

Lab No. 12: Microsoft Access (Basic Features)

Key Points:

- Define RDMS
- Create Database
- Create Table
- Data Type
- Data Views
- Data Insertion

Objectives:

- To learn how to start working with Microsoft Access. After completing this tutorial, you will have a better understanding of MS Access and how you can use it to store and retrieve data.

CLO's:

- CLO 02

What is MS Access?

Microsoft Access is a Database Management System (DBMS) from Microsoft that combines the relational Microsoft Jet Database Engine with a graphical user interface and software-development tools. It is a member of the Microsoft Office suite of applications, included in the professional and higher editions.

- Microsoft Access is just one part of Microsoft's overall data management product strategy.
- It stores data in its own format based on the Access Jet Database Engine.
- Like relational databases, Microsoft Access also allows you to link related information easily. For example, customer and order data. However, Access 2013 also complements other database products because it has several powerful connectivity features.
- It can also import or link directly to data stored in other applications and databases.
- As its name implies, Access can work directly with data from other sources, including many popular PC database programs, with many SQL (Structured Query Language) databases on the desktop, on servers, on minicomputers, or on mainframes, and with data stored on Internet or intranet web servers.
- Access can also understand and use a wide variety of other data formats, including many other database file structures.
- You can export data to and import data from word processing files, spreadsheets, or database files directly.
- Access can work with most popular databases that support the Open Database Connectivity (ODBC) standard, including SQL Server, Oracle, and DB2.
- Software developers can use Microsoft Access to develop application software.

Microsoft Access stores information which is called a database. To use MS Access, you will need to follow these four steps:

- **Database Creation** - Create your Microsoft Access database and specify what kind of data you will be storing.
- **Data Input** - After your database is created, the data of every business day can be entered into the Access database.
- **Query** - This is a fancy term to basically describe the process of retrieving information from the database.
- **Report (optional)** - Information from the database is organized in a nice presentation that can be printed in an Access Report.

Architecture

- Access calls anything that can have a name an object. Within an Access desktop database, the main objects are tables, queries, forms, reports, macros, data macros, and modules.
- If you have worked with other database systems on desktop computers, you might have seen the term database used to refer to only those files in which you store data.
- But, in Access, a desktop database (.accdb) also includes all the major objects related to the stored data, including objects you define to automate the use of your data.

MS Access RDBMS:

Microsoft Access has the look and feel of other Microsoft Office products as far as its layout and navigational aspects are concerned, but MS Access is a database and, more specifically, a relational database.

- Before MS Access 2007, the file extension was ***.mdb**, but in MS Access 2007 the extension has been changed to ***.accdb** extension.
- Early versions of Access cannot read accdb extensions but MS Access 2007 and later versions can read and change earlier versions of Access.
- An Access desktop database (.accdb or .mdb) is a fully functional RDBMS.
- It provides all the data definition, data manipulation, and data control features that you need to manage large volumes of data.
- You can use an Access desktop database (.accdb or .mdb) either as a standalone RDBMS on a single workstation or in a shared client/server mode across a network.
- A desktop database can also act as the data source for data displayed on webpages on your company intranet.
- When you build an application with an Access desktop database, Access is the RDBMS.

Data Definition

Let us now understand what Data Definition is:

- In document or a spreadsheet, you generally have complete freedom to define the contents of the document or each cell in the spreadsheet.
- In a document, you can include paragraphs of text, a table, a chart, or multiple columns of data displayed with multiple fonts.
- In spreadsheet, you can have text data at the top to define a column header for printing or display, and you might have various numeric formats within the same column, depending on the function of the row.
- An RDBMS allows you to define the kind of data you have and how the data should be stored.
- You can also usually define rules that the RDBMS can use to ensure the integrity of your data.

For example, a validation rule might ensure that the user can't accidentally store alphabetic characters in a field that should contain a number.

Data Manipulation

Working with data in RDBMS is very different from working with data in a word processing

or spreadsheet program.

- In a word processing document, you can include tabular data and perform a limited set of functions on the data in the document.
- You can also search for text strings in the original document and, with ActiveX controls, include tables, charts, or pictures from other applications.
- In a spreadsheet, some cells contain functions that determine the result you want, and in other cells, you enter the data that provides the source information for the functions.

An RDBMS provides you many ways to work with your data. For example,

- You can search a single table for information or request a complex search across several related tables.
- You can update a single field or many records with a single command.
- You can write programs that use RDBMS commands to fetch data that you want to display and allow the user to update the data.

Access uses the powerful SQL database language to process data in your tables. Using SQL, you can define the set of information that you need to solve a particular problem, including data from perhaps many tables.

Data Control

Spreadsheets and word processing documents are great for solving single-user problems, but they are difficult to use when more than one person needs to share the data.

- When you need to share your information with others, RDBMS gives you the flexibility to allow multiple users to read or update your data.
- An RDBMS that is designed to allow data sharing also provides features to ensure that no two people can change the same data at the same time.
- The best systems also allow you to group changes (which is also known as transaction) so that either all the changes or none of the changes appear in your data.
- You might also want to be sure that no one else can view any part of the order until you have entered all of it.
- Because you can share your Access data with other users, you might need to set some restrictions on what various users are allowed to see or update.

MS Access Objects

MS Access uses "objects" to help the user list and organize information, as well as prepare specially designed reports. When you create a database, Access offers you Tables, Queries, Forms, Reports, Macros, and Modules. Databases in Access are composed of many objects but the following are the major objects:

- Tables
- Queries
- Forms
- Reports

Together, these objects allow you to enter, store, analyze, and compile your data. Here is a summary of the major objects in an Access database;

Table

Table is an object that is used to define and store data. When you create a new table, Access asks you to define fields which is also known as column headings

- Each field must have a unique name, and data type.

- Tables contain fields or columns that store different kinds of data, such as a name or an address, and records or rows that collect all the information about a particular instance of the subject, such as all the information about a customer or employee etc.
- You can define a primary key, one or more fields that have a unique value for each record, and one or more indexes on each table to help retrieve your data more quickly.

Query

An object that provides a custom view of data from one or more tables. Queries are a way of searching for and compiling data from one or more tables.

- Running a query is like asking a detailed question of your database.
- When you build a query in Access, you are defining specific search conditions to find exactly the data you want.
- In Access, you can use the graphical query by example facility or you can write Structured Query Language (SQL) statements to create your queries.
- You can define queries to Select, Update, Insert, or Delete data.
- You can also define queries that create new tables from data in one or more existing tables.

Form

Form is an object in a desktop database designed primarily for data input or display or for control of application execution. You use forms to customize the presentation of data that your application extracts from queries or tables.

- Forms are used for entering, modifying, and viewing records.
- The reason forms are used so often is that they are an easy way to guide people toward entering data correctly.
- When you enter information into a form in Access, the data goes exactly where the database designer wants it to go in one or more related tables.

Report

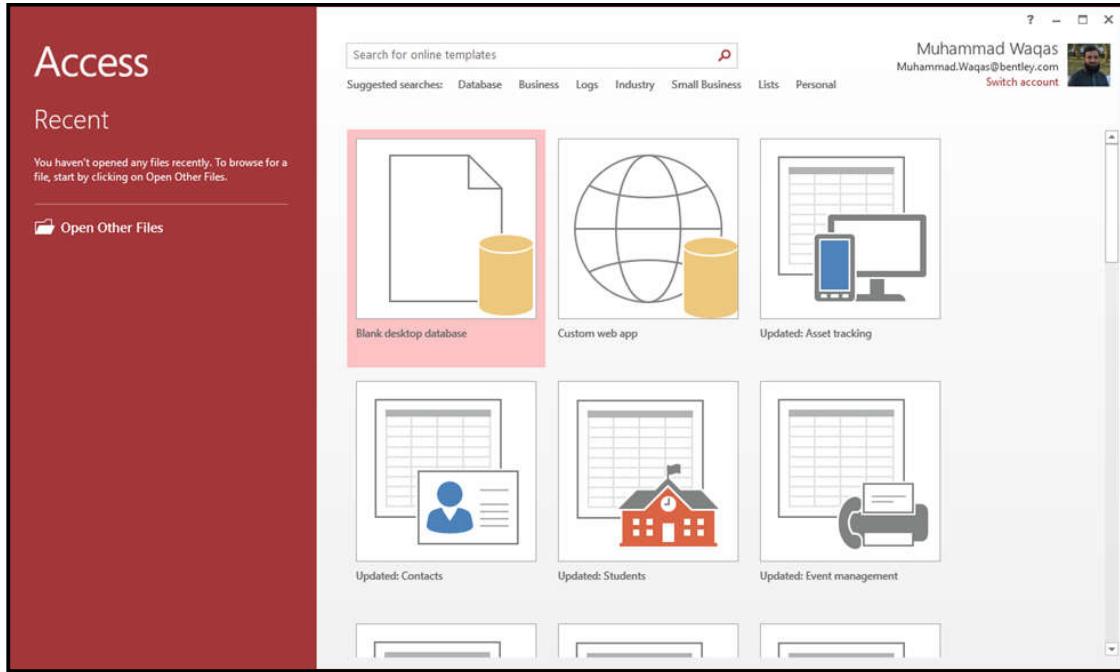
Report is an object in desktop databases designed for formatting, calculating, printing, and summarizing selected data.

- You can view a report on your screen before you print it.
- If forms are for input purposes, then reports are for output.
- Anything you plan to print deserves a report, whether it is a list of names and addresses, a financial summary for a period, or a set of mailing labels.
- Reports are useful because they allow you to present components of your database in an easy-to-read format.
- You can even customize a report's appearance to make it visually appealing.
- Access offers you the ability to create a report from any table or query.

MS Access Database

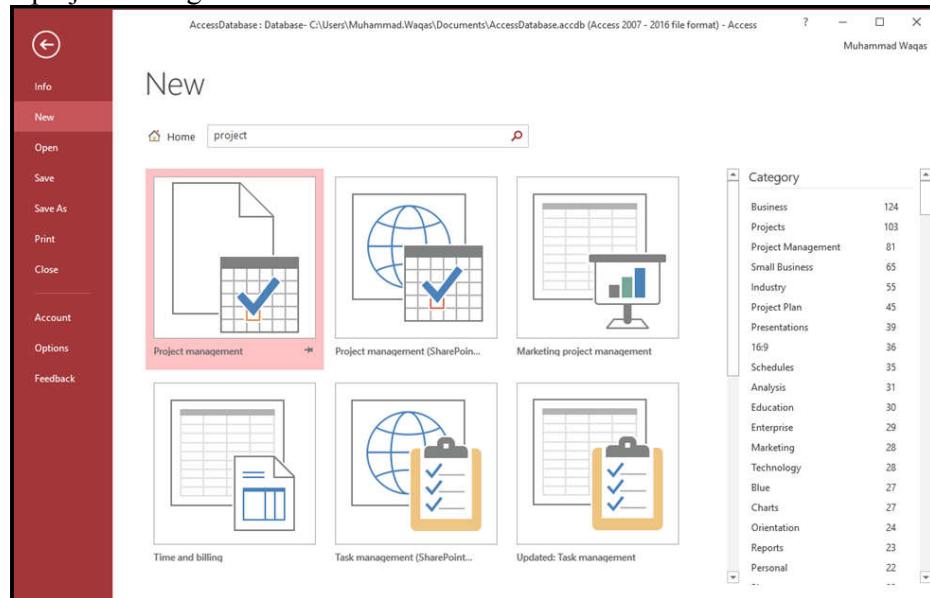
In this chapter, we will be covering the basic process of starting Access and creating a database. This chapter will also explain how to create a desktop database by using a template and how to build a database from scratch.

To create a database from a template, we first need to open MS Access and you will see the following screen in which different Access database templates are displayed.

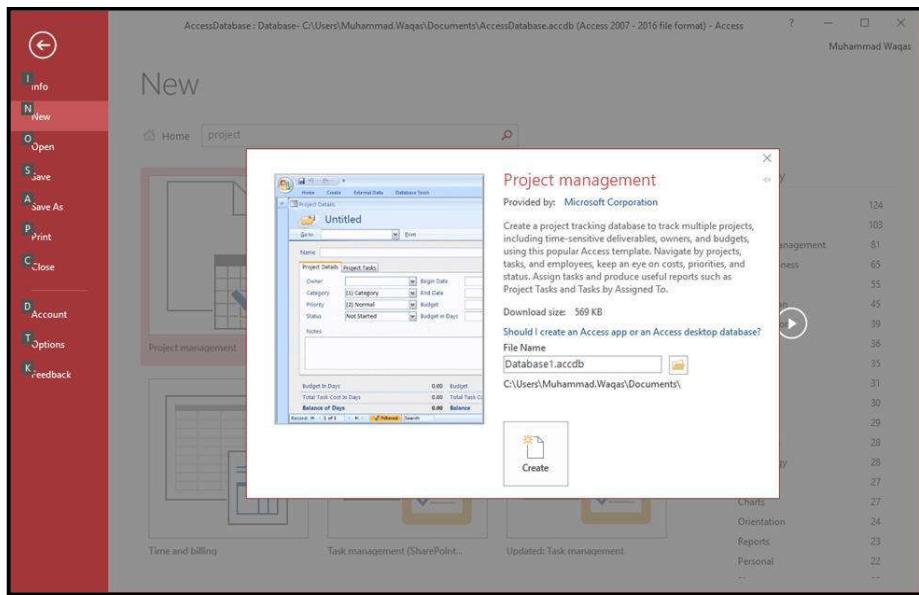


To view the all the possible databases, you can scroll down or you can also use the search box.

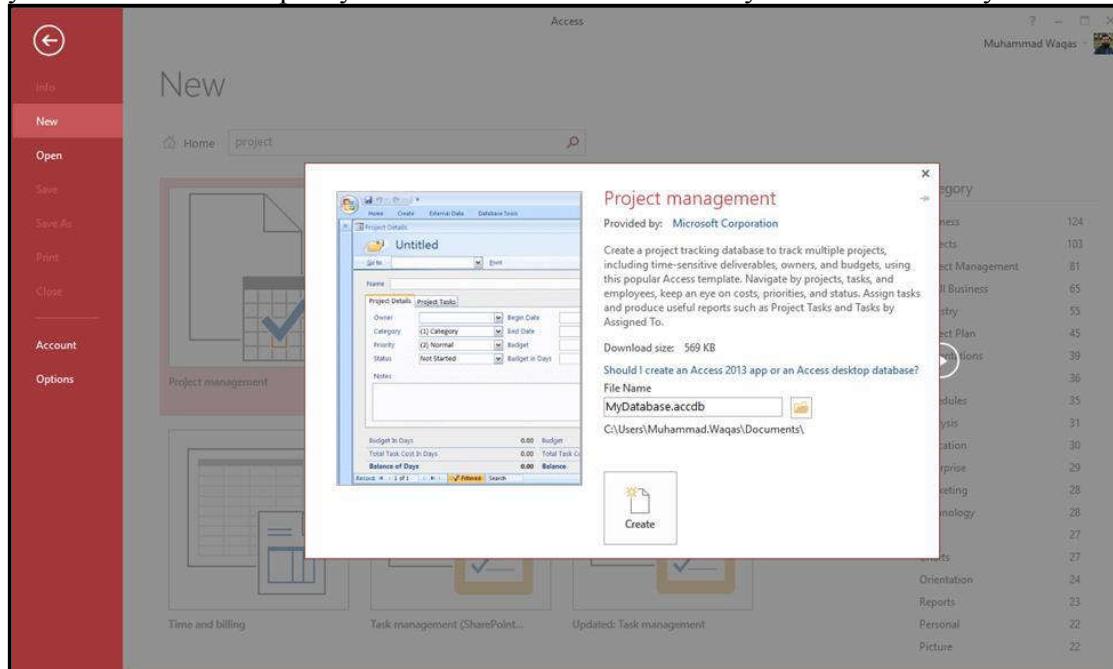
Let us enter project in the search box and press Enter. You will see the database templates related to project management.



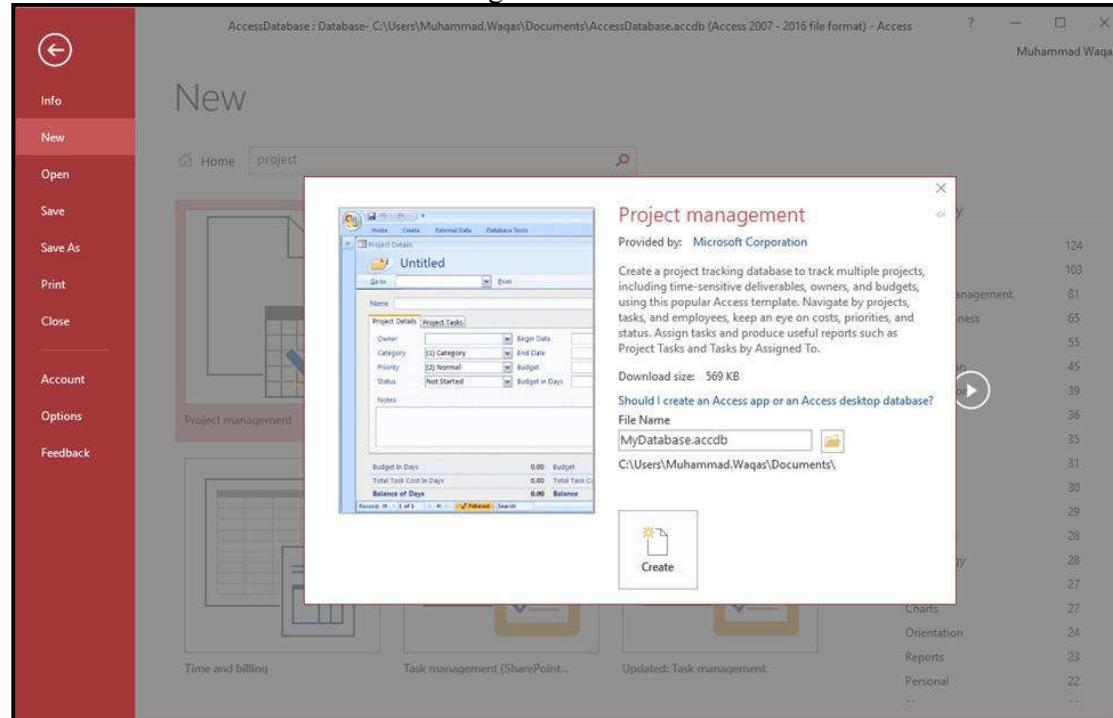
Select the first template. You will see more information related to this template. MS Access



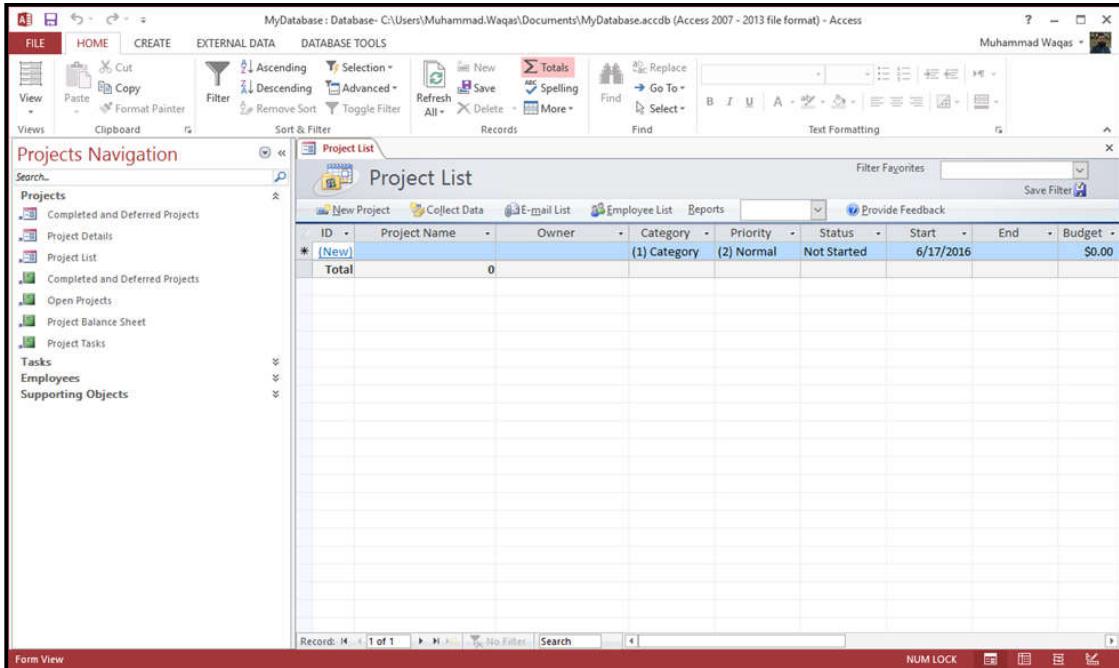
After selecting a template related to your requirements, enter a name in the **File name** field and you can also specify another location for your file if you want.



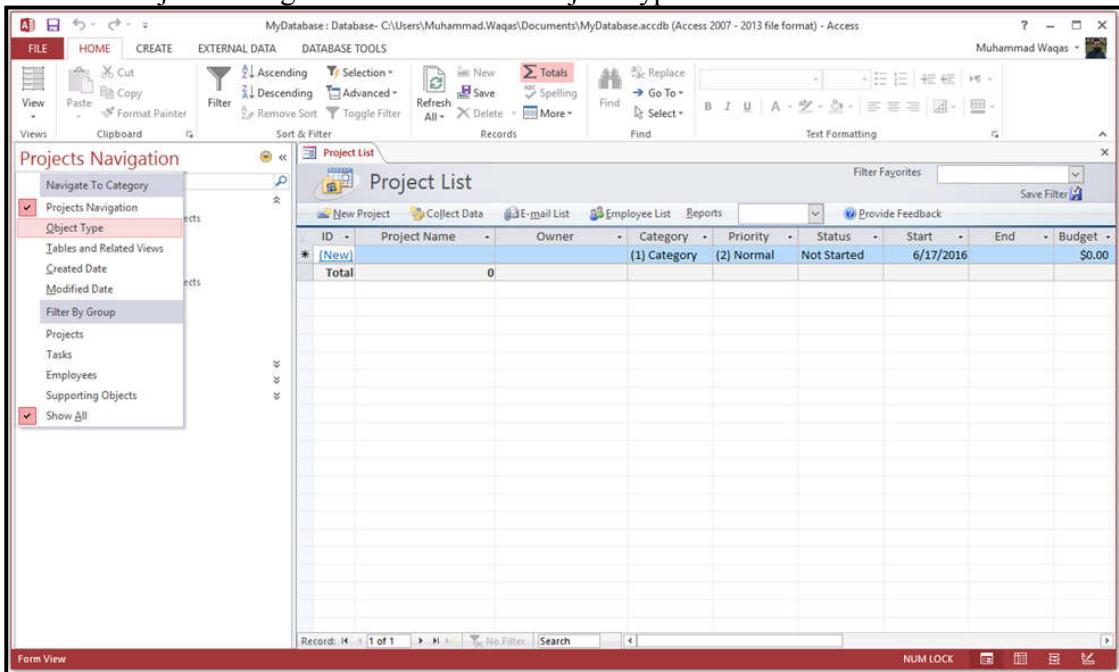
Now, press the Create option. Access will download that database template and open a new blank database as shown in the following screenshot.



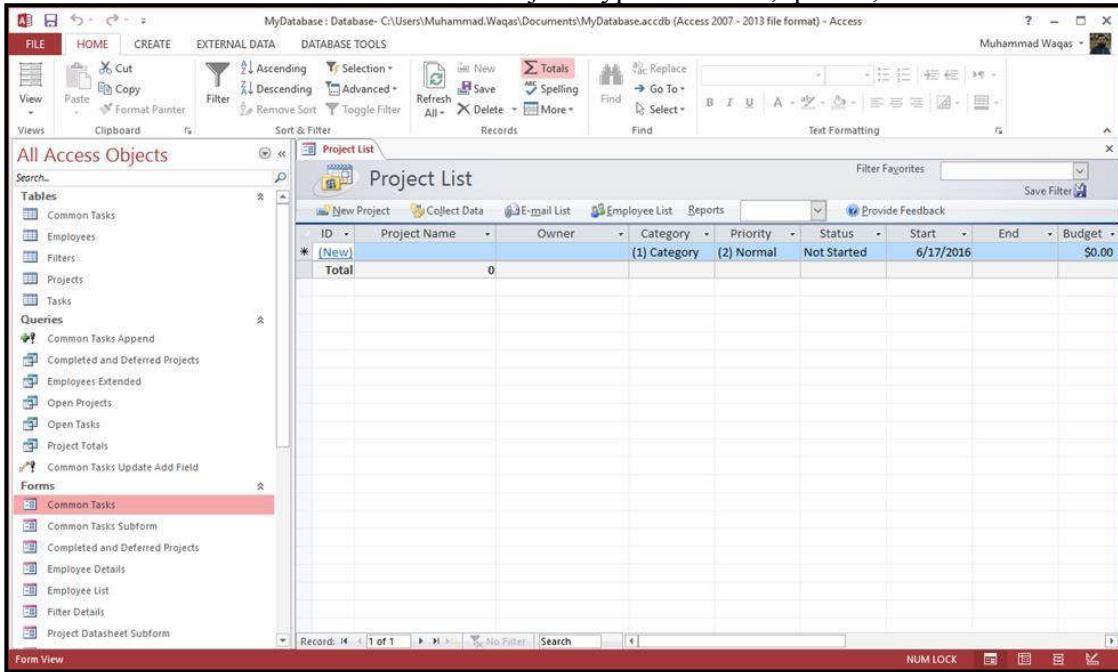
Now, click the Navigation pane on the left side and you will see all the other objects that come with this database.



Click the Projects Navigation and select the Object Type in the menu.



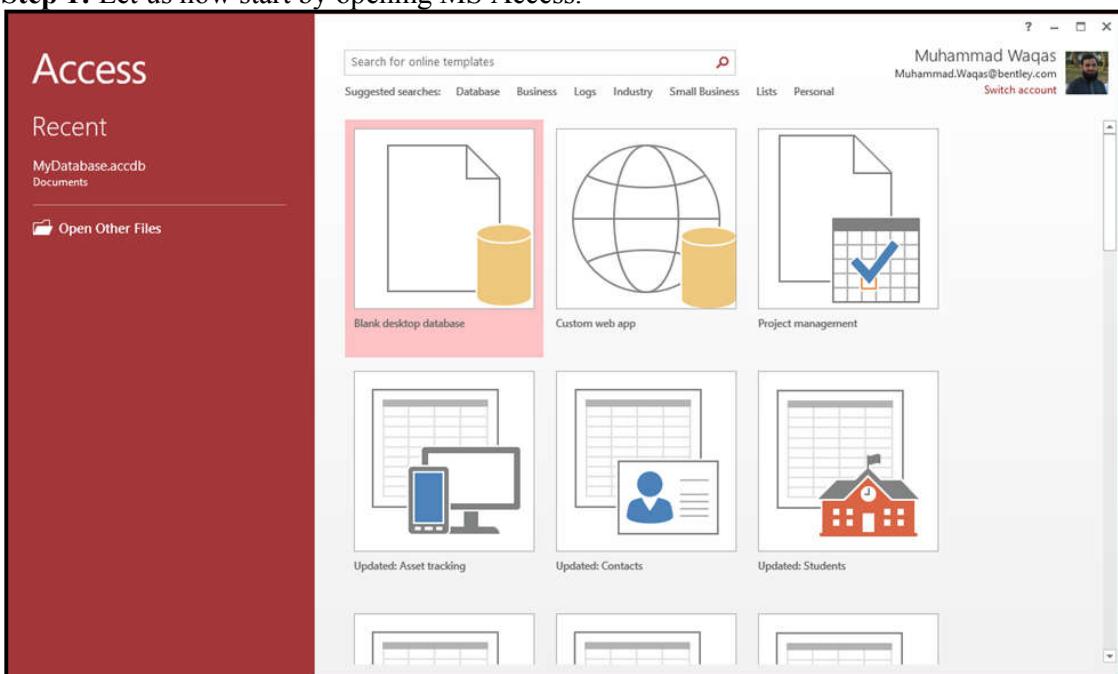
You will now see all the objects types — tables, queries, etc.



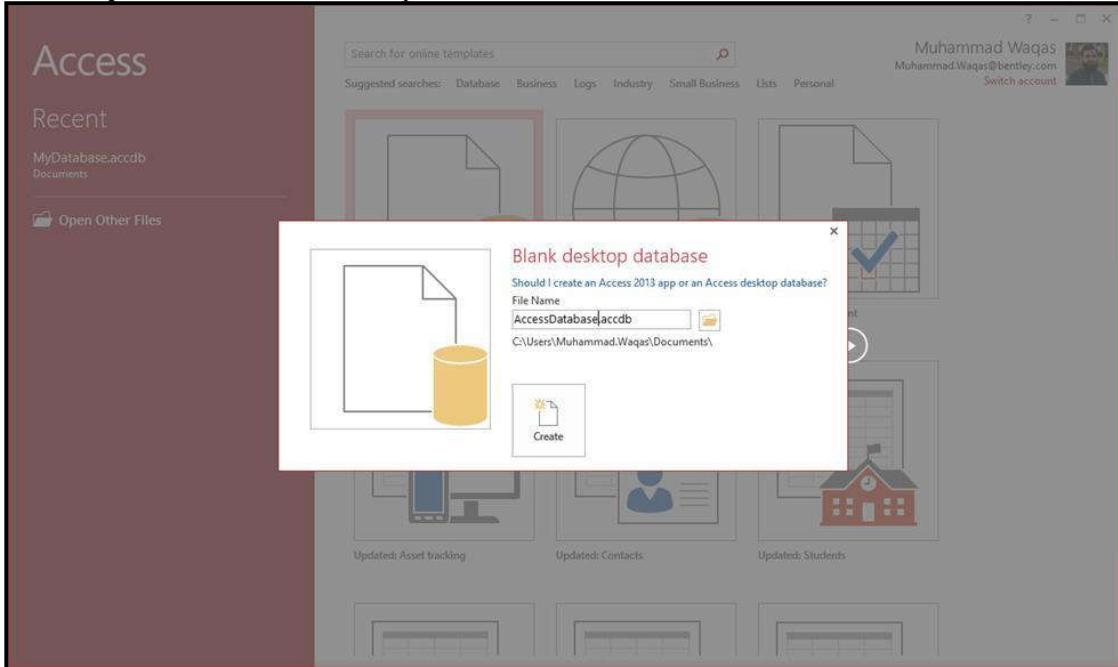
Create Blank Database

Sometimes database requirements can be so specific that using and modifying the existing templates requires more work than just creating a database from scratch. In such case, we make use of blank database.

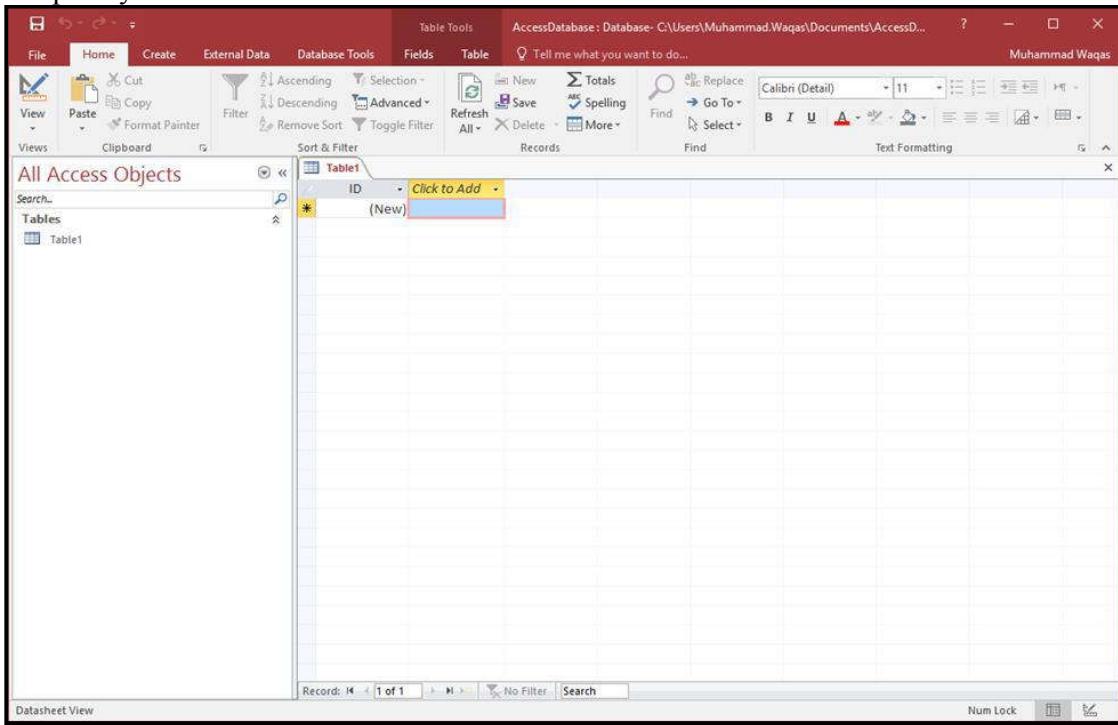
Step 1: Let us now start by opening MS Access.



Step 2: Select Blank desktop database. Enter the name and click the Create button.



Step 3: Access will create a new blank database and will open up the table which is also completely blank.



MS Access Database

Every field in a table has properties and these properties define the field's characteristics and

behavior. The most important property for a field is its data type. A field's data type determines what kind of data it can store. MS Access supports different types of data, each with a specific purpose.

- The data type determines the kind of the values that users can store in any given field.
- Each field can store data consisting of only a single data type.

Here are some of the most common data types you will find used in a typical Microsoft Access database.

Type of Data	Description	Size
Short Text	Text or combinations of text and numbers, including numbers that do not require calculating (e.g. phone numbers).	Up to 255 characters.
Long Text	Lengthy text or combinations of text and numbers.	Up to 63, 999 characters.
Number	Numeric data used in mathematical calculations.	1, 2, 4, or 8 bytes (16 bytes if set to Replication ID).
Date/Time	Date and time values for the years 100 through 9999.	8 bytes.
Currency	Currency values and numeric data used in mathematical calculations involving data with one to four decimal places.	8 bytes.
AutoNumber	A unique sequential (incremented by 1) number or random number assigned by Microsoft Access whenever a new record is added to a table.	4 bytes (16 bytes if set to Replication ID).
Yes/No	Yes and No values and fields that contain only one of two values (Yes/No, True/False, or On/Off).	1 bit.

If you use previous versions of Access, you will notice a difference for two of those data types.

- In Access 2013, we now have two data types — short text and long text. In previous versions of Access these data types were called text and memo.
- The text field is referred to as short text and your memo field is now called long text.

Here are some of the other more specialized data types, you can choose from in Access.

Data Types	Description	Size
Attachment	Files, such as digital photos. Multiple files can be attached per record. This	Up to about 2 GB.

	data type is not available in earlier versions of Access.	
OLE objects	OLE objects can store pictures, audio, video, or other BLOBs (Binary Large Objects)	Up to about 2 GB.
Hyperlink	Text or combinations of text and numbers stored as text and used as a hyperlink address.	Up to 8,192 (each part of a Hyperlink data type can contain up to 2048 characters).
Lookup Wizard	The Lookup Wizard entry in the Data Type column in the Design view is not actually a data type. When you choose this entry, a wizard starts to help you define either a simple or complex lookup field. A simple lookup field uses the contents of another table or a value list to validate the contents of a single value per row. A complex lookup field allows you to store multiple values of the same data type in each row.	Dependent on the data type of the lookup field.
Calculated	You can create an expression that uses data from one or more fields. You can designate different result data types from the expression.	You can create an expression that uses data from one or more fields. You can designate different result data types from the expression.

These are all the different data types that you can choose from when creating fields in a Microsoft Access table.

MS Access Create Table

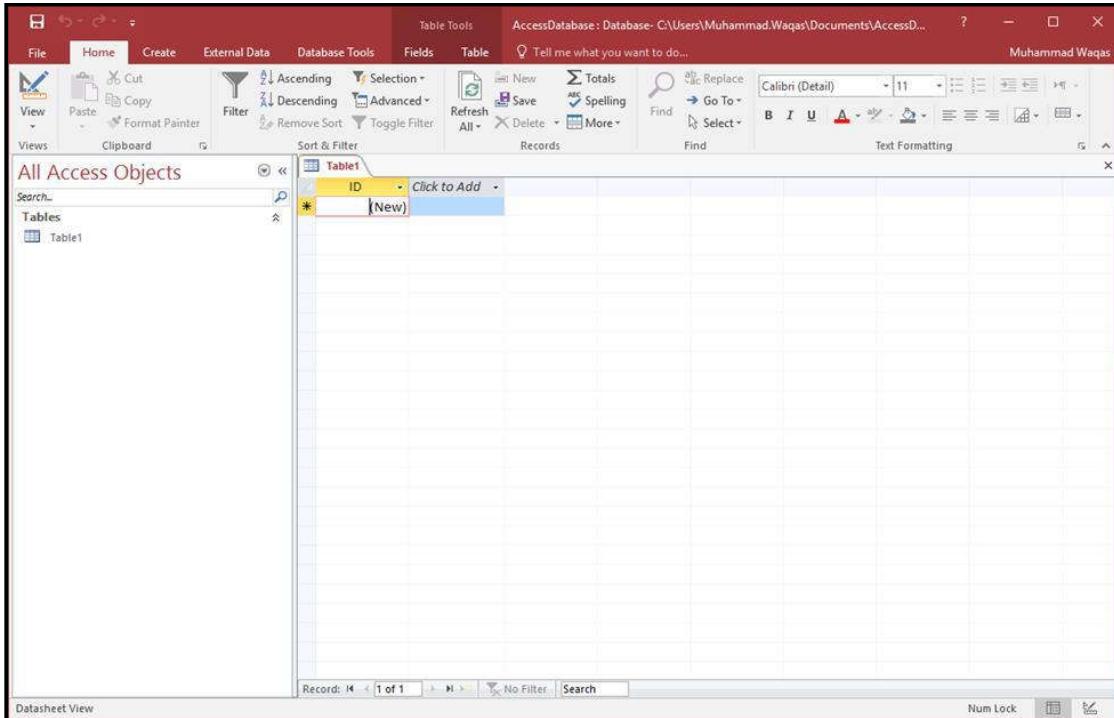
When you create a database, you store your data in tables. Because other database objects depend so heavily on tables, you should always start your design of a database by creating all of its tables and then creating any other object. Before you create tables, carefully consider your requirements and determine all the tables that you need.

Let us try and create the first table that will store the basic contact information concerning the employees as shown in the following table:

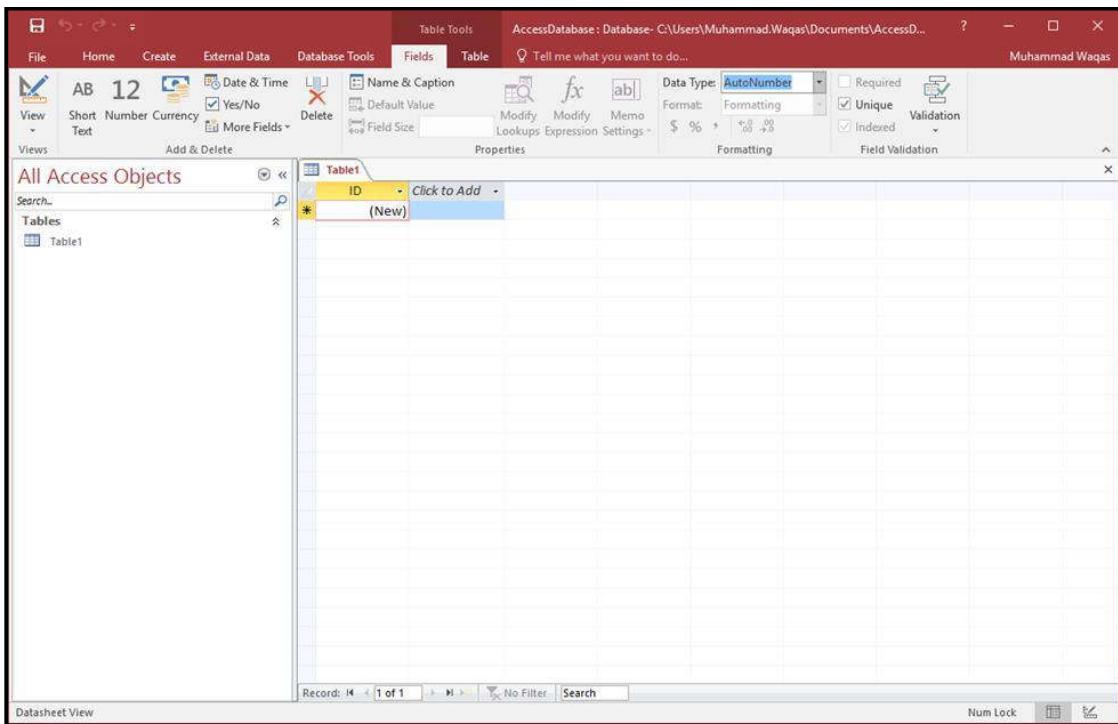
Field Name	Data Type
EmployeeID	AutoNumber
FirstName	Short Text
LastName	Short Text
Address1	Short Text
Address2	Short Text

City	Short Text
State	Short Text
Zip	Short Text
Phone	Short Text
PhoneType	Short Text

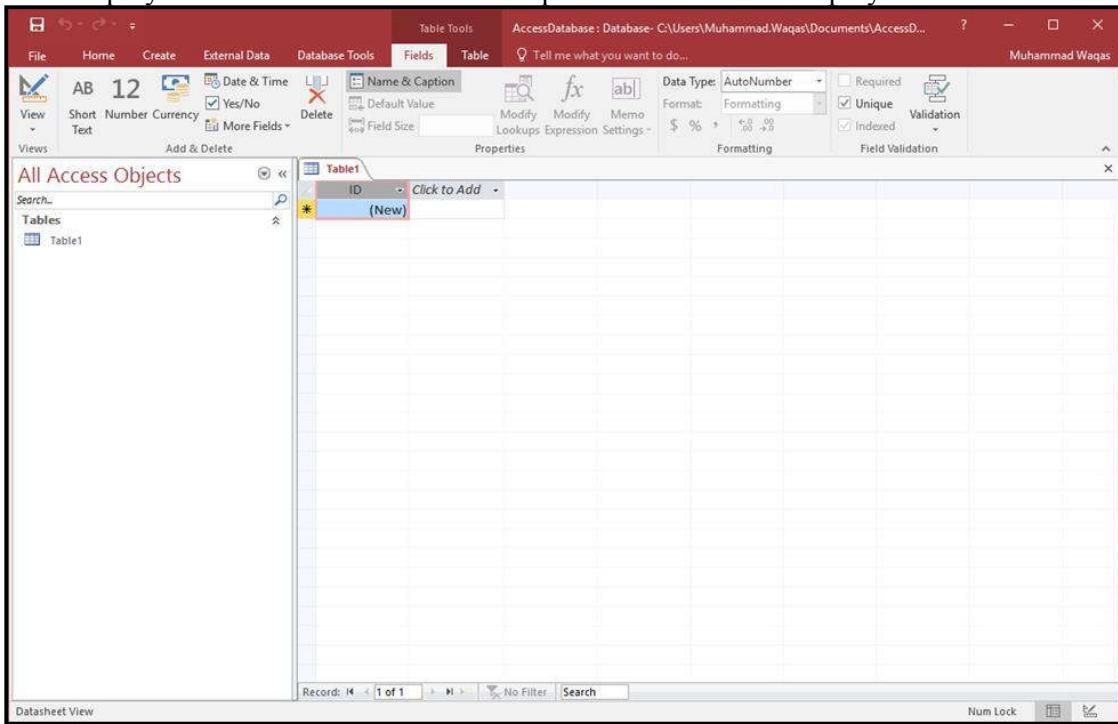
Let us now have short text as the data type for all these fields and open a blank database in Access.



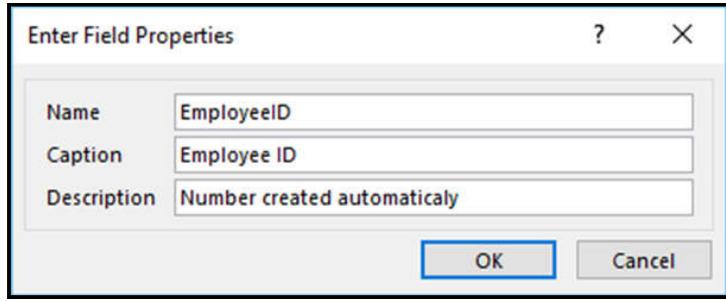
This is where we left things off. We created the database and then Access automatically opened up this table-one-datasheet view for a table.



Let us now go to the Field tab and you will see that it is also automatically created. The ID which is an AutoNumber field acts as our unique identifier and is the primary key for this table. The ID field has already been created and we now want to rename it to suit our conditions. This is an Employee table and this will be the unique identifier for our employees.



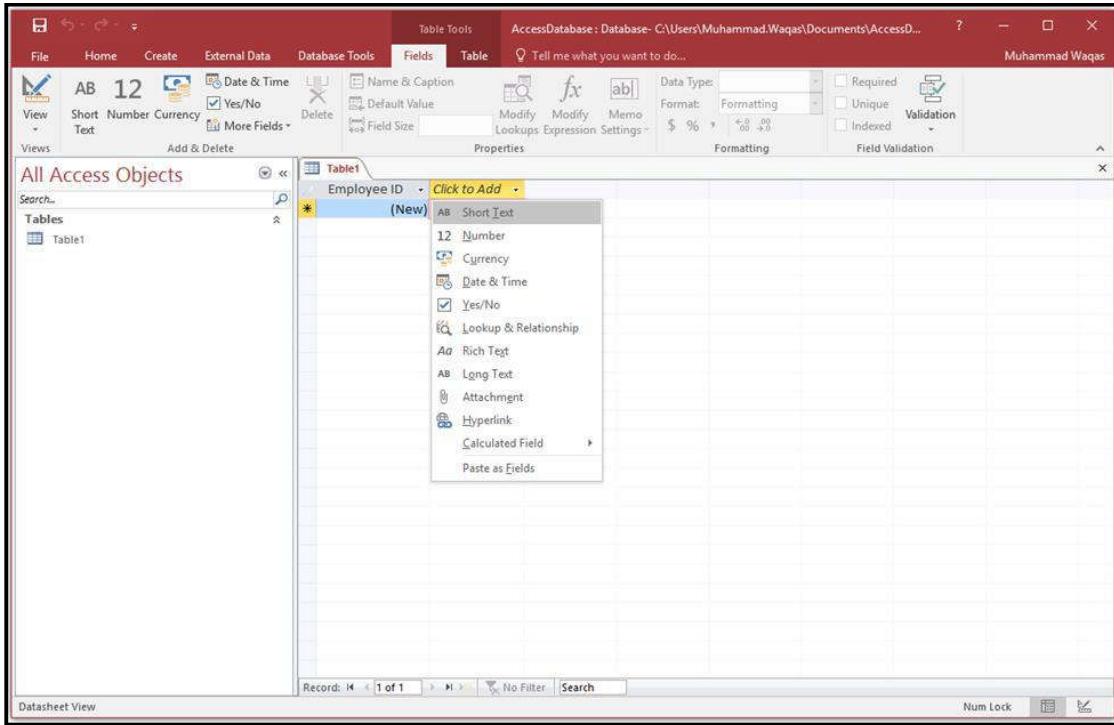
Click on the **Name & Caption** option in the Ribbon and you will see the following dialog box.



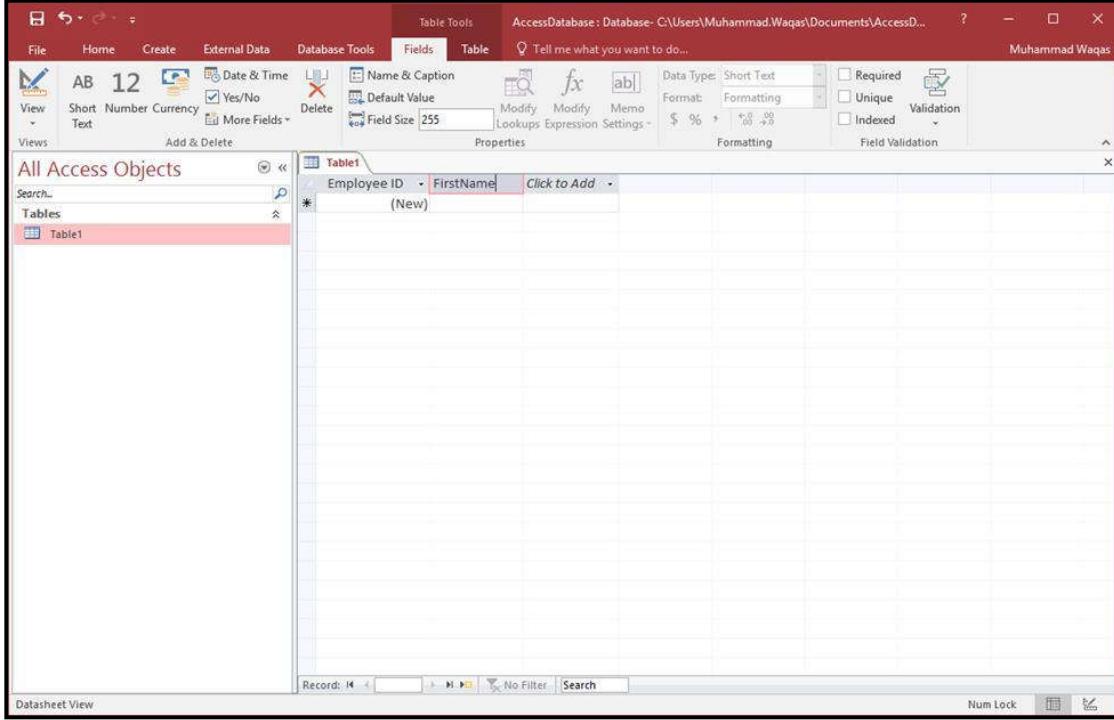
Change the name of this field to **EmployeeID** to make it more specific to this table. Enter the other optional information if you want and click Ok.

The screenshot shows the Microsoft Access 2016 interface. The 'Table Tools Fields' tab is active. A new field named 'Employee ID' is being added to the table 'Table1'. The properties for this field are set to 'AutoNumber' with 'Unique' and 'Indexed' checked. The status bar at the bottom displays the message 'Number created automatically'.

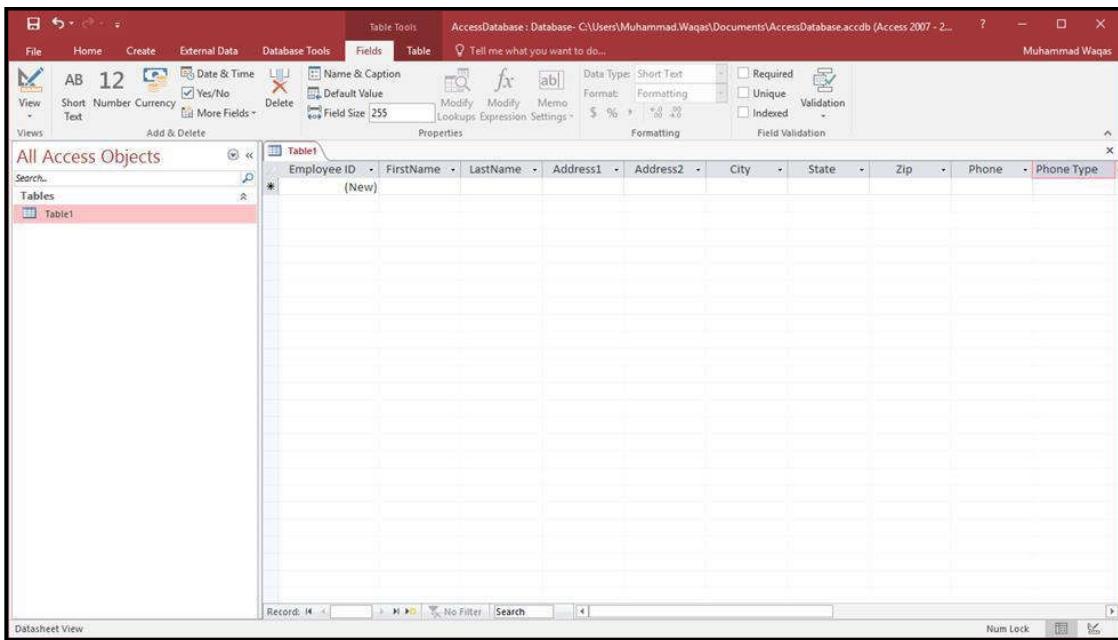
We now have our employee ID field with the caption Employee ID. This is automatically set to auto number so we don't really need to change the data type.
Let us now add some more fields by clicking on **click to add**.



Choose **Short Text** as the field. When you choose short text, Access will then highlight that field name automatically and all you have to do is type the field name

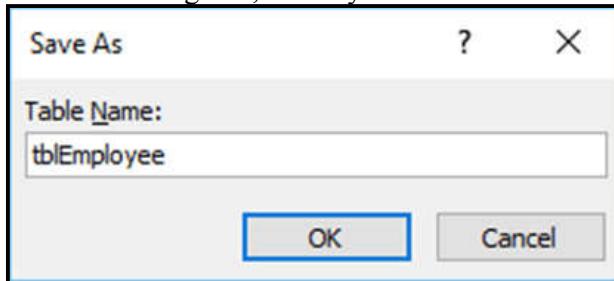


Type **FirstName** as the field name. Similarly, add all the required fields as shown in the following screenshot.



Once all the fields are added, click the Save icon.

You will now see the **Save As** dialog box, where you can enter a table name for the table.



Enter the name of your table in the Table Name field. Here the **tbl** prefix stands for table. Let us click Ok and you will see your table in the navigation pane.

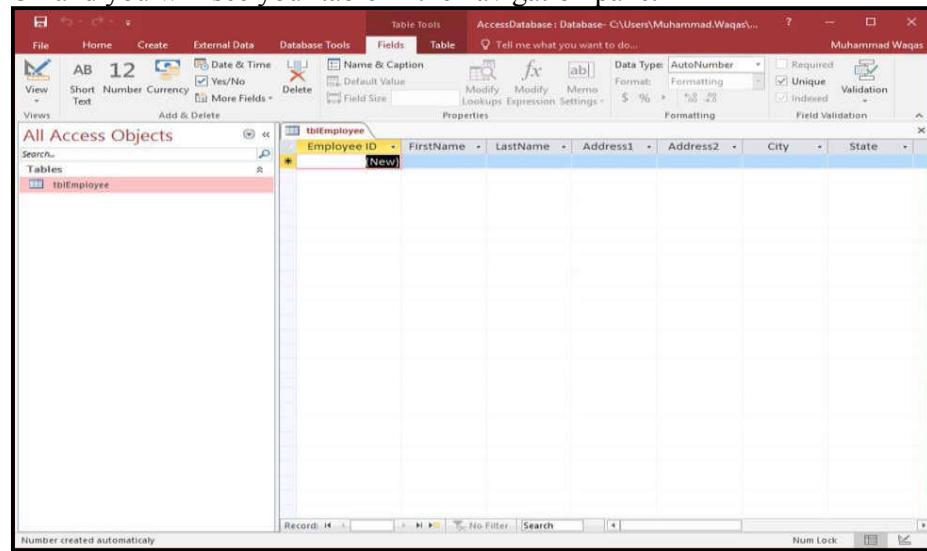
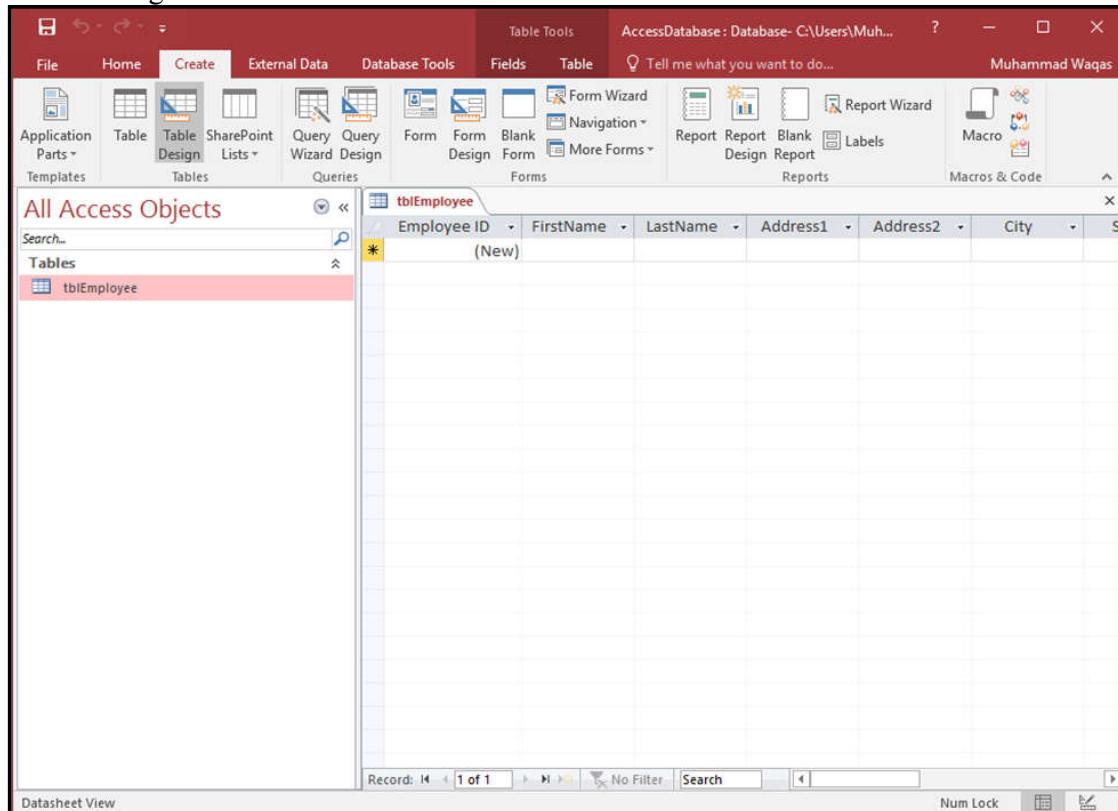


Table Design View

As we have already created one table using **Datasheet View**. We will now create another table using the **Table Design View**. We will be creating the following fields in this table. These tables will store some of the information for various book projects.

Field Name	Data Type
Project ID	AutoNumber
ProjectName	Short Text
ManagingEditor	Short Text
Author	Short Text
PStatus	Short Text
Contracts	Attachment
ProjectStart	Date/Time
ProjectEnd	Date/Time
Budget	Currency
ProjectNotes	Long Text

Let us now go to the Create tab.



In the tables group, click on Table and you can see this looks completely different from the Datasheet View. In this view, you can see the **field name** and **data type** side by side.

The screenshot shows the Microsoft Access application in Design view. The ribbon at the top has the 'Design' tab selected. On the left, the 'All Access Objects' pane shows a list of tables, with 'tblEmployee' selected. The main area displays the structure of 'tblEmployee' with one record in the table grid:

Field Name	Data Type	Description (Optional)
ProjectID	AutoNumber	
ProjectName	Short Text	
ManagingEditor	Short Text	
Author	Short Text	
PStatus	Short Text	
Contracts	Attachment	
ProjectStart	Date/Time	
ProjectEnd	Date/Time	
Budget	Currency	
ProjectNotes	Long Text	

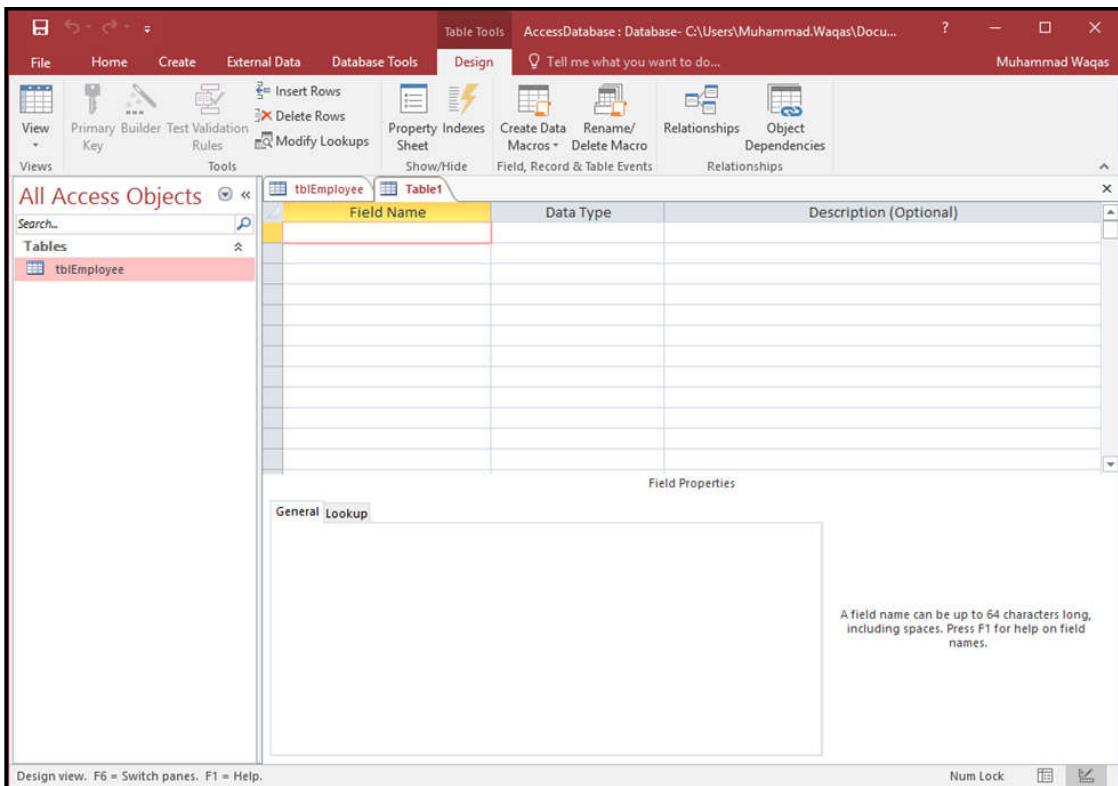
Below the table grid is the 'Field Properties' pane, which is currently displaying the properties for the 'ProjectID' field. The 'General' tab is selected, showing the following settings:

Field Size	Long Integer
New Values	Increment
Format	
Caption	
Indexed	Yes (Duplicates OK)
Text Align	General

A tooltip message is visible on the right side of the pane: "A field name can be up to 64 characters long, including spaces. Press F1 for help on field names."

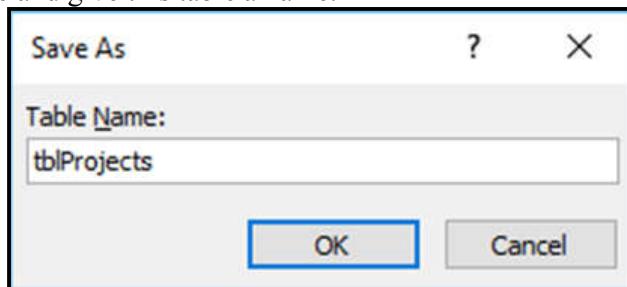
We now need to make **ProjectID** a primary key for this table, so let us select **ProjectID** and click on **Primary Key** option in the ribbon

The screenshot shows the Microsoft Access application in Design view, identical to the previous one but with a key difference: the 'Primary Key' button in the ribbon's 'Tools' group is now highlighted. This indicates that the 'ProjectID' field has been designated as the primary key for the 'tblEmployee' table.



You can now see a little key icon that will show up next to that field. This shows that the field is part of the table's primary key.

Let us save this table and give this table a name.



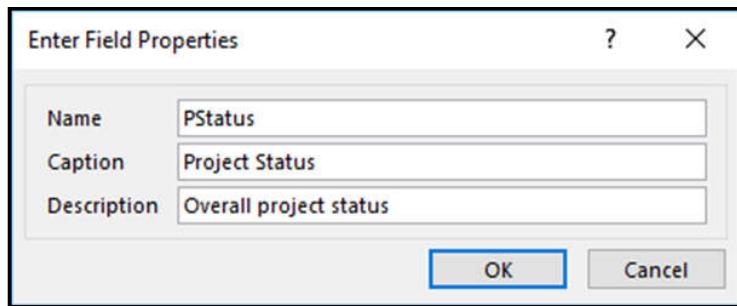
Click Ok and you can now see what this table looks like in the Datasheet View.

The screenshot shows the Microsoft Access application in Design view. The ribbon at the top has 'Design' selected. On the left, there's a navigation pane titled 'Access Objects' with 'Tables' expanded, showing 'tblEmployee' and 'tblProjects'. The main area displays the structure of the 'tblProjects' table. A new field, 'ProjectID', is being added to the first column. The 'Field Name' is set to 'ProjectID', 'Data Type' is 'AutoNumber', and 'Description (Optional)' is empty. Below the table, the 'Field Properties' dialog is open, showing settings like 'Field Size: Long Integer', 'Format: Increment', and 'Caption: ProjectID'. A note in the bottom right corner says: 'A field name can be up to 64 characters long, including spaces. Press F1 for help on field names.' The status bar at the bottom indicates 'Design view. F6 = Switch panes. F1 = Help.'

Let us click the datasheet view button on the top left corner of the ribbon.

The screenshot shows the Microsoft Access application in Datasheet View. The ribbon at the top has 'Home' selected. The navigation pane on the left shows 'tblEmployee' and 'tblProjects'. The main area displays the 'tblProjects' table in a grid format. The first column is labeled 'ProjectID' and contains a single row with the value '(New)'. The status bar at the bottom indicates 'Ready'.

If you ever want to make changes to this table or any specific field, you don't always have to go back to the Design View to change it. You can also change it from the Datasheet View. Let us update the PStatus field as shown in the following screenshot.



Click Ok and you will see the changes.

ProjectID	ProjectName	ManagingEd	Author	Project Status	ProjectStart	ProjectEnd	Budget
*	(New)						

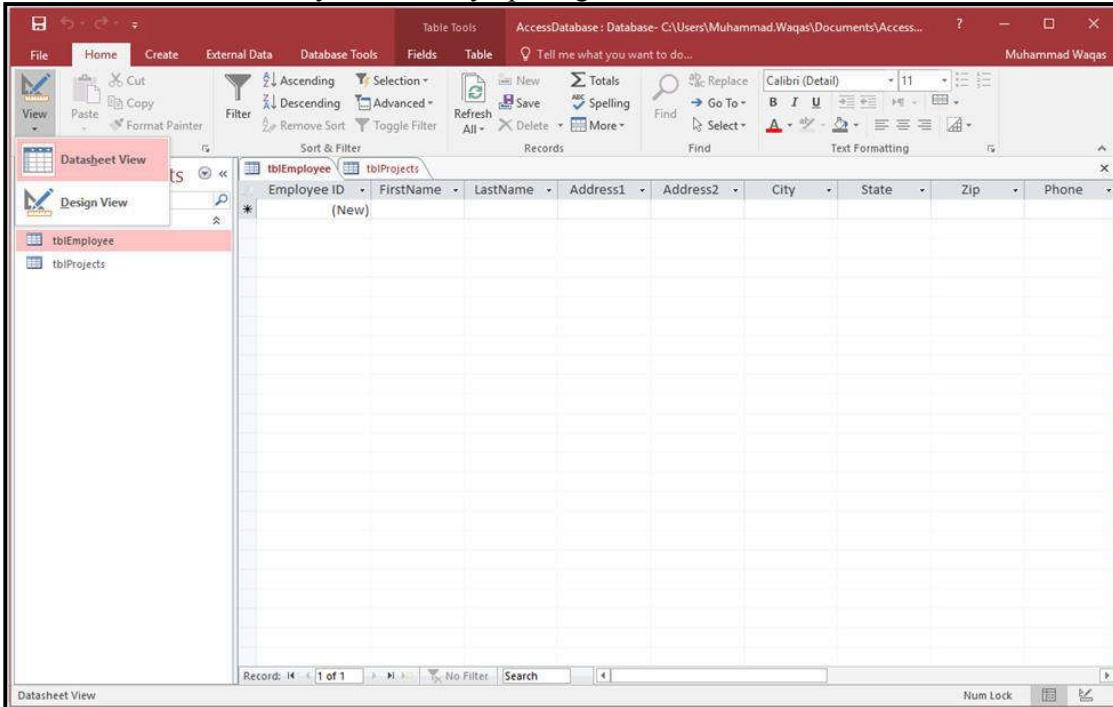
MS Access Adding Data

An Access database is not a file in the same sense as a Microsoft Office Word document or a Microsoft Office PowerPoint are. Instead, an Access database is a collection of objects like tables, forms, reports, queries etc. that must work together for a database to function properly. We have now created two tables with all of the fields and field properties necessary in our database. To view, change, insert, or delete data in a table within Access, you can use the table's Datasheet View.

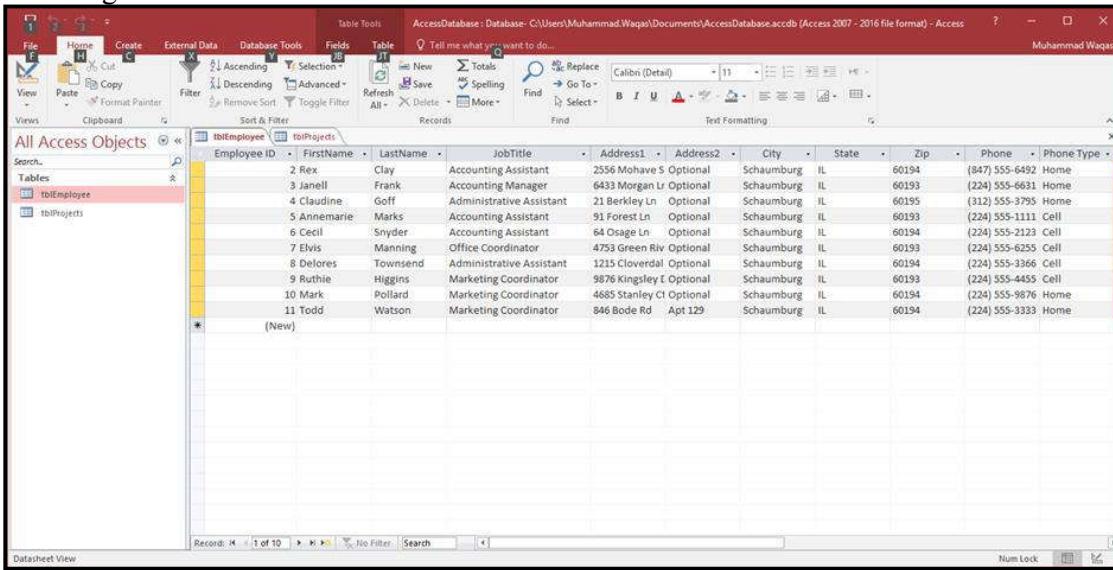
- A datasheet is a simple way to look at your data in rows and columns without any special formatting.
- Whenever you create a new web table, Access automatically creates two views that you can start using immediately for data entry.
- A table open in Datasheet View resembles an Excel worksheet, and you can type or paste data into one or more fields.
- You do not need to explicitly save your data. Access commits your changes to the table when you move the cursor to a new field in the same row, or when you move the cursor to another row.

- By default, the fields in an Access database are set to accept a specific type of data, such as text or numbers. You must enter the type of data that the field is set to accept. If you don't, Access displays an error message:

Let us add some data into your tables by opening the Access database we have created.



Select the **Views > Datasheet View** option in the ribbon and add some data as shown in the following screenshot.

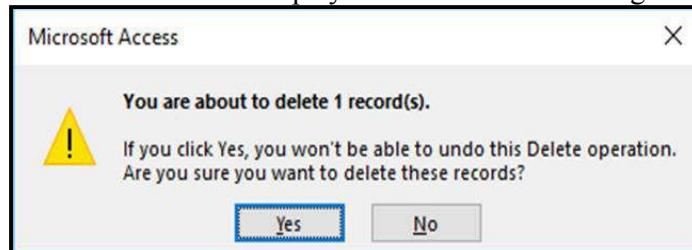


Similarly, add some data in the second table as well as shown in the following screenshot.

ProjectID	ProjectName	ManagingEditor	Author	Project Status	ProjectStart	ProjectEnd	Budget	ProjectNotes
2	Project Quarterly 1.1	12		Completed	01/11/2006	2/15/2007	\$5,000.00	A quarterly literary journal de
11	Project Quarterly 1.2	12		Completed	02/1/2007	5/15/2007	\$5,000.00	A quarterly literary journal de
12	Project Quarterly 1.3	12		Completed	05/1/2007	8/15/2007	\$5,000.00	A quarterly literary journal de
13	Project Quarterly 1.4	12		Completed	08/1/2007	11/15/2007	\$5,000.00	A quarterly literary journal de
14	Project Quarterly 2.1	12		Completed	11/1/2007	2/15/2008	\$6,000.00	A quarterly literary journal de
15	Project Quarterly 2.2	12		Completed	02/1/2008	5/15/2008	\$6,000.00	A quarterly literary journal de
16	Project Quarterly 2.3	12		Completed	05/1/2008	8/15/2008	\$6,000.00	A quarterly literary journal de
17	Project Quarterly 2.4	12		Completed	08/1/2008	11/15/2008	\$6,000.00	A quarterly literary journal de
(New)				0			\$0.00	

You can now see that inserting a new data and updating the existing data is very simple in Datasheet View as working in spreadsheet. But if you want to delete any data you need to select the entire row first as shown in the following screenshot.

Now press the delete button. This will display the confirmation message.



Click Yes and you will see that the selected record is deleted now.

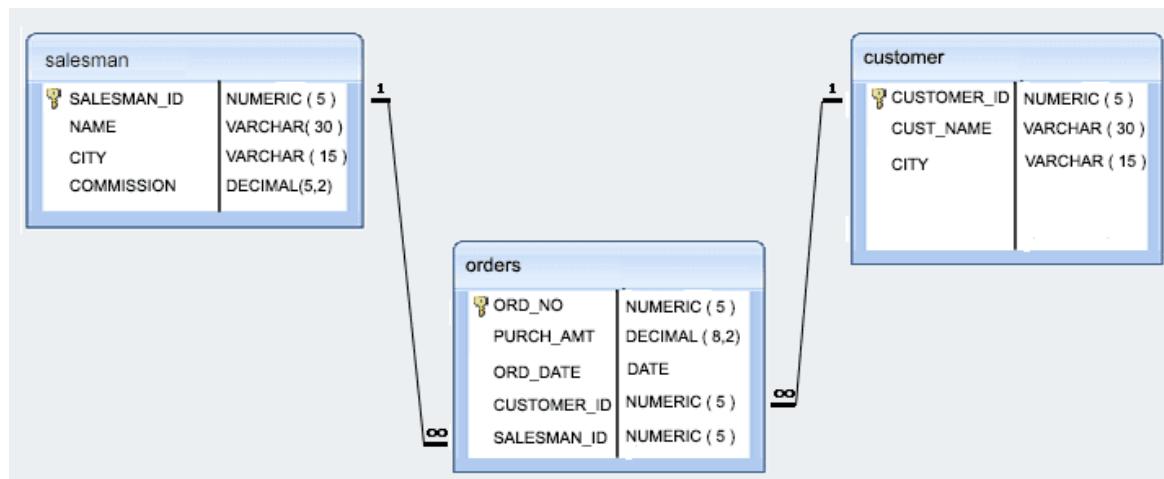
ProjectID	ProjectName	ManagingEditor	Author	Project Status	ProjectStart	ProjectEnd	Budget	ProjectNotes
2	Project Quarterly 1.1	12		Completed	01/11/2006	2/15/2007	\$5,000.00	A quarterly literary journal de
11	Project Quarterly 1.2	12		Completed	02/1/2007	5/15/2007	\$5,000.00	A quarterly literary journal de
12	Project Quarterly 1.3	12		Completed	05/1/2007	8/15/2007	\$5,000.00	A quarterly literary journal de
13	Project Quarterly 1.4	12		Completed	08/1/2007	11/15/2007	\$5,000.00	A quarterly literary journal de
14	Project Quarterly 2.1	12		Completed	11/1/2007	2/15/2008	\$6,000.00	A quarterly literary journal de
15	Project Quarterly 2.2	12		Completed	02/1/2008	5/15/2008	\$6,000.00	A quarterly literary journal de
16	Project Quarterly 2.3	12		Completed	05/1/2008	8/15/2008	\$6,000.00	A quarterly literary journal de
New				0			\$0.00	

Task:

You are given with the ER Model of small Inventory System Database and also the sample data is inserted into the given tables below.

You have to perform the following tasks

1. Create the database name Inventory System.
2. Create the given table as shown in figures.
3. Add attribute in each table of given data type as shown in figure.
4. Define the relation among the table.
5. Add data into the tables.



Salesman				
salesman_id	name	city	commission	
5001	James Hoog	New York	0.15	
5002	Nail Knite	Paris	0.13	
5005	Pit Alex	London	0.11	
5006	Mc Lyon	Paris	0.14	
5003	Lauson Hen		0.12	
5007	Paul Adam	Rome	0.13	
Orders				
ord_no	purch_amt	ord_date	customer_id	salesman_id
70001	150.5	2012-10-05	3005	5002
70009	270.65	2012-09-10	3001	5005
70002	65.26	2012-10-05	3002	5001
70004	110.5	2012-08-17	3009	5003
70007	948.5	2012-09-10	3005	5002
70005	2400.6	2012-07-27	3007	5001
Customer				
customer_id	cust_name	city		
3002	Nick Rimando	New York		
3005	Graham Zus	California		
3001	Brad Guzan	London		
3004	Fabian Johns	Paris		
3007	Brad Davis	New York		
3009	Geoff Camero	Berlin		