

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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ISBN: 978-1540422651

Ordering Information:

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associations, and others. For details, contact the publisher at
info@SQLPracticeProblems.com.

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/mBLhXiXlHW0?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 earlier problem, 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 or 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

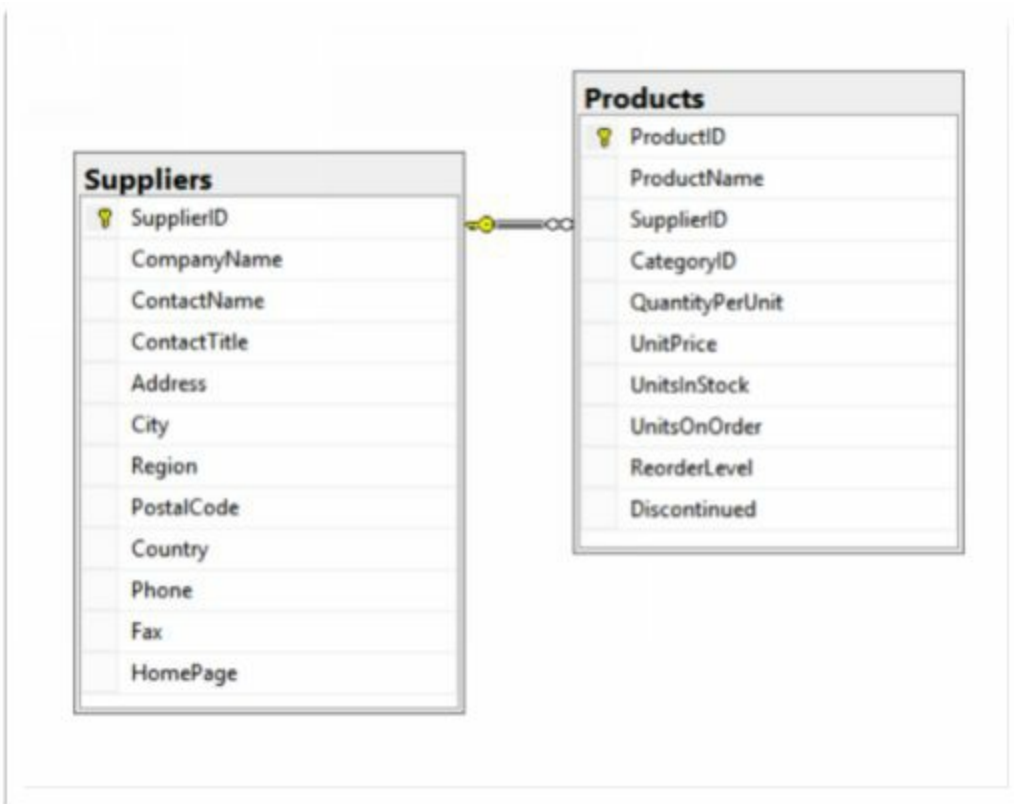
The answer for this problem builds on multiple concepts introduced in previous problem, such as grouping, aggregate functions, and aliases.

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

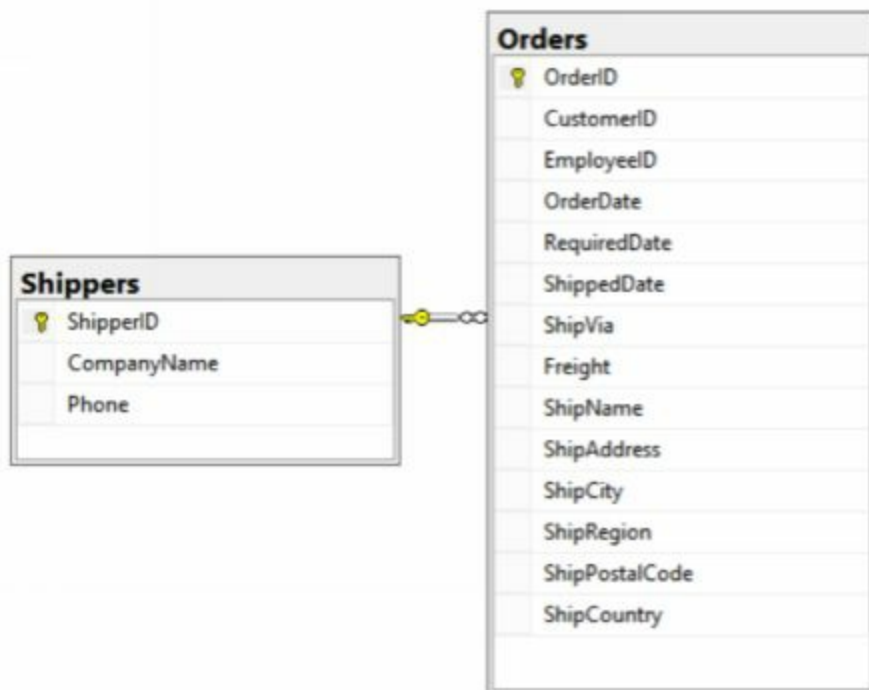
(52 row(s) affected)

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 to do 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 få 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 få 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	0.041666666666666
3	Leverling	127	5	0.0393700787401
4	Peacock	156	10	0.0641025641025
5	Buchanan	42	0	0.000000000000000
6	Suyama	67	3	0.0447761194029
7	King	72	4	0.055555555555555
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 statement 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

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

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 descending 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 easiest 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
        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 which 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

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 opinion 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 suggestions are most welcome! Please email me at: feedback@SQLPracticeProblems.com.

Thank you!

Sylvia Moestl Vasilik