	Any characters except (must be in brackets)	[!N-Z]	Excludes Jones but not Janes

Operators

=	Equals	=50	must be 50
>	Greater than	>3000	Must be greater than 3000
<	Less than	<50	Must be less than 50
>=	Greater than or equal to	>=30	Any number 30 or larger
<=	Less than or equal to	<=500	Any number 500 or smaller
<>	Not equal to	<>CA	Does not equal CA
Between	Between two values	Between 30 and 50	Any number from 30 to 50

Comparison Operators

In	Within a set or list of values	In(NY FL OR)	New York, Florida or Oregon
Is Null	Field is empty	Is Null	Records that have no value in that field
Is Not Null	Field isn't empty	Is Not Null	Records that contain <i>something</i> in that field
Like	Matches a Pattern	Like M-*	Missourri, Mississippi, Montana, etc

Logical Operators

And	Both must be true	>5 and <10	Any number 6 through 9
Or	At least one must be true	IL or FL	Either Illinois <i>or</i> Florida (both)
Not	Can't be true	Not >50	Can't be greater than 50

Working with Criteria

Queries provide the key to manipulating existing data in Access. They allow one to view only those records that meet specific criteria; to display only those fields that are necessary to view, to analyze groups of records, to show only particular information.

Queries are used to specify "criteria" for what you are looking for. Typical queries look something like this:

"Chicago"	[find everyone in Chicago]
*m	[anything that begins with m]

m*	[anything that ends with m]
>10/31/08	[find dates after October 31, 2008]
>500	[find amounts larger than 500, but not 500]
>=500 and <=750	[find amounts between 500 and 750, inclusive]

Multiple criteria written on the same line are considered “and” queries (the results must meet both conditions); criteria written on separate lines are “or” queries (results must meet one or the other). Once you have written your criteria, use the red exclamation mark [!] to run the query and view the results, or “dynasets.”

Calculated Fields

What if taxes were 17% of income? It might be helpful to have a field that displays the amount of taxes paid per person, as well as the net income. Often called “Calculated Fields,” action queries allow you perform calculations on the data in your records, then display the results in new fields created for that dynaset. A calculated field would look like this:

$$\text{Tax: [Quantity]*[Price]*(1+[Tax Rate])}$$

where Tax is the new Action Query Field Name, and “Quantity”, “Price” and “Tax Rate” are numeric fields in the record. Note that field names must be between brackets ([]), and the Action Query Field Name must be followed by a colon (:).

Calculated fields calculate and display results that are based on values in existing fields.

First	Last	Date of Birth	Age	Income	tax amt	net income
Fritz	Huegger	5/15/37	61	\$18,750.00	\$4,125.00	\$14,625.00
Jane	Doe	4/19/67	31	\$31,250.00	\$6,875.00	\$24,375.00
Cynthia	Perry	9/15/58	40	\$50,000.00	\$11,000.00	\$39,000.00
Karen	Fortune	8/15/85	13	\$75,000.00	\$16,500.00	\$58,500.00
James	Nichols	5/5/57	41	\$25,000.00	\$5,500.00	\$19,500.00
Denise	Brown	5/4/53	45	\$41,875.00	\$9,212.50	\$32,662.50
Glenn	Cutts	4/1/57	41	\$50,000.00	\$11,000.00	\$39,000.00
Benetta	Thomas	7/15/59	39	\$75,000.00	\$16,500.00	\$58,500.00
felix	Adams	8/19/67	31	\$47,500.00	\$10,450.00	\$37,050.00
mary	Fortune	1/15/98	0	\$45,666.00	\$10,046.52	\$35,619.48
Jack	Ripper	10/13/59	39	\$39,000.00	\$8,580.00	\$30,420.00
Pete	Smith	12/12/81	16	\$52,000.00	\$11,440.00	\$40,560.00
				\$0.00	\$0.00	\$0.00

This is how the calculated fields would appear in the query’s design view:

Field:	Age: Date() - [DOB]	tax amt: [Income]*.17	Net: [Income] - [tax amt]	
Table:				
Sort:				
Show:				
Criteria:				
Or:				

Here are some rules required to create calculated fields:

- The calculated field’s name must be followed by a colon (also, no periods in the calculated field’s name).
- The field names within the formula or “expression” must sit between square brackets [], and the field names must be perfectly spelled.

Properties

Properties define and modify how things look and work. Fields in the Table Design view have them. Output fields in Query Design have them, and all objects in Forms and Reports have them. They are found on the Property Sheet at the end of the Design ribbon.

Imagine creating a calculated field where the price of a product is multiplied by a fixed tax rate (let's say 6.75%). Calculated fields are perfect for displaying the tax amount and the new total.

Price	Tax Amount: [Price]*.0675	Total: [Price]+[Tax Amount]
\$100.00	6.75	106.75
\$42.50	2.86875	45.36875

But shouldn't the Tax Amount and Total fields reflect a currency value? Properties such as Format allow you to change the look of fields. In this case, the Format should indicate "Currency."

Concatenation

To concatenate is to join field values. Rather than two columns reflecting first and last names, concatenation can join the two field values together with a space between them:

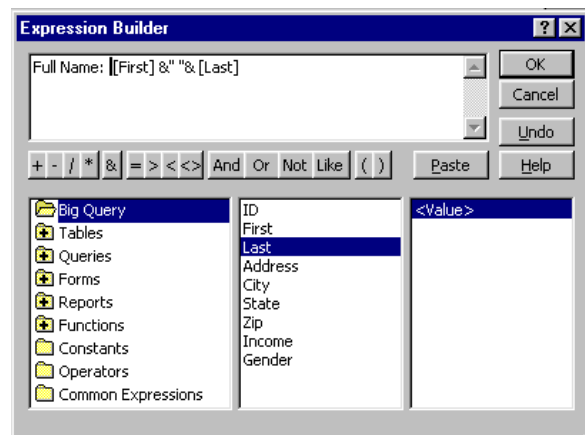
First	Last	Full Name:[First]&" "&[Last]
Jane	Doe	Jane Doe
Cynthia	Perry	Cynthia Perry
Karen	Fortune	Karen Fortune

Note that three things are being concatenated – the first name value, the last name value, and the space. And also remember that field values must be contained within square brackets, the join operator is an ampersand (&), and that a space is a character, and that all characters must be contained within quotation marks (" ").

The Expression Builder

Like so many tools in Access, the Expression Builder is a utility that can be used in queries, reports, or forms. At the top of the window is an area to type and view the calculated expression. The bottom contains three list boxes that can be used to find fields and function names needed to build the expressions.

Probably the most-used feature of the Expression Builder is the Functions. The + at the front indicates you need to double-click the folder, where you will find (in the second column) a category called "Built-In Functions." If you select that you will get a list of all functions that operate in Access (much like the list in Excel).



Top Value Queries

What if you want to see only the top 3 income earners? Top Value Queries can show these records, but there are two important steps to make this query work.

Sort the records by the "Income" field in descending order (the purpose of this is to get the top earners physically to the top of the dynaset. Click the "Top Values" button on the Ribbon (the default reads "All"). Select or type the number of records you want to see or the percentage of records to be displayed.

It is important to understand in Top Value Queries that the top values are those records that are physically skimmed off the top of the dynaset. That's why sorting is so important; it puts the records in the correct order.

Grouping & Analysis Queries

How many males and females are in your table?

Gender	CountOfGender
female	5
Male	6

How many people live in each state, and what is their average income?

State	CountOfState	AvgOfIncome
CA	1	\$50,000.00
GA	1	\$45,666.00
IL	3	\$50,000.00
MA	2	\$25,000.00
MD	1	\$47,500.00
MI	2	\$58,437.50
OH	2	\$45,500.00

Grouping or Analysis queries can provide these answers by looking at groups of records, then analyzing those groups. This query does not look at individual records, but rather groups of unique values. To create a group query:

- Display only the field on which you are grouping – In this case, “State.” Then run it. Each record’s state value is displayed. Lots of repeated values.
- Back in the Design view, Click the “Totals” button (Σ). A new row is added to the Criteria Grid that displays “Group By” beneath the field name. Run the query. Now each unique state value is listed only once.
- Again in Design View, bring down “State” again, but replace “Group By” with “Count”. Then run it and notice that the new field displays the number of times each state is listed.
- Return to Design View, and bring down “Income”, but this time in the grouping row, replace “Group By” with “Average”.

Do not display fields that are not essential for your analysis or criteria.

Parameters

Parameters allow you to type in the criteria each time that query is run. For instance, a dialog box will prompt you to type in the state abbreviation to find those matching records.

Parameters must be placed within square brackets and entered in the criteria row (not the field):

Field:	Everyone I Know.*	State
Table:	Everyone I Know	Everyone I Know
Sort:		
Show:		
Criteria:		[Type in State Abbreviation]
Or:		

Each time the query is run, a parameter dialog box will display the text within the square brackets (above) will appear.

Advanced Queries

There are several query types that are not select or action queries. They are much more specialized in their usefulness;

CrossTab Groups data in categories, displaying values in a spreadsheet format, with summary data (sum, average, count). To understand CrossTab Queries, you must first understand the concepts behind Grouping & Analysis Queries (there is also a CrossTab query wizard).

Make-Table Creates a new table with the data resulting from the query, so that it can be edited without changing the contents of the original table.

Append Adds records that meet specific criteria from one query to another table.

Update Makes big sweeping changes in an existing table (i.e., increase the value of all the numbers in a field by 25%).

Delete Deletes records that meet specific criteria from a table or tables.

Relationships

What makes Access so very popular is its ability to set up links across tables so they can share information. You do not have to use relationships in Access. You might want to set up one table to hold *all* your data; this is called a “flat-file” database. However, watch for fields in which you have to re-enter the same data time and again. If you find yourself repeatedly typing the same information, you should re-design your table using linked relations. Any information that is repeated (such as a person’s name and address) should be entered *one time* in a table, then *linked* to other tables that can then look up the appropriate data.

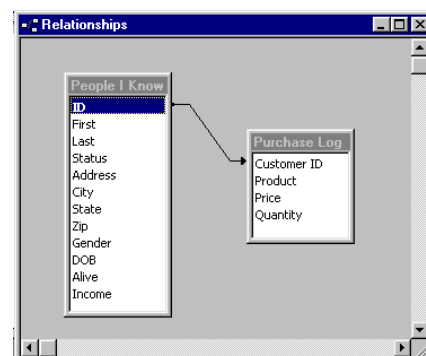
The primary purpose for relationships is to eliminate redundant data by putting the data into separate tables. The most important table is the *Primary* table. The other *related* table(s) can be associated with the Primary Table. With related tables, *there must be at least one common field for both tables*; this is the field on which the link or relationship is based—*through a query* (not a form or report). In addition, this common field *must be primary* in one of the tables (usually in the primary or controlling table) to control the links. (There might be times when you want the linking field to be the primary key in *both* tables, but remember that primary keys cannot have duplicates, so you would only be able to enter data once for each unique entry. This establishes what is called a one-to-one relationship, as opposed to most relational queries, which are one to many.)

Creating Relationships

To create a permanent link, select Database Tools on the Ribbon, then choose Relationships. Add the tables that are to be linked or joined. Their field lists will appear in the Relationships Area. Then click and drag the field name from the primary table (the field in bold) onto the corresponding fieldname in the related table. Turn on “relational integrity” if you want to enforce rules of consistency.

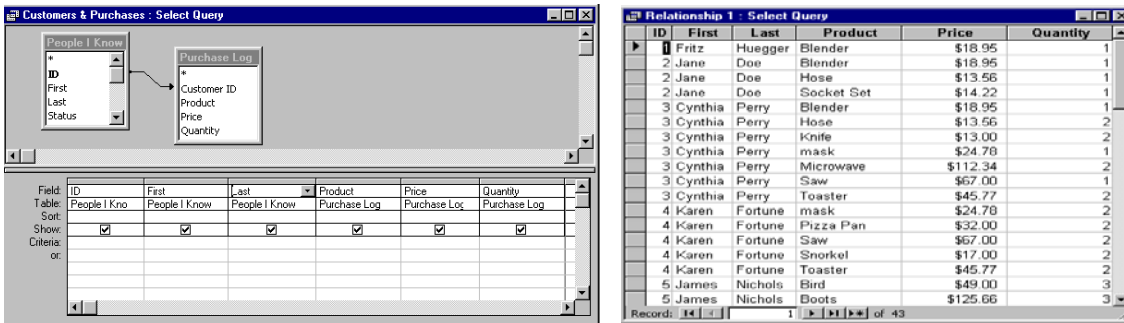
Join Types

Access will then create a “join” across the tables. If you link primary key to primary key, Access will create a “**One to One**” or Equi-Join. This is used primarily for eliminating duplicate values. If you link a primary key to the same field that is nonprimary, you will have a “**One to Many**” join (indicated by a small 1 and infinity ∞ symbol). This is the most common type of relationship, where each record on the Primary table can correspond to several on the Related Table. Each person (primary) can relate to several purchases, but each purchase can only relate to one customer.



Working with Related Tables

Once you have established the relationship, create a query. Instead of adding one table, add two (or more). You should see the join line connecting the two tables. Then add all fields you wish to use in your query; you usually *do not* want to add the primary key field (the controlling link field) since it is a unique value —each person could show only one purchase. You probably *do* want to add the link-field from the secondary table. Then, the query will output the data from the multiple tables:



With the combined data from both tables, all the purchases from one table can be related to people in the primary table. Using grouping queries, you can count all the purchases each person has made, sum them, average them, etc. You can also use other query types to search the related query to generate new tables, create calculations, set criteria, and all other query functions. You can also now do data entry through your linked query; as you type in the field on which the link is based, you will see Access fill in all related information.

Once you have your tables linked in a relational query, remember that you can create forms for easy data entry, generate subqueries on the linking query, and report all the above!

The Navigation Pane

Once you have created the components of your database, it sometimes becomes confusing to keep track of what goes where. In Access, the navigation pane on the left of the screen has multiple ways of presenting your database parts. The default or built-in setting is called “Tables and Related Views.” This means that different tables show in different sections, with their related queries, forms, and reports. This sometimes is confusing, because if you have a query that is relational, it will show up twice for both tables (and the same with forms and reports).

An alternative view is to show “Object Type.” This puts your tables into a Tables section, queries into a Queries section, forms into a Forms section, and reports into a Reports section. If you have used older versions of Access, this is the view you’ll be accustomed to.

You can switch these views at any point, as you work. There are also functions to show by creation or modify date or by object type (just show forms, or just show queries).

Experiment to find the one that makes sense for you!