

**Introduction to
Information &
Communication
Technologies
CL-1000**

Lab 04

**Introduction to
Databases/DBMS: Creating
Tables, Key Columns, Data
Insertion, Data Forms, Relations**

National University of Computer & Emerging Sciences – NUCES – Karachi



National University of Computer & Emerging Sciences – NUCES – Karachi

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| Course Code: CL-1000 | Introduction to Information & Communication Technologies |
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1. Database

A database is an organized collection of structured information, or data, typically stored electronically in a computer system.

2. Database Management System (DBMS)

Database Management Systems (DBMS) are software systems used to store, retrieve, and run queries on data. A DBMS serves as an interface between an end-user and a database, allowing users to create, read, update, and delete data in the database.

3. What is a Database Table?

A table is a collection of related data entries, and it consists of columns and rows. A column holds specific information about every record in the table. A record (or row) is each individual entry that exists in a table.

Look at a selection from the Northwind **"Customers"** table:

| CustomerID | CustomerName | ContactName | Address | City | PostalCode | Country |
|------------|------------------------------------|--------------------|-------------------------------|-------------|------------|---------|
| 1 | Alfreds Futterkiste | Maria Anders | Obere Str. 57 | Berlin | 12209 | Germany |
| 2 | Ana Trujillo Emparedados y helados | Ana Trujillo | Avda. de la Constitución 2222 | México D.F. | 05021 | Mexico |
| 3 | Antonio Moreno Taquería | Antonio Moreno | Mataderos 2312 | México D.F. | 05023 | Mexico |
| 4 | Around the Horn | Thomas Hardy | 120 Hanover Sq. | London | WA1 1DP | UK |
| 5 | Berglunds snabbköp | Christina Berglund | Berguvsvägen 8 | Luleå | S-958 22 | Sweden |

4. What is Microsoft Access?

Microsoft Access is a Database Management System offered by Microsoft. It uses the Microsoft Jet Database Engine and comes as a part of the Microsoft Office suite of application.

Microsoft Access offers the functionality of a database and the programming capabilities to create easy to navigate screens (forms). It helps you analyses large amounts of information and manage data efficiently.

4.1 Important Terms and Basic Objects

Now in this Microsoft Access tutorial, we will learn about some important terms and basic objects in MS Access.

4.2 Database File

It is a file which stores the entire database. The database file is saved to your hard drive or other storage devices.

4.3 Datatypes

Datatypes are the properties of each field. Every field has one datatype like text, number, date, etc.

4.4 Table

- A Table is an object which stores data in Row & Column format to store data.
- A Table is usually related to other tables in the database file.
- Each column must have Unique name.
- We can also define Primary Key in a table.

4.5 Query

- Queries answer a question by selecting and sorting and filtering data based on search criteria.
- Queries show a selection of data based on criteria (limitations) you provide.
- Queries can pull from one or more related Tables and other Queries.
- Types of Queries can be **SELECT, INSERT, UPDATE, DELETE**.

4.6 Form

A form is a database object that you can use to create a user interface for a database application. Forms help you to display live data from the table. It mainly used to ease the process of data entry or editing.

4.7 Report

A report is an object in desktop databases primarily used for formatting, calculating, printing, and summarizing selected data.

You can even customize the report's look and feel.

4.8 Microsoft Access Data Types

MS Access common data types are listed below:

| Type of Data | Description | Size |
|--------------|--|---|
| Short Text | Text, including numbers which does not need calculation. (e.g., Mobile numbers). | Up to 255 characters. |
| Long Text | This data type is used for lengthy text or alphanumeric data. | Maximum 63, 999 characters. |
| Number | Numeric data type used for storing mathematical calculations. | 1, 2, 4, 8, and 16 bytes. |
| Date/Time | Store Date/time for the years 100 through 9999. | 8 bytes. |
| Currency | It allows you to store currency values and numeric data with one to four decimal places. | 8 bytes. |
| Auto Number | Assign a unique number or assigned by Microsoft Access when any new record is created. Usually used as the primary key | Four bytes (16 bytes if it is set as a Replication ID). |
| Yes/No | It only stores logical values Yes and No. | 1 bit |
| Attachment | It stores files, such as digital photos. Multiple files can be attached per record. | Up to 2GB Data can be stored. |
| OLE objects | OLE objects can store audio, video, other Binary Large Objects. | Up to 2GB data can be stored. |
| Hyperlink | Text or combinations of text and numbers stored. That text is used as hyperlink address. | Each part of a Hyperlink data type allows you to store a maximum 2048 characters. |
| Calculated | Helps you to create an expression that uses data from one or more fields. | You can create an expression which uses data from one or more fields. |

5. How to Create a Database?

Before we create a Database, let's quickly understand the holistic picture of what Database is, with particular reference to MS Access.

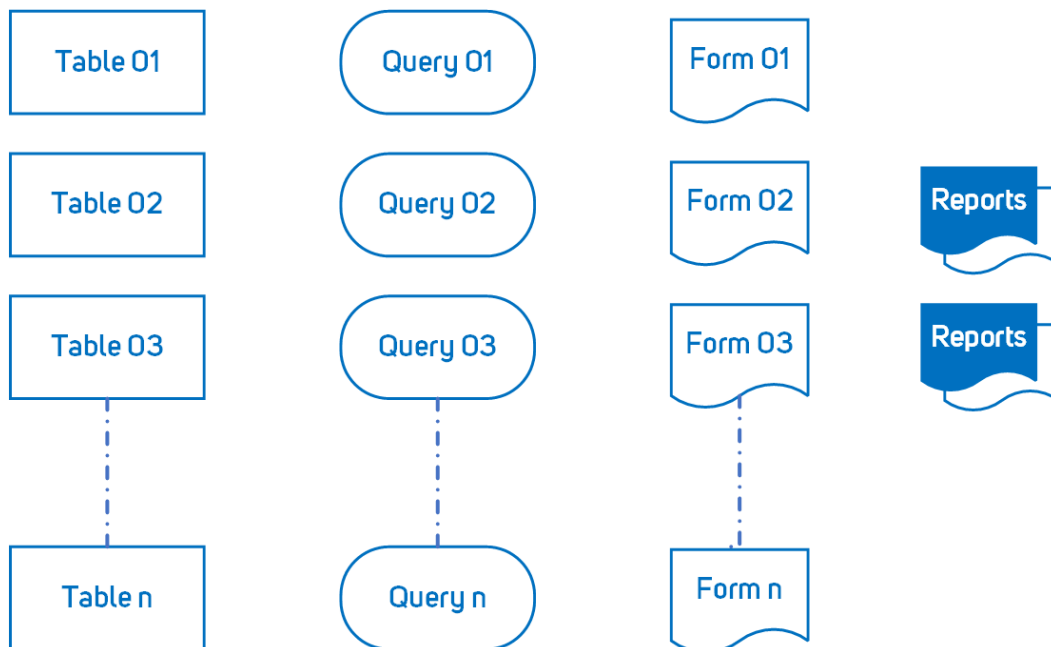
Let's, start with a few real-life Microsoft Access databases example:

- We have Bookcase where Books resides,
- We have iPods where we have a collection of music & cases are countless.

Similarly, we have MS Access Database is a kind of home for all your **Tables, Queries, Forms, Reports**, etc. in MS Access which are interlinked.

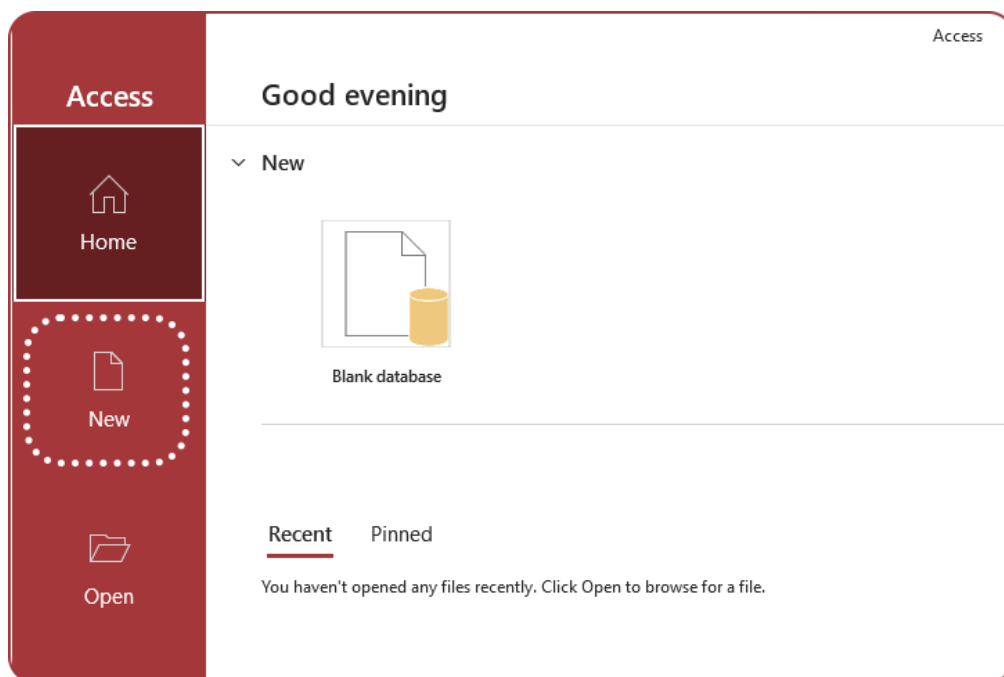
Technically, Database store the data in a well-organized manner for easy access and retrieval.

Database

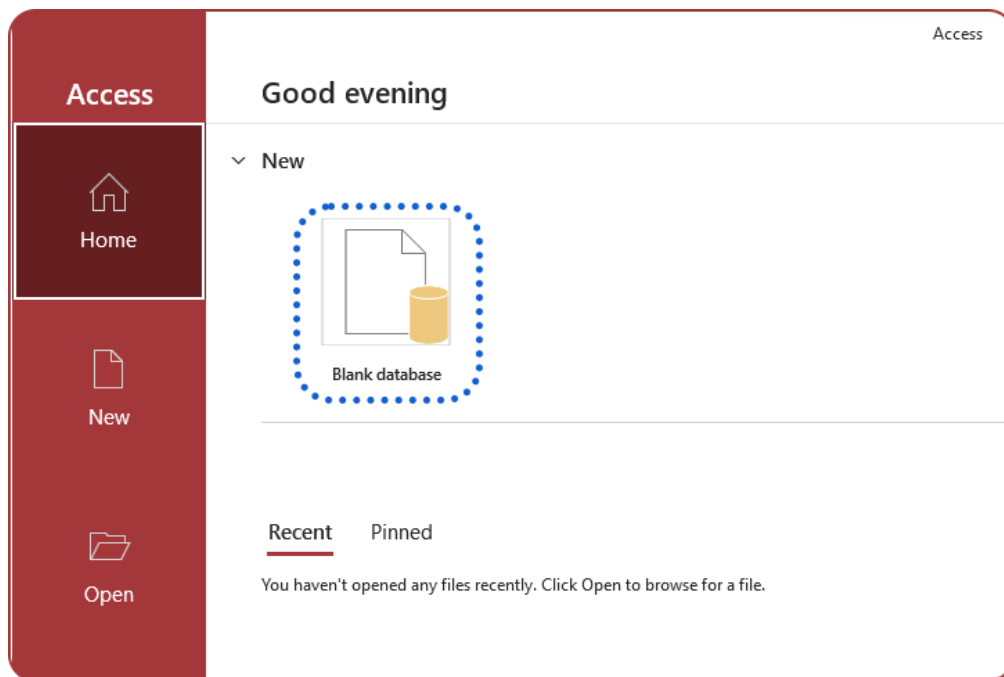


5.1 Create a Blank Database

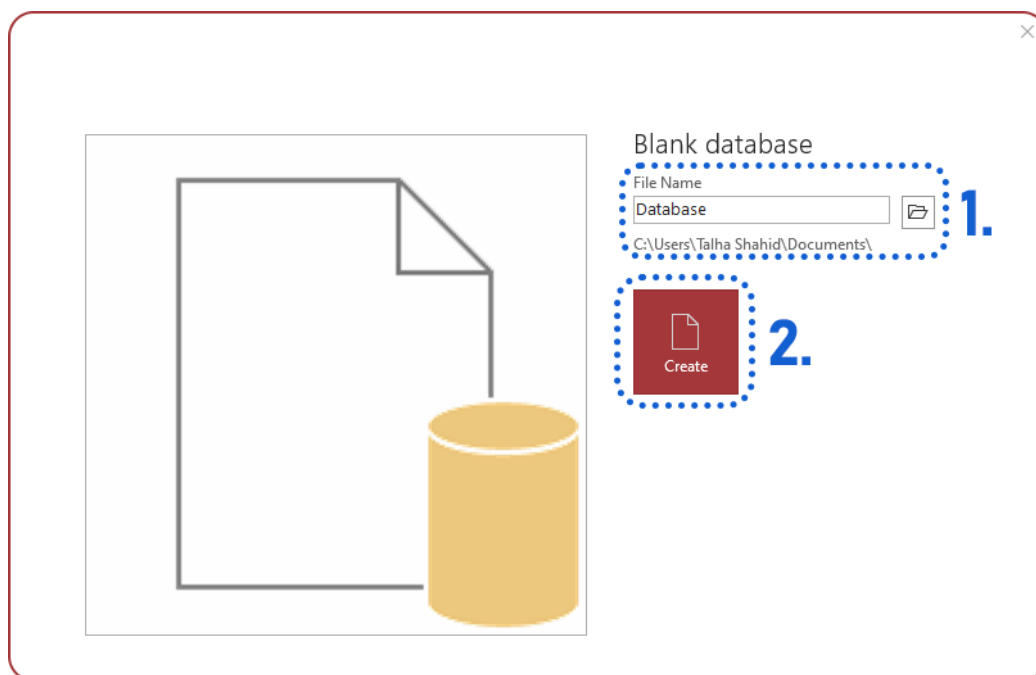
1. Open MS Access and click on **New**.



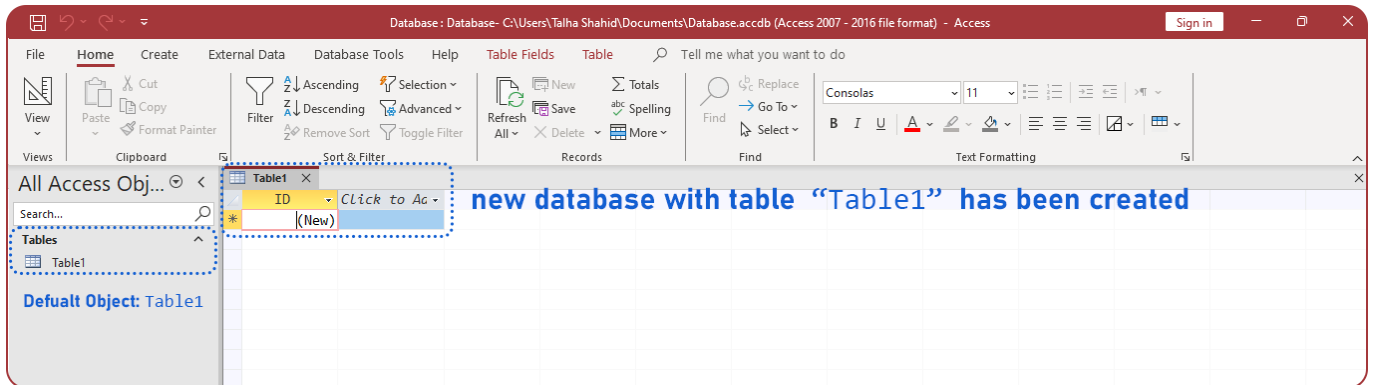
2. Click on **Blank database**.



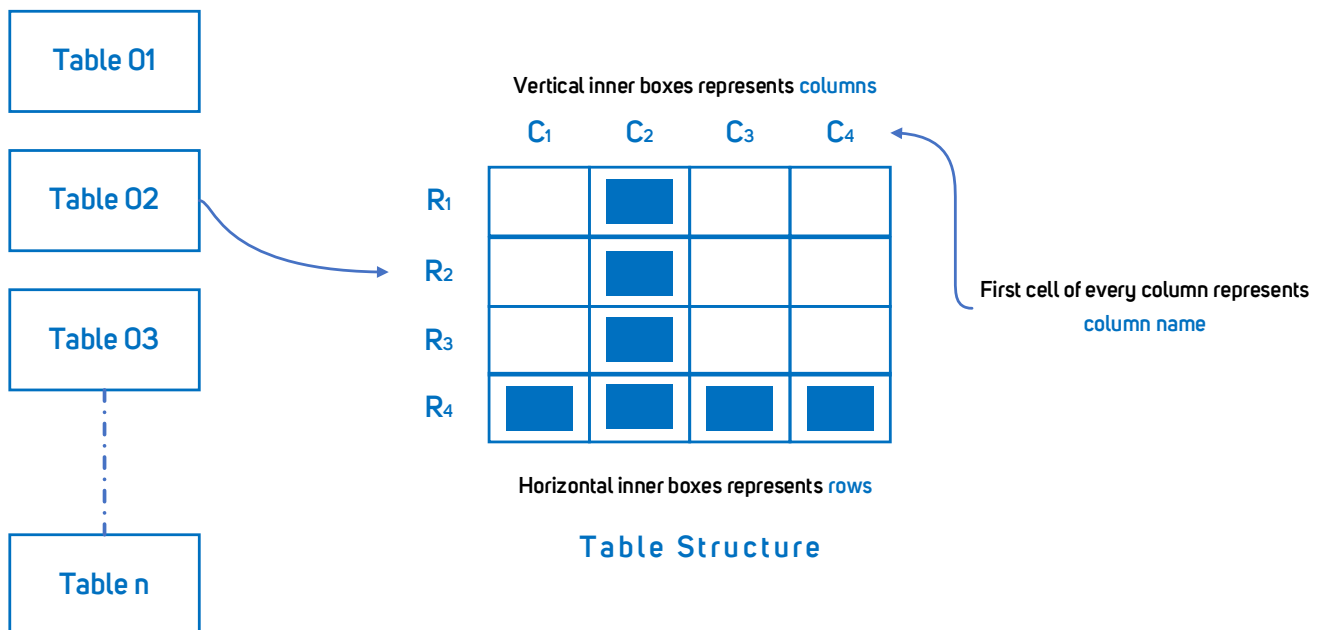
3. You can give a name to your database file in the **File Name** field and can also change the location to save your database file.
4. Click on **Create**.



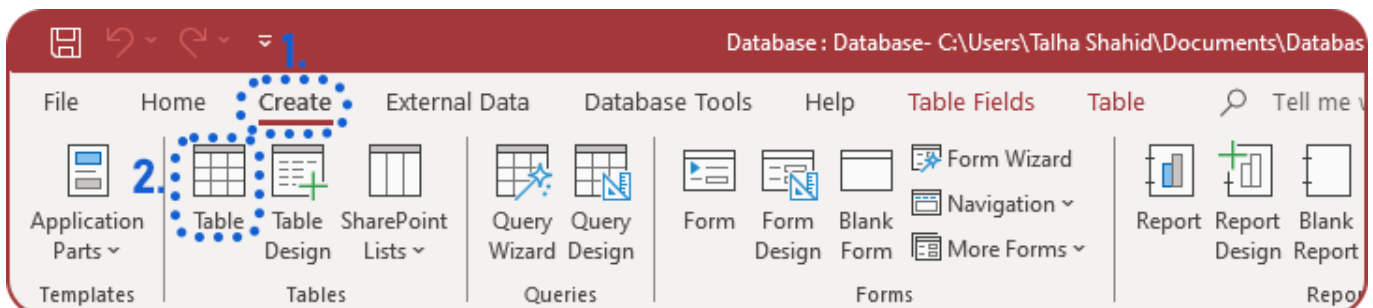
5. An empty database with **.accdb** extension and with a table name **Table1** has been created. You can see the table in left-most **Object Pane**.



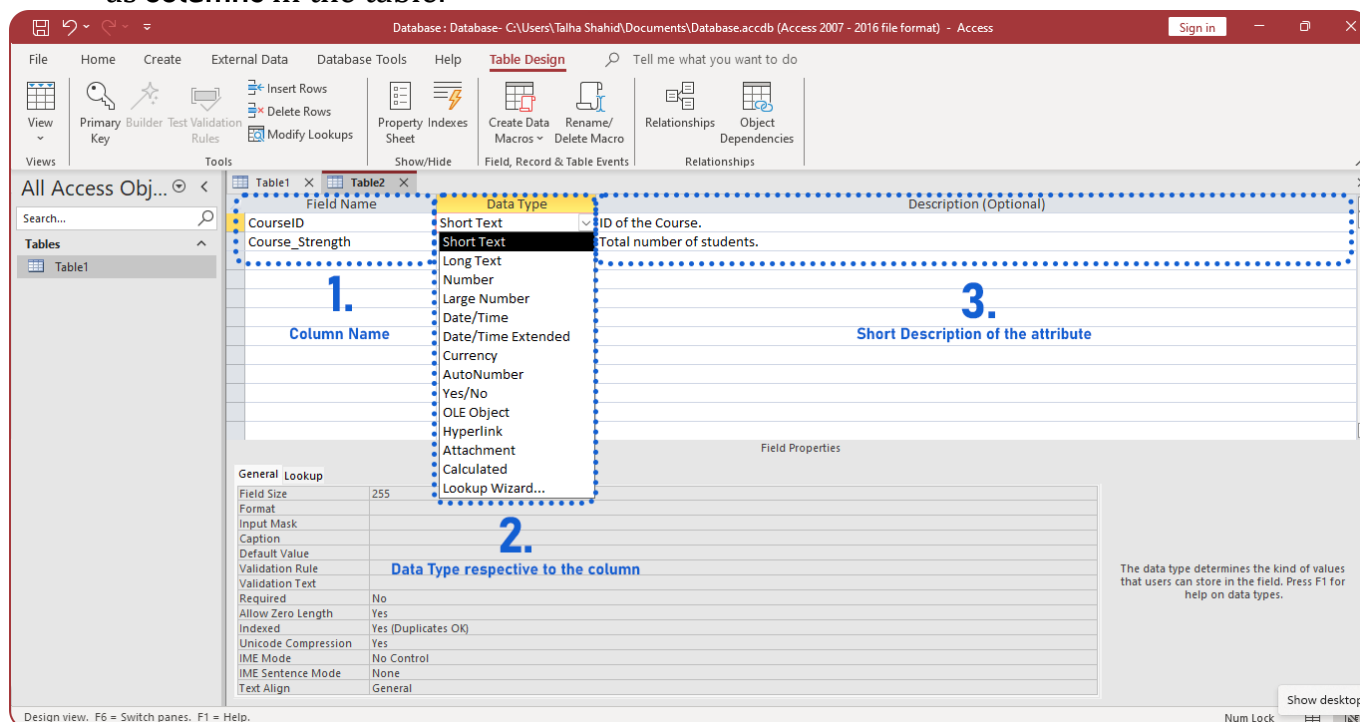
5.2 Create a Table



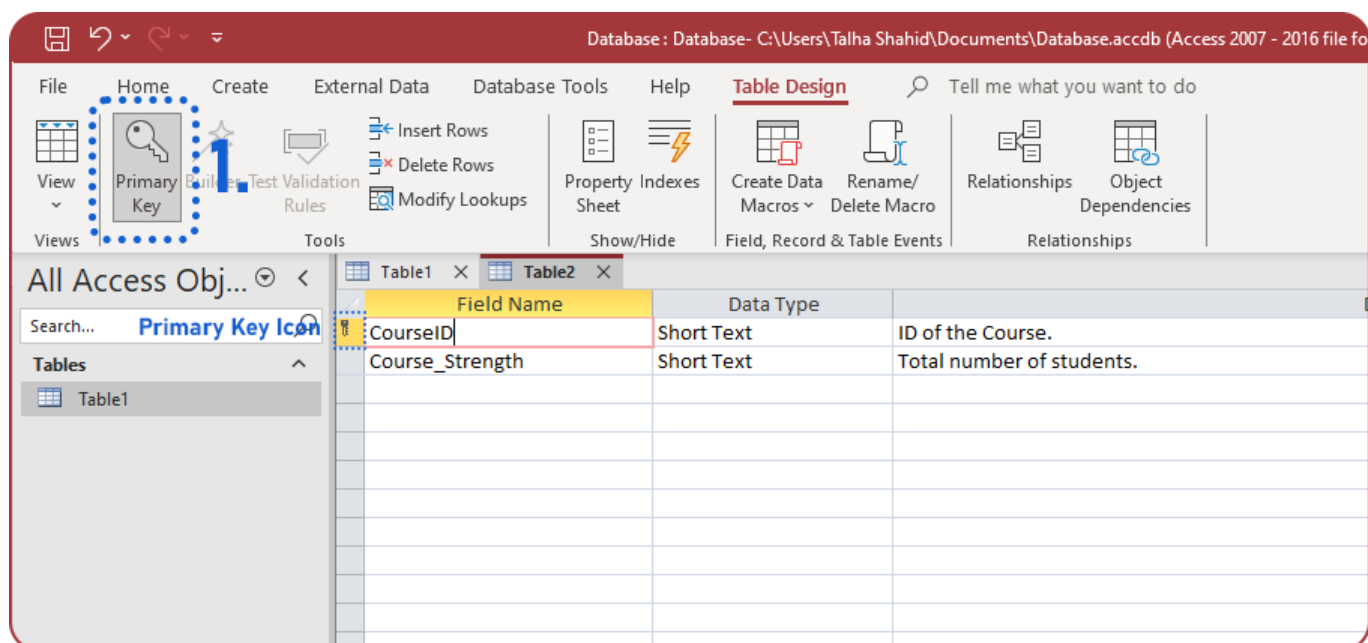
1. Click on the **Create** tab.
2. Click on **Table** in the **Tables** section.



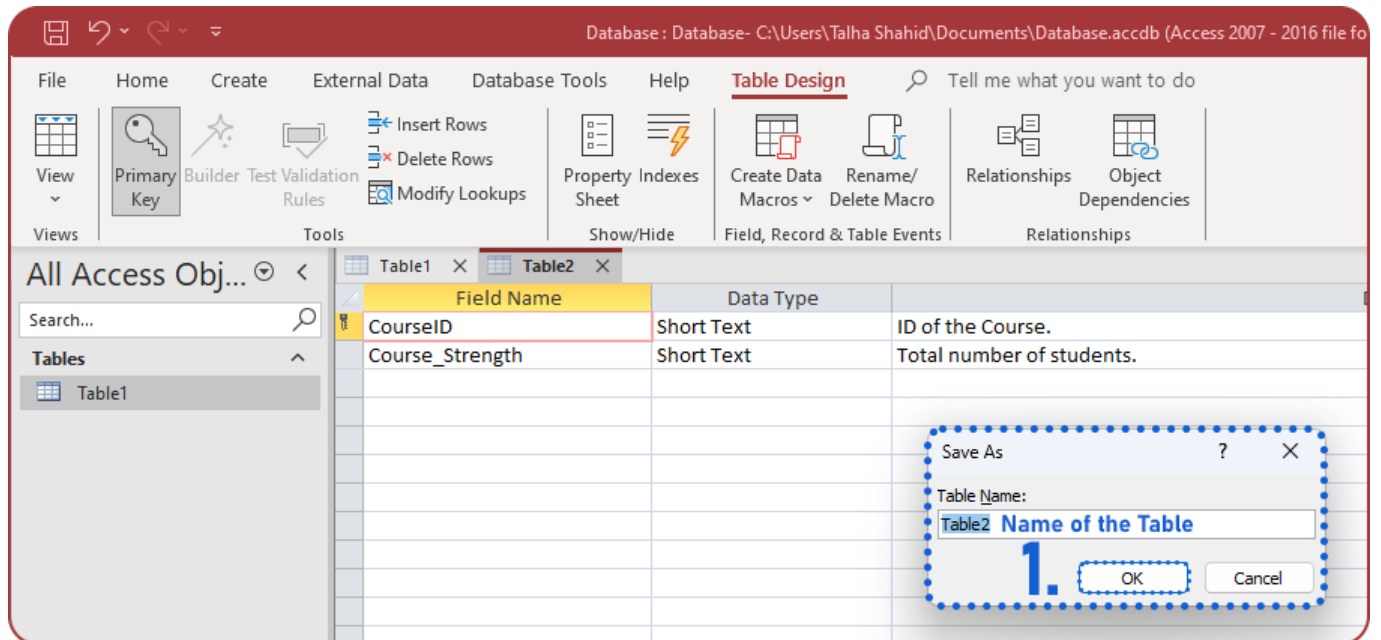
3. You can enter **new attributes** as **Field Name** and their **data types** in the tables which act as **columns** in the table.



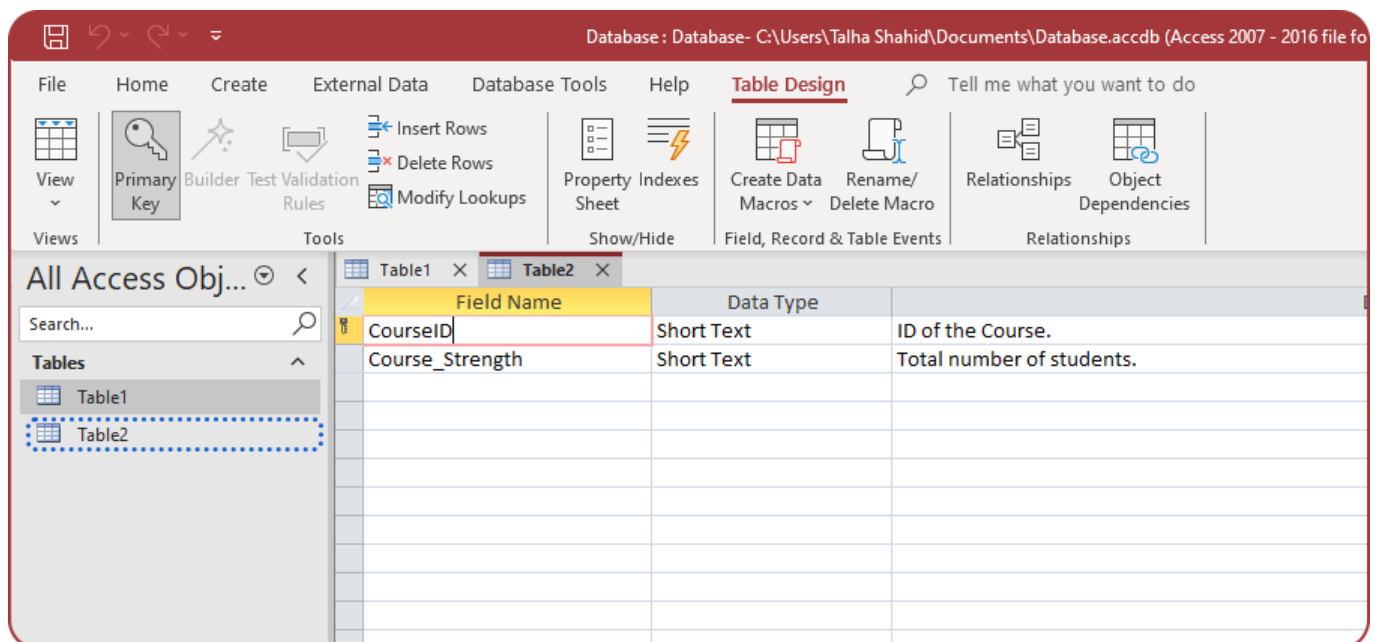
4. You can also assign a **unique key** to a column known as **Primary Key** to uniquely identify records in your table.



5. Press **Ctrl + s** to save the Table.
6. Enter the **table name** you like in the **Table Name** field and hit **OK**.

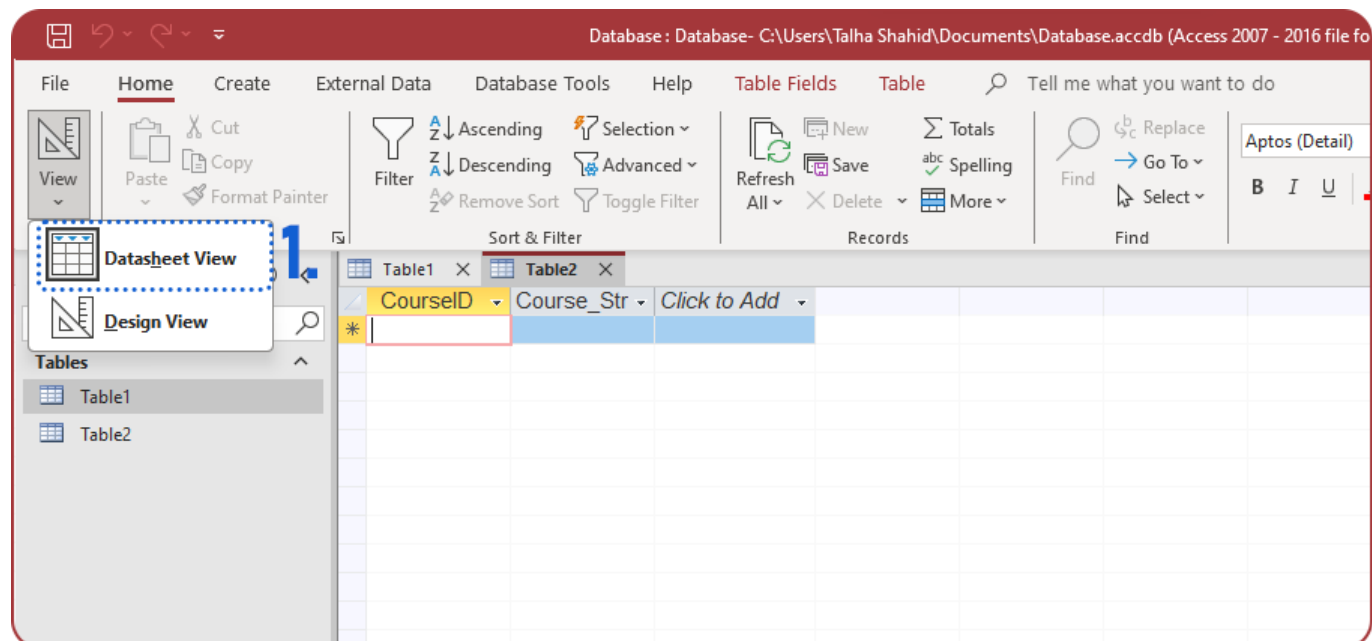


7. The new table has been created.

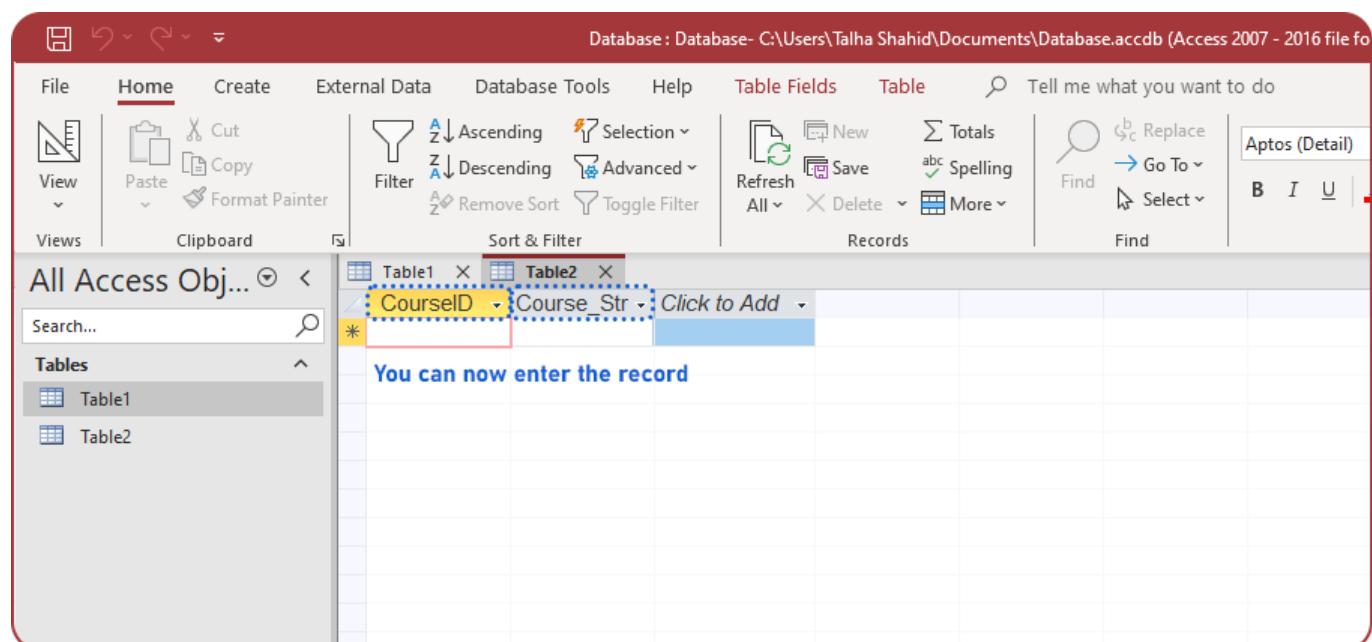


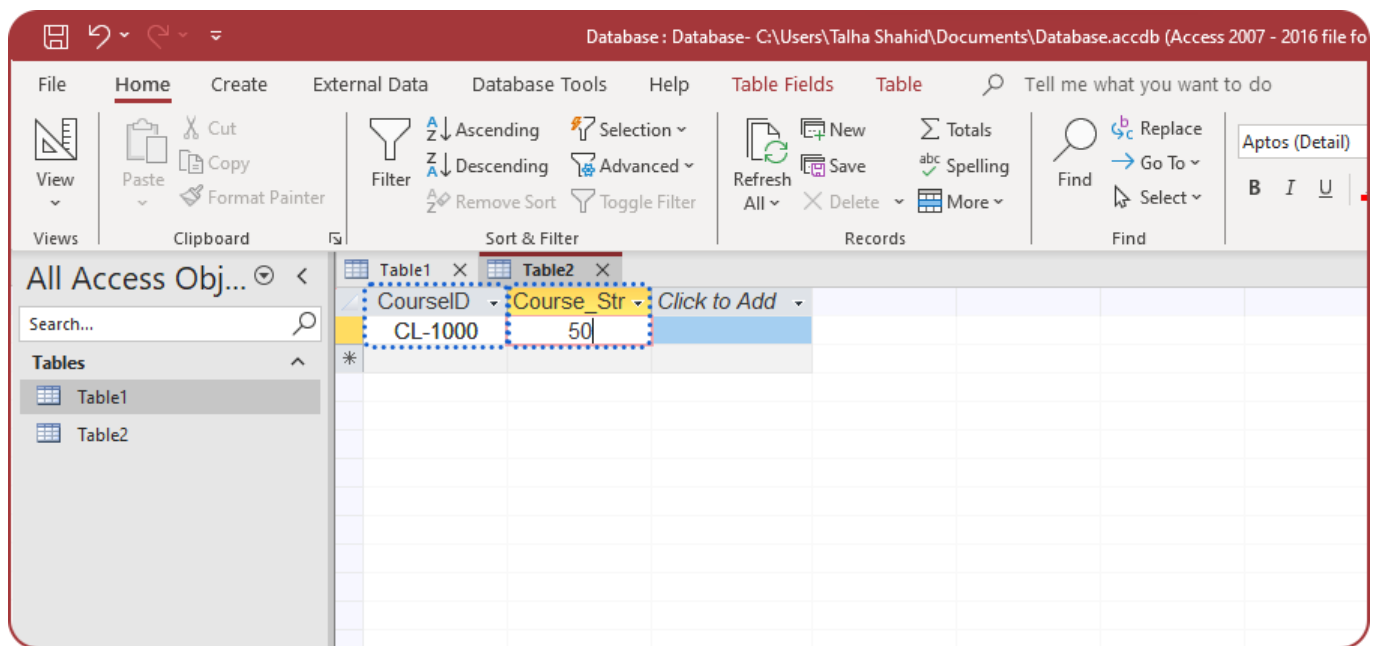
5.3 Enter Records in the Table

1. Under the **Home** tab, click on **View**.
2. Click on **Datasheet View**.



3. Now enter your records.





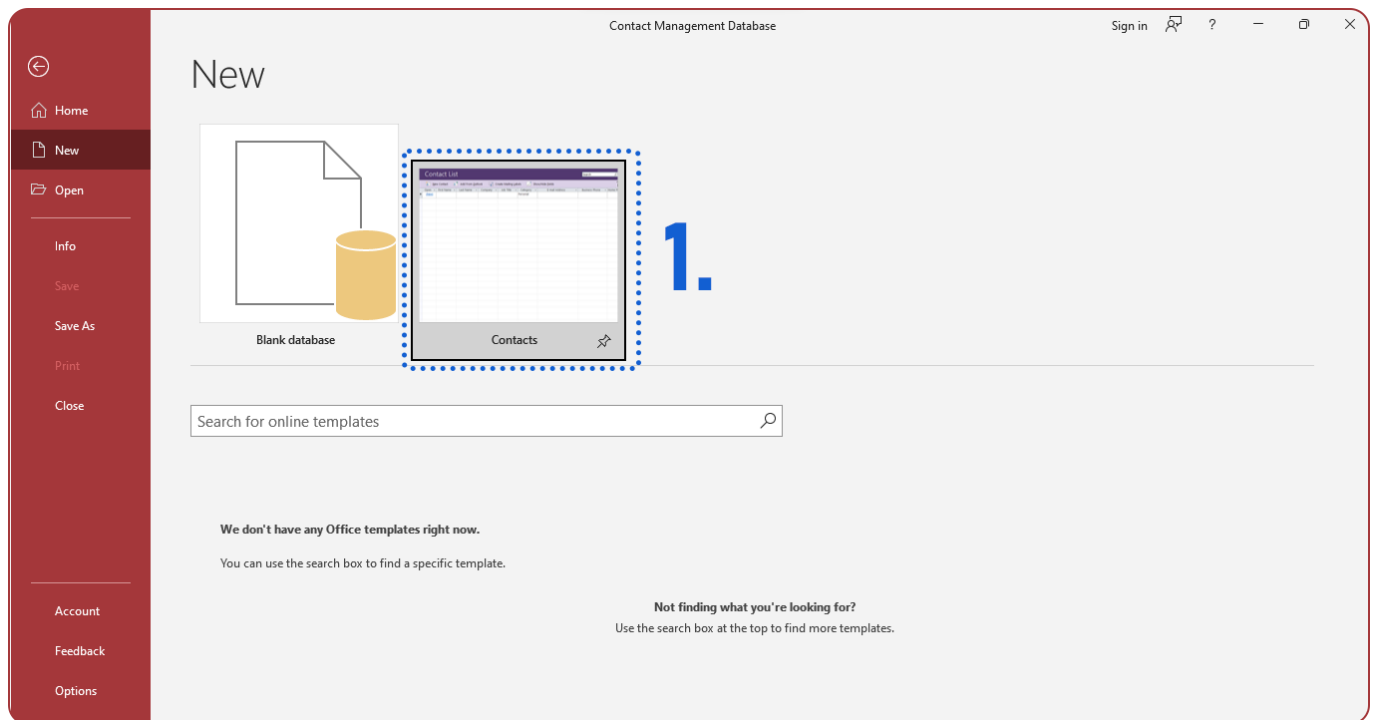
6. Forms in MS Access

- A form is a database object that you can use to create a user interface for a database application.
- It mainly used to ease the process of data entry or editing.
- Data in a form can be selected from one or more tables.
- Forms can also be used to control access to data, like which fields or rows of data are visible to which users.
- Forms have a Form View.
- Help you to display live data with easy creation of new data.

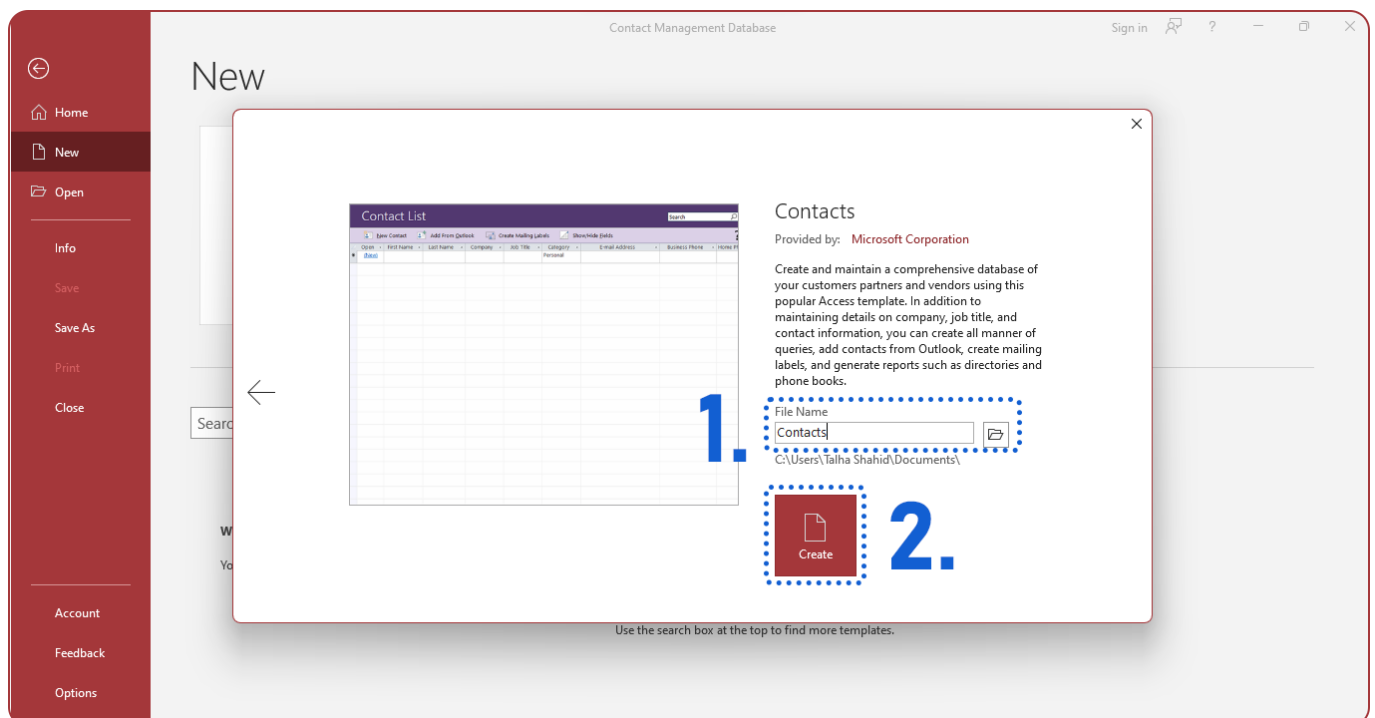
6.1 Create a Form from Templates

1. Go to the **File** tab and click on **New**.
2. Click on the **Contacts** template. (You can also search the **Contacts** template or click on the link below to download the .accdb file)

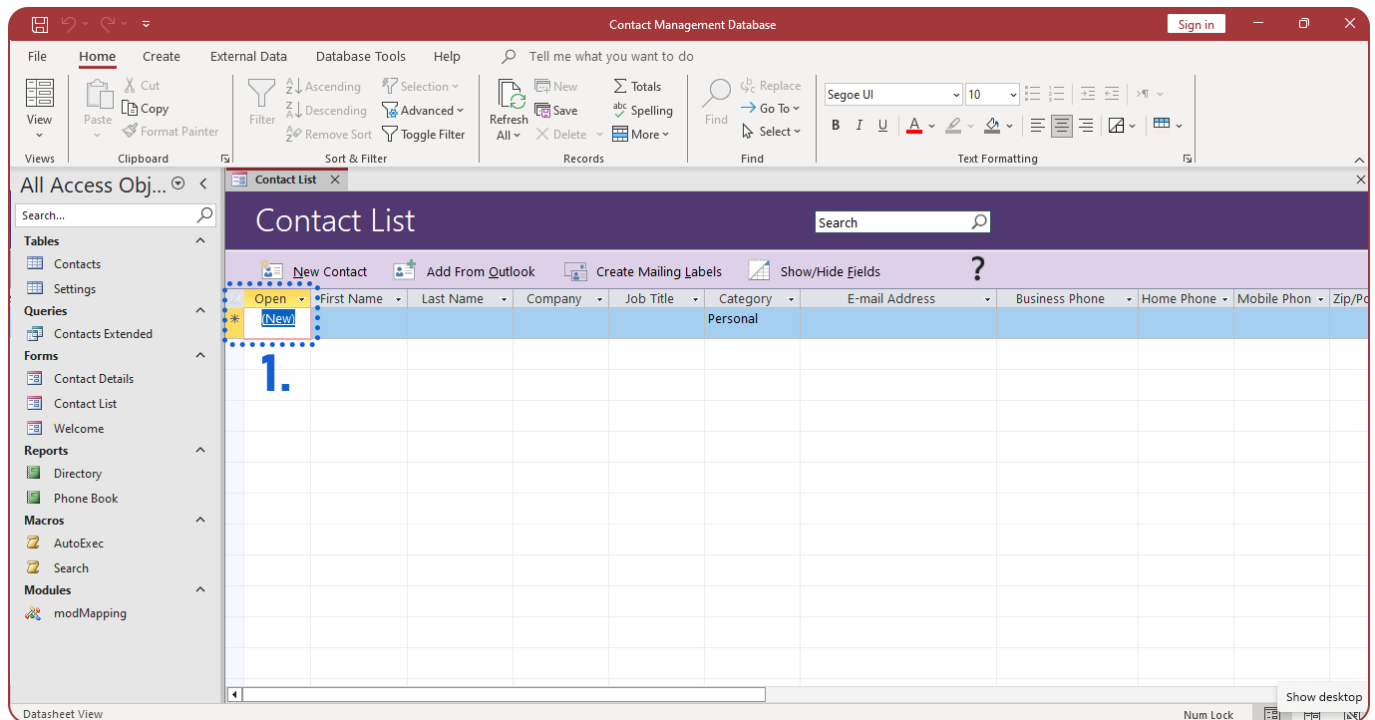
Link: [Contacts](#)



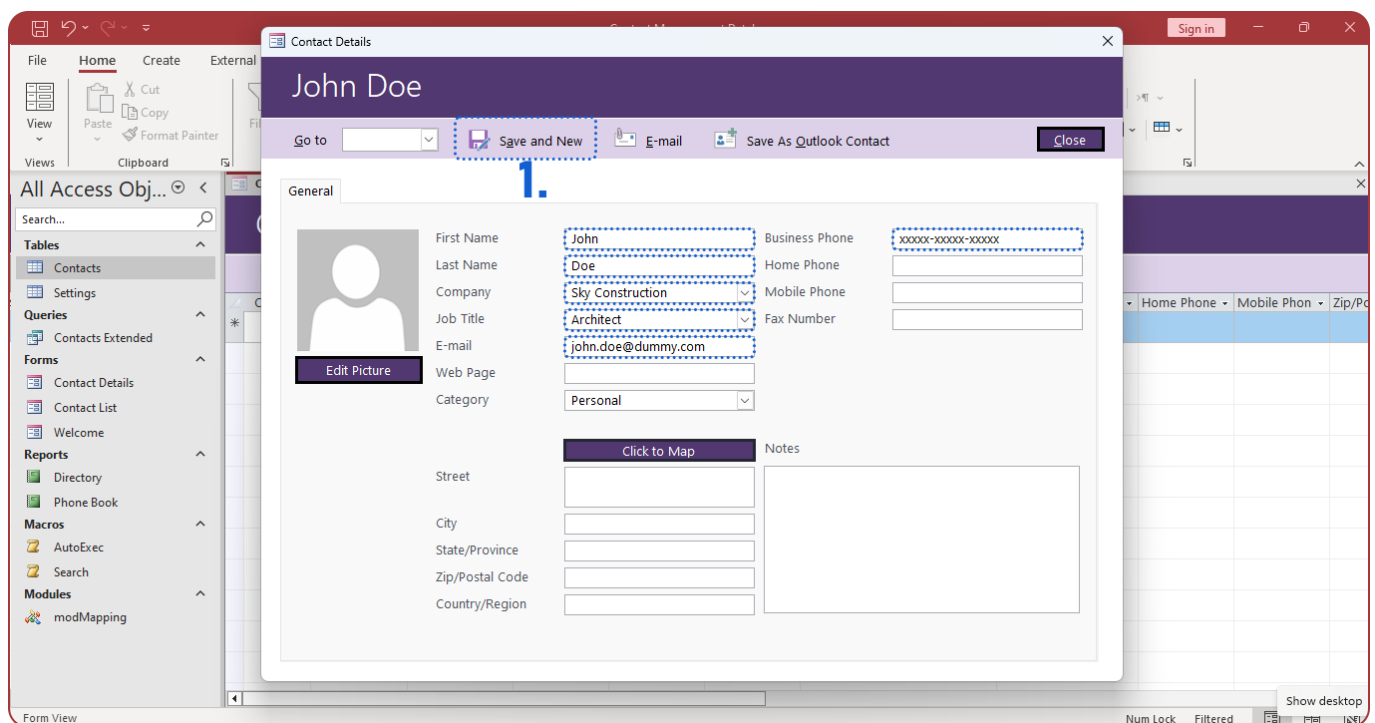
3. Enter the name you want for the **.accdb Contacts** file. You can also modify the default directory for saving the file.
4. Click on **Create**.



5. Now you can see different forms under the **Forms** section in the Left **Object Pane**.
6. The **Contact List** form will open by default and if not, you can manually open it by double clicking the **Contact List** form from the **Object Pane**.
7. Now, click on **New** in the column named **"Open"**.

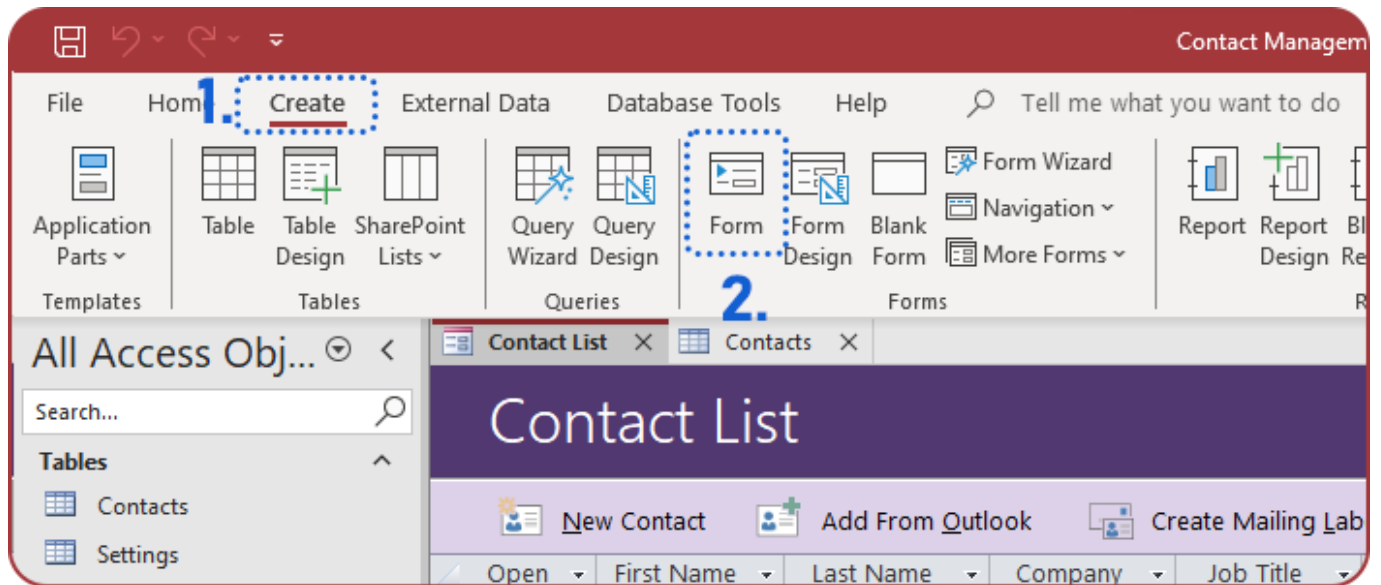


8. A form window will open in which you can fill the attributes. (i.e., **First Name, Last Name**).
9. After entering the data for the desired attributes, click on **Save and New**.

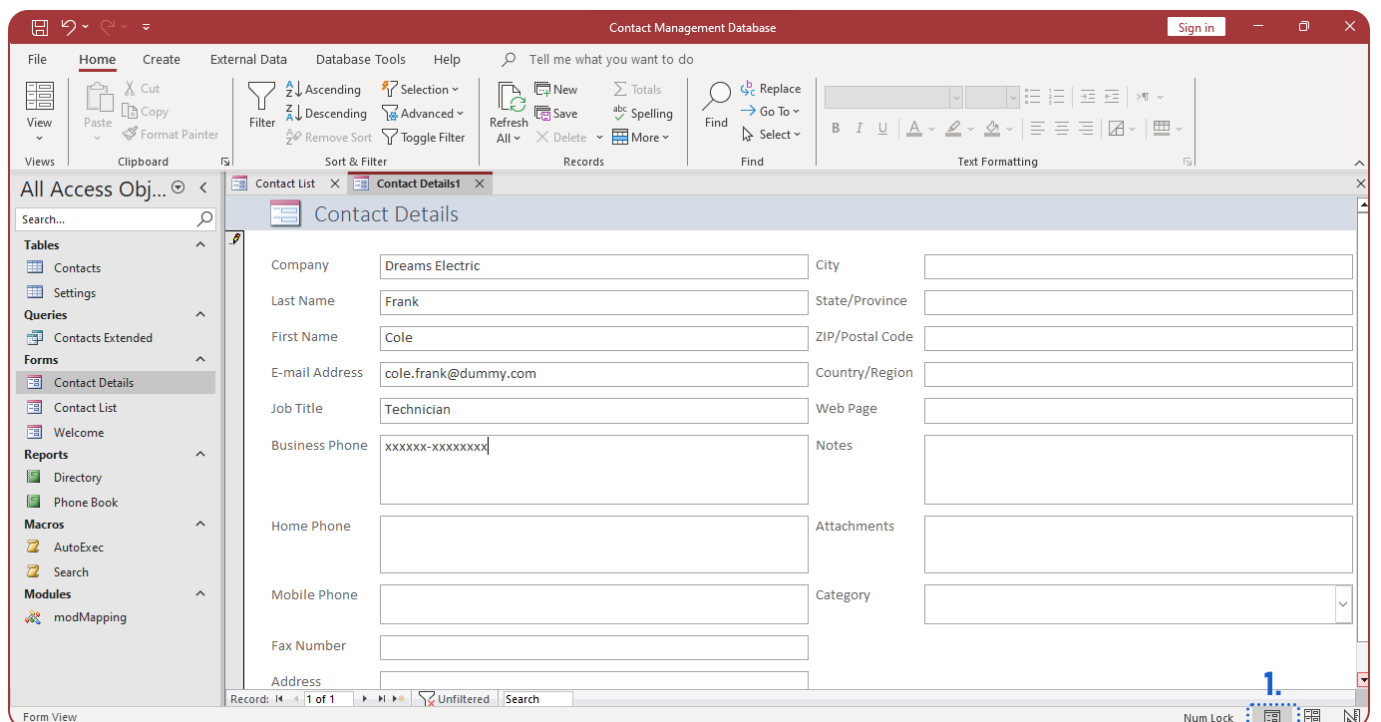


6.2 Creating a New Form

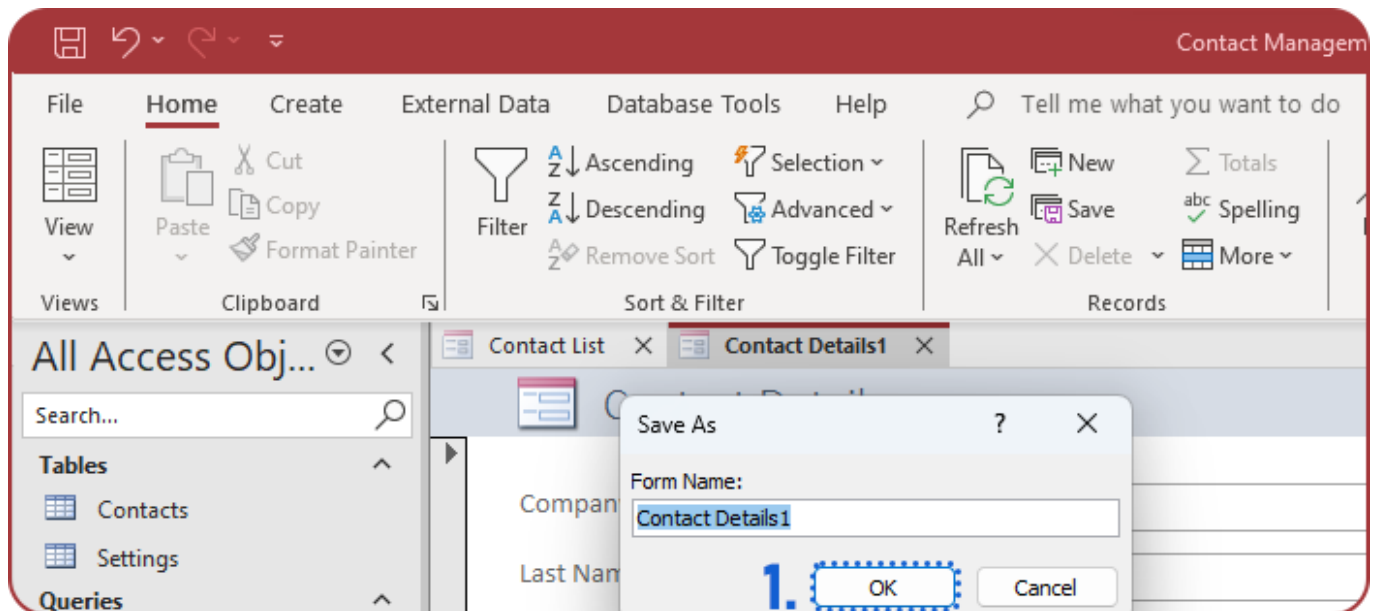
1. Click on the **Create** tab.
2. Click on **Form**.



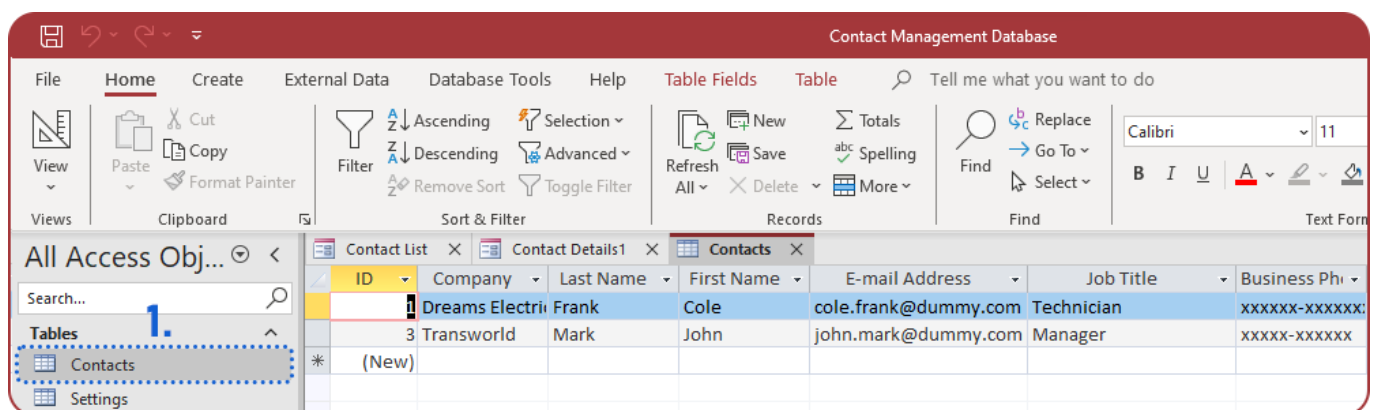
3. A new sub-tab will open.
4. To enter the data in the desired attributes, click on the **Form View** button at bottom-right corner of the windows. Alternatively, you can click on **View** under the **Home** tab and click on **Form View**.



5. Press **Ctrl + s** to save the form.
6. Enter name of the **Form** you want and hit **OK**.

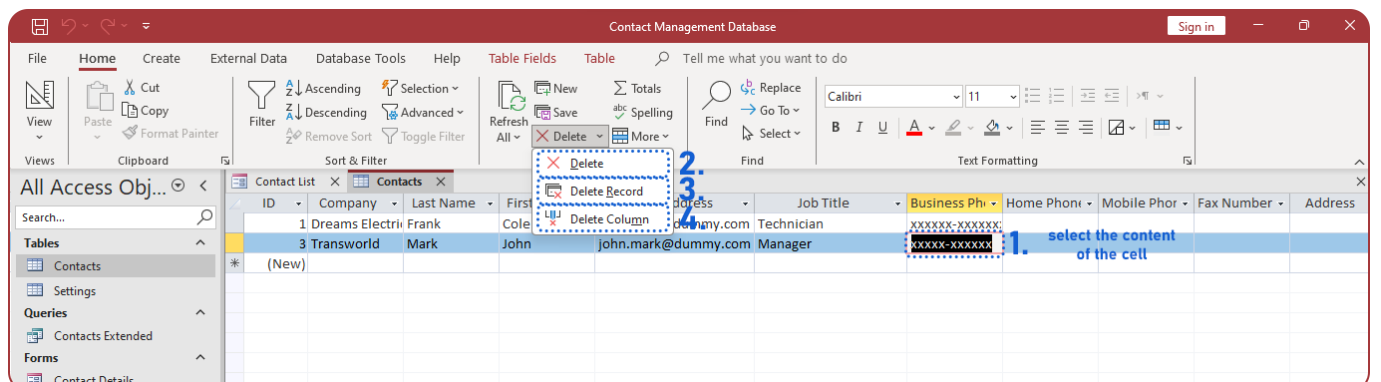


7. Under the **Home** tab, click on **Save** button to save the record.
8. Click on **Refresh All**.
9. Click on **Contacts** in the **Object Pane** to see the changes after refreshing the table and the form.



6.3 Delete Option in Form

1. You can delete data in an attribute, delete the whole record, or delete the entire column.



7. Relationships in MS Access

In a relational database (Access), the data in one table is related to the data in other tables. In general, tables can be related in one of three different ways: one-to-one, one-to-many or many-to-many. The relationship is used to cross reference information between tables.

7.1 One to One

In a one-to-one relationship each record in one table has at most one related record in another table.

In a one-to-one relationship, each record in Table A can have only one matching record in Table B, and each record in Table B can have only one matching record in Table A. This type of relationship is not common, because most information related in this way would be in one table. You might use a one-to-one relationship to divide a table with many fields, to isolate part of a table for security reasons, or to store information that applies only to a subset of the main table.

7.2 One to Many

A one-to-many relationship, often referred to as a "master-detail" or "parent-child" relationship.

A one-to-many relationship is the most common type of relationship. In a one-to-many relationship, a record in Table A can have many matching records in Table B, but a record in Table B has only one matching record in Table A.

7.3 Many to Many

In a many-to-many relationship, a record in Table A can have many matching records in Table B, and a record in Table B can have many matching records in Table A. This type of relationship is only possible by defining a third table (called a junction table) whose primary key consists of two fields and the foreign keys from both Tables A and B. A many-to-many relationship is really two one-to-many relationships with a third table.

A many-to-many relationship means that for each record in one table there can be many records in another table and for each record in the second table there can be many in the first.

Many-to-many relationships cannot be directly represented in relational database programs and have to be built by using two or more one-to-many relationships.

7.4 Defining relationships

You define a relationship by adding the tables that you want to relate to the Relationships window, and then dragging the key field from one table and dropping it on the key field in the other table.

The kind of relationship that Microsoft Access creates depends on how the related fields are defined:

- A one-to-many relationship is created if only one of the related fields is a primary key or has

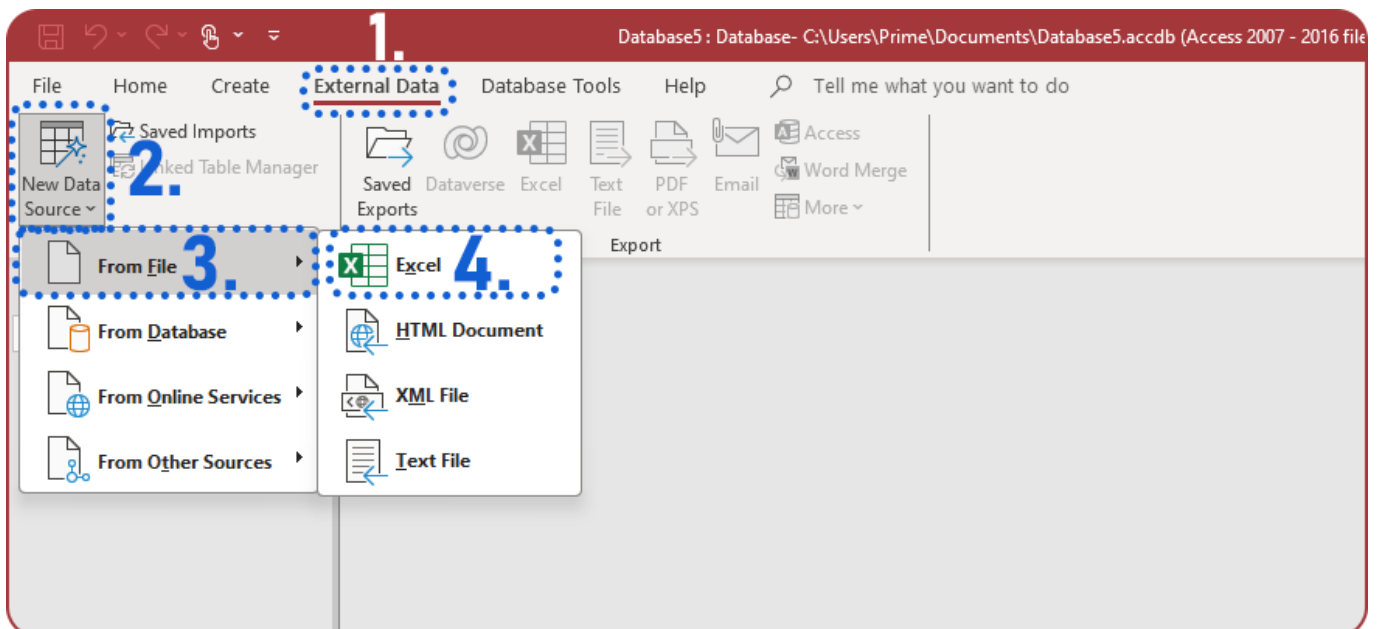
- A one-to-one relationship is created if both of the related fields are primary keys or have unique indexes.
- A many-to-many relationship is really two one-to-many relationships with a third table whose primary key consists of two fields and the foreign keys from the two other tables.

7.5 Creating Relationships in MS Access

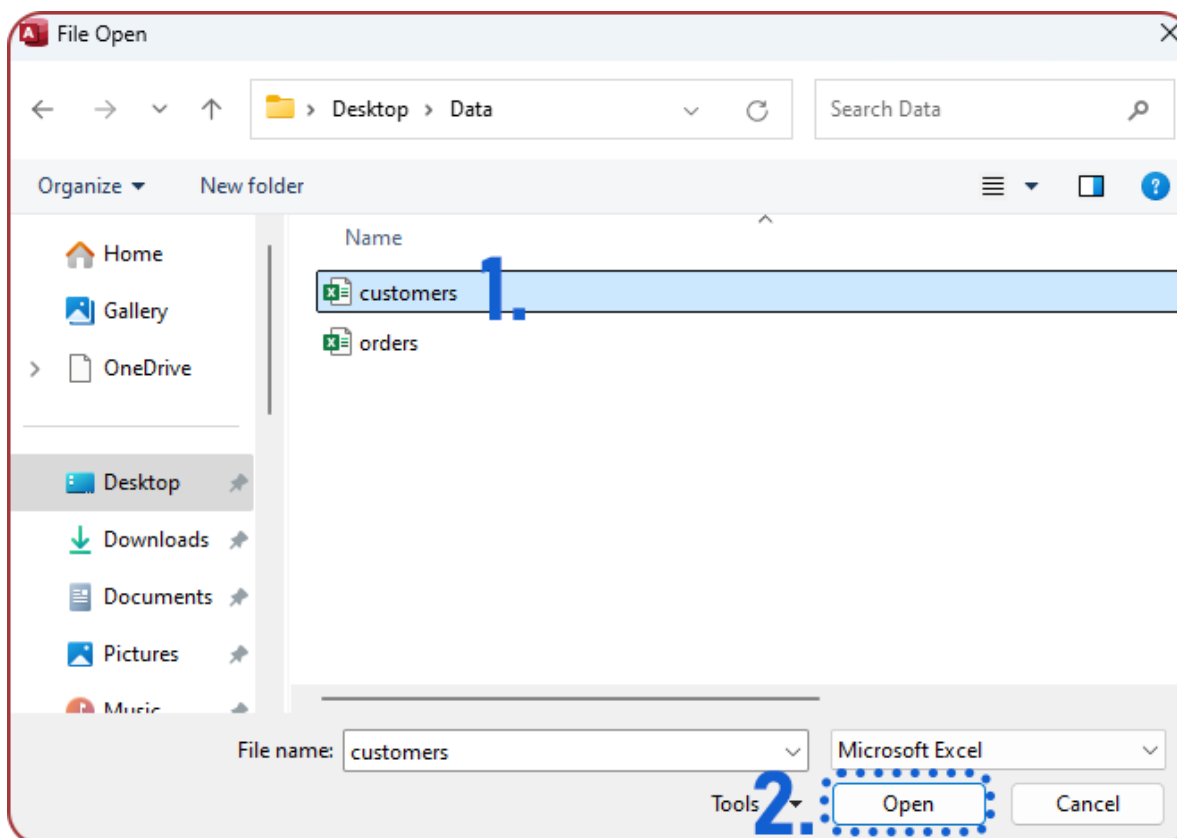
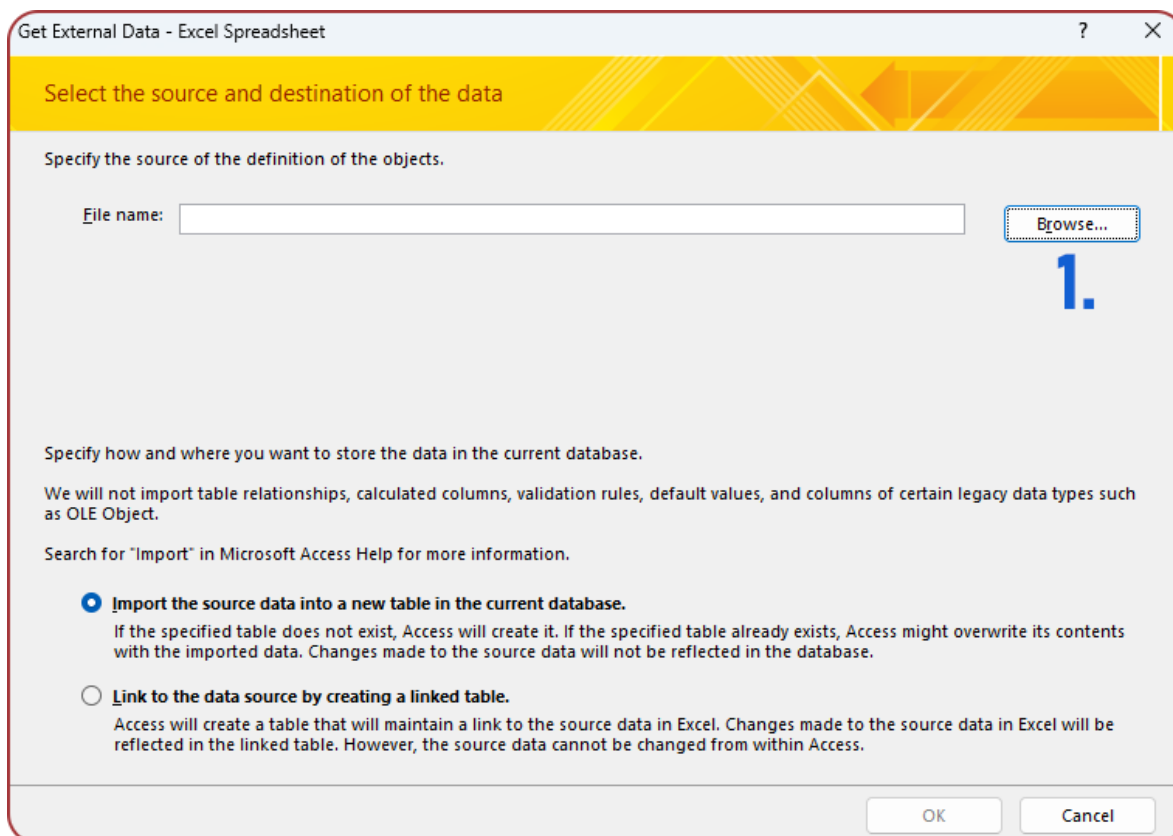
1. The following **Excel** files contains data of customers and their order in form of two separate tables. Click on the link to download the files.

Link: [Customers](#) Link: [Order](#)

2. Now, Open **MS Access**.
3. Click on the **External Data** tab.
4. Click on **New Data Source**.
5. Click on **From File**.
6. Choose **Excel**.



7. Locate the **Excel** file **customers** and open it.



8. The **Import Sheet Wizard** will open.
9. Click on **Next**.

Your spreadsheet file contains more than one worksheet or range. Which worksheet or range would you like?

☒ Show Worksheets
☐ Show Named Ranges

Result 1
Query

Sample data for worksheet 'Result 1'.

| | customer_id | first_name | last_name | birth_date | phone | address | city |
|----|-------------|------------|------------|------------|--------------|------------------------|------|
| 1 | 1 | Babara | MacCaffrey | 1986-03-28 | 781-932-9754 | 0 Sage Terrace | Walt |
| 2 | 2 | Ines | Brushfield | 1986-04-13 | 804-427-9456 | 14187 Commercial Trail | Hamp |
| 3 | 3 | Freddi | Boagey | 1985-02-07 | 719-724-7869 | 251 Springs Junction | Colo |
| 4 | 4 | Ambur | Roseburgh | 1974-04-14 | 407-231-8017 | 30 Arapahoe Terrace | Orla |
| 5 | 5 | Clemmie | Betchley | 1973-11-07 | | 5 Spohn Circle | Arli |
| 6 | 6 | Elka | Twiddell | 1991-09-04 | 312-480-8498 | 7 Manley Drive | Chic |
| 7 | 7 | Ilene | Dowson | 1964-08-30 | 615-641-4759 | 50 Lillian Crossing | Nash |
| 8 | 8 | Thacher | Naseby | 1993-07-17 | 941-527-3977 | 538 Mosinee Center | Sara |
| 9 | 9 | Romola | Rumgay | 1992-05-23 | 559-181-3744 | 3520 Ohio Trail | Visa |
| 10 | 10 | Levy | Mynett | 1969-10-13 | 404-246-3370 | 68 Lawn Avenue | Atla |

Cancel < Back **1.** Next > Finish

10. Select **First Row Contains Columns Heading**.
11. Click on **Next**.

Microsoft Access can use your column headings as field names for your table. Does the first row specified contain column headings?

☒ First Row Contains Column Headings

| | customer id | first name | last name | birth date | phone | address | city |
|----|-------------|------------|------------|------------|--------------|------------------------|------|
| 1 | 1 | Babara | MacCaffrey | 1986-03-28 | 781-932-9754 | 0 Sage Terrace | Walt |
| 2 | 2 | Ines | Brushfield | 1986-04-13 | 804-427-9456 | 14187 Commercial Trail | Hamp |
| 3 | 3 | Freddi | Boagey | 1985-02-07 | 719-724-7869 | 251 Springs Junction | Colo |
| 4 | 4 | Ambur | Roseburgh | 1974-04-14 | 407-231-8017 | 30 Arapahoe Terrace | Orla |
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| 7 | 7 | Ilene | Dowson | 1964-08-30 | 615-641-4759 | 50 Lillian Crossing | Nash |
| 8 | 8 | Thacher | Naseby | 1993-07-17 | 941-527-3977 | 538 Mosinee Center | Sara |
| 9 | 9 | Romola | Rumgay | 1992-05-23 | 559-181-3744 | 3520 Ohio Trail | Visa |
| 10 | 10 | Levy | Mynett | 1969-10-13 | 404-246-3370 | 68 Lawn Avenue | Atla |

Cancel < Back **2.** Next > Finish

12. Click on **Next**.

You can specify information about each of the fields you are importing. Select fields in the area below. You can then modify field information in the 'Field Options' area.

Field Options

Field Name: Data Type:

Indexed: ☐ Do not import field (Skip)

| | customer_id | first name | last name | birth date | phone | address | city |
|----|-------------|------------|------------|------------|--------------|------------------------|------|
| 1 | 1 | Babara | MacCaffrey | 1986-03-28 | 781-932-9754 | 0 Sage Terrace | Walt |
| 2 | 2 | Ines | Brushfield | 1986-04-13 | 804-427-9456 | 14187 Commercial Trail | Hamp |
| 3 | 3 | Freddi | Boagey | 1985-02-07 | 719-724-7869 | 251 Springs Junction | Colo |
| 4 | 4 | Ambur | Roseburgh | 1974-04-14 | 407-231-8017 | 30 Arapahoe Terrace | Orla |
| 5 | 5 | Clemmie | Betchley | 1973-11-07 | | 5 Spohn Circle | Arli |
| 6 | 6 | Elka | Twiddell | 1991-09-04 | 312-480-8498 | 7 Manley Drive | Chic |
| 7 | 7 | Ilene | Dowson | 1964-08-30 | 615-641-4759 | 50 Lillian Crossing | Nash |
| 8 | 8 | Thacher | Naseby | 1993-07-17 | 941-527-3977 | 538 Mosinee Center | Sara |
| 9 | 9 | Romola | Rumgay | 1992-05-23 | 559-181-3744 | 3520 Ohio Trail | Visa |
| 10 | 10 | Levy | Mynett | 1969-10-13 | 404-246-3370 | 68 Lawn Avenue | Atla |

Cancel < Back **Next >** Finish

13. Select **choose my own primary key** and set primary key on **customer_id**.

14. Click on **Next**.

Microsoft Access recommends that you define a primary key for your new table. A primary key is used to uniquely identify each record in your table. It allows you to retrieve data more quickly.

☐ Let Access add primary key.

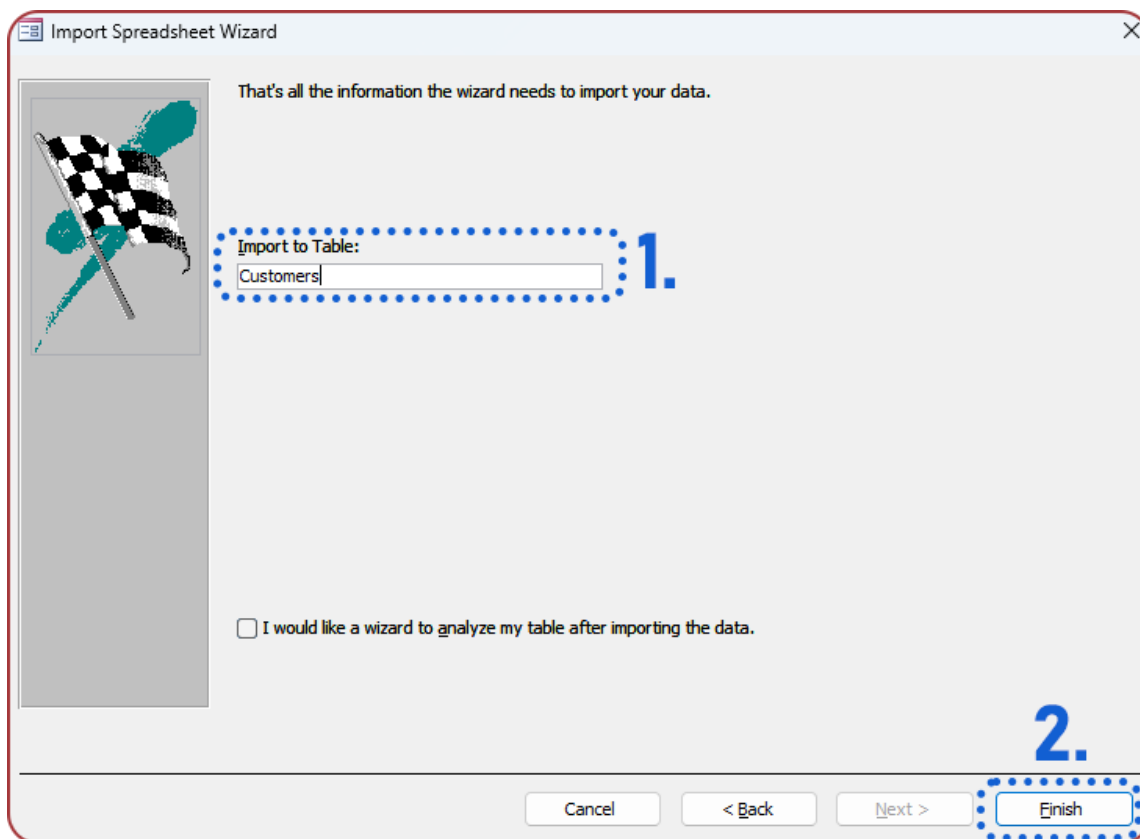
☒ Choose my own primary key. **1.**

☐ No primary key.

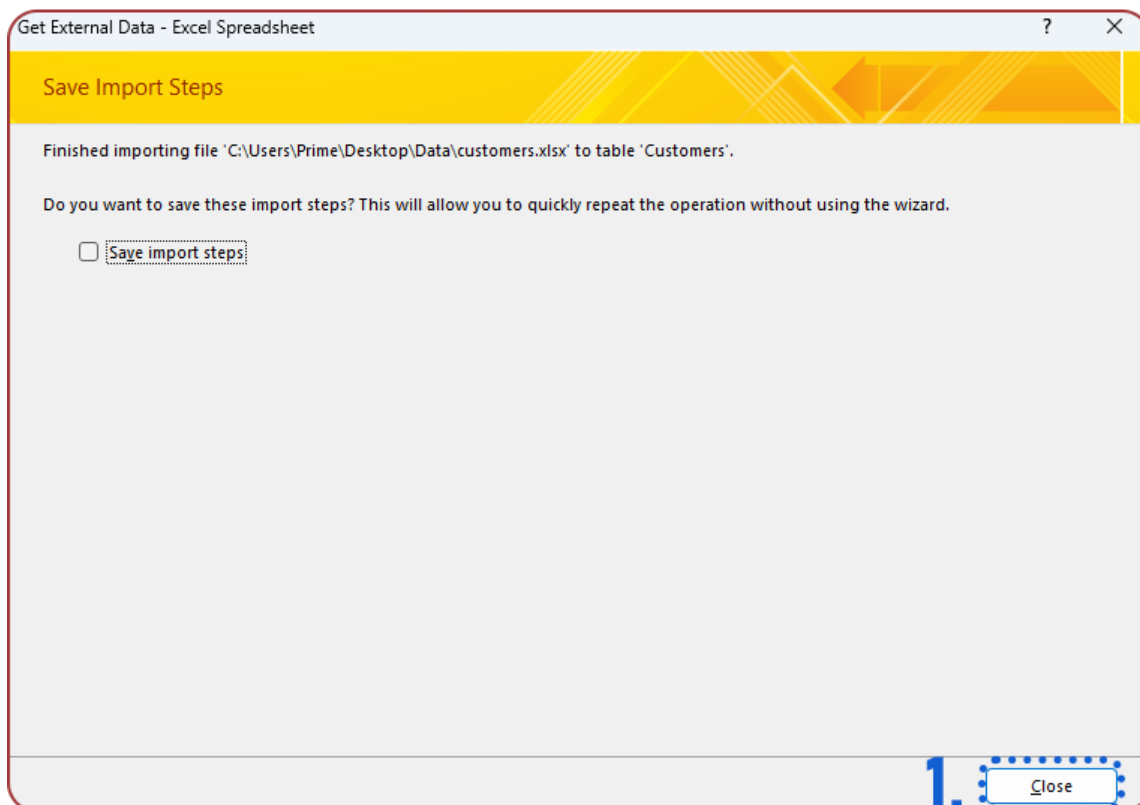
| | customer_id | first name | last name | birth date | phone | address | city |
|----|-------------|------------|------------|------------|--------------|------------------------|------|
| 1 | 1 | Babara | MacCaffrey | 1986-03-28 | 781-932-9754 | 0 Sage Terrace | Walt |
| 2 | 2 | Ines | Brushfield | 1986-04-13 | 804-427-9456 | 14187 Commercial Trail | Hamp |
| 3 | 3 | Freddi | Boagey | 1985-02-07 | 719-724-7869 | 251 Springs Junction | Colo |
| 4 | 4 | Ambur | Roseburgh | 1974-04-14 | 407-231-8017 | 30 Arapahoe Terrace | Orla |
| 5 | 5 | Clemmie | Betchley | 1973-11-07 | | 5 Spohn Circle | Arli |
| 6 | 6 | Elka | Twiddell | 1991-09-04 | 312-480-8498 | 7 Manley Drive | Chic |
| 7 | 7 | Ilene | Dowson | 1964-08-30 | 615-641-4759 | 50 Lillian Crossing | Nash |
| 8 | 8 | Thacher | Naseby | 1993-07-17 | 941-527-3977 | 538 Mosinee Center | Sara |
| 9 | 9 | Romola | Rumgay | 1992-05-23 | 559-181-3744 | 3520 Ohio Trail | Visa |
| 10 | 10 | Levy | Mynett | 1969-10-13 | 404-246-3370 | 68 Lawn Avenue | Atla |

Cancel < Back **Next >** Finish

15. Enter name of the **Table** and click on **Finish**.

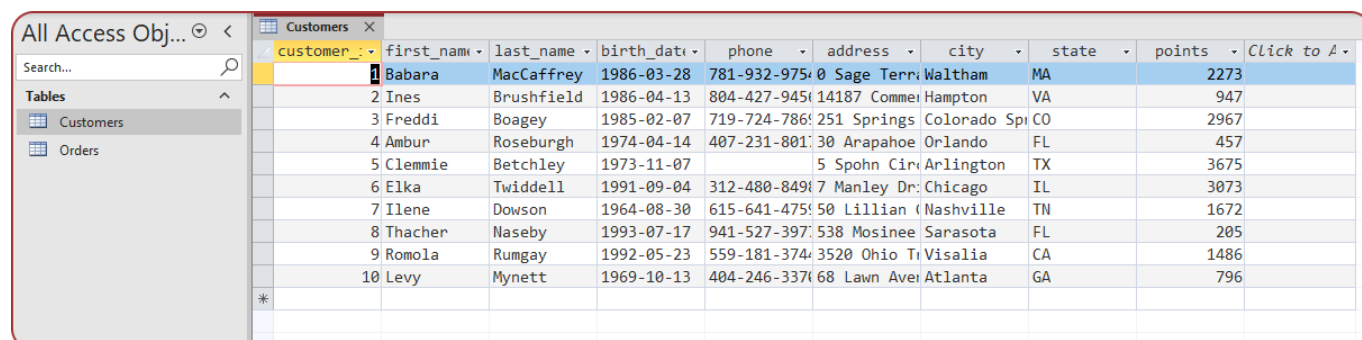


16. Close the **Get External Data – Excel Spreadsheet** window.

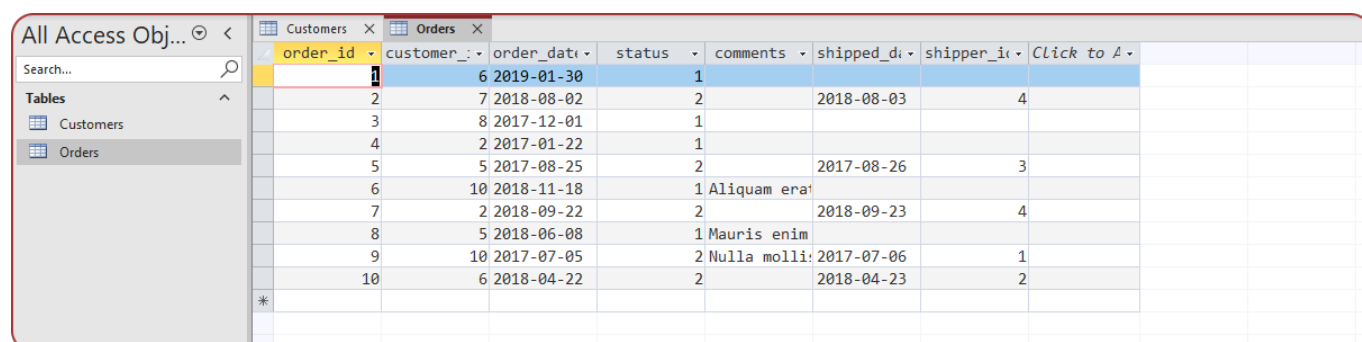


Follow the same steps to create the Order table and primary key on order_id instead of customer_id.

Following are the two tables:



| customer_id | first_name | last_name | birth_date | phone | address | city | state | points |
|-------------|------------|------------|------------|--------------|--------------|-------------|-------|--------|
| 1 | Babara | MacCaffrey | 1986-03-28 | 781-932-9750 | 0 Sage Terr | Waltham | MA | 2273 |
| 2 | Ines | Brushfield | 1986-04-13 | 804-427-9456 | 14187 Commer | Hampton | VA | 947 |
| 3 | Freddi | Boagey | 1985-02-07 | 719-724-7865 | 251 Springs | Colorado Sp | CO | 2967 |
| 4 | Ambur | Roseburgh | 1974-04-14 | 407-231-8013 | 30 Arapahoe | Orlando | FL | 457 |
| 5 | Clemmie | Betchley | 1973-11-07 | | 5 Spohn Cir | Arlington | TX | 3675 |
| 6 | Elka | Twiddell | 1991-09-04 | 312-480-8496 | 7 Manley Dr | Chicago | IL | 3073 |
| 7 | Ilene | Dowson | 1964-08-30 | 615-641-4755 | 50 Lillian | Nashville | TN | 1672 |
| 8 | Thacher | Naseby | 1993-07-17 | 941-527-3977 | 538 Mosinee | Sarasota | FL | 205 |
| 9 | Romola | Rumgay | 1992-05-23 | 559-181-3743 | 3520 Ohio T | Visalia | CA | 1486 |
| 10 | Levy | Mynett | 1969-10-13 | 404-246-3376 | 68 Lawn Aven | Atlanta | GA | 796 |

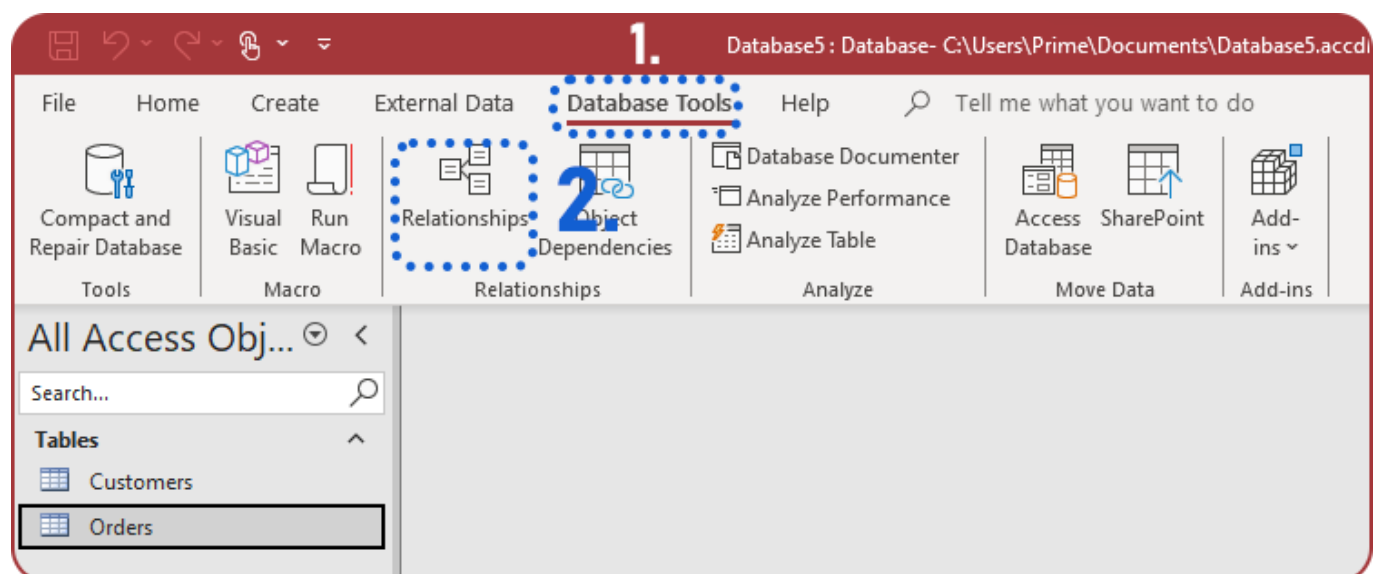


| order_id | customer_id | order_date | status | comments | shipped_date | shipper_id |
|----------|-------------|------------|--------|--------------|--------------|------------|
| 6 | 2019-01-30 | 1 | | | | |
| 2 | 7 | 2018-08-02 | 2 | | 2018-08-03 | 4 |
| 3 | 8 | 2017-12-01 | 1 | | | |
| 4 | 2 | 2017-01-22 | 1 | | | |
| 5 | 5 | 2017-08-25 | 2 | | 2017-08-26 | 3 |
| 6 | 10 | 2018-11-18 | 1 | Aliquam erat | | |
| 7 | 2 | 2018-09-22 | 2 | | 2018-09-23 | 4 |
| 8 | 5 | 2018-06-08 | 1 | Mauris enim | | |
| 9 | 10 | 2017-07-05 | 2 | Nulla molli | 2017-07-06 | 1 |
| 10 | 6 | 2018-04-22 | 2 | | 2018-04-23 | 2 |

17. Close any open table tab. (important)

18. Click on the Database Tools.

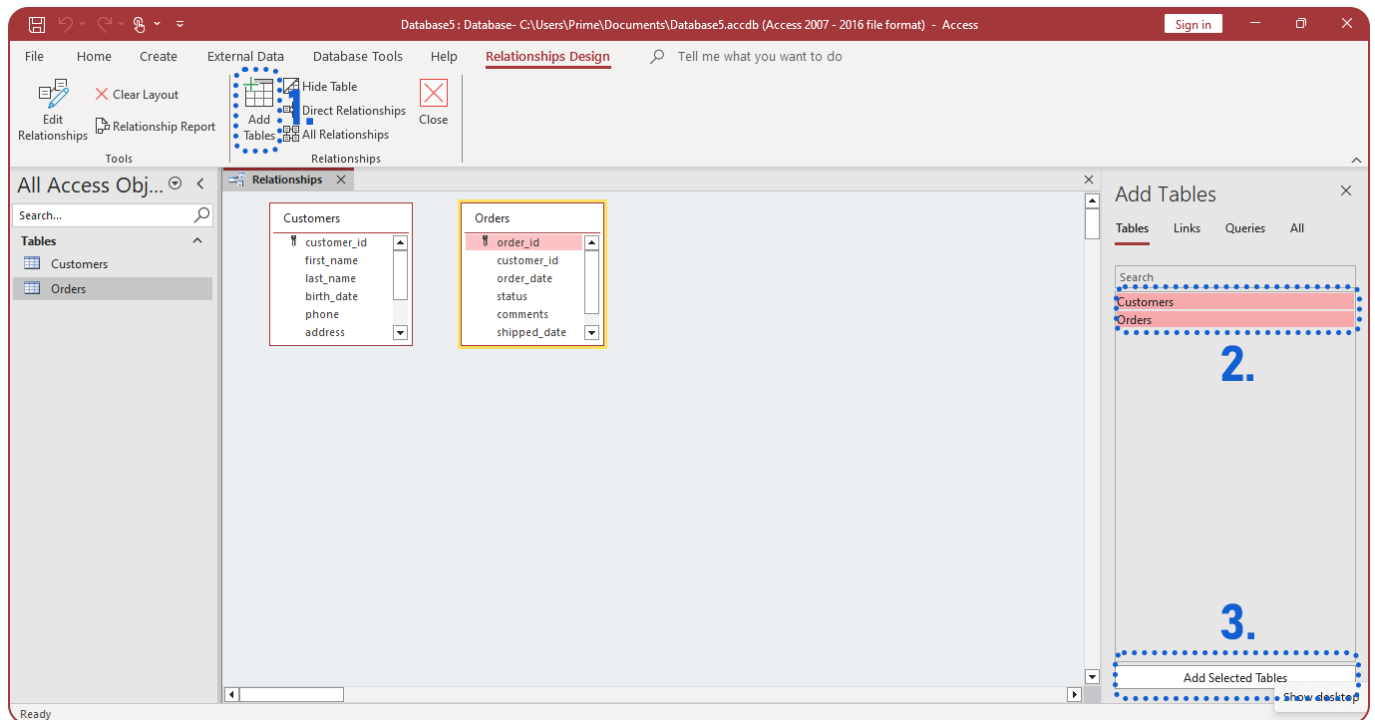
19. Click on Relationships.



20. Under the **Relationships Design** tab, click on **Add Tables**.

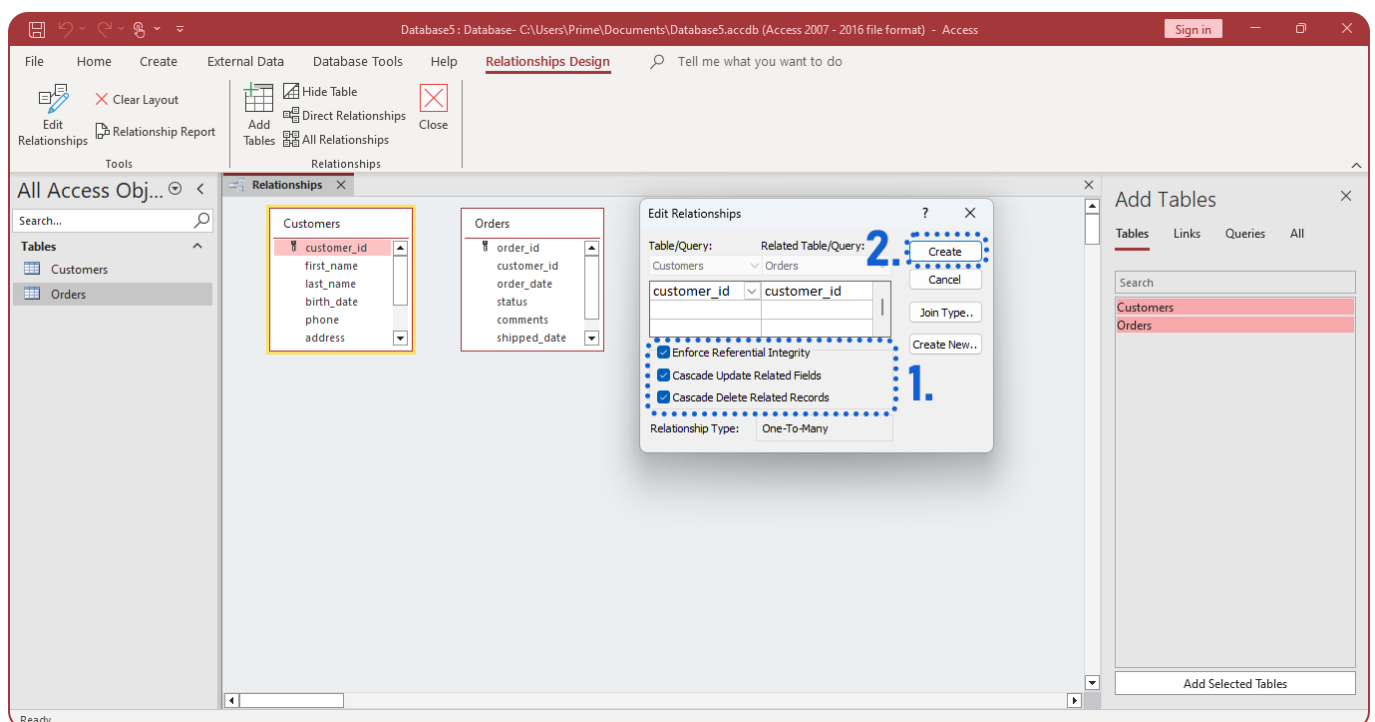
21. Select both the tables from the right **Add Tables** Pan. (in old versions of MS Access, a separate window will open to select the tables)

22. Click on **Add Selected Tables**.

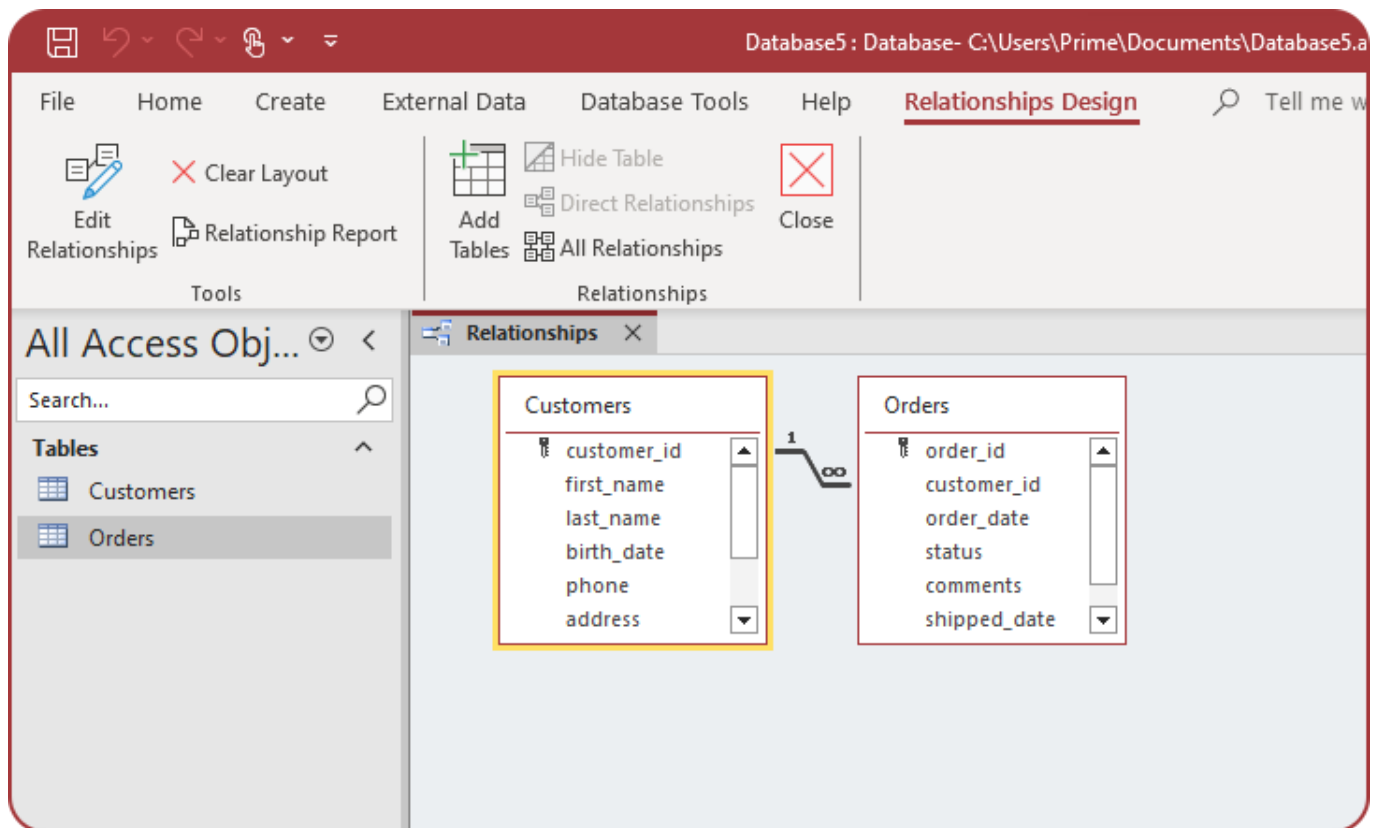


23. Drag the **customer_id** attribute from the **Customers** tables into the **customer_id** attribute in the **Orders** table.

24. In the **Edit Relationship** window, check all the boxes and click on **Create**.



25.A **one-to-many** relationship has been created.



26.Close the **Relationship** tab.

27.Double click on the **Customers** table in the Object Pane.

28.Now you can see how the **Customer** and **Orders** table are related.

