Chapter 6

TABLE AND QUERY

6.1 OVERVIEW

In a relational database the data is stored in tables. The table is the fundamental concept of relational databases. It is also called relation. It is the foundation of every Relational Database Management System is a database object called table.

Tables are grids that store information in a database similar to the way an Excel worksheet stores information in a workbook. Access provides three ways to create a table for which there are icons in the Database Window. Double-click on any of the icons to create a table.

Every database consists of one or more tables which store data. Each table has its own unique name and consists of columns and rows. It is a very convenient way to store information.

The columns in a table (also called table fields) have their own unique names and have a pre-defined data type. The field can be a primary key, an index defined on it and it can have certain default value.

The table columns describe the data types, whereas the table rows contain the actual data. Here is an example of a simple database table, containing students' data. The first row, listed in bold, contains the names of the table columns:

Table: **Students**

Students : Table

Student ID	First Name	Last Name	Parents Name	Address	City	MajorID	Class ID
1	Ali	Azmat	Azmat Hasan	345, street #.56	Islamabad	56	1
2	Rashid	Ahmed	Ahmed Butt	78, Gali 5-D	Lahore	56	2
3	Zain-ul-Abid	Khan	M.R.Khan	567, D-cat	Rawalpindi	52	1
(AutoNumber)							

Characteristics of Tables

The tables of a relational database have following characteristics:

- Each cell of the table contains only one value.
- Each column has a distinct name, which is the name of the attribute (field) it represents.
- The order of the columns is immaterial.
- Each row represents a record.
- Each row is distinct; there are no duplicate rows.
- The order of rows is immaterial.

Using a separate table for each entity means that you store that data only once, which makes your database more efficient, and reduces data entry errors. Tables form the foundation of an Access database structure.

Degree of a Relation

The number of fields in a relation is called the degree of a table. Once the table has been created, its degree usually dose not changes, e.g. a table with five fields has a degree of 5.

Cardinality of a Relation

The number of record in a relation is called the cardinality of the relation. The cardinality of a relation changes as new records are added or existing records are deleted, e.g. a table with 50 records has a cardinality of 50.

A Basic Terminology

These words are used often in Assess so you will want to become familiar with them before using the program and this book.

- A *database* is a collection of related data (or record).
- An *object* is a component in the database such as a table, query, form, or macro.
- A *table* is a group of related data organized in fields (columns) and records (rows). By using a common field in two tables, the data can be linked. Many tables can be stored in a single database.
- A *field* is a column in a table and defines a data type for a set of values in the table. For example a mailing list table might include fields for first name, last name, address, city, state, zip code, and telephone number.
- A *record* is a row in a table and is a set of values defined by fields. In a mailing list table, each record would contain the data for one person as specified by the intersecting fields.
- *Design View* provides the tools for creating field in a table.

- *Datasheet View* allows you to update, edit, and delete information from a table.

6.1.1 Access IDE

IDE stand for **I**ntegrated **D**evelopment **E**nvironment. It is an interface that is used to create a database. An IDE makes the using of database simple, manageable for end users who may not have a complicate programming knowledge of the database system.

Microsoft Access is an example of a database management system. The access IDE simplifies the task of creating, designing good-looking screens with features (i.e. text boxes, list boxes, button, dialog boxes etc.). It provides the facilities for searching, sorting, and retrieving the data.

6.1.2 Starting Microsoft Access

You can build a database in two ways by using the Database Wizard, or by opening an empty database and building all your objects with wizards or from scratch.

(i) Double click on the Microsoft Access icon on the desktop if its icon in the desktop.

(ii) Click on Start

6.2 TABLE DESIGN VIEW

Design View allows you to define fields in the table before adding any data to datasheet.

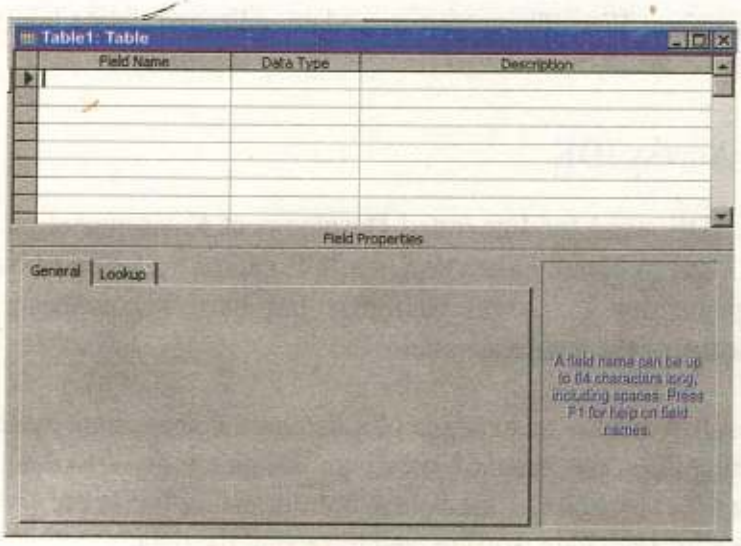


Fig. 6.1 Table Design View

6.2.1 Datasheet View

When you open a table or query using the database window, it will be displayed in datasheet view. A table or query is opened in Datasheet view to perform different operations on the data in the table such as displaying data, adding new data, searching data etc.

The Datasheet view is like worksheet. When table is opened in Datasheet view, the field names are displayed as header of columns and each row contains a complete record.

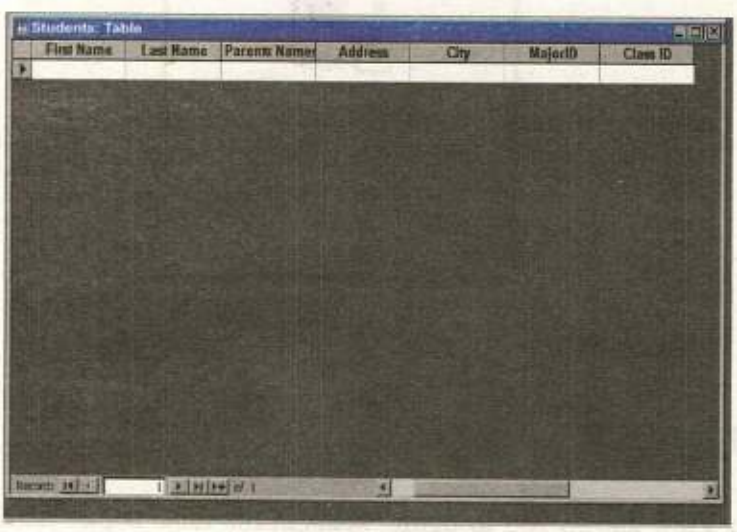


Fig. 6.2 Datasheet View

Switching Views

- To switch views form the datasheet (spreadsheet view) to the design view, simply click the button in the top-left corner of the Access program.

Datasheet View	Design View
	
Displays the view, which allows you to enter raw data into your database table.	Displays the view, which allows you define fields, data-types, and descriptions into your database table.

Table 6.1

6.3 TABLE CREATION

You can open or create a table in several ways in Microsoft Access i.e.,

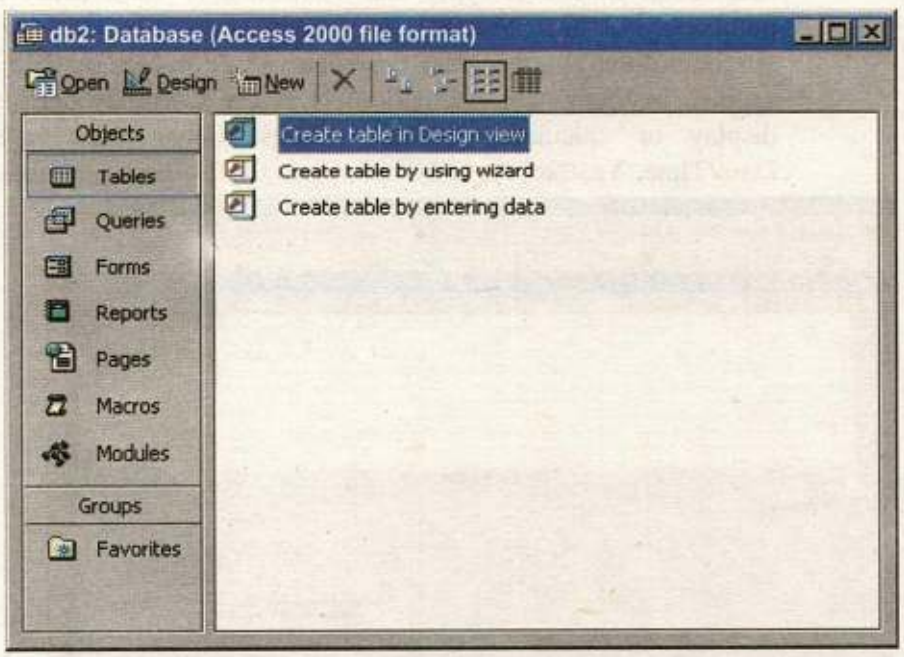


Fig. 6.3 Creating Database through Different way.

(i) Creating database in Design view.
(ii) Creating database by wizard.
(iii) Creating database by entering data.

Creating database in Design View

- *Click* on the *Table* object from the list of database object.
- In Database Window, *Double-Click* on "*Create table in Design view*"; a table window in *Design View* is appeared to design the structure of table.

OR

- *Click* on *New*, in Database Window. The New Table dialog box will open.
- *Click* on *Design View Option.*
- *Click* on *OK*. A blank table will open in *Design View.*
- Define each of the fields in your table.
- Under the Field Name column, enter the categories of your table.
- Under Data Type column, enter the type you want for you categories.

❖ The attribute of a variable or field determines what kind of data it can hold. For example, in a Microsoft Access database, the Text and Memo field data types allow the field to store either text or numbers, but the Number data type allow the field to store numbers only. Number data type fields store numerical data that is used in mathematical calculations. Use the Currency data type to display or calculate currency values. Other data types are Date/Time, Yes/No, Auto Number, and OLE object (Picture).

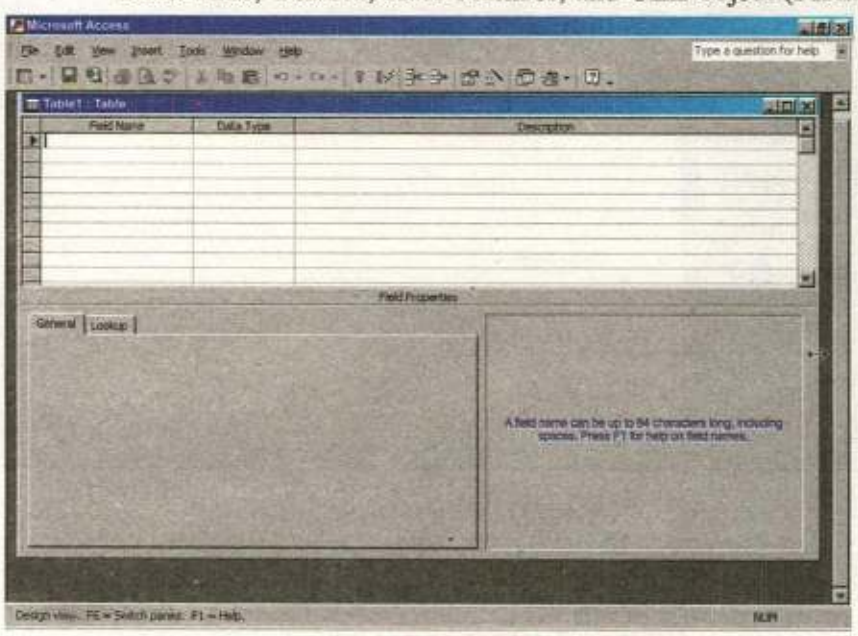


Fig.6.4 Creating Database in Design View

- Under the Description column, enter the text that describes the field. (This field is optional).

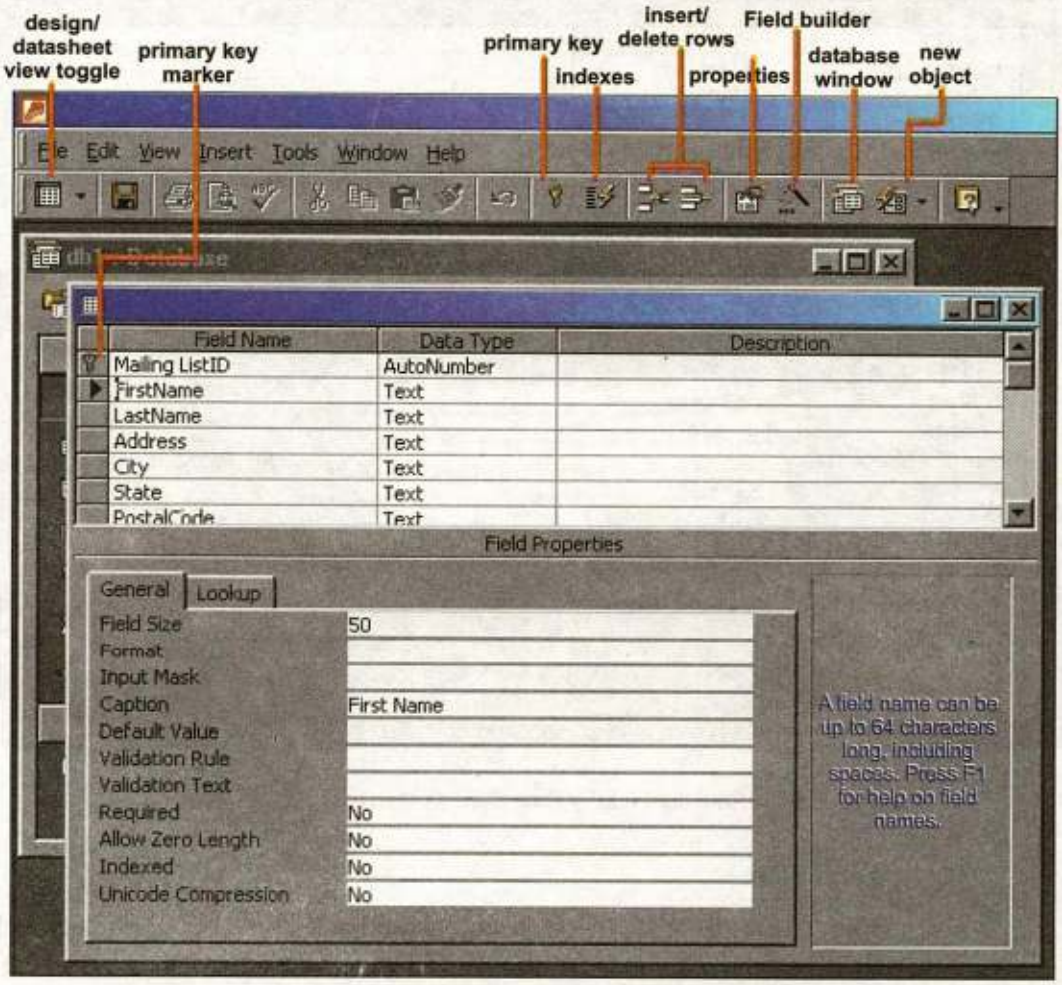


Fig. 6.5 Define the fields in Database Design View

Defining Field Properties in Design View

The properties of each field can be set in design View. The window is divided into two parts: a top pane for entering the field name, data type, and an optional description of the field, and a bottom pane for specifying field properties.

To assign the Primary Key, select the field and click the Primary Key button in the toolbar. You can set the remaining properties in the Table Window's lower pane. The following properties are defined briefly.

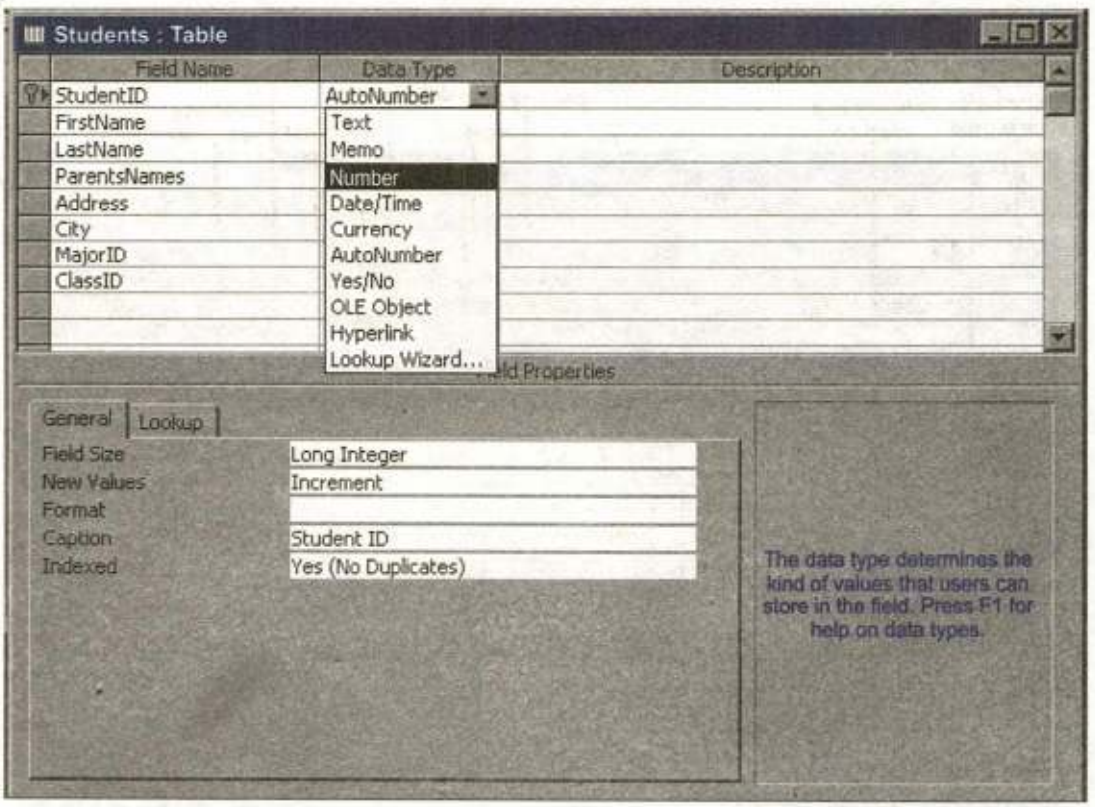


Fig. 6.6 Define the Field' s Data Type in Database Design View

(i) Field Name

This is the name of the field and should represent the contents of the field such as "Name", "Address", "Final Grade", etc. The name cannot exceed 64 characters in length and may include spaces (However, this is not considered a good practice).

(ii) Data Type

Before you start creating a new table in Access, you first consider how you want to break down the information you are organizing into smaller units of data in the table. Dividing the data into units of information is the process of determining the fields. Each field will be assigned a unique field name. Each field is also assigned a data type. Following are the data types available in Ms. Access:

- **Text** - The default type, text type allows any combination of letters and numbers up to a maximum of 255 characters per field record.
- **Memo** - A text type that can store more than 64,000 characters and is used for detailed descriptive feilds0.
- **Number** – This data type is used to store numbers that are used in mathematical calculations. Several number field sizes are available. The most useful are summarized in table 6.3.
- **Date/Time** - A *Date*, *Time*, or combination of both can be specified in this field.
- **Currency** - Monetary values that can be set up to automatically include a dollar sign ($) and correct decimal and comma positions.
- **Auto Number** - When a new record is created, Access will automatically assign a unique integer to the record in this field. From the General options, select Increment if the numbers should be assigned in order or random if any random number should be chosen. Since every record in a datasheet must include at least one field that distinguishes it from all others, this is a useful data type to use if the existing data will not produce such values.
- **Yes/No** - Use this option for *True/False*, *Yes/No*, *On/Off*, or other values that must be only one of two.
- **OLE Object** - An *OLE* (Object Linking and Embedding) object is a sound, picture, or other object such as a Word document or Excel spreadsheet that is created in another program. Use this data type to embed an *OLE* object or link to the object in the database.
- **Hyper link** - A hyperlink will link to a website, or another location in the database. A hyperlink address have up to four parts: the text that is displayed in the field; the path to a file or URL; a subaddress which is a location in the file or page in the web site; and the text that is displayed as the tooltip. The data

consists of up to four parts each separated by the pound sign (#):DisplayText#Address#SubAddress#ScreenTip. The Address is the only required part of the string. Examples:

Internet hyperlink example: Google Home Page#http://www.google.com#

Database link example: #c:\My Documents\database.mdb#MyTable

Description (optional)

Enter a brief description of what the contents of the field are.

Field Properties

Select any pertinent properties for the field from the bottom pane. Properties for each field are set from the bottom pane of the Design View window.

- **Field Size** is used to set the number of characters needed in a text or number field. The default field size for the text type is 50 characters. If the records in the field will only have two or three characters, you can change the size of the field to save disk space or prevent entry errors by limiting the number of characters allowed. Likewise, if the field will require more than 50 characters, enter a number up to 255. The field size is set in exact characters for Text type, but options are give for numbers:
  - **Byte** - Positive integers between 1 and 255
  - **Integer** - Positive and negative integers between -32,768 and 32,767
  - **Long Integer (default)** - Larger positive and negative integers between -2 ,147,483,648 to 2,147,483,647.
  - **Single** - Single-precision floating-point number
  - **Double** - Double-precision floating-point number
  - **Decimal** - Allows for Precision and Scale property control

- **Format** conforms the data in the field to the format specified in the format property. For text and memo fields, this property has two

parts that are separated by a semicolon. The first part of the property
is used to apply to the field and the second applies to empty fields.

Text and memo format.

Text Format			
Format	**Datasheet Entry**	**Display**	**Explanation**
@@@-@@@@	1234567	123-4567	@ indicates a required character or space
@@@-@@@&	123456	123-456	& indicates an optional character or space
<	HELLO	hello	< converts characters to lowercase
>	Hello	HELLO	> converts characters to uppercase
@\!	Hello	Hello!	\ adds characters to the end
@;"No Data Entered"	Hello	Hello	
@;"No Data Entered"	(blank)	No Data Entered	

Table 6.2

- **Number format.** Select one of the preset options from the drop down menu or construct a custom format using symbols explained below:

Number Format			
Format	**Datasheet Entry**	**Display**	**Explanation**
###,##0.00	123456.78	123,456.78	0 is a placeholder that displays a digit or 0 if there is none. # is a placeholder that displays a digit or nothing if there is none.
$###,##0.00	0	$0.00	
###.00%	123	12.3%	% multiplies the number by 100 and added a percent sign

Table 6.3

- **Currency format.** This formatting consists of four parts separated by semicolons:format for positive numbers; format for negative numbers; format for zero values; format for Null values.

Currency Format	
Format	**Explanation**
$##0.00;($##0.00)[Red];$0.00;"none"	Positive values will be normal currency format, negative numbers will be red in parentheses, zero is entered for zero values, and "none" will be written for Null values.

Table 6.4

- **Date format.**

In the table below, the value "1/1/01" is entered into the datasheet, and the following values are displayed as a result of the different assigned formats.

Date Format		
Format	**Display**	**Explanation**
dddd","mmmm d","yyyy	Monday, January 1, 2001	dddd, mmmm, and yyyy print the full day name, month name, and year
ddd","mmm ". " d", "'yy	Mon, Jan. 1, '01	ddd, mmm, and yy print the first three day letters, first three month letters, and last two year digits
"Today is " dddd	Today is Monday	
h:n:s: AM/PM	12:00:00 AM	"n" is used for minutes to avoid confusion with months

Table 6.5

- **Yes/No**

Fields are displayed as check boxes by default on the datasheet. To change the formatting of these fields, first click the Lookup tab and change the Display Control to a text box. Go back to the General tab choices to make formatting changes. The formatting is designated in three sections separated by semicolons. The first section does not contain anything but the semicolon must be included. The second section specifies formatting for Yes values and the third for No values.

Yes/No Format	
Format	**Explanation**
;"Yes"[green];"No"[red]	Prints "Yes" in green or "No" in red

Table 6.6

- **Default Value**

  There may be cases where the value of a field might usually be the same for all records. In this case, a changeable default value can be set to prevent typing the same value numerous times.

- **Indexes**

  Creating indexes allow Access to query and sort records faster. To set an indexed field, select a field that is commonly searched and change the Indexed property to *Yes* (*Duplicates OK*) if multiple entries of the same data value are allowed or *Yes* (*No Duplicates*) to prevent duplicates.

- **Field Validation Rules**

  Validation Rules specify criteria for the data entered in the worksheet. A customized message can be displayed to the user when data that violates the rule is entered. Click the expression builder ("...") button at the end of the Validation Rule box to write the validation rule. Examples of field validation rules include **<> 0** (not allow zero values in the record), and??? (only data strings with three characters in length).

- **Input Masks**

  An input mask controls the value of a record and sets it in a specific format. They are similar to the Format property, but instead display the format on the datasheet before the data is entered. For example, a telephone number field can be formatted with an input mask to accept ten digits in the form "(555) 123-4567". The blank field would look like (___) ___-____. An an input mask can be applied to a field by following these steps:

  - In design view, place the cursor in the field that the input mask will be applied to.
  - Click in the white space following **Input Mask** under the **General** tab.
  - Click the "..." button to use the wizard or enter the mask such as, (@@@) @@@-@@@@, into the field provided. The following symbols can be used to create an input mask from scratch:

Input Mask Symbols	
Symbol	**Explanation**
A	Letter or digit
0	A digit 0 through 9 without a + or - sign and with blanks displayed as zeros
9	Same as 0 with blanks displayed as spaces
#	Same as 9 with +/- signs
?	Letter
L	Letter A through Z
C or &	Character or space
<	Convert letters to lower case
>	Convert letters to upper case

Table 6.7

Primary Key

Every record in a table must have a primary key that differentiates it from all other record in the table. In some cases, it is only necessary to designate an existing field as the primary key if you are certain that every record in the table will have a different value for that particular field. A social security number is an example of a field whose values will only appear once in a database table.

Designate the primary key field by right-clicking on the record and selecting *Primary Key* from the shortcut menu or select *Edit\Primary Key* from the menu bar. The primary key field will be marked with a key image to the left. To remove a primary key, repeat one of these steps.

If none of the existing *fields* in the table produces unique values for every record, a separate field must be added. Ms.- Access will prompts you to create this type of field the first time you save the table if a primary key field has not been assigned. The field is named "ID" and the data type is "autonumber". Since this extra field serves no purpose to you as the user, the autonumber type automatically updates whenever a record is added so there is no extra work on your part. You may also choose to hide this column in the datasheet as explained at later stage in this book.

Creating database through using Wizard

The Access Table Wizard offers an easy way to create tables. Access includes numerous table templates that you can use to create both business and personal database tables. The Wizard can help you create common types of

tables, including those that store mailing lists, recipes, investments, video collection etc.

- *Click* on the *Table button* in the main database window.
- *Double-click* on the "*Create table by using wizard*" option. The table Wizard will appear.
- Next, choose the specific field for the table. *Click* on the *Business* or *Personal* option button. Sample business or personal table will appear in the *Sample Tables* scroll box.
- Scroll down the Sample Tables scroll box until you see the table you want to use. *Click* on this *Sample Table*. Sample field, based on the table you choose, will appear in the *Sample Fields* scroll box.
- *Click* on the Sample field from the *Sample Fields* scroll box that you want to include in your table. The field will be selected.

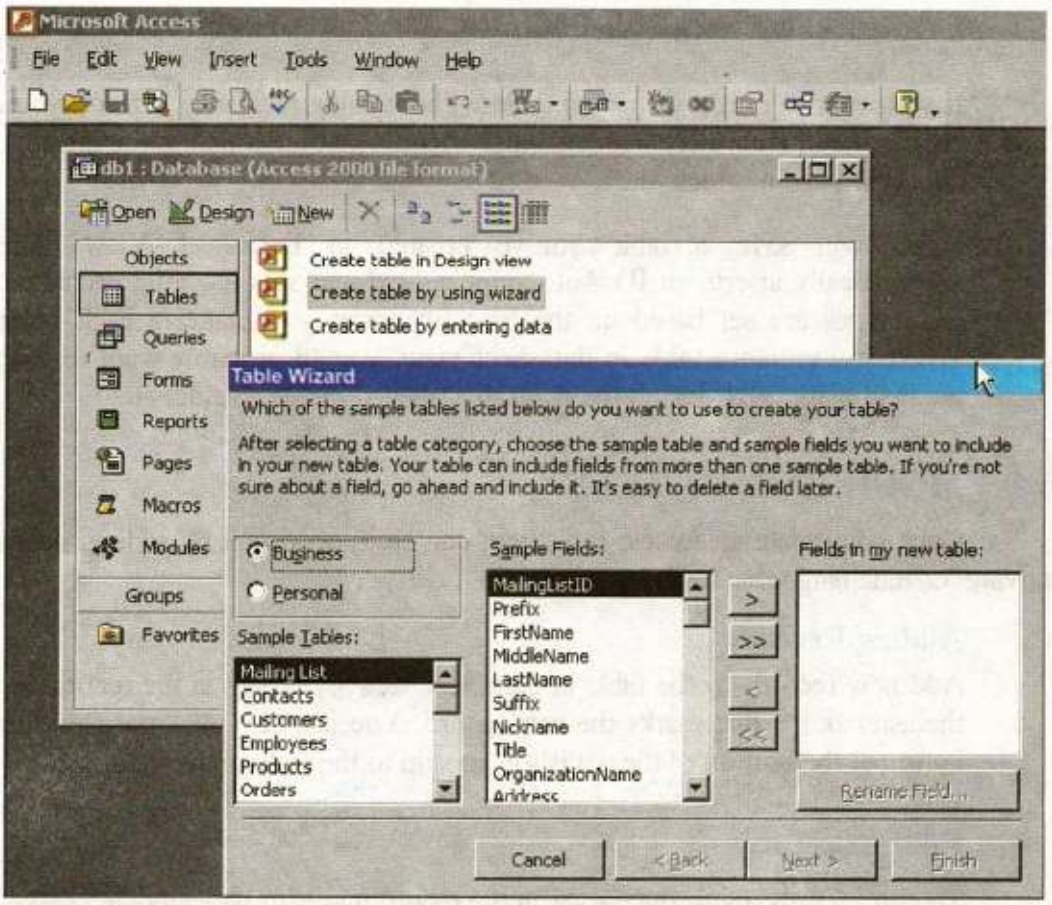


Fig. 6.7 Creating Database by using Wizard

- The sample field will move to the field, click on *right arrow button*  or click on the *right double-arrow button*  for all fields. You can easily to remove a single field by clicking on *left arrow button*  or click on double arrow button  for removing all fields. You can also rename a field after you move it to the Field in my new table scroll box.
- Enter a name for your table in text box. Set the *Primary Key*, it is an important concept in relational database.
- Click on Next if your new table isn't related to any existing tables. If you want to relate your new table to an existing one, Access can create the relationship for you.

Note: A table name can have up to 64 characters including letters, numbers, and spaces.

Create Table by entering data

If you want to create your own table without using the Table Wizard, you can create one in Datasheet View, then let Access analyse it and automatically sea data types and a primary key.

When you save a table you've created in Datasheet View, Access automatically inserts an ID AutoNumber field and sets it as the primary key. Data types are set based on the type of entries you make in each column. When you create a table in datasheet view, you 'll probably want to modify the field names. By default the fields are labelled Field1, Field2, etc.

6.4 MODIFYING A TABLE

Once you create an Access table, you can easily modify it by adding, deleting, moving, or renaming table fields.

Adding Records

Add new records to the table in datasheet view by typing in the record beside the asterisk (*) that marks the new record. You can also click the new record button at the bottom of the datasheet to skip to the last empty record.

Editing Records

To edit records, place the cursor in the record that is to be edited and make the necessary changes. Use the arrow keys to move through the record grid. The

previous, next, first, and last record buttons at the bottom of the datasheet are helpful in manoeuvring through the datasheet.

Deleting Records

Delete a record on a datasheet by placing the cursor in any field of the record row and *select Edit\Delete* Record *from the menu bar or click the* Delete Record *button on the datasheet toolbar.*

Inserting and Deleting Fields

Although it is best to add new fields (displayed as columns in the datasheet) in design view because more options are available, they can also be quickly added in datasheet view. Highlight a column by clicking its label at the top of the datasheet and select *Insert\Column* from the menu bar. The new column will be added to the left of the selected column.

Entire columns can be deleted by placing the cursor in the column and selecting *Edit\Delete Column* from the menu bar.

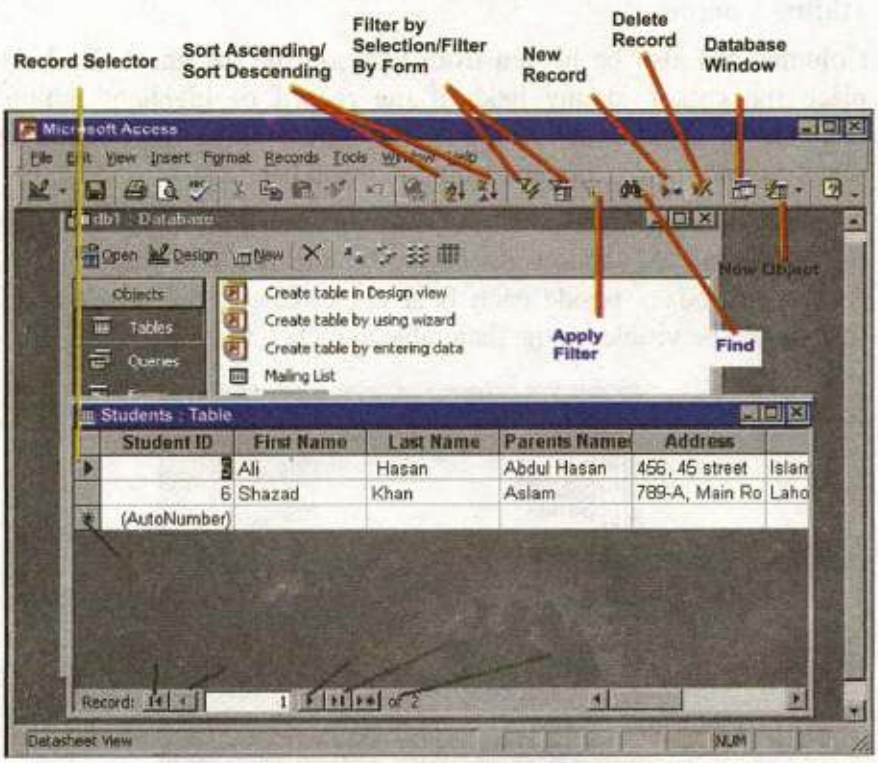


Fig.6.8 Defining the Datasheet View

Resizing Rows and Columns

The height of rows on a datasheet can be changed by dragging the grey sizing line between row labels up and down with the mouse. By changing the height of one row, the height of all rows in the datasheet will be changed to the new value.

Column width can be changed in a similar way by dragging the sizing line between columns. Double click on the line to have the column automatically fit to the longest value of the column. Unlike rows, columns on a datasheet can be of different widths. More exact values can be assigned by selecting *Format|Row Height* or *Format|Column Width* from the menu bar.

Freezing Columns

Similar to freezing panes in Excel, columns on an Access table can be frozen. This is helpful if the datasheet has many columns and relevant data would otherwise not appear on the screen at the same time. Freeze a column by placing the cursor in any record in the column and select *Format|Freeze* Columns from the menu bar. Select the same option to unfreeze a single column or select *Format|Unfreeze* All Columns.

Hiding Columns

Columns can also be hidden from view on the datasheet. To hide a column, place the cursor in any field of the record or highlight multiple adjacent columns by clicking and dragging the mouse along the column headers, and select *Format|Hide Columns* from the menu bar.

To show columns that have been hidden, select *Format|Unhide Columns* from the menu bar. A window displaying all the fields in the table will be listed with check boxes beside each field name. Check the boxes beside all fields that should be visible on the data table and click the *Close* button.

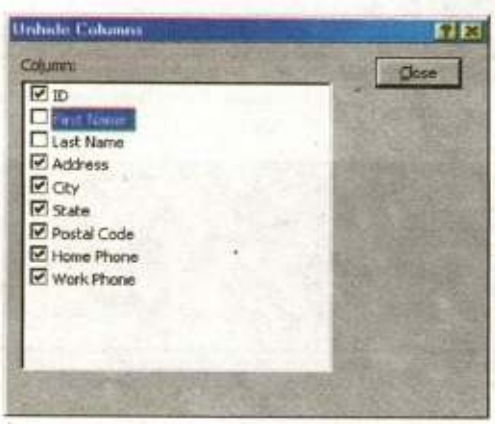


Fig.6.9 Shows the Hiding and Unhidden Columns

Finding Data in a Table

Data in a datasheet can be quickly located by using the *Find* command.

- Open the table in datasheet view.
- Place the cursor in any record in the field that you want to search and select *Edit|Find...* from the menu bar.
- Enter the value criteria in the *Find What*: box.
- From the *Look In*: drop-down menu, define the area of the search by selecting the entire table or just the field in the table you placed your cursor in during step 2.

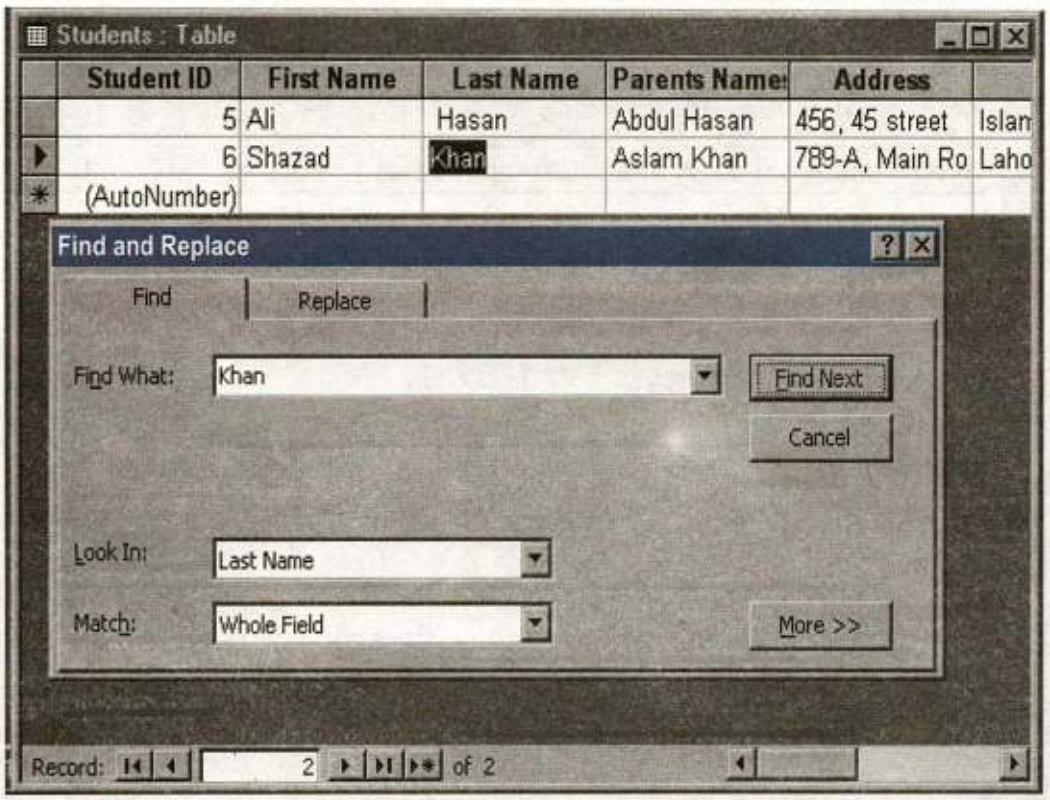


Fig.6.10 Finding Data in a Table

- Select the matching criteria from *Match*: and click the *More* >> button for additional search parameters.
- When all of the search criteria are set, click the *Find Next* button. If more than one records meet the criteria, keep clicking *Find Next* until you reach the desired record.

Replace

The replace function allows you to quickly replace a single occurrence of data with a new value or to replace all occurrences in the entire table.

- Select *Edit\Replace...* from the menu bar (or click the *Replace* tab if the Find window is already open).
- Follow the steps described in the Find procedure to search the data that should be replaced and type the new value of the data in the *Replace With:* box.

Click the *Find Next* button to step through occurrences of the data in the table and click the *Replace* button to make single replacements. Click *Replace All* to change all occurrences of the data in one step.

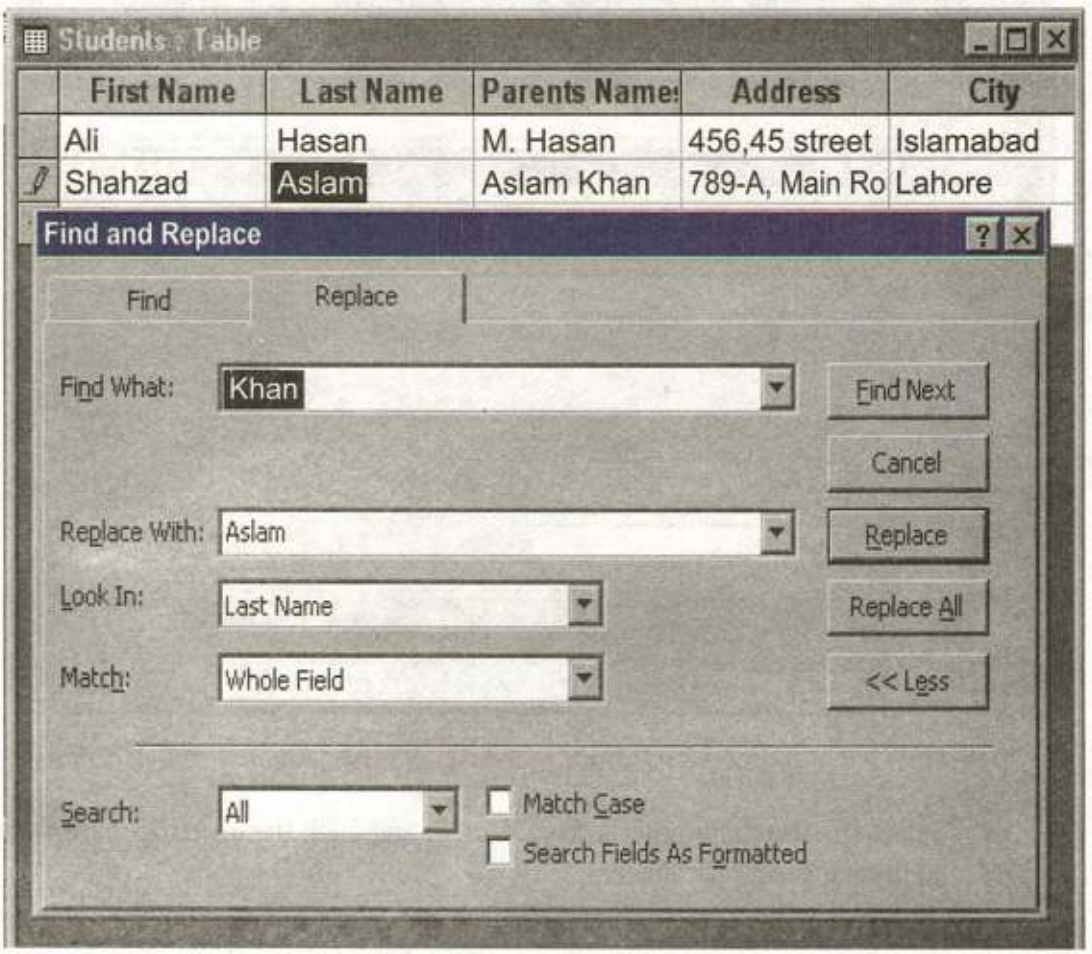


Fig.6.11 Replacing Data in a Table

Check Spelling and AutoCorrect

The spell checker can be used to locate spelling errors in text and menu fields in a datasheet. Select *Tools|Spelling* from the menu bar to activate the spell checker and make corrections just as you would use Word or Excel. The AutoCorrect feature can automatically correct common spelling errors such as two "initial capitals", capitalizing the first letter of the first word, and anything you define. Select *Tools|AutoCorrect* to set these features.

6.5 PRINT A DATASHEET

Datasheets can be printed by clicking the *Print* button on the toolbar or select *File|Print* to set more printing options.

6.6 TABLE RELATIONSHIPS

Relationships can be established among tables by repeating field in more than one table in this way duplication of information can be prevented in database. Follow the steps below to set up a relational database:

- Click the *Relationships* button on the toolbar.
- From the *Show Table* window (click the *Show Table* button on the toolbar to make it appear), double click in the names of the tables you would like to include in the relationships. When you have finished adding tables, click *Close*

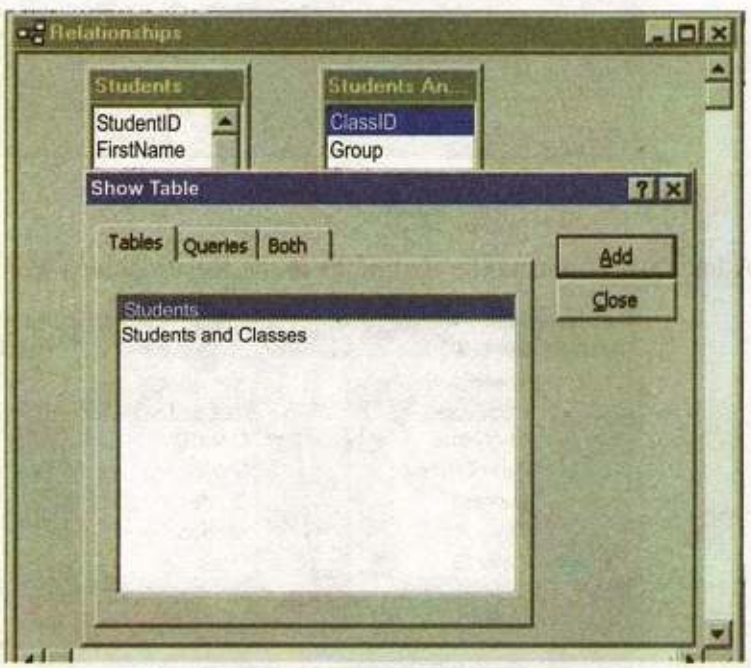


Fig.6.12 Relationship in Show Table

- To link fields in two different tables, click and drag a field from one table to the corresponding field in the other table and release the mouse button. The *Edit Relationships* window will appear. From this window, select different fields if necessary and select an option from "*Enforce Referential Integrity*" if necessary. These options give Access permission to automatically make changes to referencing tables if key records in one of the tables is deleted. Check the *Enforce Referential Integrity* box to ensure that the relationships are valid and that the data is not accidentally lost when a record is added, edited, or deleted. Click *Create* to create the link.

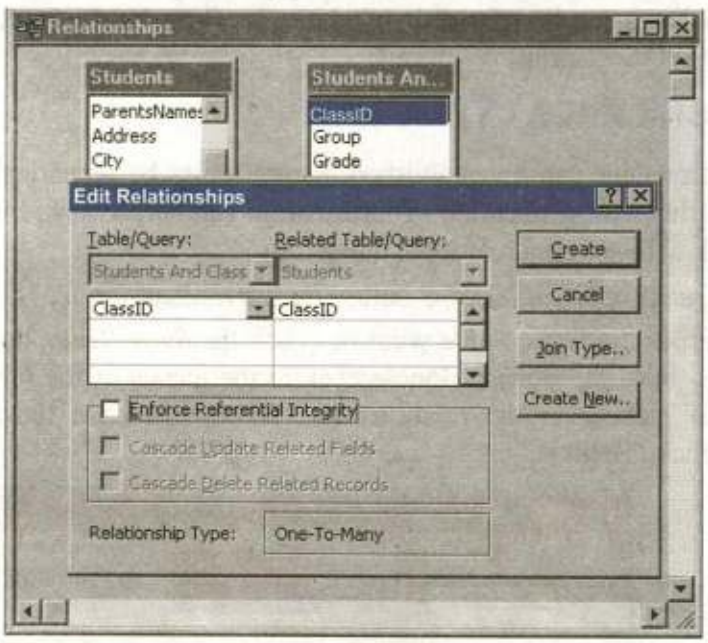


Fig.6.13 Edit Relationship Dialog Box to Define the Relationship between Student Table and Student and Classes.

- A line now connects the two fields in the Relationships window.

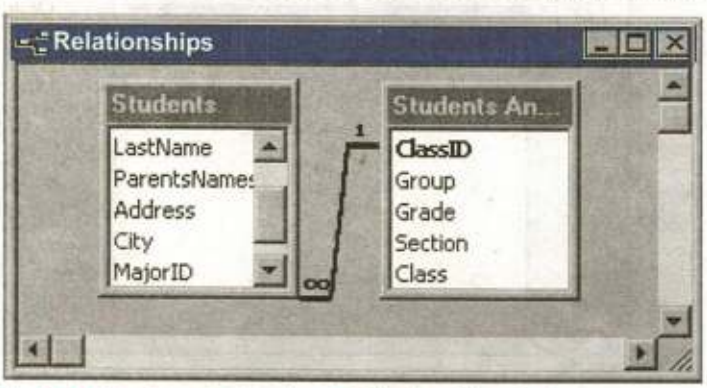
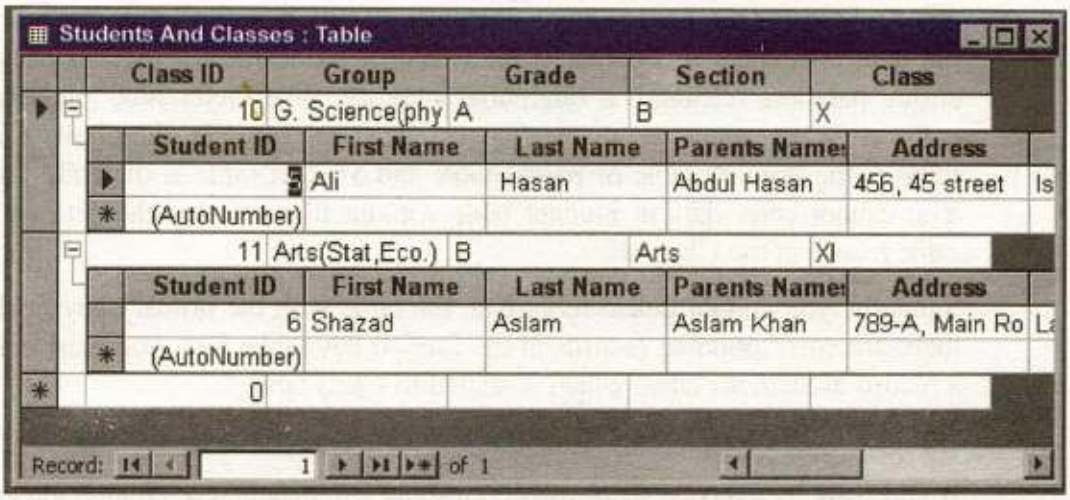


Fig.6.14 Showing the database's Relationship windows

The datasheet of a relational table will provide expand and collapse indicators to view subdatasheets containing matching information from the other table. In the example below, the *student* and *student and classes table* were related and the two can be shown simultaneously using the expand feature. To expand or collapse all subdatasheets at once, select *Format\Subdatasheet\Expand All* or *Collapse All* from the toolbar.


Students And Classes : Table

Class ID	Group	Grade	Section	Class
10	G. Science(phy	A	B	X

Student ID	First Name	Last Name	Parents Name:	Address	
5	Ali	Hasan	Abdul Hasan	456, 45 street	Is
(AutoNumber)					

Class ID	Group	Grade	Section	Class
11	Arts(Stat,Eco.)	B	Arts	XI

Student ID	First Name	Last Name	Parents Name:	Address	
6	Shazad	Aslam	Aslam Khan	789-A, Main Ro	La
(AutoNumber)					

0

Record: 1 of 1

Fig.6.15 Showing the relationship between Student table and Student and Classes table.

Relationship and Join

Relationships are really at the center of Relational Database Design for obvious reasons. While there are many benefits to have a relational database, there's also a requirement that you have an understanding of how database design – and relationships in particular – work.

Without a relational database structure, you've got a flat-file. A big block of data – similar to an Excel sheet. While in some cases this "relationship-less" database may be exactly what the Doctor ordered, as soon as you get a substantial amount of data, or throw even a slightly complicated piece of data into the equation, you're destined for a hard time. You simply cannot access the kinds of statistics in a flat-file that you normally would with relational database design, at least not with such ease as you normally would.

Joins are what make relationships work (don't use that line in a bar, you'll get slapped – nobody likes database humor). With something like a flat-file, none of this is a concern to you. Of course, that's not necessarily good because you're probably more concerned with having hundreds or thousands more

records than you actually need or can manage. When two tables start to make goo-goo eyes and you think they're ready for a relationship, it's time to make a join!

Referential Integrity

A referential Integrity constraint is a rule that maintains consistency among the rows of two tables. The rule states that if there is a foreign key in one relation, either each foreign key value must match a primary key value in the other relation or the foreign key value must be null. It is absolutely crucial that the data contained in a database file is reliable. One method Access uses to ensure database reliability is referential integrity. When referential integrity is enforced, you cannot delete or change related records. In the above *Class table* is the primary table or parent table and *Student table* is the child table. You cannot enter data in Student table without first entering the data of the same record in the *Class table*.

Similarly, you cannot delete records in the table with the primary key field, if there are corresponding records in the foreign key table. First you must delete a record in *Students* table, which is related to *Class* table.

Cascade Update Related Fields and Cascade Delete Related Fields

If you want to override these restrictions and still maintain referential integrity you can select the Cascade Update Related Fields and the Cascade Delete Related Records check boxes in Edit Relationship dialog box. If the Cascade Update Related Fields check box is selected, whenever you change the primary key of a record in the primary table, Access automatically updates the primary key to the new value in all related records. If the Cascade Delete Related Records check box is selected, whenever you delete records in the primary table, Access automatically delete related records in the related table.

6.7 SORTING AND FILTERING

Sorting and filtering allow you to view records in a table in a different way either by reordering all of the records in the table or view only those records in a table that meet certain criteria that you specify.

Sorting 

You may want to view records in a table in a different order than they appear such as sorting by date or in alphabetical order. Follow these steps to sort records in a table based on the values of one field:

- In table view, place the cursor in the column that you want to sort by.

- Select *Records|Sort|Sort Ascending* or *Records|Sort|Sort Descending* from the menu bar or click the *Sort Ascending* or *Sort Descending* buttons on the toolbar.

To sort by more than one column (such as sorting by date and then sorting records with the same date alphabetically), highlight the columns and select one of the sort methods stated above.

Filter by Selection

This feature will filter records that contain identical data values in a given field such as filtering out all of the records that have the value "Smith" in a name field. To Filter by Selection, place the cursor in the field that you want to filter the other records by and click the *Filter by Selection* button on the toolbar or select *Records|Filter|Filter By Selection* from the menu bar. In the figure, the cursor is placed in the City field of the second record that displays the value "Lahore" so the filtered table will show only the records where the city is Lahore.

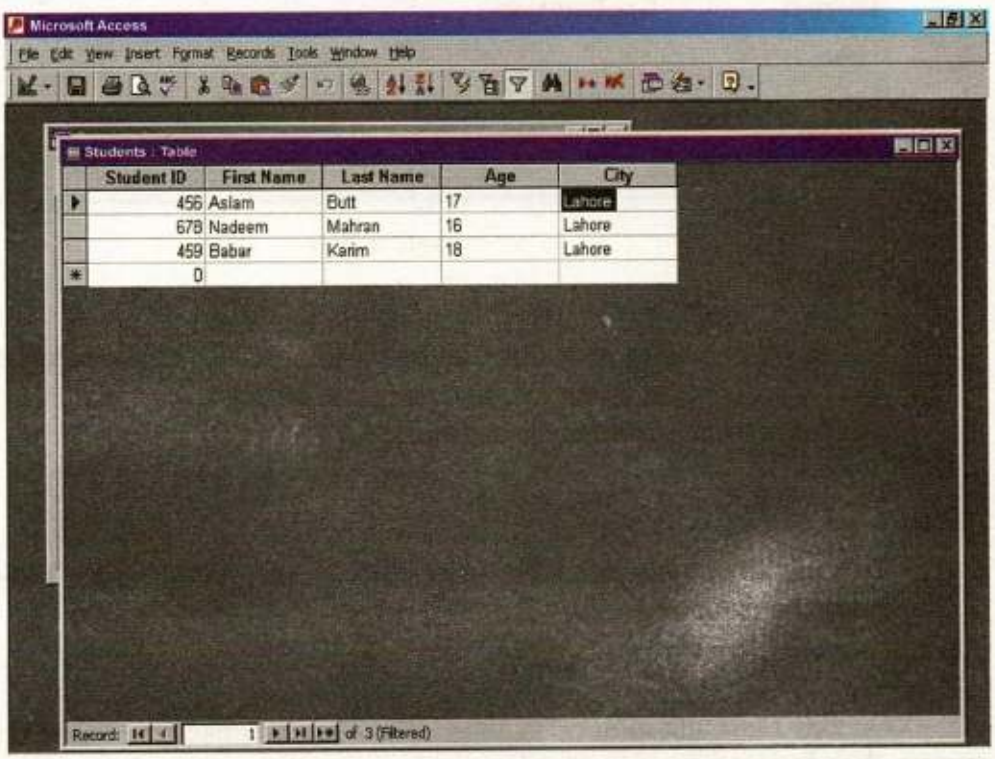


Fig.6.16 Filtering Data in table

Filter by Form 

If the table is large, it may be difficult to find the record that contains the value you would like to filter by so using Filter by Form may be advantageous instead. This method creates a blank version of the table with drop-down menus for each field each menu contains the values found in the records of that field. Under the default *Look for* tab of the Filter by Form window, click in the field to enter the filter criteria. To specify an alternate criteria if records contain one of two specified values, click the *Or* tab at the bottom of the window and select another criteria from the drop-down menu. More *Or* tabs will appear after one criteria is set to allow you to add more alternate criteria for the filter. After you have selected all of the criteria you want to filter, click the *Apply Filter* button  on the toolbar.

Following methods can be used to select records based on the record selected by that do not have exactly the same value. Type these formats into the field where the drop-down menu appears instead of selecting an absolute value.

Filter by Form	
Format	**Explanation**
Like "*Street"	Selects all records that end with "Street"
<="G"	Selects all records that begin with the letters A through G
>1/1/00	Selects all dates since 1/1/00
<> 0	Selects all records not equal to zero

Table 6.7

Saving A Filter

The filtered contents of a table can be saved as a query by selecting *File|Save As Query* from the menu bar. Enter a name for the query and click *OK*. The query is now saved within the database.

Remove a Filter 

To view all records in a table again, click the depressed **Apply Filter** toggle button on the toolbar.

6.8 INTRODUCTION TO QUERIES

Queries mean question or inquires. The questions like statements that are to retrieve data form one or more database tables are called queries. It is a powerful and flexible way of selecting, filtering and sorting records.

Queries select records from one or more tables in a database; these selected records can be viewed, analyzed, and sorted on a common datasheet. The resulting collection of records, called a *dynaset* (short for dynamic subset), is saved as a database object and can therefore be easily used in future.

The query will be updated whenever the original tables are updated. Types of queries are *select queries* that extract data from tables based on specified values, *find duplicate* queries that display records with duplicate values for one or more of the specified fields, and *find unmatched* queries display records from one table that do not have corresponding values in a second table.

Types of Queries

In general, there are five types of query: Select queries, Action queries, Crosstab queries, Parameter queries and SQL queries.

Select Queries

A select query gathers, collates and presents information in usable forms. It retrieves data from one or more tables and displays the results in a datasheet where you can update the records. You can also use a select query to group records and calculate sums, counts, averages, and other types of totals.

Action Queries

An action query makes changes in specified records of an existing table, or creates a new table. There are four types of action queries:

- **Delete Queries:**

  A delete query deletes a group of records from one or more tables.

- **Update Queries:**

  An update query makes changes to a group of records in one or more tables.

- **Append Queries:**

  An append query adds a group of records from one or more tables to the end of one or more tables.

Crosstabe Queries

There are crosstab queries to calculate and restructure data for easier analysis of your data. Crosstab queries calculate a sum, average, count, or other type of computation for data. These queries are grouped by two types of information one down the left side of the datasheet and another across the top.

Parametic Queries

A parameter query is a query that when run displays its own dialog box prompting you for information. Parameter queries are also used as the basis for forms and reports.

Create a Query in Design View

Follow these steps to create a query in Design View:

- From the Queries page on the Database Window, click the **New** button.

Fig.6.17 Creating a Query in Design View

- Select Design View and click **OK**.
- Select tables and existing queries from the **Tables** and **Queries** tabs and click the **Add** button to add each one to the new query.
- Click **Close** when all of the tables and queries have been selected.

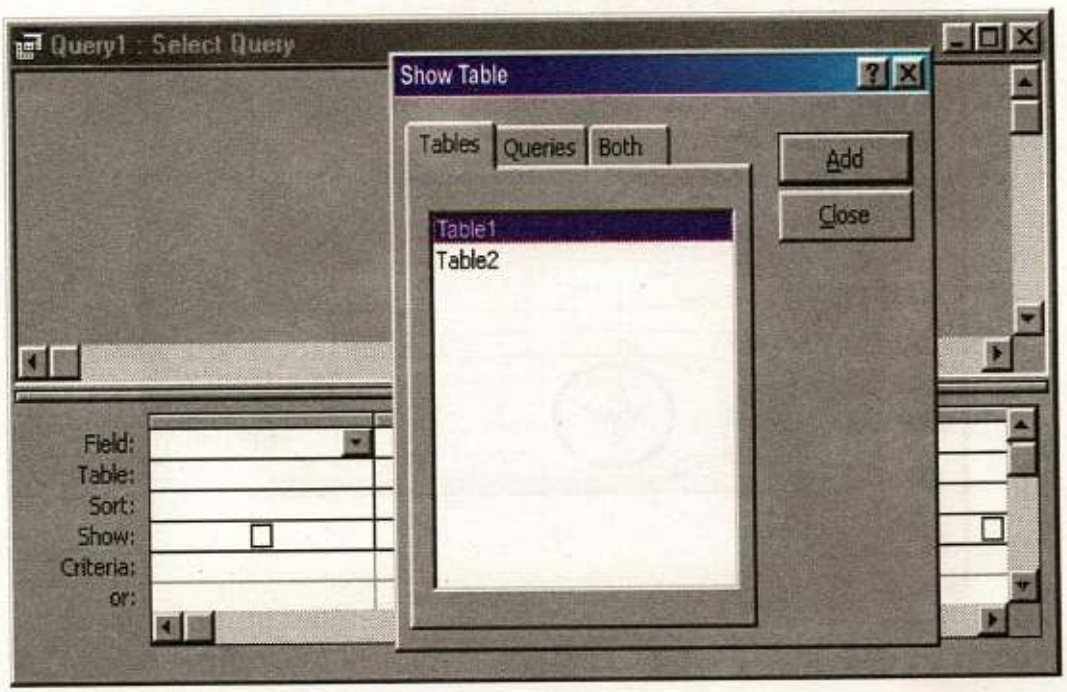


Fig.6.18. Add a Table to the Query in Design View

- Add fields from the tables to the new query by double-clicking the field name in the table boxes or selecting the field from the *Field*: and *Table*: drop-down menus on the query form. Specify sort orders if necessary.
- Enter the criteria for the query in the *Criteria*: field. The following table provides examples for some of the wildcard symbols and arithmetic operators that may be used. The *Expression Builder* can also be used to assist in writing the expressions.
- After you have selected all of the fields and tables, click the *Run* button on the toolbar.
- Save the query by clicking the *Save* button.

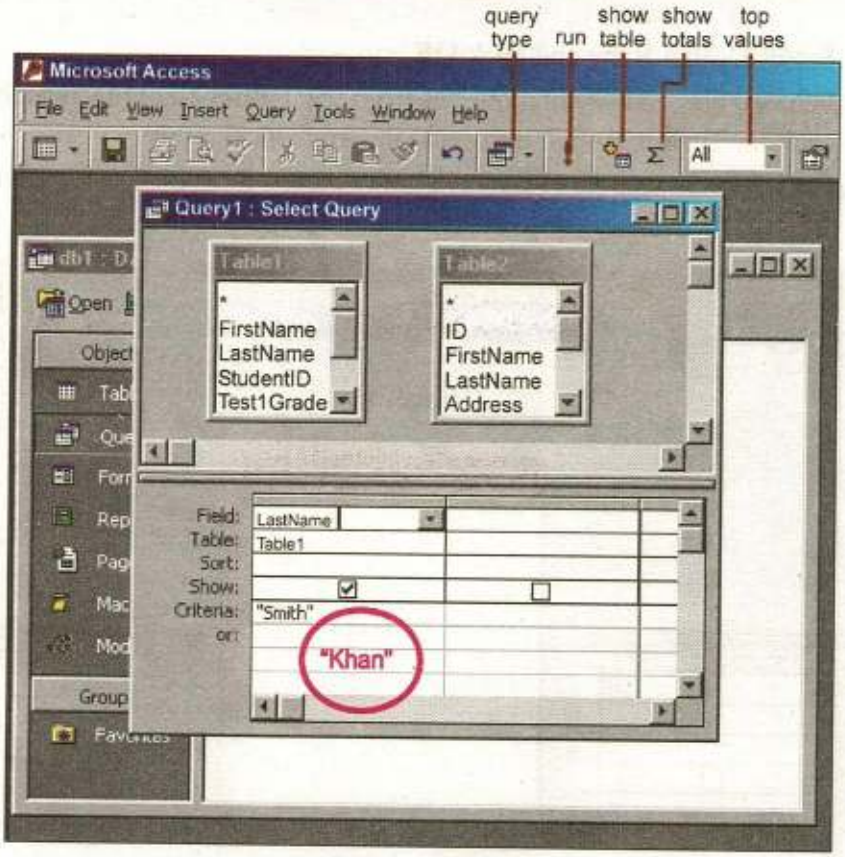


Fig.6.19 Specifying Criteria

Specifying Criteria

Once you've selected all your query fields, you can narrow your query to include only data that matches specific criteria. You may want to display only records with certain field values, for example. A query that display only employees in a certain state is an example of the use of criteria or indicate what values not to include.

Wildcards

Wildcards offer a way of setting criteria based on patterns or partial words rather than exact matches. For example, the criterion A* in a *First Name* field specify name beginning with the letter A, such as Ahmed Ali. The following are the most common wildcard operators:

Query Wildcards and Expression Operators	
Wildcard / Operator	**Explanation**
? Street	The question mark is a wildcard that takes the place of a single letter.
43th *	The asterisk is the wildcard that represents a number of characters.
<100	Value less than 100
>=1	Value greater than or equal to 1
<>"XI"	Not equal to (all classes besides XI)
Between 1 and 10	Numbers between 1 and 10
Is Null **Is Not Null**	Finds records with no value. or all records that have a value
Like "a*"	All words beginning with "a"
>0 And <=10	All numbers greater than 0 and less than 10
"Khan" Or "Ahmed"	Values are Khan or Ahmed

Table 6.8

Query Wizard

Ms-Access' Query Wizard will easily assist you to begin creating a select query.

- Click the *Create query by using wizard* icon in the database window to have Access step you through the process of creating a query.

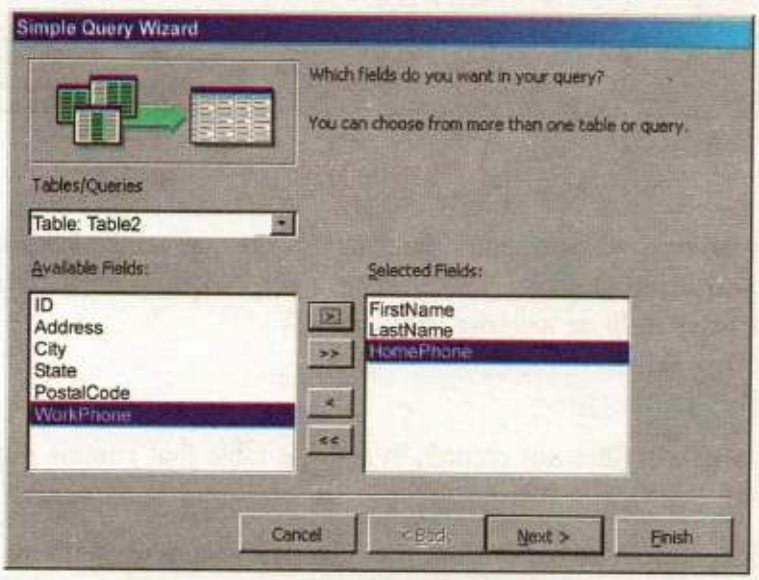


Fig.6.20 Creating query by using wizard

- From the first window, select fields that will be included in the query by first selecting the table from the drop-down *Tables/Queries* menu. Select the fields by clicking the > button to move the field from the Available Fields list to Selected Fields or Click the double arrow button >> to move all of the fields to Selected Fields. Select another table or query to choose from more fields and repeat the process of moving them to the Selected Fields box. Click *Next* > when all required fields have been selected.

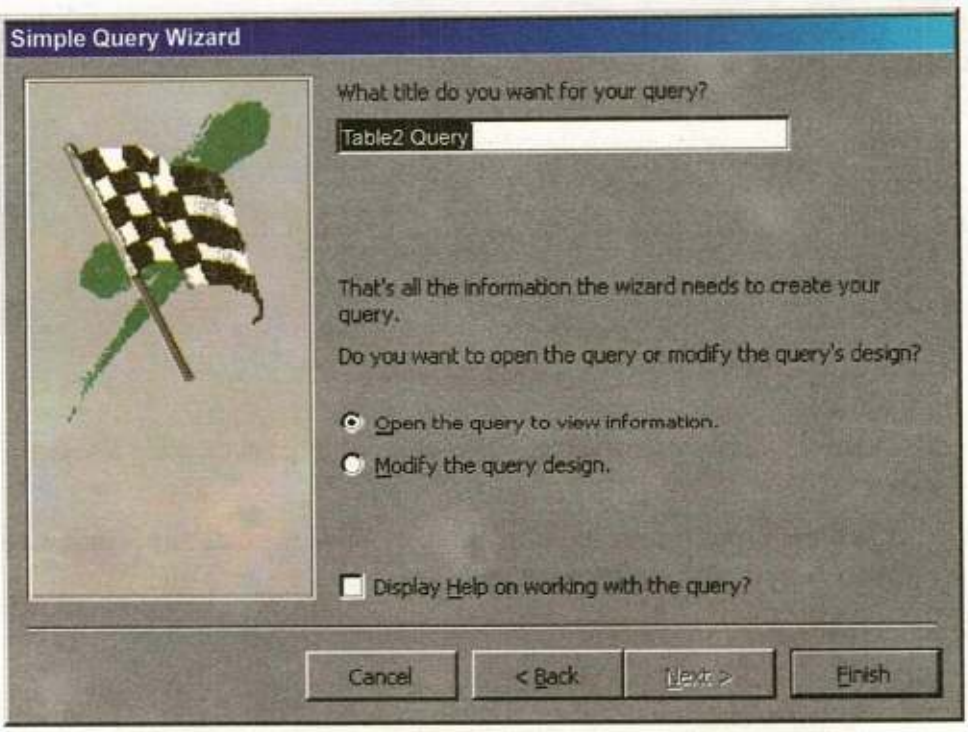


Fig.6.21 Finishing query wizard

- On the next window, enter the name for the query and click *Finish*.
- If you want to automatically open a help window click on check box of "*Display Help on working with query*?".

Find Duplicates Query

This query will filter out records in a single table that contain duplicate values in a field.

- Click the *New* button on the Queries database window, select *Find Duplicates Query Wizard* from the *New Query* window and click *OK*.

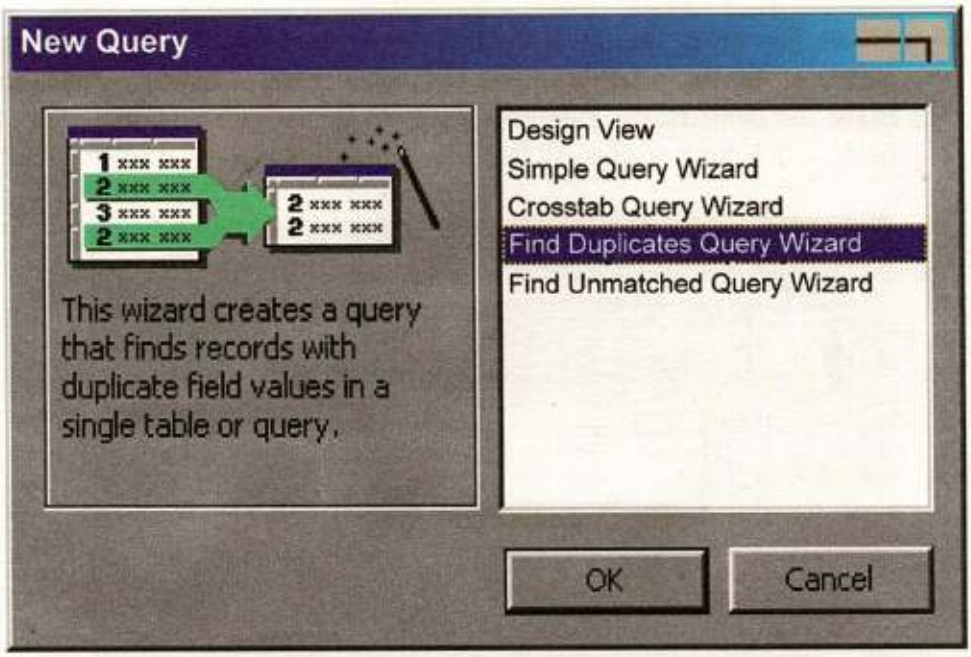


Fig. 6.22 Creating a Query that finds records with Duplicate Field

- Select the table or query that the find duplicates query will be applied to from the list provided and click *Next* >.

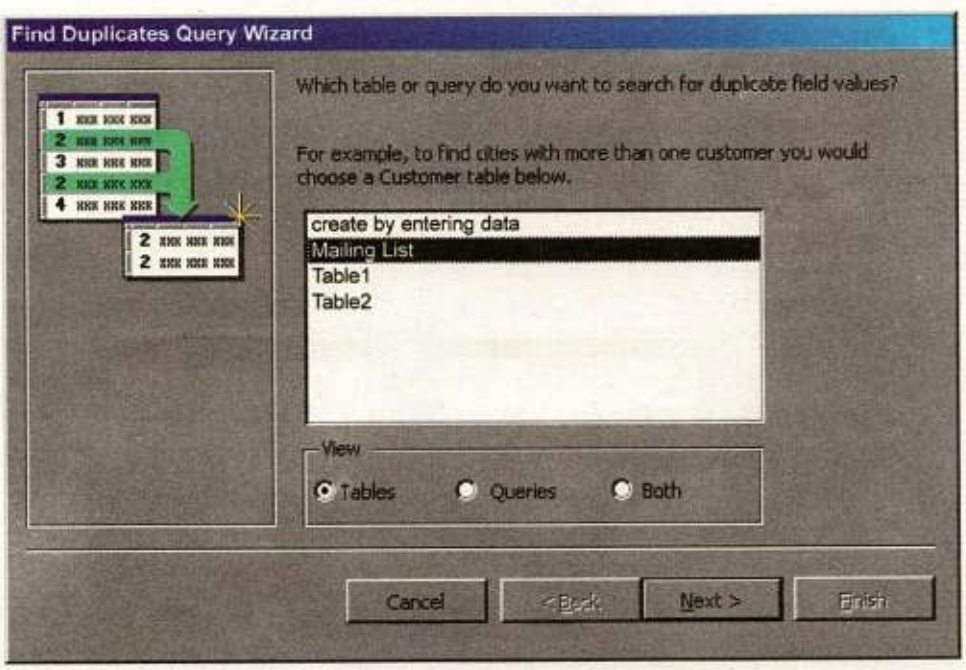


Fig.6.23 Defining Table or Query to find Duplicate Field Value.

- Select the fields that may contain duplicate values by highlighting the names in the Available fields list and clicking the > button to individually move the fields to the Duplicate-value fields list or >> to move all of the fields. Click **Next >** when all fields have been selected.

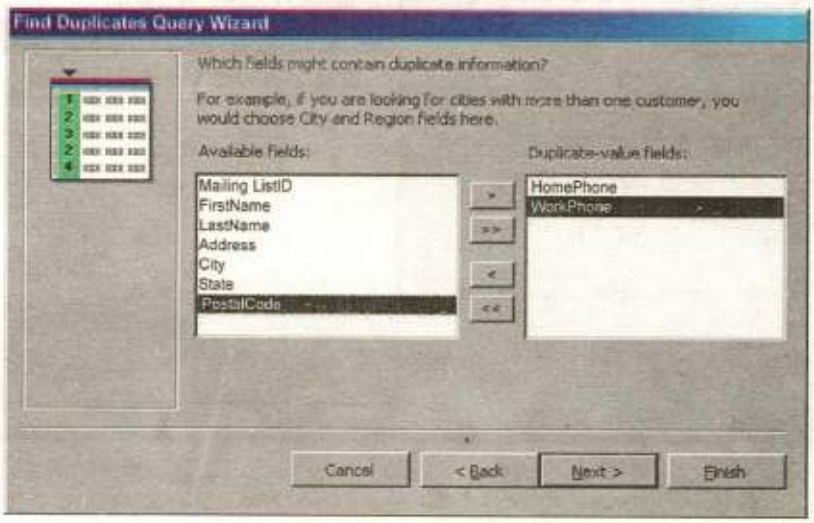


Fig.6.24 Definging Fields that have more than one Duplicate Information

- Select the fields that should appear in the new query along with the fields selected on the previous screen and click *Next* >.

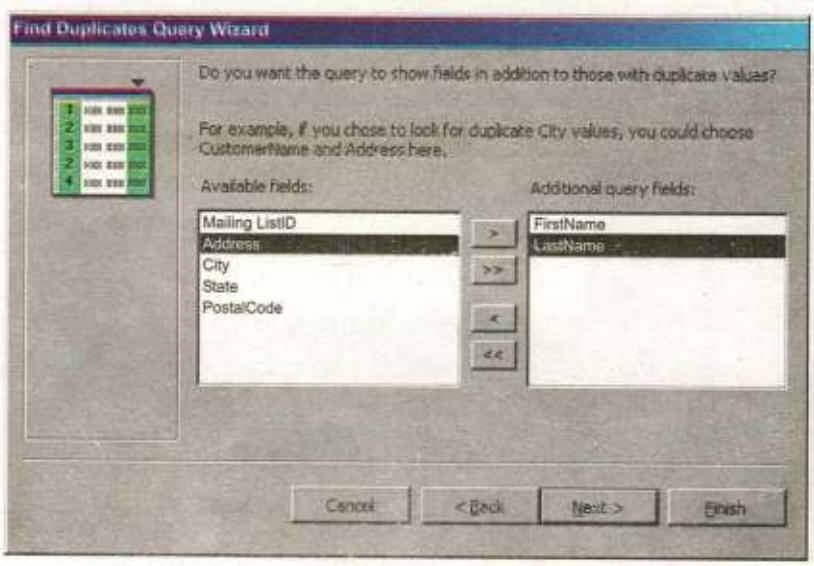


Fig.6.25 A Query to Show Fields for Duplicate Information.

- Name the new query and click *Finish*.

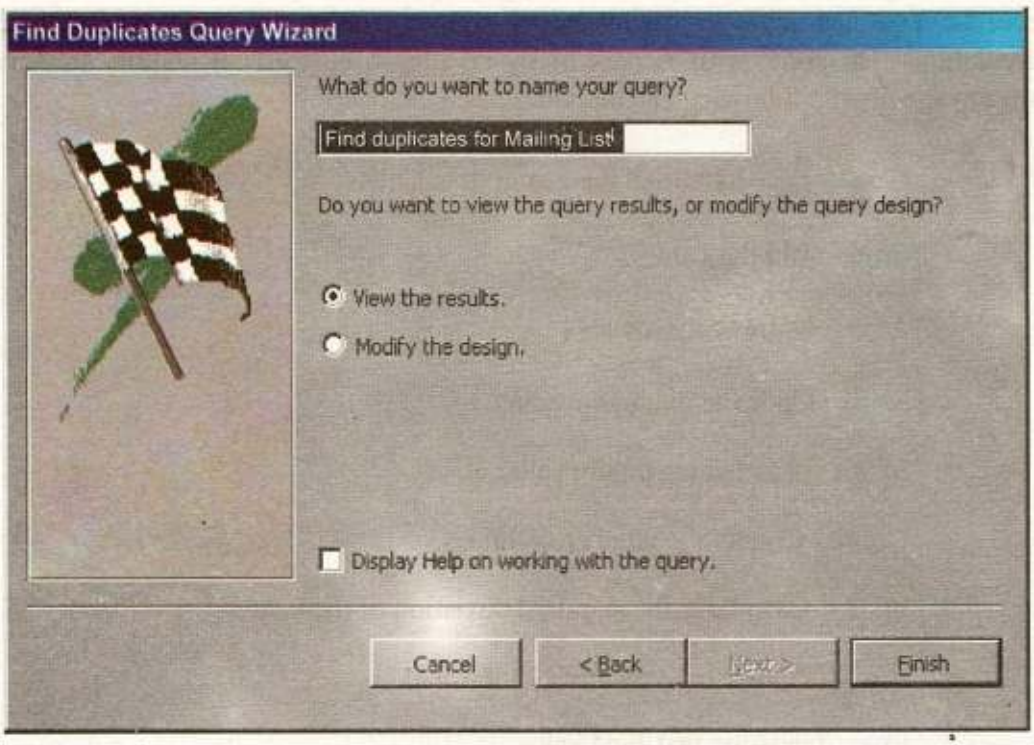


Fig.6.25 Finishing the Find Duplicate Query

Delete a table from the Query

- To delete a table from the query, click the table's title bar and press the **Delete** key on the keyboard.

Sorting Query Field

By default, query fields are not sorted. You can, however, sort any field in either ascending or descending order.

- Click on the *Sort row* in the field column you want to sort. A down arrow will appear to the right of the field.
- Click on the *down arrow*. A menu will appear.
- Click on *Ascending / Descending or not sorted* to sort in ascending/descending order or not sort the field.

6.9 PERFORMING CALCULATION IN A QUERY

Using a query is a convenient way to perform a calculation on a group of records. You can perform calculation in a query either by using the predefined calculations that come with Access or by creating a custom calculation. In Access, you can specify the following calculation types:

- **Group By:** Identified the group to calculate.
- **Sum:** Add the values.
- **Avg:** Average the values.
- **Min:** Finds the minimum value.
- **Max:** Finds the maximum value.
- **Count:** Counts the number of values.
- **StDev:** Calculates the standard deviation of the value.
- **Var:** Calculate the variance of the value.
- **First:** Finds the first field value.
- **Last:** Finds the last field value.
- **Expression:** Creates a calculate field through an expression.
- **Where:** Indicates criteria for a field not included in the query.

Exercise 6c

1. Fill in the blank

(i) The _____ is specified in table to avoid duplicate entries of records.

(ii) In Microsoft Access, the data of the table is displayed in _____ view.

(iii) In the relational model, _____ is the basic structure in which data is stored.

(iv) The _____ is a graphical representation of the structure of a database.

(v) The _____ button shows the current record in the table.

(vi) If the primary key is made up of a group of two or more fields, it is called _____.

(vii) _____ are special characters that are used in queries to specify the criteria.

(viii) In Microsoft Access, the output of a query is in the form of a _____.

(ix) A query that involves two tables is called _____.

(x) The wildcard character _____ is used to specify any number of characters.

(xi) The _____ data type is used when the field is to contain text consisting of about 300 characters.

(xii) The number of rows in a table of a relational database is called the _____ of the table.

(xiii) The number of columns in a table is called the _____ of the table.

(xiv) A query that only retrieve and displays data is called _____.

(xv) The wildcard character _____ is used to specify a single digit.

2. Select the correct option.

(i) The data in table is entered in:

a) Design View
b) Normal View
c) Datasheet View
d) Layout View

(ii) How many types of relationship?.

a) 2 b) 3 c) 4 d) 5

(iii) In a relational database, a single piece of information is called:

a) Field b) Record
c) Entity d) Attribute

(iv) The rule that a record from a table cannot be deleted if its associated record exits in a related table is called _____ rule.

a) Referential integrity
b) Entity – relationship
c) Normalization
d) All of them

(v) How many table views are available in Microsoft Access.

a) 4 b) 3 c) 2 d) 1

(vi) To find a four-character name that starts with H, the criteria is specified as.

a) H*4 b) H?4 c) H???? d) H####

(vii) Which of the following buttons of Find and Replace dialog box is clicked to start the search process?

a) Find b) Find Next c) Search d) Next

(viii) As in Design view, you can move from field to field in the Table window in Datasheet view using _____ button:

a) Tab b) Esc c) Enter d) Spacebar

(ix) The relationship between countries and their capitals is an example of _____ relationships.

a) one-to-one b) one-to-many

c) many-to-many d) None of them

(x) The wildcard _____ Sal[ei]ma.

a) Saleema b) Salima

c) both a and b d) None of them

3. Write T for true and F for false statement.

(i) If for each entity in B, and for each entity in B, there is only one related entity in A, then the relationship between the entities is one-to-many.

(ii) Date/Time data type is used when data such as data of birth or time of day is to be stored.

(iii) The primary key is assigned in a table to avoid duplicate entries of records.

(iv) An append query adds a group of records from one or more tables to the end of one or more tables.

(v) The currency data type cannot be used in calculations.

(vi) The most commonly used type of query is Scratch Query.

(vii) A query is used to extract specific information from a database.

(viii) The wildcard character "?" is used to specify any number of characters.

(ix) Fields are displayed as check boxes by default on the datasheet.

(x) An action query makes changes in specified records of an existing table, or creates a new table.

4. Define the different data types available in Microsoft Access.

6. Define the primary key.

7. What is Referential Integrity?

8. What are relationships?
9. How are relationship defined in Microsoft Access?
10. Explain the options in Find and Replace dialog box.
11. Differentiate between Relationship and Join.
12. Define different types calculation in a query and also specifies the some Functions.
13. What is query? Discuss its uses and advantages.
14. Explain the criteria in a query. How is it specified?
15. What is a join? Explain its purpose.
16. Differentiate between Sorting and Filtering.
17. What are wildcards?
18. Define the various types of queries.
19. How can you create a query in Design View?
20. Create a Query in Design View Create a Query in Design View.