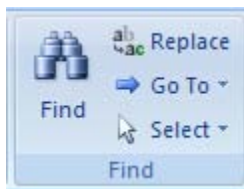
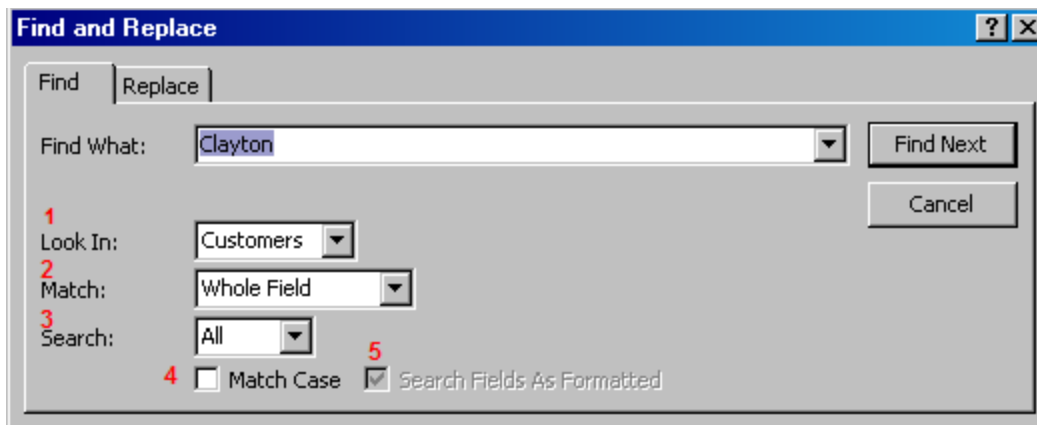


You have created tables in an Access database. Data in Access tables can be added, deleted, and updated to be current (practiced in Introduction part). Data can also be searched and replaced like in Excel spreadsheets. Open ***Subscription.accd*** and open the *Customers Table*.

Find & Replace Records:



Use *Find & Replace Commands* under Home tab to search and replace data.

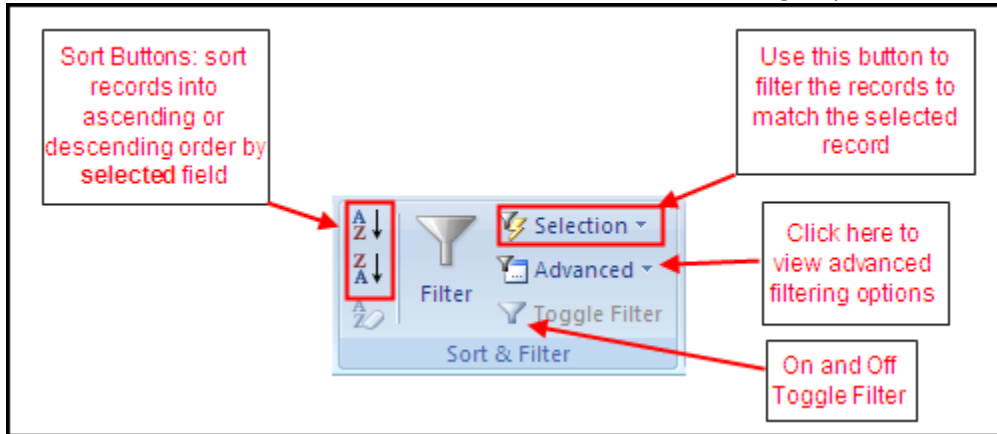




- 1:** Look in drop-down box will give you an option to either include the column or the entire table. Normally, you will see two options: the field name that your cursor is in and the entire table name.
- 2:** Match drop-down list restricts the scope of the search in whole, part, or start of the field.
- 3:** Search drop-down list specifies the direction (All, Up, Down) in which the search should proceed.
- 4:** Match Case will match the characters in the same case.
- 5:** This box will search values with the input mask and is automatically checked when an input mask format is set for a table. Unchecking this check box will lead to improper results or no results for a search operation.

In ***Subscription.accdb*** practice looking for the word *Mexico* in the *Customers Table*. Make sure to search in the entire table by selecting the table name in *Look In* drop-down box and by selecting the option to match 'any part of the field' in *Match* drop-down box. By doing so, the search will stop in all those fields that have *Mexico* in it.

Sort & Filter Records:

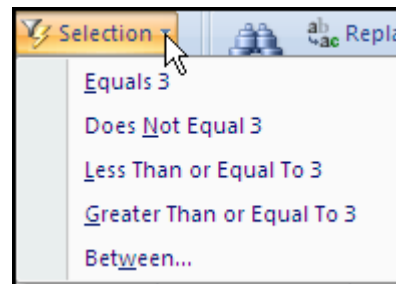
This command can be found under the Home tab in Sort & Filter group.





In **Subscription.accdb** database, open *Customers* Table; click a column and click either ascending  or descending  button to sort the order by that field (column). To sort more than one field or to display only those records meeting a specific criteria, use one of these two options below.



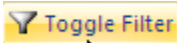
Filtering a text field

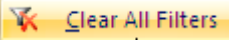
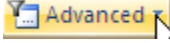


Filtering a number field

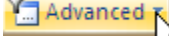
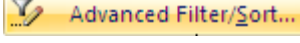
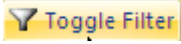
- 1) **Filter By Selection:** For example, if you want to select all customers from USA, click a cell containing "USA" in the *Country/Region* field, and then click the Selection button. Choose from the drop-down list. If you are filtering a field that has a number value (such as a customer ID field), the drop-down list would have a different options available. See the samples above.
- 2) **Filter By Form:** If you want to filter by more than one criteria, such as limiting to customers with prefix "Mr" from the country/region "USA". Under the Advanced button, select **Filter by Form**  from the drop-down list. The datasheet will be displayed with drop-down arrows by each field name. You may select more than one item from the lists, and then click the toggle Filter button  to apply the filter.

Removing Filters

- 1) Click the Toggle Filter button  to remove a filter. All records will be displayed, but Access remembers the most recent filter settings and can reapply them by clicking on the same button again.

- 2) Click Clear All Filters  from the drop-down list under the Advanced button  to clear all filters. All records will be displayed and the record of the filter will be cleared.

Advanced Sorting and Filtering

- 1) Click the Advanced button  in the Sort & Filter group and select Advanced Filter/Sort  from the drop-down list. A new tab will open up with two sections.
- 2) At the top section, you will see a list of available fields; double click on any field to add it to the sort or filter setup in the bottom section. Try placing the fields in the order you want to sort by, left to right. You can always easily grab the whole field and drag your mouse to re-position the order.
- 3) In the bottom section, click in the Sort row and select either Ascending or Descending order.
- 4) Click Toggle Filter button  to do the sort.
- 5) We will expand more on placing 'criteria' in the Criteria row in the Query section.

Relationships between Tables

Access databases, as in any other relational database management system, have great querying power, *provided* that the relationship between the tables in the database is properly setup. To be able to do that assigning primary and foreign keys is essential to creating useful relationships between your tables. *Primary key acts as an index for all records and implement a relationship between two tables in a relational database while the foreign key helps you establish a relationship with a primary key table to enable you to retrieve matching records.*

Designation of Primary and Foreign Keys

Primary Keys: As briefly explained in Introduction of this course, a primary key is a field (or combination of fields) that contains unique values, which are used to identify each record. This key is used to establish appropriate relationships between tables. Facts about primary key:

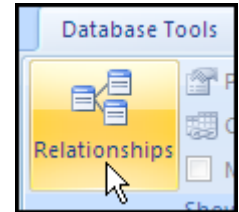
- Can be of any data type, except for Memo, OLE Object, or Attachment
- Values that are never blank
- Values that rarely change
- Never allow duplicate values

Good Example: Student ID, Order Number, Item Code, SSN, Part Number, etc.

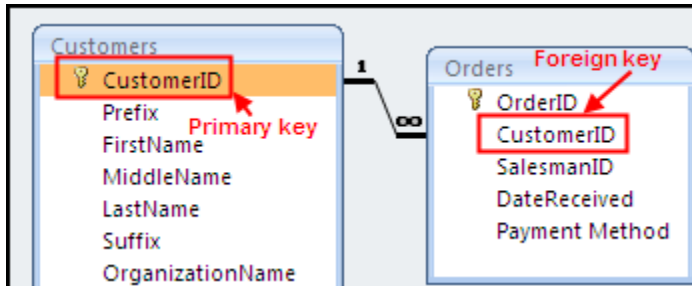
Bad Example: Last Name (it can duplicate); email address or phone# (it can change and allow blank values)

Foreign Keys: A foreign key is a field or combination of fields in a table and relates to a primary key field of another table. Facts about foreign key:

- Its data type must match that of the related primary key field
- Duplicate values can appear in the foreign key field



In *Subscription Database*, click on the Database Tools tab and click on the Relationships button. *CustomerID* in Customers table is the primary key (because it will only occur once), but the same *CustomerID* in the Orders table (since it will have multiple occurrences in that table) is the foreign key. The *CustomerID* field is the common field since it appears in both tables. The common field must have the same data type in both fields and normally has the same name.



There are three types of Table Relationships.

1. **One-to-One:** It is the type of relationship between two tables where both the primary and foreign keys (common fields) are unique. For each record in the first table, there will be exactly one record in the second table and vice versa. This type of relationship is **not common** because most information related in this way would be all in one table. See in the example where every PatientID record in **Patient**

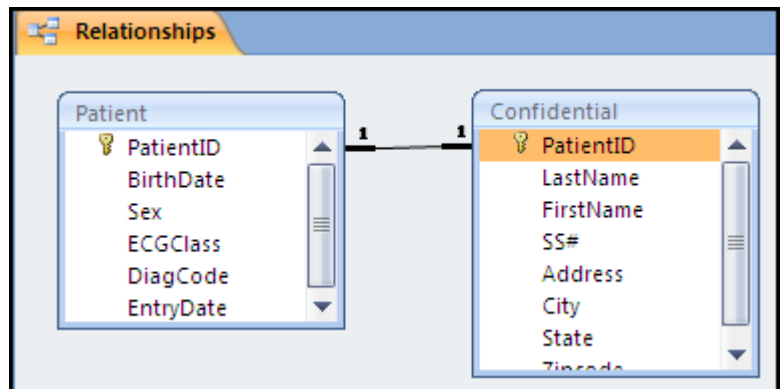
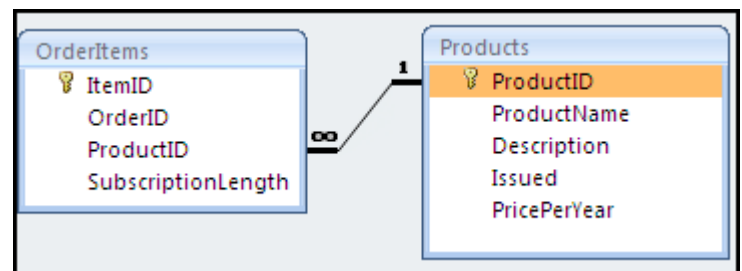
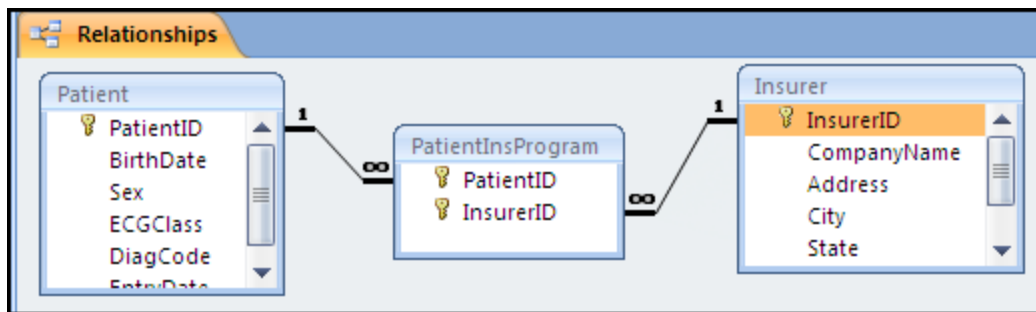


table is matched against exactly one PatientID record in **Confidential** table. Why use it: when you want to isolate or restrict access to a table field (**Confidential** table) for a security reason due to confidential information. Both primary key and foreign key in these tables are denoted with a key symbol. If both common fields are primary keys of their tables, their indexed property set to “Yes (No Duplicates)” automatically. If you do not have any security reason but detect the need for a one-to-one relationship in your database, consider whether you can put the information together in one table.

2. **One-to-Many:** This is the relationship between two tables where the primary key is unique, but the foreign key allows duplicate values. For each record in the primary key table, there can be multiple records in the foreign key table. That means for every row in the first table, there can be zero, one, or many rows in the second table, but for every row in the second table there is exactly one row in the first table. **Most common** relationship of all three.



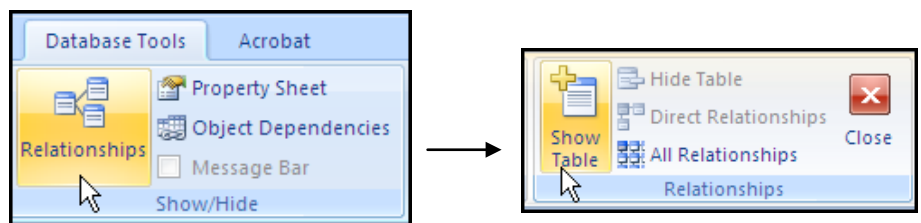
- Many-to-Many:** Another **common** relationship type. In this relationship for every row in the first table, there can be many rows in the second table, and for every row in the second table, there can be many rows in the first table. **Many-to-many relationships can't be directly created in relational database programs, including Microsoft Access.** These types of relationships must be broken into multiple one-to-many relationships. For example, a patient may be covered by multiple insurance plans and a given insurance company covers multiple patients. Thus, the Patient table in a medical database would be related to the Insurer table in a many-to-many relationship. In order to model the relationship between these two tables, you would create a third, linking table, in this example, called PatientInsProgram that would contain a row for each insurance program under which a patient was covered. Then, the many-to-many relationship between Patient and Insurer could be broken into **two** one-to-many relationships (Patient table would be related to PatientInsProgram table and Insurer table would be related to PatientInsProgram in one-to-many relationships). See below.



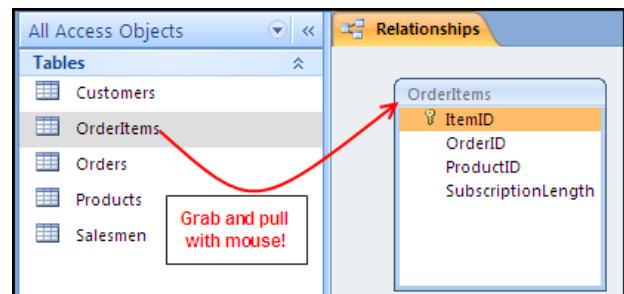
Setting up Relationships among Tables

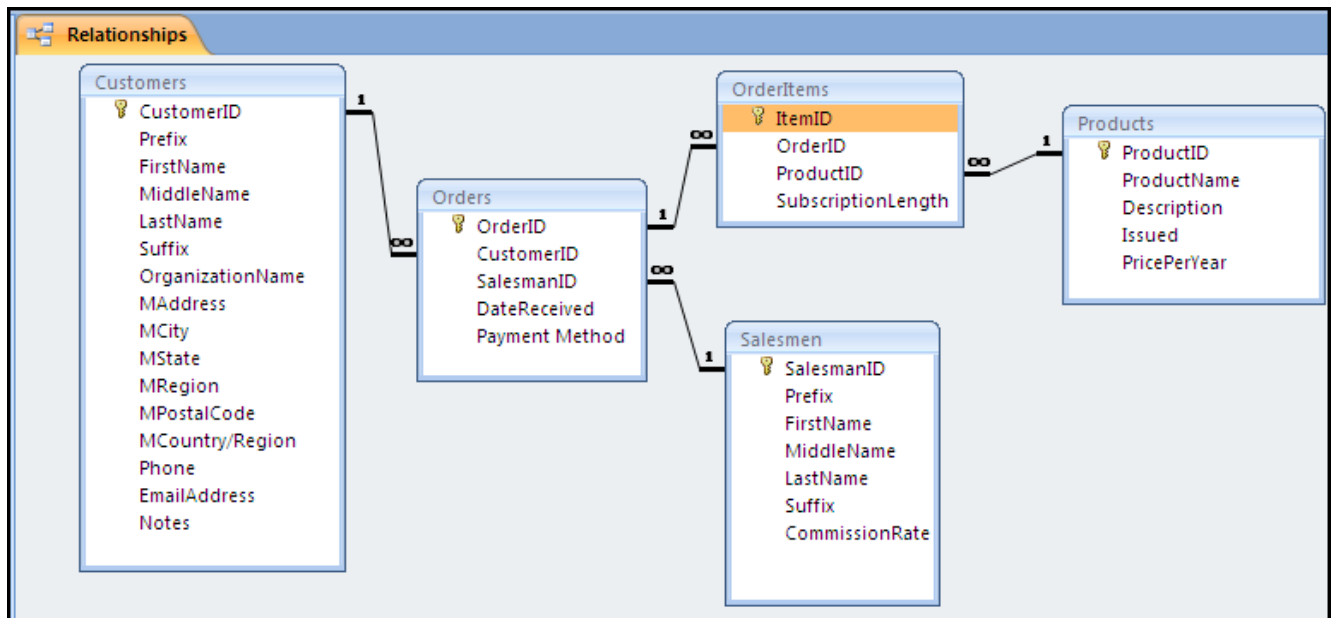
Once the table structures have been set up with common fields in tables for which you are going to establish relationships, we can establish the relationships between tables. Follow the steps below.

- Click on the Database Tools tab on the Ribbon.
- Click on Relationships command in the Show/Hide group.



- Click on Show Table command to display all available tables that you can include in your relationship. Double-click on the desired tables (or click table then click Add) to include them in the relationships window. You can drag tables like images to arrange the way you want. OR you can directly grab the tables from Navigation Pane from the left onto the Relationships window directly. Re-arrange as necessary. We are going to set up the relationships among these tables as shown on the following page.





- Once all tables are on your Relationships window, create the relationship by dragging the selected (common) field and drop it onto the common field you wish to link it to in the other table. The Edit Relationships box will appear as below.

Check this box to enforce Referential Integrity. Click Create to establish the relationship.

Edit Relationships

Table/Query: Products Related Table/Query: OrderItems

ProductID ProductID

Enforce Referential Integrity

Cascade Update Related Fields

Cascade Delete Related Records

Relationship Type: One-To-Many

Buttons: Create, Cancel, Join Type.., Create New..

Why Enforce Referential Integrity?

Referential integrity ensures that your primary and foreign key fields stay in synch whenever you:

- add data** - you must create an ID first in your CustomerID in Customers table before you can sell anything to that customer in your Order Table,
- change data** - you cannot change the value in the primary table while there are many records in the foreign table - for example, you cannot change a patron's library barcode number if she has books checked out under that barcode (with exception for Referential Integrity Options below under 4(a)), or
- remove data** - you cannot remove the patron ID from primary table while the patron has books checked out under that ID number.

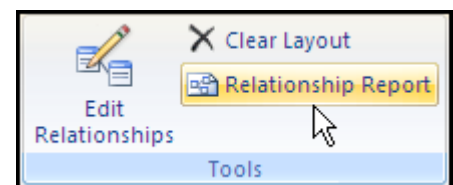
So Referential integrity prevents **orphaned records**. Imagine in a library database where a PublisherID (in parent table) is accidentally deleted. All those records associated with that PublisherID (in foreign table) will become now **Orphaned records**. In other words, the deletion **cascades** through your data. You set referential integrity by editing a relationship as follows:

1. Close any open tables, click the **Database Tools** tab, and in the **Show/Hide** group, click **Relationships**.
2. Click the line that represents the relationship you want to edit. The line becomes thicker.
3. Right-click the line and click **Edit Relationship** or double-click on the line. The **Edit Relationship** dialog box appears.
4. Select the **Enforce Referential Integrity** check box. There are two options:
 - a. You can change data in one place and have that change appear in other related data. To do so, check the **Cascade Update Related Fields** box. For example, if you want to change a patron's library barcode due to loss of the card while the books are checked out, allowing **Cascade Update Related Fields** will switch all her checked out books to her new card number.
 - b. The second option **Cascade Delete Related Records** will permit the deletion of a record in the primary table and deletes all related records in the foreign table.
(Both of these options should not be taken lightly.)

Edit a Relationship: In the Relationships window, double click or right-click the relationship line to reopen the Edit Relationships box. **Note:** Remember to close all opened-tables before editing.

Delete a Relationship: In the Relationships window, right-click on the relationship line and select Delete from the pop-up menu. **Note:** If either of the tables employed in the relationship is in use by another person or process, or in an open database object, such as a form – you will not be able to delete the relationship *until you close any open objects that employ these tables* before you remove the relationship. Also note when you remove a relationship, you also remove referential integrity support for that relationship, if it is enabled. As a result, Access will no longer automatically prevent the creation of orphaned records on the “many” side of a relationship.

Print a Relationship Report: Click on the Relationship Report button under the Tools group while the Relationship Window is open. You will see the Relationship Report in a Print Layout. Click on the Printer button on the top left to print.

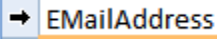
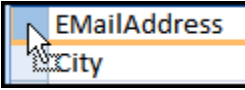
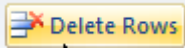
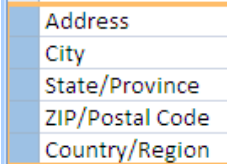


Project Tables:

We are going to create two more tables to complete our Library Database.

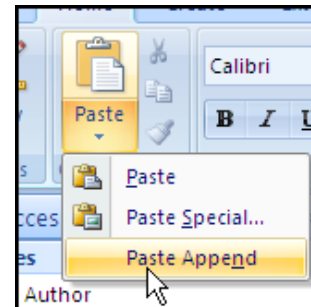
Publisher Table:

Access provides table templates with already built-in table structure for commonly used situation, including name and address structures. We will use one of the table templates – Contacts – from the list in creating the Publisher Table.

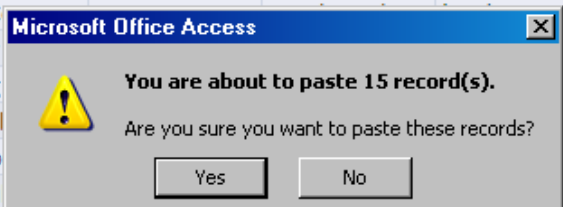
- Open [LibraryDatabaseAcces2.accdb](#). Enable the Security Content. Click on Create Tab.
- Click Table Templates in Tables group and select Contacts.
- A new table is created, and it is displayed in Datasheet view.
- Save the table as *Publisher* and take the table into Design view.
- Adjust the field structure and properties to the following settings. You will have to overtype some fields to match the following field names and delete a few unnecessary fields to create only twelve fields.
 - PublisherID (overtyping on ID): AutoNumber; set this key to be the primary key
 - Company: Text, limit to 50 characters
 - Address1 (overtyping on Last Name): Text, limit to 25 characters
 - Address2 (overtyping on First Name): Text, limit to 25 characters
 - EMailAddress: Text, limit to 40 characters
 - City (overtyping on Job Title): Text, limit to 30 characters
 - Postcode (overtyping on Business Phone): Text, limit to 14 characters
 - Region (overtyping on Home Phone): Text, limit to 30 characters
 - Country (overtyping on Mobile Phone): Text, limit to 20 characters
 - Click on the next field (Fax Number) and click on Design tab; click on Insert Rows in Tools group. A new field will be inserted. Type BusinessPhone: Text, limit to 30 characters
 - FaxNumber: Text, limit to 30 characters
 - Click on the left side of the E-mail Address field to select the entire field. Your mouse should turn into right-arrow. . Click there to select the entire field. Hold down your left mouse button on that location until you see the image like this. . Hold down your left mouse button and move the location of this field below the Fax Number field and let go of your mouse.
 - Select the next 5 fields (select the first entire field, hold-down the shift button and click on the last field). Click on Delete Rows button on Design tab above. . Say 'Yes' to warning. 
 - Website (overtyping on Webpage). Hyperlink is already there.
 - Delete the last two rows (Notes, Attachments) as above.
 - View the Publisher table in Data Sheet view. You will be asked to save. Say 'yes'.

Access also allows copying and pasting the data from Excel spreadsheets (We will learn importing from Excel in the next task.). It is best to keep same field names in both Excel and Access data. If you keep the exact field names, you can copy the entire column one at a time or in group from Excel and paste into Access. If not, copy the data block and paste on Access column. To insert data in the Publisher table you just created, follow the steps below. **Note:** Use the Excel formula =Len() to find out how many characters in your Excel columns.

- Open Publisher Table.xlsx in Excel.
- Select all columns from PublisherID to Website.
- Copy by using Control + C or copy button on Home tab.
- Go to Publisher table in Access. Click in the first record cell under the Publisher ID field. Then click the drop down arrow under the Paste button. Click on *Paste Append*. You will get the confirmation box as below. Say yes.



PublisherID	Company	Address 1	Address 2	City
1	Hodder & Stou	338 Euston Roa		london
2	Borthwick-Hen	Applewood Ho	Applewood Hil	oxford
3	Westward Lock	18 Clifftop Stre		london
4	Softcell Press	One Softcell Ri		orlando
5	Christy Corpor:	20 E 103rd Stre		indianapolis
6	Arrows Publica	Randall House	1 Cagulier Bridg	london
7	Harry C			
8	Beaver			
9	Darling			
10	City Pul			
11	Scramb			
12	BPU Pu			
13	Outreach Colle	Wilson Way Wi		liverpool
14	Carling & Sons	4 St Thomas Pa		london
15	Trueform Pres:	Maderson Hou	8 George Stree	london
*	(New)			



Book Table:

We will use Import function this time to import data from an Excel spreadsheet. You can set up fields in Access first before importing or edit field properties and notes after the import. If you choose to set up before importing, follow these steps:

- In [LibraryDatabaseAccess2.accdb](#) database, click on Create tab. Select Table, save as Book and open in Design view.
- Create 14 fields with the followings Field Names, Data Type, Properties and Notes:
 1. ISBN: text; limit to 20 characters; set as primary key and Required: Yes; Notes - "Primary Key"
 2. Title: text, limit to 50 characters
 3. AuthorID: Number; Long Integer
 4. PublisherID: Number; Long Integer
 5. SubjectID: Number; Long Integer; Description- "Value will be looked up in the subject table". We will walk through how to use Lookup wizard.
 6. Row Number: Number; Integer; Validation rule - ≥ 1 and ≤ 40 ; Validation text - "enter a number between 1 and 40"; Description – Rows numbered 1-40, if an incorrect entry is made, display the validation text message.
 7. Shelf Number: Number; Integer; Validation rule - ≥ 1 and ≤ 6 ; Validation text – "enter a number between 1 and 6"; Description – Shelves numbered 1-6, if an incorrect entry is made, display the validation text message.

8. Number of Copies: Number; Integer
9. Publication Year: Number; Integer; Description – year only
10. Price: Currency; Description – US Dollar
11. Reference: Yes/No (Default value – Leave as zero; zero = unchecked, 1 = checked)
12. Lending: Yes/No; Default value – Leave as zero (same as above)
13. Picture: OLE object; Description –book jacket
14. Additional Information: Attachment; Description – Background info & summary of book
15. Save and close the table before importing as follows.

Importing from Excel:

1. Click on External Data tab. Select Excel in Import group. (Note: Make sure all column headers in Excel have same names as in Access fields you created above. In this case, we leave out Additional Information column heading in Excel since it is an attachment field in Access. When a field is set as Attachment in Access, you will insert attachment in those fields by double-clicking on each field in Datasheet view in Access, click Add button and simply navigate to the attachment file on your computer. We will not do this step now yet.)
2. On next window, click on the Browse button and go to the file location where the Excel spreadsheet is saved. In this case, My Documents>Access>Access2>Excel Sheets>Book Table.xlsx.
3. Select the second radio button: Append a copy of the records to the Table and direct to import into **Book Table** in Access. Click OK. Click Next on the following screen to agree to use the Book-Table worksheet. Click Next and Finish on the next two screens. Click Close. (We are using this option since we created a Book Table in Access with all desired fields.)

If we had not created those fields yet, you will use the first option – *Import the source data into a new table in the current database* - and select Data Type as you import the data. See example window below if we had used the first option.)

Click Next.


Microsoft Access can use column headings from your Excel sheet as field names in your Access Table. Agree with that and click on Next.

Verify the name of the table on next screen as Book. Click Finish.

Click No to save steps and Click on Close.

Notice as of now, the SubjectID field (also PublisherID and AuthorID) in Book Table displays ID Numbers. It would help for a user to see the actual terms assigned to these ID #s when filling up data in a table or on a form. Now, it is time to edit SubjectID field by using the Lookup Wizard. Why use it? You can select data from another table or you can select to type in the values yourself by using the Lookup Wizard. In our example, you have created the Subject Table and you want to limit to the exact values (SubjectID) that can be entered by adding a list of permissible values to the field.

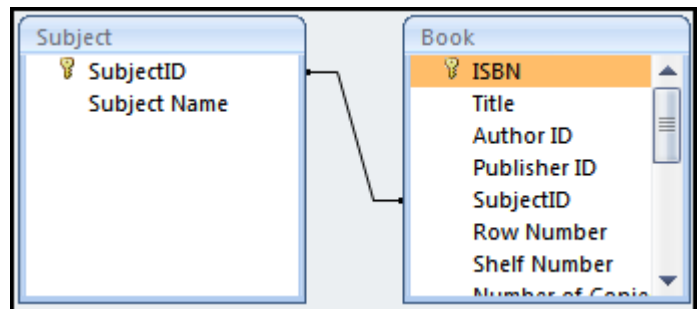
- Open Book Table in Design view.
- Select SubjectID field line. Use the drop-down arrow on Data Type and select Lookup Wizard. Lookup Wizard box will come up. You can create the list by typing or pull the list from another table.
- Select to lookup the values in the table or query. Click Next.

- Select Subject table from the list on next screen. Click Next.
- On next window, from “Available Fields” box, select both fields “SubjectID” and “Subject Name” by clicking on  to move into “Selected Fields” box.
- Select Subject Name to be sorted in Ascending Order on next window. Click Next.



- Adjust the column width as- needed on next window. (Hint: double-clicking on the column header as in Excel.) Click Next.
- Accept the suggestion to “hide the key column” (unless you want to see the pair of SubjectID and Subject Name together) and click Next.
- On next window, type a label for the lookup list field and click Finish. (If you check the box to allow multiple values, then you can select more than one value into the same field. For example, a book can have two different subjects: Adult Fiction and Romantic Fiction. For this exercise, leave the box unchecked. Save the Table.

Remember that relationships will automatically be created when you generate a lookup column. To see these relationships, in the Relationships window, click All Relationships in the Relationships group of the Design contextual tab. You should see a join line between Subject and Book Tables.

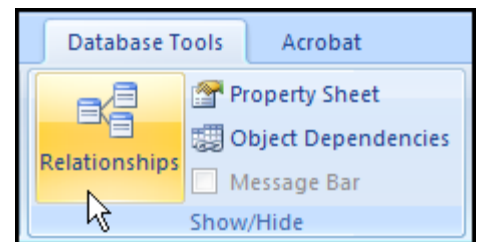


We now have 4 tables in our database. And our tables have common fields and same data type. For example:

- In both Subject and Book Tables, there is the common field: Subject ID. SubjectID field (Autonumber field) in Subject Table is going to correspond to SubjectID field (a number field with a field size of Long Integer) in Book Table.
- Similar rules apply to AuthorID and PublisherID fields with same name in Book Tables.

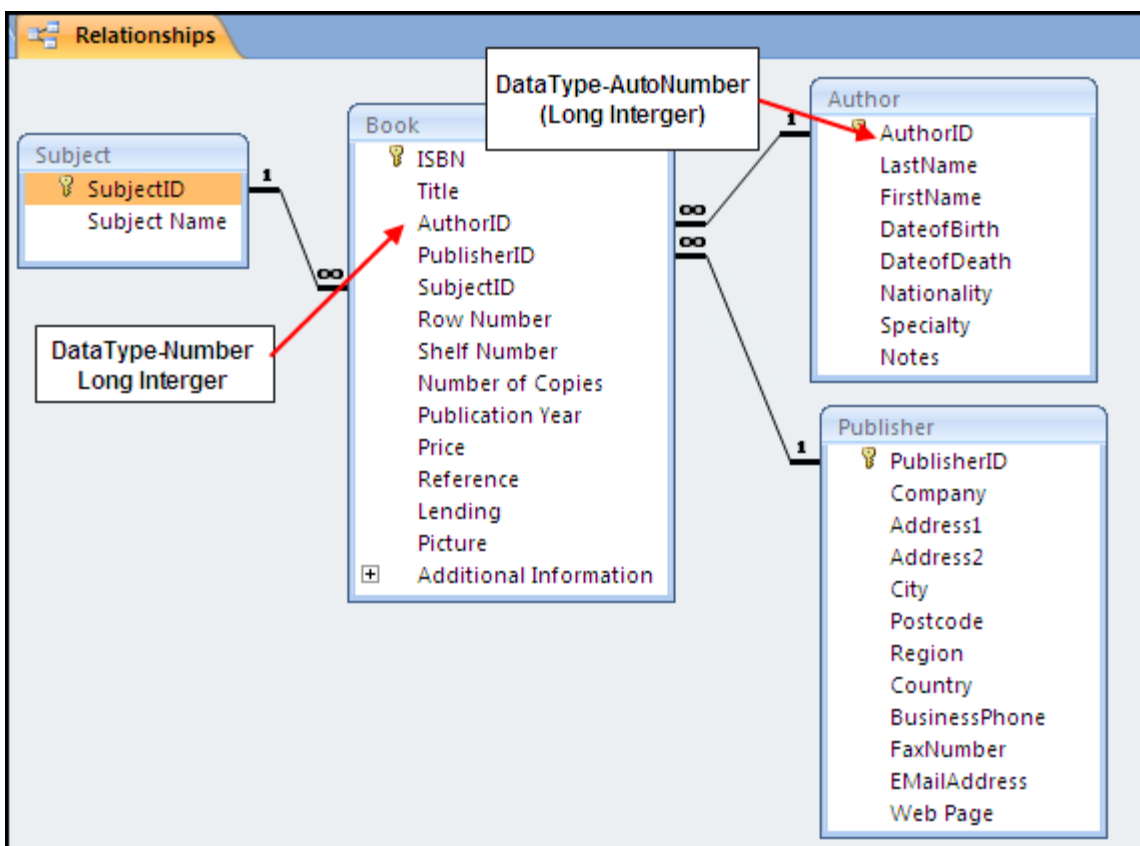
Let's establish relationships among these tables.

1. Click Relationships in the Show/Hide group.



2. Next, the relationships tab will open and you can see the relationships between the Subject Table and the Book Table via the SubjectID field. (This is the result of the lookup field created earlier). The key icon to their left identifies the primary key fields.
3. To add more tables, click the Show Table button in the Relationships group. Select two more tables (Author and Publisher) to be added to the relationships. Click Add. You can also simply double click on the table names in that window to add to the Relationships tab. Click Close after adding.
4. To edit the relationship between Subject and Book Tables, double-click or right-click on the join line to bring up Edit Relationships window. Check the box to enforce referential integrity to have one-to-many relationship (For each SubjectID field in Subject Table, we can have zero or more than one SubjectID fields in Book Table.)

- To establish relationships between Author Table and Book Table, drag the AuthorID field (primary key) from the Author Table and drop it onto the AuthorID field (foreign key) in the Book Table. Make sure to check the box to enforce referential integrity field to create one-to-many relationship. Repeat the same process between Publisher Table and Book Table by using PublisherID fields. Drag and move the table if necessary to have a clear relationship window. Your relationship window should look similar to what is shown below.



When you create a relationship between tables, the common fields are not required to have the same names although it is often the case that they do. Rather, the common fields must have the same data type. For example, *AuthorID* field in the “one” side of the Author Table has AutoNumber as Data Type with the *Field Properties* – Long Integer. Thus, the *AuthorID* field in the “many” side of the Book Table has to have Number as Data Type with *Field Properties* – Long Integer.

To summarize above relationship in a table:

Table	Related to	Joining Fields	Type of Relationship
Publisher	Book	PublisherID	One-to-many
Author	Book	AuthorID	One-to-many
Category	Book	Category Name	One-to-many