CGS 2545: Database Concepts
Spring 2012

ERDs in Access

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More on Building a Database In Access

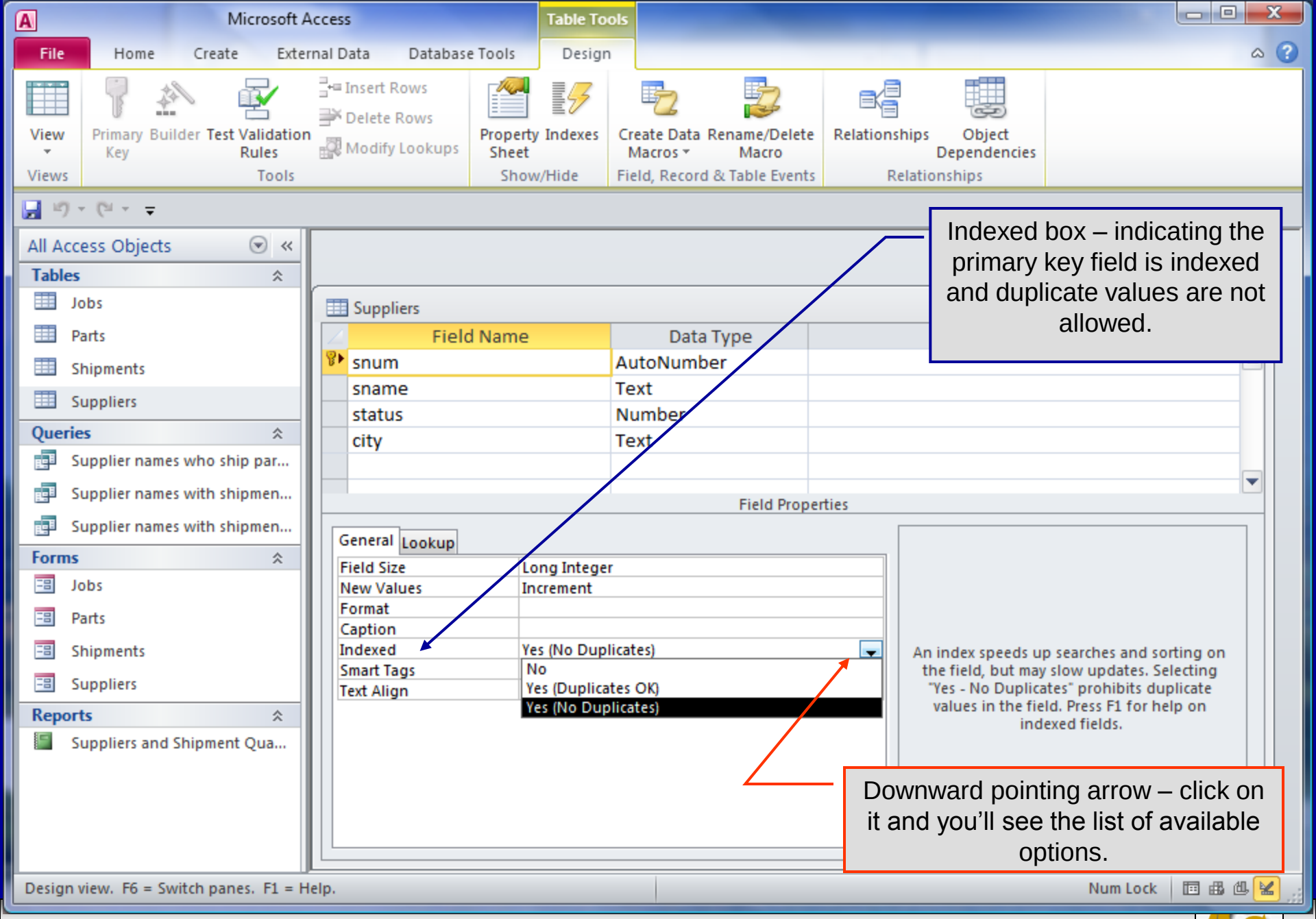
- While this is not a lab in the strict sense of the word, since there is no assignment associated with it, it will be done in the style of other labs this semester.
- The objective of this lab is to introduce more advanced features of Access in defining your database.
- For this lab, I'll use the supplier-parts-jobs-shipments.accdb database as in Lab #4. It is available on WebCourses and the course webpage.

As with previous labs – start Access and maximize the window. If Security Warning message bar appears, Click on options … and choose Enable this content.

NOTE: In the slides that follow, if the call-out symbol is outlined in red, it means that there is something for you to try, if the call-out is outlined in blue, I am simply giving you some information about what is displayed on that page.

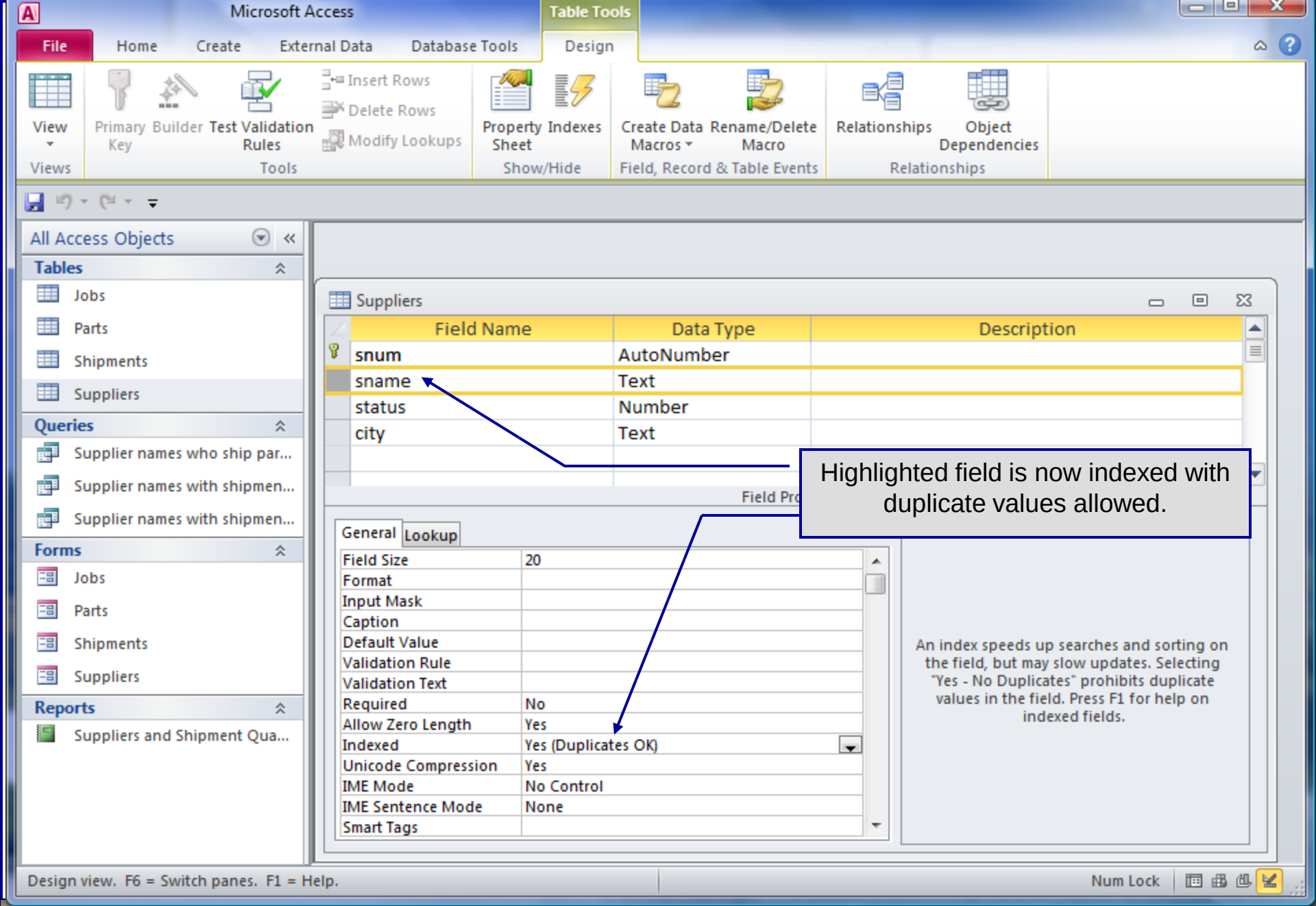
Index Fields In A Table

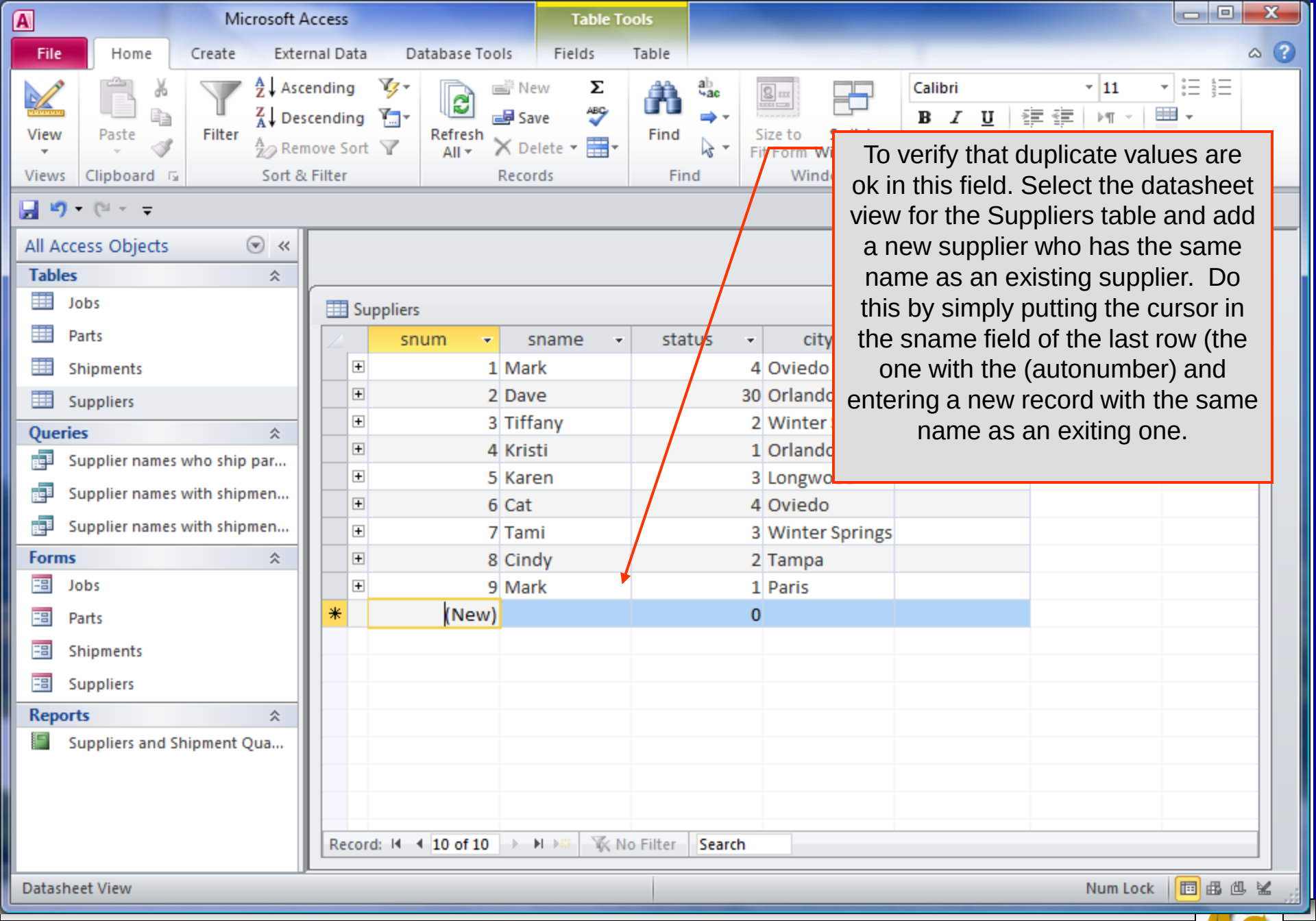
- Assuming you have opened the suppliers-parts-jobs-shipments database.
- Adding a primary key to a field automatically creates an index for that field. An index is a special list that is created in Access to speed up searching and sorting – much like the index in the back of a textbook. The index is visible only to Access (not you).
- Indices can also be built on non-key fields, including multiple-field indices.
- When you add an index to a field, you have the option of allowing duplicate values in that field or not allowing them.
  - When a primary key is created, the field is always indexed without duplicates.
- Start Access and load the suppliers-parts-jobs database.
- From the Tables list, select the Suppliers table and then switch to the Design View.
- Once in the design view for the Suppliers table, click on the row near the bottom that reads "Indexed" – it will add a downward pointing arrow to the box and you should see the image shown on the next page.


Microsoft Access
Table Tools
File
Home
Create
External Data
Database Tools
Design
View
Views
Primary Key
Builder
Test Validation Rules
Insert Rows
Delete Rows
Modify Lookups
Tools
Property Sheet
Indexes
Show/Hide
Create Data Macros
Rename/Delete Macro
Field, Record & Table Events
Relationships
Object Dependencies
Relationships
All Access Objects
Tables
Jobs
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shipment Qua...
Suppliers
Field Name
Data Type
snum
AutoNumber
sname
Text
status
Number
city
Text
Field Properties
General
Lookup
Field Size
Long Integer
New Values
Increment
Format
Caption
Indexed
Yes (No Duplicates)
Smart Tags
Text Align
No
Yes (Duplicates OK)
Yes (No Duplicates)
An index speeds up searches and sorting on the field, but may slow updates. Selecting "Yes - No Duplicates" prohibits duplicate values in the field. Press F1 for help on indexed fields.
Indexed box – indicating the primary key field is indexed and duplicate values are not allowed.
Downward pointing arrow – click on it and you'll see the list of available options.
Design view. F6 = Switch panes. F1 = Help.
Num Lock

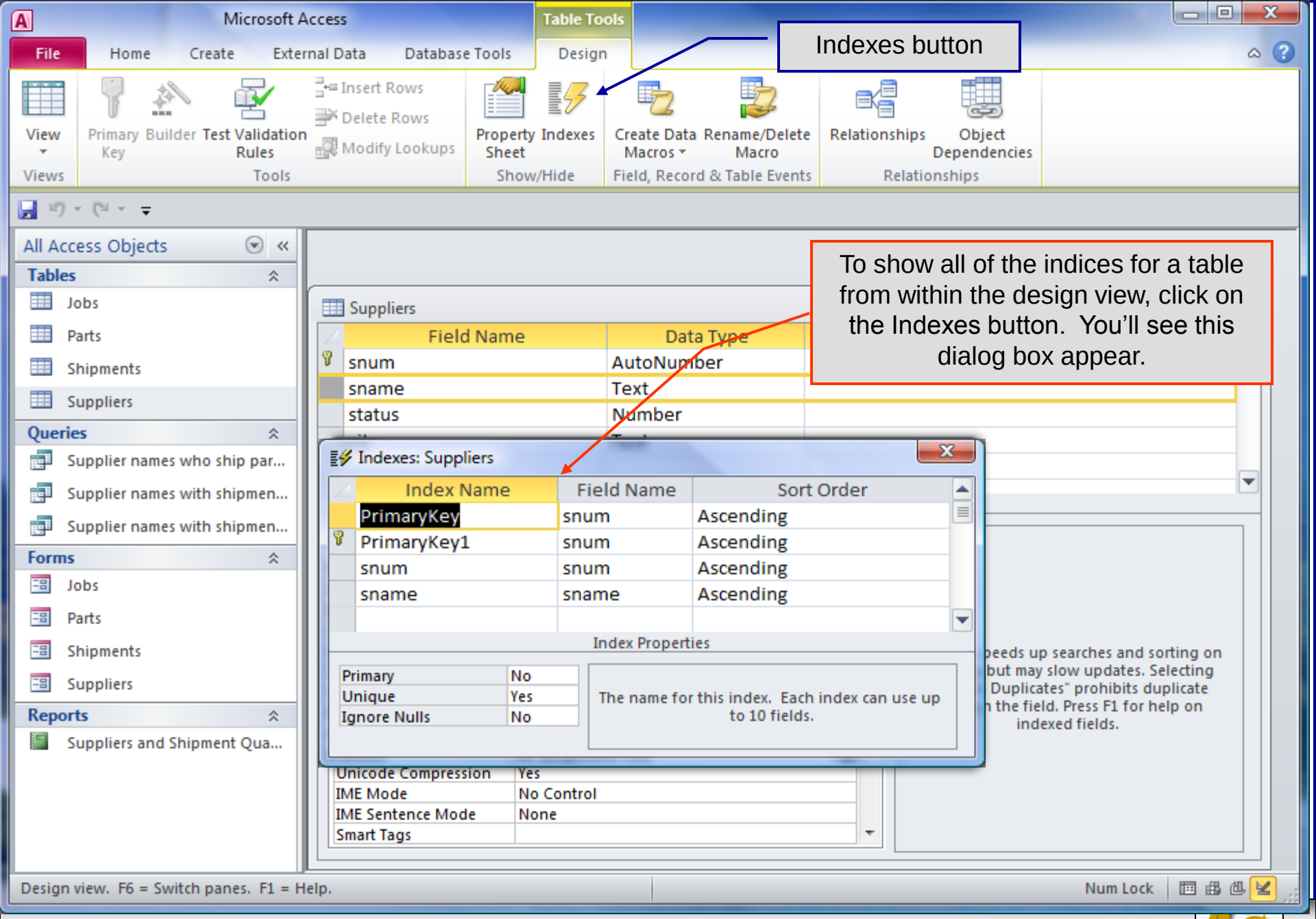
Adding an index to a non-key field

- Using the Suppliers table, let's add an index to the "sname" field that will allow for duplicates.
  - Click on the sname field in the field listing for the Supplier table.
  - Next click on Indexed under the General tab (just like the previous example.
  - Then click on the Indexed row to bring up the downward arrow. (You can also double click in the row to step through the options.)
  - Select Yes, (Duplicates OK). You'll see the final result as shown on the next slide.
  - Close the view and Access will ask if you want to save your changes to the table – select YES.


Microsoft Access
Table Tools
File
Home
Create
External Data
Database Tools
Design
View
Primary Key
Builder
Test Validation Rules
Insert Rows
Delete Rows
Modify Lookups
Property Sheet
Indexes
Create Data Macros
Rename/Delete Macro
Relationships
Object Dependencies
Views
Tools
Show/Hide
Field, Record & Table Events
Relationships
All Access Objects
Tables
Jobs
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shipment Qua...
Suppliers
Field Name
Data Type
Description
snum
AutoNumber
sname
Text
status
Number
city
Text
Field Pro
General
Lookup
Field Size
20
Format
Input Mask
Caption
Default Value
Validation Rule
Validation Text
Required
No
Allow Zero Length
Yes
Indexed
Yes (Duplicates OK)
Unicode Compression
Yes
IME Mode
No Control
IME Sentence Mode
None
Smart Tags
Highlighted field is now indexed with duplicate values allowed.
An index speeds up searches and sorting on the field, but may slow updates. Selecting "Yes - No Duplicates" prohibits duplicate values in the field. Press F1 for help on indexed fields.
Design view. F6 = Switch panes. F1 = Help.
Num Lock

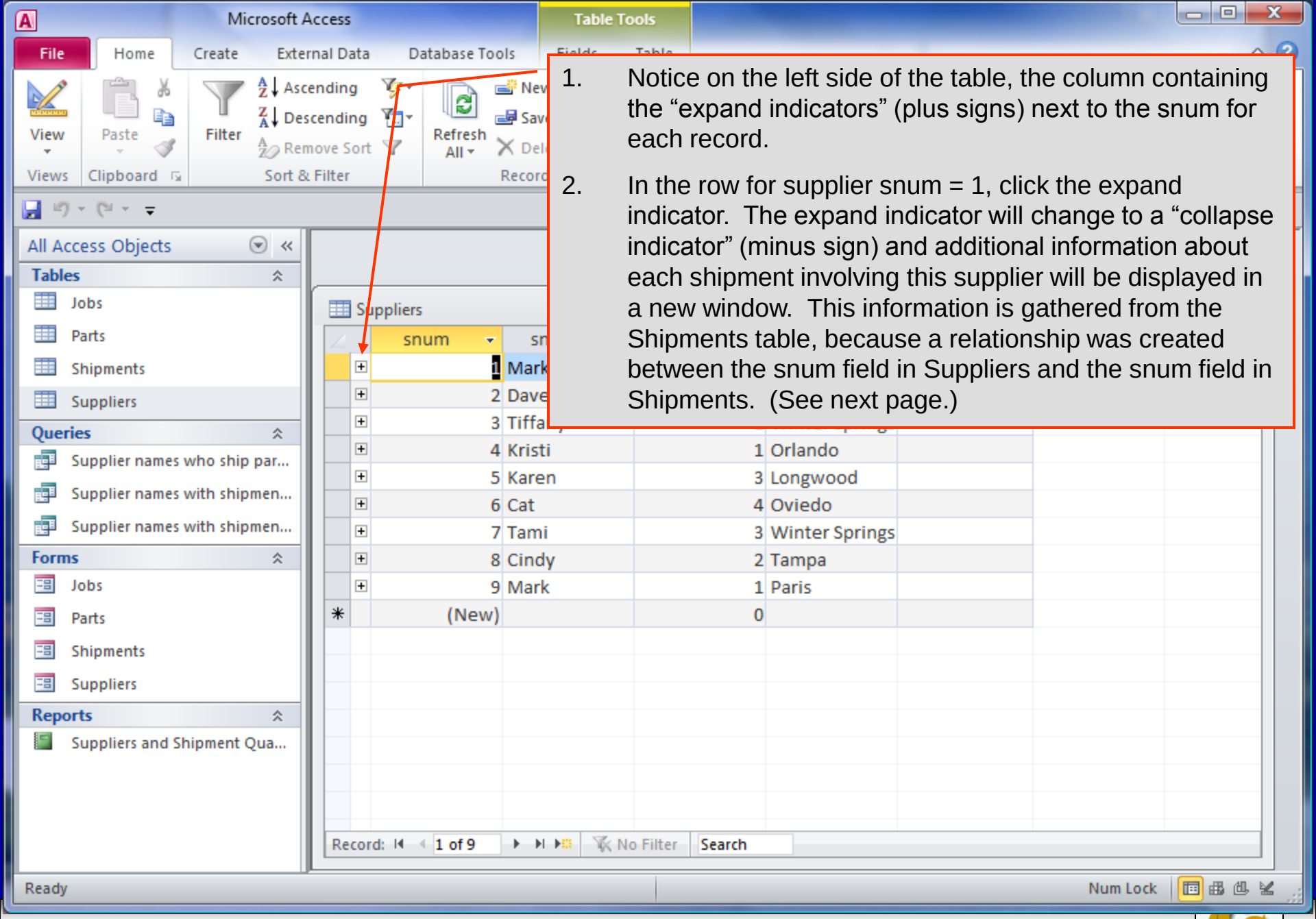


To verify that duplicate values are ok in this field. Select the datasheet view for the Suppliers table and add a new supplier who has the same name as an existing supplier. Do this by simply putting the cursor in the sname field of the last row (the one with the (autonumber) and entering a new record with the same name as an exiting one.


Microsoft Access
Table Tools
File
Home
Create
External Data
Database Tools
Design
Indexes button
View
Primary Key
Builder
Test Validation Rules
Insert Rows
Delete Rows
Modify Lookups
Property Sheet
Indexes
Create Data Macros
Rename/Delete Macro
Relationships
Object Dependencies
Views
Tools
Show/Hide
Field, Record & Table Events
Relationships
All Access Objects
Tables
Jobs
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shipment Qua...
To show all of the indices for a table from within the design view, click on the Indexes button. You'll see this dialog box appear.
Suppliers
Field Name
Data Type
snum
AutoNumber
sname
Text
status
Number
Indexes: Suppliers
Index Name
Field Name
Sort Order
PrimaryKey
snum
Ascending
PrimaryKey1
snum
Ascending
snum
snum
Ascending
sname
sname
Ascending
Index Properties
Primary
No
Unique
Yes
Ignore Nulls
No
The name for this index. Each index can use up to 10 fields.
Unicode Compression
Yes
IME Mode
No Control
IME Sentence Mode
None
Smart Tags
Design view. F6 = Switch panes. F1 = Help.
Num Lock

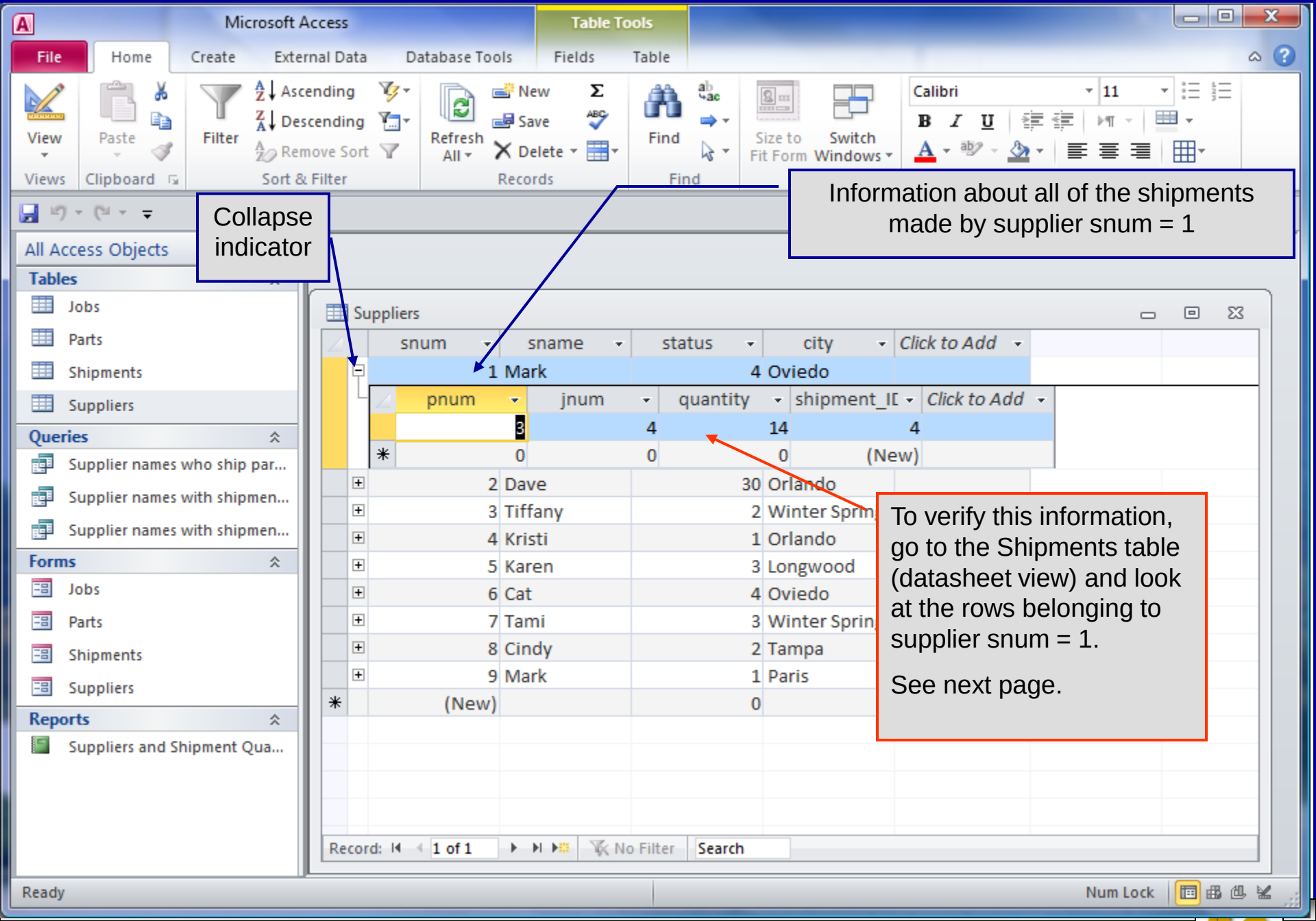
Viewing Relationships in the Database

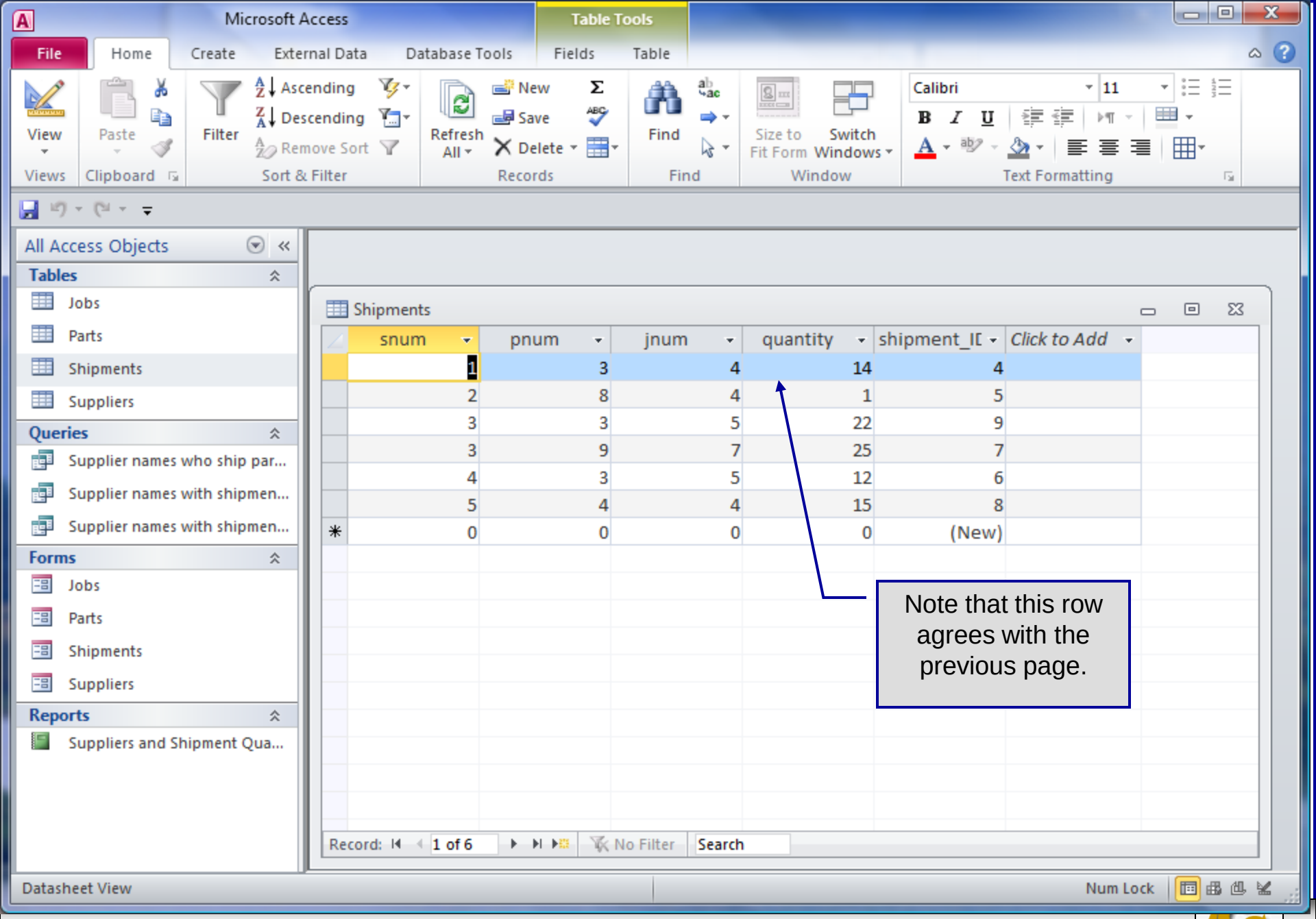
- Access has the ability to allow you to view and set the relationships that exist between the tables of your database.
- It is a somewhat rudimentary form of an ERD. Not nearly as sophisticated as we were able to develop in class, but still fairly powerful for enforcing cardinality and referential integrity constraints.
- Access allows you to view related data together fairly simply. To illustrate this, follow these steps:
  - Select the Suppliers table and go to the datasheet view as shown on the next page.



1. Notice on the left side of the table, the column containing the “expand indicators” (plus signs) next to the snum for each record.

2. In the row for supplier snum = 1, click the expand indicator. The expand indicator will change to a “collapse indicator” (minus sign) and additional information about each shipment involving this supplier will be displayed in a new window. This information is gathered from the Shipments table, because a relationship was created between the snum field in Suppliers and the snum field in Shipments. (See next page.)


Microsoft Access
Table Tools
File
Home
Create
External Data
Database Tools
Fields
Table
View
Paste
Filter
Ascending
Descending
Remove Sort
Refresh All
New
Save
Delete
Find
Size to Fit Form
Switch Windows
Calibri
11
Views
Clipboard
Sort & Filter
Records
Find
All Access Objects
Tables
Jobs
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shipment Qua...
Collapse indicator
Information about all of the shipments made by supplier snum = 1
Suppliers
snum
sname
status
city
Click to Add
1 Mark 4 Oviedo
pnum
jnum
quantity
shipment_ID
Click to Add
3 4 14 4
0 0 0 (New)
2 Dave 30 Orlando
3 Tiffany 2 Winter Sprin
4 Kristi 1 Orlando
5 Karen 3 Longwood
6 Cat 4 Oviedo
7 Tami 3 Winter Sprin
8 Cindy 2 Tampa
9 Mark 1 Paris
(New) 0
To verify this information, go to the Shipments table (datasheet view) and look at the rows belonging to supplier snum = 1.
See next page.
Record: 1 of 1
No Filter
Search
Ready
Num Lock

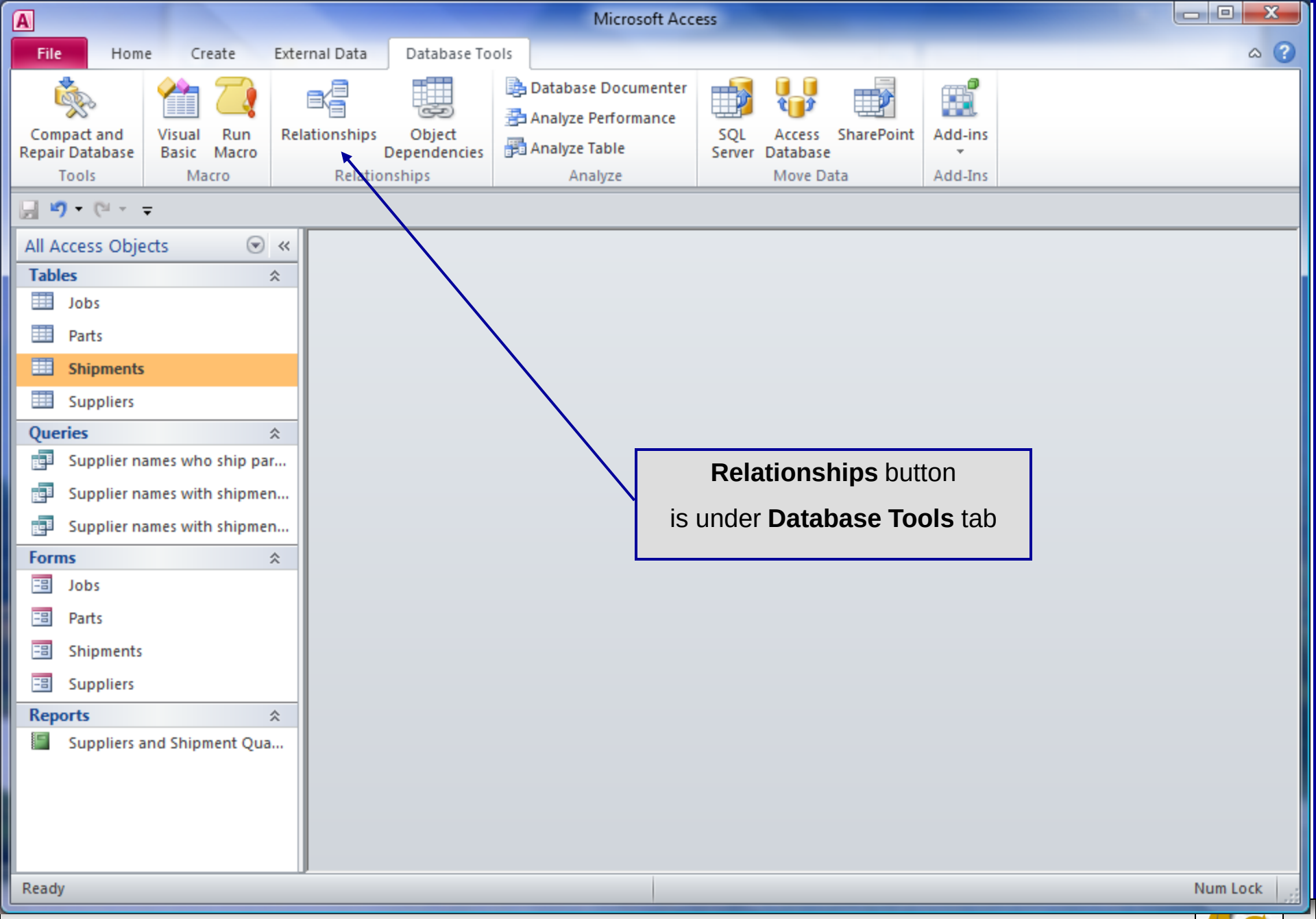

Microsoft Access
Table Tools
File
Home
Create
External Data
Database Tools
Fields
Table
View
Paste
Filter
Ascending
Descending
Remove Sort
Refresh All
New
Save
Delete
Find
Size to Fit Form
Switch Windows
Calibri
11
Views
Clipboard
Sort & Filter
Records
Find
Window
Text Formatting
All Access Objects
Tables
Jobs
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shipment Qua...
Shipments
snum
pnum
jnum
quantity
shipment_ID
Click to Add
1 3 4 14 4
2 8 4 1 5
3 3 5 22 9
3 9 7 25 7
4 3 5 12 6
5 4 4 15 8
0 0 0 0 (New)
Note that this row agrees with the previous page.
Record: 1 of 6
No Filter
Search
Datasheet View
Num Lock

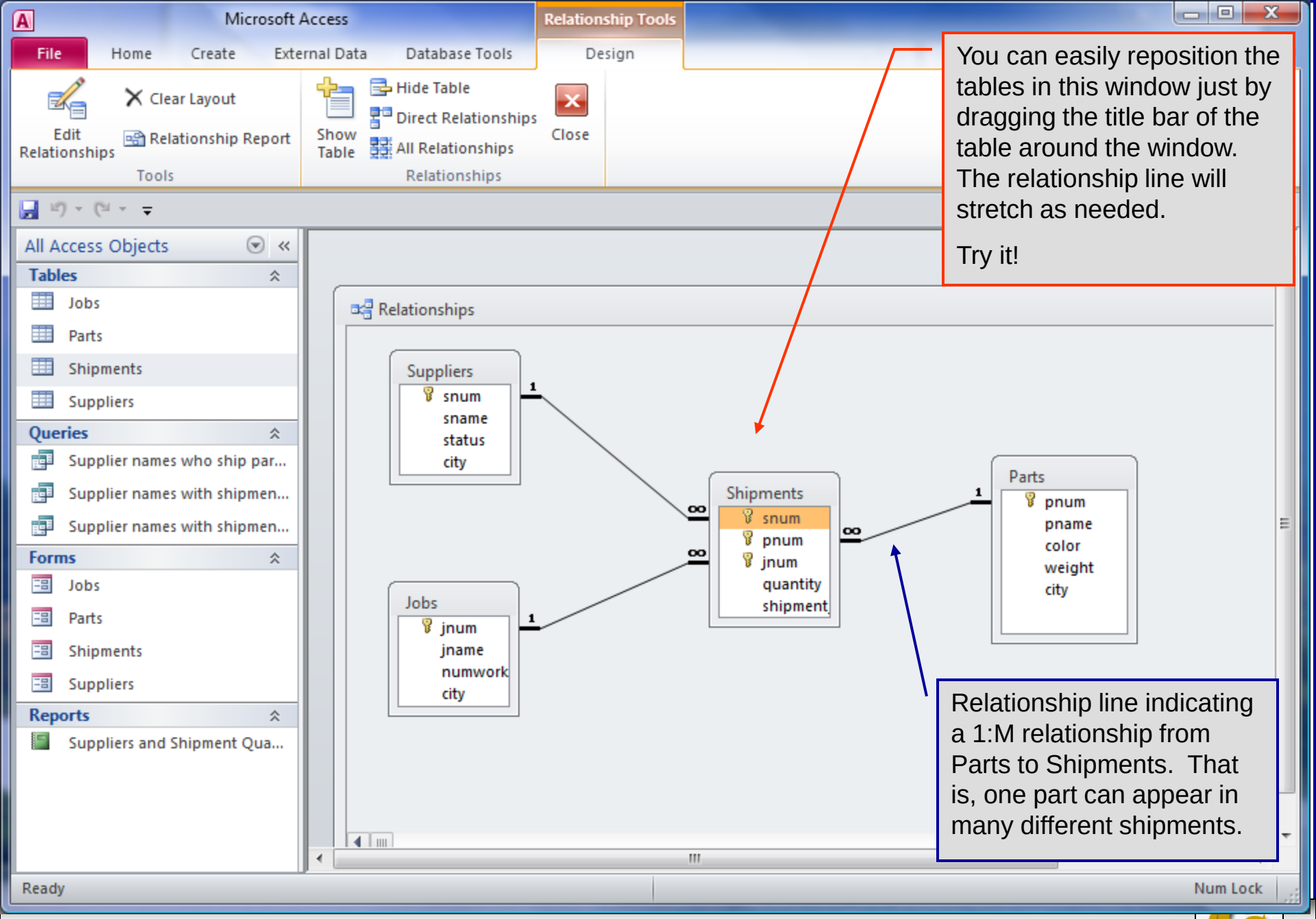
Assessment Point #1

- At this point, select some of the other tables in this database and see which fields are indexed and which are not indexed.
- Try creating some indices on non-key fields that allow for duplicates and some that do not allow duplicates.
- Experiment a bit more with the viewing the relationships in this database from the datasheet view.

Viewing the Relationships in a Database In Access

- On the database toolbar, click the Relationships button. See next page.
- The Relationships window displays. From here you can view, create, and modify relationships between tables and also between queries.
- Since we created this database earlier, we already see the relationships that have been defined for this database. See page 16.

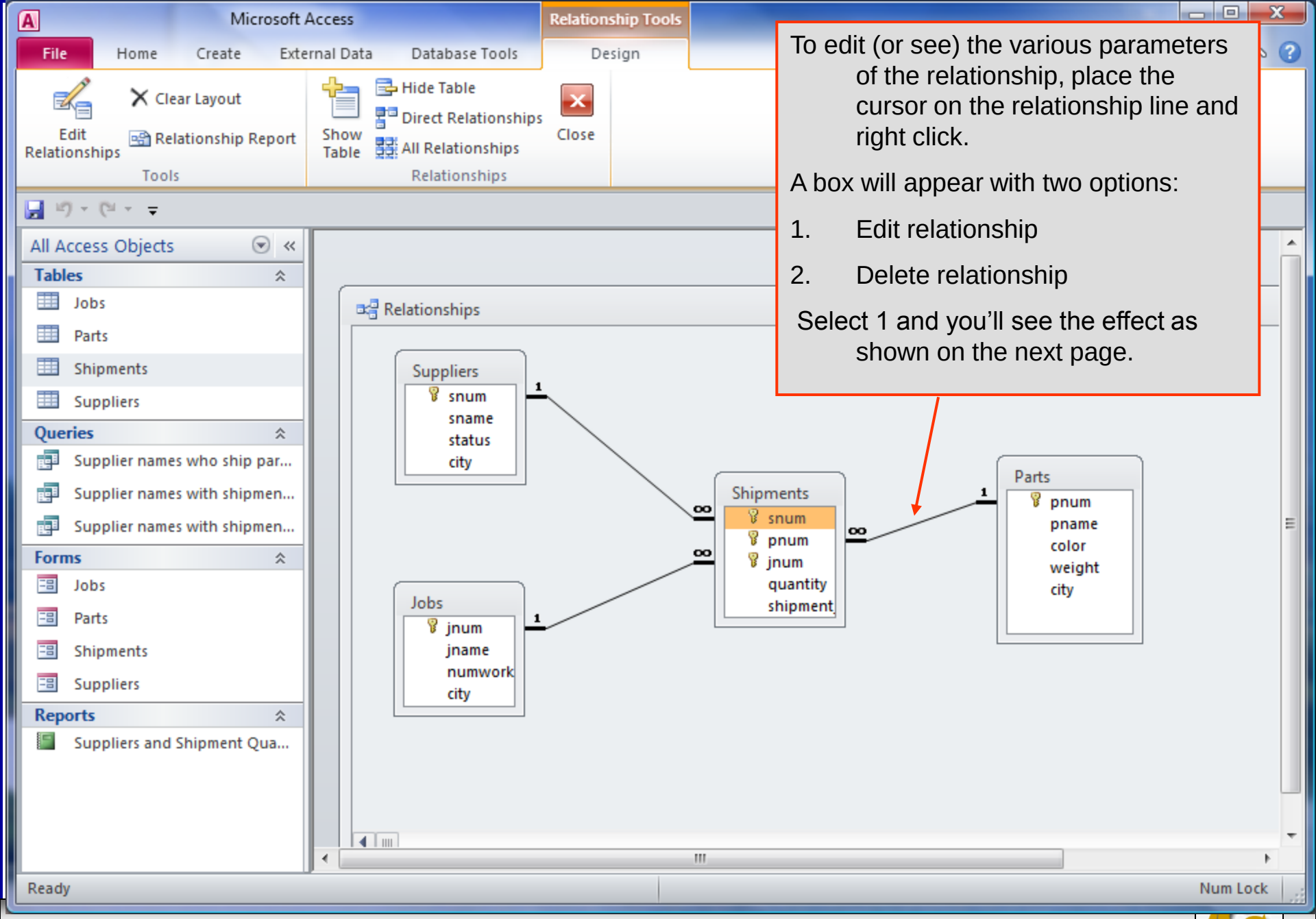

Microsoft Access
File
Home
Create
External Data
Database Tools
Compact and Repair Database
Tools
Visual Basic
Run Macro
Macro
Relationships
Object Dependencies
Relationships
Database Documenter
Analyze Performance
Analyze Table
Analyze
SQL Server
Access Database
SharePoint
Move Data
Add-ins
Add-Ins
All Access Objects
Tables
Jobs
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shipment Qua...
Relationships button
is under Database Tools tab
Ready
Num Lock



You can easily reposition the tables in this window just by dragging the title bar of the table around the window. The relationship line will stretch as needed.

Try it!

Relationship line indicating a 1:M relationship from Parts to Shipments. That is, one part can appear in many different shipments.

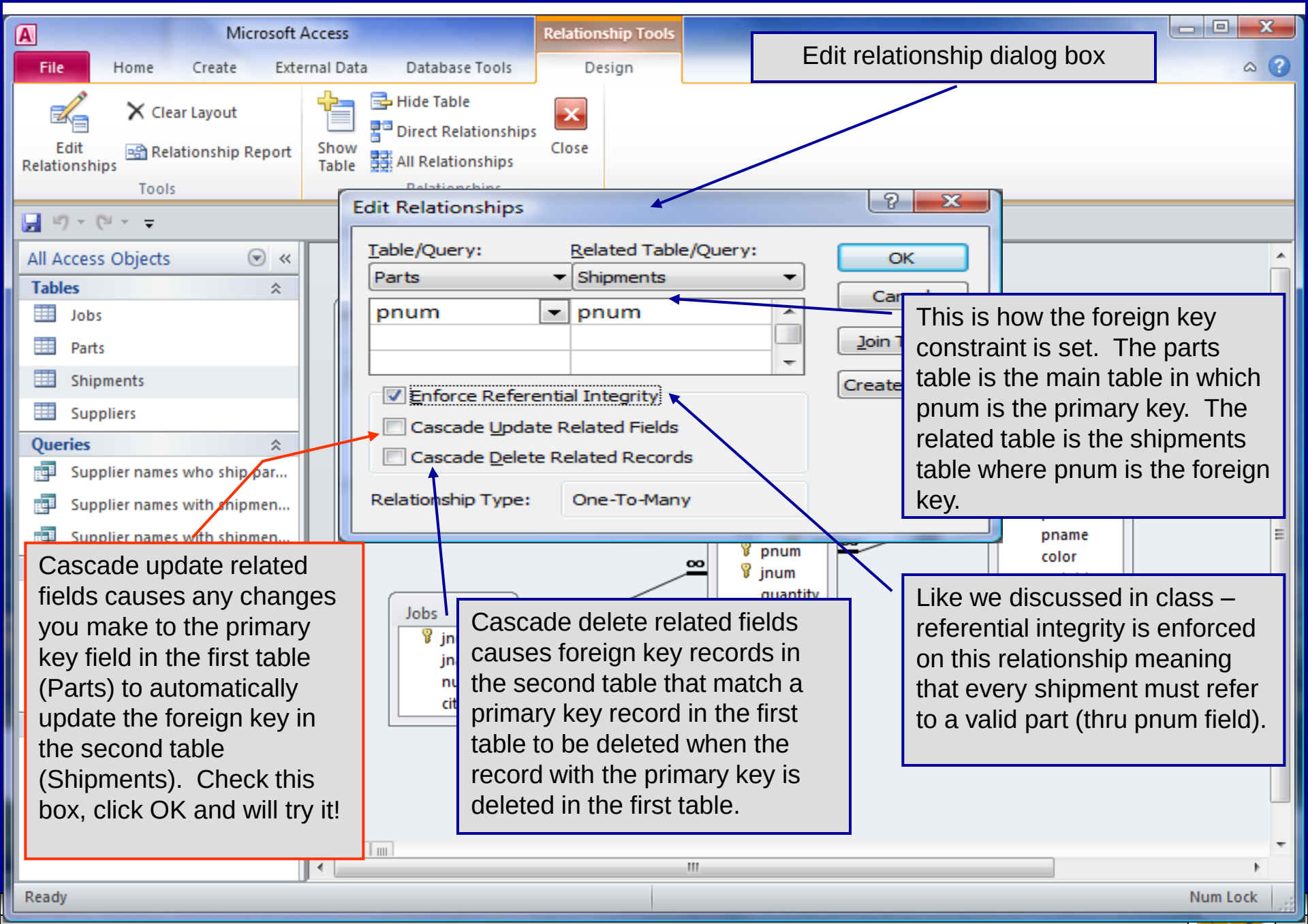


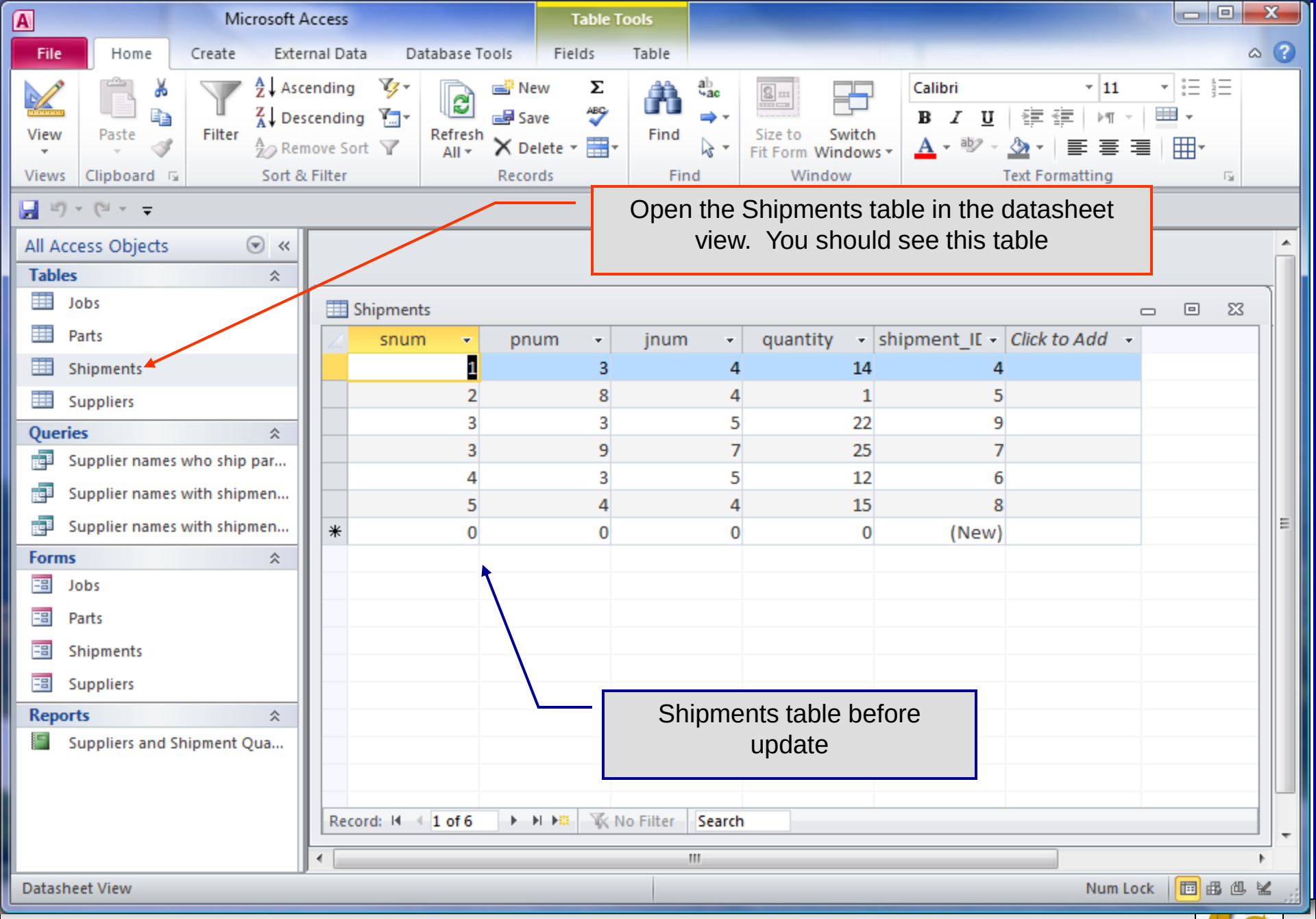
To edit (or see) the various parameters of the relationship, place the cursor on the relationship line and right click.

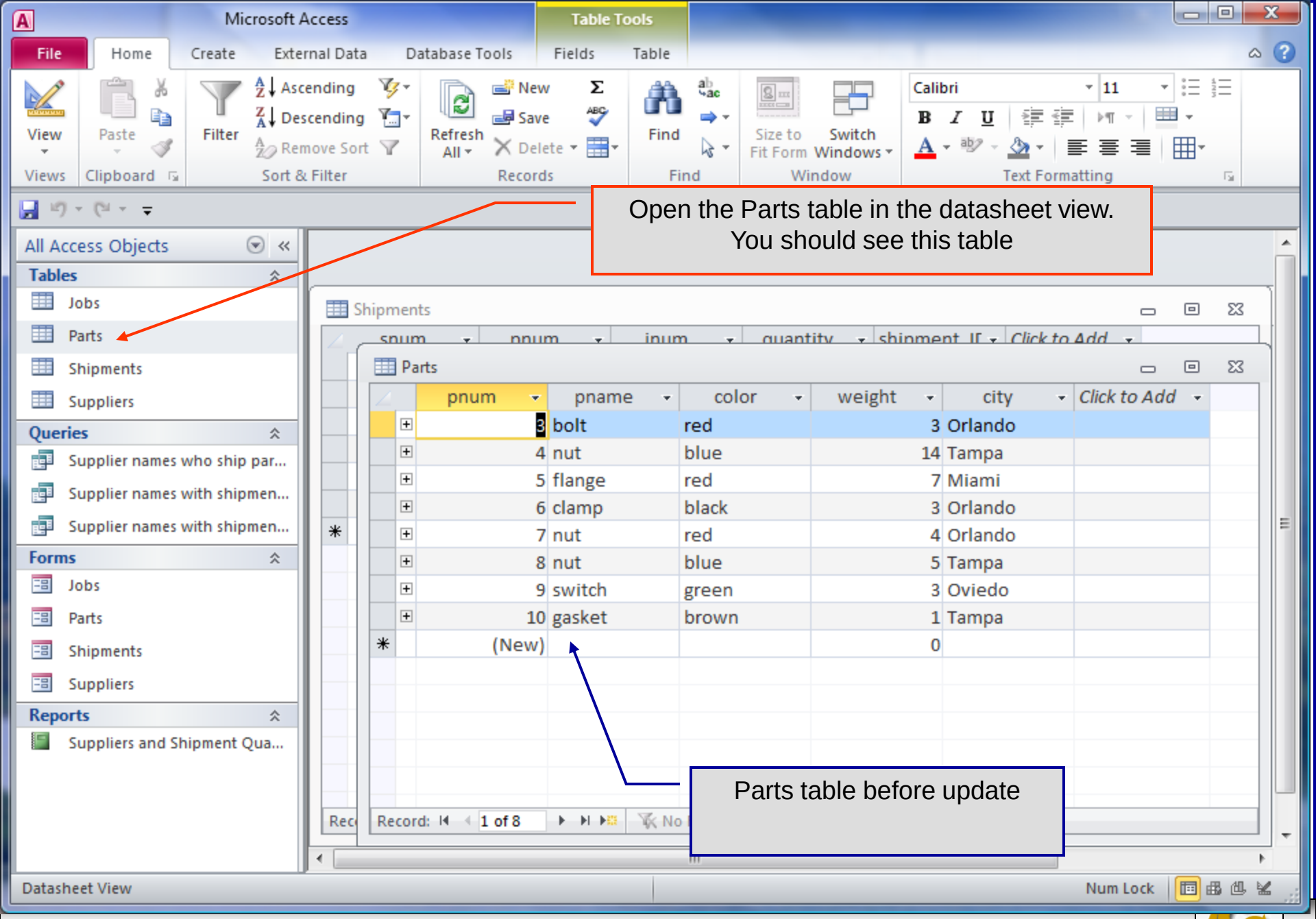
A box will appear with two options:

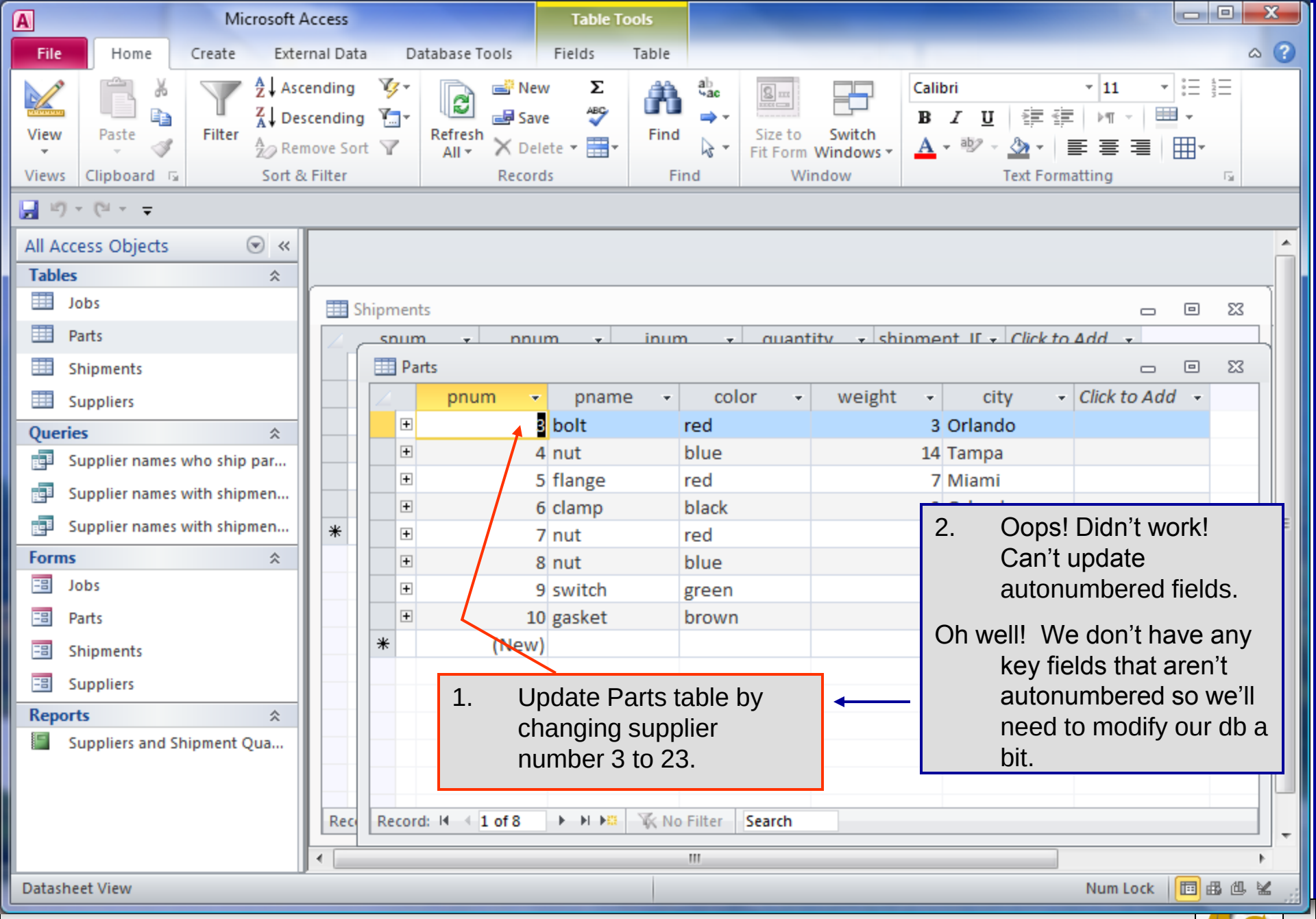
1. Edit relationship
2. Delete relationship

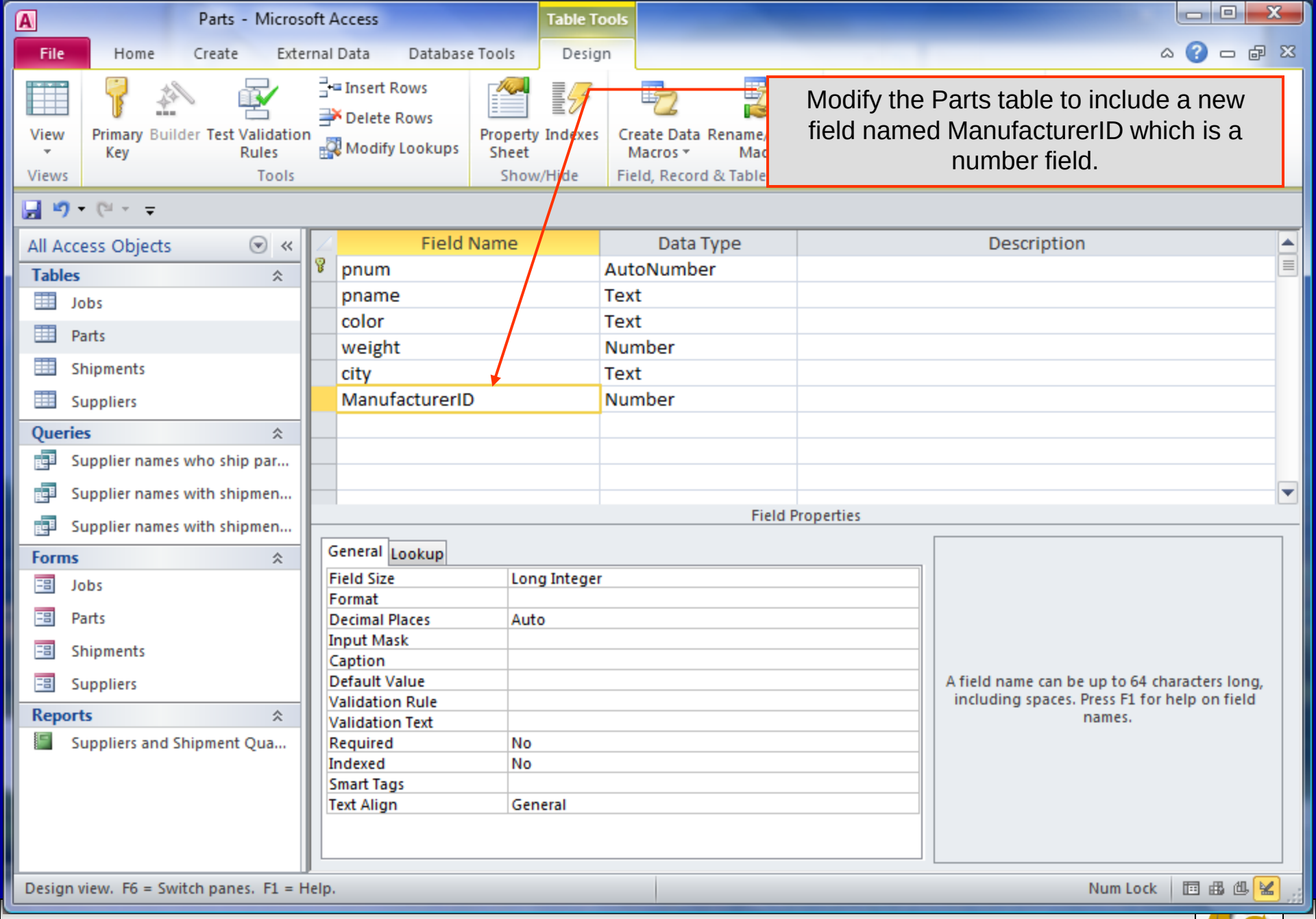
Select 1 and you'll see the effect as shown on the next page.

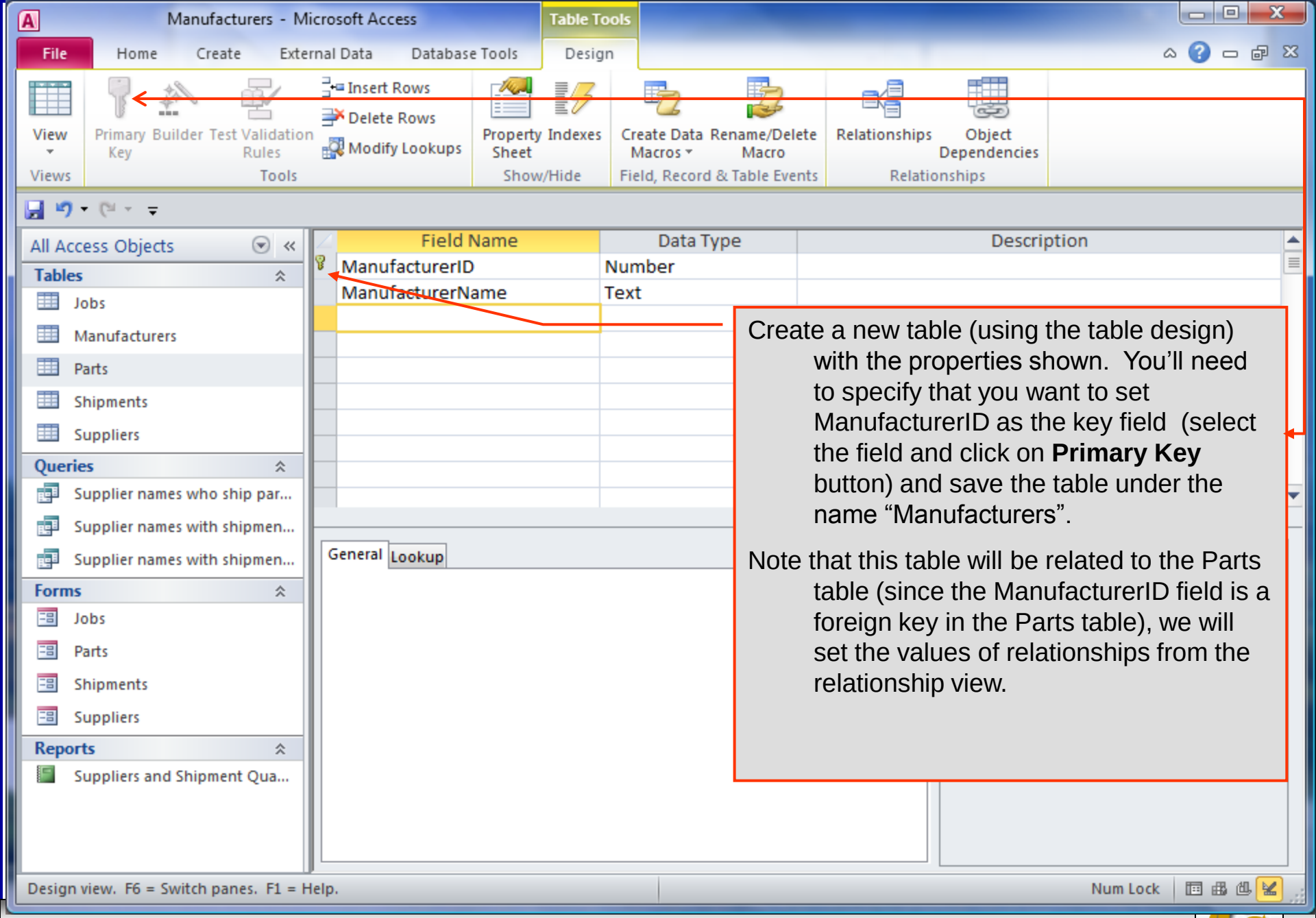

Edit relationship dialog box
Edit Relationships
Table/Query:
Related Table/Query:
Parts
Shipments
pnum
pnum
OK
Enforce Referential Integrity
Cascade Update Related Fields
Cascade Delete Related Records
Relationship Type:
One-To-Many
This is how the foreign key constraint is set. The parts table is the main table in which pnum is the primary key. The related table is the shipments table where pnum is the foreign key.
Cascade update related fields causes any changes you make to the primary key field in the first table (Parts) to automatically update the foreign key in the second table (Shipments). Check this box, click OK and will try it!
Cascade delete related fields causes foreign key records in the second table that match a primary key record in the first table to be deleted when the record with the primary key is deleted in the first table.
Like we discussed in class – referential integrity is enforced on this relationship meaning that every shipment must refer to a valid part (thru pnum field).
Microsoft Access
Relationship Tools
File
Home
Create
External Data
Database Tools
Design
Edit Relationships
Clear Layout
Relationship Report
Tools
Show Table
Hide Table
Direct Relationships
All Relationships
Close
All Access Objects
Tables
Jobs
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
pnum
jnum
quantity
pname
color
Jobs
Ready
Num Lock


Microsoft Access
Table Tools
File
Home
Create
External Data
Database Tools
Fields
Table
All Access Objects
Tables
Jobs
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shipment Qua...
Open the Shipments table in the datasheet view. You should see this table
Shipments
snum
pnum
jnum
quantity
shipment_ID
Click to Add
1 3 4 14 4
2 8 4 1 5
3 3 5 22 9
3 9 7 25 7
4 3 5 12 6
5 4 4 15 8
0 0 0 0 (New)
Shipments table before update
Record: 1 of 6
No Filter
Search
Datasheet View
Num Lock


Microsoft Access
Table Tools
File
Home
Create
External Data
Database Tools
Fields
Table
All Access Objects
Tables
Jobs
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shipment Qua...
Open the Parts table in the datasheet view.
You should see this table
Shipments
Parts
pnum
pname
color
weight
city
Click to Add
3 bolt red 3 Orlando
4 nut blue 14 Tampa
5 flange red 7 Miami
6 clamp black 3 Orlando
7 nut red 4 Orlando
8 nut blue 5 Tampa
9 switch green 3 Oviedo
10 gasket brown 1 Tampa
(New) 0
Record: 1 of 8
Parts table before update
Datasheet View
Num Lock

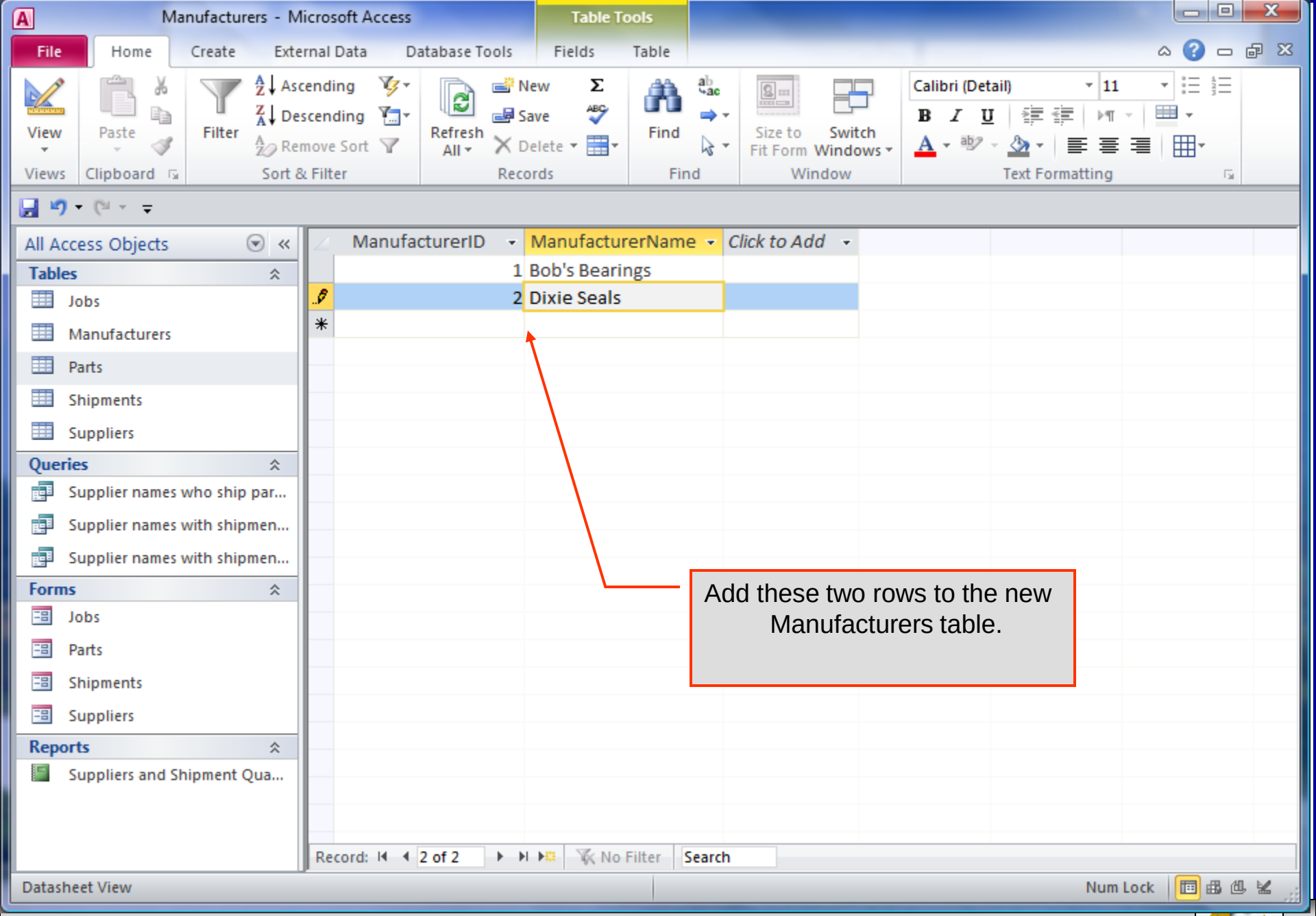

Microsoft Access
Table Tools
File
Home
Create
External Data
Database Tools
Fields
Table
All Access Objects
Tables
Jobs
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shipment Qua...
Shipments
Parts
pnum
pname
color
weight
city
Click to Add
3 bolt red 3 Orlando
4 nut blue 14 Tampa
5 flange red 7 Miami
6 clamp black
7 nut red
8 nut blue
9 switch green
10 gasket brown
(New)
Record: 1 of 8
No Filter
Search
1. Update Parts table by changing supplier number 3 to 23.
2. Oops! Didn't work! Can't update autonumbered fields.
Oh well! We don't have any key fields that aren't autonumbered so we'll need to modify our db a bit.
Datasheet View
Num Lock

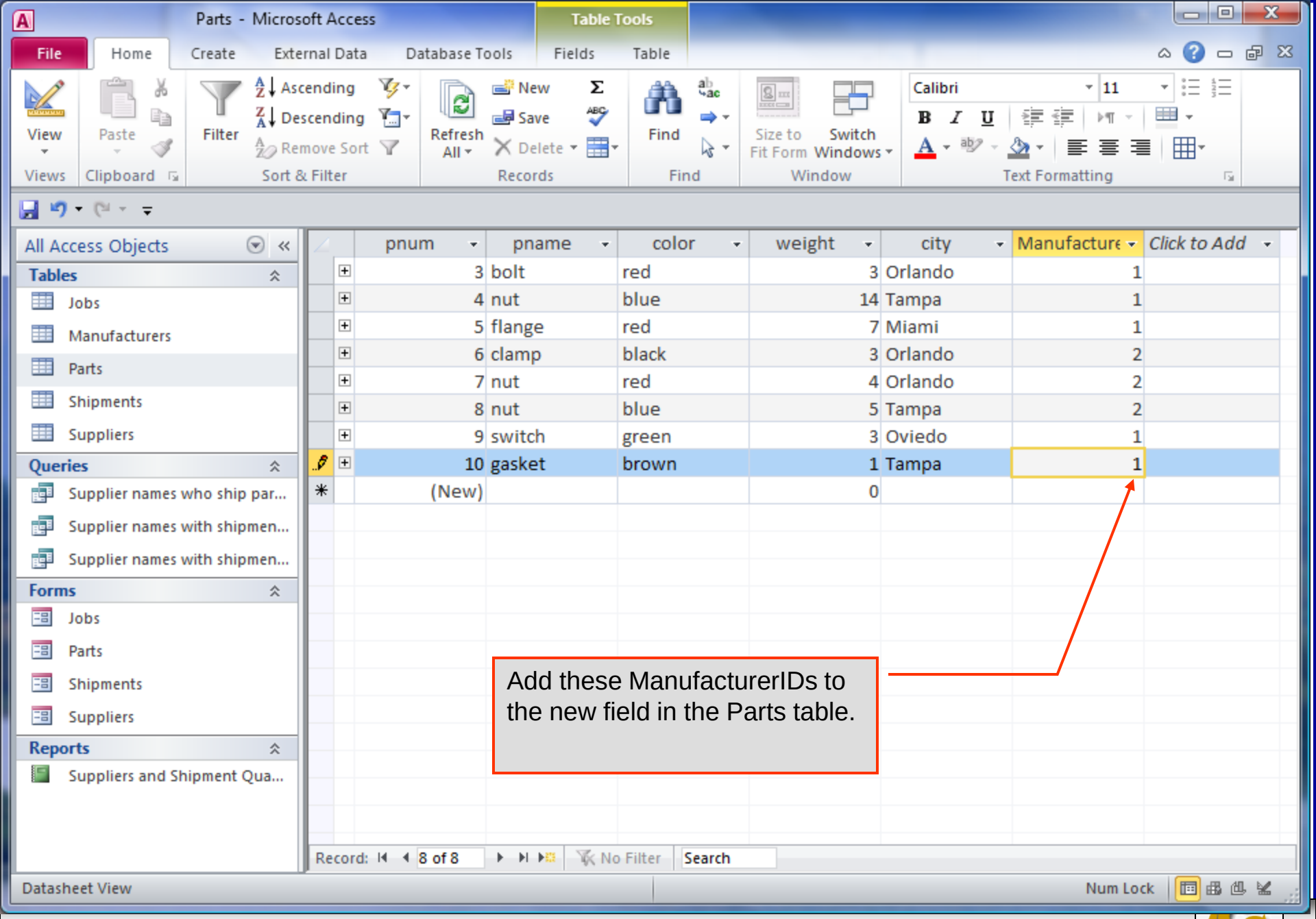

Parts - Microsoft Access
Table Tools
File
Home
Create
External Data
Database Tools
Design
View
Primary Key
Builder
Test Validation Rules
Insert Rows
Delete Rows
Modify Lookups
Property Sheet
Indexes
Create Data Macros
Views
Tools
Show/Hide
Field, Record & Table
Modify the Parts table to include a new field named ManufacturerID which is a number field.
All Access Objects
Tables
Jobs
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shipment Qua...
Field Name
Data Type
Description
pnum
AutoNumber
pname
Text
color
Text
weight
Number
city
Text
ManufacturerID
Number
Field Properties
General
Lookup
Field Size
Long Integer
Format
Decimal Places
Auto
Input Mask
Caption
Default Value
Validation Rule
Validation Text
Required
No
Indexed
No
Smart Tags
Text Align
General
A field name can be up to 64 characters long, including spaces. Press F1 for help on field names.
Design view. F6 = Switch panes. F1 = Help.
Num Lock

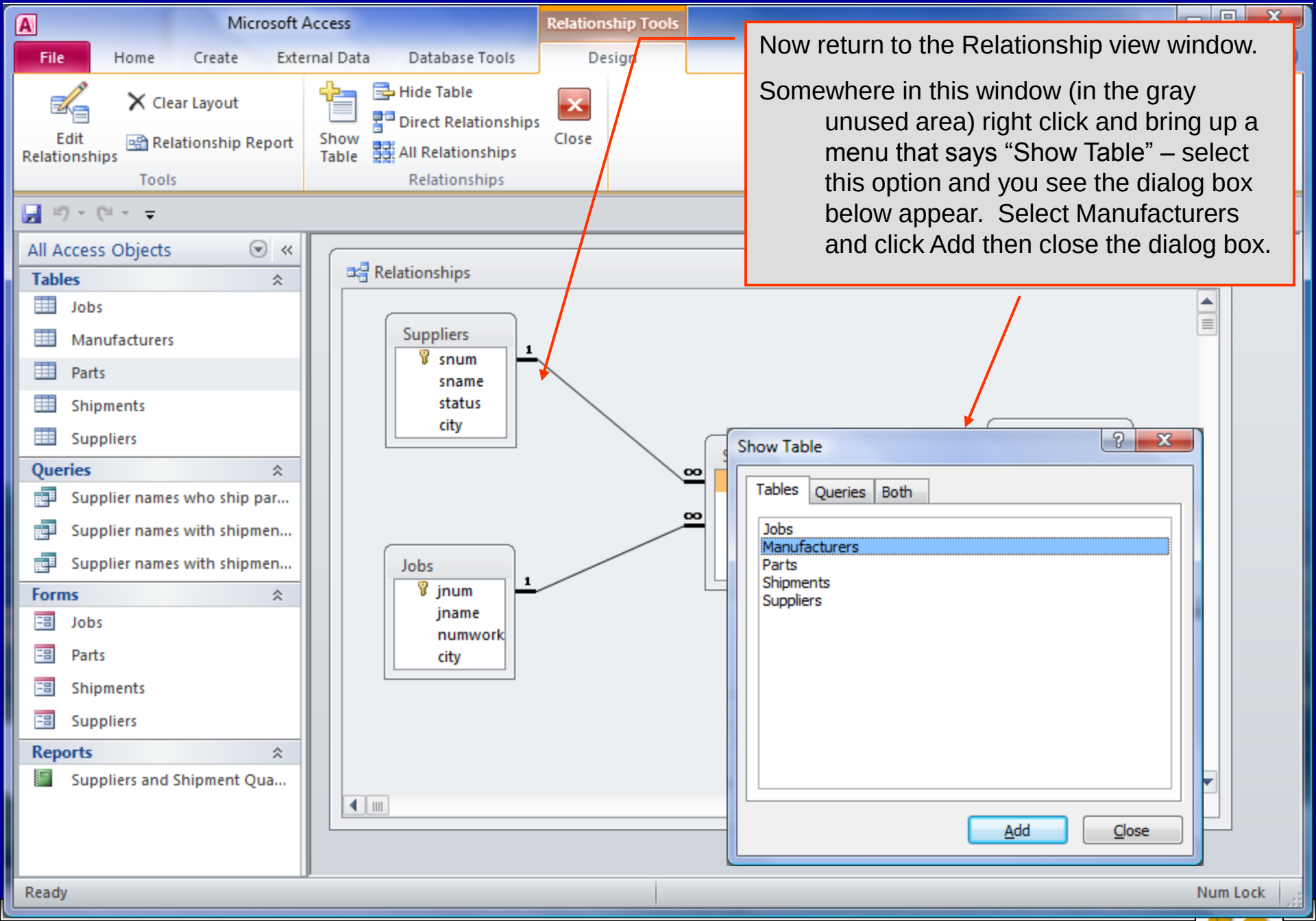


Create a new table (using the table design) with the properties shown. You'll need to specify that you want to set ManufacturerID as the key field (select the field and click on **Primary Key** button) and save the table under the name "Manufacturers".

Note that this table will be related to the Parts table (since the ManufacturerID field is a foreign key in the Parts table), we will set the values of relationships from the relationship view.

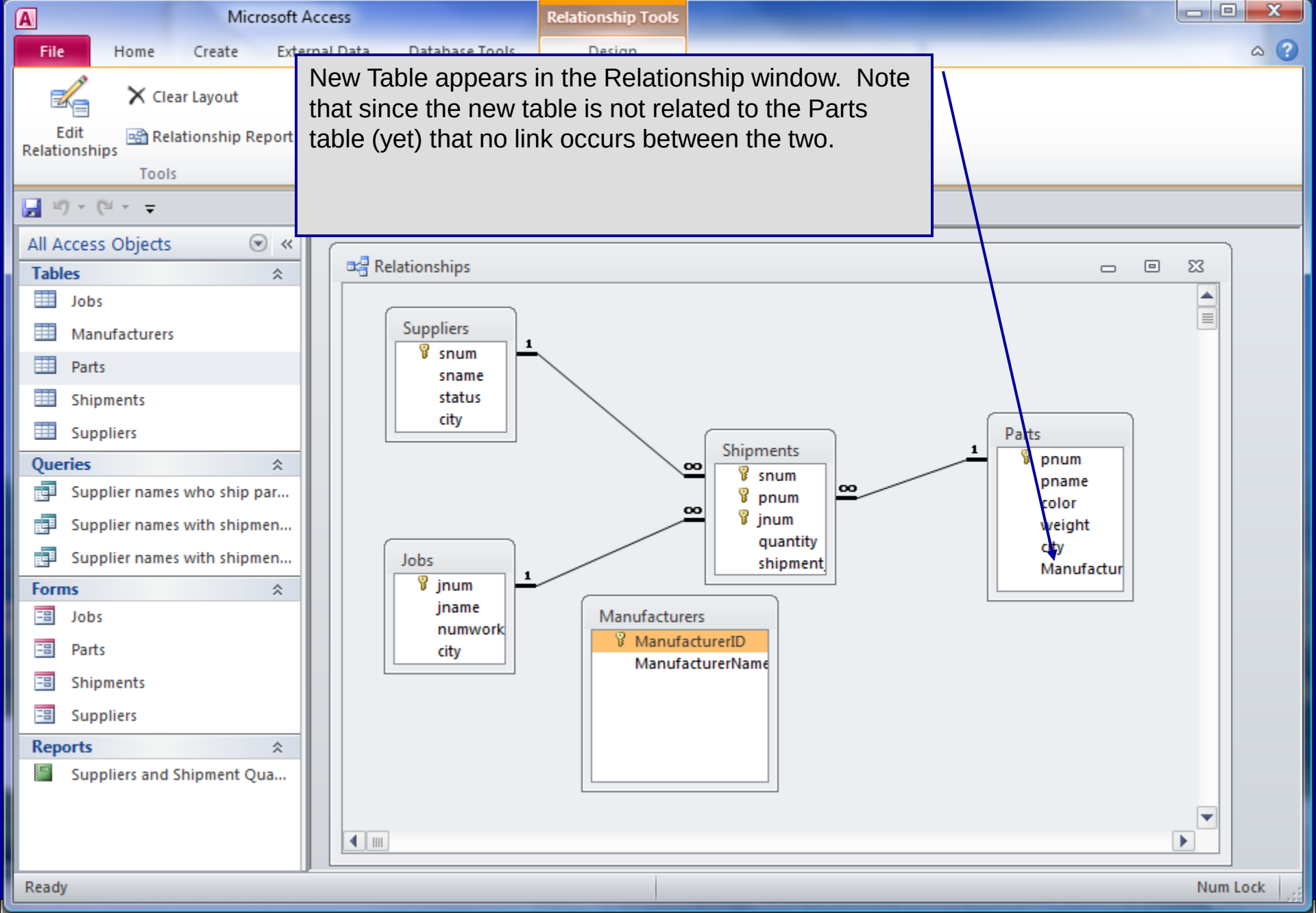

Manufacturers - Microsoft Access
Table Tools
File
Home
Create
External Data
Database Tools
Fields
Table
View
Paste
Filter
Ascending
Descending
Remove Sort
Refresh All
New
Save
Delete
Find
Size to Fit Form
Switch Windows
Calibri (Detail)
11
Views
Clipboard
Sort & Filter
Records
Find
Window
Text Formatting
All Access Objects
Tables
Jobs
Manufacturers
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shipment Qua...
ManufacturerID
ManufacturerName
Click to Add
1 Bob's Bearings
2 Dixie Seals
Add these two rows to the new Manufacturers table.
Record: 2 of 2
No Filter
Search
Datasheet View
Num Lock


Parts - Microsoft Access
Table Tools
File
Home
Create
External Data
Database Tools
Fields
Table
All Access Objects
Tables
Jobs
Manufacturers
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shipment Qua...
pnum
pname
color
weight
city
Manufacture
Click to Add
3 bolt red 3 Orlando 1
4 nut blue 14 Tampa 1
5 flange red 7 Miami 1
6 clamp black 3 Orlando 2
7 nut red 4 Orlando 2
8 nut blue 5 Tampa 2
9 switch green 3 Oviedo 1
10 gasket brown 1 Tampa 1
(New) 0
Add these ManufacturerIDs to the new field in the Parts table.
Record: 8 of 8
No Filter
Search
Datasheet View
Num Lock



Now return to the Relationship view window.

Somewhere in this window (in the gray unused area) right click and bring up a menu that says “Show Table” – select this option and you see the dialog box below appear. Select Manufacturers and click Add then close the dialog box.

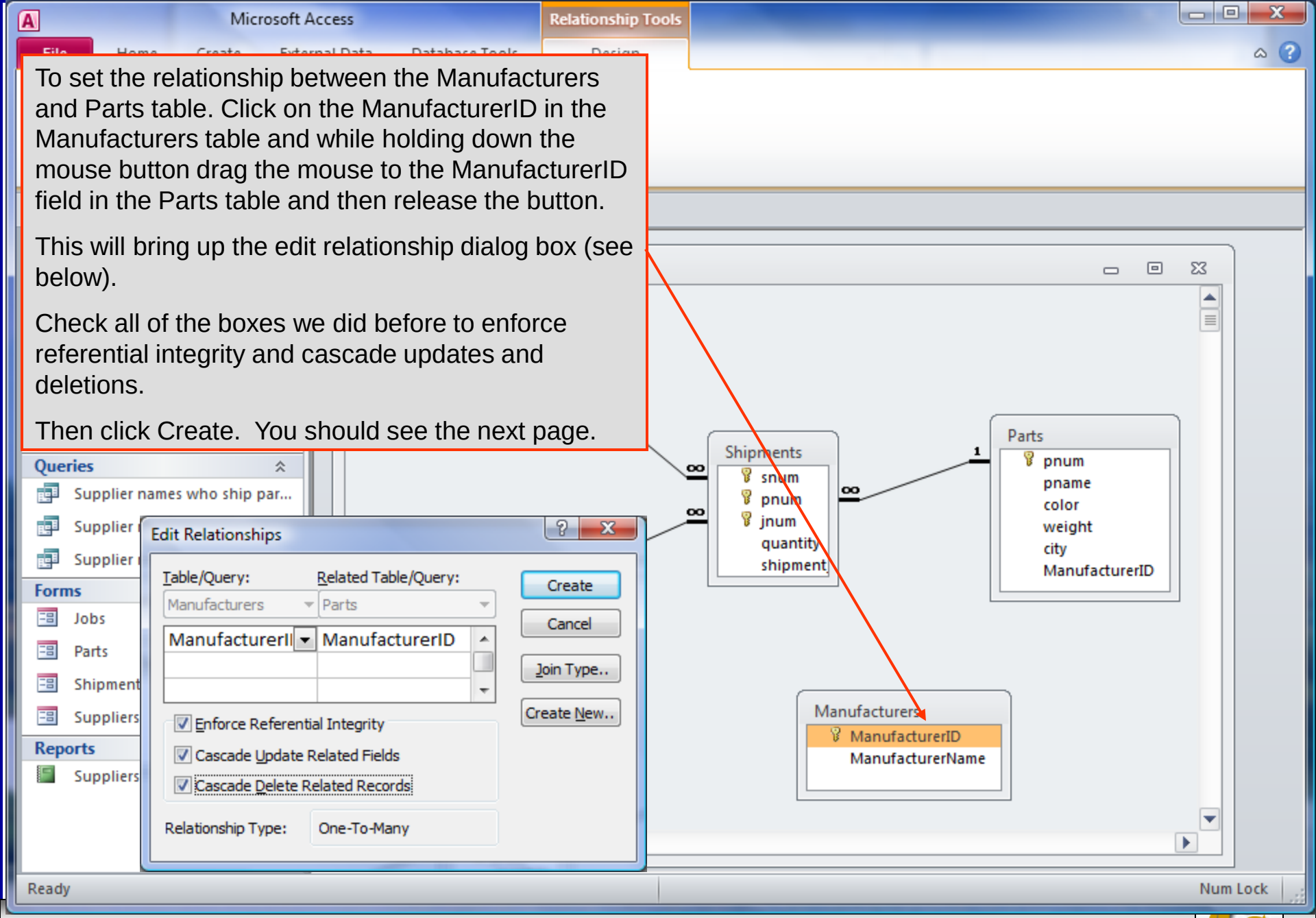

Microsoft Access
Relationship Tools
File
Home
Create
External Data
Database Tools
Design
Edit Relationships
Clear Layout
Relationship Report
Tools
New Table appears in the Relationship window. Note that since the new table is not related to the Parts table (yet) that no link occurs between the two.
All Access Objects
Tables
Jobs
Manufacturers
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shipment Qua...
Relationships
Suppliers
snum
sname
status
city
Shipments
snum
pnum
jnum
quantity
shipment
Parts
pnum
pname
color
weight
city
Manufactur
Jobs
jnum
jname
numwork
city
Manufacturers
ManufacturerID
ManufacturerName
1
∞
Ready
Num Lock

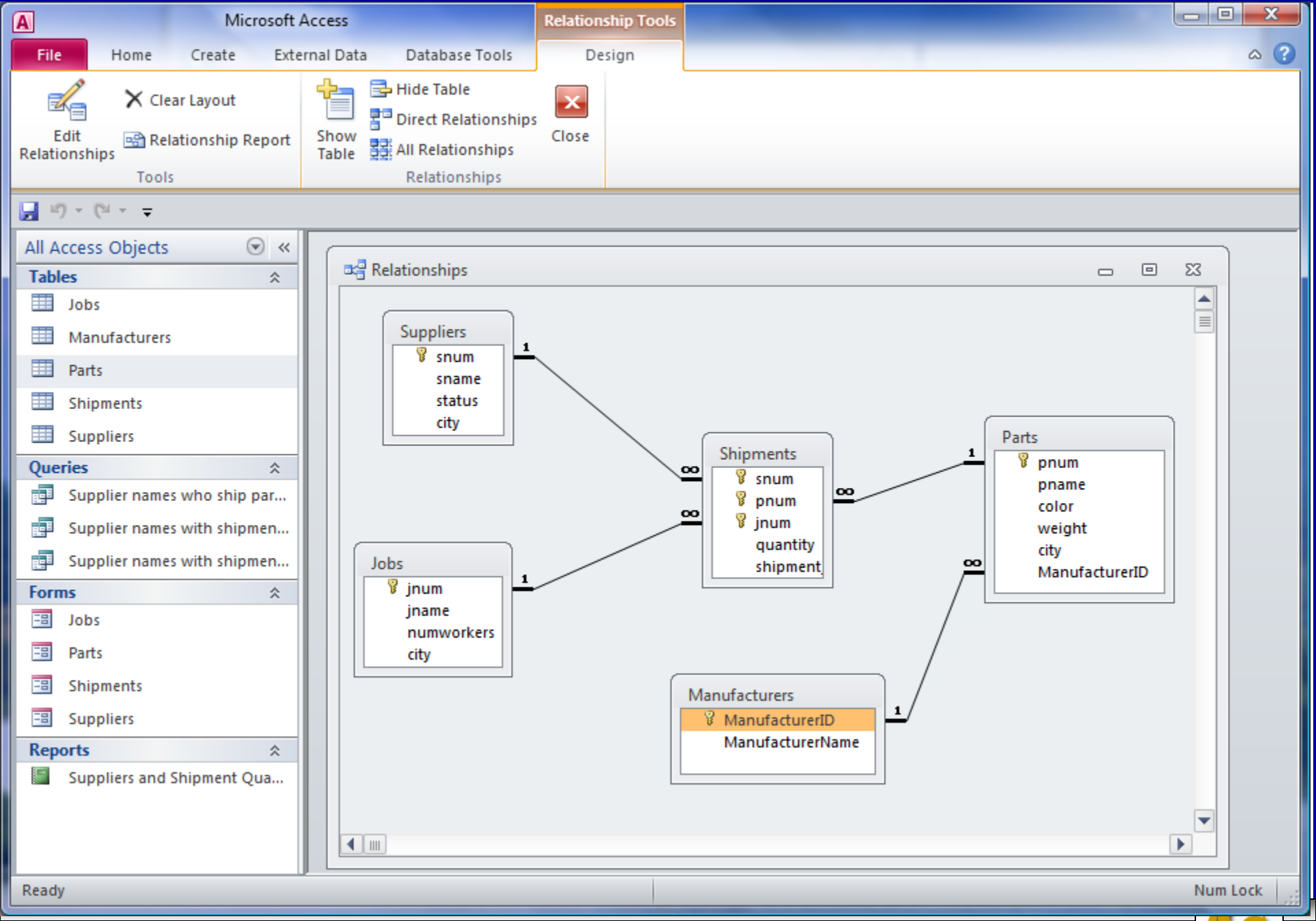
To set the relationship between the Manufacturers and Parts table. Click on the ManufacturerID in the Manufacturers table and while holding down the mouse button drag the mouse to the ManufacturerID field in the Parts table and then release the button.

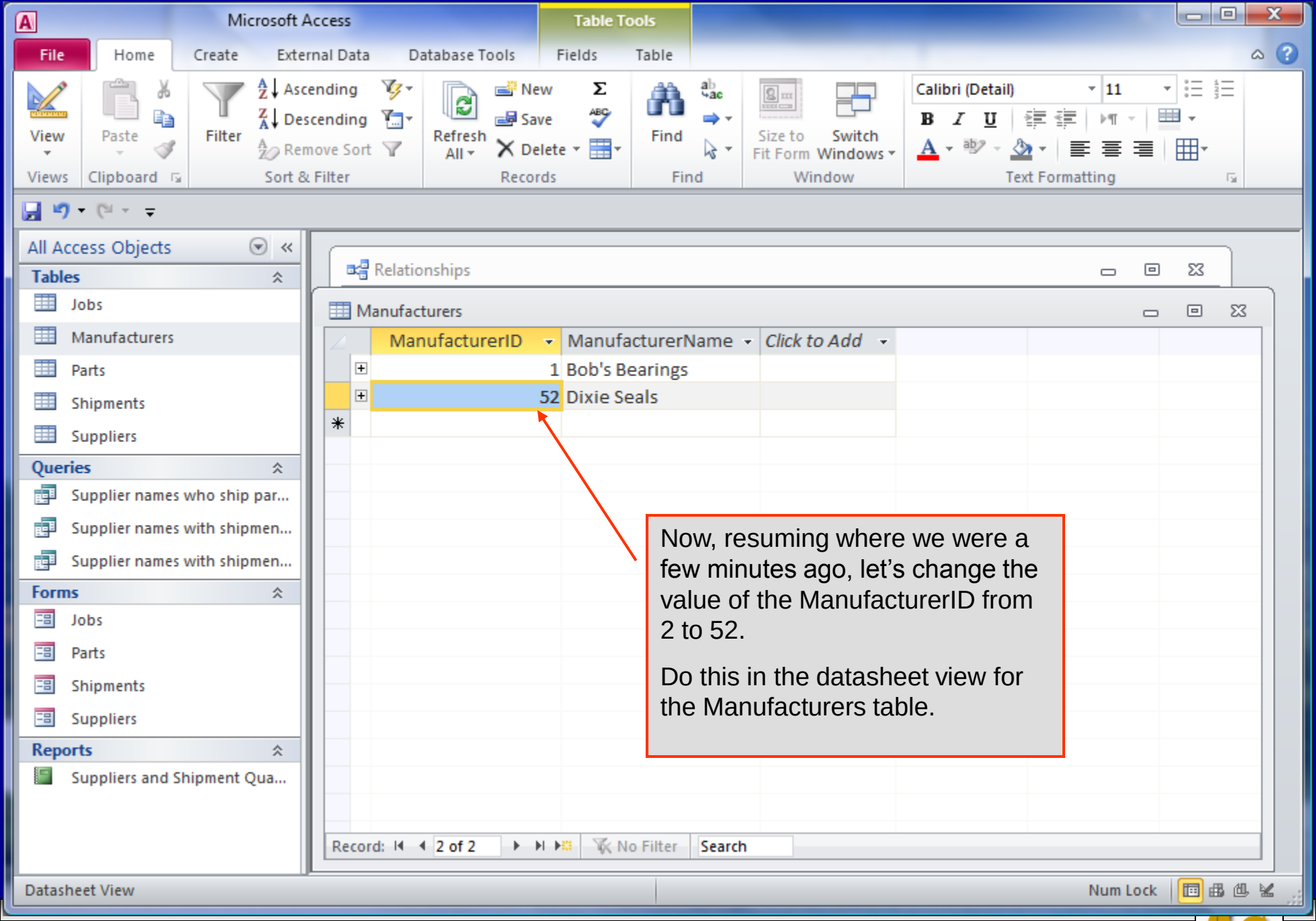
This will bring up the edit relationship dialog box (see below).

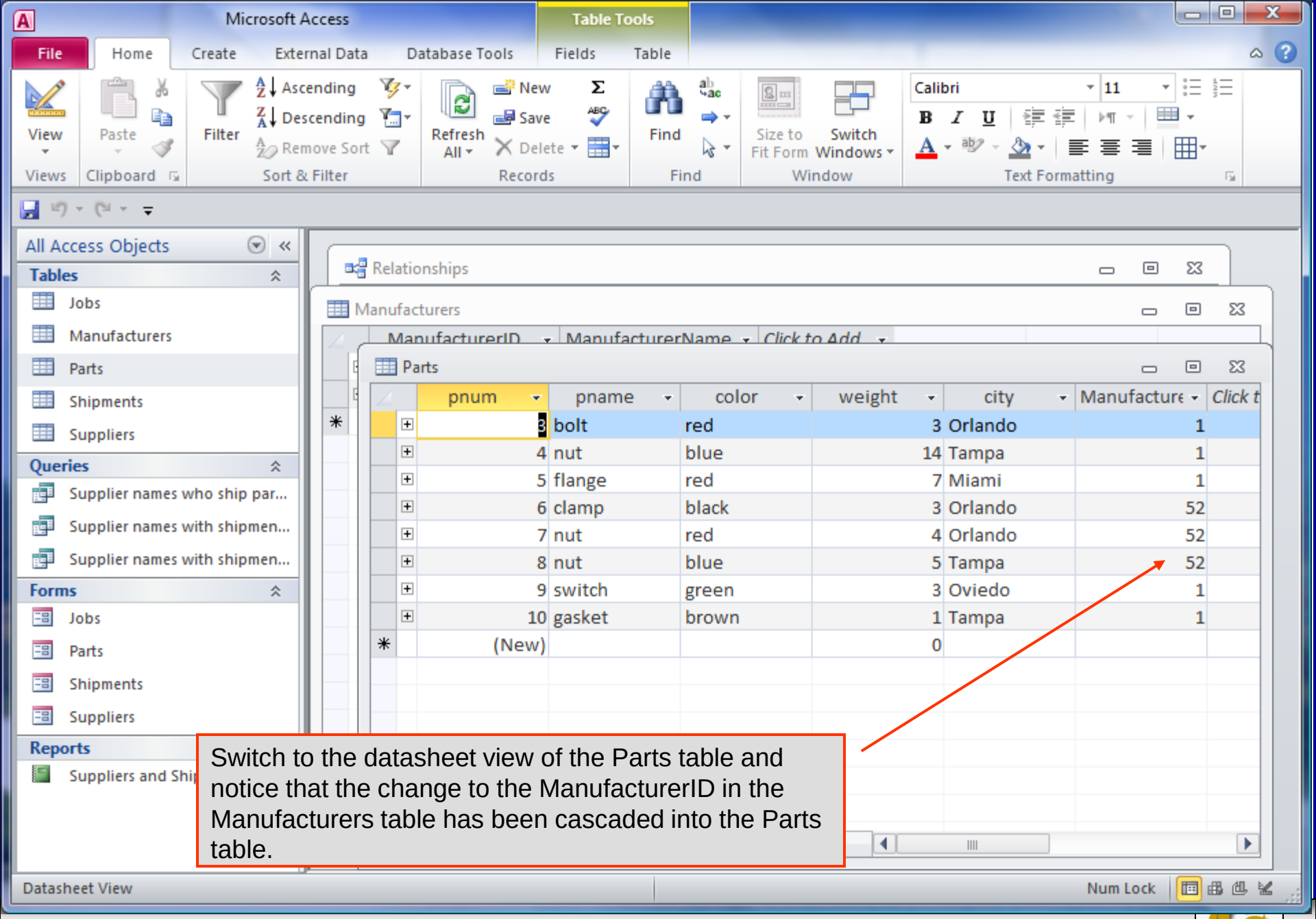
Check all of the boxes we did before to enforce referential integrity and cascade updates and deletions.

Then click Create. You should see the next page.



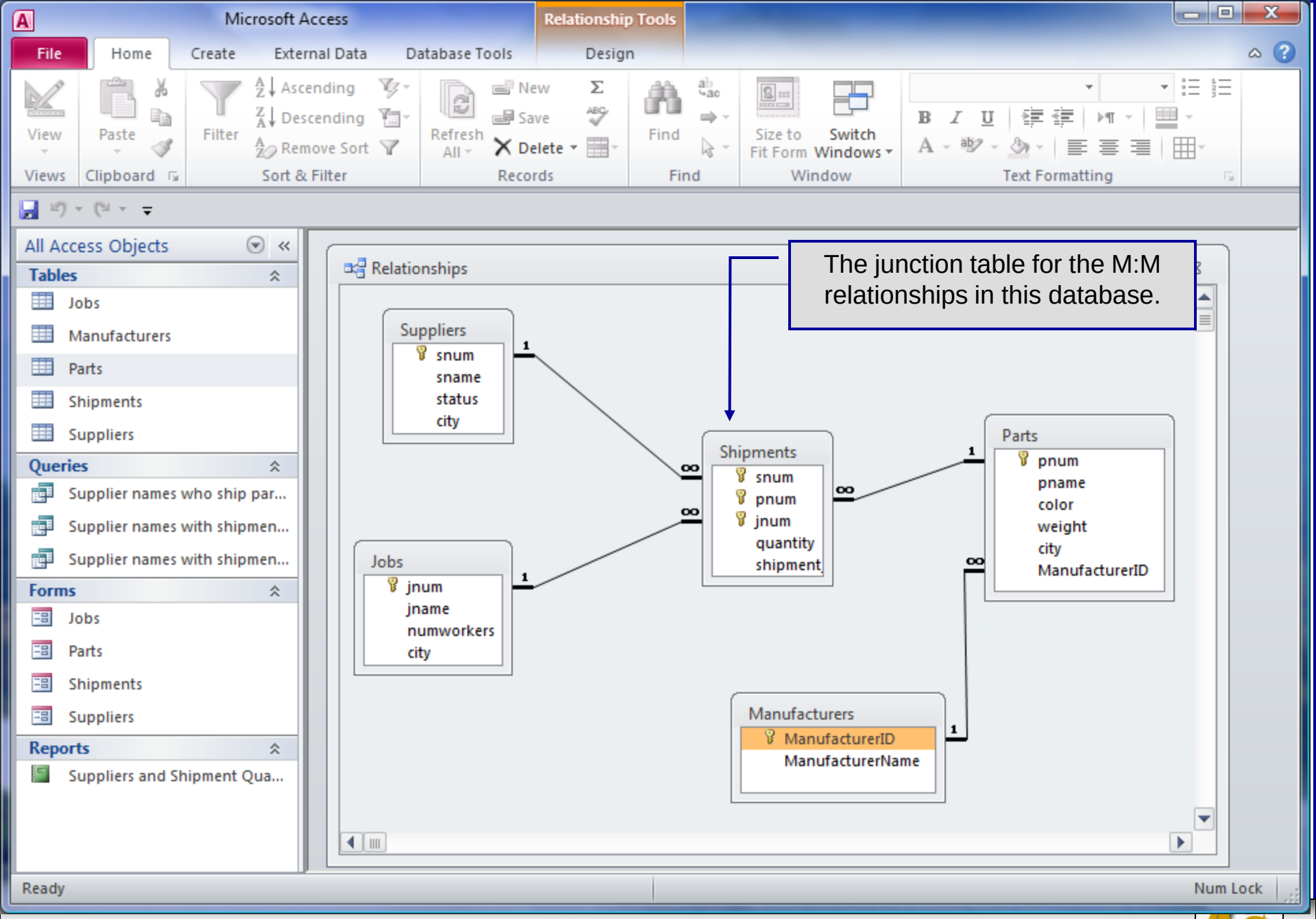

Microsoft Access
Relationship Tools
File
Home
Create
External Data
Database Tools
Design
Edit Relationships
Clear Layout
Relationship Report
Tools
Show Table
Hide Table
Direct Relationships
All Relationships
Relationships
Close
All Access Objects
Tables
Jobs
Manufacturers
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shipment Qua...
Relationships
Suppliers
snum
sname
status
city
Shipments
snum
pnum
jnum
quantity
shipment
Parts
pnum
pname
color
weight
city
ManufacturerID
Jobs
jnum
jname
numworkers
city
Manufacturers
ManufacturerID
ManufacturerName
1
∞
Ready
Num Lock


Microsoft Access
Table Tools
File
Home
Create
External Data
Database Tools
Fields
Table
All Access Objects
Tables
Jobs
Manufacturers
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shipment Qua...
Relationships
Manufacturers
ManufacturerID
ManufacturerName
Click to Add
1
Bob's Bearings
52
Dixie Seals
Record: 2 of 2
No Filter
Search
Now, resuming where we were a few minutes ago, let's change the value of the ManufacturerID from 2 to 52.
Do this in the datasheet view for the Manufacturers table.
Datasheet View
Num Lock


Microsoft Access
Table Tools
File
Home
Create
External Data
Database Tools
Fields
Table
All Access Objects
Tables
Jobs
Manufacturers
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shi
Relationships
Manufacturers
ManufacturerID
ManufacturerName
Click to Add
Parts
pnum
pname
color
weight
city
Manufacture
Click t
3 bolt red 3 Orlando 1
4 nut blue 14 Tampa 1
5 flange red 7 Miami 1
6 clamp black 3 Orlando 52
7 nut red 4 Orlando 52
8 nut blue 5 Tampa 52
9 switch green 3 Oviedo 1
10 gasket brown 1 Tampa 1
(New) 0
Switch to the datasheet view of the Parts table and notice that the change to the ManufacturerID in the Manufacturers table has been cascaded into the Parts table.
Datasheet View
Num Lock

Working with M:M Relationships In Access

- In Access a M:M relationship involves two tables that each have a 1:M relationship with a third table called a *junction table*.
- As we saw in class converting ERDs to relational schemas, the primary key of the junction table is composed of the primary keys of the other two tables.
- Our supplier-parts-jobs database already models the M:M relationships between suppliers and shipments, parts and shipments, and jobs and shipments as can be seen on the next page. The junction table in each of these cases is the shipments table.
- If you look at page 29 of the Chapter 4 – Part 1 lecture notes, you will see a very clear case of a M:M relationship. In this case the junction table is the table named `Certificate`.


Microsoft Access
Relationship Tools
File
Home
Create
External Data
Database Tools
Design
All Access Objects
Tables
Jobs
Manufacturers
Parts
Shipments
Suppliers
Queries
Supplier names who ship par...
Supplier names with shipmen...
Supplier names with shipmen...
Forms
Jobs
Parts
Shipments
Suppliers
Reports
Suppliers and Shipment Qua...
Relationships
The junction table for the M:M relationships in this database.
Suppliers
snum
sname
status
city
Shipments
snum
pnum
jnum
quantity
shipment
Parts
pnum
pname
color
weight
city
ManufacturerID
Jobs
jnum
jname
numworkers
city
Manufacturers
ManufacturerID
ManufacturerName
Ready
Num Lock