

Microsoft Access

Overview

This document is a quick reference guide for reviewing the techniques in the laboratory.

For these exercises, use the Session 5 spreadsheet and Orders database from BlackBoard.

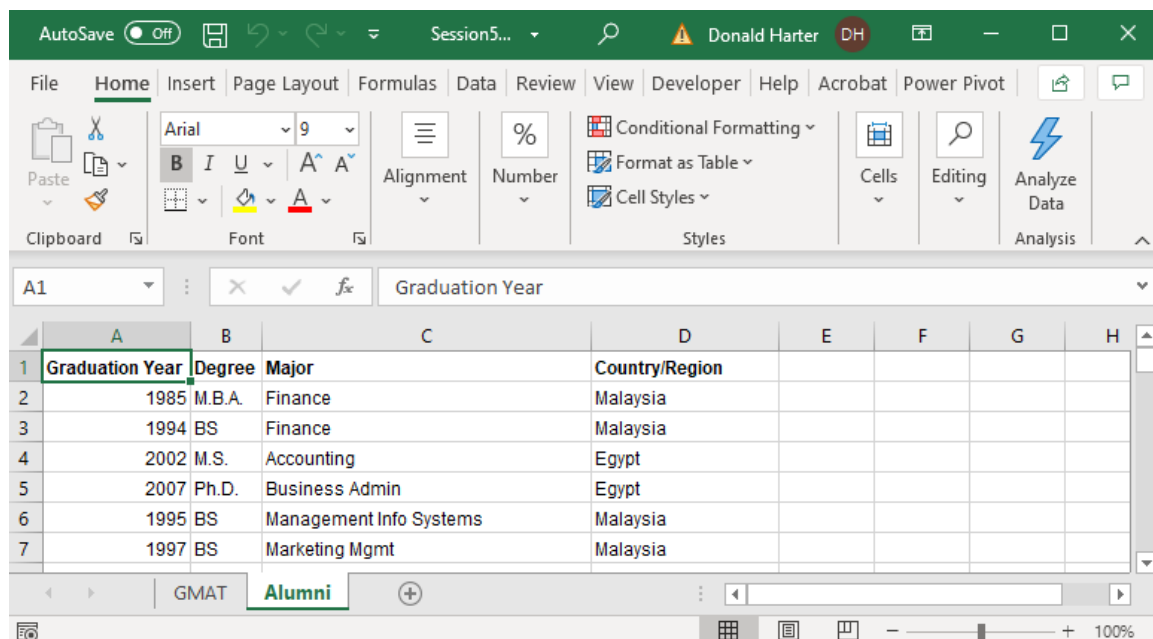
Background

In Excel, we could have multiple spreadsheets within a workbook. However, these spreadsheets did not necessarily relate to each other. In Microsoft Access, we will use a similar concept, but it's called tables. A table is like a spreadsheet. The key difference is that multiple tables can relate to each other and be combined to form calculations, summaries, queries and reports. When tables are combined, we say they are joined. Tables can be joined based on relationships. This tutorial explores tables, relationships, and their uses in retrieving and adding data to a database.

Importing Data

Generally, if you are starting from scratch, it's easiest to build data into an Excel spreadsheet and import it into Access. Excel allows data to easily be imported from the web or entered directly. Editing and formulas can manipulate the data before you convert it to Access format.

Let's first examine data in the Alumni tab of your spreadsheet.



The screenshot shows the Microsoft Excel interface with the 'Alumni' tab selected. The table contains the following data:

Graduation Year	Degree	Major	Country/Region
1985	M.B.A.	Finance	Malaysia
1994	BS	Finance	Malaysia
2002	M.S.	Accounting	Egypt
2007	Ph.D.	Business Admin	Egypt
1995	BS	Management Info Systems	Malaysia
1997	BS	Marketing Mgmt	Malaysia

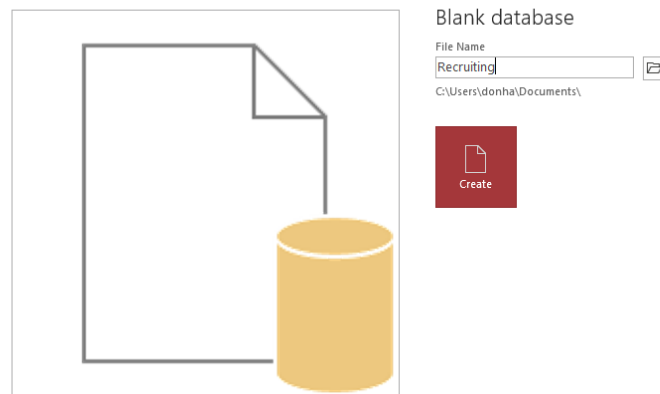
Data includes graduation year, degree, major and country/region for each student.

Data for GMAT test takers is shown in the GMAT tab.

Country/Region	Tests 2017	Tests 2018	Tests 2019	AvgGMAT 2008	AvgGMAT 2009
Afghanistan	22	29	63		
Aland Islands	0	0	1		
Albania	50	61	72	491	478
Algeria	8	8	1		440
American Samoa	6	15	7		
Andorra	1	4	7		449

Let's import the data from Excel to Access by using the Access Import capability.

1. Open Microsoft Access by clicking on the Start button, all Programs, Microsoft Office, Access.
2. Click on Blank Database.
3. In the File Name field, enter Recruiting, then click Create.



4. A default table called Table 1 was created; to delete this table, click on the X at the top of Table1
5. Click on the tab External Data, then New Data Source, From File, Excel.

6. Search for file with Browse, Open, OK

Get External Data - Excel Spreadsheet

Select the source and destination of the data

Specify the source of the definition of the objects.

File name: E:\SCM651-BusAnalytics-2021 Spring\Lectures\Session 5\Session5 Excel 365.xlsx Browse...

Specify how and where you want to store the data in the current database.

We will not import table relationships, calculated columns, validation rules, default values, and columns of certain legacy data types such as OLE Object.

Search for "Import" in Microsoft Access Help for more information.

☒ **Import the source data into a new table in the current database.**
If the specified table does not exist, Access will create it. If the specified table already exists, Access might overwrite its contents with the imported data. Changes made to the source data will not be reflected in the database.

☐ **Link to the data source by creating a linked table.**
Access will create a table that will maintain a link to the source data in Excel. Changes made to the source data in Excel will be reflected in the linked table. However, the source data cannot be changed from within Access.

OK Cancel

7. Select the appropriate worksheet from the workbook. In this case, use Alumni, then Next.

Import Spreadsheet Wizard

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

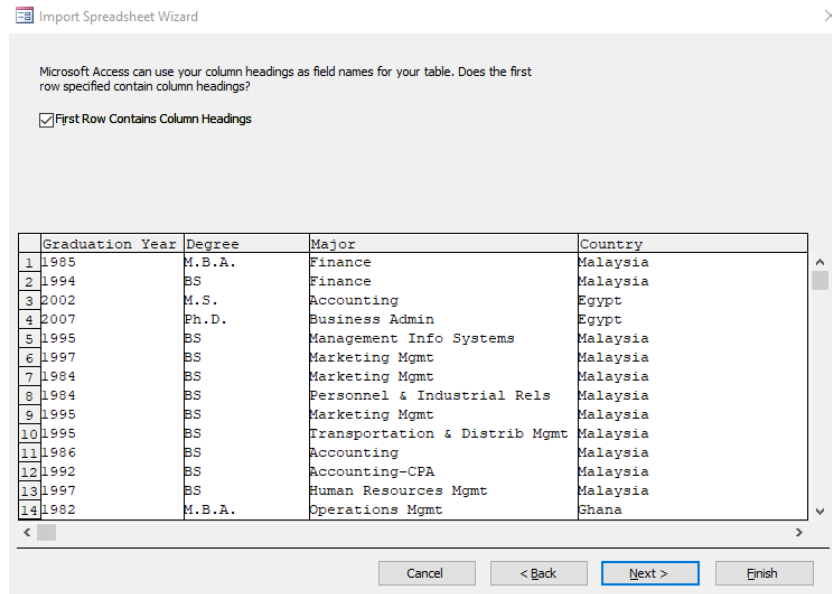
☒ Show Worksheets GMAT
☐ Show Named Ranges Alumni

Sample data for worksheet 'Alumni'.

	Graduation Year	Degree	Major	Country
1	1985	M.B.A.	Finance	Malaysia
2	1994	BS	Finance	Malaysia
3	2002	M.S.	Accounting	Egypt
4	2007	Ph.D.	Business Admin	Egypt
5	1995	BS	Management Info Systems	Malaysia
6	1997	BS	Marketing Mgmt	Malaysia
7	1984	BS	Marketing Mgmt	Malaysia
8	1984	BS	Personnel & Industrial Rels	Malaysia
9	1995	BS	Marketing Mgmt	Malaysia
10	1995	BS	Transportation & Distrib Mgmt	Malaysia
11	1986	BS	Accounting	Malaysia
12	1992	BS	Accounting-CPA	Malaysia
13	1997	BS	Human Resources Mgmt	Malaysia

Cancel < Back Next > Finish

8. Access will try to detect if you have labels in the first row. Check the box for First Row Contains Column Headings and click Next.



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

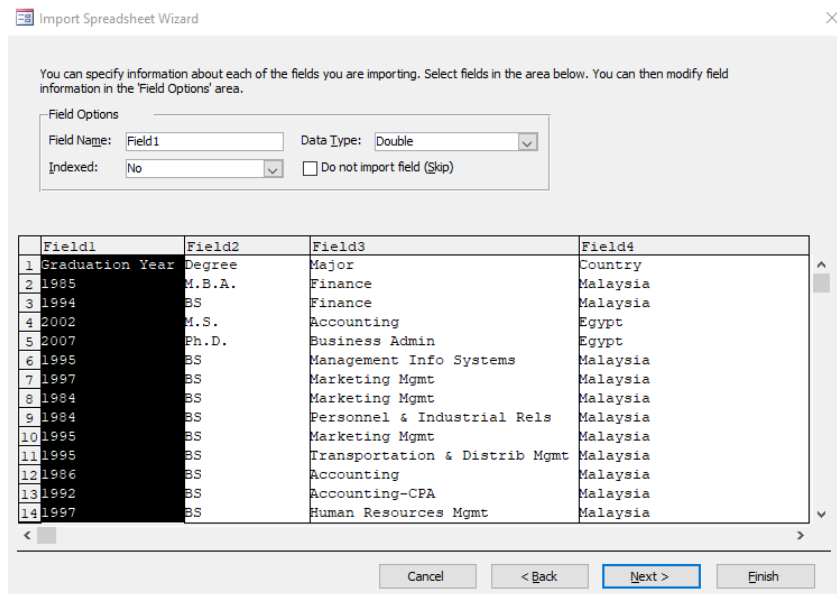
☒ First Row Contains Column Headings

	Graduation Year	Degree	Major	Country
1	1985	M.B.A.	Finance	Malaysia
2	1994	BS	Finance	Malaysia
3	2002	M.S.	Accounting	Egypt
4	2007	Ph.D.	Business Admin	Egypt
5	1995	BS	Management Info Systems	Malaysia
6	1997	BS	Marketing Mgmt	Malaysia
7	1984	BS	Marketing Mgmt	Malaysia
8	1984	BS	Personnel & Industrial Rels	Malaysia
9	1995	BS	Marketing Mgmt	Malaysia
10	1995	BS	Transportation & Distrib Mgmt	Malaysia
11	1986	BS	Accounting	Malaysia
12	1992	BS	Accounting-CPA	Malaysia
13	1997	BS	Human Resources Mgmt	Malaysia
14	1982	M.B.A.	Operations Mgmt	Ghana

< [] >

Cancel < Back Next > Finish

9. The next screen allows you to determine whether each column is text, numeric, etc., and set the characteristics. Access is pretty good at setting these automatically. Click 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: Field1 Data Type: Double

Indexed: No ☐ Do not import field (Skip)

	Field1	Field2	Field3	Field4
1	Graduation Year	Degree	Major	Country
2	1985	M.B.A.	Finance	Malaysia
3	1994	BS	Finance	Malaysia
4	2002	M.S.	Accounting	Egypt
5	2007	Ph.D.	Business Admin	Egypt
6	1995	BS	Management Info Systems	Malaysia
7	1997	BS	Marketing Mgmt	Malaysia
8	1984	BS	Marketing Mgmt	Malaysia
9	1984	BS	Personnel & Industrial Rels	Malaysia
10	1995	BS	Marketing Mgmt	Malaysia
11	1995	BS	Transportation & Distrib Mgmt	Malaysia
12	1986	BS	Accounting	Malaysia
13	1992	BS	Accounting-CPA	Malaysia
14	1997	BS	Human Resources Mgmt	Malaysia

< [] >

Cancel < Back Next > Finish

10. Next, Access allows you to add a primary key. Primary keys allow you to uniquely identify each row in a table. However, if you let Access add one, it always adds an arbitrary key that means nothing. Click on No primary key, then Next.

Import Spreadsheet Wizard

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.

☒ No primary key.

	Field1	Field2	Field3	Field4
1	Graduation Year	Degree	Major	Country
2	1985	M.B.A.	Finance	Malaysia
3	1994	BS	Finance	Malaysia
4	2002	M.S.	Accounting	Egypt
5	2007	Ph.D.	Business Admin	Egypt
6	1995	BS	Management Info Systems	Malaysia
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12	1986	BS	Accounting	Malaysia
13	1992	BS	Accounting-CPA	Malaysia
14	1997	BS	Human Resources Mgmt	Malaysia

Cancel < Back Next > Finish

11. The last screen allows you to name the table. Let's call it Alumni. Click Finish, then Close.

Import Spreadsheet Wizard

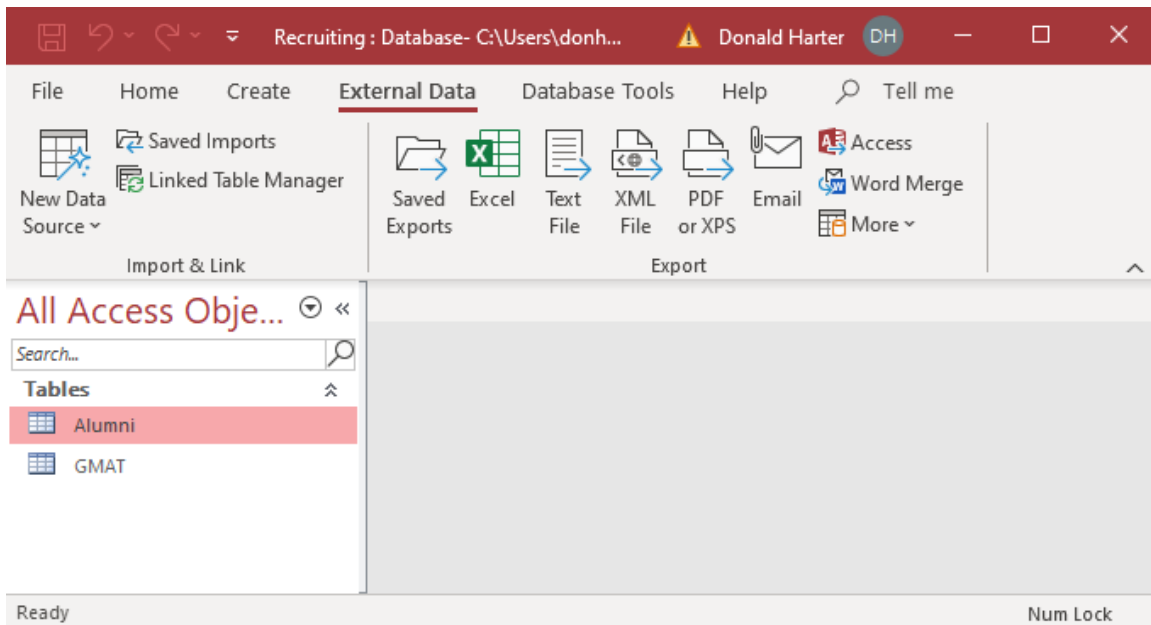
That's all the information the wizard needs to import your data.

Import to Table:

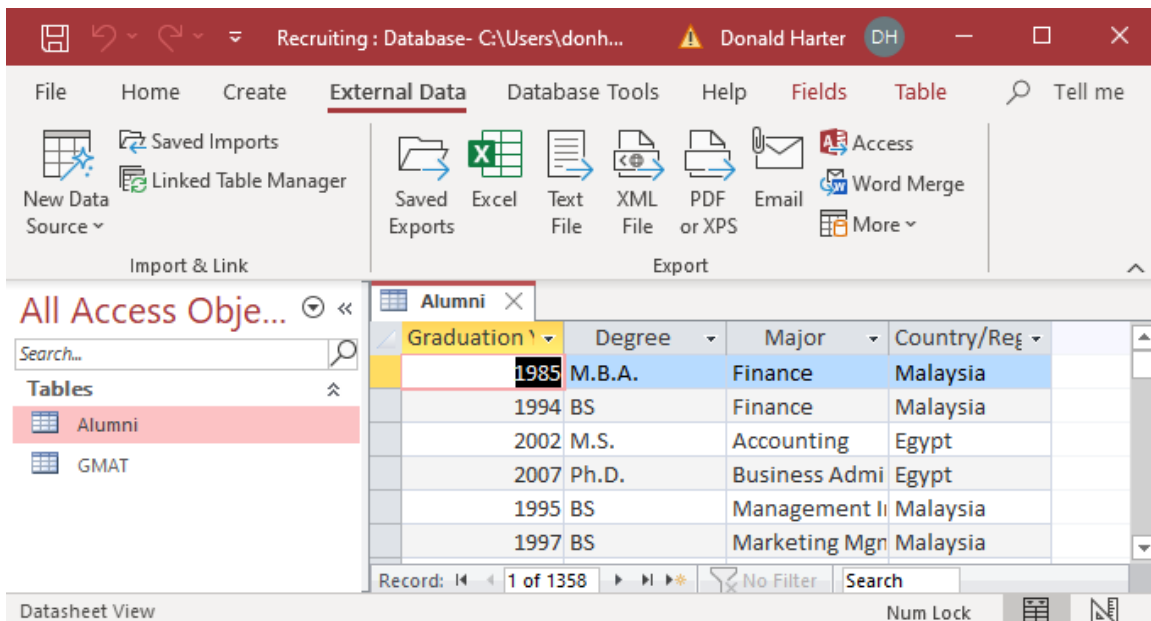
☐ I would like a wizard to analyze my table after importing the data.

Cancel < Back Next > Finish

12. Now follow the same set of steps to add the GMAT data from your spreadsheet. Both tables should appear in your Access database.



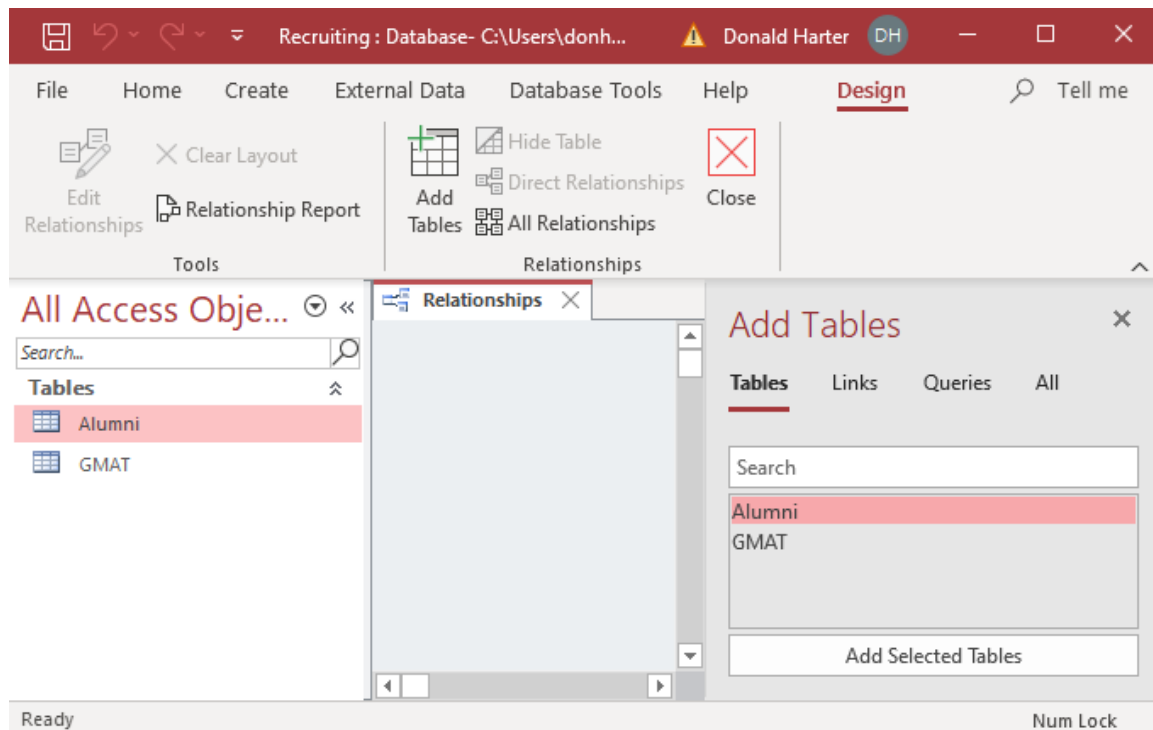
13. Double click on the table name Alumni to view the data.
14. Click on the X next to Alumni when you are done.



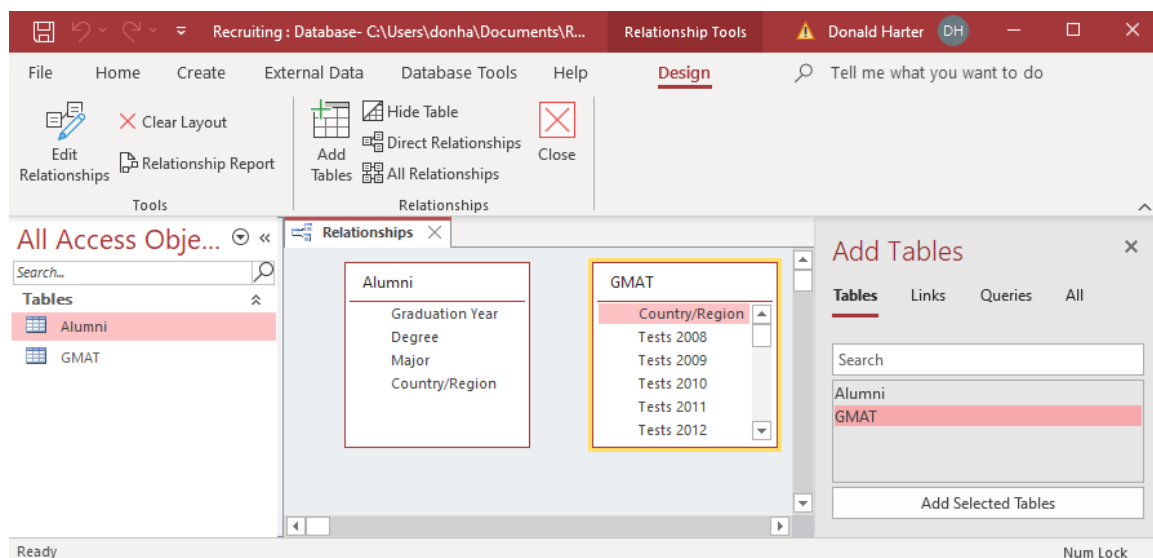
Relationships

Relationships describe how tables relate to each other.

1. Click on the Database Tools tab, then Relationships. You should see the following pop-up.



2. On the right side, double click on Alumni
3. On the right side, double click on GMAT



- There is no relationship (yet) between these tables. Click on Country/Region in Alumni, then drag to Country/Region in GMAT.

Edit Relationships ? X

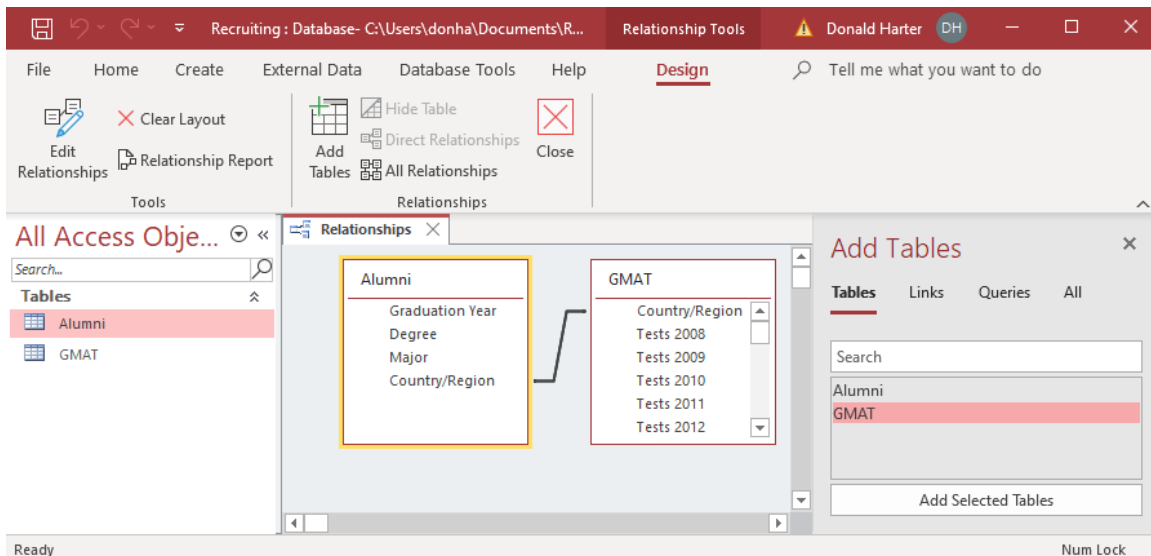
Table/Query:	Related Table/Query:
Alumni	GMAT
Country/Region	Country/Region

☐ Enforce Referential Integrity
☐ Cascade Update Related Fields
☐ Cascade Delete Related Records

Relationship Type: Indeterminate

Create
 Cancel
 Join Type..
 Create New..

- Now click Create. This “joins” the two tables using the field Country/Region in each table.
- Click on the X to the right of Relationships. When it asks if you want to save Relationships, click Yes.

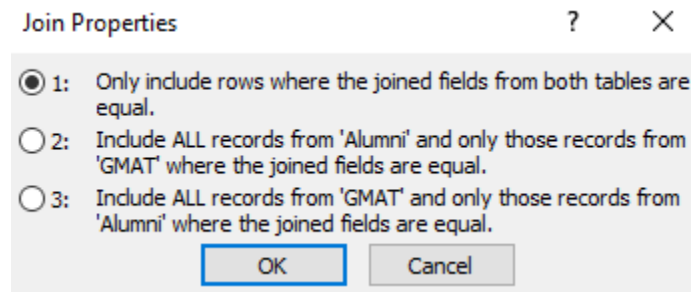


Join Types

There are four types of Joins:

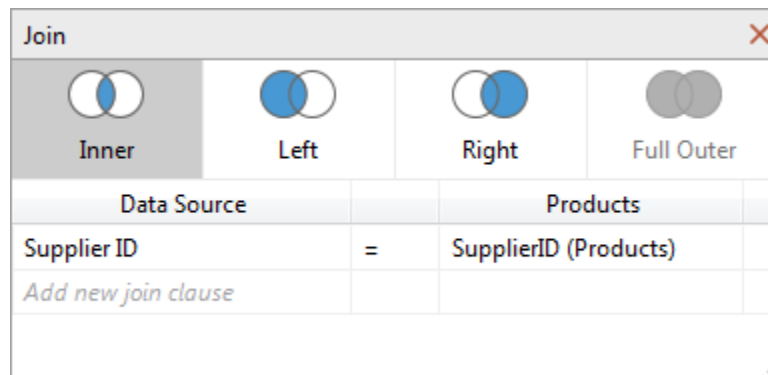
- Inner Join – only include rows where the joined fields from both tables are equal
- Left Join – Include all records from the left table and only those records from the right table where the joined fields are equal
- Right Join – Include all records from the right table and only those records from the left table where the joined fields are equal
- Outer Join – Include all records from the left and right table where the key field appears in either table

Access only supports Inner Join, Left Join, and Right Join:



Outer join is available via SQL, Tableau and Power BI.

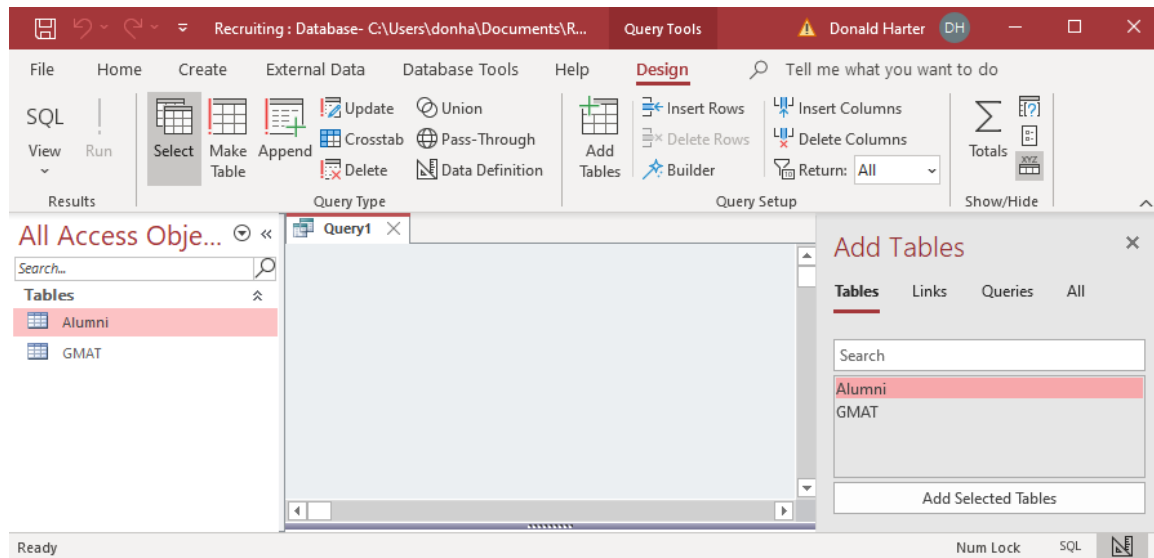
Graphical representation of each join is shown below.



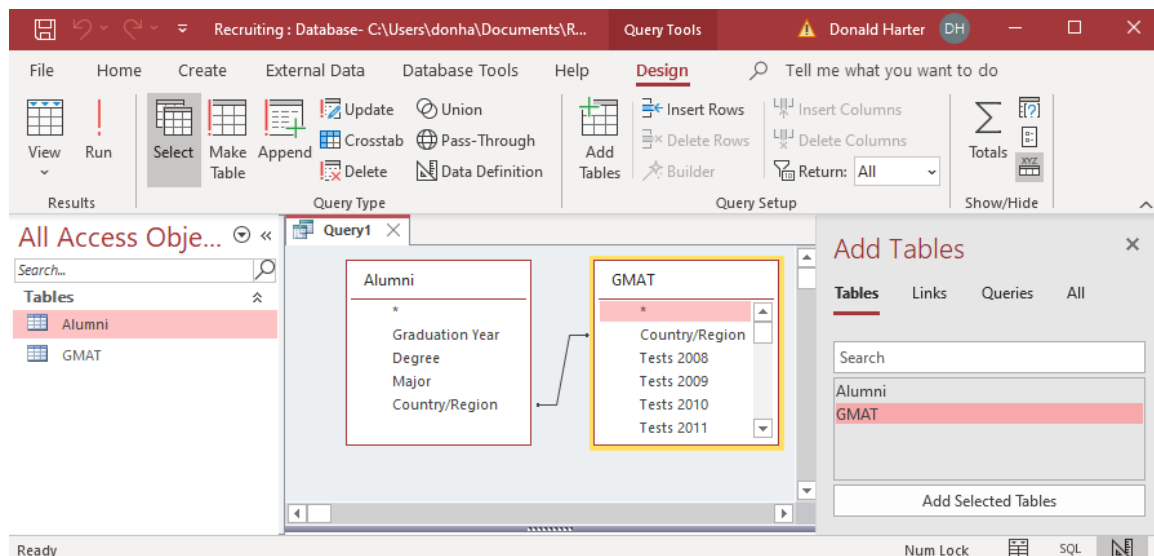
Simple Queries

When you want to retrieve specific data from a database, you can use a query. A query is like a filter in Excel, but much more powerful. It can allow you to restrict what data is displayed, sort the data, and perform calculations. However, dirty data can corrupt your queries. Let's see how.

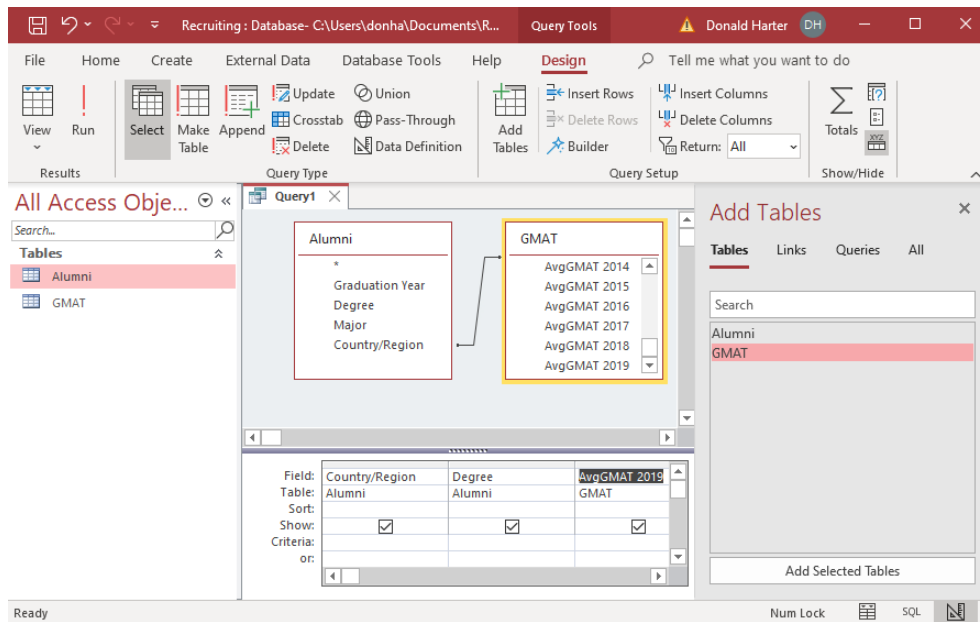
1. To create a query, click on CREATE, then Query Design.



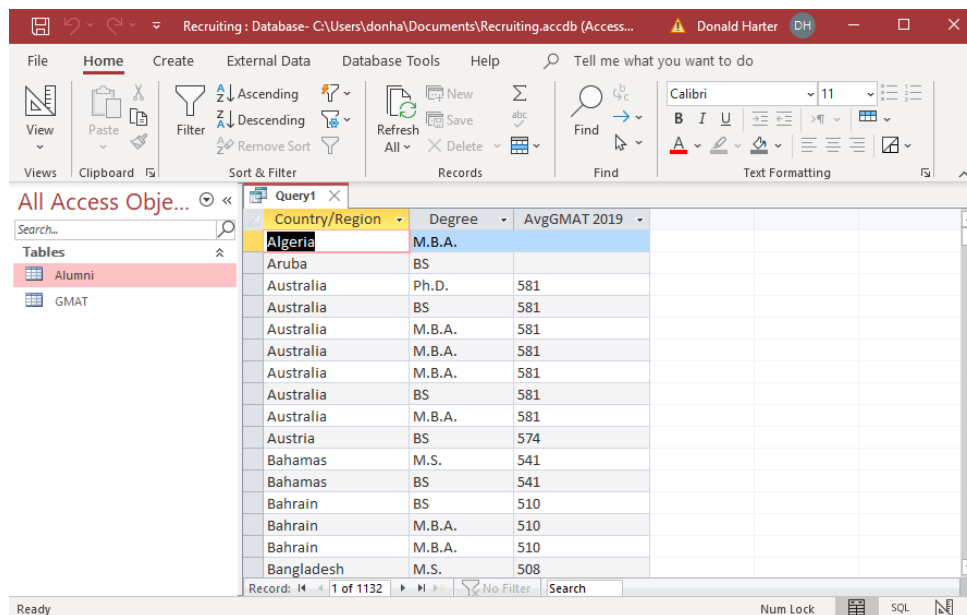
2. On the right side, double click on Alumni, then double click on GMAT..



3. In the table Alumni, double click Country/Region.
4. In the table Alumni, double click Degree
5. In the table GMAT, double click AvgGMAT 2019.

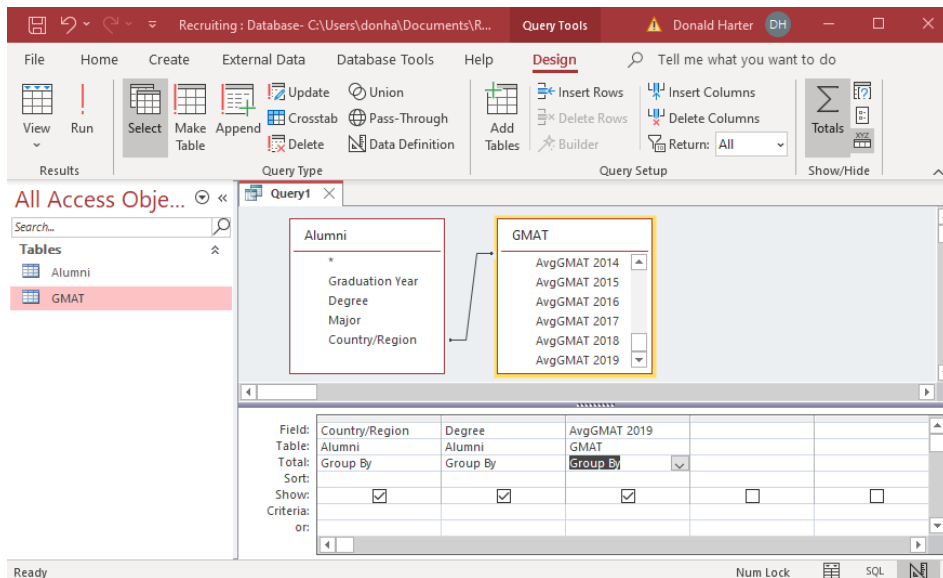


6. Now click Run ! in the upper left corner.



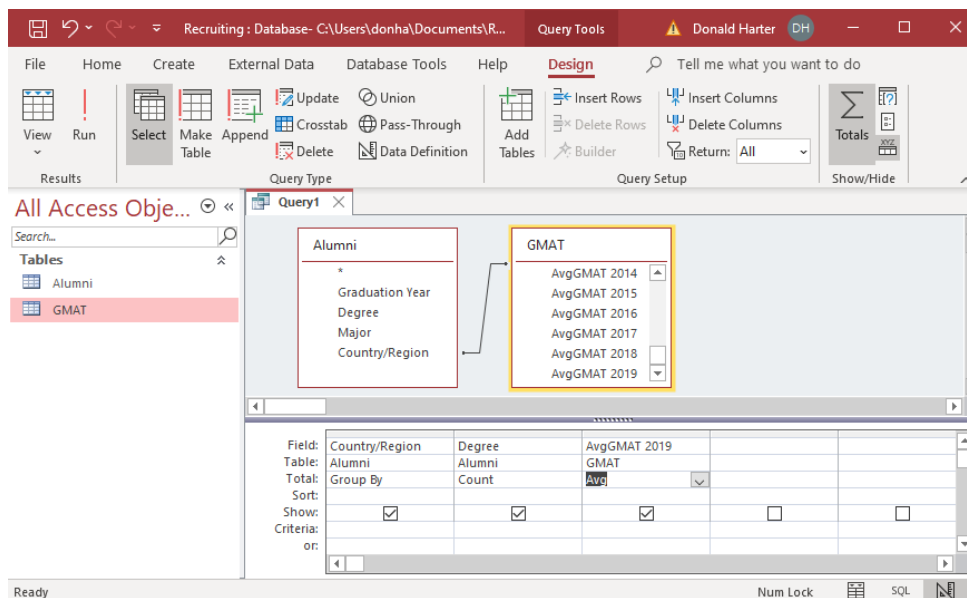
This lists each student, rather than a summary.

7. Click on View, Design View, to go back to the query.
8. Click on the Sigma (summation sign).

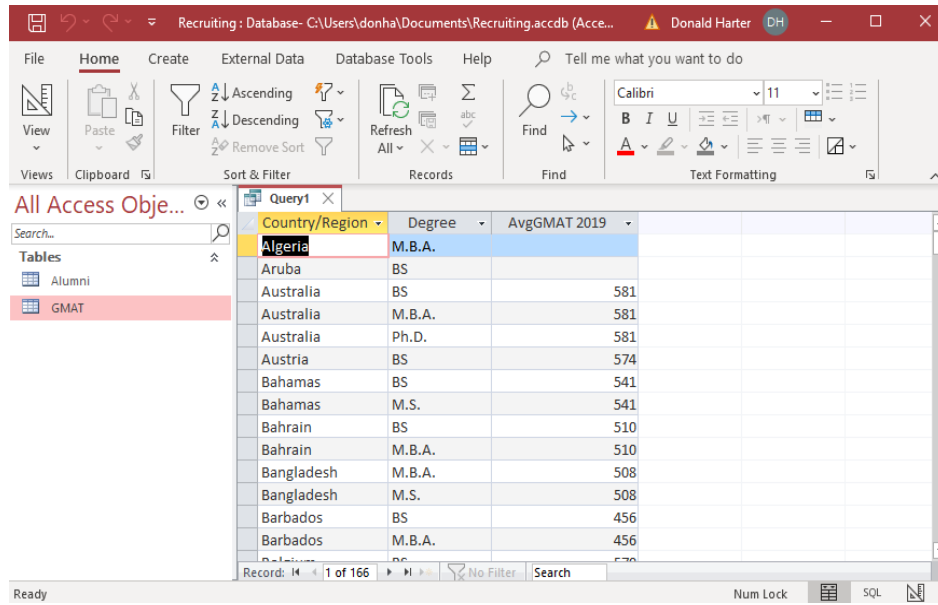


It now adds the Total line Group By. Group by collapses or aggregates for a variables. We want to Group By country/region, but we really want to count degrees and average the GMAT scores.

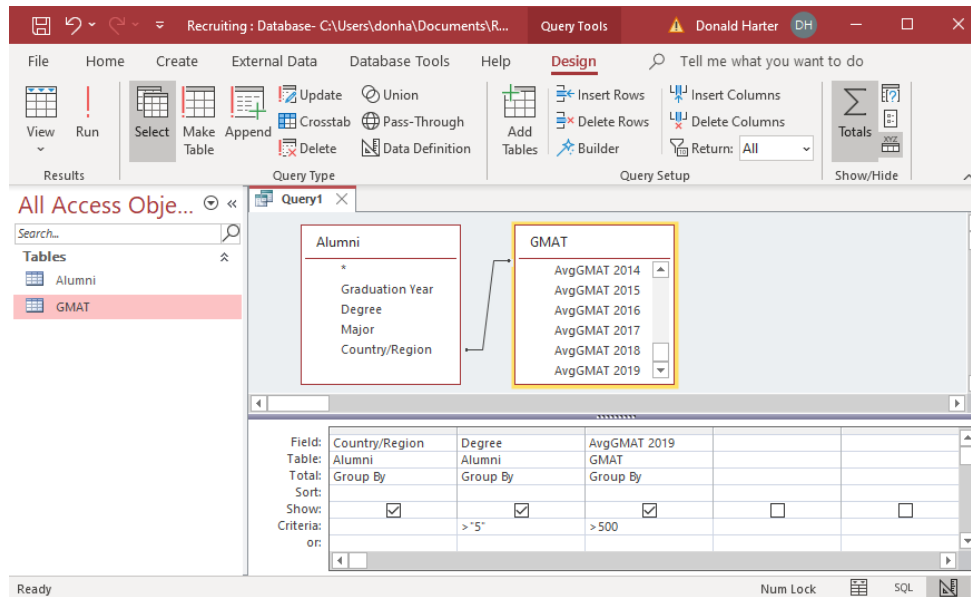
9. Where it says Group By under Degree, use the drop down menu to change to Count.
10. Where it says Group By under AvgGMAT 2019, use the drop down menu to change to Average (Avg).



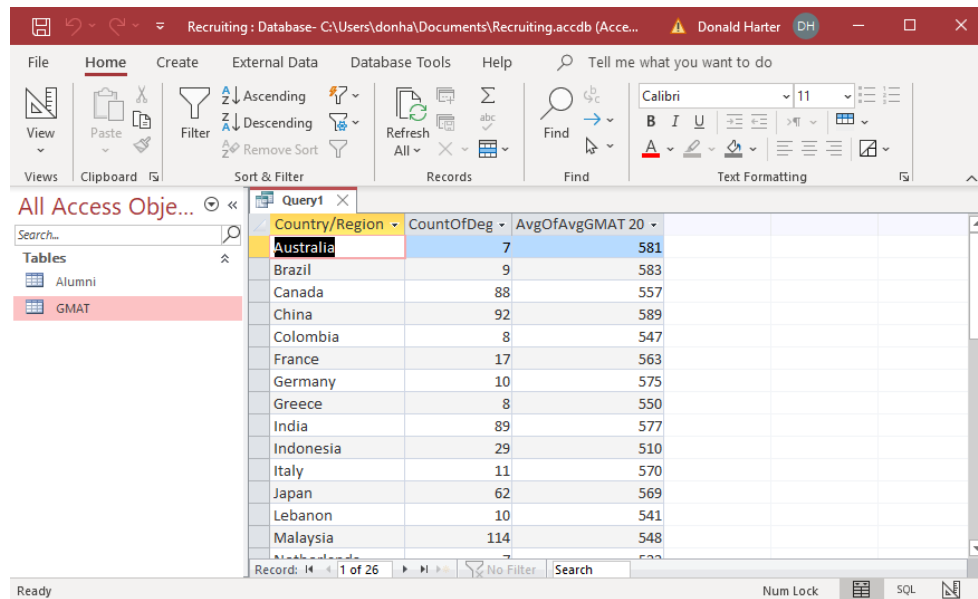
11. Now click Run !.



12. Go back to the Design and use the Sort field to change how data is sorted. You can select Ascending (increasing) or Descending (decreasing).
13. The criteria field allows you to filter results. Click on View, Design. Find the countries that have more than five alumni and average GMAT more than 500 by using >5 and >500.



14. Click Run !.

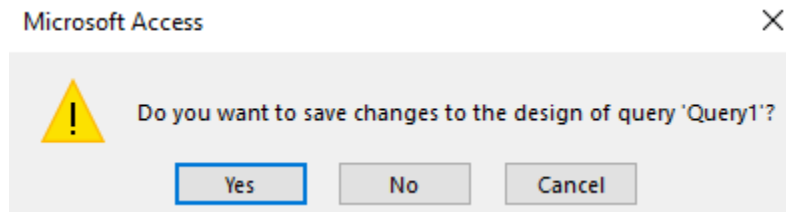


The screenshot shows the Microsoft Access interface with a query named 'Query1' displayed in Datasheet View. The table has three columns: 'Country/Region', 'CountOfDeg', and 'AvgOfAvgGMAT 20'. The data is sorted by 'Country/Region' in ascending order. The 'Australia' row is highlighted. The status bar at the bottom indicates 'Record: 14 of 1 of 26'.

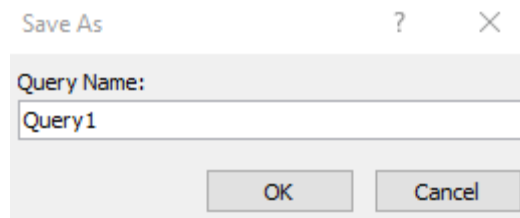
Country/Region	CountOfDeg	AvgOfAvgGMAT 20
Australia	7	581
Brazil	9	583
Canada	88	557
China	92	589
Colombia	8	547
France	17	563
Germany	10	575
Greece	8	550
India	89	577
Indonesia	29	510
Italy	11	570
Japan	62	569
Lebanon	10	541
Malaysia	114	548

15. To close the query, click on the X next to Query 1.

16. When asked if you want to save, click Yes.



17. Type in the name of your query, then click OK.



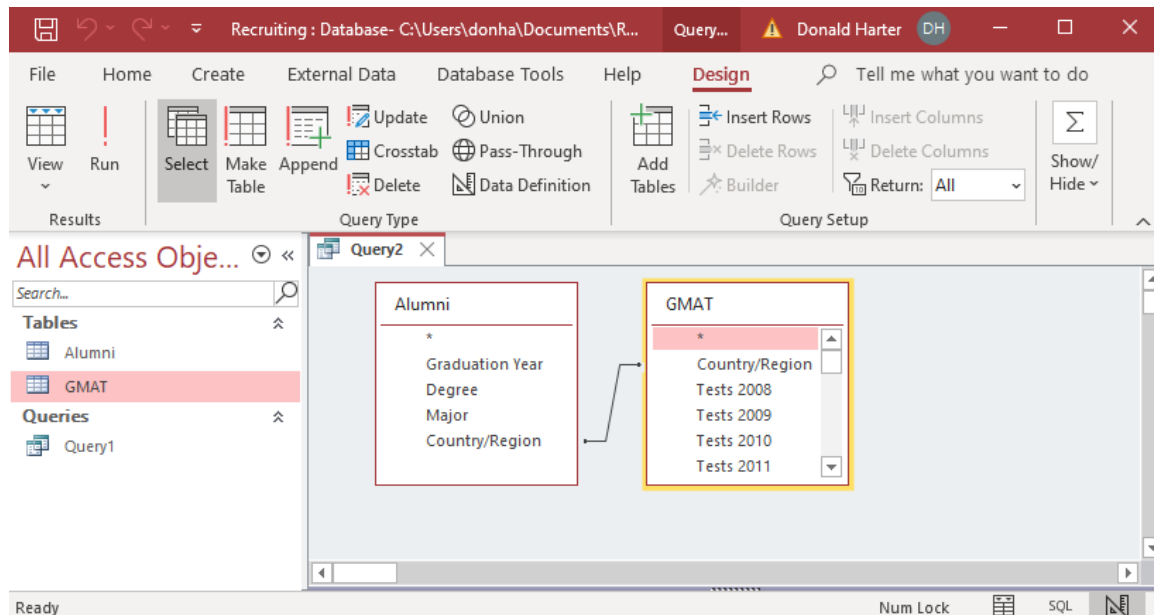
Microsoft Access

Fixing Dirty Data

Queries & Fixing Dirty Data

When you want to retrieve specific data from a database, you can use a query. A query is like a filter in Excel, but much more powerful. It can allow you to restrict what data is displayed, sort the data, and perform calculations. However, dirty data can corrupt your queries. Let's see how.

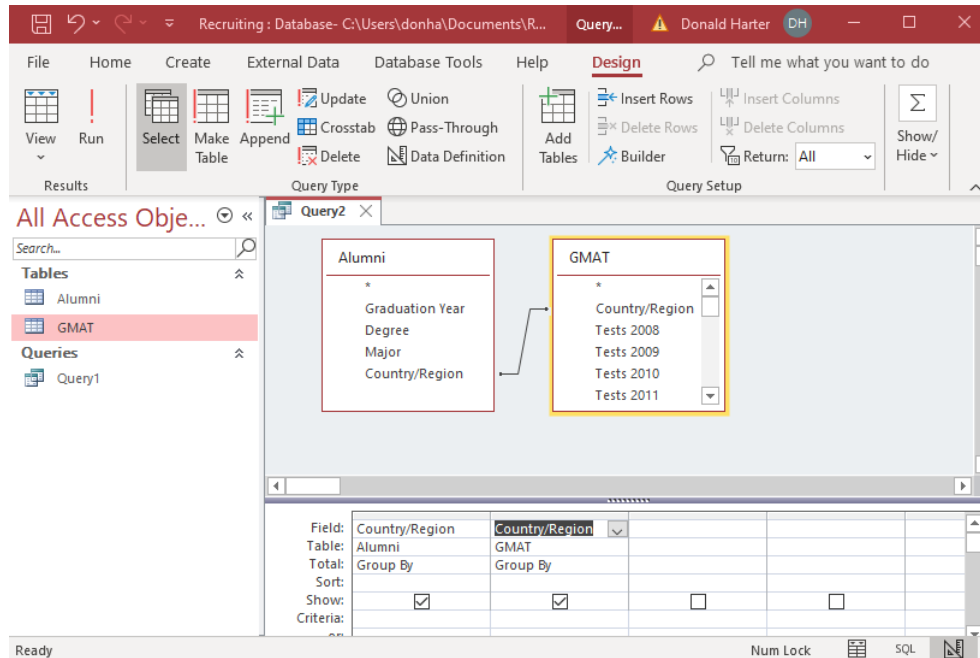
1. To create a query, click on CREATE, then Query Design.
2. Double click on Alumni, then double click on GMAT.



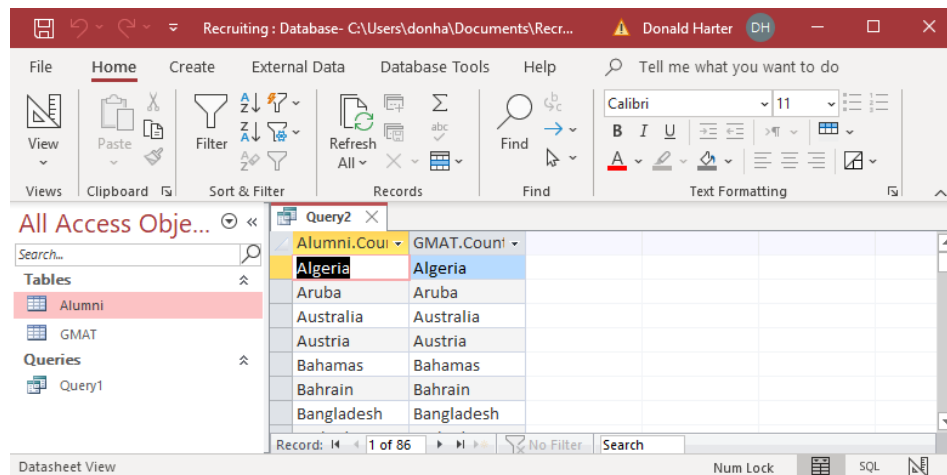
Let's compare Country/Region in the Alumni table to Country/Region in the GMAT table.

3. In the table Alumni, double click Country/Region.
4. In the table GMAT, double click Country/Region.
5. Click Run !

7. Notice that this lists duplicates of each country. Next, we will eliminate duplicates.
8. Click on View, Design View.
9. Click on the summation sign (Sigma) for Totals.
10. A Group By appears.
11. Click Run !



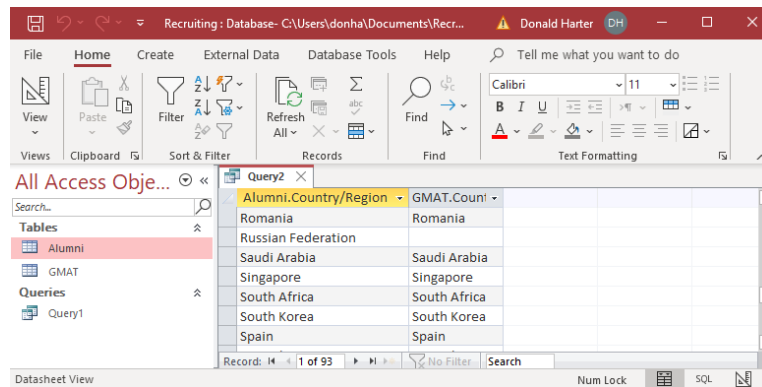
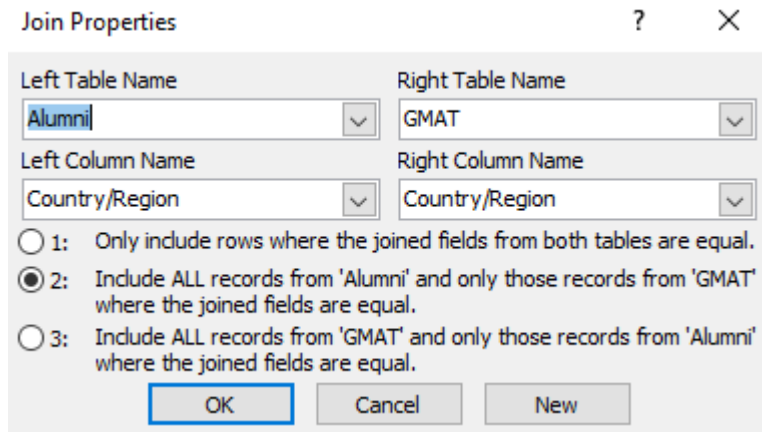
12. Now duplicates are eliminated.



13. Look for Russia in the data. Does it appear?
14. Open the table for GMAT. Does Russia appear?
15. Open the table for GMAT. Does Russia appear?
16. What's the difference?

Now, let's allow Access to identify data discrepancies.

17. In your query, click on View, Design View.
18. Right click on the line connecting the tables.
19. Click on Join Properties
20. Change the selection to 2: Include All records from "Alumni" and only those records from "GMAT" where the joined fields are equal, then click OK. This is called a Left Join.
21. Click Run !
22. Are there any entries in column 1 (Alumni.Country/Region) that have blank entries in column 2 (GMAT.Country/Region)? Why?



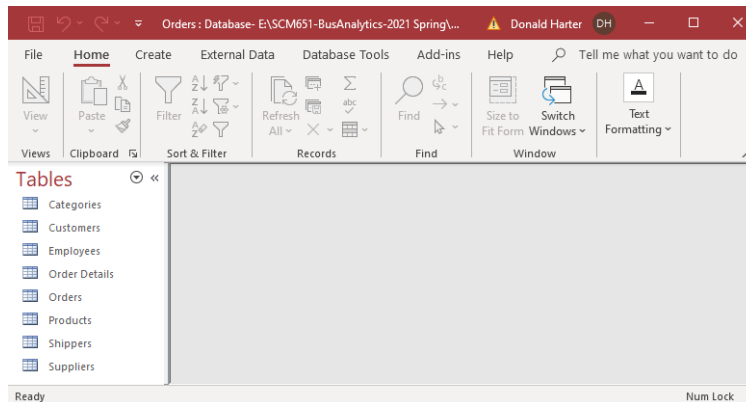
23. Change the relationship to selection 3. This is a Right Join. What happens?
24. Inner Joins hide dirty data. Left Joins and Right Joins identify inconsistencies in the key fields, exposing dirty data. The Full Outer Join, available in SQL, Tableau, and Power BI, identifies dirty data in both directions simultaneously.

Microsoft Access

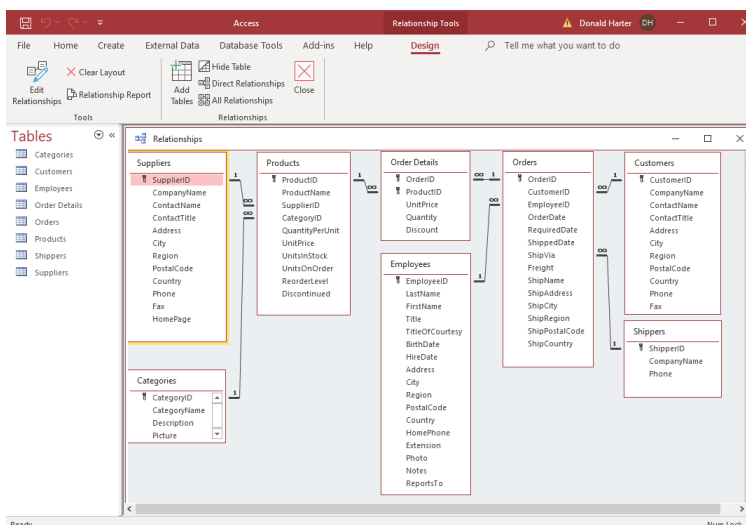
Complex Relationships & Queries

Complex Relationships

1. Open the database titled Orders.



2. Click on Database Tools, Relationships

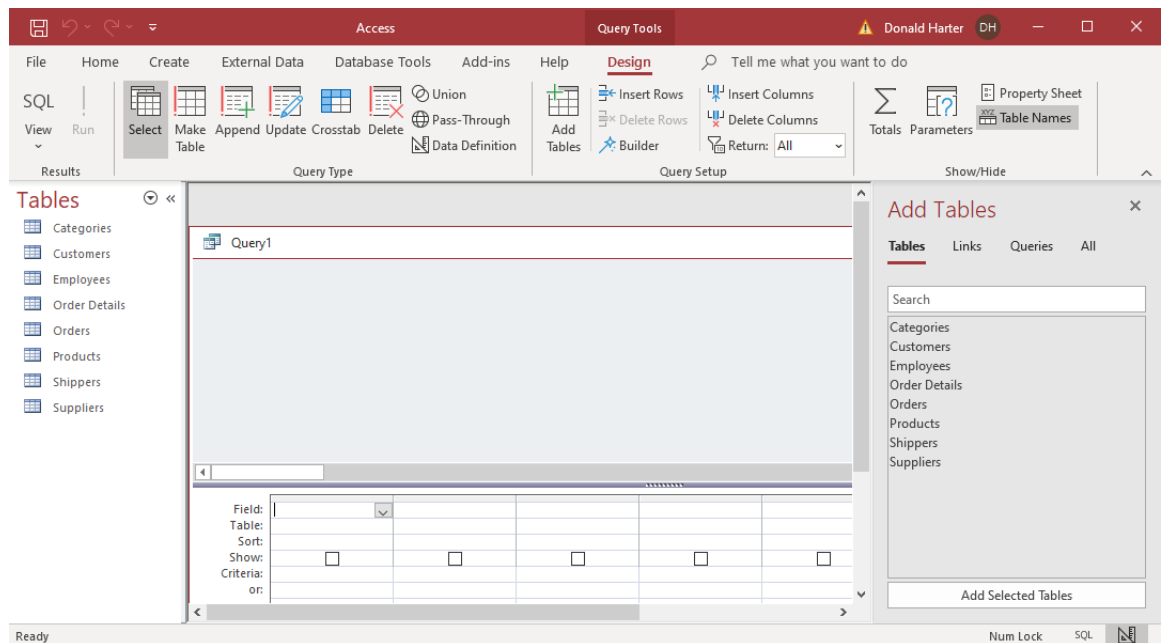


3. The relationships are already defined. If they were not defined, you could add the relationships as shown earlier in this session.
4. What does the notation on the relationship line mean? One-to-infinity means that a one-to-many relationship exists. For every one item in one table, there can be many items in the second table.
5. Key fields are identified by a picture of a key.
6. When a key field in one table is joined to a non-key field in another table, that non-key field is called a foreign key.
7. When you enforce referential integrity, all non-key fields in one table must have an instance of each value as the key in the other table. For example, if a SupplierID appears in the Products table, then the same SupplierID must also appear in the Suppliers table.
8. Click Close to close the relationship screen.

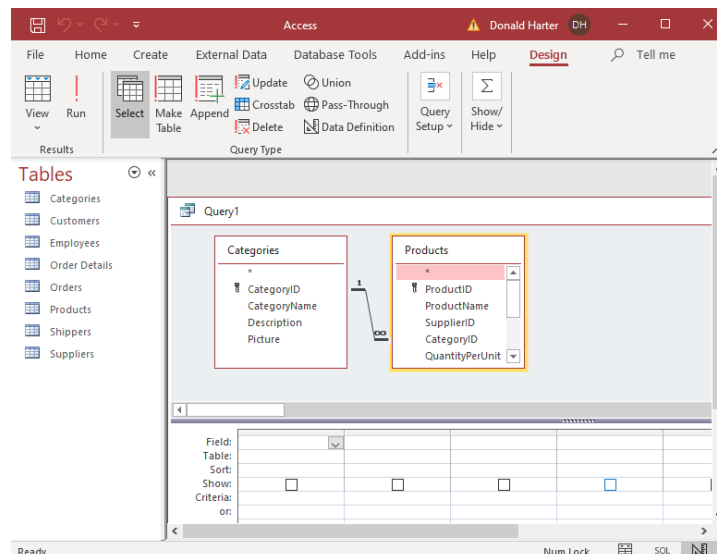
Complex Queries

Let's find all ProductNames that have a CategoryName of beverages. Looking at the tables in the relationship diagram, can you find ProductNames and CategoryName? What tables are they in?

1. To create a query, click on the Create tab, then Query Design.

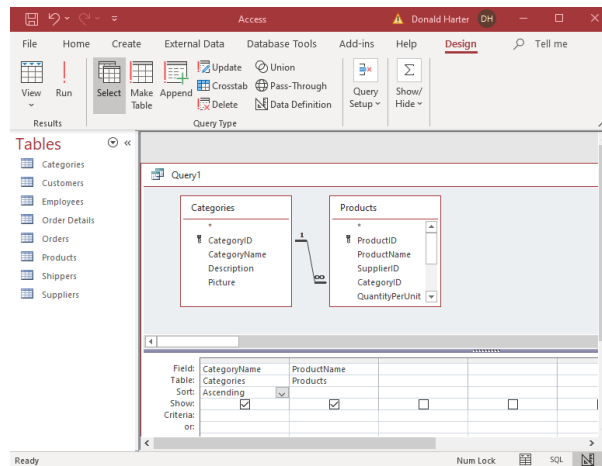


2. Since we want to use the tables Categories and Products, double click on each one.
3. Click on the X to the right of Add Tables to free up some space.

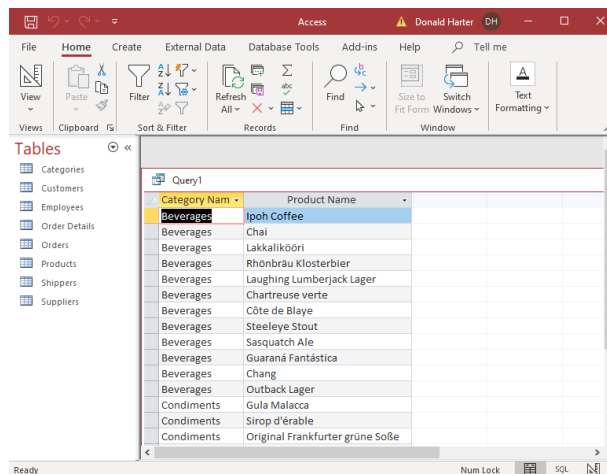


4. At the top of the screen are the two tables. At the bottom is a set of options to set up the query.
5. We want to find all the Product Names for each Category Name. First, double click on Category Name. It should appear at the bottom of the page
6. Next, double click on Product Name. It should appear next to Category Name.

- If you want to sort the data, click on sort under Category Name, then ascending.



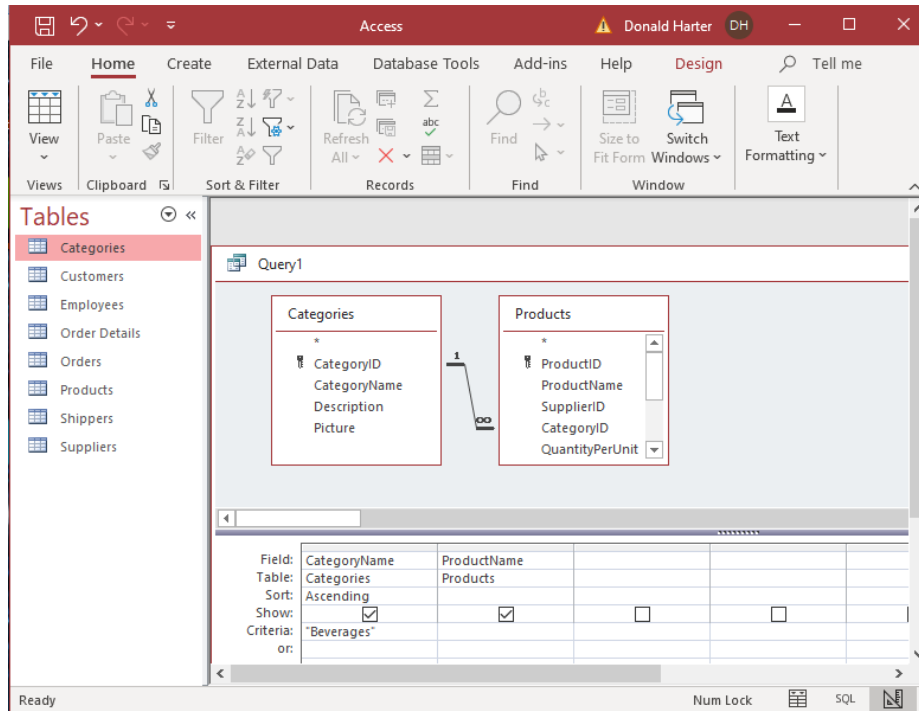
- To run the query, click Run (see red exclamation point). You should see the following result.



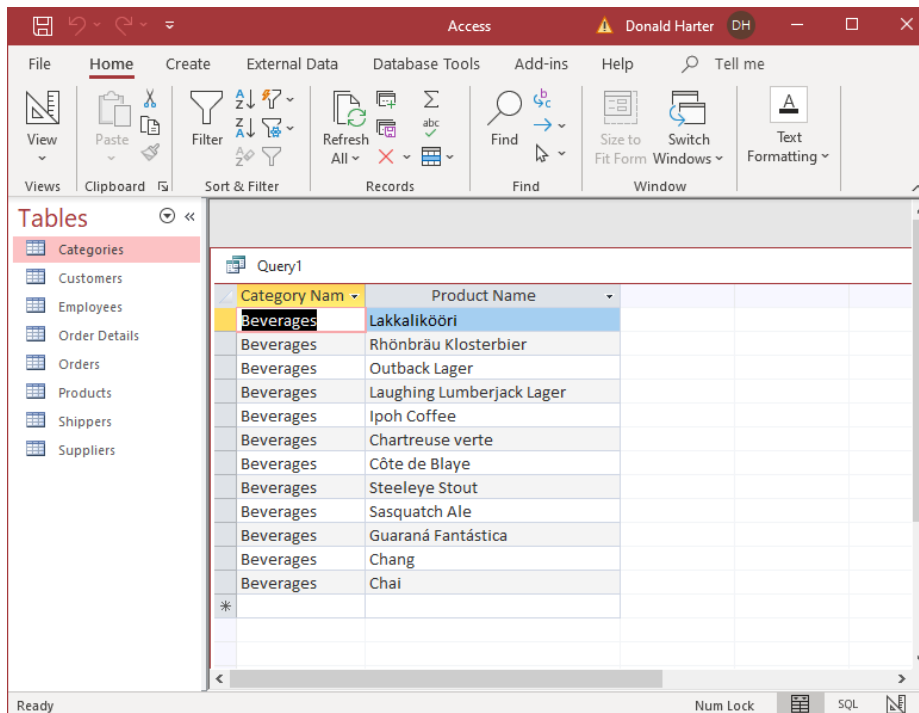
Filtering or Using Criteria to Restrict the Output

Just as you filtered data in Excel, you can filter data in Access. If we only want Beverages listed, use the following steps.

- On the Home tab, click on View, Design View. This takes you back to the design of the query.
- In the field called Criteria under Category name, enter the word Beverages. Notice that it puts quotation marks around it automatically.



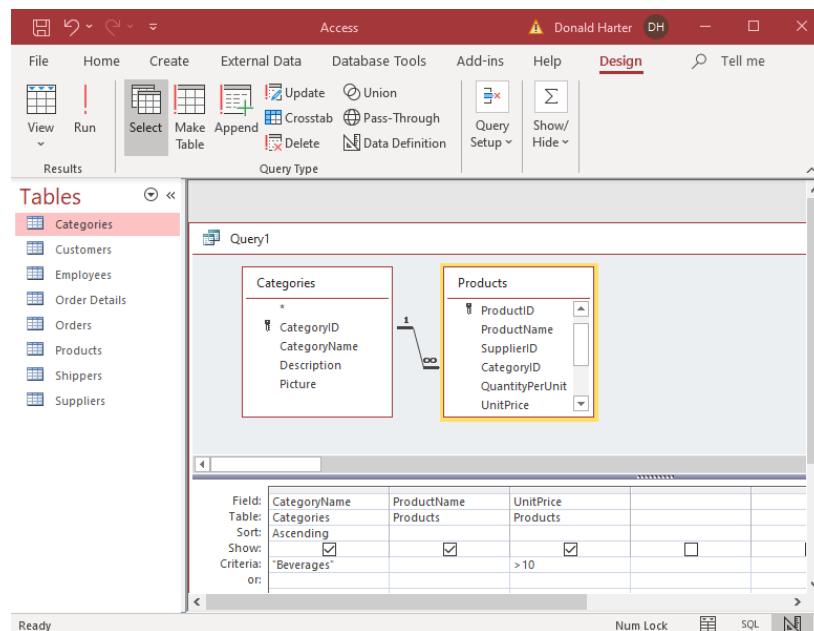
3. Run the query. Only Beverages are displayed.



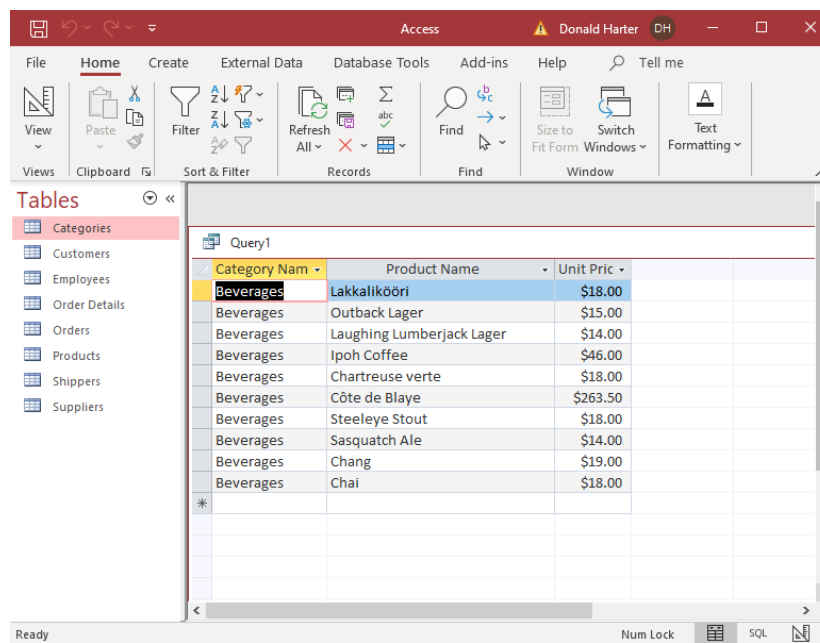
Queries with Two or More Criteria Using “And”

You can also run queries when multiple conditions must be true. Let's find beverages with Unit Price greater than 10.

1. Click on the Home tab, View, Design View.
2. Since we don't have Unit Price in the query screen, add it by double clicking on Unit Price in Products.
3. In the criteria for Unit Price, enter >10



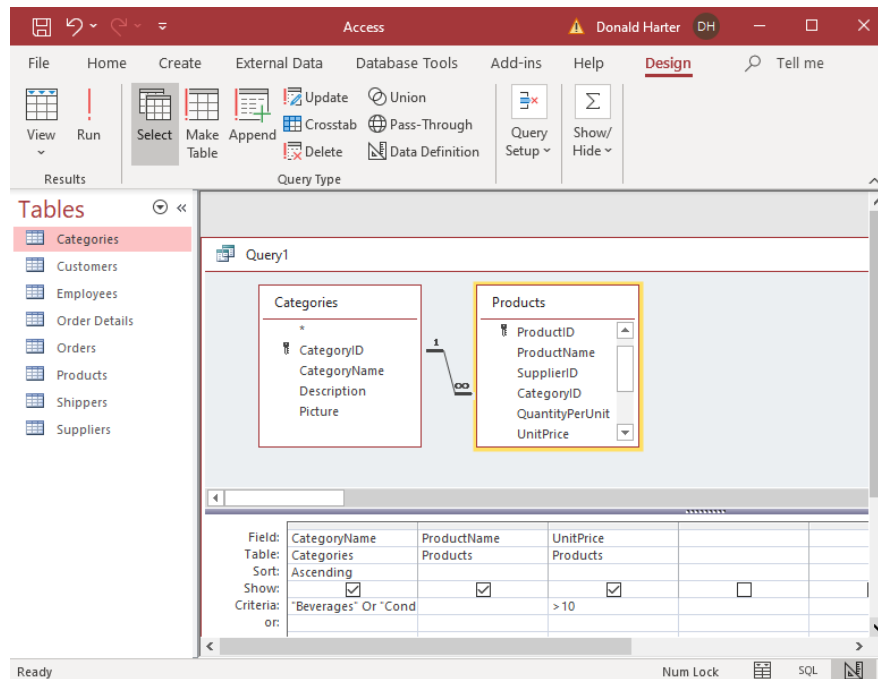
4. Run the query



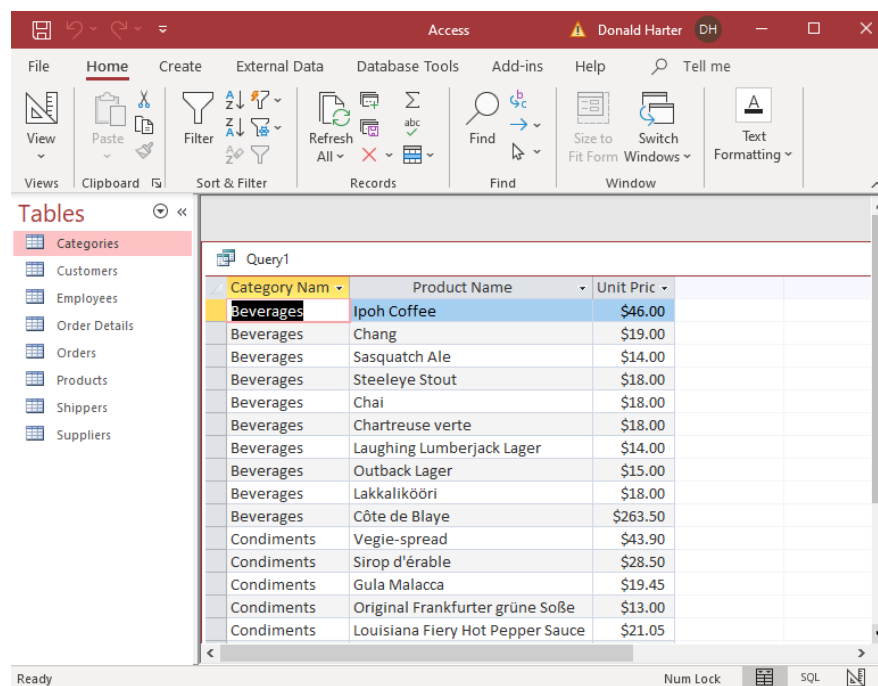
Query with an “Or” Condition – within one field

You can also have an OR condition.

1. For example, if we want Beverages or Condiments, we can put “Beverages” OR “Condiments” in the criteria field for Category Name.
2. This query will return (Beverages OR Condiments) AND (Price>10)



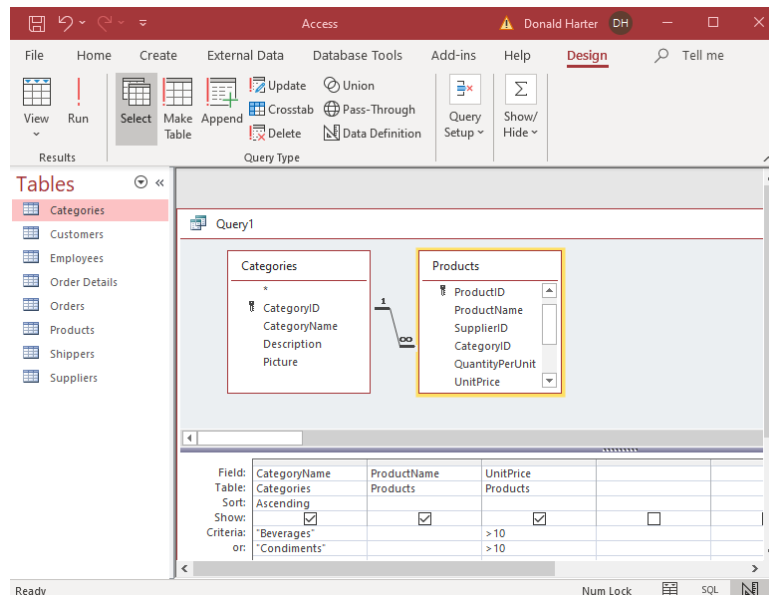
3. The result of running the query is shown below.



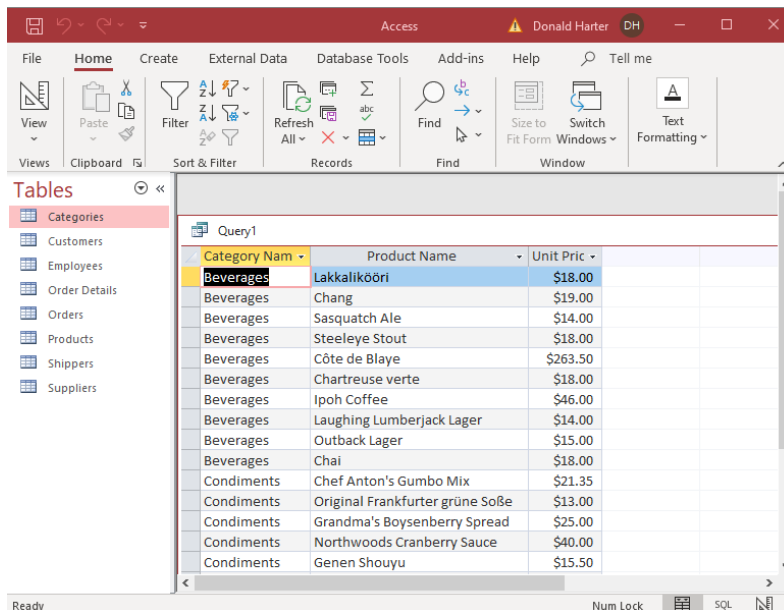
Query with an “Or” Condition – between fields

You can also use multiple criteria rows for an OR condition instead of cramming everything into one cell. Let's use multiple lines for the previous query. Note that if we also want >10, that >10 has to be on both lines.

1. Enter Beverages as a criteria for CategoryName
2. Enter Condiments as a criteria for CategoryName on the next criteria line (or:)
3. Enter >10 for both lines as a criteria for UnitPrice



4. Click Run!

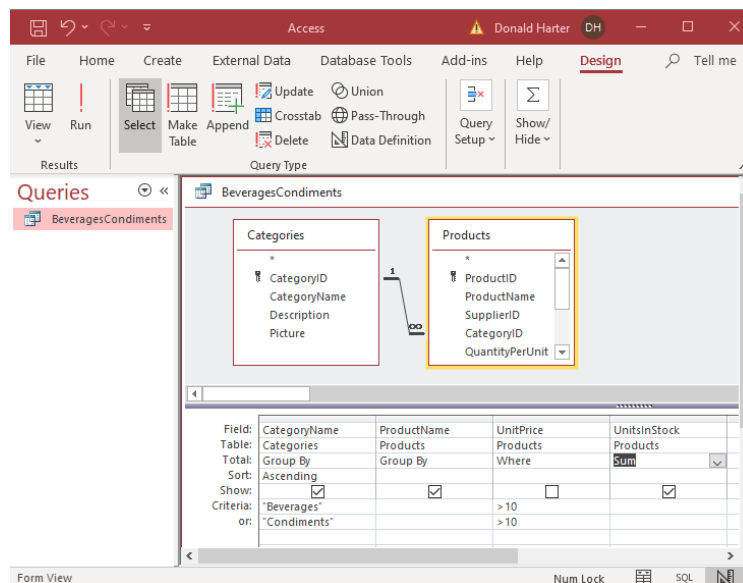


5. What would happen if UnitPrice > 10 were only added to one line?

Calculations

The calculation of sums, averages, counts, minimum, maximum can also be performed in a query. Let's sum the total number of units in stock using our current criteria.

1. First, add UnitsInStock from the Products table
2. Click on the Design tab, then click on the summation symbol Σ
3. In the Total:, Group by should appear, where it says Group by for each variable.
4. We want to have groupings of Categories and Products, but not UnitPrice. For UnitPrice, use the down arrow on GroupBy and change it to Where. A Where clause is used to filter data; you never group on a where.
5. We don't want to group on UnitsInStock, instead we want to sum the total. Change GroupBy for UnitsInStock to Sum. You should have the following.



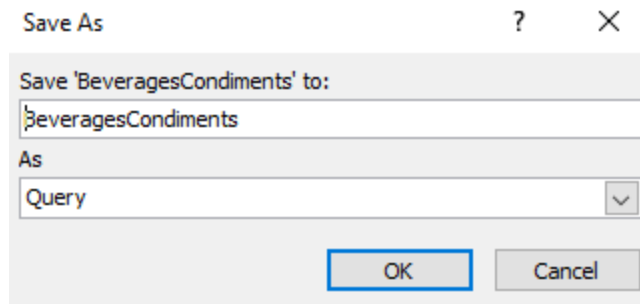
6. Now run the query.

Category Name	Product Name	SumOfUnits
Beverages	Chai	39
Beverages	Chang	17
Beverages	Chartreuse verte	69
Beverages	Côte de Blaye	17
Beverages	Ipoh Coffee	17
Beverages	Lakkalikööri	57
Beverages	Laughing Lumberjack Lager	52
Beverages	Outback Lager	15
Beverages	Sasquatch Ale	111
Beverages	Steeleye Stout	20
Condiments	Chef Anton's Cajun Seasoning	53
Condiments	Chef Anton's Gumbo Mix	0
Condiments	Genen Shouyu	39
Condiments	Grandma's Boysenberry Spread	120
Condiments	Gula Malacca	27
Condiments	Louisiana Fiery Hot Pepper Sauce	76

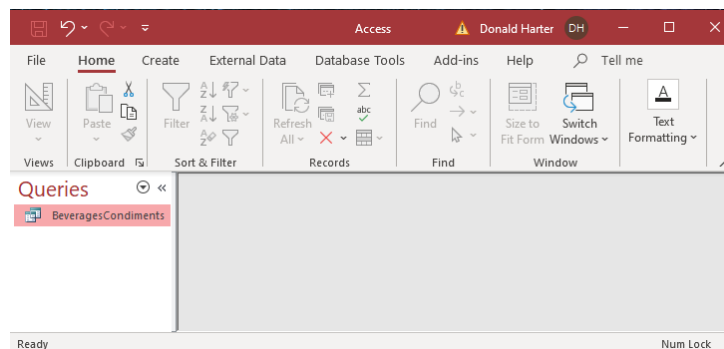
Saving a Query

To save a query

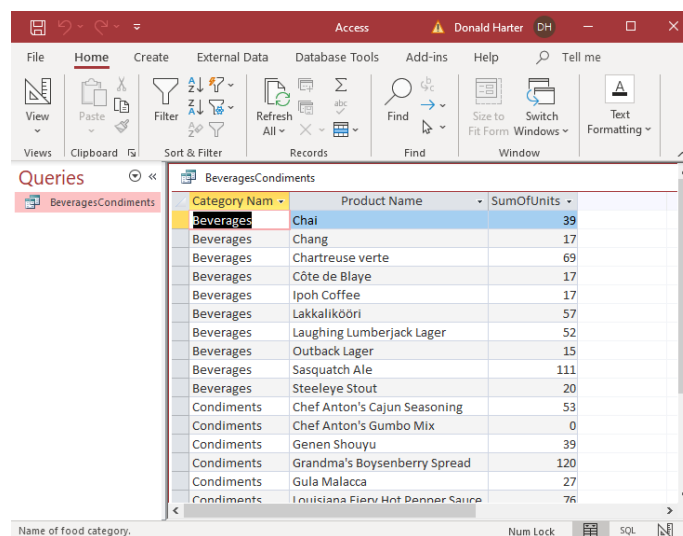
1. Click on File, Save As, Save Object As, then click on the Save As Icon
2. In the pop-up menu, enter BeveragesCondiments in Save "Query1" to:
3. Click OK



4. You can retrieve old queries by clicking on the down arrow next to the word Tables, then selecting Queries.



5. Double click on the query to reopen it.

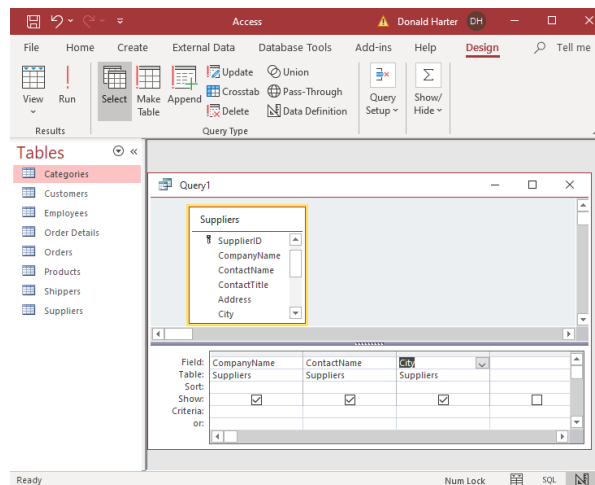


Subqueries

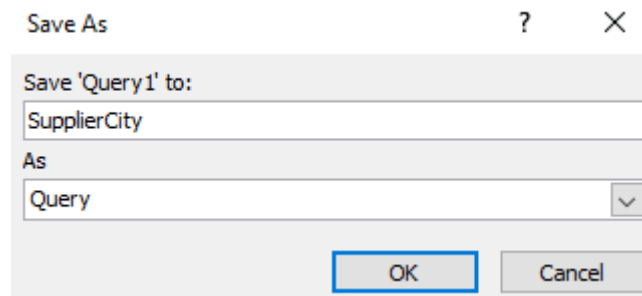
We have seen that queries can be built by retrieving data from one or more tables. Queries can also be built to retrieve data from other queries or a combination of queries and tables.

In the next example, we will create two queries identifying Supplier City and Customer City, then a query on the query to identify which customers are in the same city as their suppliers with the Company Contact.

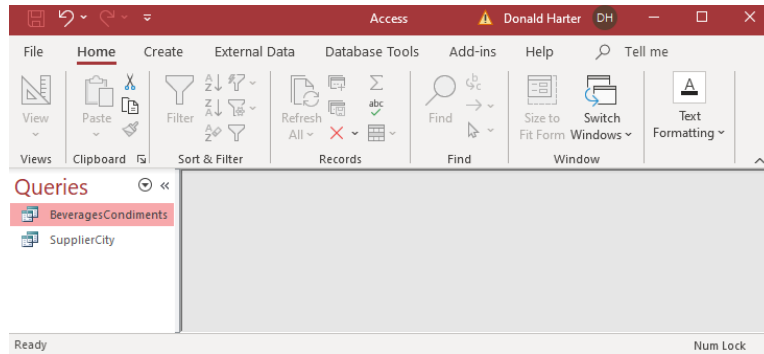
1. Click on Create, Query Design
2. Under Add Tables, double click on the Suppliers Table, then click on the X next to Add Tables
3. Double click on CompanyName, ContactName, and City
4. Click Run !



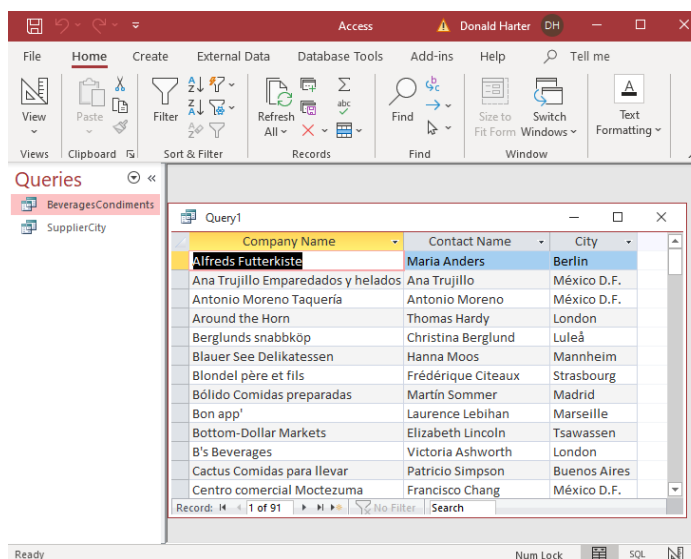
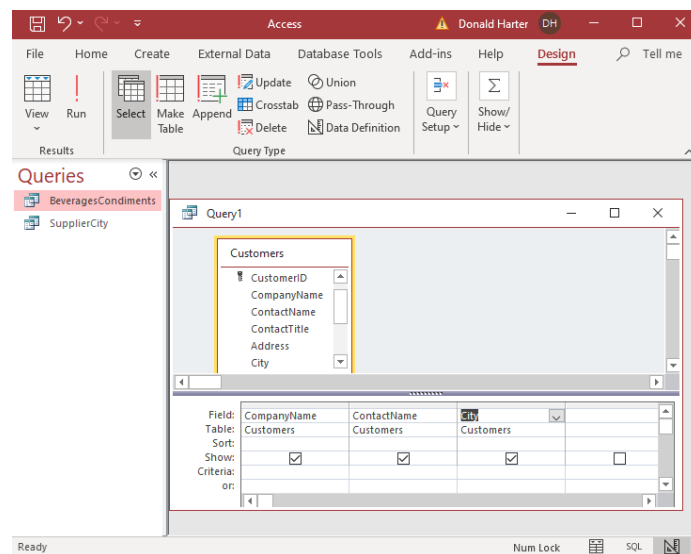
5. To save the query, click File, Save As, Save Object As, Save As
6. Change the name to SupplierCity, then click OK



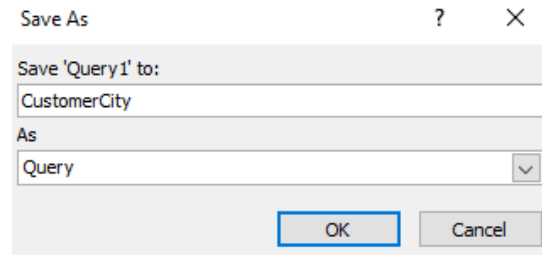
7. Close the query
8. On the left side of the screen, click on the down arrow next to Tables
9. Select Queries
10. SupplierCity should appear in the list of Queries



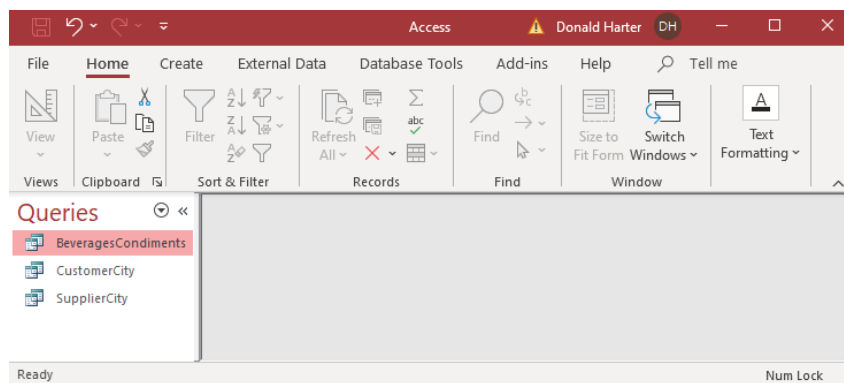
11. Next, create a query for Customers.
12. Click Create, Query Design
13. Double click on Customers, then close
14. Double click on CompanyName, ContactName, City
15. Click Run !



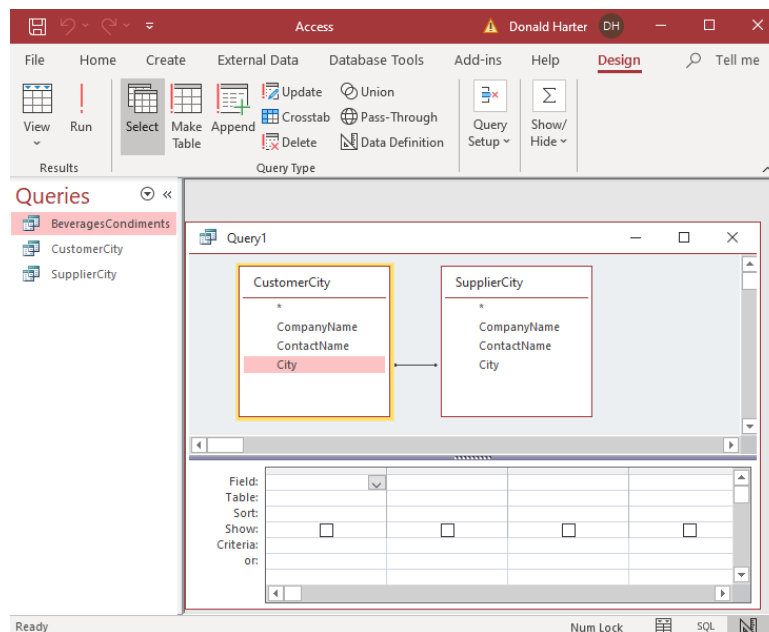
16. To save the query, click File, Save As, Save Object As, Save As
17. Change the name to CustomerCity, then click OK



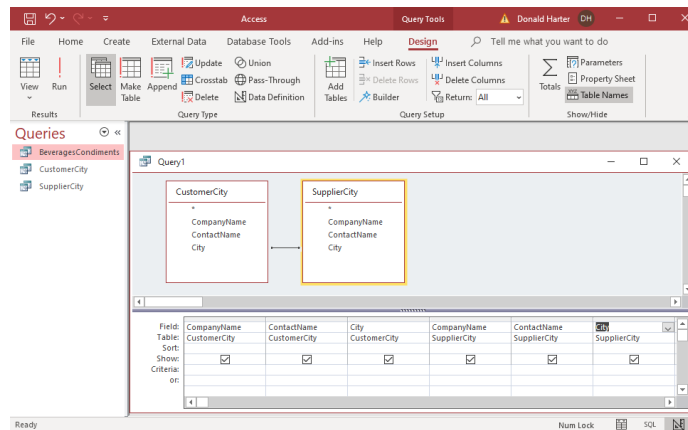
18. Close the query
19. CustomerCity should appear in the list of Queries



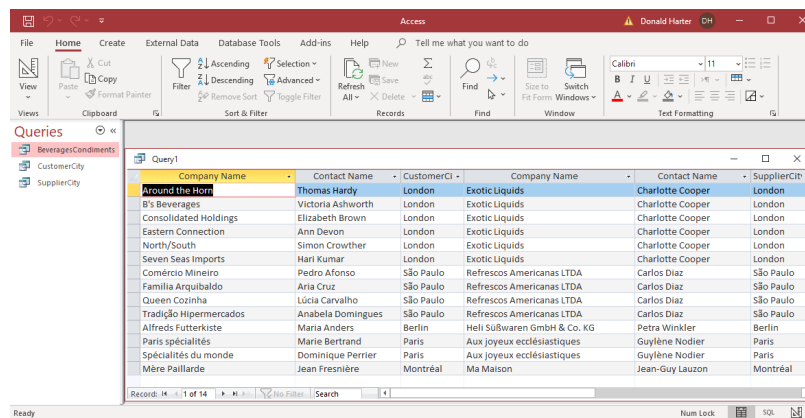
20. Finally, let's create a query using these two queries
21. Click Create, Query Design
22. In the Add Tables screen, click on the tab for Queries
23. Double click on both Customer City and Supplier City, then close Add Tables
24. The two queries are not linked. Drag City in CustomerCity to City in SupplierCity



25. Double click on each field in CustomerCity and Supplier City

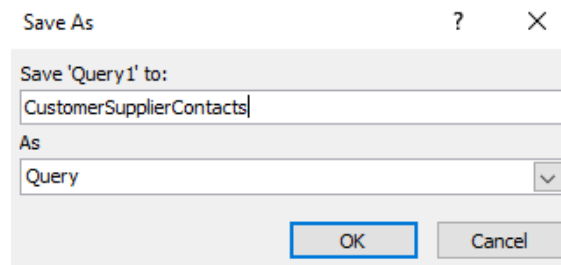


26. Click Run !



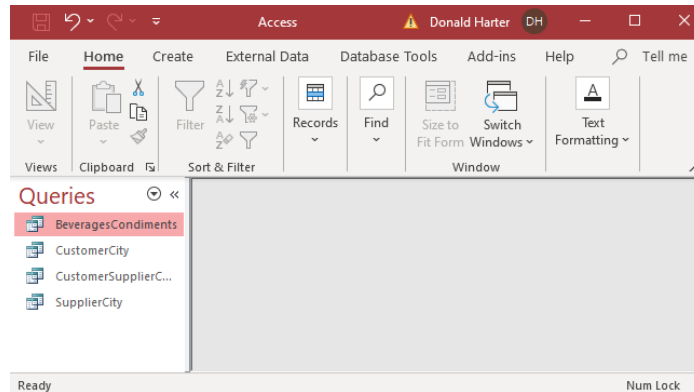
27. To save the query, click File, Save As, Save Object As, Save As

28. Change the name to CustomerSupplierContacts, then click OK

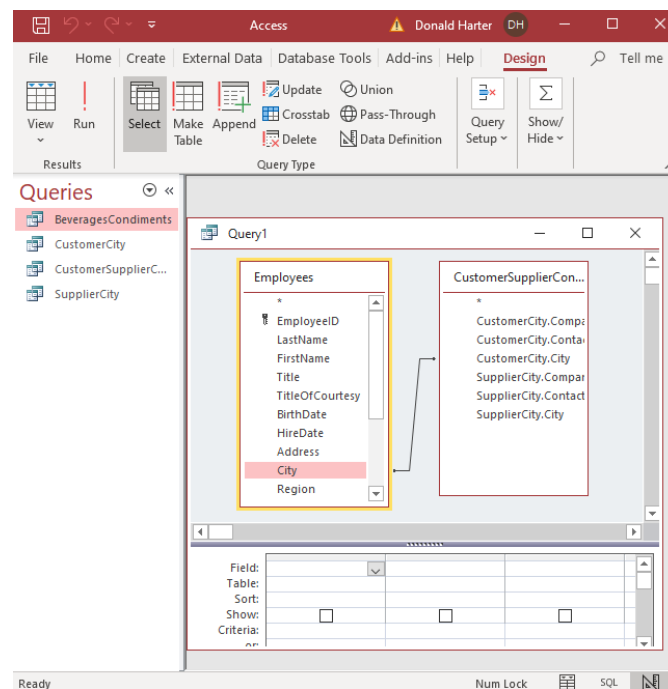


29. Close the query

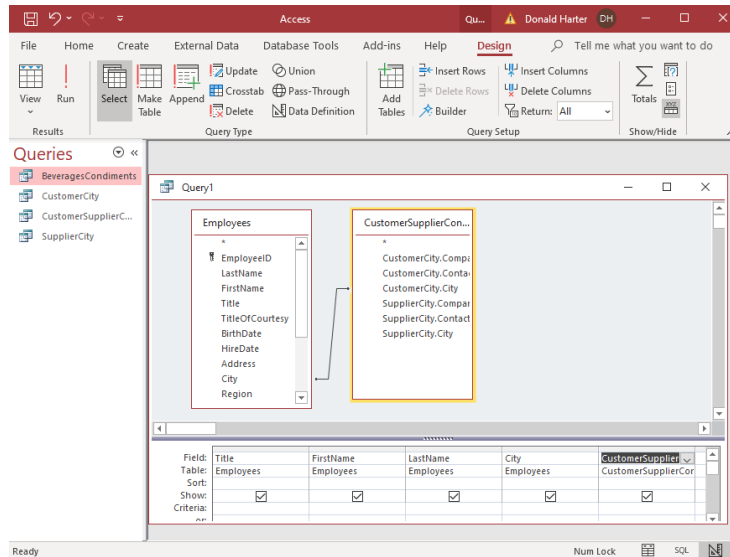
30. CustomerSupplierContacts should appear in the list of Queries



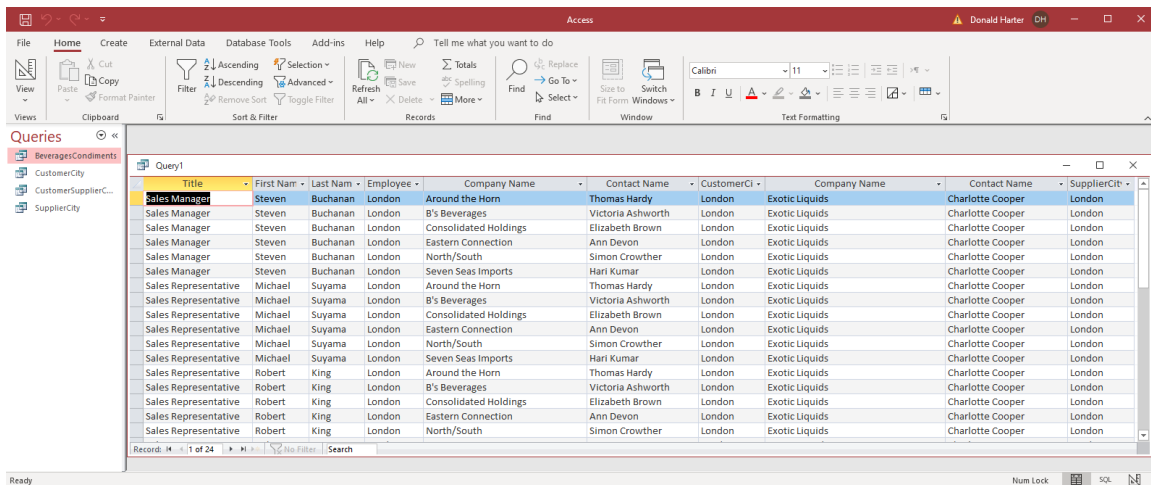
31. Finally, we can perform queries on Tables and Queries simultaneously.
32. Click on Create, Query Design
33. In the Add Tables screen, on the Tables tab, double click on Employees
34. In the Add Table screen, on the Queries tab, double click on CustomerSupplierContacts
35. There is no relationship between the table and the query
36. To create a relationship, drag City in Employees to Customer.City in CustomerSupplierContacts



37. In Employees, double click on Title, FirstName, LastName, City
38. In CustomerSupplierContacts, click on *; the * will include all fields in CustomerSupplierContacts



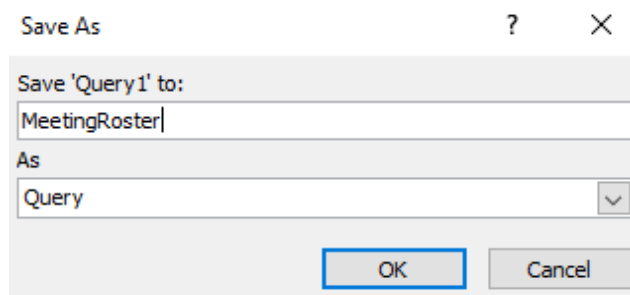
39. Click Run !



40. The results show which of your employees are located in the same city as Customers and Suppliers, if you wanted to have three way meetings among your company, customers, and suppliers.

41. To save the query, click File, Save As, Save Object As, Save As

42. Change the name to MeetingRoster, then click OK



43. Close the query

44. MeetingRoster should appear in the list of Queries

