SQL Practice Problems

57 beginning, intermediate, and advanced challenges for you to solve using a "learn-by-doing" approach

Sylvia Moestl Vasilik

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How to use this book

This edition of SQL Practice Problems assumes that you have some basic background knowledge about relational databases and tables. However, I've added some beginner level questions to gradually introduce the various parts of the SQL Select statement for those with less experience in SQL.

A note on the database used—the database used for these problems, which you will set up in the in the Installation Instructions, is *not* the standard Northwind database. There have been multiple modifications made to it, including additional tables, and modified data, to support the problems in this book. Do not try to use the standard Northwind sample database that came with previous installations of SQL Server, many of the problems will not work.

Do you need to finish *all* the problems? Absolutely not. The introductory problems are fairly simple, so you may want to skip directly to the Intermediate Problems section. If you're not a beginner, but not sure where you should start, just take a look at the problems and expected results in the Introductory Problems section and make sure you understand the concepts. If you do, start working on the Intermediate Problems section.

If you're uncertain about how to start on a problem, the hints are designed to gradually walk you through how to approach each problem. Try hard to solve the problems first without the hints! The information will stick better if you can do that. But if you're stuck, the hints will get you starting in thinking with a data mindset.

If there's code you want to copy from this book and run on your server—believe it or not, I recommend that you actually type it out, instead of copying and pasting. Why go to the hassle of re-typing something? Science shows that the act of typing establishes it more firmly in your mind. Sometimes when you just copy and paste, the code just goes directly from one window in your computer to another, without making much impression on your memory. But when you type it out, you have to focus much more, and that helps tremendously with retaining the information.

Should you search online for answers, examples, etc.? Absolutely. I expect you do research online throughout the book, and in many places it's necessary. I do not include all the syntax in this book. In my day-to-day work as a data engineer, I would be lost without being able to do online research. Sometimes I search online just for a reminder of a certain syntax, sometimes for examples of a particular type of code, and sometimes for approaches to specific problems. Learning to find answers online effectively can cut your problem-solving time dramatically.

Once you finish all the questions, you’ll have some very useful skills in data analysis and advanced Select statement usage. This isn’t all there is to SQL, of course. There’s also the syntax that let’s you actually modify data (update, insert, delete), DDL (data definition language, i.e. how to create and modify database objects), programming concept such as stored procedures, and of course many other topics.

In this book, I’m only presenting problems involving retrieving data with Select statements, because that’s an area where it’s hard for people to get solid practice with real life data problems, without actually working as a data engineer or programmer. It’s also a critical first step for almost any of the other database topics.

Any feedback would be greatly appreciated. For any questions or issues, please send email to feedback@SQLPracticeProblems.com and I will be happy to respond.

Thank you for purchasing this book!

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Setup

This section will help you install Microsoft SQL Server 2016, SQL Server Management Studio (SSMS) and also walk you through setting up the practice database. The setup of Microsoft SQL Server 2016 and SSMS will take about 45 minutes, with about 5 minutes of interaction here and there. It may take one or two reboots of your system, depending on which version of certain support files you have (dot.net framework).

SQL Server 2016 will run with more recent versions of Windows, including Windows 8 and Windows 10. Please review this requirements page (https://msdn.microsoft.com/en-us/library/ms143506.aspx) for full details.

Install Steps

Pre-setup - To download the backup file necessary in step 3, as well as a PDF version of this book and a SQL setup script to use if you already have SQL Server 2012 or SQL Server 2014, go to www.SQLPracticeProblems.com. Click on the “Buy Now” button. Don’t worry, you don’t actually have to buy anything. Use the 100% off coupon code

“KCSPurch” to bypass the credit card information, and get a download link sent directly to your email for free.

You may want to consider viewing this book via the PDF instead of the paper or Kindle copy, since you’ll be able to click on the links, and copy and paste code more easily.

Note: If you already have SQL Server 2012 or 2014 installed, and don’t want to install SQL Server 2016, you don’t need to. There’s a setup script called Northwind2012.sql (also works for SQL Server 2014) included in the zipped file that will allow you to use your existing version. Open that file, and follow the instructions. You can then skip all the below steps.

1. Install MS SQL Server Express Edition 2016 - Download and install MS SQL Server Express Edition 2016 (https://www.microsoft.com/en-cy/sql-server/sql-server-editions-express). It’s a free download, and the Express Edition, unlike the Developer Edition, doesn’t require you to jump through any hoops with Live.Microsoft.com subscriptions.Feel free to do the Basic install unless you need it to go in a particular location on your hard drive.

The install of Express Edition and SSMS (in the next step) will take about 45 minutes. Almost all of this is hands-off. A reboot may be required, depending on some of your system files.

2. SQL Server Management Studio (SSMS) 2016 - Download and install SQL Server Management Studio (SSMS) 2016 (https://msdn.microsoft.com/en-us/library/mt238290.aspx).This is the tool that allows you to interact with SQL Server. You can either do this as a part of the MS SQL Server Express Edition 2016 install (there's a link at the bottom), or download it directly.

3. Move the practice database - The Northwind database backup file is included in the zip file that you downloaded. Unzip the file Northwind2016.bak and place it in the backup directory of your SQL Server Express Edition install. With the Basic install, the default location is here: C:\Program Files\Microsoft SQL Server\MSSQL13.SQLEXPRESS\MSSQL\Backup.

This practice database is based on the Microsoft sample Northwind database, but it's been substantially modified, so in order to be able to solve the problems, you'll need this version.

4. Setup the practice database - Follow the instructions on this video (https://www.youtube.com/embed/mBLhXiXIHW0?rel=0) to restore the practice database that you just downloaded onto your freshly installed SQL Server.

Questions or problems with the setup? Email me at feedback@SQLPracticeProblems.com

Introductory Problems

1. Which shippers do we have?

We have a table called Shippers. Return all the fields from all the shippers

Expected Results

```
ShipperID   CompanyName                              Phone
----------- ---------------------------------------- ------------------------
1           Speedy Express                           (503) 555-9831
2           United Package                           (503) 555-3199
3           Federal Shipping                         (503) 555-9931

(3 row(s) affected)
```

Hint

The standard format for a select statement that returns all columns and all rows is “Select * from TableName”.

2. Certain fields from Categories

In the Categories table, selecting all the fields using this SQL:

```
Select * from Categories
```

…will return 4 columns. We only want to see two columns, CategoryName and Description.

Expected Results

```
CategoryName    Description
--------------- --------------------------------------------------------
Beverages       Soft drinks, coffees, teas, beers, and ales
Condiments      Sweet and savory sauces, relishes, spreads, and seasonings
Confections     Desserts, candies, and sweet breads
Dairy Products  Cheeses
Grains/Cereals  Breads, crackers, pasta, and cereal
Meat/Poultry    Prepared meats
Produce         Dried fruit and bean curd
Seafood         Seaweed and fish

(8 row(s) affected)
```

Hint

Instead of * in the Select statement, specify the column names with a comma between them

3. Sales Representatives

We’d like to see just the FirstName, LastName, and HireDate of all the employees with the Title of Sales Representative. Write a SQL statement that returns only those employees.

Expected Results

```
FirstName  LastName             HireDate
---------- -------------------- -----------------------
Nancy      Davolio              2010-05-01 00:00:00.000
Janet      Leverling            2010-04-01 00:00:00.000
Margaret   Peacock              2011-05-03 00:00:00.000
Michael    Suyama               2011-10-17 00:00:00.000
Robert     King                 2012-01-02 00:00:00.000
Anne       Dodsworth            2012-11-15 00:00:00.000

(6 row(s) affected)
```

Hint

To filter out only certain rows from a table, use a Where clause. The format for a where clause with a string filter is:

```
Where
   FieldName = 'Filter Text'
```

4. Sales Representatives in the United States

Now we’d like to see the same columns as above, but only for those employees that both have the title of Sales Representative, and also are in the United States.

Expected Results

```
FirstName  LastName             HireDate
---------- -------------------- -----------------------
Nancy      Davolio              2010-05-01 00:00:00.000
Janet      Leverling            2010-04-01 00:00:00.000
Margaret   Peacock              2011-05-03 00:00:00.000

(3 row(s) affected)
```

Hint

To apply multiple filters in a where clause, use “and” to separate the filters.

5. Orders placed by specific EmployeeID

Show all the orders placed by a specific employee. The EmployeeID for this Employee (Steven Buchanan) is 5.

Expected Results

```
OrderID     OrderDate
----------- -----------------------
10248       2014-07-04 08:00:00.000
10254       2014-07-11 02:00:00.000
10269       2014-07-31 00:00:00.000
10297       2014-09-04 21:00:00.000
10320       2014-10-03 12:00:00.000
10333       2014-10-18 18:00:00.000
10358       2014-11-20 05:00:00.000
10359       2014-11-21 14:00:00.000
10372       2014-12-04 10:00:00.000
10378       2014-12-10 00:00:00.000
10397       2014-12-27 17:00:00.000
10463       2015-03-04 13:00:00.000
10474       2015-03-13 16:00:00.000
10477       2015-03-17 02:00:00.000
10529       2015-05-07 01:00:00.000
10549       2015-05-27 03:00:00.000
10569       2015-06-16 15:00:00.000
10575       2015-06-20 22:00:00.000
10607       2015-07-22 09:00:00.000
10648       2015-08-28 22:00:00.000
10649       2015-08-28 00:00:00.000
10650       2015-08-29 06:00:00.000
10654       2015-09-02 07:00:00.000
10675       2015-09-19 06:00:00.000
10711       2015-10-21 03:00:00.000
10714       2015-10-22 03:00:00.000
10721       2015-10-29 08:00:00.000
10730       2015-11-05 07:00:00.000
10761       2015-12-02 08:00:00.000
10812       2016-01-02 02:00:00.000
10823       2016-01-09 17:00:00.000
10841       2016-01-20 21:00:00.000
10851       2016-01-26 00:00:00.000
10866       2016-02-03 01:00:00.000
```

10869	2016-02-04 09:00:00.000
10870	2016-02-04 12:00:00.000
10872	2016-02-05 06:00:00.000
10874	2016-02-06 14:00:00.000
10899	2016-02-20 09:00:00.000
10922	2016-03-03 02:00:00.000
10954	2016-03-17 16:00:00.000
11043	2016-04-22 17:00:00.000

(42 row(s) affected)

Hint

The EmployeeID is an integer field, and not a string field. So, the value “5” does not need to be surrounded by single quotes in the where clause.

6. Suppliers and ContactTitles

In the Suppliers table, show the SupplierID, ContactName, and ContactTitle for those Suppliers whose ContactTitle is *not* Marketing Manager.

Expected Results

SupplierID	ContactName	ContactTitle
1	Charlotte Cooper	Purchasing Manager
2	Shelley Burke	Order Administrator
3	Regina Murphy	Sales Representative
5	Antonio del Valle Saavedra	Export Administrator
6	Mayumi Ohno	Marketing Representative
8	Peter Wilson	Sales Representative
9	Lars Peterson	Sales Agent
11	Petra Winkler	Sales Manager
12	Martin Bein	International Marketing Mgr.
13	Sven Petersen	Coordinator Foreign Markets
14	Elio Rossi	Sales Representative
16	Cheryl Saylor	Regional Account Rep.
17	Michael Björn	Sales Representative
18	Guylène Nodier	Sales Manager
19	Robb Merchant	Wholesale Account Agent
20	Chandra Leka	Owner
21	Niels Petersen	Sales Manager
22	Dirk Luchte	Accounting Manager
23	Anne Heikkonen	Product Manager
24	Wendy Mackenzie	Sales Representative
26	Giovanni Giudici	Order Administrator
27	Marie Delamare	Sales Manager
28	Eliane Noz	Sales Representative
29	Chantal Goulet	Accounting Manager

(24 row(s) affected)

Hint

To learn how to do the “not”, you can search online for SQL comparison operators.

7. Products with “queso” in ProductName

In the products table, we’d like to see the ProductID and ProductName for those products where the ProductName includes the string “queso”.

Expected Results

```
ProductID   ProductName
----------- ----------------------------------------
11          Queso Cabrales
12          Queso Manchego La Pastora

(2 row(s) affected)
```

Hint

In an earlierproblem, we were looking for exact matches — where our filter matched the value in the field exactly. Here, we're looking for rows where the ProductName field has the value "queso" somewhere in it.

Use the "like" operator, with wildcards, in the answer. Feel free to do some research online to find examples.

8. Orders shipping to France or Belgium

Looking at the Orders table, there’s a field called ShipCountry. Write a query that shows the OrderID, CustomerID, and ShipCountry for the orders where the ShipCountry is either France or Belgium.

Expected Results

```
OrderID     CustomerID ShipCountry
----------- ---------- ---------------
10248       VINET      France
10251       VICTE      France
10252       SUPRD      Belgium
10265       BLONP      France
10274       VINET      France
10295       VINET      France
10297       BLONP      France
10302       SUPRD      Belgium
10311       DUMON      France
10331       BONAP      France
10334       VICTE      France
10340       BONAP      France
10350       LAMAI      France
10358       LAMAI      France

... (skipping some rows)

10923       LAMAI      France
10927       LACOR      France
10930       SUPRD      Belgium
10932       BONAP      France
10940       BONAP      France
10964       SPECD      France
10971       FRANR      France
10972       LACOR      France
10973       LACOR      France
10978       MAISD      Belgium
11004       MAISD      Belgium
11035       SUPRD      Belgium
11038       SUPRD      Belgium
11043       SPECD      France
11051       LAMAI      France
11076       BONAP      France
```

(96 row(s) affected)

Hint

In the where clause, instead of combining the filters with an “and” use the “or”.

9. Orders shipping to any country in Latin America

Now, instead of just wanting to return all the orders from France of Belgium, we want to show all the orders from any Latin American country. But we don’t have a list of Latin American countries in a table in the Northwind database. So, we’re going to just use this list of Latin American countries that happen to be in the Orders table:

Brazil

Mexico

Argentina

Venezuela

It doesn’t make sense to use multiple Or statements anymore, it would get too convoluted. Use the In statement.

Expected Results

```
OrderID     CustomerID ShipCountry
----------- ---------- ---------------
10250       HANAR      Brazil
10253       HANAR      Brazil
10256       WELLI      Brazil
10257       HILAA      Venezuela
10259       CENTC      Mexico
10261       QUEDE      Brazil
10268       GROSR      Venezuela
10276       TORTU      Mexico
10283       LILAS      Venezuela
10287       RICAR      Brazil
10997       LILAS      Venezuela

... (skipping some rows)

11014       LINOD      Venezuela
11019       RANCH      Argentina
11022       HANAR      Brazil
11039       LINOD      Venezuela
11042       COMMI      Brazil
11049       GOURL      Brazil
11052       HANAR      Brazil
11054       CACTU      Argentina
11055       HILAA      Venezuela
11059       RICAR      Brazil
11065       LILAS      Venezuela
11068       QUEEN      Brazil
11069       TORTU      Mexico
11071       LILAS      Venezuela
11073       PERIC      Mexico

(173 row(s) affected)
```

Hint

Here's an example of the previous questions, about orders shipping to France or Belgium, done as an In statement instead of using multiple Where clauses.

```
Select
   OrderID
   ,CustomerID
   ,OrderDate
   ,ShipCountry
From Orders
where
   ShipCountry in ('France','Belgium')
```

10. Employees, in order of age

For all the employees in the Employees table, show the FirstName, LastName, Title, and BirthDate. Order the results by BirthDate, so we have the oldest employees first.

Expected Results

```
FirstName  LastName             Title                          BirthDate
---------- -------------------- ------------------------------ -----------------------
Margaret   Peacock              Sales Representative           1955-09-19 00:00:00.000
Nancy      Davolio              Sales Representative           1966-12-08 00:00:00.000
Andrew     Fuller               Vice President, Sales          1970-02-19 00:00:00.000
Steven     Buchanan             Sales Manager                  1973-03-04 00:00:00.000
Laura      Callahan             Inside Sales Coordinator       1976-01-09 00:00:00.000
Robert     King                 Sales Representative           1978-05-29 00:00:00.000
Michael    Suyama               Sales Representative           1981-07-02
00:00:00.000
Janet      Leverling            Sales Representative           1981-08-30 00:00:00.000
Anne       Dodsworth            Sales Representative           1984-01-27
00:00:00.000

(9 row(s) affected)
```

Hint

You’ll need to use the Order by clause here for sorting the results. Look online for examples.

11. Showing only the Date with a DateTime field

In the output of the query above, showing the Employees in order of BirthDate, we see the time of the BirthDate field, which we don’t want. Show only the date portion of the BirthDate field.

Expected Results

```
FirstName  LastName            Title                          DateOnlyBirthDate
---------- -------------------- ------------------------------ -----------------
Margaret   Peacock             Sales Representative           1955-09-19
Nancy      Davolio             Sales Representative           1966-12-08
Andrew     Fuller              Vice President, Sales          1970-02-19
Steven     Buchanan            Sales Manager                  1973-03-04
Laura      Callahan            Inside Sales Coordinator       1976-01-09
Robert     King                Sales Representative           1978-05-29
Michael    Suyama              Sales Representative           1981-07-02
Janet      Leverling           Sales Representative           1981-08-30
Anne       Dodsworth           Sales Representative           1984-01-27

(9 row(s) affected)
```

Hint

Use the Convert function to convert the BirthDate column (originally a DateTime column) to a Date column.

12. Employees full name

Show the FirstName and LastName columns from the Employees table, and then create a new column called FullName, showing FirstName and LastName joined together in one column, with a space in-between.

Expected Results

```
FirstName  LastName             FullName
---------- -------------------- -------------------------------
Nancy      Davolio              Nancy Davolio
Andrew     Fuller               Andrew Fuller
Janet      Leverling            Janet Leverling
Margaret   Peacock              Margaret Peacock
Steven     Buchanan             Steven Buchanan
Michael    Suyama               Michael Suyama
Robert     King                 Robert King
Laura      Callahan             Laura Callahan
Anne       Dodsworth            Anne Dodsworth

(9 row(s) affected)
```

Hint

Joining two fields like this is called concatenation. Look online for examples of string concatenation with SQL Server.

13. OrderDetails amount per line item

In the OrderDetails table, we have the fields UnitPrice and Quantity. Create a new field, TotalPrice, that multiplies these two together. We'll ignore the Discount field for now.

In addition, show the OrderID, ProductID, UnitPrice, and Quantity. Order by OrderID and ProductID.

Expected Results

OrderID	ProductID	UnitPrice	Quantity	TotalPrice
10248	11	14.00	12	168.00
10248	42	9.80	10	98.00
10248	72	34.80	5	174.00
10249	14	18.60	9	167.40
10249	51	42.40	40	1696.00
10250	41	7.70	10	77.00
10250	51	42.40	35	1484.00
10250	65	16.80	15	252.00
10251	22	16.80	6	100.80
10251	57	15.60	15	234.00
10251	65	16.80	20	336.00
... (skipping some rows)				
11077	13	6.00	4	24.00
11077	14	23.25	1	23.25
11077	16	17.45	2	34.90
11077	20	81.00	1	81.00
11077	23	9.00	2	18.00
11077	32	32.00	1	32.00
11077	39	18.00	2	36.00
11077	41	9.65	3	28.95
11077	46	12.00	3	36.00
11077	52	7.00	2	14.00
11077	55	24.00	2	48.00
11077	60	34.00	2	68.00
11077	64	33.25	2	66.50
11077	66	17.00	1	17.00
11077	73	15.00	2	30.00
11077	75	7.75	4	31.00
11077	77	13.00	2	26.00

(2155 row(s) affected)

Hint

In this computed column, you need to use the arithmetic operator for multiplication.

14. How many customers?

How many customers do we have in the Customers table? Show one value only, and don’t rely on getting the recordcount at the end of a resultset.

Expected Results

```
TotalCustomers
--------------
91

(1 row(s) affected)
```

Hint

In order to get the total number of customers, we need to use what’s called an aggregate function. Look online for an aggregate function that would work for this problem.

15. When was the first order?

Show the date of the first order ever made in the Orders table.

Expected Results

```
FirstOrder
-----------------------
2014-07-04 08:00:00.000

(1 row(s) affected)
```

Hint

There’s a aggregate function called Min that you need to use for this problem.

16. Countries where there are customers

Show a list of countries where the Northwind company has customers.

Expected Results

```
Country
---------------
Argentina
Austria
Belgium
Brazil
Canada
Denmark
Finland
France
Germany
Ireland
Italy
Mexico
Norway
Poland
Portugal
Spain
Sweden
Switzerland
UK
USA
Venezuela

(21 row(s) affected)
```

Hint

You’ll want to use the Group By clause for this query.

17. Contact titles for customers

Show a list of all the different values in the Customers table for ContactTitles. Also include a count for each ContactTitle.

This is similar in concept to the previous question "Countries where there are customers", except we now want a count for each ContactTitle.

Expected Results

```
ContactTitle                   TotalContactTitle
------------------------------ -----------------
Owner                          17
Sales Representative           17
Marketing Manager              12
Sales Manager                  11
Accounting Manager             10
Sales Associate                7
Marketing Assistant            6
Sales Agent                    5
Assistant Sales Agent          2
Order Administrator            2
Assistant Sales Representative 1
Owner/Marketing Assistant      1

(12 row(s) affected)
```

Hint

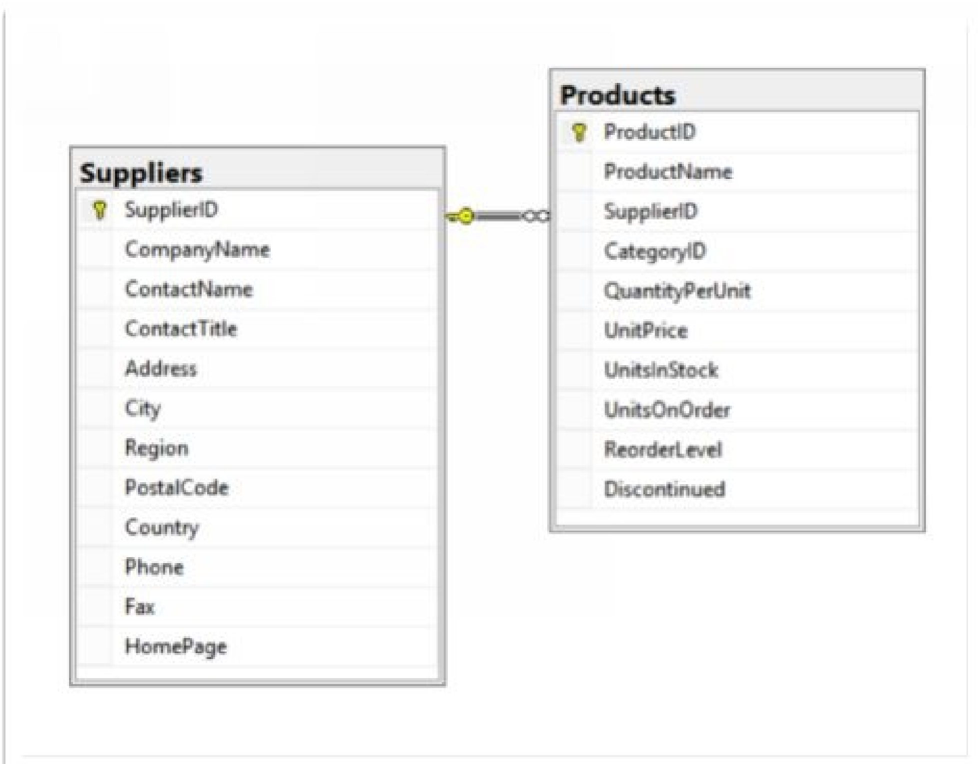
The answer for this problem builds on multiple concepts introduced in previous problem, such as grouping, aggregate functions, and aliases.

18. Products with associated supplier names

We’d like to show, for each product, the associated Supplier. Show the ProductID, ProductName, and the CompanyName of the Supplier. Sort by ProductID.

This question will introduce what may be a new concept, the Join clause in SQL. The Join clause is used to join two or more relational database tables together in a logical way.

Here’s a data model of the relationship between Products and Suppliers.



Expected Results

```
ProductID   ProductName                          Supplier
----------- ---------------------------------------- ------------------------------
1           Chai                                 Exotic Liquids
2           Chang                                Exotic Liquids
3           Aniseed Syrup                        Exotic Liquids
4           Chef Anton's Cajun Seasoning         New Orleans Cajun Delights
5           Chef Anton's Gumbo Mix               New Orleans Cajun Delights
6           Grandma's Boysenberry Spread         Grandma Kelly's Homestead
7           Uncle Bob's Organic Dried Pears      Grandma Kelly's Homestead
8           Northwoods Cranberry Sauce           Grandma Kelly's Homestead
9           Mishi Kobe Niku                      Tokyo Traders
10          Ikura                                Tokyo Traders

... (skipping some rows)

66          Louisiana Hot Spiced Okra            New Orleans Cajun Delights
67          Laughing Lumberjack Lager            Bigfoot Breweries
68          Scottish Longbreads                  Specialty Biscuits, Ltd.
69          Gudbrandsdalsost                     Norske Meierier
70          Outback Lager                        Pavlova, Ltd.
71          Flotemysost                          Norske Meierier
72          Mozzarella di Giovanni               Formaggi Fortini s.r.l.
73          Röd Kaviar                           Svensk Sjöföda AB
74          Longlife Tofu                        Tokyo Traders
75          Rhönbräu Klosterbier                 Plutzer Lebensmittelgroßmärkte AG
76          Lakkalikööri                         Karkki Oy
77          Original Frankfurter grüne Soße      Plutzer Lebensmittelgroßmärkte
AG

(77 row(s) affected)
```

Hint

Just as a reference, here's an example of what the syntax for the Join looks like, using different tables from the Northwind database. It will show all the products, with the associated CategoryName.

```
Select
    ProductID
    ,ProductName
    ,CategoryName
From Products
    Join Categories
        on Products.CategoryID = Categories.CategoryID
```

19. Orders and the Shipper that was used

We’d like to show a list of the Orders that were made, including the Shipper that was used. Show the OrderID, OrderDate (date only), and CompanyName of the Shipper, and sort by OrderID.

In order to not show all the orders (there’s more than 800), show only those rows with an OrderID of less than 10300.

Expected Results

```
OrderID     OrderDate  Shipper
----------- ---------- ----------------------------------------
10248       2014-07-04 Federal Shipping
10249       2014-07-05 Speedy Express
10250       2014-07-08 United Package
10251       2014-07-08 Speedy Express
10252       2014-07-09 United Package
10253       2014-07-10 United Package
10254       2014-07-11 United Package
10255       2014-07-12 Federal Shipping
10256       2014-07-15 United Package
10257       2014-07-16 Federal Shipping
10258       2014-07-17 Speedy Express
10259       2014-07-18 Federal Shipping
10260       2014-07-19 Speedy Express
10261       2014-07-19 United Package
10262       2014-07-22 Federal Shipping
10263       2014-07-23 Federal Shipping
10264       2014-07-24 Federal Shipping

... (skipping some rows)

10284       2014-08-19 Speedy Express
10285       2014-08-20 United Package
10286       2014-08-21 Federal Shipping
10287       2014-08-22 Federal Shipping
10288       2014-08-23 Speedy Express
10289       2014-08-26 Federal Shipping
10290       2014-08-27 Speedy Express
10291       2014-08-27 United Package
10292       2014-08-28 United Package
10293       2014-08-29 Federal Shipping
10294       2014-08-30 United Package
10295       2014-09-02 United Package
10296       2014-09-03 Speedy Express
10297       2014-09-04 United Package
```

10298	2014-09-05 United Package
10299	2014-09-06 United Package

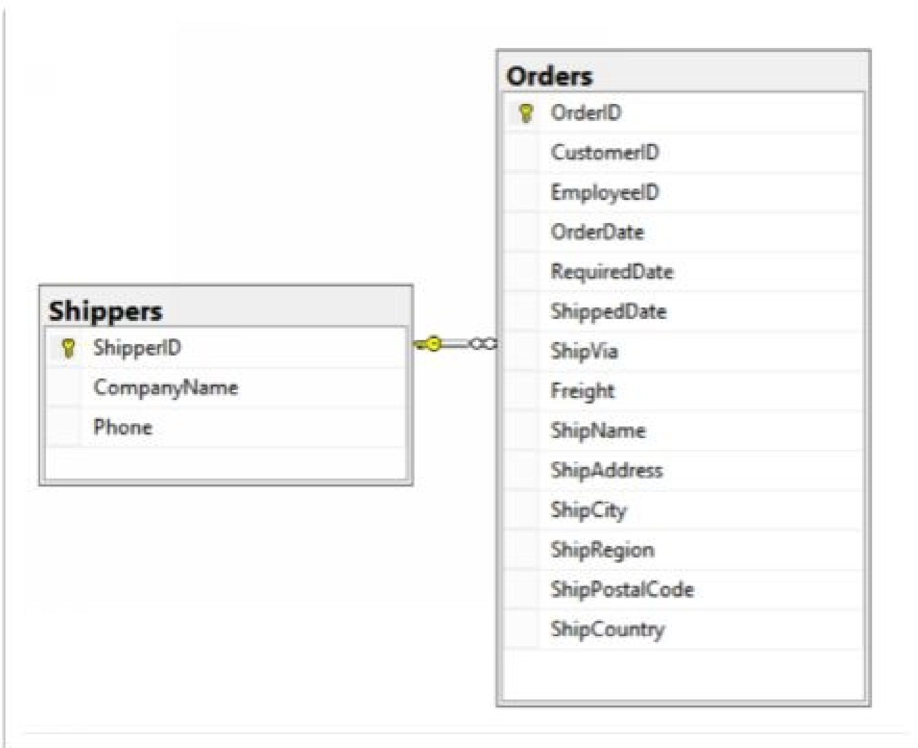
(52 row(s) affected)

Hint

First, create a SQL statement that shows only the rows and columns you need from the Orders table.

Then, work on adding the join to the Shipper table, and the necessary field from that table.

This data model should help you visualize the join between the Orders table and the Shippers table.



Hint

One thing to note for this problem is that when you join two tables, the field that’s joined on does not necessarily need to have the same name. Usually, they do. However, in this case, the ShipVia field in Orders is joined to ShipperID in Shippers.

Congratulations! You've completed the introductory problems

Any questions or feedback on the problems, hints, or answers? I'd like to hear from you. Please email me at feedback@SQLPracticeProblems.com.

Intermediate Problems

20. Categories, and the total products in each category

For this problem, we’d like to see the total number of products in each category. Sort the results by the total number of products, in descending order.

Expected Results

```
CategoryName    TotalProducts
--------------- -------------
Confections     13
Beverages       12
Condiments      12
Seafood         12
Dairy Products  10
Grains/Cereals  7
Meat/Poultry    6
Produce         5

(8 row(s) affected)
```

Hint

To solve this problem, you need to combine a join, and a group by.

A good way to start is by creating a query that shows the CategoryName and all ProductIDs associated with it, without grouping. Then, add the Group by

21. Total customers per country/city

In the Customers table, show the total number of customers per Country and City.

Expected Results

```
Country         City            TotalCustomer
--------------- --------------- -------------
UK              London          6
Mexico          México D.F.     5
Brazil          Sao Paulo       4
Brazil          Rio de Janeiro  3
Spain           Madrid          3
Argentina       Buenos Aires    3
France          Paris           2
USA             Portland        2
France          Nantes          2
Portugal        Lisboa          2
Finland         Oulu            1
Italy           Reggio Emilia   1
France          Reims           1
Brazil          Resende         1

... (skipping some rows)

Canada          Montréal        1
Germany         München         1
Germany         Münster         1
Germany         Aachen          1
USA             Albuquerque     1
USA             Anchorage       1
Denmark         Århus           1
Spain           Barcelona       1
Venezuela       Barquisimeto    1
Italy           Bergamo         1
Germany         Berlin          1
Switzerland     Bern            1
USA             Boise           1
Sweden          Bräcke          1
Germany         Brandenburg     1
Belgium         Bruxelles       1
```

(69 row(s) affected)

Hint

Just as you can have multiple fields in a Select clause, you can also have multiple fields in a Group By clause.

22. Products that need reordering

What products do we have in our inventory that should be reordered? For now, just use the fields UnitsInStock and ReorderLevel, where UnitsInStock is less than the ReorderLevel, ignoring the fields UnitsOnOrder and Discontinued.

Order the results by ProductID.

Expected Results

ProductID	ProductName	UnitsInStock	ReorderLevel
2	Chang	17	25
3	Aniseed Syrup	13	25
11	Queso Cabrales	22	30
21	Sir Rodney's Scones	3	5
30	Nord-Ost Matjeshering	10	15
31	Gorgonzola Telino	0	20
32	Mascarpone Fabioli	9	25
37	Gravad lax	11	25
43	Ipoh Coffee	17	25
45	Rogede sild	5	15
48	Chocolade	15	25
49	Maxilaku	10	15
56	Gnocchi di nonna Alice	21	30
64	Wimmers gute Semmelknödel	22	30
66	Louisiana Hot Spiced Okra	4	20
68	Scottish Longbreads	6	15
70	Outback Lager	15	30
74	Longlife Tofu	4	5

(18 row(s) affected)

Hint

We want to show all fields where the UnitsInStock is less than the ReorderLevel. So in the Where clause, use the following:

```
UnitsInStock < ReorderLevel
```

23. Products that need reordering, continued

Now we need to incorporate these fields—UnitsInStock, UnitsOnOrder, ReorderLevel, Discontinued—into our calculation. We'll define "products that need reordering" with the following:

- UnitsInStock plus UnitsOnOrder are less than or equal to ReorderLevel
- The Discontinued flag is false (0).

Expected Results

```
ProductID   ProductName             UnitsInStock UnitsOnOrder ReorderLevel
Discontinued
----------- ----------------------- ------------ ------------ ------------ ------------
30          Nord-Ost Matjeshering   10           0            15           0
70          Outback Lager           15           10           30           0

(2 row(s) affected)
```

Hint

For the first part of the Where clause, you should have something like this:

```
UnitsInStock + UnitsOnOrder <= ReorderLevel
```

24. Customer list by region

A salesperson for Northwind is going on a business trip to visit customers, and would like to see a list of all customers, sorted by region, alphabetically.

However, he wants the customers with no region (null in the Region field) to be at the end, instead of at the top, where you'd normally find the null values. Within the same region, companies should be sorted by CustomerID.

Expected Results

```
CustomerID CompanyName                          Region
---------- ---------------------------------------- ---------------
OLDWO      Old World Delicatessen               AK
BOTTM      Bottom-Dollar Markets                BC
LAUGB      Laughing Bacchus Wine Cellars        BC
LETSS      Let's Stop N Shop                    CA
HUNGO      Hungry Owl All-Night Grocers         Co. Cork
GROSR      GROSELLA-Restaurante                 DF
SAVEA      Save-a-lot Markets                   ID
ISLAT      Island Trading                       Isle of Wight
LILAS      LILA-Supermercado                    Lara
THECR      The Cracker Box                      MT
RATTC      Rattlesnake Canyon Grocery           NM

... (skipping some rows)

SANTG      Santé Gourmet                        NULL
SEVES      Seven Seas Imports                   NULL
SIMOB      Simons bistro                        NULL
SPECD      Spécialités du monde                 NULL
SUPRD      Suprêmes délices                     NULL
TOMSP      Toms Spezialitäten                   NULL
TORTU      Tortuga Restaurante                  NULL
VAFFE      Vaffeljernet                         NULL
VICTE      Victuailles en stock                 NULL
VINET      Vins et alcools Chevalier            NULL
WANDK      Die Wandernde Kuh                    NULL
WARTH      Wartian Herkku                       NULL
WILMK      Wilman Kala                          NULL
WOLZA      Wolski  Zajazd                       NULL

(91 row(s) affected)
```

Hint

You won’t be able to sort directly on the Region field here. You’ll need to sort on the Region field, and also on a computed field that you create, which will give you a secondary sort for when Region is null

First, without ordering, create a computed field that has a value which will sort the way you want. In this case, you can create a field with the Case statement, which allows you do to if/then logic. You want a field that is 1 when Region is null.

Take a look at the Examples section in the SQL Server documentation for Case (https://msdn.microsoft.com/en-us/library/ms181765.aspx#examples).

Note that when filtering for null values, you can't use “FieldName = Null”. You must use “FieldName is null”.

Hint

You should have something like this:

```
Select
    CustomerID
    ,CompanyName
    ,Region
    ,Case
        when Region is null then 1
        else 0
    End
From Customers
```

When the Region contains a null, you will have a 1 in the final column. Now, just add the fields for the Order By clause, in the right order.

25. High freight charges

Some of the countries we ship to have very high freight charges. We'd like to investigate some more shipping options for our customers, to be able to offer them lower freight charges. Return the three ship countries with the highest average freight overall, in descending order by average freight.

Expected Results

```
ShipCountry     AverageFreight
--------------- ---------------------
Austria         184.7875
Ireland         145.0126
USA             112.8794

(3 row(s) affected)
```

Hint

We'll be using the Orders table, and using the Freight and ShipCountry fields.

Hint

You'll want to group by ShipCountry, and use the Avg function. Don't worry about showing only the top 3 rows until you have the grouping and average freight set up.

Hint

You should have something like this:

```
Select
    ShipCountry
    ,AverageFreight = avg(freight)
From Orders
Group By ShipCountry
Order By AverageFreight desc;
```

Now you just need to show just the top 3 rows.

26. High freight charges - 2015

We're continuing on the question above on high freight charges. Now, instead of using *all* the orders we have, we only want to see orders from the year 2015.

Expected result

```
ShipCountry     AverageFreight
--------------- ---------------------
Austria         178.3642
Switzerland     117.1775
France          113.991

(3 row(s) affected)
```

Hint

You need to add a Where clause to the query from the previous problem. The field to filter on is OrderDate.

Hint

When filtering on dates, you need to know whether the date field is a DateTime, or a Date field. Is OrderDate a Datetime or a Date field?

27. High freight charges with between

Another (incorrect) answer to the problem above is this:

```
Select Top 3
   ShipCountry
   ,AverageFreight = avg(freight)
From Orders
Where
   OrderDate between '1/1/2015' and '12/31/2015'
Group By ShipCountry
Order By AverageFreight desc;
```

Notice when you run this, it gives Sweden as the ShipCountry with the third highest freight charges. However, this is wrong - it should be France.

What is the OrderID of the order that the (incorrect) answer above is missing?

Expected Result

(no expected results this time - we’re looking for a specific OrderID)

Hint

The Between statement is inclusive. Why isn't it showing the orders made on December 31, 2015?

Hint

Run this query, and look at the rows around December 31, 2015. What do you notice? Look specifically at the Freight field.

```
select * from orders order by OrderDate
```

28. High freight charges - last year

We're continuing to work on high freight charges. We now want to get the three ship countries with the highest average freight charges. But instead of filtering for a particular year, we want to use the last 12 months of order data, using as the end date the last OrderDate in Orders.

Expected Results

```
ShipCountry     AverageFreight
--------------- ---------------------
Ireland         200.21
Austria         186.4596
USA             119.3032

(3 row(s) affected)
```

Hint

First, get the last OrderDate in Orders. Write a simple select statement to get the highest value in the OrderDate field using the Max aggregate function.

Hint

You should have something like this:

```
Select Max(OrderDate) from Orders
```

Now you need to get the date 1 year before the last order date. Create a simple select statement that subtracts 1 year from the last order date

You can use the DateAdd function for this. Note that within DateAdd, you can use the subquery you created above. Look online for some examples if you need to.

Hint

You should have something like this:

```
Select Dateadd(yy, -1, (Select Max(OrderDate) from Orders))
```

Now you just need to put it in the where clause.

29. Inventory list

We're doing inventory, and need to show information like the below, for all orders. Sort by OrderID and Product ID.

Expected Results

EmployeeID	LastName	OrderID	ProductName	Quantity
-----------	--------------------	-----------	--	--------
5	Buchanan	10248	Queso Cabrales	12
5	Buchanan	10248	Singaporean Hokkien Fried Mee	10
5	Buchanan	10248	Mozzarella di Giovanni	5
6	Suyama	10249	Tofu	9
6	Suyama	10249	Manjimup Dried Apples	40
4	Peacock	10250	Jack's New England Clam Chowder	10
4	Peacock	10250	Manjimup Dried Apples	35
4	Peacock	10250	Louisiana Fiery Hot Pepper Sauce	15
3	Leverling	10251	Gustaf's Knäckebröd	6
3	Leverling	10251	Ravioli Angelo	15
3	Leverling	10251	Louisiana Fiery Hot Pepper Sauce	20
4	Peacock	10252	Sir Rodney's Marmalade	40
4	Peacock	10252	Geitost	25
4	Peacock	10252	Camembert Pierrot	40
3	Leverling	10253	Gorgonzola Telino	20
3	Leverling	10253	Chartreuse verte	42
3	Leverling	10253	Maxilaku	40

…

(total 2155 rows)

Hint

You'll need to do a join between 4 tables, displaying only those fields that are necessary.

30. Customers with no orders

There are some customers who have never actually placed an order. Show these customers.

Expected Results

```
Customers_CustomerID Orders_CustomerID
-------------------- -----------------
FISSA                NULL
PARIS                NULL

(2 row(s) affected)
```

Hint

One way of doing this is to use a left join, also known as a left outer join.

Hint

```
Select
    Customers_CustomerID = Customers.CustomerID
    ,Orders_CustomerID = Orders.CustomerID
From Customers
    left join Orders
        on Orders.CustomerID = Customers.CustomerID
```

This is a good start. It shows all records from the Customers table, and the matching records from the Orders table. However, we only want those records where the CustomerID in Orders is null. You still need a filter

31. Customers with no orders for EmployeeID 4

One employee (Margaret Peacock, EmployeeID 4) has placed the most orders. However, there are some customers who've never placed an order with her. Show only those customers who have never placed an order with her.

Expected Result

```
CustomerID CustomerID
---------- ----------
SEVES      NULL
THEBI      NULL
LAZYK      NULL
GROSR      NULL
PARIS      NULL
FISSA      NULL
SPECD      NULL
LAUGB      NULL
PRINI      NULL
VINET      NULL
FRANR      NULL
CONSH      NULL
NORTS      NULL
PERIC      NULL
DUMON      NULL
SANTG      NULL

(16 row(s) affected)
```

Hint

Building on the previous problem, you might think you need to do something like this:

```
Select
   Customers.CustomerID
   ,Orders.CustomerID
From Customers
   left join Orders
      on Orders.CustomerID = Customers.CustomerID
Where
   Orders.CustomerID is null
   and Orders.EmployeeID = 4
```

…adding this filter in the where clause:

```
and Orders.EmployeeID = 4
```

However, this returns no records.

Note that with outer joins, the filters on the where clause are applied *after* the join.

Congratulations! You've completed the intermediate problems

Any questions or feedback on the problems, hints, or answers? I'd like to hear from you. Please email me at feedback@SQLPracticeProblems.com.

Advanced Problems

32. High-value customers

We want to send all of our high-value customers a special VIP gift. We're defining high-value customers as those who've made at least 1 order with a total value (not including the discount) equal to $10,000 or more. We only want to consider orders made in the year 2016.

Expected Result

```
CustomerID CompanyName                              OrderID     TotalOrderAmount
---------- ---------------------------------------- ----------- ---------------------
QUICK      QUICK-Stop                               10865       17250.00
SAVEA      Save-a-lot Markets                       11030       16321.90
HANAR      Hanari Carnes                            10981       15810.00
KOENE      Königlich Essen                          10817       11490.70
RATTC      Rattlesnake Canyon Grocery               10889       11380.00
HUNGO      Hungry Owl All-Night Grocers             10897       10835.24

(6 row(s) affected)
```

Hint

First, let's get the necessary fields for all orders made in the year 2016. Don't bother grouping yet, just work on the Where clause. You'll need the CustomerID, CompanyName from Customers; OrderID from Orders; and Quantity and unit price from OrderDetails. Order by the total amount of the order, in descending order.

Hint

You should have something like this:

```
Select
    Customers.CustomerID
    ,Customers.CompanyName
    ,Orders.OrderID
    ,Amount = Quantity * UnitPrice
From Customers
    join Orders
        on Orders.CustomerID = Customers.CustomerID
    join OrderDetails
        on Orders.OrderID = OrderDetails.OrderID
Where
    OrderDate >= '20160101'
    and OrderDate  < '20170101'
```

This gives you the total amount for each Order Detail item in 2016 orders, at the Order Detail level. Now, which fields do you need to group on, and which need to be summed?

Hint

```
Select
   Customers.CustomerID
   ,Customers.CompanyName
   ,Orders.OrderID
   ,TotalOrderAmount = sum(Quantity * UnitPrice)
From Customers
   Join Orders
      on Orders.CustomerID = Customers.CustomerID
   Join OrderDetails
      on Orders.OrderID = OrderDetails.OrderID
Where
   OrderDate >= '20160101'
   and OrderDate  < '20170101'
Group By
   Customers.CustomerID
   ,Customers.CompanyName
   ,Orders.OrderID
```

The fields at the Customer and Order level need to be grouped by, and the TotalOrderAmount needs to be summed.

How would you filter on the sum, in order to get orders of $10,000 or more? Can you put it straight into the where clause?

33. High-value customers - total orders

The manager has changed his mind. Instead of requiring that customers have at least one individual orders totaling $10,000 or more, he wants to define high-value customers as those who have orders totaling $15,000 or more in 2016. How would you change the answer to the problem above?

Expected Result

```
CustomerID CompanyName                              TotalOrderAmount
---------- ---------------------------------------- ---------------------
SAVEA      Save-a-lot Markets                       42806.25
ERNSH      Ernst Handel                             42598.90
QUICK      QUICK-Stop                               40526.99
HANAR      Hanari Carnes                            24238.05
HUNGO      Hungry Owl All-Night Grocers             22796.34
RATTC      Rattlesnake Canyon Grocery               21725.60
KOENE      Königlich Essen                          20204.95
FOLKO      Folk och fä HB                           15973.85
WHITC      White Clover Markets                     15278.90

(9 row(s) affected)
```

Hint

This query is almost identical to the one above, but there's just a few lines you need to delete or comment out, to group at a different level.

34. High-value customers - with discount

Change the above query to use the discount when calculating high-value customers. Order by the total amount which includes the discount.

Expected Result

```
CustomerID CompanyName                  TotalsWithoutDiscount
TotalsWithDiscount
---------- ------------------------------ --------------------- ----------------------
ERNSH      Ernst Handel                  42598.90           41210.6500244141
QUICK      QUICK-Stop                    40526.99           37217.3150024414
SAVEA      Save-a-lot Markets            42806.25           36310.1097793579
HANAR      Hanari Carnes                 24238.05           23821.1999893188
RATTC      Rattlesnake Canyon Grocery    21725.60           21238.2704410553
HUNGO      Hungry Owl All-Night Grocers  22796.34
20402.119934082
KOENE      Königlich Essen               20204.95           19582.7739868164
WHITC      White Clover Markets          15278.90           15278.8999862671
FOLKO      Folk och fä HB                15973.85           13644.0674972534
SUPRD      Suprêmes délices              11862.50           11644.5999984741
BOTTM      Bottom-Dollar Markets         12227.40           11338.5500488281

(11 row(s) affected)
```

Hint

To start out, just use the OrderDetails table. You'll need to figure out how the Discount field is structured.

Hint

You should have something like this:

```
Select
    OrderID
    ,ProductID
    ,UnitPrice
    ,Quantity
    ,Discount
    ,TotalWithDisccount = UnitPrice * Quantity * (1- Discount)
from OrderDetails
```

Note that Discount is applied as a percentage. So, if there's a 0.15 in the discount field, you need to multiply the UnitPrice * Quantity by .85 (1.00 - .15). You need parenthesis around (1 - Discount) to make sure that calculation is done first.

35. Month-end orders

At the end of the month, salespeople are likely to try much harder to get orders, to meet their month-end quotas. Show all orders made on the last day of the month. Order by EmployeeID and OrderID

Expected Result

```
EmployeeID  OrderID     OrderDate
----------- ----------- -----------------------
1           10461       2015-02-28 00:00:00.000
1           10616       2015-07-31 00:00:00.000
2           10583       2015-06-30 00:00:00.000
2           10686       2015-09-30 00:00:00.000
2           10989       2016-03-31 00:00:00.000
2           11060       2016-04-30 00:00:00.000
3           10432       2015-01-31 00:00:00.000
3           10806       2015-12-31 00:00:00.000
3           10988       2016-03-31 00:00:00.000
3           11063       2016-04-30 00:00:00.000
4           10343       2014-10-31 00:00:00.000
4           10522       2015-04-30 00:00:00.000
4           10584       2015-06-30 00:00:00.000
4           10617       2015-07-31 00:00:00.000
4           10725       2015-10-31 00:00:00.000
4           10807       2015-12-31 00:00:00.000
4           11061       2016-04-30 00:00:00.000
4           11062       2016-04-30 00:00:00.000
5           10269       2014-07-31 00:00:00.000
6           10317       2014-09-30 00:00:00.000
7           10490       2015-03-31 00:00:00.000
8           10399       2014-12-31 00:00:00.000
8           10460       2015-02-28 00:00:00.000
8           10491       2015-03-31 00:00:00.000
8           10987       2016-03-31 00:00:00.000
9           10687       2015-09-30 00:00:00.000

(26 row(s) affected)
```

Hint

You can work on calculating this yourself, with a combination of date functions such as DateAdd and DateDiff. But feel free to shortcut the process by doing some research online.

36. Orders with many line items

The Northwind mobile app developers are testing an app that customers will use to show orders. In order to make sure that even the largest orders will show up correctly on the app, they'd like some samples of orders that have lots of individual line items. Show the 10 orders with the most line items, in order of total line items.

Expected Result

```
OrderID     TotalOrderDetails
----------- -----------------
11077       25
10979       6
10657       6
10847       6
10845       5
10836       5
10714       5
10670       5
10691       5
10698       5

(10 row(s) affected)
```

Hint

Using Orders and OrderDetails, you'll use Group by and count() functionality.

37. Orders - random assortment

The Northwind mobile app developers would now like to just get a random assortment of orders for beta testing on their app. Show a random set of 2% of all orders.

Expected Result

(note - your results will be different, because we’re returning a random set)

```
OrderID
-----------
11034
10400
10948
10931
10942
10604
10350
10499
10927
10896
10774
10932
10592
10706
10479
10782
10898

(17 row(s) affected)
```

Hint

Note that in the below SQL, the RandomValue field returns the *same* random value for each row. Do some research online to figure out how to get a *new* random value for each row.

```
Select
    OrderID
    , RandomValue = Rand()
From Orders
```

38. Orders - accidental double-entry

Janet Leverling, one of the salespeople, has come to you with a request. She thinks that she accidentally double-entered a line item on an order, with a different ProductID, but the same quantity. She remembers that the quantity was 60 or more. Show all the OrderIDs with line items that match this, in order of OrderID.

Expected Result

```
OrderID
-----------
10263
10263
10990
10658
11030

(5 row(s) affected)
```

Hint

You might start out with something like this:

```
Select
   OrderID
   ,ProductID
   ,Quantity
From OrderDetails
Where Quantity >= 60
```

However, this will only give us the orders where at least one order detail has a quantity of 60 or more. We need to show orders with *more* than one order detail with a quantity of 60 or more. Also, the same value for quantity needs to be there more than once.

Hint

In addition to grouping on the OrderID, we also need to group by the Quantity, since we need to show the order details that have the same quantity, within an order. So, we need to group by both OrderID, and Quantity.

39. Orders - accidental double-entry details

Based on the previous question, we now want to show details of the order, for orders that match the above criteria.

Expected Result

OrderID	ProductID	UnitPrice	Quantity	Discount
10263	16	13.90	60	0.25
10263	30	20.70	60	0.25
10263	24	3.60	65	0
10263	74	8.00	65	0.25
10658	60	34.00	55	0.05
10658	21	10.00	60	0
10658	40	18.40	70	0.05
10658	77	13.00	70	0.05
10990	34	14.00	60	0.15
10990	21	10.00	65	0
10990	55	24.00	65	0.15
10990	61	28.50	66	0.15
11030	29	123.79	60	0.25
11030	5	21.35	70	0
11030	2	19.00	100	0.25
11030	59	55.00	100	0.25

(16 row(s) affected)

Hint

There are many ways of doing this, including CTE (common table expression) and derived tables. I suggest using a CTE and a subquery. Here's a good article on CTEs (https://technet.microsoft.com/en-us/library/ms175972.aspx).

This is an example of a simple CTE in Northwind. It returns orders made by the oldest employee:

```
;with OldestEmployee as (
Select top 1
   EmployeeID
from Employees
order by BirthDate
)
Select
   OrderID
   ,OrderDate
from Orders
where
   EmployeeID in (Select EmployeeID from OldestEmployee)
```

40. Orders - accidental double-entry details, derived table

Here's another way of getting the same results as in the previous problem, using a derived table instead of a CTE. However, there's a bug in this SQL. It returns 20 rows instead of 16. Correct the SQL.

Problem SQL:

```
Select
   OrderDetails.OrderID
   ,ProductID
   ,UnitPrice
   ,Quantity
   ,Discount
From OrderDetails
   Join (
      Select
         OrderID
      From OrderDetails
      Where Quantity >= 60
      Group By OrderID, Quantity
      Having Count(*) > 1
   )  PotentialProblemOrders
      on PotentialProblemOrders.OrderID = OrderDetails.OrderID
Order by OrderID, ProductID
```

Hint

Your first step should be to run the SQL in the derived table

```
Select
   OrderID
From OrderDetails
Where Quantity >= 60
Group By OrderID, Quantity
Having Count(*) > 1
```

What do you notice about the results?

Hint

There are 2 rows for OrderID 10263, because there are 2 sets of rows that have the same, identical quantity, that's 60 or above.

When you do a join to a table that has duplicates, you will get duplicates in the output as well, unless you take steps to avoid it.

Find a single keyword that you can easily add to avoid duplicates in SQL.

41. Late orders

Some customers are complaining about their orders arriving late. Which orders are late?

Expected Result

OrderID	OrderDate	RequiredDate	ShippedDate
10264	2014-07-24	2014-08-21	2014-08-23
10271	2014-08-01	2014-08-29	2014-08-30
10280	2014-08-14	2014-09-11	2014-09-12
10302	2014-09-10	2014-10-08	2014-10-09
10309	2014-09-19	2014-10-17	2014-10-23
10380	2014-12-12	2015-01-09	2015-01-16
10423	2015-01-23	2015-02-06	2015-02-24
10427	2015-01-27	2015-02-24	2015-03-03
10433	2015-02-03	2015-03-03	2015-03-04
10451	2015-02-19	2015-03-05	2015-03-12
10483	2015-03-24	2015-04-21	2015-04-25
10515	2015-04-23	2015-05-07	2015-05-23
10523	2015-05-01	2015-05-29	2015-05-30
10545	2015-05-22	2015-06-19	2015-06-26
10578	2015-06-24	2015-07-22	2015-07-25
10593	2015-07-09	2015-08-06	2015-08-13
10596	2015-07-11	2015-08-08	2015-08-12
10663	2015-09-10	2015-09-24	2015-10-03
10687	2015-09-30	2015-10-28	2015-10-30
10660	2015-09-08	2015-10-06	2015-10-15
10705	2015-10-15	2015-11-12	2015-11-18
10709	2015-10-17	2015-11-14	2015-11-20
10726	2015-11-03	2015-11-17	2015-12-05
10727	2015-11-03	2015-12-01	2015-12-05
10749	2015-11-20	2015-12-18	2015-12-19
10777	2015-12-15	2015-12-29	2016-01-21
10779	2015-12-16	2016-01-13	2016-01-14
10788	2015-12-22	2016-01-19	2016-01-19
10807	2015-12-31	2016-01-28	2016-01-30
10816	2016-01-06	2016-02-03	2016-02-04
10827	2016-01-12	2016-01-26	2016-02-06
10828	2016-01-13	2016-01-27	2016-02-04

10847	2016-01-22	2016-02-05	2016-02-10
10924	2016-03-04	2016-04-01	2016-04-08
10927	2016-03-05	2016-04-02	2016-04-08
10960	2016-03-19	2016-04-02	2016-04-08
10970	2016-03-24	2016-04-07	2016-04-24
10978	2016-03-26	2016-04-23	2016-04-23
10998	2016-04-03	2016-04-17	2016-04-17

(39 row(s) affected)

Hint

To determine which orders are late, you can use a combination of the RequiredDate and ShippedDate. It's not exact, but if ShippedDate is actually AFTER RequiredDate, you can be sure it's late.

42. Late orders - which employees?

Some salespeople have more orders arriving late than others. Maybe they're not following up on the order process, and need more training. Which salespeople have the most orders arriving late?

Expected Result

```
EmployeeID  LastName             TotalLateOrders
----------- -------------------- ---------------
4           Peacock              10
3           Leverling            5
8           Callahan             5
9           Dodsworth            5
7           King                 4
2           Fuller               4
1           Davolio              3
6           Suyama               3

(8 row(s) affected)
```

Hint

The answer from the problem above is a good starting point. You'll need to join to the Employee table to get the last name, and also add Count to show the total late orders.

43. Late orders vs. total orders

Andrew, the VP of sales, has been doing some more thinking some more about the problem of late orders. He realizes that just looking at the number of orders arriving late for each salesperson isn't a good idea. It needs to be compared against the *total* number of orders per salesperson. Return results like the following:

Expected Result

```
EmployeeID  LastName             AllOrders   LateOrders
----------- -------------------- ----------- -----------
1           Davolio              123         3
2           Fuller               96          4
3           Leverling            127         5
4           Peacock              156         10
6           Suyama               67          3
7           King                 72          4
8           Callahan             104         5
9           Dodsworth            43          5

(8 row(s) affected)
```

Hint

You can use more than one CTE in a query. That would be a straightforward way of solving this problem.

Hint

Here are 2 SQL statements that could be put into CTEs and put together into a final SQL statement.

```
-- Late orders
Select
   EmployeeID
   ,TotalOrders = Count(*)
From Orders
Where
   RequiredDate <= ShippedDate
Group By
   EmployeeID

-- Total orders
Select
   EmployeeID
   ,TotalOrders = Count(*)
From Orders
Group By
   EmployeeID
```

44. Late orders vs. total orders - missing employee

There's an employee missing in the answer from the problem above. Fix the SQL to show all employees who have taken orders.

Expected Result

EmployeeID	LastName	AllOrders	LateOrders
1	Davolio	123	3
2	Fuller	96	4
3	Leverling	127	5
4	Peacock	156	10
5	Buchanan	42	NULL
6	Suyama	67	3
7	King	72	4
8	Callahan	104	5
9	Dodsworth	43	5

(9 row(s) affected)

Hint

How many rows are returned when you run just the AllOrders CTE? How about when you run just the LateOrders CTE?

Hint

You'll want to add a left join (also known as a left outer join), to make sure that we show a row, even if there are no late orders.

45. Late orders vs. total orders - fix null

Continuing on the answer for above query, let's fix the results for row 5 - Buchanan. He should have a 0 instead of a Null in LateOrders.

Expected Result

EmployeeID	LastName	AllOrders	LateOrders
1	Davolio	123	3
2	Fuller	96	4
3	Leverling	127	5
4	Peacock	156	10
5	Buchanan	42	0
6	Suyama	67	3
7	King	72	4
8	Callahan	104	5
9	Dodsworth	43	5

(9 row(s) affected)

Hint

Find a function to test if a value is null, and return a different value when it is.

46. Late orders vs. total orders - percentage

Now we want to get the percentage of late orders over total orders.

Expected Result

```
EmployeeID  LastName             AllOrders   LateOrders  PercentLateOrders
----------- -------------------- ----------- ----------- -------------------
1           Davolio              123         3           0.0243902439024
2           Fuller               96          4           0.0416666666666
3           Leverling            127         5           0.0393700787401
4           Peacock              156         10          0.0641025641025
5           Buchanan             42          0           0.0000000000000
6           Suyama               67          3           0.0447761194029
7           King                 72          4           0.0555555555555
8           Callahan             104         5           0.0480769230769
9           Dodsworth            43          5           0.1162790697674

(9 row(s) affected)
```

Hint

By dividing late orders by total orders, you should be able to get the percentage of orders that are late. However, there's a common problem people run into, which is that an integer divided by an integer returns an integer. For instance, if you run the following SQL to divide 3 by 2:

```
select 3/2
```

You’ll get 1 instead of 1.5, because it will return the closest integer.

Do some research online to find the answer to this issue.

47. Late orders vs. total orders - fix decimal

So now for the PercentageLateOrders, we get a decimal value like we should. But to make the output easier to read, let's cut the PercentLateOrders off at 2 digits to the right of the decimal point.

Expected Result

EmployeeID	LastName	AllOrders	LateOrders	PercentLateOrders
1	Davolio	123	3	0.02
2	Fuller	96	4	0.04
3	Leverling	127	5	0.04
4	Peacock	156	10	0.06
5	Buchanan	42	0	0.00
6	Suyama	67	3	0.04
7	King	72	4	0.06
8	Callahan	104	5	0.05
9	Dodsworth	43	5	0.12

(9 row(s) affected)

Hint

One straightforward way of doing this would be to explicitly convert PercentageLateOrders to a specific Decimal data type. With the Decimal datatype, you can specify how many digits you want to the right of the decimal point

Hint

The calculation PercentLateOrders is getting a little long and complicated, and it can be tricky to get all the commas and parenthesis correct.

One way to simplify it is to break it down with an actual value instead of a calculation.

For instance:

```
Select convert(decimal(10,2), 0.0243902439024)
```

48. Customer grouping

Andrew Fuller, the VP of sales at Northwind, would like to do a sales campaign for existing customers. He'd like to categorize customers into groups, based on how much they ordered in 2016. Then, depending on which group the customer is in, he will target the customer with different sales materials.

The customer grouping categories are 0 to 1,000, 1,000 to 5,000, 5,000 to 10,000, and over 10,000.

A good starting point for this query is the answer from the problem “High-value customers - total orders. We don’t want to show customers who don’t have any orders in 2016.

Order the results by CustomerID.

Expected Result

CustomerID	CompanyName	TotalOrderAmount	CustomerGroup
ALFKI	Alfreds Futterkiste	2302.20	Medium
ANATR	Ana Trujillo Emparedados y helados	514.40	Low
ANTON	Antonio Moreno Taquería	660.00	Low
AROUT	Around the Horn	5838.50	High
BERGS	Berglunds snabbköp	8110.55	High
BLAUS	Blauer See Delikatessen	2160.00	Medium
BLONP	Blondesddsl père et fils	730.00	Low
BOLID	Bólido Comidas preparadas	280.00	Low
BONAP	Bon app'	7185.90	High
BOTTM	Bottom-Dollar Markets	12227.40	Very High
BSBEV	B's Beverages	2431.00	Medium
CACTU	Cactus Comidas para llevar	1576.80	Medium
CHOPS	Chop-suey Chinese	4429.40	Medium

... (skipping some rows)

SPLIR	Split Rail Beer & Ale	1117.00	Medium
SUPRD	Suprêmes délices	11862.50	Very High
THEBI	The Big Cheese	69.60	Low
THECR	The Cracker Box	326.00	Low
TOMSP	Toms Spezialitäten	910.40	Low
TORTU	Tortuga Restaurante	1874.50	Medium
TRADH	Tradição Hipermercados	4401.62	Medium
TRAIH	Trail's Head Gourmet Provisioners	237.90	Low
VAFFE	Vaffeljernet	4333.50	Medium
VICTE	Victuailles en stock	3022.00	Medium
WANDK	Die Wandernde Kuh	1564.00	Medium
WARTH	Wartian Herkku	300.00	Low
WELLI	Wellington Importadora	1245.00	Medium
WHITC	White Clover Markets	15278.90	Very High
WILMK	Wilman Kala	1987.00	Medium
WOLZA	Wolski Zajazd	1865.10	Medium

(81 row(s) affected)

Hint

This is the SQL from the problem “High-value customers - total orders”, but without the filter for order totals over 10,000.

```
Select
    Customers.CustomerID
    ,Customers.CompanyName
    ,TotalOrderAmount = SUM(Quantity * UnitPrice)
From Customers
    Join Orders
        on Orders.CustomerID = Customers.CustomerID
    Join OrderDetails
        on Orders.OrderID = OrderDetails.OrderID
Where
    OrderDate >= '20160101'
    and OrderDate  < '20170101'
Group By
    Customers.CustomerID
    ,Customers.CompanyName
Order By TotalOrderAmount Desc;
```

Hint

You can use the above SQL in a CTE (common table expression), and then build on it, using a Case statement on the TotalOrderAmount.

49. Customer grouping - fix null

There's a bug with the answer for the previous question. The CustomerGroup value for one of the rows is null.

Fix the SQL so that there are no nulls in the CustomerGroup field.

Expected Result

(Including only a subset of the output)

CustomerID	CompanyName	TotalOrderAmount	CustomerGroup
LILAS	LILA-Supermercado	5994.06	High
LINOD	LINO-Delicateses	10085.60	Very High
LONEP	Lonesome Pine Restaurant	1709.40	Medium
MAGAA	Magazzini Alimentari Riuniti	1693.00	Medium
MAISD	Maison Dewey	5000.20	High
MORGK	Morgenstern Gesundkost	245.00	Low
NORTS	North/South	45.00	Low
OCEAN	Océano Atlántico Ltda.	3031.00	Medium
OLDWO	Old World Delicatessen	5337.65	High
OTTIK	Ottilies Käseladen	3012.70	Medium
PERIC	Pericles Comidas clásicas	1496.00	Medium
PICCO	Piccolo und mehr	4393.75	Medium
PRINI	Princesa Isabel Vinhos	2633.90	Medium
QUEDE	Que Delícia	1353.60	Medium
QUEEN	Queen Cozinha	7007.65	High
QUICK	QUICK-Stop	40526.99	Very High
RANCH	Rancho grande	1694.70	Medium
RATTC	Rattlesnake Canyon Grocery	21725.60	Very High
REGGC	Reggiani Caseifici	4263.00	Medium
RICAR	Ricardo Adocicados	7312.00	High

Hint

What is the total order amount for CustomerID MAISD? How does that relate to our CustomerGroup boundaries?

Hint

Using “between” works well for integer values. However, the value we're working with is Money, which has decimals. Instead of something like:

```
when TotalOrderAmount between 0 and 1000 then 'Low'
```

You'll need to something like this:

```
when TotalOrderAmount >= 0 and TotalOrderAmount  < 1000 then 'Low'
```

50. Customer grouping with percentage

Based on the above query, show all the defined CustomerGroups, and the percentage in each. Sort by the total in each group, in descending order.

Expected Result

```
CustomerGroup TotalInGroup PercentageInGroup
------------- ------------ ---------------------------------------
Medium        35           0.432098765432
Low           20           0.246913580246
High          13           0.160493827160
Very High     13           0.160493827160

(4 row(s) affected)
```

Hint

As a starting point, you can use the answer from the problem “Customer grouping - fix null”.

Hint

We no longer need to show the CustomerID and CompanyName in the final output. However, we need to count how many customers are in each CustomerGrouping. You can create another CTE level in order to get the counts in each CustomerGrouping for the final output.

51. Customer grouping - flexible

Andrew, the VP of Sales is still thinking about how best to group customers, and define low, medium, high, and very high value customers. He now wants complete flexibility in grouping the customers, based on the dollar amount they've ordered. He doesn't want to have to edit SQL in order to change the boundaries of the customer groups.

How would you write the SQL?

There's a table called CustomerGroupThreshold that you will need to use. Use only orders from 2016.

Expected Result

(The expected results are the same as for the original problem, it’s just that we’re getting the answer differently.)

```
CustomerID CompanyName                              TotalOrderAmount
CustomerGroupName
---------- ---------------------------------------- -------------------- --------------------
ALFKI      Alfreds Futterkiste                      2302.20              Medium
ANATR      Ana Trujillo Emparedados y helados       514.40               Low
ANTON      Antonio Moreno Taquería                  660.00               Low
AROUT      Around the Horn                          5838.50              High
BERGS      Berglunds snabbköp                       8110.55              High
BLAUS      Blauer See Delikatessen                  2160.00              Medium
BLONP      Blondesddsl père et fils                 730.00               Low
BOLID      Bólido Comidas preparadas                280.00               Low
BONAP      Bon app'                                 7185.90              High
BOTTM      Bottom-Dollar Markets                    12227.40             Very High
BSBEV      B's Beverages                            2431.00              Medium
CACTU      Cactus Comidas para llevar               1576.80              Medium
CHOPS      Chop-suey Chinese                        4429.40              Medium
COMMI      Comércio Mineiro                         513.75               Low

... (skipping some rows)

SPLIR      Split Rail Beer & Ale                    1117.00              Medium
SUPRD      Suprêmes délices                         11862.50             Very High
THEBI      The Big Cheese                           69.60                Low
THECR      The Cracker Box                          326.00               Low
TOMSP      Toms Spezialitäten                       910.40               Low
TORTU      Tortuga Restaurante                      1874.50              Medium
TRADH      Tradição Hipermercados                   4401.62              Medium
TRAIH      Trail's Head Gourmet Provisioners        237.90               Low
VAFFE      Vaffeljernet                             4333.50              Medium
VICTE      Victuailles en stock                     3022.00              Medium
```

WANDK	Die Wandernde Kuh	1564.00	Medium
WARTH	Wartian Herkku	300.00	Low
WELLI	Wellington Importadora	1245.00	Medium
WHITC	White Clover Markets	15278.90	Very High
WILMK	Wilman Kala	1987.00	Medium
WOLZA	Wolski Zajazd	1865.10	Medium

(81 row(s) affected)

Hint

As a starting point, use the SQL of the first CTE from the problem "Customer grouping with percentage"

```
Select
   Customers.CustomerID
   ,Customers.CompanyName
   ,TotalOrderAmount = SUM(Quantity * UnitPrice)
From Customers
   join Orders
      on Orders.CustomerID = Customers.CustomerID
   join OrderDetails
      on Orders.OrderID = OrderDetails.OrderID
Where
   OrderDate >= '20160101'
   and OrderDate  < '20170101'
Group By
   Customers.CustomerID
   ,Customers.CompanyName
```

Hint

When thinking about how to use the table CustomerGroupThreshold, note that when joining to a table, you don't need to only use an equi-join (i.e., “=“ in the join). You can also use other operators, such as between, and greater than/less than (> and <).

52. Countries with suppliers or customers

Some Northwind employees are planning a business trip, and would like to visit as many suppliers and customers as possible. For their planning, they'd like to see a list of all countries where suppliers and/or customers are based.

Expected Results

```
Country
---------------
Argentina
Australia
Austria
Belgium
Brazil
Canada
Denmark
Finland
France
Germany
Ireland
Italy
Japan
Mexico
Netherlands
Norway
Poland
Portugal
Singapore
Spain
Sweden
Switzerland
UK
USA
Venezuela

(25 row(s) affected)
```

Hint

Use the Union statekent for this. It’s a good way of putting together a simple resultset from multiple SQL statements.

53. Countries with suppliers or customers, version 2

The employees going on the business trip don’t want just a raw list of countries, they want more details. We’d like to see output like the below, in the Expected Results.

Expected Result

```
SupplierCountry CustomerCountry
--------------- ---------------
NULL            Argentina
Australia       NULL
NULL            Austria
NULL            Belgium
Brazil          Brazil
Canada          Canada
Denmark         Denmark
Finland         Finland
France          France
Germany         Germany
NULL            Ireland
Italy           Italy
Japan           NULL
NULL            Mexico
Netherlands     NULL
Norway          Norway
NULL            Poland
NULL            Portugal
Singapore       NULL
Spain           Spain
Sweden          Sweden
NULL            Switzerland
UK              UK
USA             USA
NULL            Venezuela

(25 row(s) affected)
```

Hint

A good way to start would be with a list of countries from the Suppliers table, and a list of countries from the Customers table. Use either Distinct or Group by to avoid duplicating countries. Sort by country name

Hint

You should have something like this:

```
Select Distinct Country from Customers
Select Distinct Country from Suppliers
```

You can combine these with a CTEs or derived tables.

Note that there’s a specific type of outer join you’ll need, designed to return rows from *either* resultset. What is it? Look online for the different types of outer join available.

54. Countries with suppliers or customers - version 3

The output of the above is improved, but it’s still not ideal

What we’d really like to see is the country name, the total suppliers, and the total customers.

Expected Result

```
Country        TotalSuppliers TotalCustomers
--------------- -------------- --------------
Argentina      0              3
Australia      2              0
Austria        0              2
Belgium        0              2
Brazil         1              9
Canada         2              3
Denmark        1              2
Finland        1              2
France         3              11
Germany        3              11
Ireland        0              1
Italy          2              3
Japan          2              0
Mexico         0              5
Netherlands    1              0
Norway         1              1
Poland         0              1
Portugal       0              2
Singapore      1              0
Spain          1              5
Sweden         2              2
Switzerland    0              2
UK             2              7
USA            4              13
Venezuela      0              4

(25 row(s) affected)
```

Hint

You should be able to use the above query, and make a few changes to the CTE source queries to show the total number of Supplier countries and Customer countries. You won’t be able to use the Distinct keyword anymore.

Hint

When joining the 2 CTEs together, you can use a computed column, with the IsNull function to show a non-null Country field, instead of the Supplier country or the Customer country.

55. First order in each country

Looking at the Orders table—we'd like to show details for each order that was the first in that particular country, ordered by OrderID.

So, we need one row per ShipCountry, and CustomerID, OrderID, and OrderDate should be of the first order from that country.

Expected Results

```
ShipCountry     CustomerID OrderID     OrderDate
--------------- ---------- ----------- ----------
Argentina       OCEAN      10409       2015-01-09
Austria         ERNSH      10258       2014-07-17
Belgium         SUPRD      10252       2014-07-09
Brazil          HANAR      10250       2014-07-08
Canada          MEREP      10332       2014-10-17
Denmark         SIMOB      10341       2014-10-29
Finland         WARTH      10266       2014-07-26
France          VINET      10248       2014-07-04
Germany         TOMSP      10249       2014-07-05
Ireland         HUNGO      10298       2014-09-05
Italy           MAGAA      10275       2014-08-07
Mexico          CENTC      10259       2014-07-18
Norway          SANTG      10387       2014-12-18
Poland          WOLZA      10374       2014-12-05
Portugal        FURIB      10328       2014-10-14
Spain           ROMEY      10281       2014-08-14
Sweden          FOLKO      10264       2014-07-24
Switzerland     CHOPS      10254       2014-07-11
UK              BSBEV      10289       2014-08-26
USA             RATTC      10262       2014-07-22
Venezuela       HILAA      10257       2014-07-16

(21 row(s) affected)
```

Hint

Your first step will probably be to create a query like this:

```
Select
    ShipCountry
    ,CustomerID
    ,OrderID
    ,OrderDate = convert(date, OrderDate)
From orders
Order by
    ShipCountry
    ,OrderID
```

…which shows all the rows in the Order table, sorted first by Country and then by OrderID.

Hint

Your next step is to create a computed column that shows the row number for each order, partitioned appropriately.

There’s a class of functions called Window functions or Ranking functions that you can use for this problem. Specifically, use the Row_Number() function, with the Over and Partition clause, to get the number, per country, of a particular order.

Hint

You’ll have something like this:

```
Select
    ShipCountry
    ,CustomerID
    ,OrderID
    ,OrderDate = convert(date, OrderDate)
    ,RowNumberPerCountry =
        Row_Number()
            over (Partition by ShipCountry Order by ShipCountry, OrderID)
From Orders
```

Because of some limitations with Window functions, you can’t directly filter the computed column created above. Use a CTE to solve the problem.

56. Customers with multiple orders in 5 day period

There are some customers for whom freight is a major expense when ordering from Northwind.

However, by batching up their orders, and making one larger order instead of multiple smaller orders in a short period of time, they could reduce their freight costs significantly.

Show those customers who have made more than 1 order in a 5 day period. The sales people will use this to help customers reduce their costs.

Note: There are more than one way of solving this kind of problem. For this problem, we will *not* be using Window functions.

Expected Result

```
CustomerID InitialOrderID InitialOrderDate NextOrderID NextOrderDate
DaysBetween
---------- -------------- ---------------- ----------- ------------- -----------
ANTON      10677          2015-09-22       10682       2015-09-25    3
AROUT      10741          2015-11-14       10743       2015-11-17    3
BERGS      10278          2014-08-12       10280       2014-08-14    2
BERGS      10444          2015-02-12       10445       2015-02-13    1
BERGS      10866          2016-02-03       10875       2016-02-06    3
BONAP      10730          2015-11-05       10732       2015-11-06    1
BONAP      10871          2016-02-05       10876       2016-02-09    4
BONAP      10932          2016-03-06       10940       2016-03-11    5
BOTTM      10410          2015-01-10       10411       2015-01-10    0
BOTTM      10944          2016-03-12       10949       2016-03-13    1
BOTTM      10975          2016-03-25       10982       2016-03-27    2
BOTTM      11045          2016-04-23       11048       2016-04-24    1
BSBEV      10538          2015-05-15       10539       2015-05-16    1
BSBEV      10943          2016-03-11       10947       2016-03-13    2

... (skipping some rows)

SEVES      10800          2015-12-26       10804       2015-12-30    4
SUPRD      10841          2016-01-20       10846       2016-01-22    2
SUPRD      11035          2016-04-20       11038       2016-04-21    1
TRADH      10830          2016-01-13       10834       2016-01-15    2
TRADH      10834          2016-01-15       10839       2016-01-19    4
TRAIH      10574          2015-06-19       10577       2015-06-23    4
VICTE      10806          2015-12-31       10814       2016-01-05    5
VICTE      10843          2016-01-21       10850       2016-01-23    2
VINET      10737          2015-11-11       10739       2015-11-12    1
WARTH      10412          2015-01-13       10416       2015-01-16    3
WELLI      10803          2015-12-30       10809       2016-01-01    2
WELLI      10900          2016-02-20       10905       2016-02-24    4
WHITC      10693          2015-10-06       10696       2015-10-08    2
WILMK      10873          2016-02-06       10879       2016-02-10    4

(71 row(s) affected)
```

Hint

You can use a self-join, with 2 instances of the Orders table, joined by CustomerID. Good naming for the table aliases (table instances) are important for readability. Don't name them Order1 and Order2.

Hint

```
Select
    InitialOrder.CustomerID
    ,InitialOrderID = InitialOrder.OrderID
    ,InitialOrderDate = InitialOrder.OrderDate
    ,NextOrderID = NextOrder.OrderID
    ,NextOrderDate = NextOrder.OrderDate
from Orders InitialOrder
    join Orders NextOrder
        on InitialOrder.CustomerID = NextOrder.CustomerID
Order by
    InitialOrder.CustomerID
    ,InitialOrder.OrderID
```

This is a good start. You will need to filter on additional fields in the join clause between InitialOrder and NextOrder, because as it is, this returns far too many orders. It has what's called a cartesian product between the 2 instances of the Orders table. This means that for the total number of orders for a particular customer in Orders, you'll have that number, squared, in the output.

Look at some of the OrderID and OrderDate values in InitialOrder and NextOrder. Some of them definitely disqualify a row based on our criteria.

Hint

Should the OrderID of the NextOrder ever be less than or equal to the OrderID of the NextOrder?

Hint

Based on the hint above, we added a where clause.

```
Select
   InitialOrder.CustomerID
   ,InitialOrderID = InitialOrder.OrderID
   ,InitialOrderDate = InitialOrder.OrderDate
   ,NextOrderID = NextOrder.OrderID
   ,NextOrderDate = NextOrder.OrderDate
from Orders InitialOrder
   join Orders NextOrder
      on InitialOrder.CustomerID = NextOrder.CustomerID
where
   InitialOrder.OrderID < NextOrder.OrderID
Order by
   InitialOrder.CustomerID
   ,InitialOrder.OrderID
```

Adding this filter:

```
and InitialOrder.OrderID < NextOrder.OrderID
```

…has cut down the output a lot. However, we still need to filter for the 5 day period.

Create a new field called DaysBetween that calculates the number of days between the InitialOrder OrderDate and the NextOrder OrderDate. Use the DateDiff function.

Hint

You should now have a line like this:

```
DaysBetween = datediff(dd, InitialOrder.OrderDate, NextOrder.OrderDate)
```

Use this calculation in the Where clause to filter for 5 days or less between orders.

57. Customers with multiple orders in 5 day period, version 2

There's another way of solving the problem above, using Window functions. We would like to see the following results.

Expected Results

```
CustomerID OrderDate  NextOrderDate DaysBetweenOrders
---------- ---------- ------------- -----------------
ANTON      2015-09-22 2015-09-25    3
AROUT      2015-11-14 2015-11-17    3
BERGS      2014-08-12 2014-08-14    2
BERGS      2015-02-12 2015-02-13    1
BERGS      2016-02-03 2016-02-06    3
BONAP      2015-11-05 2015-11-06    1
BONAP      2016-02-05 2016-02-09    4
BONAP      2016-03-06 2016-03-11    5
BOTTM      2015-01-10 2015-01-10    0
BOTTM      2016-03-12 2016-03-13    1
BOTTM      2016-03-25 2016-03-27    2
BOTTM      2016-04-23 2016-04-24    1

... (skipping some rows)

SAVEA      2016-03-27 2016-03-30    3
SAVEA      2016-04-17 2016-04-17    0
SEVES      2015-12-26 2015-12-30    4
SUPRD      2016-01-20 2016-01-22    2
SUPRD      2016-04-20 2016-04-21    1
TRADH      2016-01-13 2016-01-15    2
TRADH      2016-01-15 2016-01-19    4
TRAIH      2015-06-19 2015-06-23    4
VICTE      2015-12-31 2016-01-05    5
VICTE      2016-01-21 2016-01-23    2
VINET      2015-11-11 2015-11-12    1
WARTH      2015-01-13 2015-01-16    3
WELLI      2015-12-30 2016-01-01    2
WELLI      2016-02-20 2016-02-24    4
WHITC      2015-10-06 2015-10-08    2
WILMK      2016-02-06 2016-02-10    4

(69 row(s) affected)
```

Hint

The window function to use here is the Lead function.

Look up some examples of the Lead function online.

As a first step, write SQL using the Lead function to return results like the following. The NextOrderDate is a computed column that uses the Lead function.

```
CustomerID OrderDate  NextOrderDate
---------- ---------- -------------
ALFKI      2015-08-25 2015-10-03
ALFKI      2015-10-03 2015-10-13
ALFKI      2015-10-13 2016-01-15
ALFKI      2016-01-15 2016-03-16
ALFKI      2016-03-16 2016-04-09
ALFKI      2016-04-09 NULL
ANATR      2014-09-18 2015-08-08
ANATR      2015-08-08 2015-11-28
ANATR      2015-11-28 2016-03-04
ANATR      2016-03-04 NULL
```

Hint

You should have something like this:

```
Select
   CustomerID
   ,OrderDate = convert(date, OrderDate)
   ,NextOrderDate =
      convert(
         date
         ,Lead(OrderDate,1)
            OVER (Partition by CustomerID order by CustomerID, OrderDate)
         )
From Orders
Order by
   CustomerID
   ,OrderID
```

Now, take the output of this, and using a CTE and the DateDiff function, filter for rows which match our criteria.

Congratulations! You've completed the advanced problems

Any questions or feedback on the problems, hints, or answers? I'd like to hear from you. Please email me at feedback@SQLPracticeProblems.com.

ANSWERS

Introductory Problems

1. Which shippers do we have?

Answer

Select
 *
From Shippers

Discussion

This is a basic select statement, returning all rows, just to get you warmed up.

Most of the time, a simple select statement like this is written all on one line, like this:

```
Select * From Shippers
```

But because we'll be getting more complex quickly, we'll start out with formatting it with separate lines for each clause, which we'll be doing in future questions.

2. Certain fields from Categories

Answer

```
Select
   CategoryName
   ,Description
from Categories
```

Discussion

Instead of doing a “Select *”, we specify the column names, and only get those columns returned.

3. Sales Representatives

Answer

```sql
Select
    FirstName
    ,LastName
    ,HireDate
From Employees
Where
    Title = 'Sales Representative'
```

Discussion

This is a simple filter against a string datatype. When comparing a value to a string datatype, you need to enclose the value in single quotes.

What happens when you don't? Try running the following:

```
Select
   FirstName
   ,LastName
   ,HireDate
From Employees
Where
   Title = Sales Representative
```

Notice that SQL Server gives the error:

Incorrect syntax near 'Representative'.

What about if you compare against a number? Try the following:

```
Select
   FirstName
   ,LastName
   ,HireDate
From Employees
Where
   Title = 1
```

You should get a conversion failure error.

4. Sales Representatives in the United States

Answer

```
Select
   FirstName
   ,LastName
   ,HireDate
From Employees
Where
   Title = 'Sales Representative'
   and Country = 'USA'
```

Discussion

You can have as many filters in the where clause as you need. I usually indent all the filters, and put them on new lines, in order to make it easier to read.

5. Orders placed by specific EmployeeID

Answer

```
Select
   OrderID
   ,OrderDate
From Orders
Where
   EmployeeID = 5
```

Discussion

This simple query filters for one value in the EmployeeID field, using the “=” comparison operator.

Here’s another set of very commonly used comparison operators that you’re probably familiar with from math class:

>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to

6. Suppliers and ContactTitles

Answer

```
Select
   SupplierID
   ,ContactName
   ,ContactTitle
From Suppliers
Where
   ContactTitle <> 'Marketing Manager'
```

Discussion

Another way of expressing the Not is by using the following

!=

So, the below is equivalent to the answer with “<>”.

```
Select
   CompanyName
   ,ContactName
   ,ContactTitle
From Suppliers
Where
   ContactTitle != 'Marketing Manager'
```

7. Products with “queso” in ProductName

Answer

```
Select
   ProductID
   ,ProductName
From Products
Where
   ProductName like '%queso%'
```

Discussion

The “Like” operator is always used with wildcards, such as the percent symbol (%), which substitutes for any number of characters.

Note that even though the search string used a lowercase “q” with the Like clause

```
ProductName like '%queso%'
```

the resulting rows both had an uppercase Q.

Queso Cabrales

Queso Manchego La Pastora

This is because the default installation of SQL Server is case insensitive, although it is also possible to have a case-sensitive installation.

8. Orders shipping to France or Belgium

Answer

```sql
Select
    OrderID
    ,CustomerID
    ,ShipCountry
From Orders
where
    ShipCountry = 'France'
    or ShipCountry = 'Belgium'
```

Discussion

This is a very simple example, but in many situations you will have multiple where clauses, with combined “Or” and “And” sections.

In this situation, an alternative would have been to use the “In” operator. We’ll do that in a future problem.

9. Orders shipping to any country in Europe

Answer

```
Select
   OrderID
   ,CustomerID
   ,ShipCountry
From Orders
where
   ShipCountry in
      (
      'Brazil'
      ,'Mexico'
      ,'Argentina'
      ,'Venezuela'
      )
```

Discussion

Using the In statement like this is a very common scenario when writing SQL. Whenever there’s more than just a few—say 2 or 3—values that we’re filtering for, I will generally put them on separate lines. It’s easier to read, understand, and modify.

Also, many times the list of items you’re filtering for will be coming from somewhere else—for instance, a spreadsheet—and will already be on separate lines.

10. Employees, in order of age

Answer

```
Select
   FirstName
   ,LastName
   ,Title
   ,BirthDate
From Employees
Order By Birthdate
```

Discussion

This is a simple example of an Order By clause.

By default, SQL Server sorts by ascending order (first to last). To sort in desending order (last to first), run the following, with the **desc** keyword:

```
Select
    FirstName
    ,LastName
    ,Title
    ,BirthDate
From Employees
Order By Birthdate desc  -- keyword desc for last to first search
```

11. Showing only the Date with a DateTime field

Answer

```
Select
   FirstName
   ,LastName
   ,Title
   ,DateOnlyBirthDate = convert(date, BirthDate)
From Employees
Order By Birthdate
```

Discussion

What we’re using here is called a computed column, also sometimes called a calculated column. Anytime you’re doing something besides just returning the column, as it is stored in the database, you’re using a computed column. In this case, we’re applying a function to convert the datatype returned.

Note that we’ve added a name, DateOnlyBirthDate, for our computed column. This is called an “alias”.

```
DateOnlyBirthDate = convert(date, BirthDate)
```

If you don’t actually specify the column alias, you get an empty column header, which is very unhelpful.

12. Employees full name

Answer

```
Select
    FirstName
    ,LastName
    ,FullName = FirstName + ' ' + LastName
From Employees
```

Discussion

This is another example of the computed column. In this case, instead of applying a function to a field, we're concatenating two fields.

Another way to do concatenation, as of SQL Server 2012, is using the Concat function, as below.

```
Select
   FirstName
   ,LastName
   ,FullName = concat(FirstName , ' ' , LastName)
From Employees
```

The Concat function isn't very well known yet, since SQL programmers are more familiar with using the + operator to concatenate strings. However, there are benefits to using Concat — mainly when there are nulls in the data.

13. OrderDetails amount per line item

Answer

```
Select
   OrderID
   ,ProductID
   ,UnitPrice
   ,Quantity
   ,TotalPrice = UnitPrice * Quantity
From OrderDetails
Order by
   OrderID
   ,ProductID
```

Discussion

Here we have another example of a computed column, this time using the arithmetic operator “*”for multiplication.

A note on aliases—I believe the alias structure that I have above, with the alias name first and the computation after, is easiset to read.

However, you’ll also very frequently see this structure, using “as”:

```
Select
   OrderID
   ,ProductID
   ,UnitPrice
   ,Quantity
   ,UnitPrice * Quantity as TotalPrice    -- Alias using "as"
From OrderDetails
Order by
   OrderID
   ,ProductID
```

14. How many customers?

Answer

```
Select
   TotalCustomers = count(*)
from Customers
```

Discussion

Aggregates functions and grouping are very important when retrieving data. In almost all cases, when doing data analysis, you’ll be using multiple groupings and aggregates.

15. When was the first order?

Answer

```
Select
   FirstOrder = min(OrderDate)
From Orders
```

Discussion

For the aggregate function Count, you don’t need to specify a column name - just count(*) will work.

However, for other aggregate functions such as Min, Avg, Sum, etc, you will need to specify a column name since you’re not just counting all rows.

16. Countries where there are customers

Answer

```
Select
   Country
From Customers
Group by
   Country
```

Discussion

The Group By clause is a cornerstone of SQL. With most data analysis of any complexity at all, you'll be using multiple Group By clauses, so they're important to understand.

Another way of getting the same results is to use the Distinct keyword, as below:

```
Select distinct
    Country
From Customers
```

It looks simpler, and it is, for queries that are very straightforward. But in everyday use, you'll almost always be using the Group By instead of Distinct, because you'll need to use additional aggregate functions such as Count, and Sum.

17. Contact titles for customers

Answer

```
Select
   ContactTitle
   ,TotalContactTitle = count(*)
From Customers
Group by
   ContactTitle
Order by
   count(*) desc
```

Discussion

This particular construction, with a grouping, and then a count of the total in each group, is very common both on its own, and as a part of other queries.

18. Products with associated supplier names

Answer

```
Select
   ProductID
   ,ProductName
   ,Supplier = CompanyName
From Products
   Join Suppliers
      on Products.SupplierID = Suppliers.SupplierID
```

Discussion

Joins can range from the very simple, which we have here, to the very complex. You need to understand them thoroughly, as they're critical in writing anything but the simplest SQL.

One thing you'll see when reading SQL code is, instead of something like the answer above, something like this:

```
Select
   ProductID
   ,ProductName
   ,Supplier = CompanyName
From Products P          -- Aliased table
   Join Suppliers S     -- Aliased table
      on P.SupplierID = S.SupplierID
```

Notice that the Products table and Suppliers table is aliased, or renamed, with one letter aliases—P and S. If this is done, the P and S need to be used in the On clause as well.

I'm not a fan of this type of aliasing, although it's common. The only benefit is avoiding some typing, which is trivial. But the downside is severe—it leads to code that is much harder to read.

It's not so much a problem in small chunks of SQL like this one. However, in long, convoluted SQL, you'll find yourself wondering what the one-letter aliases mean, always needing to refer back to the From clause, and translate in your head.

The only time I use tables aliases is if the table name is extremely long. And then, I use table alias names that are understandable, just shortened.

19. Orders and the Shipper that was used

Answer

```
Select
   OrderID
   ,OrderDate = convert(date, OrderDate)
   ,Shipper =  CompanyName
From Orders
   join Shippers
      on Shippers.ShipperID = Orders.ShipVia
Where
   OrderID < 10300
Order by
   OrderID
```

Discussion

One common coding practice is to write the SQL as follows, with a table alias added to each column in the Select statement:

```
Select
   O.OrderID
   ,OrderDate = convert(date, O.OrderDate)
   ,Shipper =  S.CompanyName
From Orders O
   join Shippers S
      on S.ShipperID = O.ShipVia
Where
   O.OrderID < 10300
Order by
   O.OrderID
```

In this case O is prefixed to the fields from the Orders table, and S to the fields from the Shippers table.

Usually I don't do this—I think it just adds extra text without enhancing readability.

However, it is sometimes impossible to run SQL without prefixing the column name with the table name. For instance, try running the following:

```
Select
   ProductID
   ,ProductName
   ,Supplier = CompanyName
   ,SupplierID
From Products
   Join Suppliers
```

```sql
on Products.SupplierID = Suppliers.SupplierID
```

What error do you get? Fix the error by adding a table name in front of the SupplierID.

Adding a table name to SupplierID is necessary because otherwise SQL Server doesn’t know if you want to return the SupplierID from Products or Suppliers.

Intermediate Problems

20. Categories, and the total products in each category

Answer

```
Select
  CategoryName
  ,TotalProducts = count(*)
From Products
  Join Categories
    on Products.CategoryID = Categories.CategoryID
Group by
  CategoryName
Order by
  count(*) desc
```

Discussion

We're expanding our knowledge of grouping here with a very common scenario—grouping across two joined tables. In this case, the tables have what's called a parent-child relationship. The parent table is Categories, and the child table is Products.

21. Total customers per country/city

Answer

```
Select
    Country
    ,City
    ,TotalCustomer = Count(*)
From Customers
Group by
    Country
    ,City
Order by
    count(*) desc
```

Discussion

Note that once you have a Group by clause in a SQL statement, every field that appears in the Select statement needs to either appear in the Group by clause, or needs to have some kind of aggregate function applied to it.

For instance, try running the following, with the City in the Group by clause commented out, so we're no longer grouping by City.

```
Select
    Country
    ,City
    ,TotalCustomer = Count(*)
From Customers
Group by
    Country
    --,City
Order by
    count(*) desc
```

When you run this, you should receive this error message:

Msg 8120, Level 16, State 1, Line 3
Column 'Customers.City' is invalid in the select list because it is not contained in either an aggregate function or the GROUP BY clause.

This means that the query engine doesn't know *which* City that you want to display. Every field in the Select clause needs to either have an aggregate function (like Sum, Count, etc), or also be in the Group by. The reason behind this is that there could potentially be multiple different cities for any one value in the Country, and the database engine wouldn’t know whinch one to show.

22. Products that need reordering

Answer

```
Select
   ProductID
   ,ProductName
   ,UnitsInStock
   ,ReorderLevel
From Products
Where
   UnitsInStock <= ReorderLevel
Order by ProductID
```

Discussion

This is a straightforward query on one table. Instead of using a string or numeric value to filter, we’re using another field.

23. Products that need reordering, continued

Answer

```
Select
   ProductID
   ,ProductName
   ,UnitsInStock
   ,UnitsOnOrder
   ,ReorderLevel
   ,Discontinued
From Products
Where
   UnitsInStock + UnitsOnOrder <= ReorderLevel
   and Discontinued = 0
Order by ProductID
```

Discussion

Instead of writing

```
and Discontinued = 0
```

…you can also write the following if you find it easier to read:

```
and Discontinued = convert(bit, 'FALSE')
```

SQL Server will automatically convert it to 0.

24. Customer list by region

Answer

```
Select
    CustomerID
    ,CompanyName
    ,Region
From Customers
Order By
    Case
        when Region is null then 1
        else 0
    End
    ,Region
    ,CustomerID
```

Discussion

Once we have the Case expression set up correctly, you just need to create an Order By clause for it, and add the additional fields for sorting (Region and CustomerID).

If we had wanted to include the sorting field in the output , you could write this:

```
Select
   CustomerID
   ,CompanyName
   ,Region
   ,RegionOrder=
      Case
      when Region is null then 1
      else 0
   End
From Customers
Order By
   RegionOrder
   ,Region
   ,CustomerID
```

You would not need to repeat the case statement in the Order By, you can just refer to the alias - RegionOrder.

25. High freight charges

Answer

```
Select Top 3
   ShipCountry
   ,AverageFreight = Avg(freight)
From Orders
Group By ShipCountry
Order By AverageFreight desc;
```

Discussion

Using Top is the easiest and most commonly used method of showing only a certain number of records. Another way is by using Offset, as below.

```
Select
   ShipCountry
   ,AverageFreight = AVG(freight)
From Orders
Group By ShipCountry
Order by AverageFreight DESC
OFFSET 0 ROWS FETCH FIRST 3 ROWS ONLY
```

26. High freight charges - 2015

Answer

```
Select Top 3
   ShipCountry
   ,AverageFreight = avg(freight)
From Orders
Where
   OrderDate >= '20150101'
   and OrderDate  < '20160101'
Group By ShipCountry
Order By AverageFreight desc;
```

Discussion

An alternate way to write the where clause is this:

```
Where
   OrderDate >= '1/1/2015'
   and OrderDate  < '1/1/2016'
```

Depending on which date format you're used to, it may be easier to read. However, using the format YYYYMMDD will be correct world-wide, regardless of the DateFormat setting in SQL Server.

And here's still another way of writing this:

```
Select Top 3
   ShipCountry
   ,AverageFreight = avg(freight)
From Orders
Where
   year(OrderDate) = 2015          -- using Year function
Group By ShipCountry
Order By AverageFreight desc;
```

This looks straightforward and is easy to read. However, when you put a function such as Year on the OrderDate field, we can't use the index anymore. Also, you can only filter for specific calendar years, so it's not very flexible.

27. High freight charges with between

Answer

The OrderID that’s causing the different results is 10806.

Discussion

There’s an order made on December 31, 2015 with a really high value in the Freight field. This would have skewed the results, and put France in third place for highest freight charges, but only if it were included in the Where clause.

This SQL would have worked fine if OrderDate were a Date field, instead of DateTime.

```
OrderDate between '1/1/2015' and '12/31/2015'
```

However, since it’s a DateTime field, it gives an incorrect answer because it's not taking into account records where the OrderDate is *during the day* on December 31, 2015.

Note that for a DateTime field, the value

    12/31/2015

is equivalent *only* to

    2015-12-31 00:00:00.000

…and *not* to values that have a time component.

28. High freight charges - last year

Answer

```
Select TOP (3)
   ShipCountry
   ,AverageFreight = Avg(freight)
From Orders
Where
   OrderDate >= Dateadd(yy, -1, (Select max(OrderDate) from Orders))
Group by ShipCountry
Order by AverageFreight desc;
```

Discussion

Using SQL like this that can generate a dynamic date range is critical for most data analysis work. Most reports and queries will need to be flexible, without hard-coded date values.

29. Inventory list

Answer

```
Select
  Employees.EmployeeID
  ,Employees.LastName
  ,Orders.OrderID
  ,Products.ProductName
  ,OrderDetails.Quantity
From Employees
  join Orders
    on Orders.EmployeeID = Employees.EmployeeID
  join OrderDetails
    on Orders.OrderID = OrderDetails.OrderID
  join Products
    on Products.ProductID = OrderDetails.ProductID
Order by
  Orders.OrderID
  ,Products.ProductID
```

Discussion

This problem is more practice with basic joins and multiple tables.

You can replace Join with Inner Join, but mostly people just use Join.

30. Customers with no orders

Answer

```
Select
    Customers_CustomerID = Customers.CustomerID
    ,Orders_CustomerID = Orders.CustomerID
From Customers
    left join Orders
        on Orders.CustomerID = Customers.CustomerID
Where
    Orders.CustomerID is null
```

Discussion

There are many ways of getting the same results. The main options are the Left Join with Is Null, Not In, and Not Exists.

Above, we used the Left Join option. When performance is equivalent, I prefer the Not In method, shown below.

```
Select CustomerID
From Customers
Where
   CustomerID not in (select CustomerID from Orders)
```

I believe this is the easiest to read and understand.

Another option is to use Not Exists. This requires a correlated subquery.

```
Select CustomerID
From Customers
Where Not Exists
   (
   Select CustomerID
   from Orders
   where
      Orders.CustomerID = Customers.CustomerID
   )
```

Performance for the different options can be affected by whether or not the fields are indexed or nullable. For additional reading on the details, check out this article:

NOT IN vs. NOT EXISTS vs. LEFT JOIN / IS NULL: SQL Server (https://explainextended.com/2009/09/15/not-in-vs-not-exists-vs-left-join-is-null-sql-server/).

31. Customers with no orders for EmployeeID 4

Answer

```
Select
   Customers.CustomerID
   ,Orders.CustomerID
From Customers
   left join Orders
      on Orders.CustomerID = Customers.CustomerID
      and Orders.EmployeeID = 4
Where
   Orders.CustomerID is null
```

Discussion

Because the filters in the Where clause are applied after the results of the Join, we need the EmployeeID = 4 filter in the Join clause, instead of the Where clause.

Run the below query and review the results. It should give you a better sense of how the left join with “is null” works. Note that the Where clause is commented out.

```
Select
   Customers.CustomerID
   ,Orders.CustomerID
   ,Orders.EmployeeID
From Customers
   left join Orders
      on Orders.CustomerID = Customers.CustomerID
      and Orders.EmployeeID = 4
-- Where
--      Orders.CustomerID is null
```

The most common way to solve this kind of problem is as above, with a left join. However, here are some alternatives using Not In and Not Exists.

```
Select CustomerID
From Customers
Where
   CustomerID not in (select CustomerID from Orders where EmployeeID = 4)

Select CustomerID
From Customers
Where Not Exists
   (
   Select CustomerID
   from Orders
```

```
    where Orders.CustomerID = Customers.CustomerID
    and EmployeeID = 4
)
```

Advanced Problems

32. High-value customers

Answer

```
Select
    Customers.CustomerID
    ,Customers.CompanyName
    ,Orders.OrderID
    ,TotalOrderAmount = SUM(Quantity * UnitPrice)
From Customers
    Join Orders
        on Orders.CustomerID = Customers.CustomerID
    Join OrderDetails
        on Orders.OrderID = OrderDetails.OrderID
Where
    OrderDate >= '20160101'
    and OrderDate  < '20170101'
Group by
    Customers.CustomerID
    ,Customers.CompanyName
    ,Orders.Orderid
Having Sum(Quantity * UnitPrice) > 10000
Order by TotalOrderAmount DESC
```

Discussion

If you tried putting this filter

```
and sum(Quantity * UnitPrice) >= 10000
```

… in the where clause, you got an error. Aggregate functions can only be used to filter (with some exceptions) in the Having clause, not the Where clause.

33. High-value customers - total orders

Answer

```
Select
    Customers.CustomerID
    ,Customers.CompanyName
    --,Orders.OrderID
    ,TotalOrderAmount = SUM(Quantity * UnitPrice)
From Customers
    Join Orders
        on Orders.CustomerID = Customers.CustomerID
    Join OrderDetails
        on Orders.OrderID = OrderDetails.OrderID
Where
    OrderDate >= '20160101'
    and OrderDate  < '20170101'
Group by
    Customers.CustomerID
    ,Customers.CompanyName
    --,Orders.Orderid
Having sum(Quantity * UnitPrice) > 15000
Order by TotalOrderAmount desc;
```

Discussion

All that was necessary here was to comment out references in the Select clause and the Group By clause to OrderID. By doing that, we're grouping at the Customer level, and not at the Order level.

34. High-value customers - with discount

Answer

```
Select
    Customers.CustomerID
    ,Customers.CompanyName
    ,TotalsWithoutDiscount = SUM(Quantity * UnitPrice)
    ,TotalsWithDiscount = SUM(Quantity * UnitPrice * (1- Discount))
From Customers
    Join Orders
        on Orders.CustomerID = Customers.CustomerID
    Join OrderDetails
        on Orders.OrderID = OrderDetails.OrderID
Where
    OrderDate >= '20160101'
    and OrderDate  < '20170101'
Group by
    Customers.CustomerID
    ,Customers.CompanyName
Having sum(Quantity * UnitPrice * (1- Discount)) > 10000
Order by TotalsWithDiscount DESC;
```

Discussion

Note that you need to use the new calculation for order totals with discounts in the Select clause, the Having clause, and also the Order by clause. In the Order by clause, you can re-use the alias that you created in the Select clause, but in the Having clause, you need to repeat the calculation.

35. Month-end orders

Answer

```
Select
   EmployeeID
   ,OrderID
   ,OrderDate
From Orders
Where OrderDate = EOMONTH(OrderDate )
Order by
   EmployeeID
   ,OrderID
```

Discussion

Very frequently the end of the month will be needed in queries and reports. The function EOMONTH was introduced in SQL Server 2012, so before that point, developers had to use a combination of functions like the below:

```
Where OrderDate = dateadd(month,1 + datediff(month,0,OrderDate),-1)
```

36. Orders with many line items

Answer

```
Select top 10
   Orders.OrderID
   ,TotalOrderDetails = count(*)
From Orders
   Join OrderDetails
      on Orders.OrderID = OrderDetails.OrderID
Group By Orders.OrderID
Order By count(*) desc
```

Discussion

What happens when you select the top 50 instead of top 10? There are many more rows that have 5 as the TotalOrderDetails. If you want to show all of them you can use the With Ties option as below:

```
Select top 10 With Ties
   Orders.OrderID
   ,TotalOrderDetails = count(*)
From Orders
   Join OrderDetails
      on Orders.OrderID = OrderDetails.OrderID
Group By Orders.OrderID
Order By count(*) desc
```

Note that the same query, with the “With Ties” keyword, now returns 37 rows because there are many rows with a value of 5 for TotalOrderDetails.

37. Orders - random assortment

Answer

```
Select top 2 percent
   OrderID
From Orders
Order By NewID()
```

Discussion

The NewID() function creates a globally unique identifier (GUID). When you order by this identifier, you get a random sorting. In this case, we're using

```
top 2 percent
```

...to get the top 2 percent instead of a specific number of rows.

Using NewID() on a very large table can cause some problems, see this article (https://msdn.microsoft.com/en-us/library/cc441928.aspx) for more details.

38. Orders - accidental double-entry

Answer

```sql
Select
   OrderID
From OrderDetails
Where Quantity >= 60
Group By
   OrderID
   ,Quantity
Having Count(*) > 1
```

Discussion

This SQL shows orders that have at least 1 order detail with a quantity of 60 or more (the Where clause), *and* the quantity is duplicated within the order (the Group by and Having clause). This occurs because we're grouping on *both* OrderID and Quantity.

39. Orders - accidental double-entry details

Answer

```
;with PotentialDuplicates as (
    Select
        OrderID
    From OrderDetails
    Where Quantity >= 60
    Group By OrderID, Quantity
    Having Count(*) > 1
    )
Select
    OrderID
    ,ProductID
    ,UnitPrice
    ,Quantity
    ,Discount
From OrderDetails
Where
    OrderID in (Select OrderID from PotentialDuplicates)
Order by
    OrderID
    ,Quantity
```

Discussion

There are quite a few different ways of getting the same results for this problem. Based on years of painful troubleshooting caused by poorly-written, tangled SQL, I suggest that writing easily understandable, straightforward code is one of the most important things to strive for. Using a well thought-out CTE is one way of doing this.

In the next problem, we'll look at another way of getting the same result.

40. Orders - accidental double-entry details, derived table

Answer

```
Select
   OrderDetails.OrderID
   ,ProductID
   ,UnitPrice
   ,Quantity
   ,Discount
From OrderDetails
   Join (
      Select distinct
         OrderID
      From OrderDetails
      Where Quantity >= 60
      Group By OrderID, Quantity
      Having Count(*) > 1
   )  PotentialProblemOrders
      on PotentialProblemOrders.OrderID = OrderDetails.OrderID
Order by OrderID, ProductID
```

Discussion

Note the Distinct keyword, added after the Select in the derived table. This gives us only distinct rows in the output, which avoids the problem with duplicate OrderIDs.

41. Late orders

Answer

```
Select
   OrderID
   ,OrderDate = convert(date, OrderDate)
   ,RequiredDate = convert(date, RequiredDate)
   ,ShippedDate = convert(date, ShippedDate)
From Orders
Where
   RequiredDate <= ShippedDate
```

Discussion

This is a straight-forward query that we'll use as a base for future problems.

42. Late orders - which employees?

Answer

```
Select
   Employees.EmployeeID
   ,LastName
   ,TotalLateOrders = Count(*)
From Orders
   Join Employees
      on Employees.EmployeeID = Orders.EmployeeID
Where
   RequiredDate <= ShippedDate
Group By
   Employees.EmployeeID
   ,Employees.LastName
Order by TotalLateOrders desc
```

Discussion

Note that both the LastName and the EmployeeID from the Employees table need to be included in the Group by clause, otherwise we get the error:

Msg 8120, Level 16, State 1, Line 3
Column 'Employees.LastName' is invalid in the select list because it is not contained in either an aggregate function or the GROUP BY clause.

Technically, EmployeeID is a primary key field, and since we're grouping by that already, there can only be one LastName associated with an EmployeeID. However, the database engine doesn't know this, and still requires the LastName in the Group by clause.

43. Late orders vs. total orders

Answer

```
;With LateOrders as (
   Select
      EmployeeID
      ,TotalOrders = Count(*)
   From Orders
   Where
      RequiredDate <= ShippedDate
   Group By
      EmployeeID
)
, AllOrders as (
   Select
      EmployeeID
      ,TotalOrders = Count(*)
   From Orders
   Group By
      EmployeeID
)
Select
   Employees.EmployeeID
   ,LastName
   ,AllOrders = AllOrders.TotalOrders
   ,LateOrders = LateOrders.TotalOrders
From Employees
   Join AllOrders
      on AllOrders.EmployeeID = Employees.EmployeeID
   Join LateOrders
      on LateOrders.EmployeeID = Employees.EmployeeID
```

Discussion

The above query is almost correct, but if you're paying careful attention, you'll realize it has a slight problem. We'll learn more in the next problem.

44. Late orders vs. total orders - missing employee

Answer

```
;With LateOrders as (
   Select
      EmployeeID
      ,TotalOrders = Count(*)
   From Orders
   Where
      RequiredDate <= ShippedDate
   Group By
      EmployeeID
)
, AllOrders as (
   Select
      EmployeeID
      ,TotalOrders = Count(*)
   From Orders
   Group By
      EmployeeID
)
Select
   Employees.EmployeeID
   ,LastName
   ,AllOrders = AllOrders.TotalOrders
   ,LateOrders = LateOrders.TotalOrders
From Employees
   Join AllOrders
      on AllOrders.EmployeeID = Employees.EmployeeID
   Left Join LateOrders
      on LateOrders.EmployeeID = Employees.EmployeeID
```

Discussion

If we wanted to show *all* employees, even if they had no orders, we would also have needed to use a Left Join for AllOrders.

45. Late orders vs. total orders - fix null

Answer

```
;With LateOrders as (
   Select
      EmployeeID
      ,TotalOrders = Count(*)
   From Orders
   Where
      RequiredDate <= ShippedDate
   Group By
      EmployeeID
)
, AllOrders as (
   Select
      EmployeeID
      ,TotalOrders = Count(*)
   From Orders
   Group By
      EmployeeID
)
Select
   Employees.EmployeeID
   ,LastName
   ,AllOrders = AllOrders.TotalOrders
   ,LateOrders = IsNull(LateOrders.TotalOrders, 0)
From Employees
   Join AllOrders
      on AllOrders.EmployeeID = Employees.EmployeeID
   Left Join LateOrders
      on LateOrders.EmployeeID = Employees.EmployeeID
```

Discussion

Using a straightforward IsNull on LateOrder is the best way to solve this problem.

Another way to write it would be using a Case statement

```
LateOrders =
    Case
        When LateOrders.TotalOrders is null Then 0
        Else LateOrders.TotalOrders
    End
```

But when you don’t need any other logic besides a test for null, IsNull is the way to go.

46. Late orders vs. total orders - percentage

Answer

```
;With LateOrders as (
   Select
      EmployeeID
      ,TotalOrders = Count(*)
   From Orders
   Where
      RequiredDate <= ShippedDate
   Group By
      EmployeeID
)
, AllOrders as (
   Select
      EmployeeID
      ,TotalOrders = Count(*)
   From Orders
   Group By
      EmployeeID
)
Select
   Employees.EmployeeID
   ,LastName
   ,AllOrders = AllOrders.TotalOrders
   ,LateOrders = IsNull(LateOrders.TotalOrders, 0)
   ,PercentLateOrders =
      (IsNull(LateOrders.TotalOrders, 0) * 1.00) / AllOrders.TotalOrders
From Employees
   Join AllOrders
      on AllOrders.EmployeeID = Employees.EmployeeID
   Left Join LateOrders
      on LateOrders.EmployeeID = Employees.EmployeeID
```

Discussion

If you just add a field like this:

```
PercentLateOrders = LateOrders.TotalLateOrders/AllOrders.TotalOrders
```

…you'll get 0 for all the fields, although that's obviously not correct. But this is what happens when you divide two integers together. You need to convert one of them to a data type such as decimal. A common way to convert to a decimal datatype is by multiplying by 1.00

Note that you need to convert the integer to a decimal *before* you do the division. If you do it after the division, like this:

```
(IsNull(LateOrders.TotalOrders, 0)  / AllOrders.TotalOrders) * 1.00
```

… you'll still get 0.

47. Late orders vs. total orders - fix decimal

Answer

```
;With LateOrders as (
   Select
      EmployeeID
      ,TotalOrders = Count(*)
   From Orders
   Where
      RequiredDate <= ShippedDate
   Group By
      EmployeeID
)
, AllOrders as (
   Select
      EmployeeID
      ,TotalOrders = Count(*)
   From Orders
   Group By
      EmployeeID
)
Select
   Employees.EmployeeID
   ,LastName
   ,AllOrders = AllOrders.TotalOrders
   ,LateOrders = IsNull(LateOrders.TotalOrders, 0)
   ,PercentLateOrders =
      Convert(
         Decimal (10,2)
         ,(IsNull(LateOrders.TotalOrders, 0) * 1.00) / AllOrders.TotalOrders
         )
From Employees
   Join AllOrders
```

```
    on AllOrders.EmployeeID = Employees.EmployeeID
Left Join LateOrders
    on LateOrders.EmployeeID = Employees.EmployeeID
```

Discussion

Rounding, truncating, and converting data types can get complicated, and there are many ways that you could get unexpected results. Always check your results carefully, and know whether you want rounding, or truncation.

Frequently, when creating this kind of query, you'll put the output into a tool like Excel, and do any additional formatting such as setting the decimal precision there. However, it's good to at least know how to do it in SQL.

You may have noticed that I added some new lines in the calculation to make it easier to read. This isn't necessary, but it's good programming practice, and easier to read and troubleshoot compared to having everything on one line.

48. Customer grouping

Answer

```
;with Orders2016 as (
    Select
        Customers.CustomerID
        ,Customers.CompanyName
        ,TotalOrderAmount = SUM(Quantity * UnitPrice)
    From Customers
        Join Orders
            on Orders.CustomerID = Customers.CustomerID
        Join OrderDetails
            on Orders.OrderID = OrderDetails.OrderID
    Where
        OrderDate >= '20160101'
        and OrderDate  < '20170101'
    Group by
        Customers.CustomerID
        ,Customers.CompanyName
)
Select
    CustomerID
    ,CompanyName
    ,TotalOrderAmount
    ,CustomerGroup =
        Case
            when TotalOrderAmount between 0 and 1000 then 'Low'
            when TotalOrderAmount between 1001 and 5000 then 'Medium'
            when TotalOrderAmount between 5001 and 10000 then 'High'
            when TotalOrderAmount > 10000 then 'Very High'
        End
from Orders2016
Order by CustomerID
```

Discussion

(Note - there's a small bug in the above SQL, which we'll review in the next problem.)

The CTE works well for this problem, but it's not strictly necessary. You could also use SQL like this:

```
Select
    Customers.CustomerID
    ,Customers.CompanyName
    ,TotalOrderAmount = SUM(Quantity * UnitPrice)
    ,CustomerGroup =
        Case
            when SUM(Quantity * UnitPrice) between 0 and 1000 then 'Low'
            when SUM(Quantity * UnitPrice) between 1001 and 5000 then 'Medium'
            when SUM(Quantity * UnitPrice) between 5001 and 10000 then 'High'
            when SUM(Quantity * UnitPrice) > 10000 then 'Very High'
        End
From Customers
    Join Orders
        on Orders.CustomerID = Customers.CustomerID
    Join OrderDetails
        on Orders.OrderID = OrderDetails.OrderID
Where
    OrderDate >= '20160101'
    and OrderDate  < '20170101'
Group By
    Customers.CustomerID
    ,Customers.CompanyName
```

This gives the same result, but notice that the calculation for getting the TotalOrderAmount was repeated 5 times, including the 4 times in the Case statement.

It's best to avoid repeating calculations like this. The calculations will usually be quite complex and difficult to read, and you want to have them only in one place. In something simple, like Quantity * UnitPrice, it's not necessarily a problem. But most of the time, you should avoid repeating any calculations and code. An easy way to remember this is with the acronym DRY - “Don’t Repeat Yourself”. Here’s an article (https://en.wikipedia.org/wiki/Don%27t_repeat_yourself) on the topic.

49. Customer grouping - fix null

Answer

```
;with Orders2016 as (
  Select
    Customers.CustomerID
    ,Customers.CompanyName
    ,TotalOrderAmount = SUM(Quantity * UnitPrice)
  From Customers
    Join Orders
      on Orders.CustomerID = Customers.CustomerID
    Join OrderDetails
      on Orders.OrderID = OrderDetails.OrderID
  Where
    OrderDate >= '20160101'
    and OrderDate  < '20170101'
  Group by
    Customers.CustomerID
    ,Customers.CompanyName
)
Select
  CustomerID
  ,CompanyName
  ,TotalOrderAmount
  ,CustomerGroup =
    case
      when TotalOrderAmount >= 0 and TotalOrderAmount  < 1000 then
'Low'
      when TotalOrderAmount >= 1000 and TotalOrderAmount  < 5000 then
'Medium'
      when TotalOrderAmount >= 5000 and TotalOrderAmount  <10000 then
'High'
      when TotalOrderAmount >= 10000 then 'Very High'
```

```
        end
from Orders2016
Order by CustomerID
```

Discussion

As you've been seeing in the above problems, knowing the data types you're working with and understanding the differences between them is important to get the right results. Using “between” would have been fine for integer values, but not for Money.

50. Customer grouping with percentage

Answer

```
;with Orders2016 as (
   Select
      Customers.CustomerID
      ,Customers.CompanyName
      ,TotalOrderAmount = SUM(Quantity * UnitPrice)
   From Customers
      join Orders
         on Orders.CustomerID = Customers.CustomerID
      join OrderDetails
         on Orders.OrderID = OrderDetails.OrderID
   Where
      OrderDate >= '20160101'
      and OrderDate  < '20170101'
   Group By
      Customers.CustomerID
      ,Customers.CompanyName
)
,CustomerGrouping as (
   Select
      CustomerID
      ,CompanyName
      ,TotalOrderAmount
      ,CustomerGroup =
         case
            when TotalOrderAmount >= 0 and TotalOrderAmount  < 1000 then
'Low'
            when TotalOrderAmount >= 1000 and TotalOrderAmount  < 5000
then 'Medium'
            when TotalOrderAmount >= 5000 and TotalOrderAmount  <10000
then 'High'
```

```
            when TotalOrderAmount >= 10000 then 'Very High'
        end
    from Orders2016
    -- Order by CustomerID
)
Select
    CustomerGroup
    , TotalInGroup = Count(*)
    , PercentageInGroup = Count(*) * 1.0/ (select count(*) from
CustomerGrouping)
from CustomerGrouping
group by CustomerGroup
order by TotalInGroup  desc
```

Discussion

In the answer we added an intermediate CTE called CustomerGrouping. CustomerGrouping is referenced twice - once to get the total number of customers in the group, and once to get the total, as the denominator for the percentage.

Notice that the Order by in the second CTE is commented out. If you leave it in, you get this error:

Msg 1033, Level 15, State 1, Line 32
The ORDER BY clause is invalid in views, inline functions, derived tables, subqueries, and common table expressions, unless TOP, OFFSET or FOR XML is also specified.

51. Customer grouping - flexible

Answer

```
;with Orders2016 as (
   Select
      Customers.CustomerID
      ,Customers.CompanyName
      ,TotalOrderAmount = SUM(Quantity * UnitPrice)
   From Customers
      Join Orders
         on Orders.CustomerID = Customers.CustomerID
      Join OrderDetails
         on Orders.OrderID = OrderDetails.OrderID
   Where
      OrderDate >= '20160101'
      and OrderDate  < '20170101'
   Group by
      Customers.CustomerID
      ,Customers.CompanyName
)
Select
   CustomerID
   ,CompanyName
   ,TotalOrderAmount
   ,CustomerGroupName
from Orders2016
   Join CustomerGroupThresholds
      on Orders2016.TotalOrderAmount between
         CustomerGroupThresholds.RangeBottom and
CustomerGroupThresholds.RangeTop
Order by CustomerID
```

Discussion

Note that this gives the same results as the original problem. However, instead of using hard-coded values in the Case statement to define the boundaries of the CustomerGroups, you have them in a table.

The benefit of this is that you don't need to duplicate the following code in every query where you need to group customers, since it's defined in the table.

```
,CustomerGroup =
   case
      when TotalOrderAmount >= 0 and TotalOrderAmount  < 1000 then 'Low'
      when TotalOrderAmount >= 1000 and TotalOrderAmount  < 5000 then
'Medium'
      when TotalOrderAmount >= 5000 and TotalOrderAmount  <10000 then
'High'
      when TotalOrderAmount >= 10000 then 'Very High'
   end
```

Also, take a look at the values in CustomerGroupThresholds.

```
select * From CustomerGroupThresholds
```

Note that there's no overlap between the rows, with regards to the RangeBottom and RangeTop. If it were a data type besides Money (which goes to 4 decimal places), there might be gaps or overlap.

52. Countries with suppliers or customers

Answer

```
Select Country From Customers
Union
Select Country From Suppliers
Order by Country
```

Discussion

There are 2 ways of using the Union statement. One is a simple Union as in the answer here. Using a simple Union statement eliminates all the duplicates in the resultset.

You can also use Union All. Try it and take a look at the resultset:

```
Select distinct Country From Customers
Union All
Select distinct Country From Suppliers
Order by Country
```

Notice that within the individual SQL statements, I’ve put a Distinct. However, there are still duplicates in the final output, because we have Union All, which doesn’t eliminate duplicates.

53. Countries with suppliers or customers, version 2

Answer

```
;With SupplierCountries as
   (Select Distinct Country from Suppliers)
,CustomerCountries as
   (Select Distinct Country from Customers)
Select
   SupplierCountry = SupplierCountries .Country
   ,CustomerCountry = CustomerCountries .Country
From SupplierCountries
   Full Outer Join CustomerCountries
      on CustomerCountries.Country = SupplierCountries.Country
```

Discussion

The Full Outer join isn't commonly used, but in certain situations it's critical. Another way that these queries could have been joined is via a derived table, like below.

```
Select
   SupplierCountry = SupplierCountries .Country
   ,CustomerCountry = CustomerCountries .Country
From (Select Distinct Country from Suppliers) SupplierCountries
   Full Outer Join (Select Distinct Country from Customers) CustomerCountries
      on CustomerCountries.Country = SupplierCountries.Country
```

In this instance, you get the identical output to the CTE option, but I think the CTE option is easier to read.

Why are CTEs, in general, easier to read? The main reason is that the code can be more logically structured, and read from top to bottom without needing to jump around to different sections. See this article (http://www.essentialsql.com/non-recursive-ctes/) for more details.

Are CTEs always the answer? No, not always. The main case in which you should switch from a CTE to something else (for instance, a table variable or temporary table) would be when you need to reference the results of the select statement multiple times, in a longer piece of code

54. Countries with suppliers or customers - version 3

Answer

```
;With SupplierCountries as
   (Select Country , Total = Count(*) from Suppliers group by Country)
,CustomerCountries as
   (Select  Country , Total = Count(*) from Customers group by Country)
Select
   Country = isnull( SupplierCountries.Country, CustomerCountries.Country)
   ,TotalSuppliers= isnull(SupplierCountries.Total,0)
   ,TotalCustomers= isnull(CustomerCountries.Total,0)
From SupplierCountries
   Full Outer Join CustomerCountries
      on CustomerCountries.Country = SupplierCountries.Country
```

Discussion

Note that we had to switch from Distinct to Group By in the CTE, because we needed to get the total with Count(*), for which you need to do a Group By.

The Full Outer type join is not very commonly used, but in some situations, it’s the only thing that will get the results we want.

55. First order in each country

Answer

```
;with OrdersByCountry as
(
   Select
      ShipCountry
      ,CustomerID
      ,OrderID
      ,OrderDate = convert(date, OrderDate)
      ,RowNumberPerCountry =
         Row_Number()
            over (Partition by ShipCountry Order by ShipCountry, OrderID)
   From Orders
)
Select
   ShipCountry
   ,CustomerID
   ,OrderID
   ,OrderDate
From OrdersByCountry
Where
   RowNumberPerCountry = 1
Order by
   ShipCountry
```

Discussion

Before Window functions were available, in previous versions of SQL Server, there were other options to get the same results.

The below returns the same resultset as we got with the Row_Number() function:

```
;with FirstOrderPerCountry as (
   Select
      ShipCountry
      ,MinOrderID = min(OrderID)
   From Orders
   Group by
      ShipCountry)
Select
   Orders.ShipCountry
   ,CustomerID
   ,OrderID
from FirstOrderPerCountry
   Join Orders
      on Orders.OrderID = FirstOrderPerCountry.MinOrderID
Order by
   Orders.ShipCountry
```

However, what if we had wanted to order by something else, and not the OrderID? For instance, the ShippedDate? Since ShippedDate isn't a unique value like OrderID, we would not have been able to join on it.

There are workarounds for this issue, but a Window function is definitely easier.

56. Customers with multiple orders in 5 day period

Answer

```
Select
   InitialOrder.CustomerID
   ,InitialOrderID = InitialOrder.OrderID
   ,InitialOrderDate = convert(date, InitialOrder.OrderDate)
   ,NextOrderID = NextOrder.OrderID
   ,NextOrderDate = convert(date, NextOrder.OrderDate)
   ,DaysBetween = datediff(dd, InitialOrder.OrderDate, NextOrder.OrderDate)
from Orders InitialOrder
   join Orders NextOrder
      on InitialOrder.CustomerID = NextOrder.CustomerID
where
   InitialOrder.OrderID < NextOrder.OrderID
   and datediff(dd, InitialOrder.OrderDate, NextOrder.OrderDate) <= 5
Order by
   InitialOrder.CustomerID
   ,InitialOrder.OrderID
```

Discussion

Including multiple instances of a table is one way of finding the answer we need.

When aliasing tables and columns, be careful to name them something meaningful, that you can read and understand your SQL.

57. Customers with multiple orders in 5 day period, version 2

Answer

```
;With NextOrderDate as (
    Select
        CustomerID
        ,OrderDate = convert(date, OrderDate)
        ,NextOrderDate =
            convert(
                date
                ,Lead(OrderDate,1)
                    OVER (Partition by CustomerID order by CustomerID, OrderDate)
                )
    From Orders
)
Select
    CustomerID
    ,OrderDate
    ,NextOrderDate
    ,DaysBetweenOrders = DateDiff (dd, OrderDate, NextOrderDate)
From NextOrderDate
Where
    DateDiff (dd, OrderDate, NextOrderDate) <= 5
```

Discussion

There's two main ways of solving this problem, the first using multiple instances of the table (which we did in the first version of the problem), and the other using Window functions.

Which is better? If we're okay with getting a narrower resultset, I'd prefer this version, using the Lead window function, instead of the previous solution.

But if we need multiple columns from the following order, then it's best to use the first version. Otherwise, you'd need multiple calculated columns with the same Partition and Order by.

Notice that the row count between the 2 answers are slightly different, 71 and 69. You can use this SQL to look at one difference in more detail.

```
Select
    CustomerID
    ,OrderID
    ,OrderDate
From Orders
Where
    CustomerID = 'ERNSH'
 Order by
    CustomerID
    ,OrderID
```

What causes the difference between the 2 answers?

Congratulations!

You're finished! If you have a moment, I would really appreciate a review of the book on Amazon.com (https://www.amazon.com/SQL-Practice-Problems-learn-doing/dp/1540422658). Your honest opinon can help people decide between the many SQL learning options available.

Now that you've completed the practice problems, you've improved your SQL skills tremendously. If you've just read through the book without actually writing out the SQL—that's a great start! I encourage you to go through the problems again, this time actually working out the SQL, and not looking at the answers and hints unless you need to.

Any comments and sugggestions are most welcome!
Please email me at:
feedback@SQLPracticeProblems.com.

Thank you!
Sylvia Moestl Vasilik