# Unit 8: Introduction to Database

**Introduction**

A database is an organized collection of data. This unit describes the basic concepts of database, Database Management System, advantage of Database Management System, Application of Database Management System. In this unit you will be familiar with Microsoft Access database.

# Lesson 8.1: Understanding Database, Database Management System

**Learning Objectives**
On completion of this lesson you will be able to learn:

- about Data and Database.
- about Database Management System.
- objective of Database Management System.
- purpose of Database Management System.
- applications of Database Management System.
- function of Database.
- access Database Files.

**8.1.1 Data**
Generally, pieces of information are called data. In computing, data is also information but that has been translated into a form which is more convenient to manipulate or process by the computer.

**8.1.2 Database**
A database is a collection of data or information that is organized in such a manner so that it can easily be accessed, managed, updated and retrieved. Computerized databases are much more powerful than non-computerized databases because users can easily search and reorganize data in hundreds of ways. As for example- the telephone index of a non-computerized database contains names, addresses, and telephone numbers arranged alphabetically by last name so that it is easy to find information for a particular person but in computerized database, you could search by address, first name, or phone number, instead of just by last name.
Oracle, Microsoft SQL server, Sybase, DB2, DB2-UDB, Informix are the examples of commercial databases management system. MySQL, PostgreSQL, Predator are some free database management system.

How database is different from word-processors and spreadsheets?
- Word-processor- Works with text, graphics.
- Spreadsheets- Numbers, Data modeling, Statistical analysis.
- Database-Use same data for many purposes.

### 8.1.3 Database Management System

Database Management System (DBMS) is essentially a collection of interrelated data and a set of software programs (or group of programs) that provides storage, access, security, and other facilities of those data. From 8.1.2 we already know the collection of data is usually referred to as database .Database systems are designed to manage huge amount of data. The management of data involves both data definition and the manipulation of data. The DBMS acts as an interface between application programs and physical data files and provides tools to add, delete, display, print, search, select, sort, and update data.

### 8.1.4 Objective of Database Management System

The primary objective of DBMS is
* To provide a convenient way to store data into a database.
* To provide an efficient manner to retrieve data from database.

### 8.1.5 Purpose of Database Management System

In traditional file system each program has its own file, so too many files will be needed and there may be many redundant data that create inconsistency. Database Management System removes these disadvantages. The DBMS permits an organization to centralize data, manage them efficiently, and provide access to stored data by application programs. Database Management System can store data one time and allow multiple programs to access those data. So data redundancy and inconsistency is removed in Database Management System. A major purpose of a database management system is to provide users with an abstract view of data.

### 8.1.6 Applications of Database Management System

Databases touch all aspects of our lives.
* Human resources: Payroll.
* Banking: Transactions.
* Universities: Student information management system, library information system.
* Sales: customers, products, purchases.
* Manufacturing: inventory, orders, production.

### 8.1.7 Advantages of DBMS
* Find information quickly.
* Performs complex retrieval and data manipulation tasks based on queries.
* Data inconsistency and redundancy is reduced.
* Restricting unauthorized users.
* Providing backup and recovery.
* Better service to the users.

- Create mailing list for mail merges. This allows the user to send out letters containing personal information kept in database.

## 8.1.8 Database Management System Offers the Following Services:

- Data Definition.
- Data Maintenance.
- Data Manipulation.
- Data Display.
- Data Integrity.

## 8.1.9 Microsoft Access Database:
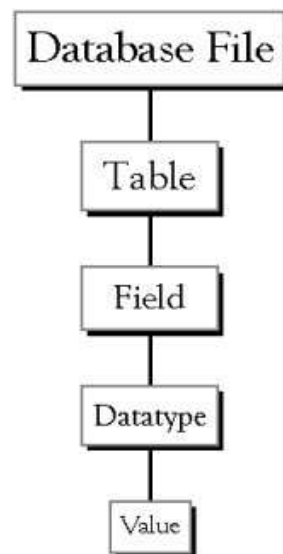


- **Database File:** Database file is the main file that represents the entire database. Example: student.mdb

- **Table:** A table is a collection of data about a specific topic. There can be multiple tables in a database. Example: student, employee.

- **Field:** Each column represents as field. Each field in a table has a field name; appearing at the top of the column. Tables usually contain multiple fields. Example: studentid, studentname, are the field name of student table.

- **Record:** Each row represents as record. For example, studentid, studentname fields make up a single student record.

- **DataType:** Data types are the properties of each field. It indicates the type of data that each field can hold. A field only has one data type. For example text, number, date etc.

## Exercise

**1.** *Multiple choice questions*

a.      Pieces of information called

i)      data
ii)     database
iii)    DBMS
iv)     none of the above.

b.      Accuracy of the data ensures.

i)      data integrity
ii)     data definition
iii)    data manipulation
iv)     data maintenance.

c.      Which one is a free database system?

i)      Oracle
ii)     Microsoft SQL server
iii)    Sybase
iv)     MySQL.

**2.** *Analytical questions*

1.      What is database?
2.      What is DBMS? What are the primary objectives of DBMS?
3.      Discuss the services offer by the DBMS.
4.      Discuss the purposes of DBMS.
5.      What are the advantages of DBMS?

# Lesson 8.2: Getting Familiar with Microsoft Access for Windows

Microsoft Access is a database software package. With Access you can create a computerized database. For example, you can use Access to organize the students who attend in a school, the courses they registered, and the instructors who teach them. After you create an Access database, you can search it, manipulate it, and extract information from it. Dear learners, this lesson introduce you to Access windows and teach how to create Access database.

## Learning Objectives
On completion of this lesson you will be able to learn:

- access database objects.
- how to run Microsoft Access.
- crating database.

## 8.2.1 Microsoft Access Database Objects
The Objects bar lists the major types of objects in an Access database. Objects are as follows.
- Tables
- Queries
- Forms
- Reports
- Page
- Macros
- Modules.
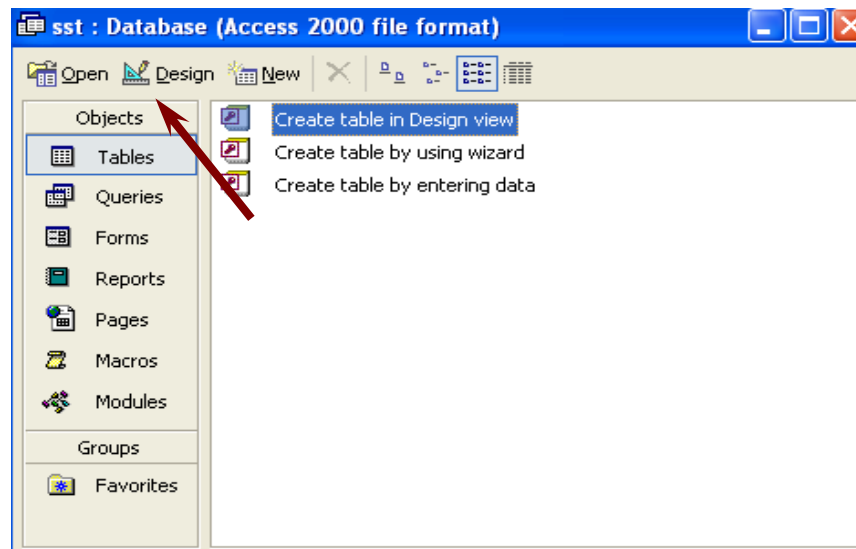
| Objects | |
|---|---|
| Tables | In Access, data is stored in tables. A table is a set of columns and rows, with each column referred to as a field. Each row of a table is referred to as a record. Each value in a field represents a single type of data. |
| Queries | Queries used to retrieve specific data from database and to answer questions about your data. For example, you can use a query to find the names of the employees in your database who live in a particular district. |
| Forms | Forms give the ability to choose the format and arrangement of fields. You can use a form to enter, edit, and display data. |
| Reports | Reports organize or summarize data so that you can print it or view it on screen. You often use reports when you want to analyze your data or present your data to others. |
| Macros | Macros give you the ability to automate tasks. You can use a macro to add functionality to a form, report, or control. |
| Modules | Like macros, modules give you ability to automate tasks and add functionality to a form, report, or control. |

## 8.2.2 Starting Microsoft Access

Dear learners let us follow any one of the following way to start Microsoft Access

To start Microsoft Access:
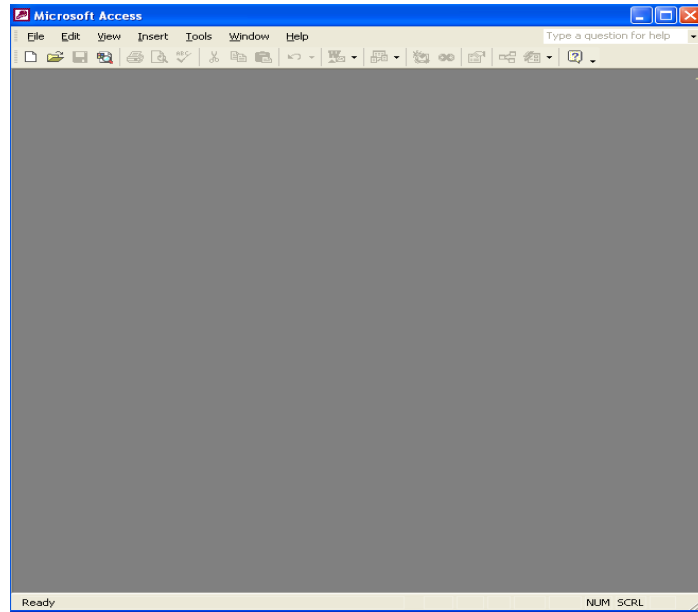Use the start button on the task bar to open run then type msaccess then press enter



Or
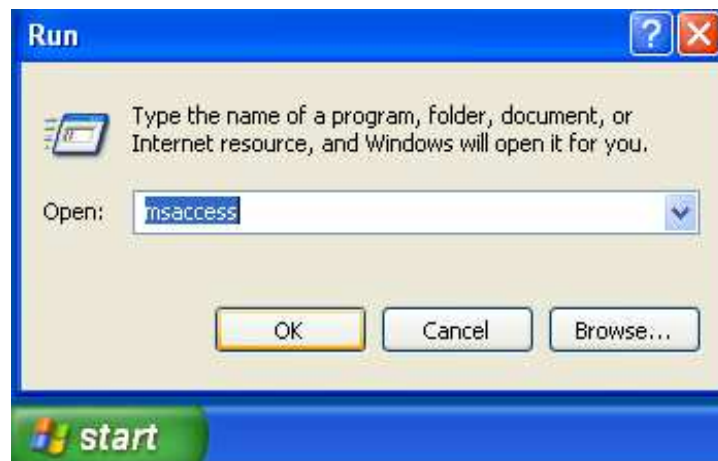
Use the Start button on the task bar to open: Programs -> MS Office -> Microsoft Access

Or

Double click on the Microsoft Access icon on the desktop.



Once Access is running an initial screen will be displayed and it looks as follows:



To exit Access, pull down the File menu and select the Exit menu item.

Or

You can click the cross( X ) at the top right corner of the window.

### 8.2.3 Creating Database

To create new databases choose Blank Database from "Task Pane" appear on the right-hand side of the screen and specify a new file name for the database. Use a descriptive name for the new database. Click on the OK button to create the new database.

To open an existing database choose open an Existing Database from "Task Pane" appear on the right-hand side of the screen, select More Files then navigates to the drive, highlight the existing database file on disk and click the open button to open the database.

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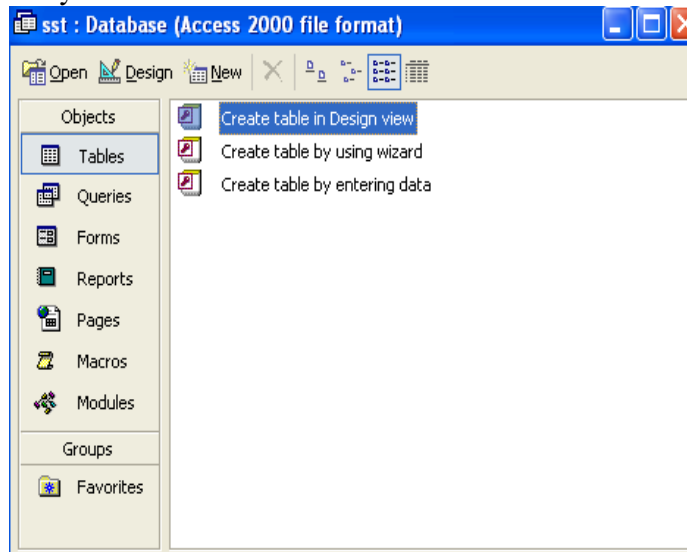
To create a new database in Access
1. From the menu choose File -> New.

2. The "New File" Task Pane will appear on the right-hand side of the screen.
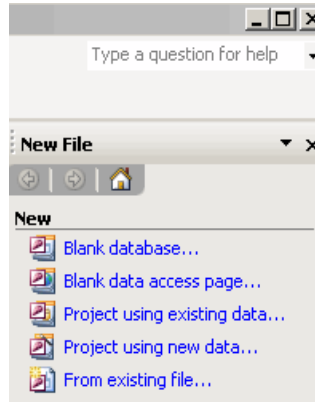


3. Click the option "Blank database" which will then ask you to name your database. Access databases are saved with the .mdb extension.

4. Name your file (we chose sst) and press Create. This will automatically save your blank database as sst.
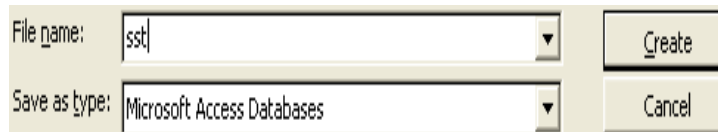


5. The Access Database interface should now be displayed and you are ready to learn Access.



Now the database has been created. We can begin to create Access table.

## Exercise

### 1. *Multiple choice questions*

a. Table is a set

i) columns
ii) rows
iii) columns and rows
iv) field.

b. File extension of Microsoft Access database

i) .mdb
ii) .dbf
iii) .txt
iv) .exe

c. The core component of database is

i) table
ii) form
iii) report
iv) query.

### 2. *Analytical questions*

1. Discuss about the objects of Microsoft Access database.
2. Discuss the steps to create a database.

# Lesson 8.3: Inserting Data to Database

**Learning Objectives**
On completion of this lesson you will be able to learn:

- data types.
- crating new tables.
- modifying tables.
- adding records.
- editing records.
- save records.
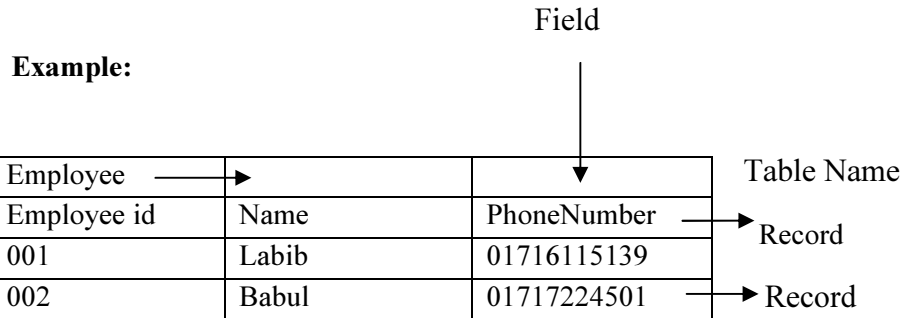- deleting records.

### 8.3.1 Understanding Data Types

Data type determines the type of information that may be entered in that field. A field with a data type of text can store alphabetic characters and numbers. Generally you cannot perform mathematical calculations by using a text field. For example, you can use a text field to store a street address. Unless you do some manipulation, you cannot use the numbers in the street address in mathematical calculations. You will not able to sum or average the numbers in an address field. Alternatively, you can assign a Test Score field a data type of Number. You can enter numbers into the field and then average, sum, or perform other calculations with the numbers. However, you cannot enter an alphabetic character in a number field.

| Data Types | | |
|---|---|---|
| **Data Type** | **Use** | **Notes** |
| Text | Alphanumeric data. Use for text and for numbers that are not used in mathematical calculations. Use for names, addresses, and other relatively short pieces of text. It can store up to 255 characters. | |
| Memo | Long text. Use for long pieces of text, such as notes and long descriptions. Can store up to 64,000 characters. | |
| Number | This field is used for numbers where you want to add, subtract, multiply, divide, average, and do numerical calculations. | |
| Date/Time | Use for dates and times. | |
| Currency | Use for currency like Dollars ($) | Prevents rounding during calculation |
| AutoNumber | Unique sequential numbers or random numbers automatically inserted when you create a record. Use to create a primary | |

| | | |
|---|---|---|
| | key. | |
| Yes/No | Logical data. Use when only one of two values is valid. Yes/No, True/False, etc. | |
| Hyperlink | Use to store hyperlinks. | |
| Attachment | Use to store attachments. | |
| OLE Object | OLE means "Object Link Embedding" which indicates you can insert a graphic, picture, sound, word document, Excel spreadsheet, power point presentation etc. | |

## 8.3.2 Tables

A table is a set of columns and rows. Each column is called a field. Within a table, each field must have a name and no two fields can have the same name. Each value in a field represents a single category of data. For example, a table might have three fields: employee id, Name, and Phone Number. The table consists of three columns: one for employee id, one for Name, and one for phone number. In every row of the table, the employee id field contains the employee id number, the Name field contains the employee name, and the Phone Number field contains the phone number of the employee. Each row in a table is called a record.

Field

**Example:**

| Employee | | | Table Name |
|---|---|---|---|
| Employee id | Name | PhoneNumber | Record |
| 001 | Labib | 01716115139 | |
| 002 | Babul | 01717224501 | Record |

Here the employee table has 3 columns (Employee id, Name, Phone Number) and 2 rows or records of data.

## 8.3.3 How Data is organized in Tables?

Tables organize data into columns (called fields) and rows (called records). For example, each field in a Products table contains the same type of information for every product, such as the product's name. Each record in that table contains all the information about one product, such as the product's name, supplier ID number, units in stock, and so on.

## 8.3.4 Creating Microsoft Access Tables

Tables are the foundation of an Access database. Access stores data in tables. How to create a table, add fields to a table, assign data types to fields, and set field properties have been discussed in this section.

**Creating a Table**

To create Access table you can follow any of the three instructions below:

- Create a table in Design view, where you can add fields, define how each field appears or handles data, and create a primary key.

- Use the Table Wizard to choose the fields for your table from a variety of predefined tables such as products, employees, suppliers, order details.

- Entering data directly into a blank datasheet. When you save the new datasheet, Microsoft Access will analyze your data and automatically assign the appropriate data type and format for each field.

**Create a Table in Design View**

Creating a new table in design view requires the following steps:

1. In the Database window click on the Tables tab [icon] under Objects on the Access main screen.

2. Click on the new button.

3. Choose the Design View and click the OK button.

4. Define each of the fields in your table.

5. Click in the Field Name column and type a unique name for the field.

6. In the Data Type column keep the default (Text) or click in the Data Type column, click the arrow, and select the data type you want.

7. In the Description column, type a description of the information this field will contain. This description is displayed on the status bar when adding data to the field and is included in the Object Definition of the table. The description is optional.

8. To set the property of a field click the field whose property you want to set. General tab which appears lower portion of the window contains field property like FieldSize, Format, Input mask, Caption, Default Value, validation Text etc. FieldSize- You can enter maximum number of characters in the field. Default Value- You can enter a value automatically for new records. Format- Display layout for the field.

9. Designate a primary key by clicking on one of the fields that you want to define as primary key with the right mouse button and then choose Primary Key [icon] from the pop-up menu.

10. Save the table by pulling down the File menu and click Save.

11. Close the new table by pulling down the File menu and click close.

Dear learner you don't have to define a primary key, but it's usually a good idea, if you don't define a primary key; Microsoft Access asks if you want to create one for you when you save the table.
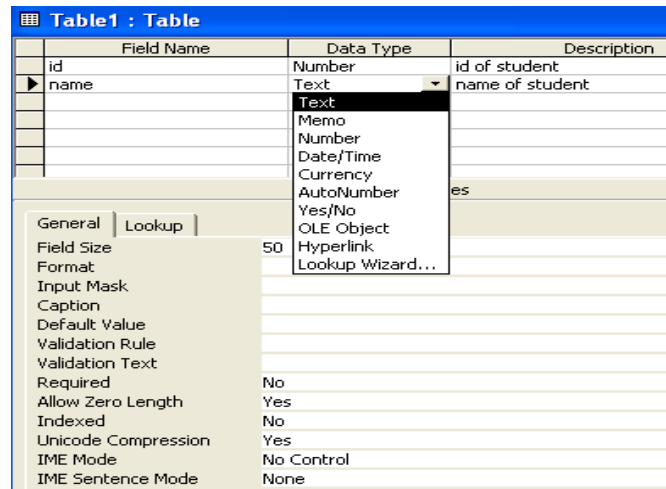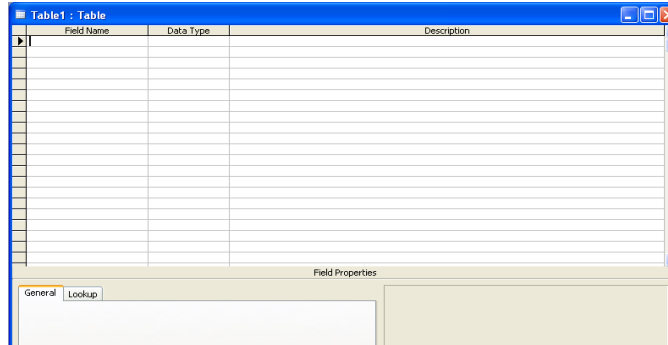




**Create Table by Using the Table Wizard**
Creating table by using table wizard is a quick way to create a database. Creating new table by using the table wizard requires the following steps:

1.  Click Tables tab under Objects, and then click New on the Database window toolbar.

2.  Double-click Table Wizard.

3.  Follow the directions in the Table Wizard dialog boxes.
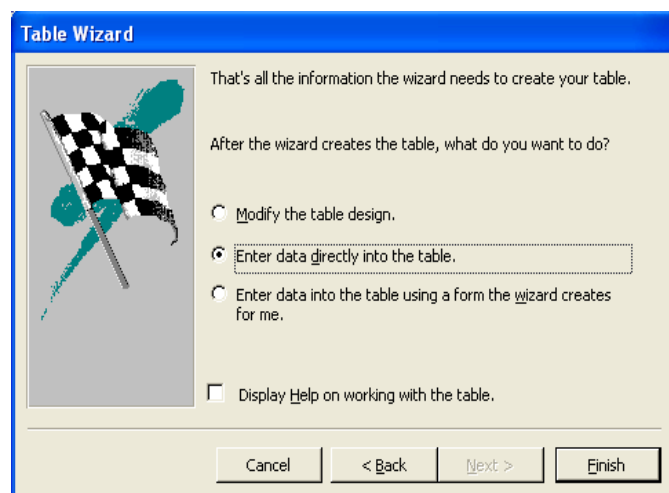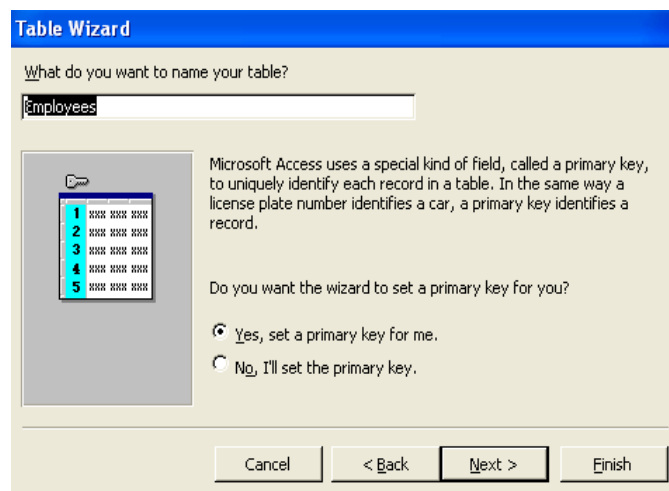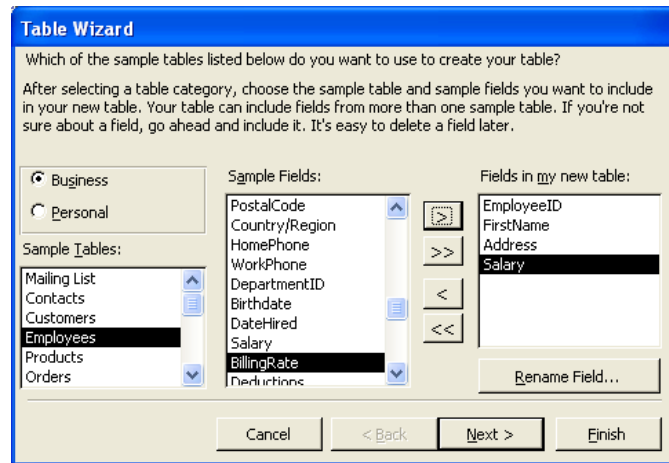
Note   If you want to modify or extend the resulting table, you can do so in Design View. In Design View, you can create new database objects and modify the Design View existing ones.

### 8.3.5 Opening Existing Table

1. In the Database window, click Tables ⊞ under Objects.

2. Click the table you want to open.

3. Do one of the following:

   - Click Design on the Database window toolbar to open the table in Design view.
   - Click Open on the Database window toolbar to open the table in Datasheet view.

**To change the structure of an existing table (modify, add or delete fields)**

Follow the given instruction below to change the structure of an existing table:

1. Click on the Tables tab ⊞ on the Access main screen

2. Highlight the name of the table to be modified and click on the Design button.

3. Make the necessary changes.

4. To add a field select the fields where you want to add then click right mouse button and choose insert rows ⊞ from the popup menu and type a unique name for the field Name column.

5. Select the field that you want to delete then click right mouse button and choose delete rows ⊞ from the popup menu

6. Save the table by pulling down the File menu and choosing Save.

7. Close the table by pulling down the File menu and choosing Close.

After creating a table you can insert data into it. Access assigns data type to each field based on your entry. Your can enter data by typing in each field.

### 8.3.6 Entering Data to a Table

Data can be inserted, deleted or modified in tables using a simple spreadsheet-like display. To bring up this view of a single table's data, highlight the name of the table and then click on the Open button. In this view of the table, shown in the figure below, the fields (columns) appear across the top of the window and the rows or records appear below. This view is similar to how a spreadsheet would be designed.

**Insetting, Editing or Deleting Record**

Insert or edit data in datasheet

Open datasheet.

To add a new record, click New Record ▶✳ on the toolbar, type the data, and then press TAB to go to the next field. At the end of the record, press TAB to go to the next record.

To edit data within a field, click in the field you want to edit, and then type the data.

Dear learners, if you want to correct a typing mistake, press BACKSPACE. To cancel your changes in the current field, press ESC. To cancel your changes in the entire record, press ESC again before you move out of the field. When you move to another record, Microsoft Access saves your changes.
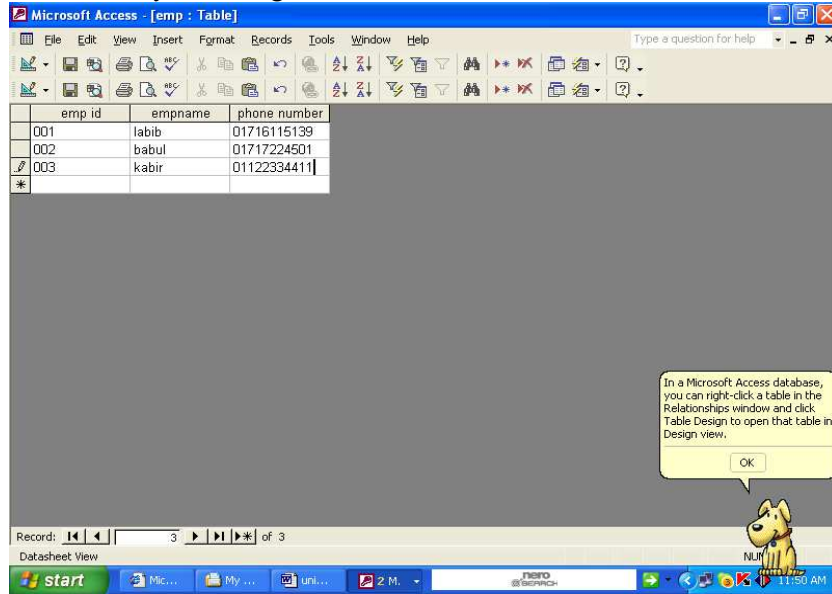


Note: at the bottom of the window the number of records is displayed. In this case, since the table was just created, only one blank record appears.

To add data to the table, simply type in values for each of the fields (columns). Press the Tab key to move between fields within a record. Use the up and down arrow keys to move between records. Enter the data as given below:

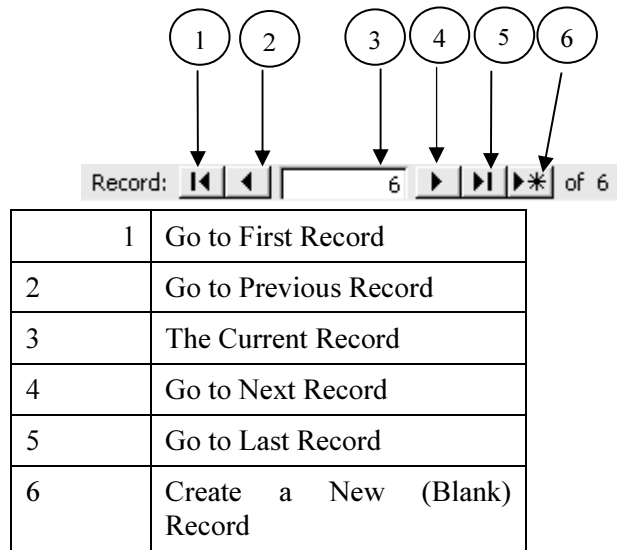| Employee id | Name | Phone Number |
|---|---|---|
| 004 | mamun | 01716115139 |
| 005 | alim | 01718353366 |
| 006 | sharif | 01728516824 |
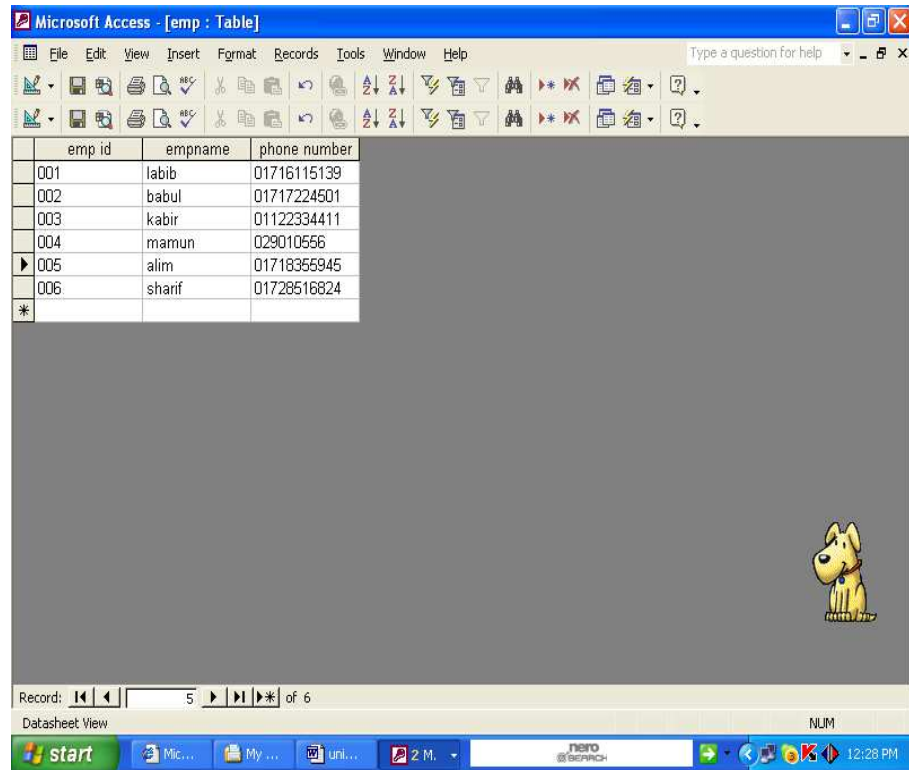
To use keys to move around a table:

| Key to Press | Action |
|---|---|
| Tab | Moves to the next field to the right. If you are in the last field in a record, moves you to the next record. If you are in the last record in a table, creates a new record. |
| Left-Arrow | Moves to the next field to the left. If you are in the first field in a record, moves you to the previous record. |
| Shift+Tab | Moves to the previous field. If you are in the first field in a record, moves you to the previous record. |
| Right-Arrow | Moves to the next field. If you are in the last field in a record, moves you to the next record. If you are in the last record in a table, creates a new record. |
| Up-Arrow | Moves you up one record. |
| Down-Arrow | Moves you down one record. |
| Ctrl++ | Creates a new record. |

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To use the Navigation bar to move around a table:



| | 1 | Go to First Record |
|---|---|---|
| | 2 | Go to Previous Record |
| | 3 | The Current Record |
| | 4 | Go to Next Record |
| | 5 | Go to Last Record |
| | 6 | Create a New (Blank) Record |

To modify existing data, simply navigate to the record of interest and tab to the appropriate field then change the existing data.

To delete a record, first navigate to the record which one you want to delete. Then pull down the Edit menu and choose Delete record and click on it.

To close the table and return to the Access main screen, pull down the File menu and choose the Close menu item.

**Delete a Record**

1. Open a datasheet.
2. Click the record you want to delete.
3. Click Delete Record ![icon] on the toolbar.

**Save a Record**

Microsoft Access automatically saves the record when you are adding or editing as soon as you move the insertion point to a different record, or close the form or datasheet you are working on.

To explicitly save the data in a record while you are editing it, click Save Record on the Records menu.

## Exercise

**1.** *Multiple choice questions*

a. Which one is the foundation of an Access Database?

i) tables
ii) forms
iii) queries
iv) none of the above.

b. Memo data type can store

i) up to 64,000 characters
ii) up to 44,000 characters
iii) up to 60,000 characters
iv) up to 6,000 characters.

**2.** *Analytical questions*

1. Discuss about data types.
2. Write down the steps to create a new table in design view.
3. Write down the steps required to change the structure of an existing table.
4. How you can enter data to a table.

**Hands on Practice**

1.

a) Create a database and save it as sst

b) Create a table containing 3 columns and 5 rows and insert 5 records.

c) Save the table as bou.

d) Select the 3 rd record.

e) Delete 2$^{nd}$ record.

f) Select 1 st record.

g) Create blank (new) record.