

Introduction:

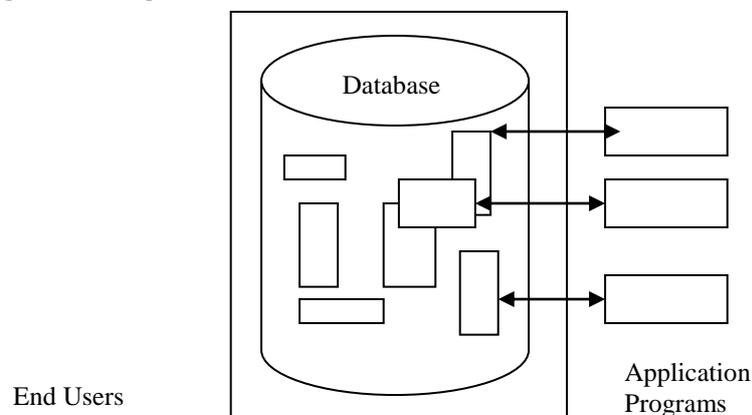
A data base refers to a collection of related data and a data base system is basically a computer based record keeping system. A database contains information about one particular enterprise. It maintains any information that may be necessary to the decision making process involved in the management of the organization.

Database Functioning:

In a typical file-processing system, permanent records are stored in various files. A number of different application programs are written to extract records from and add records to the appropriate files. But this scheme has a number of major limitations and disadvantages, such as data redundancy (duplication of data), inconsistency, unsharable data unstandardized data, insecure data, incorrect data etc. A database management system is answer to all these problems as it provides a centralized control of the data.

How Database Works:

The database systems do not maintain separate copies of the same data. Rather, all the data are kept at one place and all the application that require data refer to the centrally maintained database (collection of data). Now, if any change is to be made to data, it will be made at just one place and the same changed information will be available to all the applications referring to it.

Data Management System**Advantage of database****1. Database reduce the data redundancy to a large extend**

Data redundancy means duplication of data. Non-database systems maintain separate copy of data for each application.

DBMS store all data to at one place and all the application program that require this data can refer to the same central place. This centralization makes sure, that data remain consistent and secure.

2. Database can control data consistency to a large extent

This is really a corollary of the previous point. When the redundancy not controlled, there may be occasions on which the two entries about the same data do not agree. At such times, database is said to be inconsistent. Obviously, an inconsistent database will provide incorrect or conflicting information.

By controlling redundancy, the inconsistency is also controlled.

Multiple mismatching copies of same data are known as data inconsistency.

3. Database facilitates sharing of data

Sharing of data means that individual piece of data in the database may be shared among several different users, in the sense that each of those users may have access to the same piece of data and each of them may use it for different purposes. The database management system makes that not only the existing applications can share the data in the database, but also that new applications can be developed to operate against that same stored data.

4. Database enforce standards

The standard management systems can ensure that all the data follow the applicable standards. Standardizing stored data formats is particularly desirable as an aid to data interchange or migration between systems.

5. Database can ensure data security

A database management system ensure data and privacy by ensuring that the only means of access is the database is through the proper channel and also by carrying out authorization checks whenever access to sensitive data is attempted.

Flat vs. Relational Database

When all the data is stored in one file then such a data is called flat database. A spreadsheet is an example of flat database. When the data is stored in multiple tables that are linked via common fields, then such a database is called Relational database. Microsoft Access is an example of Relational database.

Microsoft Access- A Powerful DBMS:

Microsoft Access is a popular RDBMS (Relational Database management system- a system that manages data in terms of special tables called relations) lets you manage your database by offering a variety of features. Using Microsoft access you can manage all your information from a single data base file.

Database files in MS Access are stored with extension .mdb which expends to Microsoft database. Within the file, you can divide your data into separate storage containers called tables; view, add, and update table data by using on line forms; find and retrieve just the data you want by using queries; and analyze or print data in a specific layout by using reports.

1. Tables

To store your data we can create a platform which is tabular in format and has rows and columns. This is called as a table. A table is needed for each type of information that you track.

Components of table

Byte	A byte is a group of eight bits and is used to store a character.
Data item	A data item is the smallest unit of named data. It may consist of any number of bits or bytes. A data item represents one type of information and often referred to as a field or data element.
Record	A record is a named collection of data items which represents a complete unit of information.
Table	A table is a named collection of all occurrences of a given type of logical record.

Fields are the columns containing one type of information.

Records are the rows representing one complete unit of information. A logical record contains of all the fields.

Table is a group of all the logically related records.

Salesman No.	First Name	Last Name	Sales Made	Target
EA-01	VINEET	ARORA	25000	29000
EA-05	SUNITA	LUNA	16000	20000
EA-12	KAPIL	KUMAR	23000	21000
NO-10	BHUPESH	ARORA	15000	15000
NO-11	SHILPI	SINGH	18000	16000

See primary key field has unique value for each row

In a table, each record is identified with a unique value i.e., in a field of table, there are unique values for all records. This unique value identified the record. For instance in fig. 4.3, the field salesman number has unique values for all the records. So salesman number is the primary key here.

2. Queries

To find and retrieve just the data that meets conditions that you specify, including data from multiple tables, you may create a query. A query can also update or delete multiple records at the same time and perform predefined or custom calculations on your data.

3. Forms

To easily view, enter, and change data in a table, you can create a form when you open a form, ms access retrieves the data form one or more tables, and displays it on the screen with the layout specified by you.

4. Reports

To analyze your data or present it in a certain way in print, you can create a report. For example, you might print one report that groups data and calculates totals, and another report with different data formatted for printing mailing labels

Step in designing a database

While designing a database, you should follow a general procedure describe in the form of the following steps:

1. Determine the purpose of your database

The first step in designing a database is to determine its purpose and how its to be used.

2. Determine the tables you need

Determine the tables can be the trickiest step in the database designing process. That's because the result you want from your database-the reports you want to print, the forms you want to use, the questions you want answer-don't necessarily provide clues about the structure of the tables that produce them.

- ❖ A table should not be containing duplicate information, and information should not be duplicated between tables. In this respect, a table in a relational database differs from a table in a flat file application (flat database such as a spreadsheet.)

- ❖ Each table should be containing information about one subject. When each table contains facts about only one subject, you can maintain information about each subject independently from other subjects.

3. Determine the fields you need

Each table contains information about the same subject, and each field in a table contains individual facts about the table's subject. When sketching out the fields for each table, keep these tips in mind:

Relate each field directly to the subject of the table.

- ❖ Don't include derived or calculated data.
- ❖ Include all the information you need.
- ❖ Store information in its smallest logical parts.

4. Identify the field or fields with unique values in each record

In order of Microsoft access to connect information stored in separate tables-for example, to connect a customer with all the customers' orders each table in your database must include a field or set of fields that unique identifies each individual record in the table. Such a field or set of fields is called a primary key.

5. Determine the relationship between tables

A way to tell Microsoft Access, as to how to bring related information together in meaningful ways is to setup relationships among tables. The relationships can be set on the basis of common fields in tables.

6. Refine your design

After you have designed the tables, field, and relationships you need, its time to study the design and detect any flaws that might remain. It is easier to change database design now than it will be after you have filled the tables with data.

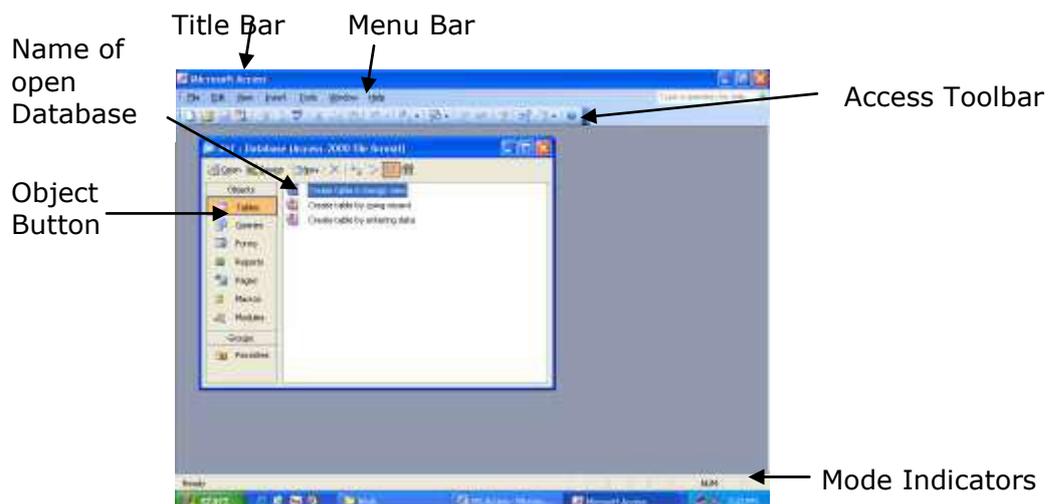
7. Enter data and create other database objects

When you are satisfied that the table structures meet the design principles described here, then its time to go ahead and add all your existing data to the tables. You can then create any queries, forms, reports and access pages that you may want.

Starting MS-Access

TO start MS-Access you may follow these steps:

- I. Click at Start button.
- II. From the start → All Programs menu, click at Microsoft Access
- III. And it will open the MS-Access window



MS-Access windows components

- I. **Title bar:** This is top most bar that displays the title.
- II. **Menu bar:** This bar, which is bellow title bar, displays various menu options of MS-Access.
- III. **Access Toolbar:** This is bar bellow menu bar. This toolbar offers tools for performing various standers functions.
- IV. **Database Window:** When a database is opened, all its components are displayed in a separate sub-window of MS-Access window called database window.
- V. **Object Button:** When a database is open, it displays various database objects like Tables, Queries, Forms, Reports etc.
- VI. **Status bar:** This bar is located on the lower right corner of MS-Access and this reports all the progress of database processing.
- VII. **Mode Indications:** These are located on lower right corner of MS-Access window and tell about various modes under which database processing is taking place.

Creating MS-Access Database

When MS-Access starts, it offers you option to either create a database or open an existing database. For creating a database MS-Access offers these two methods:

- I. Create blank database (and then create table forms, Queries etc. in it).
- II. Create database using wizard.

Before creating blank database from scratch, it's better to learn about creating database through wizard.

Creating Database using wizard

To create database using wizard you may follow these steps:

- I. **Select option to database creation through wizards.** Firstly, you need to select the option **Access Wizard, Pages and projects** form the opening dialog that appears when you start MS-Access and then click at **OK** button, (Alternatively, you can first click command **File → New** and then from new dialog box, select the desire wizard as explained in the next step).
- II. **Select the Desire database Wizard.** Once you click **OK** button, MS-Access opens New dialog box's **Databases** tab, select the desire wizard and click **OK**. [For instance, we wanted to create a database for inventory management; therefore, we selected **Inventory Control** Wizard.
- III. **Specify the Database Name.** Once you click **OK, File New Database** dialog open up, that asks you to specify the name for new database being created. Once you have specified the name for new database, click at **Create** button.
- IV. **Database Wizard Starts.** Now you will be taken to newly created database window where you are supported to created tables, forms etc. The Database wizard will guide and help you in doing so. Step by step, the Database wizard will take information from you. Click at Next button to move to next step. Finally you will get a display like below.

Designing Tables

After creating the blank database, you need to create tables in it. A table can be created in following three ways.

- Create table in design view
- Create table through wizard
- Create table by entering data

Deciding Tables contents and Properties

Before you create your tables, you need to design it property. You must decide about number of fields required, field's names, their field types, their size and other properties and the Primary Key.

Field Name:

Field name is the label that tells what type of information is being stored in this field e.g. field name **Age** gives you an idea that this field store the ages of some persons.

Field Type or Data Type:

Field within a table can hold various types of data. The field type dictates what sort of data can be stored within the field.

In Access following Data Types exist:

- a) **Text.** Text is the default field type applied when you create a new field. Text fields can contain up to 255 characters. This size can be set by using the field size property.
- b) **Memo.** Memo fields can store up to 64,000 characters. They are used for storing large information about field.
- c) **Number.** Various type of number can be stored and these can be selected using the **Field Size** property.
- d) **Date/Time.** This field type stores date and time values. Various format can be defined for dates and times.
- e) **Currency.** Currency fields were a new addition with Access 97. They are accurate to 15 digits on the left side of the decimal point and four digits on the right.
- f) **Counter/AutoNumber.** A number (long) which is automatically incremented by Access whenever a new record is added. They are usually a table's Primary Key.
- g) **Yes/No.** Only Yes or No values can be entered. These fields cannot be indexed.
- h) **OLE Object.** OLE Object fields can be used to stored object such as a Microsoft Excel spreadsheet or a Microsoft Draw graphic that is created by an object application. The maximum size is above 1gigabite. OLE Object fields can't be indexed.
- i) **Lookup Wizard.** A Lookup Wizard field, create a fields that allows you to choose a value using a combo box. Choosing this option in the Data type list starts the Lookup Wizard to define the data type.

- j) **Hyperlink.** Hyperlink field are only available in MS-Access. A hyperlink address can have up to three parts:
- Display Text – The text that appears in a field of control.
 - Address – The path to a file or page (URL).
 - Sub address – A location within the file or pages.

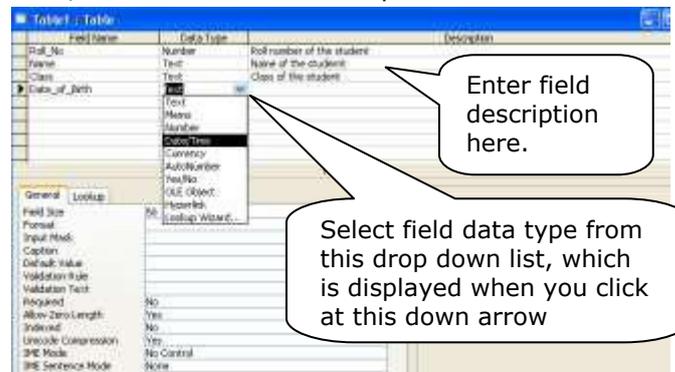


Primary Key

In a table, there must be field or group of fields, whose values are unique for record. Such a field or group of field can be declared as the Primary Key.

Creating Tables

Now that you have learnt the table design basics, you are ready to create tables. Remember tables are always created inside a database. Therefore, in order to create table you must have its present database open.



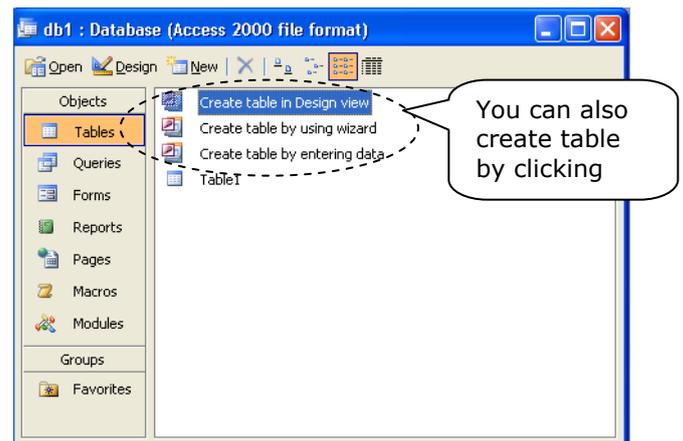
To Create a Table in Design View:

1. In the Database window, click the **Tables** tab.
2. Click the **New** button on the Database window toolbar.
3. Click the **New Table** dialog box, select **Design View**.
4. Click **OK**
5. Enter the field names and select a data type for each View.
6. Add a description if you want.

Saving a Table

After you create a table, you must save it. To do this:

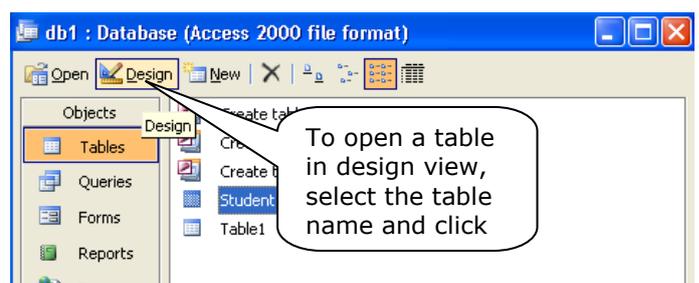
1. From the **File** menu, Choose **Save**.
Press Ctrl+S Or
Click the **Save** button on the Accss toolbar.
2. In the **Save As** dialog box, enter a name for the new table.
3. Click **Ok**
The new table is added to the list of tables in the Database Window.



Adding a Field to the Table in Design View

To add a field to a table in design view, follow these steps:

1. On the **Tables** tab of the Database window choose a table and click the Design button.
2. In the **Table** window, click a blank row in the **Field Name** column.



3. Enter a field name and press the Tab Key to move to the next column.
4. Choose a data type from the drop-down list in the **Data Type** column
5. Press the Tab key to move to next column and enter a description for the field in the **Description** column
6. Save the Changes to the table design by clicking Save icons () on the toolbar.

If a table is already open for data entry and editing you can click the **Design View** button on the Access toolbar to switch to design view.

To move a field up or down, click once in the field's far left column i.e. row selector button and then click again and draw the field.

Inserting/Deleting Fields

To insert a field between two other fields in the list, click the name of the field the should be just below the new field and then click the

Insert Row button Click a row and then click the Delete. Row button to delete a field.

Entering a Caption and Default value for a Field

A caption appears at the top of the field in the table and next to the field on a form. For Example, next to the field name "fname" in which you enter some one's first name, you can create a caption that reads "First Name". Entering a default entry allows you to set a value for a field that the user can still override. For Example, you can set the default value for a Yes/No field to Yes.

To enter a caption and default value, follow these steps:

1. On the **Tables** tab of the Database window, choose a table and click the **Design** button.
Or
If the table is already open, click the **Design View** button.
2. In the table design window, click the name of the field to format.
3. Click the Caption box and enter the text that will be used to label the field on the form
4. Click the default value box and then enter the default value.
5. Save the changes to the table design you know how?

Setting field properties: Size, Format etc

If the field data type is text, you can set the number of characters allowed and specify formatting rules. If the field data type is a numeric value, you can choose the range of numbers to be accepted and the number of decimal places to be stored. To set the field properties:

1. On the table tab of the database window, choose a table click the design button.
2. In the table window, click the name of the field to format.
3. click the field size text box and then enter a number if the field is text, or choose from the drop down list of options if the field is numeric or some

other data type for the number field size options the field size option for various field types have been discussed under section.

Number Filed size options

Number Type	Filed size option
Integer	Accept number from -32768 to 32768 occupies 2 bytes.
Long	Accept number from -2147483648 to 2147483648 Occupies 4 bytes.
Single	Store numbers with 6 digits of precision from -3402823E38 to 3402823E38. Occupies 4 bytes.
Double	Store number with 10 digits of precision from -1.7976931348623E308 to 1.7976931348623E308. Occupies 8 bytes.

4. Click the format box and then, if the field is a text, enter one of symbols as shown in table, the format options for various field types have already been discussed.

Symbol	Result
@	A text character is required in the field
&	A text character is not required
<	All characters entered will become lowercase
>	All characters entered will become uppercase.

5. Save to the changes to the table design.

Viewing table

You can view a table by double clicking upon its name in the data base window. A table can be viewed in two different views.

Tables have two views; design view and datasheet view. Design view is used to create and modify the structure of a table. Datasheet view is used to view, Add, delete, and edit data in a table.

To switch between table views

Click the view button on the toolbar

The view button is a toggle button. When your table is displayed in datasheet view, only the button to switch to design view is displayed, and vice versa.

The view button on toolbar van either look like () or () depending upon the current view of the table. If the current view is design view then the toolbar view button will show database view button and vice versa.

Setting or changing Primary key

1. Open a table in design view.
2. Select the field or fields you want to define as the primary key.
To select one field, click the row selector for the desired field
To select multiple fields, hold down the CTRL key and then click the row selector for each field.
3. Click the primary key on the toolbar

You can specify a primary key for a field that already contains data, but Microsoft access generates a message when you save the table if it finds duplicate values or **Null** values in the field. If you encounter this message, you have three choices: Use a Find Duplicates query to locate record with duplicate values or Null values and then edit the field to remove them; Choose a Different Field; or Add an AutoNumber field and set it as the primary key.

Entering Data In A Table

To fill a table with data, you enter the data record by record. To complete each record, you enter information into the fields of the record. You can enter the data directly in to the rows and columns of the table.

To enter data in a table:

1. Click the tables tab in the database window.
2. To open a table, double click its table name or select the table to add to and click open.
3. Click the New Record button () on the Access toolbar to add a new record or you can just start typing in the last empty row, where mark is shown in its row selector.
4. Enter data in the first field and then press Tab to move to the next field.
5. If the field shows an arrow button, you can click the button to display the list and then select an entry in the list.
6. Press Tab after the last field in the record to move to the start of a new record. The record you have completed is saved automatically.

Editing Data In Table

You can easily change the information in any field of any record.

To Edit data in a table:

1. After opening the table in datasheet view, click any field in the table to position an insertion point in the field Or double click any word or number in a field to select it.
2. Make changes in data or type new data.

Opening an existing database

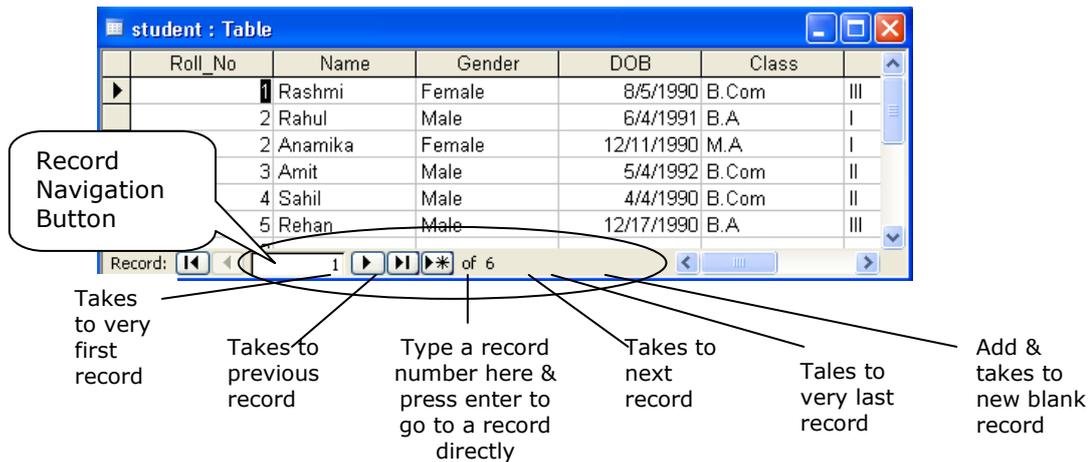
To open an already existing database, you can either select the option open an existing file from the opening dialog box when access start, and then double click upon the desired database name.

Alternatively, you can click open () icon on the database toolbar and then select desired database name by double clicking it from open dialog box. Or you can even click file- open command in place of open icon.

Navigating in table

When you are working with tables, you may need to enter new records, go to specific records, and delete particular records, and so on. To navigate in a table, you can use record navigation buttons as illustrated in fig. 5.21.

The record navigation buttons are available when you open a table in data sheet view. With navigation buttons, you can go to very fast or very last record on the table, next or previous record and even a specific record.



Data Validation In Ms-Access

Data validation can be performed at various levels in MS-Access. However, we shall be limited only to field level validation validates the data being entered in an individual field and the record level validation validates the data of more than one field w.r.t. to one another so as to ensure correct data. For example, in a table, the joining-data and Retirement data of an employee cannot be same and also Retirement date cannot be less then joining Date. Such a validation is known as record level validation. Before discussing the record level validation, let us first discuss the field level validation techniques.

Field Level Validation

As you know that field level validation ensures valid data in a single field.

At field level, following validation techniques may be used:

- (i) Input Mask
- (ii) Validation Rule & Text
- (iii) Default Values
- (iv) Allow Zero Length
- (v) Required
- (vi) Lookup Values

These validation techniques can be applied to individual fields through their field properties that are accessible in **Design View**. Let us learn about these techniques one by one. Later we'll learn to use them in a table.

1. Input Mask

The Input Mask property setting specifies how data is entered and displayed. For example, if you set this property to 000-00-0000, hyphens are displayed as shown, and an underscore (_) is displayed in place of each zero i.e., at the time of data entry, it will be displayed as _ _ _ - _ _ - _ _ _ _ .

The setting can contain up to three parts separated by semicolons (for example, (999) 000-0000! ; 0 ; " ") :

- The *first part* specifies the input mask itself (for example, (999) 000-0000!).
- The *second part* specifies whether Microsoft Access stores the literal display characters in the table when you enter data. If you use 0 for this part, all literal display characters (for example, the parentheses in a phone number input mask) are stored with the value ; if you enter 1 or leave this part blank, only characters typed into the text box are stored.
- The *third part* specifies the character that Microsoft Access displays for spaces in the input mask. For this part you can use any character; to display a space, use a space enclosed in quotation marks (" ").

Setting the input mask property to the word Password, creates a password entry text box. Any character typed in the text box is stored as the character but is displayed as an asterisk (*).

2. Validation Rule and Text

Validation Rules validate data when data in a field is added or changed, or when you save a record.

Validation Text specifies the text of the message that appears if the field, control, or record doesn't satisfy the conditions listed in the **Validation Rule** setting.

If you set the **Validation Rule** property, but not the **Validation Text** property, MS-Access displays a standard error message when the validation rule is violated.

You can use the **Validation Rule** and **Validation Text** properties to help the user enter valid data. For example, when a record is added for a new employee, you can require that the entry in the Start Date field falls between the company's founding date and the current date. If the date entered isn't in this range, you can display the message: "Start Date is incorrect" by typing this message in the **Validation Text** field.

3. Default Value

You can use the **Default Value** property to specify a value that is automatically entered in a field when a new record is created. For example, in an Addresses table you can set the default value for the City field to New Delhi. When users add a record to the table, they can either accept this value or enter the name of a different city.

The **Default Value** property doesn't apply to check box, option button, or toggle button, or toggle button controls when they are in an option group. It does apply to the option group itself. The **Default Value** property applies to all table fields except those fields with the data type of Auto Number or OLE object.

4. Allow Zero Length

Allowing zero lengths means that the user can enter a zero length string in a field (""). If zero lengths are not allowed then the field must either contain a value or a null.

5. Required Values

The Required property specifies whether or not a value is required in a field. If this property is set to **Yes** (default is **No**), then you must enter a value in the field or in any control bound to the time of data entry.

You can use this property to ensure that a particular field or control bound to a field always has a value (is never Null). For example, you might want to be sure that a Last Name control has a value for each record. In that case, you may set the **Required** property for Last Name **Yes**.

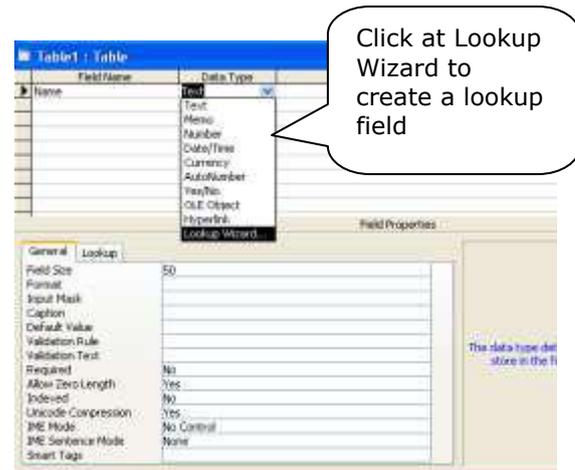
You can use the setting of the **Required** and **Allow Zero Length** properties to differentiate between information that doesn't exist (stored as a zero-length string ("") in the field). And information that may exist but is unknown (stored as a Null value in the field). If you set the **Allow Zero Length** property to **Yes**, a zero-length string is a valid entry in the field regardless of the Required property setting. If you set Required to Yes and Allow Zero length to No, you must enter a value in the field, and a zero-length string isn't a valid entry.

6. Lookup Values

The Lookup list refers to list of values wherefrom a value can be picked. These values can either be user specified (**value List**) or can come from another table or query (**Lookup List**).

How to create a field that looks up data from another table in Design view:

- In Design view, open the table where you want to add the lookup field.
- Do one of the following :
To insert a new field within the table, click in the row below where you want to add the field, and then click **Insert Rows** on the toolbar, or to add the table click in the first blank row. Type the name for the field in the **Field Name** column.
- In the Data Type column, click the arrow and select Lookup Wizard.
- Click the option that indicates you want the lookup field to look up the values in a **table or query**.
- Click **Next** and it'll ask you specify a **table** or **query** wherefrom you want to lookup values. Pick the desired **table** form table list or **query** form query list. Please note, you need to select an option out of **Tables, Queries** and **Both** in the **View** box.
- Whatever you select, the list box above View option shows the corresponding objects' list i.e., if you select **Tables**, it'll display list of tables in database, if you select **Queries**, it'll display list of queries in database, and if you select **Both**, it'll display list of both tables and queries. Once you select the desired table or query, click at **Next**.
- In the next step, it'll ask you to select fields wherefrom you want to include values in your lookup field.
To select a field, first click on it in the left box i.e., Available Fields and then click at move (>) button to move the selected field to Selected Fields box. To select more fields, repeat the same process for them. If you want to select all fields, you may click at Move All (>>) button. To unselect a field, select the field in the **Selected Fields** box and then click (<) button. Similarly to unselect all fields, you may click at (<<) button.
- After selecting desired fields, click at **Next** to move to next step, where You have to decide about width of **Lookup column**. If you want to change the width shown, then you need to drag its right edge and then click **Next**. Otherwise just click at **Next** to retain the default width.
- In the next step, the Lookup Wizard asks you to label your lookup column, type desired name for your lookup column and then click at Next.
- Now save the table in response to the alert raised by wizard in the next step,
You be able to view the values in lookup fields at the time of data entry, which you can perform either in data sheet view in forms. shows you such



a lookup field with values coming from another table. But before that let us learn to create a lookup value list

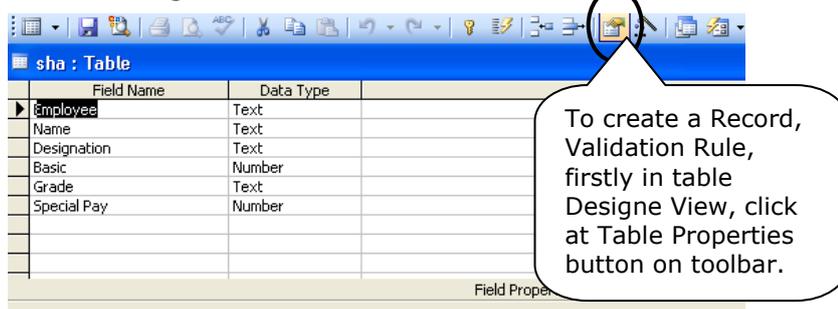
Record Validation Rules:

Record validation rules are enforced whenever you add or edit data, whether it is through table Data sheet view, a form bound to the table, an append query, an update query, Visual Basic for Applications code, or by importing data from another table.

A Field Validation Rule validates a value being entered in a field and a record validation Rule controls when an entire record is saved. Record Validation Rule can compare values from more than one field. For instance, if we have to make sure that in **Marks** table, value of field **Marks obtained** must be less than or equal to **Maximum Marks** field then, we'll have to create a Record Validation Rule as this rule has to refer to more than one field.

To create a Record Validation Rule, you need to follow these steps:

1. Open a table in Design View.



2. Click **Properties** () on the toolbar to display the table's property sheet

3. In the **validation Rule** property box of **Table Properties** dialog type the validation rule. or click the **Build** button () to create the validation rule using the Expression Builder. To make sure that he date entered into the Require Date field is within 30 days of the date in the order field.

4. In the Validation Text Property box, type the message that you want Microsoft Access to display when the rule is broken For example, for the validation expression You could enter "The required date must be within 30 days of the order date."

If you set a validation rule in a table that contains data, Microsoft Access will ask if you want to apply the new rule to existing data when you save the table.

