Peace Corps Uganda
Access Fundamentals

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Database Concepts

A database is a collection of information that's related to a particular subject or purpose, such as tracking donations or maintaining contact information. A database provides a single repository (storage space) for your data, the queries that find the exact information you want & the reports that analyze & print your data, the forms you'll use to view, add or update your data, as well as data access pages that can view, update or analyze your database from the Web.

Using a database, we store data once in one place, but view it from multiple locations. When you update the data, it's automatically updated everywhere it appears. Data is stored in a table, based on its type. You bring data from multiple tables together in queries, forms, reports or data access pages by defining the relationships between the various types of data.

For example, we might have a table of contact information for organizations & individuals, a table of donations we've received from those contacts & a table of grants for projects we're responsible for & need to report on. A particular contact organization may have awarded us a grant & also an in-kind donation that's not part of a specific grant (such as computers or vehicles).

A unique identifier, such as a contact ID, distinguishes one record from another within a table. By adding one table's unique ID field to another table and defining a relationship, Access can match related records from both tables so that you can bring them together in a form, report, or query. Our table of grants would have an associated contact ID which links that organization's contact information with the grant.

Finding & retrieving data that meets your specific conditions involves defining a query. Queries can join information across multiple tables. A query can also update or delete multiple records at the same time, and perform pre-defined or custom calculations on your data.

Forms are used to view, enter, and change data directly in a table. When you open a form, Access retrieves the data from its respective tables, and displays it on the screen with the layout you chose in the Form Wizard, or with the layout that you've created on your own in Design view.

While a table displays many records at the same time, you might have to scroll to see all of the data in a single record when you open it in Table view. Also, when viewing a table, you can't update any of its related data stored on other tables. You can update only one table at a time. A form focuses on one record at a time, and it can display fields from more than one table, as well as pictures and other objects. Forms contain buttons that print, open other objects, or otherwise automate tasks.

Reports are created to analyze your data or present it a certain way in printed form. For example, you might print one report that groups data and calculates totals, and another report with contact information formatted for printing mailing labels.

Data Access pages make data available on the Internet for interactive reporting, data entry, or data analysis, retrieving the data from its tables and displaying it on the screen. Record navigation toolbars sort & filter records, as well as providing online help.

Relational Databases

Relational database structures, such as Access, use a language called SQL (Structured Query Language) to retrieve, display & update the database records. SQL is a programming language used by many different relational databases. Relational databases also share several other features in common. They organize data by relationships, rather than by hierarchy. In other words, every column in a relational database can have a variety of relationships with any other column: one-to-one, one-to-many, many-to-many or many-to-one. All of the information related to a particular entity is stored in the same table. The rules for validation of each piece of information are encoded within that element of data. All of the relationships that an entity can be involved in have definitions within the database.

Database Design

A well-designed database is easy to maintain because its data is stored in only one place. When the value of that data changes, it only needs to be updated in one place.

Determining your Database's Purpose

The first step in designing a database is to determine its purpose and how it will be used. By brainstorming with the different groups of people who will use the database you can document the questions they want the database to answer. Part of this process involves sketching out reports they want the database to produce & gathering any forms they currently use to record their data. A list of information they want from the database will begin to emerge. From that, determine what facts need to be stored & what subject each fact belongs to. These facts correspond to the columns in your database, and the subjects that those facts belong to correspond to the tables.

Each column is a fact about a particular subject. For example, you might need to store the following facts about your contacts:

- type of contact,
- full name,
- organization name,
- job title,
- postal address, including city, state, country & postal code,
- phone numbers,
- e-mail IDs,
- preferred contact method,

- initial set-up date &
- last updated date.

Each fact has a separate column on the contacts table. When defining the columns, there are several important design principles.

1. Take the time to include all of the information you will need.
   Although you can add columns to your tables at any time, records you've already added won't contain values in these new columns. This can skew your data analysis & reporting.

2. Store information in the smallest logical parts.

   For example, names are often split into two columns, FirstName and LastName, so that it's easy to sort data by LastName & to use the FirstName only in a greeting on a mailing.

3. Don't create columns for data that consists of lists of multiple items.

   For example, don't include donation amounts in a contact table. Instead, set up a separate table for donations, with a link to the contact ID. Columns in this table would include donation date, type (funds or in-kind), valued amount, description & designated purpose.

4. Don't include derived or calculated data (data that's the result of an expression).

   For example, don't define a column for a contact's total donation amount. Instead allow a query to sum up all of the donation records associated with a particular donor.

5. Don't create fields that are similar to each other. Instead, create a separate table for that information, with links to your original table.

   For example, your contacts may make several donations over a period of time, or a donation of different types – cash, in-kind or a pledge of ongoing support. Rather than trying to define space for each of these donation events on your Contacts table, donation information can go on a separate Donations table, containing type of donation (e.g. cash, in-kind, pledge), date, amount, description & designation (e.g. OVCs, HBC, VCT, Sustainable Livelihood projects, etc.), with a link to the donor's contact ID. This way you can record one or many donations from each of your contacts.

Organizing Information into Tables

Each table should contain information about one subject. The list of columns will provide clues to the tables you need. For example, if you have a GrantAwardDate column, its subject is a grant, so it belongs in the grants table. You might also have a table for contacts, a table for donations, and tables for countries & states.

When deciding which table each column belongs to, keep these design principles in mind:

1. Add each field to only one table.
2. Don't add a column to a table if it will result in the same information appearing in multiple records in that table. If you determine that a column in a table will contain a lot of duplicate information, that column is probably in the wrong table.

If you put the column containing the address of a contact in the donations table, that information will probably be repeated in more than one record, because the contact will likely make more than one donation. However, if you put the address field in the contacts table, it will appear only once. In this respect, a table in an Access database differs from a table in a flat file, such as an Excel spreadsheet. When each piece of information is stored only once, you eliminate the possibility of duplicate entries that might eventually contain different information.

Creating Keys for Retrieval

In order for Access to connect information stored in separate tables (for example, to connect a contact with all the contact's donations) each table in the database must include a column or set of columns that uniquely identifies each individual record in the table. This is called a primary key.

Defining Relationships between Tables

Once information is split into tables and primary key fields are identified, Access needs to know how to bring related information back together again in meaningful ways. To do this requires defining relationships between tables.

If you have a table where a single field connects to one or more records on another table, your tables have a one-to-many relationship. An example might be a contacts table, which includes a record for each external contact your organization has. As these contacts become donors, a record of their donation is added to the donations table. There's a one-to-many relationship between each contact & their donation records. Relational databases use the infinity symbol (∞) to represent many.

Other examples of one-to-many relationships include tables you might define in order to help users populate fields with valid data. You might define a table containing countries, to be used in addresses, or even a table of US & Canadian state codes. In these cases, your country & state records will have a one-to-many relationship with your contacts table, where address information is stored. The contacts table, on the other hand, has a many-to-one relationship with the countries & states tables.

Sometimes you may encounter a many-to-many data relationship. For example, if you maintain a table containing information about the projects that your organization has received grants for, you might encounter projects which are funded by multiple organizations, as well as organizations which fund multiple projects. To establish a many-to-many relationship requires defining a connecting table that links, or joins, the projects & the organizations tables. The only information on this intermediate table will be the IDs (or keys) of the unique organization & unique project.

Testing & Refining the Design

After the tables, columns and relationships are established, it's time to study the design and detect any flaws that might remain. It's far easier to change your database design before the tables are filled with data.

Use Access to create the tables, specify relationships between the tables, and enter enough sample data to test the design. To test the relationships in your database, see if you can create queries to get the expected results. Create rough drafts of your forms and reports and see if they show the expected data. Eliminate unnecessary duplications of data. Access has 2 tools to help in refining database design.

1. The Table Analyzer analyzes the design of one table at a time, proposes new table structures and relationships if appropriate, and divides a table into new related tables if that makes sense.
2. The Performance Analyzer analyzes your entire database and makes recommendations for improving it. The wizard implements these suggestions.

Establishing Data & Creating Other Database Objects

When the table structures meet these design principles, then it's time to add all your existing data to the tables & create other database objects, such as queries, forms, reports, data access pages, macros, and modules.

Database Performance

Several factors can dramatically affect the running of queries & reports.

Choosing appropriate data types for columns saves space in the database and improves join operations. When defining a column, choose the smallest data type or field size that's appropriate for the data in the field.

Create indexes for fields you sort, join, or set criteria for. You can improve the speed of queries by indexing fields on both sides of joins, or by creating a relationship between those fields and indexing any field used to set criteria for the query. Finding records through the Find dialog box is also much faster when searching an indexed field.

Indexes aren't appropriate in all cases, however. Indexes add to the size of the database, reduce concurrency (the ability of more than one user to modify a page at the same time) in multi-user applications, and decrease performance when you update data in columns that are indexed or when you add or delete records. Experiment to determine which columns should be indexed, as adding an index may speed up a query by one second, but slow down adding a row of data by two seconds and cause locking problems. Regardless of the types of queries, only index columns that have mostly unique values & in a multi-column index, use only as many columns in the index as absolutely necessary.

Saving an Access database as an MDE file compiles all modules, removes all editable source code, and compacts the destination database. Code will continue to run, but it cannot be viewed or edited. This helps protect your forms and reports without requiring users to log on or requiring you to create and manage the user accounts and permissions that are needed for user-level security. The database will continue to function normally – data can still be updated & reports run. The size of the database will be reduced due to the removal of the code, so memory usage is optimized, which will improve performance.

Saving a database as an MDE file prevents the following actions:

1. Viewing, modifying, or creating forms, reports or modules in Design view.
2. Adding, deleting, or changing references to object libraries or databases.
3. Changing code— an MDE file contains no source code.
4. Importing or exporting forms, reports, or modules; however, tables, queries, data access pages, and macros can be imported from or exported to non-MDE databases.

Database Objects

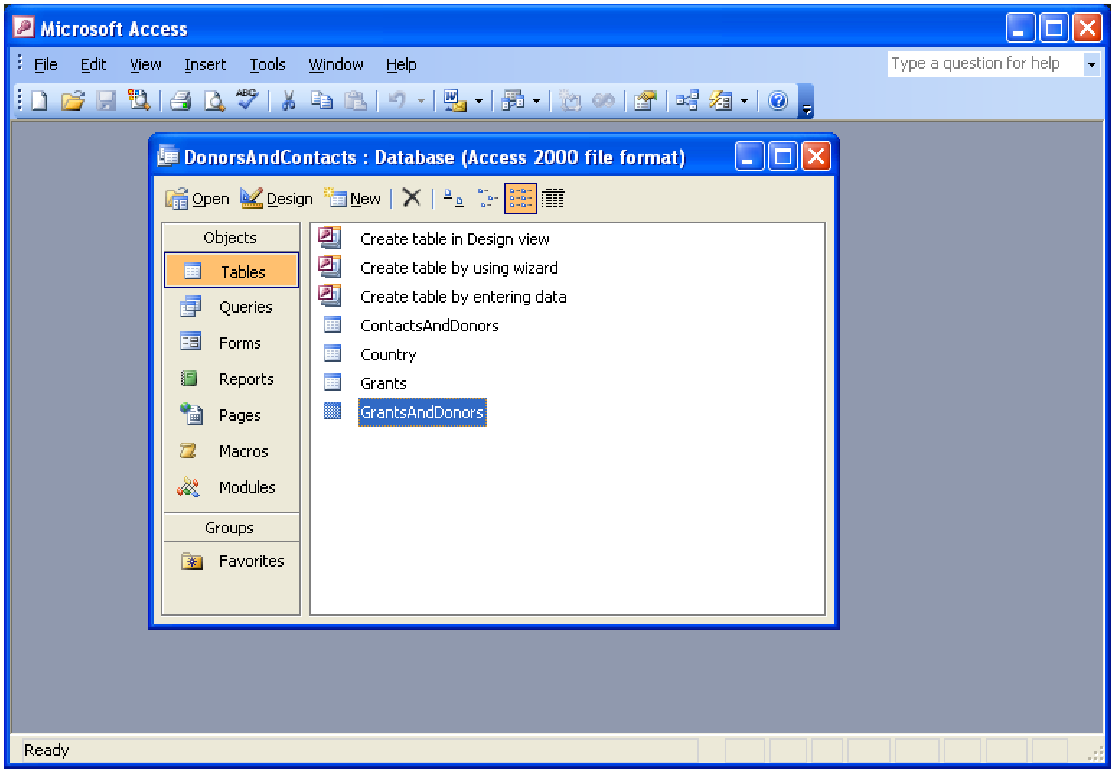


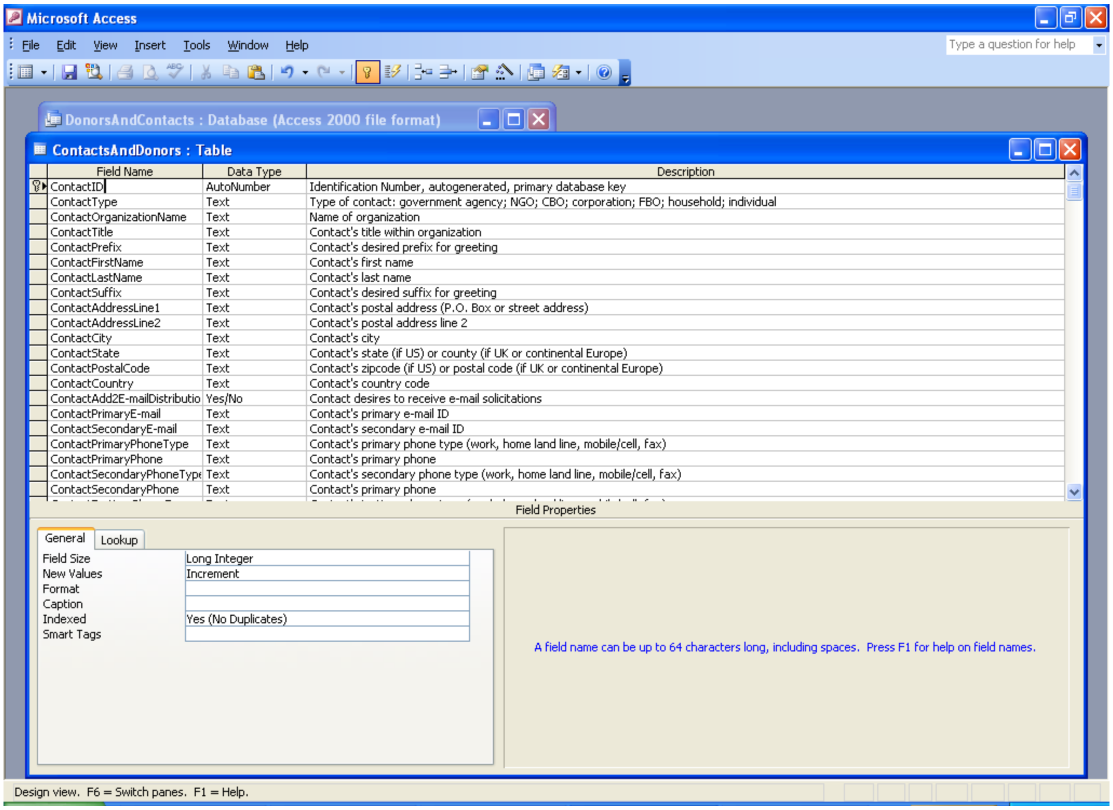
Figure 1: Access Main View

Tables

Tables organize data into columns (sometimes called fields) and rows (also called records). For example, each column in a Donations table contains the same type of information for every donation, such as the donation amount. Each record in that table contains all the information about one donation, such as the donation date, amount, description, type, designation, contact ID number, and so on.

In Table Design view, you can create an entire table from scratch, or add, delete, or customize the fields in an existing table. To track additional data in a table, simply add more columns. If an existing column name isn't descriptive enough, you can rename it. Setting a column's data type defines what kind of values you can enter in a column. For example, if you want to store numerical values that you can use in calculations, set its data type to Number or Currency.

You use a unique tag, called a primary key, to identify each record in your table. A table's primary key is a column used to refer to related records in other tables. Field properties are a set of characteristics that provide additional control over how the data in a column is stored, entered, or displayed. Which properties are available depends on a column's data type.



Microsoft Access
File Edit View Insert Tools Window Help
Type a question for help
DonorsAndContacts : Database (Access 2000 file format)
ContactsAndDonors : Table

Field Name	Data Type	Description
ContactID	AutoNumber	Identification Number, autogenerated, primary database key
ContactType	Text	Type of contact: government agency; NGO; CBO; corporation; FBO; household; individual
ContactOrganizationName	Text	Name of organization
ContactTitle	Text	Contact's title within organization
ContactPrefix	Text	Contact's desired prefix for greeting
ContactFirstName	Text	Contact's first name
ContactLastName	Text	Contact's last name
ContactSuffix	Text	Contact's desired suffix for greeting
ContactAddressLine1	Text	Contact's postal address (P.O. Box or street address)
ContactAddressLine2	Text	Contact's postal address line 2
ContactCity	Text	Contact's city
ContactState	Text	Contact's state (if US) or county (if UK or continental Europe)
ContactPostalCode	Text	Contact's zipcode (if US) or postal code (if UK or continental Europe)
ContactCountry	Text	Contact's country code
ContactAdd2E-mailDistributio	Yes/No	Contact desires to receive e-mail solicitations
ContactPrimaryE-mail	Text	Contact's primary e-mail ID
ContactSecondaryE-mail	Text	Contact's secondary e-mail ID
ContactPrimaryPhoneType	Text	Contact's primary phone type (work, home land line, mobile/cell, fax)
ContactPrimaryPhone	Text	Contact's primary phone
ContactSecondaryPhoneTyp	Text	Contact's secondary phone type (work, home land line, mobile/cell, fax)
ContactSecondaryPhone	Text	Contact's primary phone

Field Properties

Field Size	Long Integer
New Values	Increment
Format	
Caption	
Indexed	Yes (No Duplicates)
Smart Tags	

A field name can be up to 64 characters long, including spaces. Press F1 for help on field names.

Design view. F6 = Switch panes. F1 = Help.

Figure 2: Table Design View

Table Relationships

A common column relates two tables so that Access can join the data from those tables for viewing, editing, or printing. In one table, the column is a primary key that you set in Table Design view. That same column also exists in the related table as a foreign key.

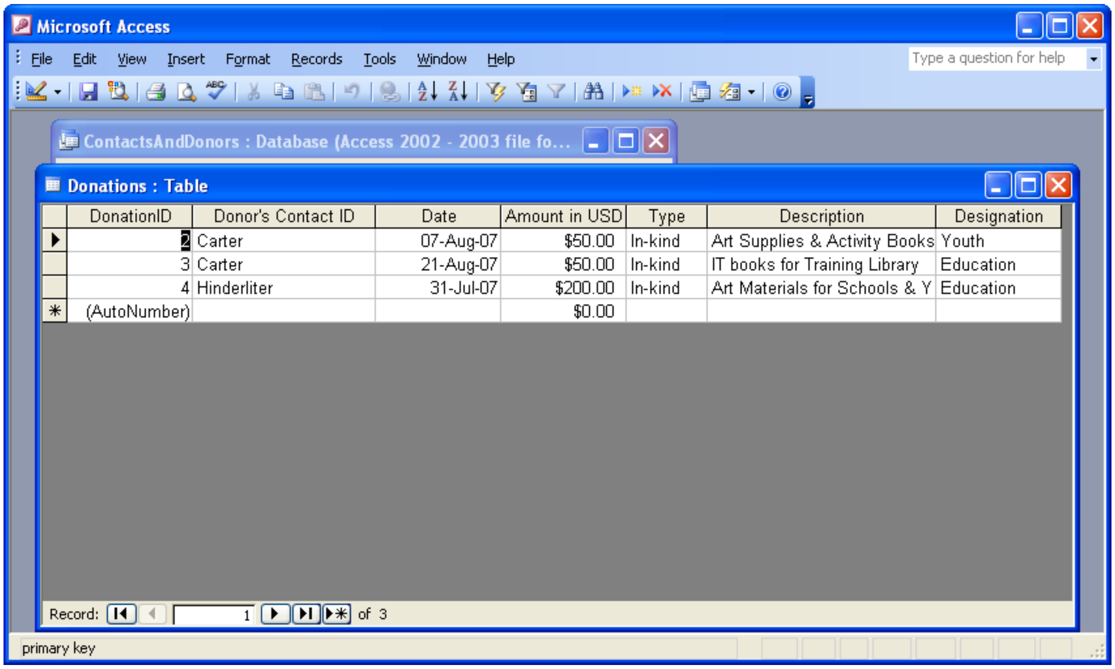
For example, in creating the Contacts table, define a contact ID along with contact name, address, and so on. Select this column (named ContactID) as the Contacts table's primary key. As you enter a record for each contact or donor, a unique ContactID value is assigned to it. In creating the Donations table, you'll create a similar field, DonationID. But you also include the ContactID column, along with the other donation information (e.g., donation date, amount, type description & designation) in the table definition. Select DonationID as the primary key for the Donations table & ContactID as its foreign key. Then, when you enter a new donation record, you can identify the donor by selecting its related ContactID.

When working with the ContactID from the Contacts table, refer to it as Contacts.ContactID. Refer to the ContactID in the Donations table as Donations.ContactID.

In this database, a table of states includes the 2-charater American & Canadian state codes (e.g. CA, DC, NY, etc.), along with each state's name & the postal code range encompassed by the state, while a table of countries includes the 2-character ISO 3166 country code (e.g. US, UK, UG, etc.), along with each country's name, their telephone code & postal rate group. Since these codes are stored in tables (named the State Table & the Country Table, respectively), their values can be restricted to those locations we wish to maintain postal relationships with. If new states or countries need to be added, anyone can open the State Form or the Country Form to update those tables.

Table Datasheet View

Datasheet View is a window that displays data from a table, form, query, view, or stored procedure in a row-and-column format. In Datasheet view, you can edit fields, add and delete data, and search for data. In a table or query, Datasheet view provides the tools you need to work with data on ToolBars.



	DonationID	Donor's Contact ID	Date	Amount in USD	Type	Description	Designation
▶	2	Carter	07-Aug-07	$50.00	In-kind	Art Supplies & Activity Books	Youth
	3	Carter	21-Aug-07	$50.00	In-kind	IT books for Training Library	Education
	4	Hinderliter	31-Jul-07	$200.00	In-kind	Art Materials for Schools & Y	Education
*	(AutoNumber)			$0.00			

Figure 3: Table Datasheet View

On the ToolBar you'll find buttons to

- Print or preview data.
- Check spelling.
- Cut, copy, or paste selected text, fields, whole records, or the entire datasheet.
- Sort records.
- Filter records, and find or replace values.
- Add or delete records.
- Work with columns, rows, and sub-datasheets

You can also find special tools for working with columns, rows, and sub-datasheets in the datasheet itself, or by right-clicking a column selector.

The values displayed in datasheet view are translated from those actually stored on the database. For example, in this table the ContactID column contains the ID associated with the contact name, but the query that populates that value in the selection list shows contact names, as they're more recognizable. Forms will also display translated values, as they're meant to assist in data entry.

Reports

Reports present your data in a printed format. Because you have control over the size and appearance of everything on a report, you can display the information in the way that you want to see it. You have a variety of layout options for your reports, including mailing label creation. Reports can include detailed information from one or more of the tables in your database. Reports can also group or summarize your information. They can be created either from tables or queries.

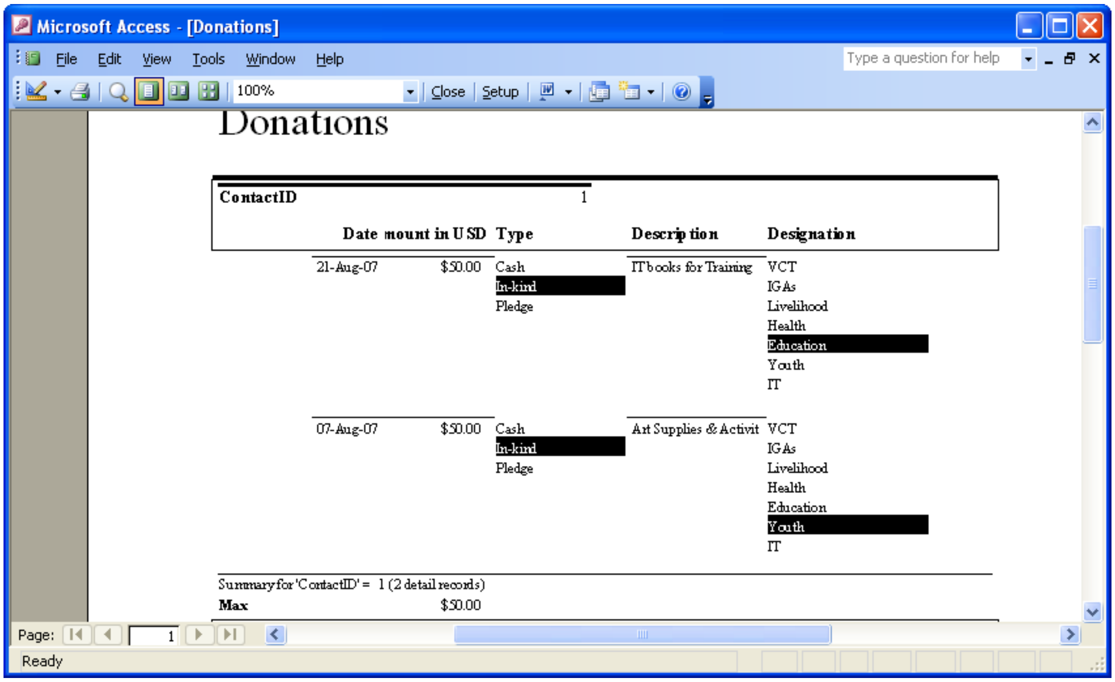
Most reports are bound to one or more table and query in the database. A report's record source refers to the columns in the underlying tables and queries. A report need not contain all the columns from each of the tables or queries that it is based on. A bound report gets its data from its underlying record source. Other information on the form, such as the title, date, and page number, is stored in the report's design.

Create the link between a report and its record source by using graphical objects called controls. Controls can be text boxes that display names and numbers, labels that display titles, or decorative lines that graphically organize the data and make the report more attractive.

There are a variety of wizards available to create different types of report layouts. Use the Label Wizard to create mailing labels, the Chart Wizard to create charts, or the Report Wizard to create a standard report. The wizard asks you questions and creates a report based on your answers. You can then customize the report the way you want it in Design view.

Customize a report by:

- Changing the tables and queries that it's based on
- Sorting data in ascending or descending order, or grouping records on one or more fields, and displaying subtotals and grand totals
- Adding or removing Maximize and Minimize buttons, changing the title bar text or other Report window elements.
- Adding, removing, hiding, or re-sizing the header, footer, and details sections of a report, or setting section properties to control its appearance and printing
- Moving, re-sizing, or setting the font properties of a control, or adding controls to display calculated values, totals, current date and time, and other useful information


Microsoft Access - [Donations]
File Edit View Tools Window Help
Type a question for help
100%
Close
Setup
Page: 1
Ready

Donations

ContactID 1

Date	mount in USD	Type	Description	Designation
21-Aug-07	$50.00	Cash In-kind Pledge	IT books for Training	VCT IGAs Livelihood Health Education Youth IT
07-Aug-07	$50.00	Cash In-kind Pledge	Art Supplies & Activit	VCT IGAs Livelihood Health Education Youth IT

Summary for 'ContactID' = 1 (2 detail records)

Max $50.00

Figure 4: Summary Report Created by Report Wizard

To create a report using the wizard, click on the Reports button on the TaskPane, then,

- Select Create report by using wizard

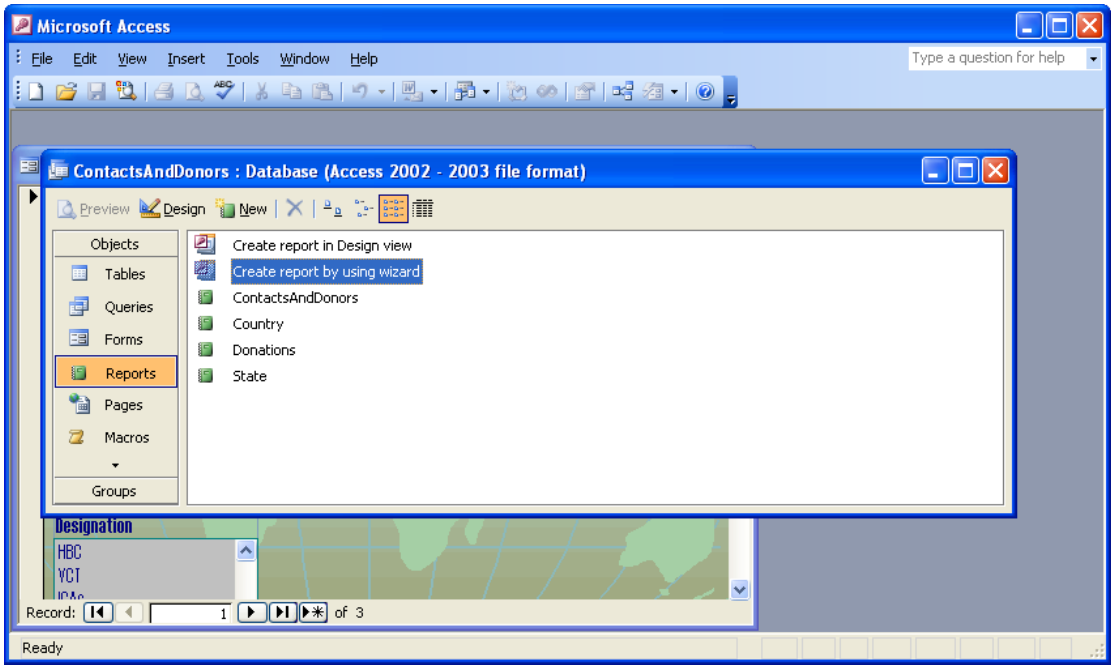
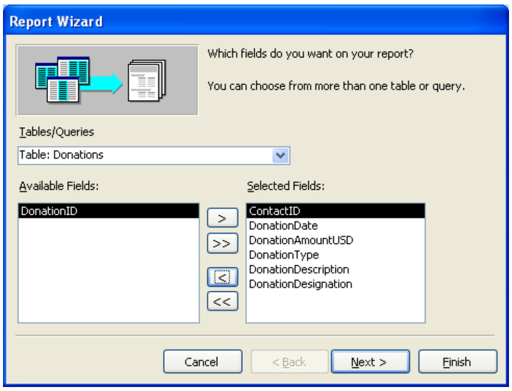


Figure 5: Using the Reports Wizard

- Select the table or query you want to base your report on from the Tables/Queries dropdown list.

- The fields associated with the table or query you selected appear in the Available Fields section. Select them using the arrow keys.
- Click Next when you've selected all of the fields you want to use.



Which fields do you want on your report?

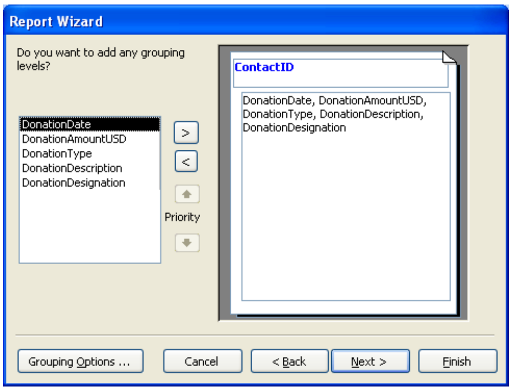
You can choose from more than one table or query.

Tables/Queries: Table: Donations

Available Fields: DonationID

Selected Fields: ContactID, DonationDate, DonationAmountUSD, DonationType, DonationDescription, DonationDesignation

Figure 6: Selecting a Report's Table/Query & Fields



Do you want to add any grouping levels?

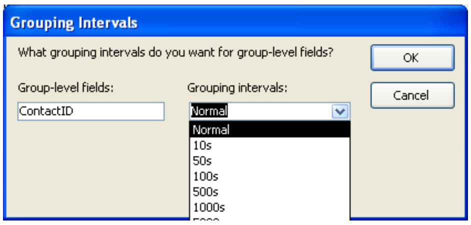
DonationDate
DonationAmountUSD
DonationType
DonationDescription
DonationDesignation

ContactID

DonationDate, DonationAmountUSD, DonationType, DonationDescription, DonationDesignation

Figure 7: Selecting a Report's Grouping Levels

- ➢ Select any fields you want to use to group sections of your report.
  - Click on Grouping Options if you want to set special grouping options for these fields.
  - Click OK when you're satisfied with the grouping intervals.
- ➢ Click Next.



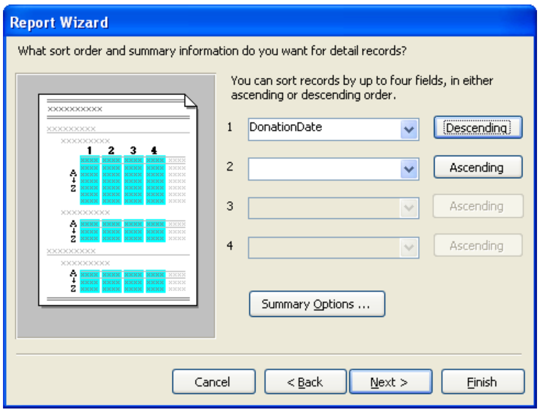
What grouping intervals do you want for group-level fields?

Group-level fields: ContactID

Grouping intervals: Normal

Normal
10s
50s
100s
500s
1000s

Figure 8: Specifying Grouping Intervals



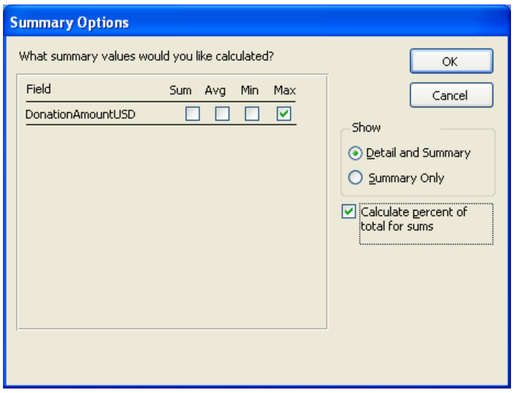
What sort order and summary information do you want for detail records?

You can sort records by up to four fields, in either ascending or descending order.

1 DonationDate Descending
2 Ascending
3 Ascending
4 Ascending

Figure 9: Selecting a Report's Sort Order

- ➢ Select up to 4 fields that you'd like to sort on & choose the sort order: either ascending or descending.
  - Click Summary Options if you'd like to calculate based on a numeric or currency field.
  - Select any summary values & click OK when you're satisfied.
  - Click Next.



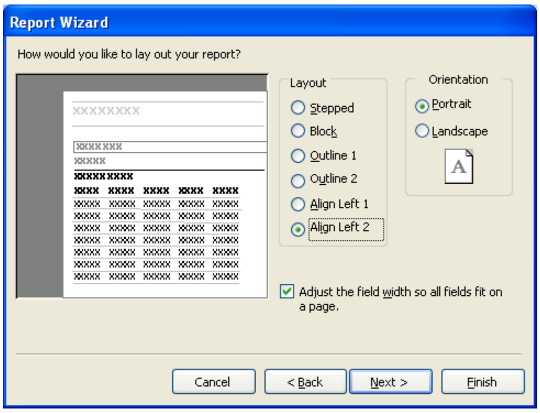
What summary values would you like calculated?

Field	Sum	Avg	Min	Max
DonationAmountUSD	□	□	□	☑

Show
● Detail and Summary
○ Summary Only

☑ Calculate percent of total for sums

Figure 10: Specifying Summary Totals



How would you like to lay out your report?

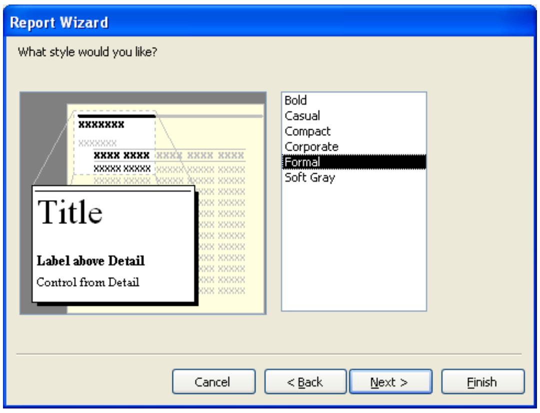
Layout
○ Stepped
○ Block
○ Outline 1
○ Outline 2
○ Align Left 1
● Align Left 2

Orientation
● Portrait
○ Landscape

☑ Adjust the field width so all fields fit on a page.

Figure 11: Selecting a Report's Layout

- ➢ Select a report layout, including orientation.
- ➢ Click Next.
- ➢ Select a style for your report.
- ➢ Click Next.
- ➢ Provide a title for your report.
- ➢ Click Finish.

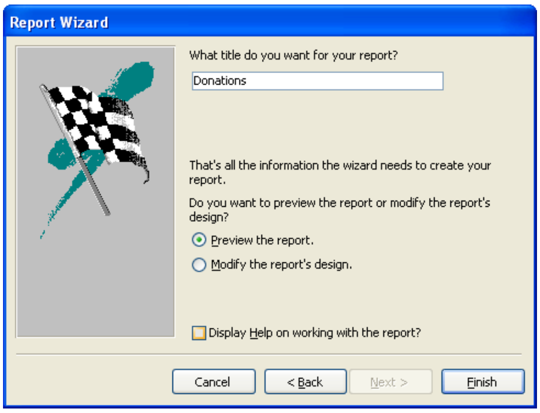


Report Wizard

What style would you like?

Bold
Casual
Compact
Corporate
Formal
Soft Gray

Figure 12: Selecting a Report's Style



Report Wizard

What title do you want for your report?

Donations

That's all the information the wizard needs to create your report.

Do you want to preview the report or modify the report's design?

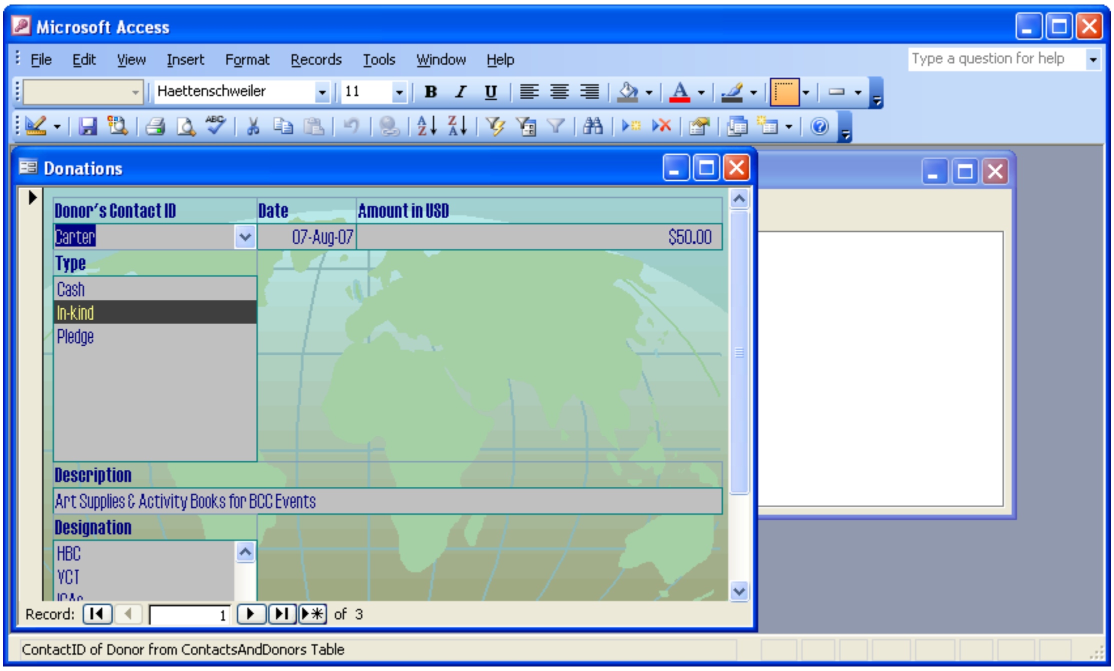
● Preview the report.
○ Modify the report's design.

□ Display Help on working with the report?

Figure 13: Selecting a Report's Title

Forms

Forms are mainly used to enter or display data in a database. They can also be switchboards that open other forms and reports in the database, or custom dialog boxes that accept user input and carry out an action based on the input. Most forms are bound to one or more tables and queries in the database. A form's record source refers to the fields in the underlying tables and queries. A form doesn't have to contain all fields on the tables & queries it's based on. However, it must contain all of the tables' required fields. A bound form stores or retrieves data from its underlying record source. Other information, such as the title, date, and page number, is stored in the form's design.



Microsoft Access

Donations

Donor's Contact ID: Carter
Date: 07-Aug-07
Amount in USD: $50.00

Type: Cash, In-Kind, Pledge

Description: Art Supplies & Activity Books for BCC Events

Designation: HBC, VCT, ICA

Record: 1 of 3

ContactID of Donor from ContactsAndDonors Table

Figure 14: Data Input Form Created by the Form Wizard

Data input (or entry) Forms show you the contents of each column on a particular record in the table. In the example above, the values in certain columns are selected from a dropdown list. The Contact ID values are based on a query to the Contact table, while the Type & Designation values are based on a pre-defined list of items. Only values included on these lists can be selected. The values associated with this particular record are highlighted in black. These last 2 lists are controlled by the database designer & if they need to be changed, must be done in Table Design View.

By using the arrows at the bottom of the screen, you can scroll through all of the records in the table. By using the vertical scroll bar on the right-hand side of the screen, you can scroll through all of the columns in the record displayed. You can change any of the values in the columns displayed, either by highlighting a different item in the list dropdowns or by entering new text in the text boxes. To add a new record to the table, click on the arrow with asterisk button. Clicking Save from the File menu saves your changes.

Creating a Form

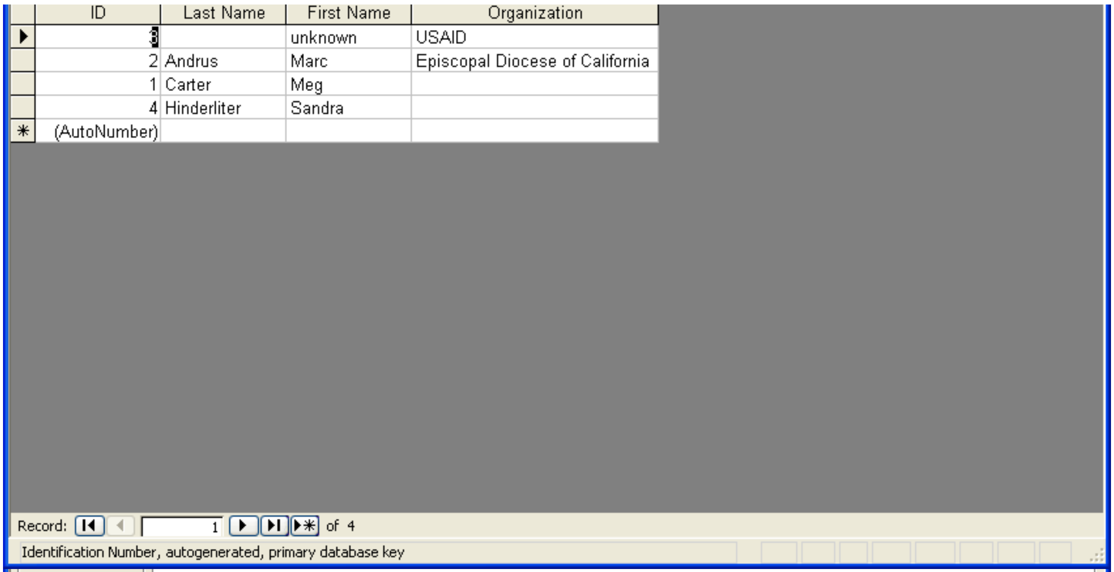
Create a form quickly either by using the AutoForm command or a Form Wizard. AutoForm creates a form that displays all fields and records in the underlying table or query. A wizard asks you questions and creates a form based on your answers. You can then customize the form the way you want it in Design view.

Customizing a form in Design view affects the form in the following ways:

- Changes the tables and queries that a form is based on.
- Sets form properties to allow or prevent users from adding, deleting, or editing records displayed in a form, or adding custom Help information.
- Adds or removes Maximize and Minimize buttons, short cut menus, and other Form window elements.
- Adds, removes, hides, or re-sizes the header, footer, and details sections of a form, or sets section properties to control the appearance and printing of a form.
- Moves, re-sizes, or sets the font properties of a control, or adds controls to display calculated values, totals, current date and time, and other useful information on a form.

To create a form using the Form Wizard, click on the Forms button in the Task Pane, then

- Select Create Form by using Wizard



	ID	Last Name	First Name	Organization
▶	3		unknown	USAID
	2	Andrus	Marc	Episcopal Diocese of California
	1	Carter	Meg	
	4	Hinderliter	Sandra	
*	(AutoNumber)			

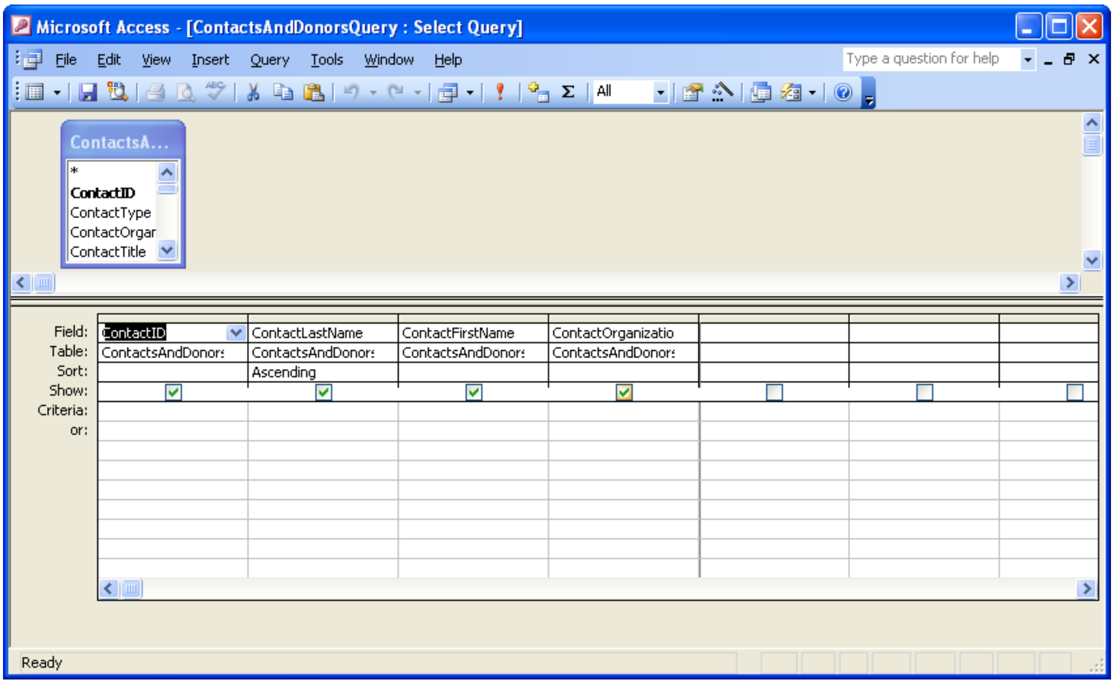
Record: 1 of 4

Identification Number, autogenerated, primary database key

Figure 21: Running a Query Against a Table

- ➤ Click on View from the MenuBar
- ➤ Select Design View from the dropdown list

Figure 15: Created a Form using the Form Wizard



Microsoft Access - [ContactsAndDonorsQuery : Select Query]

Field:	ContactID	ContactLastName	ContactFirstName	ContactOrganizatio			
Table:	ContactsAndDonor:	ContactsAndDonor:	ContactsAndDonor:	ContactsAndDonor:			
Sort:		Ascending					
Show:	☑	☑	☑	☑	□	□	□
Criteria:							
or:							

Figure 22: Query Opened in Design View

You can add a table or query if the data you need isn't already in the query, or remove a table or query if you decide you don't need them. Once you add the tables or queries you need, you can then add the fields that you want to work with to the design grid, or remove them if you decide you don't need them. A join line between field lists tells Access how the data in one table is related to the data in the other. Drag a field from the field list to a column in the design grid to show that column in the query results.

Add the values in a field or do other computations with the data by specifying the type of calculation to perform. Use an aggregate function, such as Sum or Avg, to calculate one amount for all the records in each field in the design grid. Use Group By to calculate separate amounts for groups of records in a field.

Limit the records that you see in the query's results or the records that are included in a calculation by specifying criteria. To limit the records in the query's results, enter criteria in one or more fields. Use the Or row for alternative criteria in the same field. For example, you might list the donations received between 1Sep07 and 30Sep07 or calculate the total donation amount but display only those records that exceed $1,000.

To sort the query's results, specify a sort order in the design grid. If you specify a sort order for more than one column, Access sorts the leftmost column first, so you should arrange the columns you want to sort from left to right in the design grid. You can sort each column separately by either by ascending or descending order. You can also remove a sort from a query.

To include all columns from a given table in a query, you can either select each field individually or use the asterisk (*) wildcard character. For example, for all of the columns on the Donations table, use Donations.*. Selecting by asterisk has an advantage over selecting each of the columns individually by name. When you reference by asterisk, the query results automatically include any columns that are added to the underlying table or query after the query has been created, and automatically exclude any fields that have been deleted since then. When you use the asterisk, however, you must add columns to the design grid before you can sort records on them or specify criteria for those columns.

If you open a query to make design changes and someone else modifies the query design before you have finished, Access displays a message telling you that the design has changed since you started working. You can either replace the new changes with your changes or save your version of the query with a different name. If others are using the query to view data while you're changing the design, they don't see the design changes until they close and reopen the query.

Data Access Pages

Data access pages function as forms or reports for displaying & updating database data from the internet. They're designed separately from data input forms, using a data access page wizard. They use the report design features, but don't allow you as many options for customization. For example, you can't specify grouping intervals or perform any summary calculations on the data.

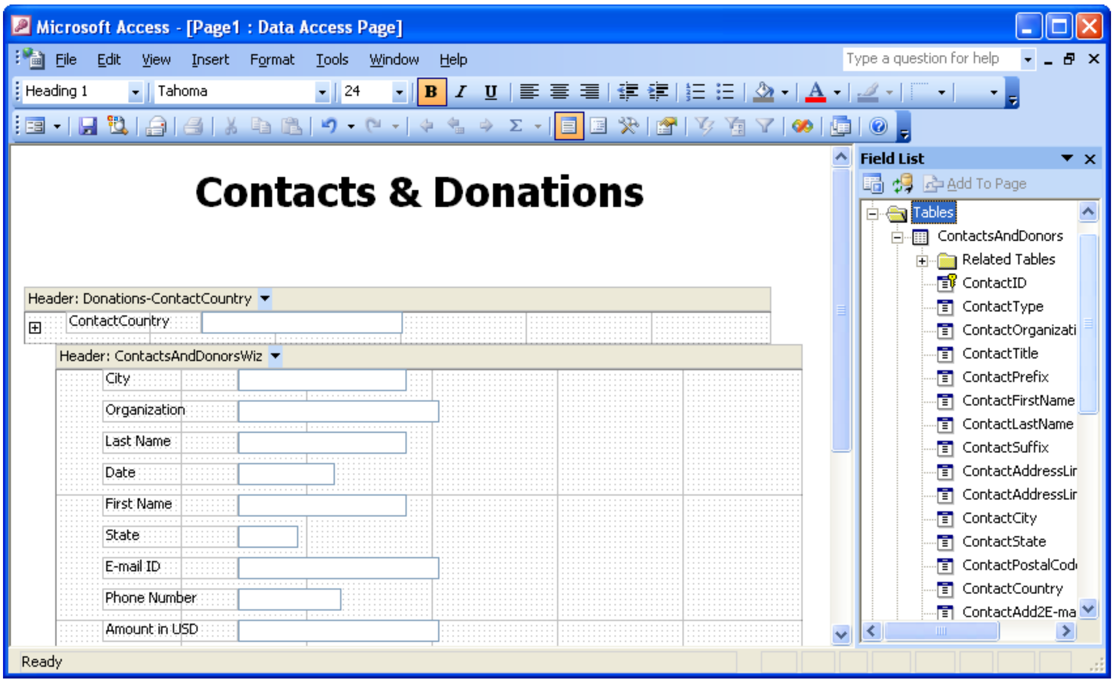


Figure 23: Data Page for Web Access

To create a data page, click on the Pages button in the Task Pane, then

- Double-click Create data access page by using wizard.

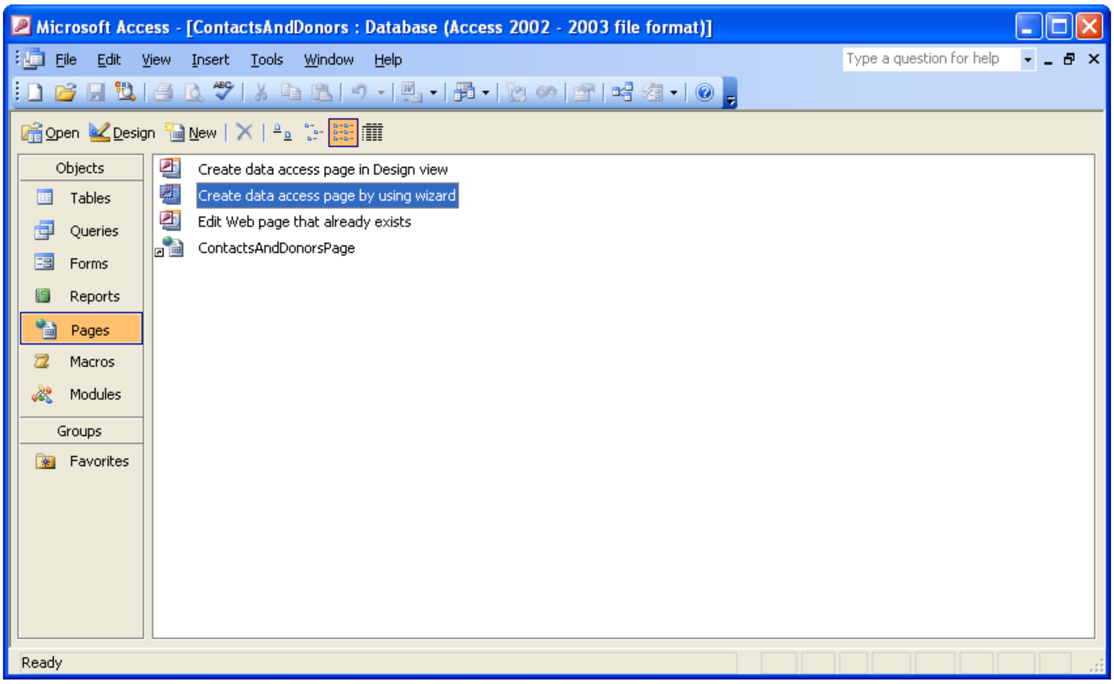

Microsoft Access - [ContactsAndDonors : Database (Access 2002 - 2003 file format)]
File Edit View Insert Tools Window Help
Type a question for help
Open
Design
New
Objects
Tables
Queries
Forms
Reports
Pages
Macros
Modules
Groups
Favorites
Create data access page in Design view
Create data access page by using wizard
Edit Web page that already exists
ContactsAndDonorsPage
Ready

Figure 24: Using the Data Page Wizard

- Select the Tables & Queries you'd like to use on your page from the dropdown list.
- Select the fields you'd like for the page by moving them from the Available Fields section to the Selected Fields section with the arrow buttons.
- Click Next.

Data Relationships

Referential Integrity

When columns in your database are referred to in other tables, you can add rules to your database that ensure the referential integrity of your data. For example, you can prevent anyone from creating a secondary reference if the primary one no longer exists. If you update the primary references, the secondary references will be updated, as well. If you delete the primary reference, the secondary references will be deleted along with it.

To view & edit the Relationships of the data elements within your database,

- ❖ Click on Tools from the MenuBar
- ❖ Select Relationships from the dropdown list

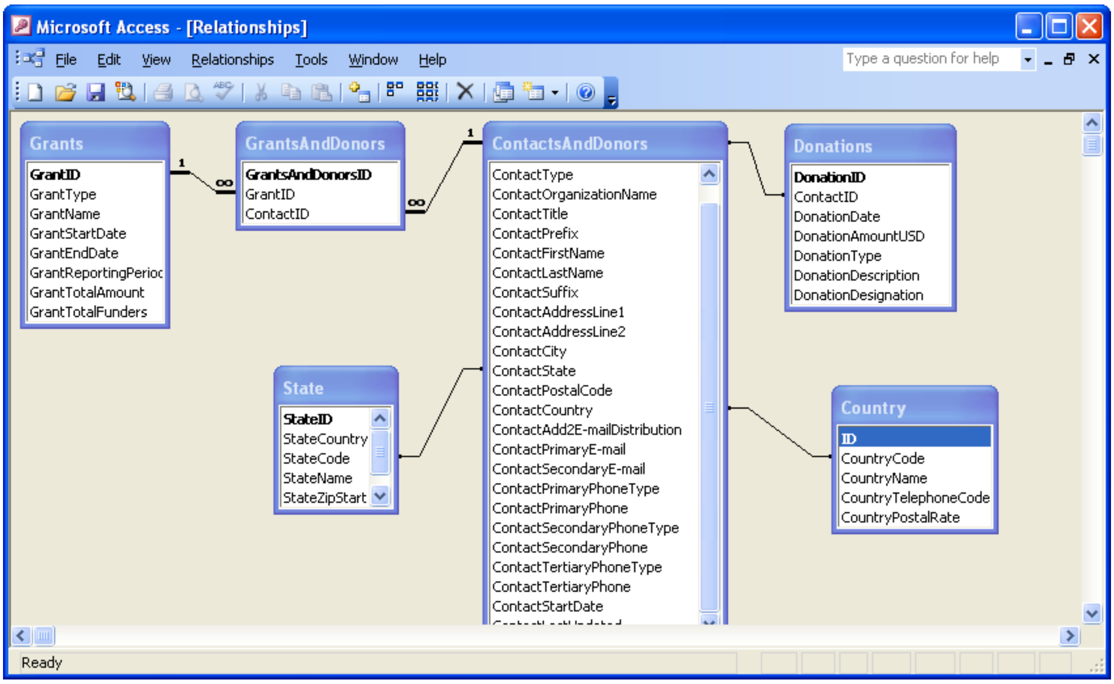


Figure 30: Relationships Chart

In this example, there are 6 tables in the database: Grants, GrantsAndDonors, ContactsAndDonors, Donations, State & Country. All have at least 1 relationship with another table. The ContactsAndDonors table contains contact information for all of the individuals, organizations & agencies who have a relationship with our organization. The ContactState & ContactCountry columns on this table are selected from the State (StateCode column) & Country (CountryCode column) tables, respectively. The ContactID column joins the ContactsAndDonors table to 2 other tables: the GrantsAndDonors table & the Donations table.

The Donations table contains the details of individual donations, whereas the Grants table contains the details of grants, which may include funding from multiple donors. Donors may also participate in multiple grants to our organization. So the GrantsAndDonors table exists to allow a many-to-many relationship between contacts & grants.

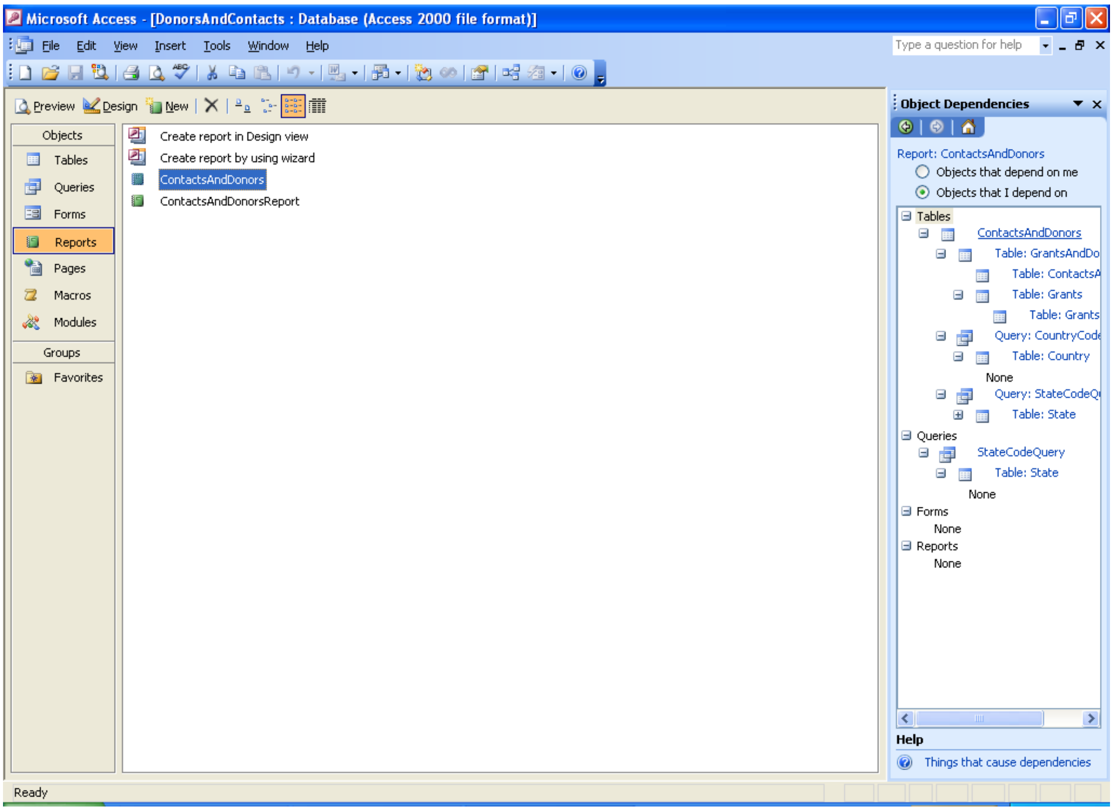
Object Dependencies

Relational databases & the objects within them represent the nature of reality – inter-dependency. When you change or remove an object, other objects will be affected. While this has advantages in terms of keeping your data synchronized, it also has its drawbacks. You cannot safely view an object in isolation, but rather must be aware of its dependencies.

Access allows you to view information on dependencies between database objects. Viewing a list of other objects that use a specific object helps maintain a database over time and avoids errors related to missing record sources. For example, before deleting a query that's no longer needed, find out which other objects in the database use that query. Then, either modify the dependent objects to remove dependencies, or delete the dependent objects, before deleting that query. Viewing a complete list of dependent objects helps you save time and minimize errors.

To create a list of all of the dependencies in your database,

- ❖ Click on View from the MenuBar
- ❖ Select Object Dependencies from the dropdown list
- ❖ On the sidebar to the left, select either of the 2 radio buttons: Objects that depend on me, or Objects that I depend on
- ❖ Click on the expand (+) icon next to an object to see a list of that object's dependencies



Report: ContactsAndDonors
○ Objects that depend on me
● Objects that I depend on

```
⊟ Tables
    ⊟ ContactsAndDonors
        ⊟ Table: GrantsAndDo
              Table: ContactsA
            ⊟ Table: Grants
                  Table: Grants
        ⊟ Query: CountryCode
            ⊟ Table: Country
                None
        ⊟ Query: StateCodeQ
            ⊞ Table: State
⊟ Queries
    ⊟ StateCodeQuery
        ⊟ Table: State
            None
⊟ Forms
    None
⊟ Reports
    None
```

Figure 31: Object Dependency Chart

Access generates dependency information by searching the name maps maintained by the Name AutoCorrect feature. If tracking name AutoCorrect information is turned off, you cannot view dependency information. If any object is open, it must first be saved and closed so that Access can generate accurate information.

For each type of object, the following table lists the types of objects it can depend on, and the nature of dependency.

Object	Depends On	Nature of Dependency
Table	Another table or a query	A relationship is defined between the objects.
		Selected table includes another table or a query as a sub-datasheet.
		Columns in the selected table look up values in the other object.
Table	A form	Columns in the selected table look up values in the form.
Query	A table or another query	The selected query is bound to the table or query.
		A relationship is defined between the objects.
Query	A form	The form is referred to in the query's SQL statement.
Form	A table or query	The selected form or one of its sub-forms is bound to the table or query.
		One or more list boxes and combo boxes in the form get data from the table or query. (n.b. Dependencies that arise from a chart on a form getting data from a table or query are not included. Manually identify any such dependencies.)
Form	Another form	The selected form includes the other form as a sub-form.
		The record source of the selected form or the row source of a list box or combo box in the selected form uses a SQL statement that refers to the other form.
Report	A table or query	The selected report or one of its sub-reports is bound to the table or query.
		One or more list boxes and combo boxes in the report get data from the table or query. (n.b. Dependencies that arise from a chart on a report getting data from a table or query are not included. Manually identify such dependencies.)
		The record source of the selected form or the row source of a list box or combo box in the selected form uses a SQL statement that refers to the other form.
Report	A form	The record source of the selected report or the row source of a list box or combo box in the selected report uses a SQL statement that refers to the form.
		The selected report includes the form as a sub-form.
Report	Another report	The selected report includes the other report as a sub-report.

Figure 32: Object Dependency Cross-Reference

Filters

Filters can be used in a table, query or form to limit the records displayed. There are 4 methods for filtering records:

1. Filter By Selection
   - When you can easily identify the value you want the filtered records to contain.
2. Filter By Form
   - When you want to choose the values you're searching for from a list without scrolling through all the records, or when you want to specify multiple search criteria at once.
3. Filter For Input
   - When the focus is in a field and you just want to type in place the exact value you're searching for or the expression whose result you want to use as your criteria, or when you want to specify multiple criteria at once.
4. Advanced Filter/Sort
   - When you need complex filters to search for records that meet multiple criteria, search for records that meet one criteria or another criteria, or to enter expressions as criteria.

(n.b. After specifying the values you're searching for by using Filter By Selection, Filter By Form, or Filter For Input, you can switch to the Advanced Filter/Sort window to see how the values you specified are translated into a criteria expression in the design grid.)

Select queries and filters are both similar in that they

1. Retrieve a subset of records from an underlying table or query.
2. Produce results that can be used as the source of data for a form or report.
3. Sort records.
4. Enable you to edit data. (You can also perform bulk updates with an update query.)

Whether you use a filter or query is determined by how you want to use the records that are returned. Generally, use a filter to temporarily view or edit a subset of records while you're in a form or datasheet. Use a query if you want to do any or all of the following:

- View the subset of records without first opening a specific table or form.
- Choose the tables containing the records you want to work with and add more tables at a later date if necessary.
- Control which fields from the subset of records display in the results.
- Perform calculations on values in fields.

(n.b. Even if you determine you need a query, consider taking advantage of the easy Filter By Form, Filter By Selection, or Filter For Input techniques for creating a filter & then save the filter as a query. This enables you to bypass the query's design grid.

The way filters are saved after they're created or applied varies depending on the object. When you save a table or form, Access saves the filters you created. You can re-apply the filters if you need them, the next time you open the table or form. When you save a query, Access saves the filters you've created, but it doesn't add the filter criteria to the query design grid. You can re-apply the filters after you run the query, the next time you open it. In a report, you can't create a filter. However, a report can inherit filters.

When you create a form or report based on a table or query that has a filter or a sort order specified in it, Access includes filter and sort order with the form or report. Sort orders are automatically applied. Whether or not filters are automatically applied depends on how you create the form or report. If you create it directly from filtered data, the filter is applied automatically each time you view the report, but it is applied only the first time you view the form. (The next time you open the form, you'll apply the filter yourself.) If you create the form or report based on a closed table or query, the filter won't be applied in the new form or report. You must apply it when you need it.

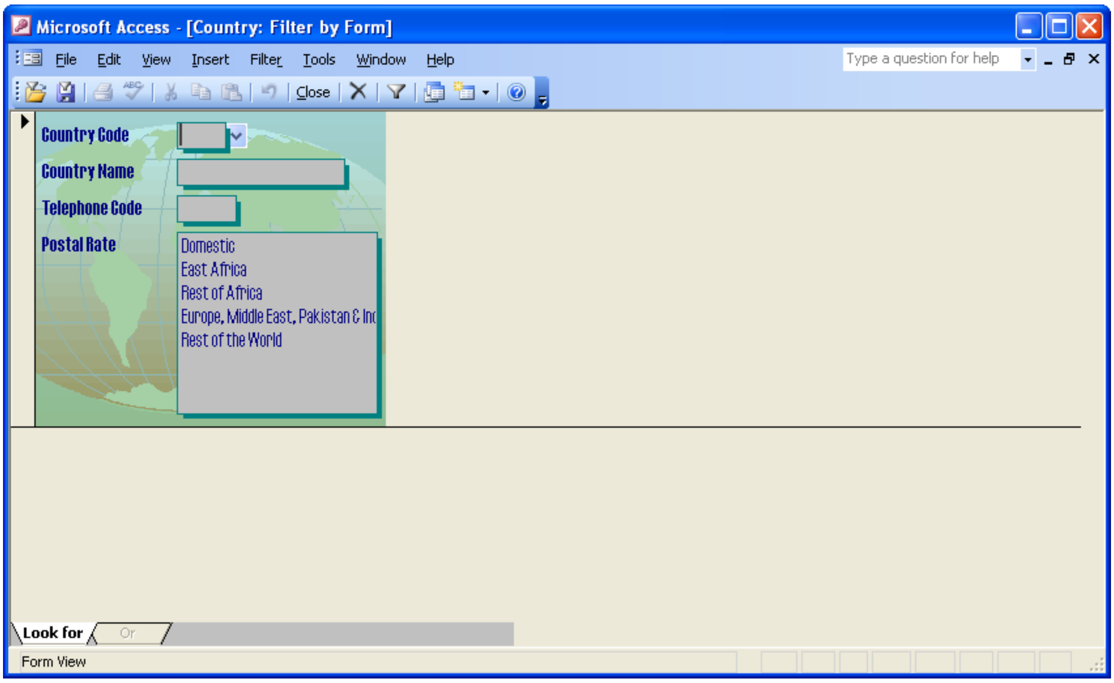
To apply a filter in a table, query, or form,

- ➢ Position your cursor in the column you want to filter on.
- ➢ Click Apply Filter (the funnel button on the toolbar).
- ➢ Click Records from the MenuBar, then select Filter
    - o Select Filter By Selection to eliminate all of the records except those matching the column you selected.
    - o Select Filter Excluding Selection to eliminate the records matching the column you selected.

When you apply a filter to a datasheet, Access also applies any filters you created in sub-datasheets. Access can apply a filter automatically when you open a form if you set the form's OnOpen property to a macro that uses the ApplyFilter action or to an event procedure that uses the ApplyFilter method of the DoCmd object. You can automatically apply a filter to a report using the OpenReport action or its corresponding method. If you create a filter in a form, sub-form, datasheet, or sub-datasheet that already contains a filter from a previous working session, the new filter replaces the previous one. While you can save only one filter for each form, sub-form, datasheet, or sub-datasheet, you can use queries that you've already created as additional filters.

To apply an existing query as a filter on a form or datasheet,

- ➢ Click in the object you want to filter.
- ➢ Switch to the Filter By Form window (the funnel & form button on the toolbar) or the Advanced Filter/Sort window (select the Records, Filter, Advanced Filter/Sort menu options).
- ➢ You'll be presented with an empty form.


Microsoft Access - [Country: Filter by Form]
File Edit View Insert Filter Tools Window Help
Type a question for help
Close
Look for
Or
Form View

Country Code

Country Name

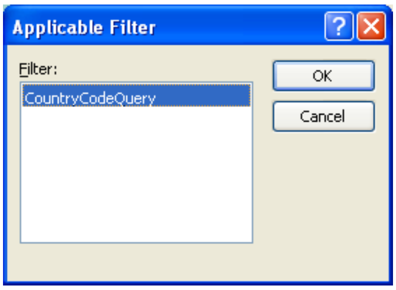
Telephone Code

Postal Rate

Domestic
East Africa
Rest of Africa
Europe, Middle East, Pakistan & In
Rest of the World

Figure 33: Filtering By Form

- ➢ On the toolbar, click Load From Query (the funnel & folder button on the toolbar).
- ➢ In the Filter box, select a query, and then click OK.

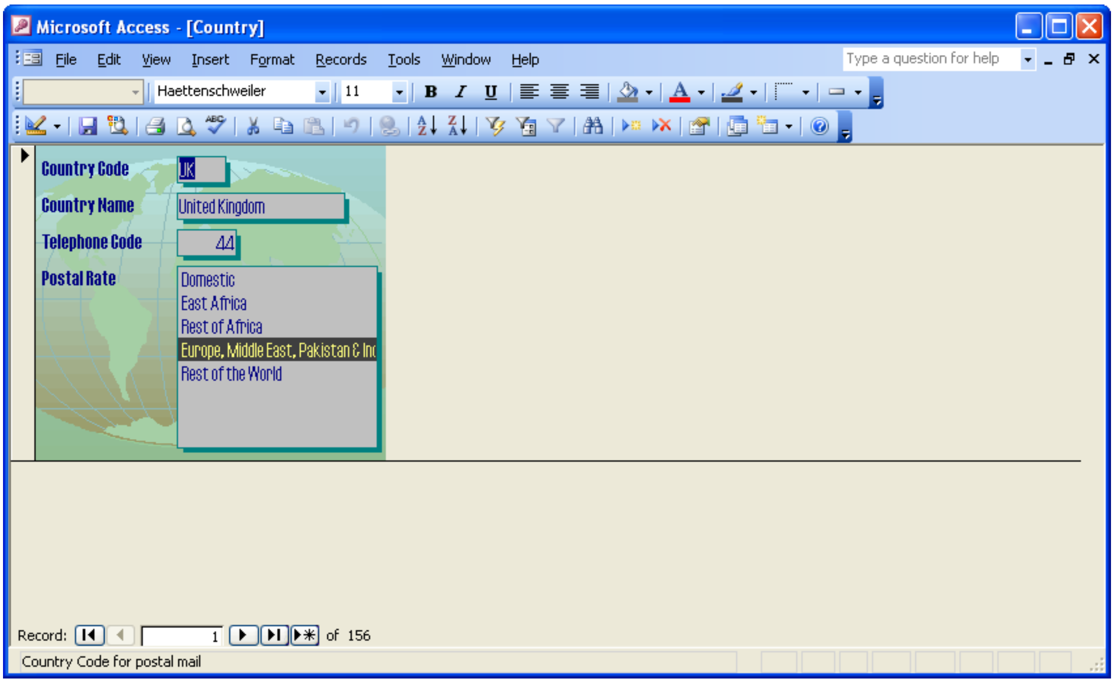


Filter:

CountryCodeQuery

Figure 34: Selecting a Filter

- ➢ Click Apply Filter (the funnel button on the toolbar).
- ➢ The form is populated with the results of the query you applied.


Microsoft Access - [Country]
File Edit View Insert Format Records Tools Window Help
Type a question for help
Haettenschweiler
11

Country Code: UK

Country Name: United Kingdom

Telephone Code: 44

Postal Rate: Domestic / East Africa / Rest of Africa / Europe, Middle East, Pakistan & Inc / Rest of the World

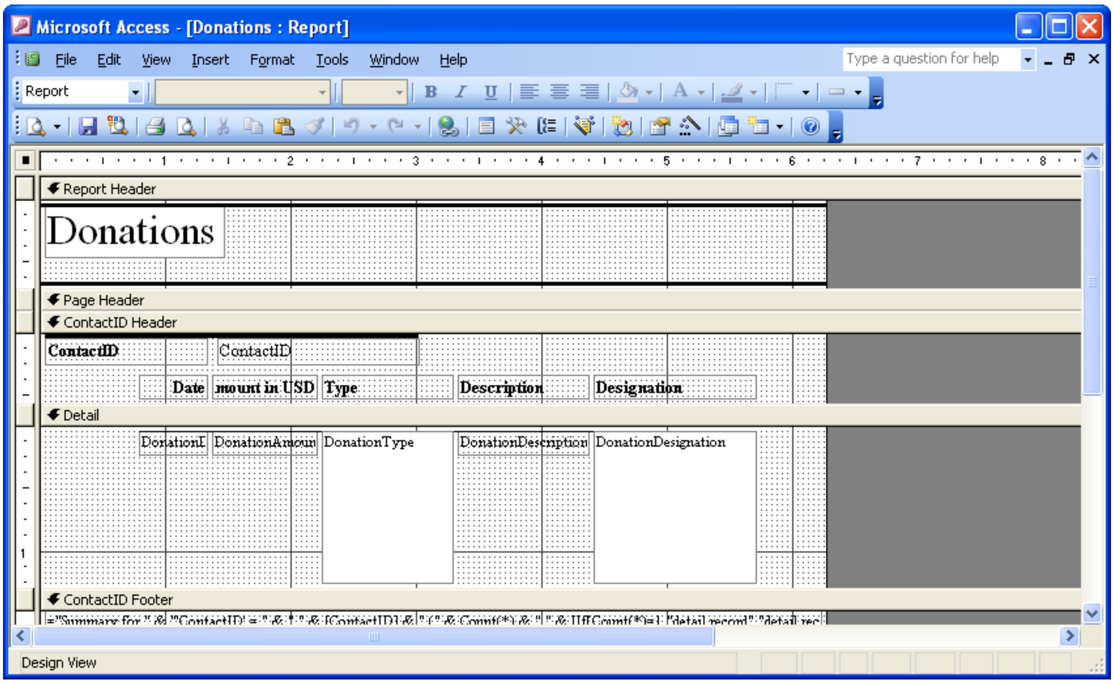
Record: 1 of 156

Country Code for postal mail

Figure 35: Results of Filtering on a Form

To apply an inherited filter in a report

- ➢ Open the report in Design view, or if the report is already open, make sure it’s selected.



Donations

ContactID | ContactID

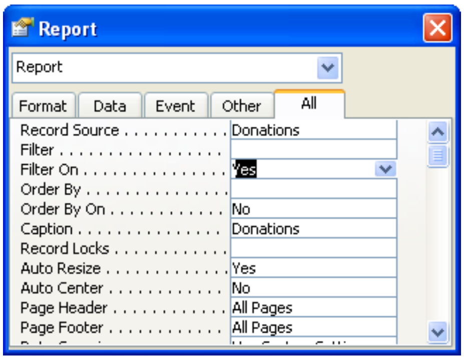
Date | mount in USD | Type | Description | Designation

DonationI | DonationAmoun | DonationType | DonationDescription | DonationDesignation

="Summary for " & "ContactID' = " & " " & [ContactID] & " (" & Count(*) & " " & IIf(Count(*)=1,"detail record","detail rec

Figure 36: Applying a Filter to a Report

- ➢ Click Properties (the hand & report page button on the toolbar) to display the report’s property sheet.
- ➢ In the FilterOn property box, click Yes.



Record Source	Donations
Filter	
Filter On	Yes
Order By	
Order By On	No
Caption	Donations
Record Locks	
Auto Resize	Yes
Auto Center	No
Page Header	All Pages
Page Footer	All Pages

Figure 37: Report Properties Dialog Box

To re-apply a filter to retrieve the most current set of records,

- With the filtered records displayed in a form, sub-form, datasheet, or sub-datasheet, click Apply Filter/Sort on the Records menu.

If you're working with filtered data in a multi-user (shared) database, you may want to re-apply the filter occasionally to see which records have been added, deleted, or changed since you opened the form or datasheet and applied the filter.

Sorts

Access provides you with 2 types of sorts: simple and complex.

Sorting in Form view, Datasheet view, or Page view, invokes a simple sort, which means you can sort all records in ascending or descending order (but you cannot use both sort orders on more than one column).

When you sort in Query Design view, the Advanced Filter/Sort window, Report Design view, Page Design view, PivotTable view, or PivotChart view, you can perform complex sorts. This means you can sort records in ascending order by some columns and in descending order by others.

How a sort is saved or re-applied depends on the object. Regardless of where you specify the sort order, Access saves the sort order when you save the form, datasheet, report, PivotTable, or PivotChart. In a form, datasheet, PivotTable, or PivotChart, Access also reapplies the sort automatically when you re-open that object or view, or base a new form or report on a form or datasheet. In a Data Access Page, Access saves the sort order if you create it in Page Design view (by using Data Outline or setting the DefaultSort property), but doesn't save the sort order if you create it in Page view (by using the Sort buttons).

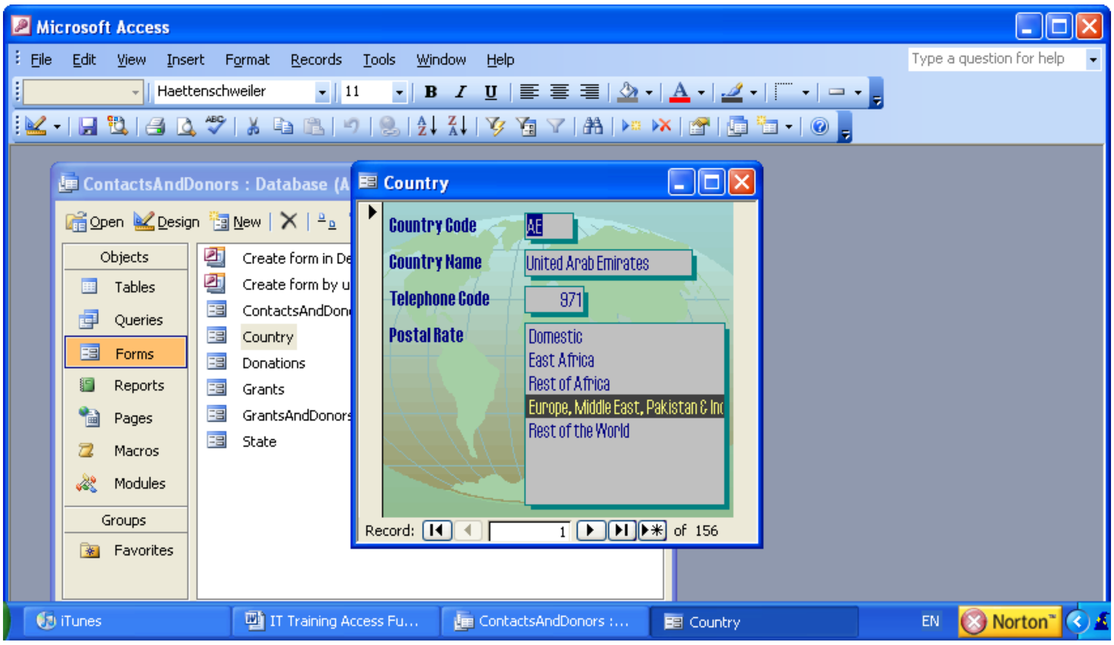
If you base a new form or report on a table or query that has a sort order saved with it, the new form or report inherits the sort order. Access will sort on up to 255 characters, in one or more columns, in the results of a query or advanced filter.
Sort order depends on the language setting you specify in the New Database Sort Order box (Options dialog box, General tab) at the time you create your database. If your database contains linked tables from a database that uses a different language sort order, Access uses the sort order of the database that contains the link to the table, not the database where the table is stored.

Numbers stored in Text columns are sorted as strings of characters, not numeric values. Therefore, to sort them in numeric order, all text strings must be the same length with shorter numbers padded with leading zeros. For example, the result of an ascending sort of the text strings '1', '2', '11', and '22' will be '1', '11', '2', '22'. You must pad the single-digit numbers with a leading zero for the strings to be sorted properly: '01', '02', '11', '22'. For columns that don't contain Null values, another solution would be to sort on the numeric values of the strings by using the Val function. If you are only storing numbers or dates in a Text field, consider changing the column's data type to Number, Currency, or Date/Time in the table where the column is stored. Then, when you sort on the column, the numbers or dates will sort in numeric or date order without requiring leading zeros.

When you sort a column in ascending order, any records in which that column is blank (contains a Null value) are listed first. If a column contains records with both Null values and zero-length strings, the fields with Null values appear first in the sort order, immediately followed by the zero-length strings.

To sort records in Form view or Datasheet view,

- ➢ Click the column you want to use for sorting records.
  - o To sort records in a sub-form, click the column you want to sort.
  - o To sort records in a sub-datasheet, display the sub-datasheet by clicking its expand indicator, and then click the column you want to sort.
- ➢ Click Sort Ascending (the A to Z button on the toolbar), or Sort Descending (the Z to A button on the toolbar).



Country Code AE

Country Name United Arab Emirates

Telephone Code 971

Postal Rate
Domestic
East Africa
Rest of Africa
Europe, Middle East, Pakistan & Inc
Rest of the World

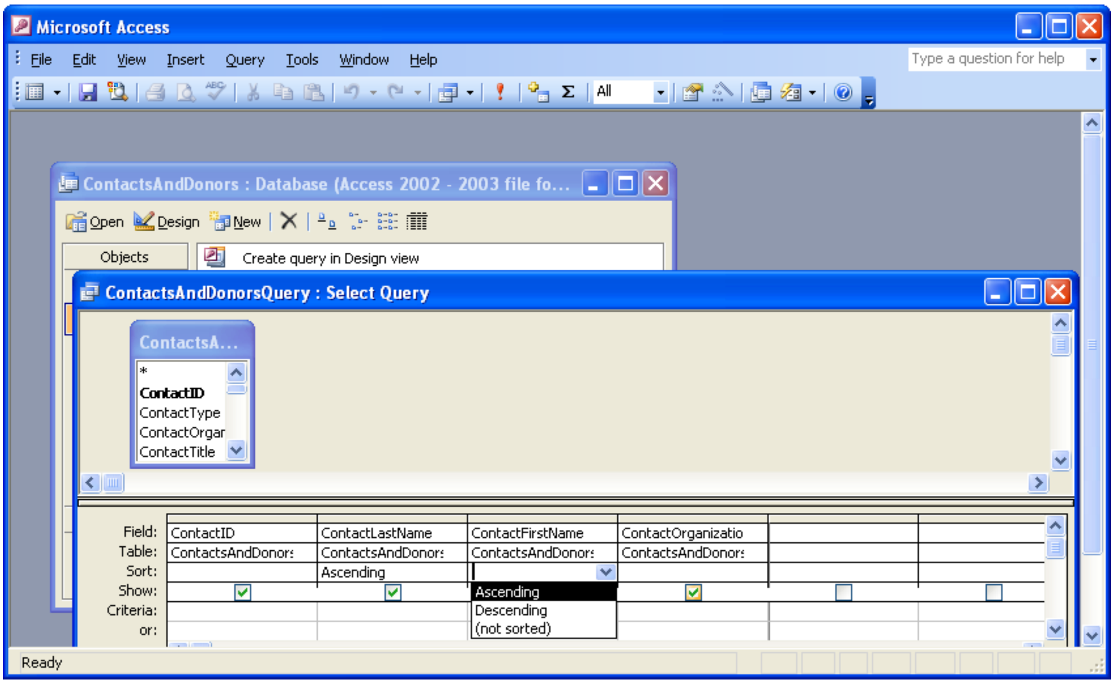
Record: 1 of 156

Figure 38: A Form with Data Sorted in Ascending Order

(n.b. In a form, you can sort on only one column at a time. In Datasheet view, when you sort the sub-datasheet for one record, Access sorts all the sub-datasheets at that level. In a datasheet or sub-datasheet, you can select two or more adjacent columns at the same time, and then sort them. Access sorts records starting with the leftmost selected column. When you save the form or datasheet, Access saves the sort order.)

To sort records by using the design grid,

- Open a query in Design view or display the Advanced Filter/Sort window for a table, query, or form.
- To sort on more than one column, first arrange the columns in the design grid in the order you want the sorts performed. Access sorts on the leftmost column first, then on the next column to the right, and so on. For example, to sort on the LastName column first and then on the FirstName column, the LastName column must be to the left of the FirstName column in the grid.


Microsoft Access
File Edit View Insert Query Tools Window Help
Type a question for help
All
ContactsAndDonors : Database (Access 2002 - 2003 file fo...
Open Design New
Objects
Create query in Design view
ContactsAndDonorsQuery : Select Query
ContactsA...
*
ContactID
ContactType
ContactOrgar
ContactTitle
Ready

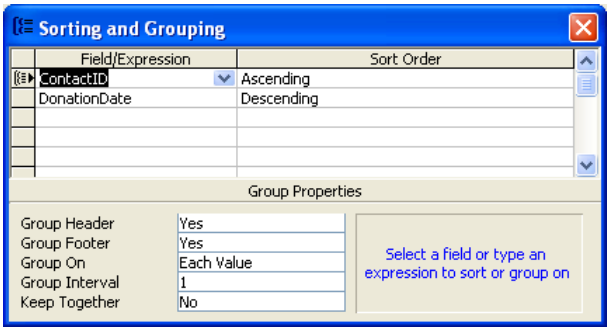
Field:	ContactID	ContactLastName	ContactFirstName	ContactOrganizatio		
Table:	ContactsAndDonor:	ContactsAndDonor:	ContactsAndDonor:	ContactsAndDonor:		
Sort:		Ascending				
Show:	☑	☑	Ascending	☑	□	□
Criteria:			Descending			
or:			(not sorted)			

Figure 39: Applying a Sort to a Query

- In the Sort cell for each of the columns you want to sort on, click an option.
- To see the results of the query, click View, then Datasheet view on the toolbar.

You can sort on up to 10 columns or expressions in a report. To sort records in a report,

- Open the report in Design view.
- Click Sorting And Grouping on the toolbar to display the Sorting And Grouping box.



Field/Expression	Sort Order
ContactID	Ascending
DonationDate	Descending

Group Properties

Group Header	Yes
Group Footer	Yes
Group On	Each Value
Group Interval	1
Keep Together	No

Select a field or type an expression to sort or group on

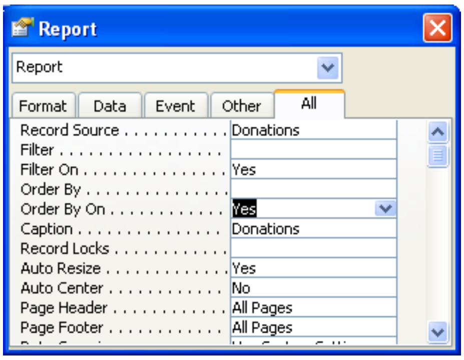
Figure 40: Sorting & Grouping Dialog Box

- In the first row of the Field/Expression column, select a column name, or type an expression.
- The column or expression in the first row is the first sorting level (the largest set). The second row is the second sorting level, and so on.

(n.b. When you fill in the Field/Expression column, Access sets the Sort Order to Ascending.)

To re-apply an inherited sort order

- Open the report in Design view, or if the report is already open, make sure it's selected.
- Click Properties on the toolbar to display the report's property sheet.
- In the OrderByOn property box, click Yes to re-apply it.



Record Source	Donations
Filter	
Filter On	Yes
Order By	
Order By On	Yes
Caption	Donations
Record Locks	
Auto Resize	Yes
Auto Center	No
Page Header	All Pages
Page Footer	All Pages

Figure 41: Re-applying Inherited Sort Orders

(n.b. If you specify a sort order in a report wizard or in the Sorting And Grouping dialog box in report Design view, it overrides the inherited sort order.)

Groups

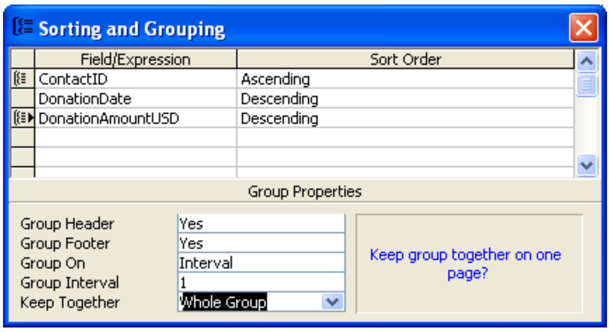
Access allows you to group records in a report based on the values in one or more columns. For example, to see all of the donations for a specific date, you could group records on the values in the DonationDate column and sort on the values in the ContactCountry and ContactType columns. A new group is started for each date, so you can skim the report to quickly find the records for a particular date. You can also calculate totals and other values for each group.

Create groups by setting properties in the Sorting and Grouping dialog box. You can set properties to display a header and footer for the group. Groups are created by setting either GroupHeader or GroupFooter (or both) to Yes. You can group on up to 10 columns or expressions in a report. When you group on more than one column or expression, Access nests the groups according to their group level. The first column or expression you group on is the first and most significant group level; the second column or expression you group on is the next group level; and so on. A header on a group level is paired with a footer on its same level.

To group records on a report,

- Open the report in Design view.
- Click Sorting And Grouping on the toolbar to display the Sorting And Grouping box.

- In the first row of the Field/Expression column, select the column or type the expression that you want to group records on.
    - The column or expression in the first row is the first grouping level (the largest set). The second row is the second grouping level, and so on.
    - When you fill in the Field/Expression column, Access sets the Sort Order to Ascending. To change the sort order, select Descending from the Sort Order list.
- Set GroupHeader or GroupFooter or both to Yes to create the group level.
- Set one or more of the following group properties:
    - GroupOn specifies how you want the values grouped. The options you see depend on the data type of the field on which you're grouping. If you group on an expression, you see all the options for all data types.
    - GroupInterval specifies any interval that is valid for the values in the field or expression you're grouping on.
    - KeepTogether specifies whether Access prints all or only part of a group on the same page.



Field/Expression	Sort Order
ContactID	Ascending
DonationDate	Descending
DonationAmountUSD	Descending

Group Properties

Group Header	Yes
Group Footer	Yes
Group On	Interval
Group Interval	1
Keep Together	Whole Group

Keep group together on one page?

Figure 42: Grouping Records on a Report

To change sorting and grouping levels on a report,

- Open the report in Design view.
- Click Sorting And Grouping on the toolbar to display the Sorting And Grouping box.
    - To change sorting or grouping order,
        - In the Sorting And Grouping box, click the row selector of the field or expression you want to move.
        - Click the selector again, and drag the row to a new location in the list.
    - To insert a sorting or grouping level,
        - In the Sorting And Grouping box, click the row selector of the row above which you want to insert the new field or expression, and then press INSERT.
        - In the Field/Expression column of the blank row, select the field you want to sort on, or type an expression.
        - When you fill in the Field/Expression column, Access sets the Sort Order to Ascending. To change the sort order, select Descending from the Sort Order list.
    - To delete a sorting or grouping level,

        - In the Sorting And Grouping box, click the row selector of the field or expression you want to delete, and then press DELETE.
        - Click Yes to delete the sorting or grouping level, or click No to keep it.
    - To modify the inherited sort order in a report,
        - Click Properties on the toolbar to display the report's property sheet.
        - Click the OrderBy property box, and then specify the field and sort order you want to sort on.
        - To sort records in one field in ascending order, type the field name enclosed in brackets ([ ]) followed by ASC.
        - To sort records in one field in descending order, type the field name enclosed in brackets ([ ]) followed by DESC.
        - To sort records in more than one field in ascending or descending order, type the setting this way:
        - [fieldname1] ASC,[fieldname2] DESC

To keep a group of records together on a page,

- Open the report in Design view.
- Click Sorting And Grouping on the toolbar to display the Sorting And Grouping box.
- Click the column or expression for the group level that you want to keep together.
- In the group properties section of the Sorting And Grouping box, set the KeepTogether property to one of the following settings:
- Whole Group (the group header, all detail records, and the group footer are printed on the same page)
- With First Detail (the group header is printed on a page only if the first detail record also fits on the same page)
- Double-click the report selector.
- Set the GrpKeepTogether property to Per Page.

(n.b. If you want to keep the data in one section together, set the KeepTogether property for that section to Yes.)

Expressions

Like a formula or function, an expression is a combination of symbols (e.g. identifiers, operators, and values) that produce a result. Use expressions

- To set a property that defines a calculated control, establishes a validation rule, or that sets a default field value.
- To enter a criteria expression, create a calculated field, or update records in a query or filter.
- To edit an SQL query in SQL view of the Query window, or to use an SQL statement in a property setting or argument.

Expression Components

You can specify a value in an expression by using a literal value, a constant, a function, or an identifier.

1. A literal value represents a value (such as a number, string, or date) that Access evaluates exactly as written. "New York," 100, and #1-Jan-01# are examples of literal values.
2. Number signs (#) around an element of an expression indicate that the element is a date/time value. Access automatically evaluates a value surrounded by number signs (or single quotation marks) as a date/time value and lets you type the value in any common date or time format.
3. Double (") quotation marks around an element of an expression indicate that the element is text.
4. A constant represents a value that doesn't change. True, False, and Null are examples of constants that are defined automatically by Access.
5. A function returns a value based on the results of a calculation or other operation. Access includes many built-in functions; for example:
   - The Date function returns the current date.
   - The Sum function returns the sum of a set of field values.
   - The DLookup function returns a specific field value.
6. An identifier refers to the value of a field, control, or property. For example, the following identifier refers to the value of the DefaultValue property of the DonationDate control on the Donations form: Forms![Donations]![DonationDate].DefaultValue

Expression Builder

The Expression Builder has three sections, located from top to bottom:

1. In the upper section of the builder is an expression box where you build the expression. Use the lower section of the builder to create elements of the expression, and then paste these elements into the expression box to form an expression. You can also type parts of the expression directly into the expression box.
2. In the middle section of the builder are buttons for commonly used operators. If you click one of the operator buttons, the Expression Builder inserts the operator at the insertion point in the expression box. For a complete list of operators you can use in expressions, click the Operators folder in the lower-left box and the

appropriate operator category in the middle box. The right box lists all operators in the selected category.

3. In the lower section of the builder are three boxes:
   - The left box contains folders that list the table, query, form, and report database objects, built-in and user-defined functions, constants, operators, and common expressions.
   - The middle box lists specific elements or categories of elements for the folder selected in the left box. For example, if you click Built-In Functions in the left box, the middle box lists categories of Access functions.
   - The right box lists the values, if any, for the elements you select in the left and middle boxes. For example, if you click Built-In Functions in the left box and a category of functions in the middle box, the right box lists all built-in functions in the selected category.

When you paste an identifier in your expression, the Expression Builder pastes only the parts of the identifier that are required in the current context.

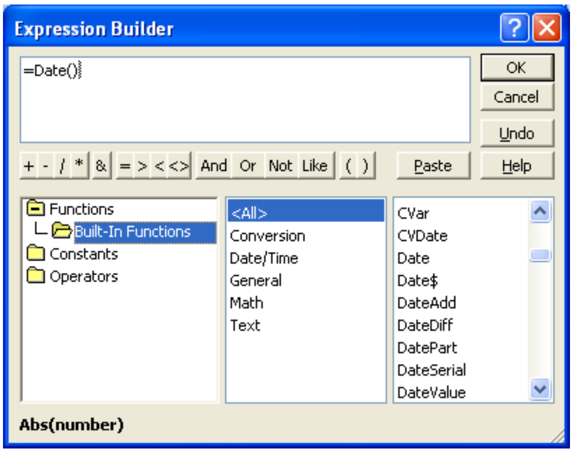


Figure 43: Expression Builder

Assignment

Design a database of the projects that your organization supports, using either WORD or Excel to document the information. Save that file in your assignments folder. Account for all of the following.

1. All of the fields you'll need to identify your projects.
2. All date & amount information necessary for tracking the project through to completion.
3. Information about the staff members assigned to the projects, including their roles (e.g., project leader, accountant, project monitor, etc.) for each project.
4. Information about project beneficiaries.
5. Information about the supplies (as well as their suppliers) necessary to complete the project successfully.
6. Mark each field that requires special handling (e.g. primary key, index key & type, default value, required field, range checks or other data validation, etc.).
7. Organize these fields into appropriate tables.
8. Describe the contents of the data entry forms you'll need to establish a project, to view a project's status, to update a project & to mark a project as complete.
9. Describe the contents of the reports you'll need to track individual projects, to summarize all open projects & to summarize your organization's project history.
10. Describe any queries & macros you'll need to retrieve information from one table to populate another or to cross-check fields.